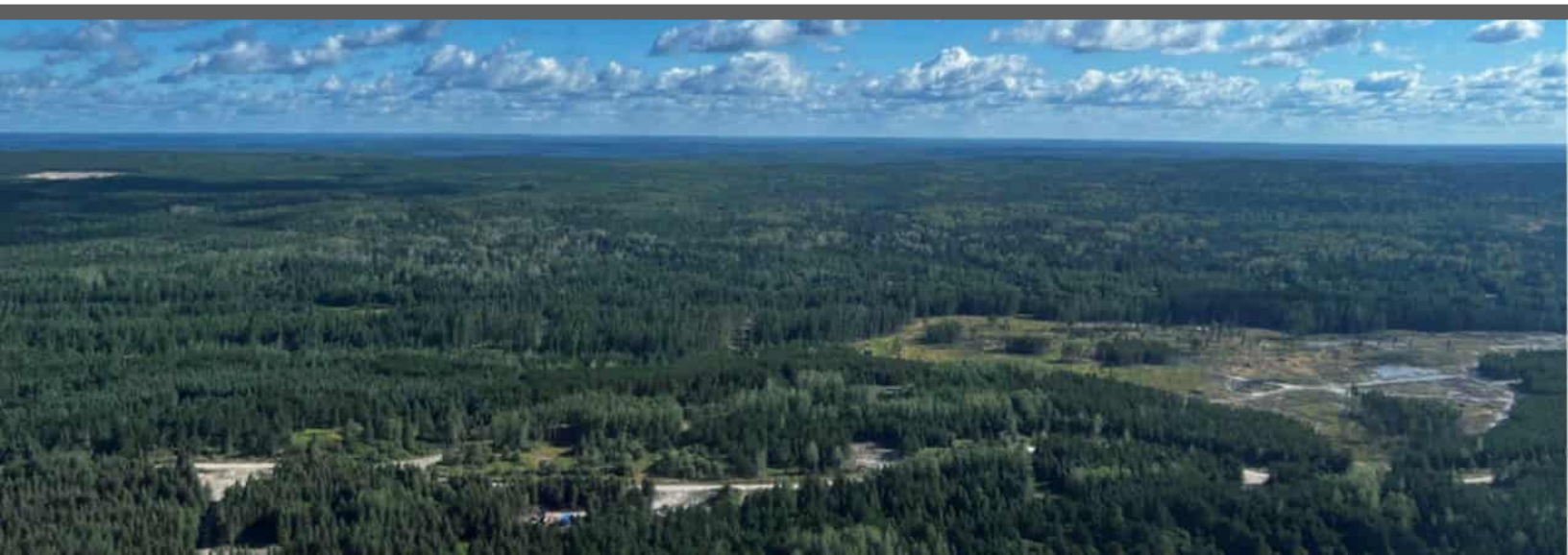
KINROSS Great Bear

Great Bear Gold Project
Impact Statement

Appendix C:

Record Of Engagement



Record of Consultation

Asubpeeschoseewagong Netum Anishinabek (Jan 1, 2022 to Jan 16, 2026)

Appendix C Record of Consultation: Asubpeeschoseewagong Netum Anishinabek (Jan 1, 2022 to Jan 16, 2026)

Ref. no.	Date	Organizations	Communication Type	Summary	Attachment ID
C-12920	22/08/29	Asubpeeschoseewagong Netum Anishinabek	Letter	Letter communication from Great Bear to Chief of ANA with a request from GBR to set up a discussion regarding the Great Bear Project in the Red Lake District. It introduces GBR as the new owner of the project and outlines its current exploration activities. The company plans to renew its mineral exploration permits in the fall and has been advised by the Ministry of Mines to notify ANA as a potentially interested community. GBR acknowledges the Ministry's role in consultation but expresses a desire to engage directly with ANA to understand its interests, potential concerns, and any effects on its people and lands. The company also seeks to establish a communication protocol for ongoing discussions. GBR states that, based on its understanding, its activities are outside ANA Territory but is open to updating this understanding through discussions. The letter invites ANA to coordinate a meeting—either in person or virtually—and provides a link for more information on the Great Bear Project.	Engagement not related to Project
C-12921	22/08/29	Asubpeeschoseewagong Netum Anishinabek	Email	Email communication from ANA Chief in response to letter communication dated August 29, 2022 noting that "We prefer our land to continue its healing journey which in turn our people will heal from the land . We do not wish to meet . There are many other areas in the Province yous can take your proposal . Miigwetch for respecting our stand to keep our territory clean."	
C-00897	22/11/11	Asubpeeschoseewagong Netum Anishinabek	Email	Great Bear issues congratulatory note to Chief and the ANA Council on their recent election and wishes them success in their term. The company, which recently acquired the Great Bear Project southeast of Red Lake, remains in the exploration phase and is renewing its mineral exploration permit and a permit to take water for drilling. As advised by the Ministry of Mines, ANA was notified of these applications, with a previous outreach to the previous Chief resulting in a respectful decline to meet, as the community focuses on healing. GBR continues to work closely with Wabauskang and Lac Seul First Nations under an Exploration Agreement, with both providing letters of support. The company remains open to any questions from Chief and Council and welcomes community interest in visiting the project site. GBR expresses sincere respect for ANA's	Engagement not related to Project
C-01933	22/11/11	Asubpeeschoseewagong Netum Anishinabek	Email	Great Bear inquiry to hold a short call with ANA leadership. Great Bear notes that they did hear from the Ministry of Mines that they had issued ANA an email this week, with information included about our Early Exploration permit application. Great Bear notes that we recognize that you and your Council and staff likely already have a number of your own projects underway, and settling in as new Chief and Council. Great Bear staff inquiry to check in with you, to help you with any questions you might have and to be sure you received the	Engagement not related to Project
C-01497	22/12/16	Asubpeeschoseewagong Netum Anishinabek	Email	Great Bear notice to ANA that it has submitted the Great Bear Resources Advanced Exploration Project Definition document and Notice of Project Status to the Ministry of Mines.	Engagement not related to Project
C-01934	22/12/16	Asubpeeschoseewagong Netum Anishinabek	Email	Great Bear notice to ANA that it has submitted the Great Bear Resources Advanced Exploration Project Definition document and Notice of Project Status to the Ministry of Mines for early review. All documentation issued to ANA for review. Request from Great Bear to meet with ANA in the new year to review this information and to understand key areas of interest to ANA. Great Bear request to confirm if there is anyone else on your Council or advisory team who should also be receiving this information, Great Bear notes they are happy to know and reach out to connect.	Engagement not related to Project
C-00973	23/02/08	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Energy & Mines (MOEM)	Email	Great Bear acknowledges ANAs request for a timeline extension on Exploration Permit PR-22-000284 and reaffirms the importance of the excluded claims. While supporting meaningful consultation, Great Bear does not oppose the extension, provided it remains reasonable and does not unduly impact its interests. If granted, Great Bear requests prior written notice and regular updates from the Ministry on any	Engagement not related to Project
C-00977	23/02/14	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Energy & Mines (MOEM)	Email	Email confirming timeline extension for ANA requested additional time to review the PR-22-000284 permit, specifically the 44 claims that were removed for further consultation. In response to the request, MINES sent a letter today (February 14th) requesting substantive comments regarding potential adverse impacts from the proposed exploration activities for this permit with comment period close on February 28, 2023. MINES will be in a position to make a decision on amending the permit to include the additional 44 mining claims, taking into account any specific comments received by that date.	Engagement not related to Project

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C-01337	23/06/22	Asubpeeschoseewagong Netum Anishinabek	Phone Call	Introduction meeting and discussion with ANA, detailing their history and involvement in community, the practices they have on the land. ANA presented a video on advancing Indigenous rights through Indigenous Protected and Conserved Areas, highlighting their ongoing land protection efforts and strong support from Chief and Council. The community has a long history of living off the land and has faced significant environmental and health impacts, including mercury contamination in the English and Wabigoon Rivers, clear-cut logging, and mining permits issued without consent. ANA declared a moratorium on industrial activity in 2007 and enacted a land declaration in 2018, banning mineral staking and exploration. ANA is committed to Free, Prior, and Informed Consent (FPIC) and has concerns about recent mining activity in their territory. ANA noted that they seek more meaningful engagement with GBR, including answers to their questions about laws and rights, and clarity on whether consent will be sought before moving forward with the project. GBR has committed to seeking consent but has not yet satisfied ANA's concerns. ANA is open to further dialogue and requests transparent, respectful communication, especially considering the language	Engagement not related to Project
C-01922	23/06/27	Asubpeeschoseewagong Netum Anishinabek	Email	Meeting planning between GBR and ANA Land Protection Team, along with follow up regarding questions about consultation, and ensuring that the Initial Project Description be shared prior to submission to the Impact Assessment Agency to initiate. GBR provides thanks for the opportunity to meet with the ANA Protection Team. As discussed, responses to the questions regarding the Early Exploration Permit application from October 2022 will be provided through the Ministry of Mines to ensure clear communication, with a response letter sent today. Our outreach last week was related to an upcoming advanced exploration permit application for the same project. GBR would appreciate the chance to further discuss the Great Bear Project and are setting up a SharePoint site for document sharing and feedback on the Advanced Exploration Project. Additionally, GBR will share the Initial Project Description of the main project before submitting it to the Impact Assessment Agency of Canada to initiate the impact assessment phase	Engagement not related to Project
C-01400	23/07/07	Asubpeeschoseewagong Netum Anishinabek Great Bear Gold Project Projet Aurifère Great Bear Impact Assessment Agency of Canada (IAAC)	Virtual	IAAC wanted to thank GBR for the opportunity to meet with the team regarding the Great Bear Gold Project, and for providing an overview of the Project. During the meeting, IAAC referenced a Project, specifically in relation to Asubpeeschoseewagong Netum Anishinabek (also known as ANA). IAAC pointed to section 9.3 of the Environmental Assessment Report, which describes the historical context, the Agency's engagement, and the views shared by the community with the Agency. The Agency encouraged GBR to think about how to collaborate with the Indigenous communities and include similar information in GBR documents.	
C-01290	23/07/24	Asubpeeschoseewagong Netum Anishinabek	Email	GBR providing an update to Asubpeeschoseewagong Netum Anishinabek and access to the Sharepoint.	
C-01347	23/08/15	Asubpeeschoseewagong Netum Anishinabek	Email	Introduction of External Relations Manager from GBR to ANA and sharing the AEX Environmental Compliance Approval Industrial Sewage Works Technical Support Document via SharePoint site. This document includes essential components such as supporting maps, technical data concerning discharge limits, the assimilative capacity of the Chukuni River ecosystem, a preliminary monitoring program, and the proposed treatment methodology. This document has been provided to Lac Seul First Nation, Wabauskang First Nation, and to the Ministry of Environment, Conservation and Parks, with the aim of seeking valuable input and insights. The opportunity to meet at their convenience was also presented.	Engagement not related to Project
C-01499	23/09/01	Asubpeeschoseewagong Netum Anishinabek Impact Assessment Agency of Canada (IAAC)	Email	The Great Bear team sincerely appreciate Asubpeeschoseewagong Netum Anishinabek's contributions during the June 22, 2023, meeting. We look forward to continued meaningful engagement and reiterate our offer of capacity funding. Great Bear notes they wish to explore synergies between the community's interests and the Great Bear Project's objectives. Invitation to reach out, and welcome the opportunity to meet in the community to discuss our commitments and next steps in person.	GNFN_09012023_01.pdf
C-01502	23/09/07	Asubpeeschoseewagong Netum Anishinabek	Email	GBR provides details of the attached Great Bear Advanced Exploration Program Reclamation Strategy. Document was prepared to summarize the reclamation strategy for the AEX program. The purpose of this memorandum is to seek input from Indigenous communities regarding the proposed closure strategy for the AEX Program. This document has been provided to Lac Seul First Nation, and Wabauskang First Nation, with the aim of seeking valuable input and insights. The opportunity to arrange a meeting with GBR has also been offered.	Engagement not related to Project
C-01529	23/09/07	Asubpeeschoseewagong Netum Anishinabek	Email	Communication from ANA expressing that at this moment there is limited capacity to review the AEX Closing Strategy memo at ANA, and that due to the reduced capacity emails, reviews, and other communications might take longer than usual. This is in reply to the receipt of the AEX Closure	Engagement not related to Project
C-01594	23/09/14	Asubpeeschoseewagong Netum Anishinabek Great Bear Gold Project Projet Aurifère Great Bear Ontario Ministry of Energy & Mines (MOEM)	Email	Communication directed to the IAAC from ANA, mentioning notable concerns relating to capacity, Indigenous rights, and lack of actions taken by the federal government. Notable concerns were also related to protocol raised by community.	GNFN_09142023_01.pdf

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C-01553	23/09/19	Asubpeeschoseewagong Netum Anishinabek Lac Seul First Nations Metis Nation of Ontario Ontario Ministry of Natural Resources (MNR) Wabaseemoong First Nation Wabauskang First Nation	Letter	MNRF providing GBR with letters and map sent to stakeholders and Indigenous communities regarding hunting closures needed for safety considerations of staff in designated area. The restriction is not intended to abrogate or restrict any rightsholder who is wishing to harvest.	GNFN_09192023_03.pdf GNFN_09192023_04.pdf
C-01638	23/09/26	Asubpeeschoseewagong Netum Anishinabek	Letter	Follow up to previous communication and in response to Asubpeeschoseewagong Netum Anishinabek's recent communication to the Impact Assessment Agency of Canada, the Great Bear team would like to reiterate its commitment to meeting with the Community and the Land Protection Team. Our goal remains to foster open and productive discussions regarding our Project, and we welcome discussion on capacity and participation considerations. Reiteration that the GBR team is open to arranging in-person, or virtual meetings at your convenience. The Great Bear team look forward to engaging in meaningful conversations with the Community. We are eager to identify potential synergies between the community's interests and the objectives of the Great Bear Project. Through this collaborative approach, our aim is to create a positive and mutually beneficial impact, contributing to community well-being.	GNFN_09262023_01.pdf
C-01670	23/09/28	Asubpeeschoseewagong Netum Anishinabek	Email	GBR provides details of the attached Great Bear Industrial Sewage Works Application Draft, and Great Bear ISW Aquatic Resources Monitoring Plan Draft supporting the Advanced Exploration (AEX) Program. Noted that both documents have been uploaded to the SharePoint site (links below). The Industrial Sewage Works and Aquatics application documents contain details related to: - Environmental setting - AEX Program project description - AEX Program water management plan - Assimilation Study, including CORMIX modelling - Proposed discharge limits to the Chukuni River (the proposed receiving environment) - Draft surface water monitoring programs - Draft aquatic monitoring programs The GBR team invites comment and input from the Land Protection Team. GBR reiterates that as part of the development of the Great Bear Project and the AEX Program is committed to robust mitigation and protection measures designed not only to meet regulatory standards but also to ensure the ongoing safeguarding of water resources. GBR requests the opportunity to arrange an in-person, brief call or virtual meetings at your convenience, in addition to dialogue on capacity and resources to support review.	Engagement not related to Project
C-01692	23/09/28	Asubpeeschoseewagong Netum Anishinabek	Email	In follow up to our earlier communications, GBR are happy to share with ANA the details of the attached Great Bear Environmental Compliance Approval for Air and Noise Draft, Emission Summary and Dispersion Modelling Report, Fugitive Dust Best Management Practices Plan supporting the Advanced Exploration (AEX) Program. All the documents have been uploaded to the SharePoint site. The GBR team welcomes comment and input from the Lands Protection Team. Consistent with GBR's prior communication GBR also provides the opportunity to arrange an in-person, call or virtual meeting at ANA's convenience, in addition to dialogue on capacity and resources to support review. The summary and cover letter are attached.	Engagement not related to Project
C-01728	23/10/06	Asubpeeschoseewagong Netum Anishinabek	Email	GBR provides details of the attached Great Bear Advanced Exploration Program, Permit to Take Water Application for Dewatering for draft input and review. The GBR team looks forward to your comments and ongoing input from the Lands Protection Team. As refelcted in the communication GBR offers to arrange an in-person, phone call or virtual meetings at your convenience. The GBR team welcomes the opportunity to discuss dialogue on resources to support ongoing input and review needs for advanced exploration documentation, and federal approvals for the Great Bear Project.	Engagement not related to Project
C-01869	23/10/06	Asubpeeschoseewagong Netum Anishinabek	Email	Details of the Great Bear Advanced Exploration Program, Permit to Take Water Application for Dewatering for draft input and review.	Engagement not related to Project
C-01983	23/10/06	Asubpeeschoseewagong Netum Anishinabek	Email	ANA requesting access to the WSP SharePoint to access the AEX PTTW for Dewatering report.	Engagement not related to Project
C-01898	23/10/19	Asubpeeschoseewagong Netum Anishinabek	Letter	Reception of letter from ANA FN Land Protection Team regarding their comments on the previous communications and IAAC concerns that have not been addressed. The letter expresses concern over IAAC's handling of the Great Bear Gold Project, citing lack of meaningful engagement, exclusion from the pre-planning phase, and failure to respect their unique circumstances, including grieving periods and capacity challenges. They argue the impact assessment process is premature, as GBR has not demonstrated a viable project, and unresolved strategic issues between ANA and the Crown remain. The letter calls for IAAC to terminate the current process and restart it only after addressing these fundamental concerns, ensuring ANA is meaningfully involved from the outset.	GNFN_10192023_01.pdf

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Ref. no.	Date	Organizations	Communication Type	Summary	Attachment ID
C-01902	23/10/20	Asubpeeschoseewagong Netum Anishinabek	Email	Great Bear sharing the Advanced Exploration Program Preliminary Mine Rock Management and Monitoring Plan Memorandum for the Great Bear Project, detailing metal leaching and acid rock drainage considerations. The memorandum outlines current geochemical test data, management plans for mine rock and overburden, and mitigation strategies to minimize potential environmental impacts. A monitoring plan is also included, with updates planned as more data becomes available. GBR welcomes feedback from the Lands Protection Team and is open to meetings to discuss input, capacity support, and review needs. The document has also been shared with Lac Seul and Wabauskang First Nations for their input. Great Bear notes that this document will continue to be updated with additional program planning and geochemical information when available, along with a request for meeting.	Engagement not related to Project
C-01905	23/10/20	Asubpeeschoseewagong Netum Anishinabek	Email	Distribution of the AEX Hydrogeology Monitoring Plans and other information related to the Advanced Exploration Program (AEX) for the Great Bear Project in support of the previous Environmental Compliance Approval for Industrial Sewage Works. This plan includes details related to monitoring approaches, mitigation, contingency measures, and data reporting.	Engagement not related to Project
C-02001	23/10/31	Asubpeeschoseewagong Netum Anishinabek Impact Assessment Agency of Canada (IAAC)	Email	Communication from the IAAC to indicate that the ANA Lands Protection Team had emailed them to schedule a joint meeting and discuss the preparation of a process agreement and address capacity supports.	
C-01975	23/11/03	Asubpeeschoseewagong Netum Anishinabek	Email	Providing ANA with a Draft Closure Plan via SharePoint. The plan builds on the previously issued Closure Strategy Memorandum. The key objective of the draft Closure Plan with respect to the AEX Program are to: Provide for the rehabilitation of affected landscapes, and return of affected ecosystems to a self-sustaining and function state that considers the desires of local Indigenous groups; Seek to the extent practice promote vegetation communities that will support habitat for local terrestrial species, and aquatic habit that will support health fish populations; Prevent, reduce or mitigate the adverse environmental effects associated with construction and operations of the AEX Program, during the closure and post-closure phases; and Reduce the need for long-term monitoring and maintenance of the AEX Program area. GBR also adds that they are looking forward to receiving comments from ANA, and that they welcome the opportunity to discuss capacity resources to support ongoing input and review needs as well.	Engagement not related to Project
C-02046	23/11/07	Asubpeeschoseewagong Netum Anishinabek Impact Assessment Agency of Canada (IAAC)	Email	Communications with ANA and the IAAC regarding their availabilities for a meeting. The proposed meeting agenda from ANA addresses the issues with the IA process to date, the premature initiation of process, the pre-planning timeline and appropriate discussion along with demands to suspend process and restart if possible. Follow-up and by Great Bear team was proposed to ANA Lands Protection Team to discuss a pause to the Phase 1 process to allow for time to prepare a Process Agreement and address capacity supports.	GNFN_11072023_01.pdf
C-01967	23/11/10	Asubpeeschoseewagong Netum Anishinabek	Email	Sharing the draft Detailed Project Description for the Great Bear Project via SharePoint with ANA. Indicated by GBR that the comments anticipated are appreciated and that a follow-up meeting to discuss can be scheduled, and that Great Bear looks forward to the upcoming joint meeting with the IAAC. Great Bear notes commitment to ongoing dialogue and welcome the opportunity to confirm a mutually agreeable approach to ensure that the Lands Protection Team and leadership can participate in an informed and capacity supported manner.	
C-02076	23/11/10	Asubpeeschoseewagong Netum Anishinabek Impact Agency of Canada (IAAC)	In Person	Meeting between representation of ANA, GBR, and the Impact Assessment Agency of Canada. IAAC provided presentation materials ahead of meeting to support, note ANA provided notice that review of GBR provided materials will not be completed at this time. Principal dialogue occurred between representatives GBR and ANA. Request from ANA to apply a pause to all activities until former protocol agreement can be put in place to ensure information sharing. Noted commitment to affirm follow up meeting timing to address actions, including consideration to pause. GBR staff reaffirmed Company commitment to provide capacity to support informed dialogue, but will not pause the permit reviews. GBR has shared all the information starting in 2022. Key concerns articulated by ANA included a focus on community dialogue and integration of that knowledge over the course of the Project, lack of consultation to date, requirement for an appropriate protocol, and illustrating concerns that the Project presents an ongoing risk to the communities Aboriginal and Treaty Rights. ANA explained that it wants to resolve long-standing issues with Ontario and Canada first before it supports any development. ANA will not support the Project no matter what GBR does to resolve ANA concerns about the Project.	GNFN_11102023_01.pdf

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Ref. no.	Date	Organizations	Communication Type	Summary	Attachment ID
C-01959	23/11/17	Asubpeeschoseewagong Netum Anishinabek	Email	Thank you message from GBR to ANA for meeting with the team on November 10th, GBR expressed their importance in understanding their interests as well as explaining ours, and emphasizing the value that they place on these relations. Commitment to community is also emphasized as they wish to continue engaging and keeping the community informed and receiving their input. A follow-up meeting was discussed to further proceed on positive footing and to establish a Process Protocol to define and facilitate Great Bear decisions and to also review project timelines and permitting and the request from ANA to pause all activities. A follow-up meeting with dates and methods were provided to ANA.	GNFN_11172023_01.pdf
C-02032	23/11/20	Asubpeeschoseewagong Netum Anishinabek	Email	Contact from GBR to ANA regarding archeological findings. Further condolences and understanding is extended to the community, along with ensuring that timely information sharing from GBR will still occur and not to worry about delays from the Lands Protection Team. The Great Bear team completed a Stage 2 Archaeological Assessment this year as part of the ongoing development of the Project. Our team has received preliminary information that several sites were identified as requiring a Stage 3 Archeological Assessment. A Stage 3 archaeological assessment is planned for 2024 to determine the extent, depth, and complexity of these sites. Collaboration with Indigenous partners is sought to develop investigation strategies and mitigation measures. The final Stage 2 report will be shared upon completion, and discussions are encouraged for Stage 3 planning and mitigation approaches. Assessment work is intended to accomplish two primary objectives: to determine the extent and complexity of the archaeological resource identified at Stage 2 and to work with Indigenous Communities in developing strategies for investigating the sites and for determining appropriate mitigation measures. The Great Bear team welcomes the participation of the Lands Protection Team in its completion, and hope this can be discussed and planned to move forward.	
C-02023	23/11/27	Asubpeeschoseewagong Netum Anishinabek	Email	Following up and thanking the ANA for meeting with the GBR team on November 10, 2023. Great Bear communicated that they understand the interests and acknowledged current community conditions and direction of ANA. This consideration was emphasized along with the further engagement and consultation note and continuation across the Project. A follow-up meeting was discussed to establish a process protocol and define and facilitate further Great Bear discussions with the Lands Protection Team.	
C-02109	23/12/05	Asubpeeschoseewagong Netum Anishinabek	Email	GBR sending ANA a draft engagement protocol in anticipation for the upcoming meeting between ANA and GBR.	GNFN_12052023_01.pdf
C-02094	23/12/15	Asubpeeschoseewagong Netum Anishinabek	In Person	Meeting between representation of ANA and GBR. Key Considerations and discussion centered on GBR applying a pause to project related activities, consent of ANA to the project, and considerations to ANA law. Noted dialogue on capacity funding and formation of a fulsome engagement agreement. Note that no dialogue related to project components outside of considerations to timeline of project.	Confidential engagement
C-02099	23/12/15	Asubpeeschoseewagong Netum Anishinabek	Letter	Follow-up from November 10th meeting with ANA. GBR expresses the importance of establishing good relations and understanding interests, along with the suggestion of a follow-up to proceed, and develop a process protocol. A follow-up meeting was established for December 15th over Zoom, with the Agenda including: Pause to IA process proposed by ANA, ANA law, Right to Consent, Engagement Protocol, and Capacity Funding. ANA also provided two documents to assist with the discussion which include the List of Issues for Negotiation between ANA and Mines, and the ANA assumptions for Great Bear Project Capacity Supports.	Confidential engagement
C-02258	24/01/02	Asubpeeschoseewagong Netum Anishinabek	Email	Funding agreement and timeline distributed to ANA in response to the December 15th, 2023 meeting. GBR extended their thanks to ANA and stated that they look forward to meeting with the Lands Protection Team and are excited to	Confidential engagement
C-02390	24/01/02	Asubpeeschoseewagong Netum Anishinabek	Letter	Distribution of the Funding Agreement and Timeline to ANA in follow-up to the December 15th, 2023, meeting. Great Bear provides detailed timelines and anticipated submission dates to ANA for consideration. Great Bear reiterates their eagerness to continue dialogue and meet with the Lands Protection Team into 2024. Capacity funding formally offered for consideration by ANA Lands Protection Team.	Confidential engagement
C-02358	24/01/31	Asubpeeschoseewagong Netum Anishinabek	Email	GBR providing an update on the proposed Work Permit(s) for the work on two rights-of-way (ROWs) over Crown land and leased land in support of the Advanced Exploration Program for the effluent discharge pipeline and associated infrastructure along with the connection of the natural gas pipeline with existing Enbridge metering station. Files included a Summary of Project Description for determination of a class EA, the Work Permit Application for Easement and Culvert Crossings; the Land Use Permit to cover the land tenure until land is brought to lease, and Request for Review from Department of Fisheries and Oceans. GBR also notes that a power line is mentioned in the WP however due to the decision not to heat trace the effluent line this distribution line is no longer needed now. Shapefiles related to the right of way, and	Engagement not related to Project
C-02467	24/01/31	Asubpeeschoseewagong Netum Anishinabek	Email	GBR providing an update on the proposed Work Permit for two ROWs over Crown Land and leased land in support of AEX, which further supports effluent discharge pipelines and associated infrastructure, and a natural gas pipeline in connection to the Enbridge metering station. GBR informed ANA regarding the submission to the MNRF submission along with which files are currently under review. A follow-up meeting with GBR was offered, along with anticipation of any immediate questions.	Engagement not related to Project

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C-02404	24/02/02	Asubpeeschoseewagong Netum Anishinabek	Email	Notification to ANA of the lease applications being sent to the Provincial Mining Recorder to start the Lease Mining Claims as of Februaty 2nd, 2024. Four separate lease packages and location maps were attached for review.	ANA_020224_01.pdf ANA_020224_02.pdf ANA_020224_03.pdf ANA_020224_04.pdf
C-02415	24/02/02	Asubpeeschoseewagong Netum Anishinabek	Email	Distribution of materials to ANA to better understand the approach Great Bear is currently taking to regional work relating to Species at Risk. The Lands Protection Team expressed interest in our environmental approach and its connection to the land and species. Our terrestrial ecology work has identified Wolverine as a notable species. To build on this research, we will be submitting an application and proposed scope of work to the MNRF for Wolverine run poles. GBR proposes constructing and operating two to three baited run poles as part of monitoring requirements under the provincial Endangered Species Act (ESA) for early mineral exploration. Run poles, a non-invasive method, help identify individual Wolverines by their unique chest markings. This approach aligns with successful monitoring efforts in Red Lake by the Wildlife Conservation Society. Great Bear looks forward to discussing our baseline program and terrestrial findings in our next meeting.	Engagement not related to Project
C-02409	24/02/08	Asubpeeschoseewagong Netum Anishinabek	Email	Distributing the Notice of Commencement for the Great Bear Temporary Power Project to ANA prior to the public distribution of the notice for radio, event boards, Facebook, and the Chronicle Journal.	GNFN_02082024_01.pdf
C-02424	24/02/09	Asubpeeschoseewagong Netum Anishinabek	Email	ANA request to have SharePoint Site Access. GBR replied that they had provided access.	
C-02470	24/02/16	Asubpeeschoseewagong Netum Anishinabek	Email	Further distribution of the Work Permit/ROW for the AEX program to ANA legal team.	Engagement not related to Project
C-04271	24/02/28	Asubpeeschoseewagong Netum Anishinabek	Email	Confirmation from ANA that they were able to download the AEX documents sent.	Engagement not related to Project
C-04272	24/02/28	Asubpeeschoseewagong Netum Anishinabek	Email	ANA confirming they have reviewed the funding agreement proposal, and sending over the assumptions and budget reflecting capacity needs for engagement in the Great Bear Project.	Confidential engagement
C-06433	24/02/28	Asubpeeschoseewagong Netum Anishinabek	Email	ANA stating that they have reviewed the funding agreement proposal, and issue back an attached assumptions and budget reflecting the capacity needs in order to engage with the GBR Project moving forward.	Confidential engagement
C-04279	24/03/07	Asubpeeschoseewagong Netum Anishinabek Impact Assessment Agency of Canada (IAAC) Ontario Ministry of Northern Economic Development and Growth (MNEDG)	Letter	ANA issued communication and memorandum report on their preliminary concerns about the Great Bear Project. Letter issued to GBR, Ministry of Mines and IAAC. In the letter, ANA explains their deep concern about the project and the impact it will have on the community. ANA formally rejects the Great Bear Project, asserting its inherent jurisdiction and governance over its lands. ANA opposes all permitting and approvals, citing environmental risks to water, wildlife, and traditional land use. It emphasizes a long-standing commitment to resisting industrial resource extraction and insists that no consultation or mitigation can justify the project. ANA demands that federal and provincial authorities respect Anishinaabe law and governance, reaffirming its sovereignty and right to self-determination.	GNFN_030724_01.pdf
C-06390	24/03/07	Asubpeeschoseewagong Netum Anishinabek Environment and Climate Change Canada Great Bear Gold Project Projet Aurifère Great Bear Ontario Ministry Indigenous Affairs & First Nations Economic Reconciliation (IAFNER) Ontario Ministry of Energy & Mines (MOEM) Ontario Ministry of Environment, Conservation and Parks (MECP) Ontario Ministry of Natural Resources (MNR)	Email	Correspondence attached from the Chief and Council of ANA concerning the Great Bear Gold Project. The letter explains ANA's views on the Crown's outstanding obligations to ANA, and the ANA concerns surrounding the process of Ontario's current approach, and the path to reconciliation. The letter also highlights ANA preliminary specific concerns regarding the downstream, and on-site, landscape, spiritual, and other impacts.	GNFN_030724_02.pdf
C-06434	24/03/07	Asubpeeschoseewagong Netum Anishinabek	Letter	GBR distributing a response letter to ANA in response to the budget request. GBR offered to provide ANA with interim funding to facilitate review for the AEX Permit Application. GBR invited ANA to a meeting at a time convenient to the Lands Protection Team after March 11th. Budget request is in relation to that issued by ANA to GBR on February 28th, 2024.	Engagement not related to Project
C-06435	24/03/07	Asubpeeschoseewagong Netum Anishinabek	Email	ANA response to GBR's letter regarding funding. ANA confirmed availability for a meeting on March 21st.	Confidential engagement
C-06436	24/03/07	Asubpeeschoseewagong Netum Anishinabek	Email	GBR agrees to proposed meeting time by ANA. GBR also reiterates that they look forward to speaking with the Lands Protection Team. They also asked ANA to confirm if their team will provide a link to a virtual meeting, or if they would prefer GBR sent one.	
C-06438	24/03/08	Asubpeeschoseewagong Netum Anishinabek	Email	ANA providing the details for the Zoom meeting on March 21st from 3-4 PM CDT.	
C-06439	24/03/08	Asubpeeschoseewagong Netum Anishinabek	Email	GBR thanking ANA for providing the call-in details in anticipation for the March 21st meeting. GBR reiterates their thanks for the meeting and inquires if ANA would appreciate a presentation on the status of the Project or any other recent	
C-06440	24/03/08	Asubpeeschoseewagong Netum Anishinabek	Email	ANA thanks GBR for their previous capacity office to support review of Advanced Exploration materials, and notes that at this time no discussion on materials will occur. ANA states that do to lack of capacity funding to engage with GBR the only purpose of the meeting is to discuss capacity funding and budget request. ANA also reiterates that the proposed capacity funding is insufficient at this time.	Engagement not related to Project

Appendix C Record of Consultation: Asubpeeschoseewagong Netum Anishinabek (Jan 1, 2022 to Jan 16, 2026)

Ref. no.	Date	Organizations	Communication Type	Summary	Attachment ID
C-06441	24/03/12	Asubpeeschoseewagong Netum Anishinabek	Email	WSP providing the emails which gave ANA members the access to the Sharepoint site.	
C-07763	24/03/21	Asubpeeschoseewagong Netum Anishinabek	Virtual	ANA and GBR held a virtual meeting on March 21, 2024. In this meeting, GBR reiterated the stance that the capacity funding committed is intended to be interim in nature, to support immediate participation while the Lands Protection Team and GBR discuss the larger budget request and define the communication protocol forward for the Great Bear Project.	Confidential engagement
C-07569	24/03/22	Asubpeeschoseewagong Netum Anishinabek Great Bear Gold Project Projet Aurifère Great Bear	Email	The Impact Assessment Agency of Canada (Agency) is of the opinion that a federal impact assessment is warranted for the Great Bear Gold Project, as proposed by GBR (the Proponent). This opinion is based on the Agency's review of the Detailed Project Description and the responses to the Summary of Issues, along with the consideration of other factors, including comments received to date from Indigenous communities, federal authorities, provincial ministries, and the	GNFN_032224_01.pdf
C-06487	24/03/26	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Energy & Mines (MOEM)	Letter	ANA reiterated concerns regarding the permitting process for the Great Bear Gold Project to the Ministry of Mines and copied Great Bear, emphasizing the significant barriers that prevent meaningful engagement. Despite repeated communications about these challenges, ANA expressed concern that MINES will proceed without addressing them. The proposed advanced exploration activities are extensive and akin to opening a small to medium-sized mine, with significant potential impacts on water quality, fish, wildlife, and ANA's rights and interests. Of particular concern is the risk of mercury methylation, given the existing contamination in the river system. A preliminary review of the permit application revealed substantial gaps in information, particularly regarding the release of substances into the environment and their effects on downstream communities. ANA asserts that free, prior, and informed consent (FPIC) is required and requests additional time and capacity support to conduct a thorough assessment. The community cautions that its inability to respond in detail at this stage should not be misinterpreted as a lack of concern. The consultation process has been flawed from the outset, with MINES erroneously assessing the duty to consult as "low," failing to seek input from ANA on its rights and land use, and improperly delegating consultation to GBR. The assessment overlooked key factors, including ANA's historical and ongoing use of the project area for hunting and other activities, its position as the first downstream community, and the severe cumulative effects the community has already endured. Despite recent developments, MINES has not committed to addressing cumulative impacts, land use control	Confidential engagement
C-07531	24/03/26	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Energy & Mines (MOEM)	Letter	Attachments from Chief and Council of Asubpeeschoseewagong Netum Anishinabek, concerning the Great Bear Gold Project including the following: ANA Juridical Review Application Records, Papers on Mercury Exposure, ANA Child Report, ANA Interim Core Area for Mining. This communication was in follow up to letter communication issued previously to the Ministry of Mines.	GNFN_032624_02.pdf GNFN_032624_03.pdf GNFN_032624_04.pdf GNFN_032624_05.pdf GNFN_032624_06.pdf GNFN_032624_07.pdf GNFN_032624_08.pdf GNFN_032624_09.pdf GNFN_032624_10.pdf GNFN_032624_11.pdf GNFN_032624_12.pdf GNFN_032624_13.pdf GNFN_032624_14.pdf GNFN_032624_15.pdf GNFN_032624_16.pdf GNFN_032624_17.pdf
C-06488	24/03/29	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Energy & Mines (MOEM)	Letter	ANA issues communication to GBR and Ministry of Mines. Communication details ANA's evaluation of the expected water quality both during and after Advanced Exploration from the Minesite Drainage Assessment Group. The letter states that the project cannot be started with sufficient certainty of environmental protection and avoidance of all off site contamination due to missing, preliminary and contradictory ML-ARD information inconsistent with regulations. The email distributing the letter also stated that they continue to urge Mines/GBR to not make a decision until complete information has been provided and ANA's review is completed.	Engagement not related to Project

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Ref. no.	Date	Organizations	Communication Type	Summary	Attachment ID
C-07667	24/04/04	Asubpeeschoseewagong Netum Anishinabek Great Bear Gold Project Projet Aurifère Great Bear Ontario Ministry Indigenous Affairs & First Nations Economic Reconciliation (IAFNER) Ontario Ministry of Energy & Mines (MOEM)	Letter	ANA letter to IAAC in response to the March 22, 2024 correspondence to Chief Turtle advising the IAAC opinion that a federal assessment is warranted for the Great Bear Gold Project. ANA reaffirms its expectation that the consultation process for the Great Bear Gold Mine Project adhere to the standard of free, prior, and informed consent (FPIC), as outlined in the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) and Canada's UNDRIP Act. ANA insists that the Impact Assessment Agency of Canada (IAAC) align the federal impact assessment process with the principles of FPIC, particularly in relation to projects impacting Indigenous lands and resources. Canada's endorsement of UNDRIP requires this standard of consultation, and ANA expects that the Agency respect its right to either provide or withhold consent throughout the process. The letter emphasizes several expectations for the impact assessment: the process must be co-created with ANA, tailored to their unique circumstances, and require ANA's consent. The Impact Assessment should be paused until the concerns expressed by ANA are addressed, and consent is obtained. Additionally, the assessment should include a determination of whether ANA's FPIC has been secured, and its scope must encompass all activities that could affect the Nation's rights and interests. The letter further stresses that no project-related impacts under federal authority should proceed without obtaining ANA FPIC. ANA requests a written response outlining how Article 32 of UNDRIP will be implemented in the	GNFN_040424_01.pdf
C-07668	24/04/04	Asubpeeschoseewagong Netum Anishinabek Impact Assessment Agency of Canada (IAAC) Ontario Ministry of Energy & Mines (MOEM)	Letter	GBR's response to ANA communication letters sent on March 6th, 2024 and March 27th, 2024. Great Bear distributed multi part response letter, citing the March 27th letter, a memo on the AEX program regarding the water and water quality, and project footprint, and the consultation record between GBR and ANA. GBR notes in communication that it acknowledges ANA's concerns outlined in the 6 March 2024 letter and seeks to establish positive relations with local Indigenous communities, including ANA, through transparent engagement. Great Bear is committed to explaining the Project, listening to community interests, and working to reconcile various perspectives. Many of the concerns raised by ANA are already included in the scope of the planned federal impact assessment, where they will be addressed. For concerns related to GBR's Advanced Exploration (AEX) Permit, GBR has provided specific responses. GBR will continue to engage with ANA throughout the project's review stages to gather input, inform planning, and address reasonable concerns.	Engagement not related to Project
C-07670	24/04/05	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Energy & Mines (MOEM)	Email	Distribution of the finalized Closure Plan to ANA, along with re-sending ANA the letter distributed on March 27, 2024 and GBR's response. This document attached outlines GBR's response to the comments in the MSDAG Letter on behalf of Asubpeeschoseewagong Netum Anishinabek (ANA), particularly regarding the geochemical information in the Advanced Exploration Program Draft Closure Plan (AEX Program Draft CP). GBR has addressed these concerns in the table provided. Since submitting the AEX Program Draft CP, GBR has continued environmental baseline investigations, geochemistry programs, and engineering designs, incorporating new findings into the plan. While updates are being made to reflect the latest results, the overall project design and reclamation strategy remain unchanged. GBR is committed to meeting or exceeding regulatory requirements and will share the Final AEX Program Closure Plan with ANA once completed.	Engagement not related to Project
C-07806	24/04/16	Asubpeeschoseewagong Netum Anishinabek	Email	GBR confirming with ANA that this message was received, and GBR will discuss internally and get back to on a proposal for the budget meeting.	
C-07795	24/04/25	Asubpeeschoseewagong Netum Anishinabek Crown-Indigenous Relations and Northern Affairs Canada Environment and Climate Change Canada Impact Assessment Agency of Canada (IAAC) Indigenous Services Canada Ontario Ministry Indigenous Affairs & First Nations Economic Reconciliation (IAFNER) Ontario Ministry of Energy & Mines (MOEM) Ontario Ministry of Environment, Conservation and Parks (MECP) Ontario Ministry of Labour, Immigration, Training and Skills Development (MLITSD) Ontario Ministry of Natural Resources (MNR)	Letter	Letter from ANA Lands Protection Team, concerning the Great Bear Gold Project directed to IAAC, and Mines and GBR in copy. The correspondence includes two documents prepared by Dr. Kevin Morin concerning metal leaching and acid rock drainage, water quality and hydrogeology. ANA raises their concerns regarding the Great Bear Gold Project, citing expert analysis from Dr. Kevin Morin of MDAG. MDAG findings highlight multiple environmental risks related to metal leaching, acid rock drainage, water quality, and hydrogeology, many of which he argues are either unrecognized or inadequately addressed by Great Bear. These concerns apply to both the advanced exploration phase and the proposed full-scale mining operation. ANA asserts that the project is advancing too quickly without sufficient environmental assessments, posing risks to the environment, public health, and the inherent, Treaty, and Indigenous rights of the community. They are calling for an immediate freeze on the regulatory process until comprehensive environmental data is available and meaningful Indigenous involvement is ensured. Additionally, ANA demands that the project, including what they consider extensive bulk sampling equivalent to full-scale mining, undergo a rigorous environmental assessment. Until these conditions are met, they maintain that moving forward with the project would be premature and irresponsible.	GNFN_042524_01.pdf

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Ref. no.	Date	Organizations	Communication Type	Summary	Attachment ID
C-07901	24/05/06	Asubpeeschoseewagong Netum Anishinabek	Email	ANA emailing GBR to arrange a technical meeting in order to review ANA's proposed budget for capacity supports. ANA states that they are prepared to meet and provide answers to questions regarding details for line items, as well as the invitation for a substantive counteroffer with rationale for the proposed numbers, including how to ensure that ANA can effectively engage with the Project.	Confidential engagement
C-07902	24/05/06	Asubpeeschoseewagong Netum Anishinabek	Email	Communication to ANA from GBR stating that they are currently in the process of preparing a proposed budget for capacity funding, and that GBR will have something soon and will then propose meeting dates along with the completed	Confidential engagement
C-07905	24/05/10	Asubpeeschoseewagong Netum Anishinabek	Email	Great Bear providing detailed updated response tables and communication to ANA Lands Protection team in response to communications on March 6th, 2024, March 27th, 2024. In addition Great Bear offer new communication in the form of letter response tables to communications received from ANA Lands Protection Team on April 11th, 2024, and April 25th, 2024. Communication are focus on technical review by ANA subject matter experts and Great Bear response to comments provided. The communications focus on the proposed Advanced Exploration program, and main project.	Engagement not related to Project
C-07911	24/05/10	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Energy & Mines (MOEM)	Email	Comment regarding the Closure plan in the ANA communication record. ANA states that they did not receive the final closure plan. ANA also states that the Sharepoint site does not comply with ANA's engagement protocols which they state have been communicated to GBR on multiple occasions.	
C-07912	24/05/10	Asubpeeschoseewagong Netum Anishinabek	Email	GBR reiterating that the Final Closure Plan was provided on April 5th, 2024, as stated in the consultation record, with the correspondence attached. GBR also provides a link to a newer version of the Closure Plan which includes the reports referenced in the responses to the updated March and April 2024 letters which GBR received from ANA.	Engagement not related to Project
C-08050	24/05/16	Asubpeeschoseewagong Netum Anishinabek	Email	GBR sending a proposed budget offer to ANA using the same format as the budget previously provided, but with updated assumptions, along with an invitation to meet and discuss.	Confidential engagement
C-08051	24/05/16	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Energy & Mines (MOEM)	Email	Distribution of the Concordance Table from GBR to ANA in order to assist in their review of the most recent version in the Great Bear Project AEX Closure Plan along with the SharePoint link to the final Closure Plan previously provided on	Engagement not related to Project
C-08240	24/05/23	Asubpeeschoseewagong Netum Anishinabek Crown-Indigenous Relations and Northern Affairs Canada Great Bear Gold Project Projet Aurifère Great Bear Indigenous Services Canada Ontario Ministry Indigenous Affairs & First Nations Economic Reconciliation (IAFNER) Ontario Ministry of Energy & Mines (MOEM) Ontario Ministry of Environment, Conservation and Parks (MECP) Ontario Ministry of Natural Resources (MNR)	Letter	ANA letter detailing comments and documentation submitted via the Environmental Registry of Ontario as it relates to GBR's proposal #019-8598 and #019-8574. The comments states that the Project will have an adverse impact and will require an impact assessment, and highlighted the Crown's outstanding obligations to ANA, and continues in its reiteration that this should be resolved in a Nation-to-Nation process. ANA also reiterated their concerns about the process and the path to reconciliation. ANA provided preliminary comments pertaining to the breaches of Crown obligations, and the current capacity barriers, along with detailing specific concerns such as mercury in the ecosystem, land claims, and spiritual impacts.	Engagement not related to Project
C-08241	24/05/24	Asubpeeschoseewagong Netum Anishinabek	Email	ANA proposing a meeting with GBR in order to discuss the proposed budget. ANA put forward a date and time and asked GBR to confirm if that timing works with them.	
C-08243	24/05/24	Canadian Environmental Law Association Asubpeeschoseewagong Netum Anishinabek	Email	Introduction of the new co-counsel for ANA. Legal counsel requested the complete application for the Permit to Take Water (PPTW), along with all supporting documentation submitted to the MECP by GBR in order to complete comments on the proposed PTTW comment period with the ERO notice. Additionally, ANA's legal counsel requested clarification on when GBR will apply to the MECP for an Environmental Compliance Approval to discharge the water	
C-08242	24/05/27	Asubpeeschoseewagong Netum Anishinabek	Email	Confirmation that the date and time work for the GBR team, and that they will be sorting out the right group internally. GBR also stated that they can send the calendar invitation if ANA	
C-08245	24/05/27	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association	Email	Follow-up communication from ANA's legal counsel regarding the email requesting the PTTW and supporting materials. The ANA's legal counsel also stated that they are looking at the ECA for industrial sewage treatment works serving the AEX, and request an electric copy of the ECA application along with all supporting documentation, along with reiterating their request for the PTTW application and all supporting	Engagement not related to Project
C-08251	24/05/27	Asubpeeschoseewagong Netum Anishinabek	Email	ANA distributing the calendar invitation to share with the GBR team to discuss the proposed budget for the funding agreement with GBR.	Confidential engagement
C-09157	24/05/27	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association	Email	GBR providing ANA legal counsel with the requested ECA ISW Application package, and the PTTW Final Application. Background was also provided on the previously stated requests from ANA regarding the permissions for the SharePoint site. GBR also provided background details on	

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Ref. no.	Date	Organizations	Communication Type	Summary	Attachment ID
C-08252	24/05/28	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Energy & Mines (MOEM)	Letter	GBR distributing the attached response to the Riverbank Mercury Methylation Study in relation to the Great Bear Project to ANA Lands Protection team for consideration. The study was included in the Prelim Comments -Supporting Materials-Great Bear AEX Closure Plan and Other Authorizations 4856-449v.1 which ANA sent to GBR on May 23, 2024. The response reiterates that these conditions in the study are not present in the Chukuni River, which is the proposed receiving environment for the effluent from the Great Bear Project, and that the conditions in the study which caused methylmercury to be present will not be sufficient to activate sulphate reducing bacteria, which then release methylmercury.	Engagement not related to Project
C-10000	24/05/29	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Ministry of Energy & Mines (MOEM)	Email	Request from ANA to MINES regarding the June 10th deadline for comments for the AEX Closure Plan. ANA will need more time in order for expert responses to have a chance to prepare their reports. ANA reiterates their concern regarding the possibility of additional contributions of additional methylation to the river system. ANA urged MINES to provide a pause on the review of the Closure Plan until the end of June in order to accommodate ANA for the receipt of their expert's advice. ANA notes that if there is any potential for the Great Bear Gold project to contribute additional methylation to the river system, impacting on fish that travel throughout that system, is of significant concern to ANA and has the potential to have not just adverse but severe impacts on the community.	Engagement not related to Project
C-10001	24/06/05	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Energy & Mines (MOEM)	Email	MINES communication to ANA Lands Protection team that it is preparing a response to a May 23, 2024 letter from ANA. MINES had initially requested comments by June 10, 2024, regarding potential adverse impacts on ANA's treaty or Aboriginal rights due to the Great Bear Advanced Exploration Project's Closure Plan. In response to ANA's May 29, 2024 request for an extension, MINES has agreed to extend the deadline to June 30, 2024. This extension allows ANA's expert, Dr. Branfireun, additional time to review Great Bear Resources' May 28, 2024 response on the River Mercury Methylation Study. MINES hopes to decide by July 2, 2024, whether to invite the proponent to submit the Closure Plan.	Engagement not related to Project
C-08542	24/06/07	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Environment and Climate Change Canada Great Bear Gold Project Projet Aurifère Great Bear	Email	The Lead Negotiator for the ANA Lands Protection Team provided GBR with ANAs initial comments on the Indigenous Engagement and Participant Plan for the Great Bear Gold Project Impact Assessment. These comments were submitted via the Agency's online Registry earlier today. Initial comments on the Tailored Impact Statement Guidelines have been submitted separately by ANA's co-counsel. ANA states they have not had enough time or capacity support funding to complete its review of the IEPP. ANA argues that 30 days is not enought to review and provide comments on the IEPP and other documents like the draft Tailored Impact Statement Guidelines. The Agency takes nearly a month to respond to short letters from ANA, even though it has extensive capacity and experience with this process. ANA repeats their request that the Impact Assessment process be paused until the concerns and barriers expressed in our previous letters have been resolved and ANA's consent for the Impact Assessment process is obtained.	Confidential engagement
C-08445	24/06/12	Asubpeeschoseewagong Netum Anishinabek	Email	ANA prepared a response to the GBR offer. GBR to review the response and reply. One key point to address is the scope of the budget proposal. ANA wants it understood that this is a preliminary budget, and that further funding will be required through the permitting process.	Confidential engagement
C-08540	24/06/14	Asubpeeschoseewagong Netum Anishinabek Lac Seul First Nations Ontario Ministry of Natural Resources (MNR) Wabauskang First Nation	Email	MNRF providing GBR with a letter providing an update on the delegation of consultation. In the letter MNRF states that they are in the process of sending letters to WFN and LSFN to give them an update on the project status and status on the delegation. MNRF will continue to keep GBR updated as they receive comments from the communities. MNRF states that unless there are outstanding questions and concerns raised regarding the FRL/PTR and Work Permit, MNRF may be in a position to deem consultation with the communities listed above complete. MNRF continues to respond to ANA regarding the authorizations and Consultation.	Engagement not related to Project
C-08443	24/06/16	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Ministry of Environment, Conservation and Parks (MECP)	Letter	Comments from CELA, co-counsel for ANA, on behalf of ANA on the PTTW. ANA states that the proposed PTTW should not be issued to GBR as they view, the PTTW is premature, unreasonable in light of the applicable law/policy framework and could result in significant environmental harm.	Engagement not related to Project
C-08448	24/06/17	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Environment and Climate Change Canada Great Bear Gold Project Projet Aurifère Great Bear Impact Assessment Agency of Canada (IAAC)	Email	GBR copied on a letter to IAAC and Environment and Climate Change Canada, in which ANA states their preliminary position with respect to an aspect of the scope of the Great Bear Gold Project Impact Assessment. ANA believes that the Advanced Exploration ("AEX") activities proposed by GBR, specifically bulk sampling and associated activities, constitute a designated project under the Impact Assessment Act. ANA requests that the Minister chooses to suspend consideration of the designation requests, until the rules of the Impact Assessment process are clear and the Minister is able to consider designation requests that are needed to protect the environment and the rights, health, and wellbeing of	Engagement not related to Project

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Ref. no.	Date	Organizations	Communication Type	Summary	Attachment ID
C-08449	24/06/17	Asubpeeschoseewagong Netum Anishinabek Environment and Climate Change Canada	Email	ANA's request to the Minister of Environment and Climate Change to refer the impact assessment of the Great Bear Gold Project (Reference No. 85832) to a review panel pursuant to section 36 of the Impact Assessment Act. ANA explains in the letter and email that it is in the public interest to refer the impact assessment to a review panel in light of the significant adverse effects of the project upon matters of federal jurisdiction and on the Aboriginal, treaty and inherent rights of	GNFN_061724_02.pdf GNFN_061724_03.pdf
C-08450	24/06/17	Asubpeeschoseewagong Netum Anishinabek	Email	ANA summary of meeting and response to all of GBR questions about the latest iteration of the Capacity Budget spreadsheet. TI was ANA's understanding that there are no major issues and that GBR would take the budget back to the GBR team and respond to ANA with a version of the Capacity Budget that GBR are ready to support, and a proposed short agreement to go with it. ANA is open to the payment arrangement that GBR proposed, whereby Great Bear would make direct payment on most expenses after receiving from ANA a brief invoice from the	Confidential engagement
C-09977	24/06/17	Asubpeeschoseewagong Netum Anishinabek	Email	GBR writing to ANA that the GBR internal team will be meeting soon to review the latest ANA budget, and that a response will come soon along with the invoicing requirements. GBR reiterated that they believe they are close to an agreeable arrangement for capacity funding.	Confidential engagement
C-08961	24/06/24	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Energy & Mines (MOEM) Ontario Ministry of Environment, Conservation and Parks (MECP)	Letter	Request from ANA to designate the Great Bear Resources Mine Project to a Part II.3 Comprehensive Environmental Assessment under the Ontario Environmental Assessment Act. The formal request cites previous reports sent to IAAC regarding mercury and metal leaching, along with reiteration of cumulative impacts which need to be examined due to other land uses in the land surrounding ANA for the reasoning behind the request.	GNFN_062424_01.pdf GNFN_062424_02.pdf
C-09978	24/06/26	Asubpeeschoseewagong Netum Anishinabek	Email	ANA response to Capacity funding conversation if there was a version of the proposed offer in a table to share and if this is a short draft agreement. ANA reiterated that there are a number of deadlines for both AEX and the IA coming up and that capacity support is one of the foundations of being able to be informed on the GBR project.	Engagement not related to Project
C-09581	24/06/30	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Energy & Mines (MOEM)	Letter	Letter sent from ANA to Mines with GBR copied on June 30, 2024. In the letter, ANA states that they will continue to rely on information from their experts, and reiterated previous letters and issues. ANA also stated that they felt there have been inadequate responses to these previous letters and issues stated from both Mines and GBR. ANA also responded to previous comments from GBR regarding the mercury methylation study and stated that GBR's response was inadequate. The review of the Closure Plan from ANA with the recommended response being "rejection" of the Project was also attached. Letter communication from ANA Lands Protection team articulates the formal objections of ANA to the proposed Closure Plan for the Advanced Exploration (AEX) phase of the Great Bear Gold Project. ANA contends that the Closure Plan is fundamentally flawed and poses a significant threat to their inherent, Aboriginal, Treaty, and Indigenous rights, as well as to the environmental integrity of their territory. A central grievance is the perceived inadequacy of Great Bear and the Ministry of Mines' responses to ANA apprehensions. ANA further argues that the Ministry of Mines has demonstrated a lack of due diligence in its assessment of the Closure Plan, prioritizing expediency over substantive engagement with the First Nation and its expert evidence. ANA criticizes the insufficiency of the Provincial Water Quality Objectives (PWQO) as a regulatory standard, highlighting its failure to account for the unique vulnerabilities of the ANA community and the bioaccumulation of mercury in the aquatic	Engagement not related to Project
C-09987	24/07/03	Asubpeeschoseewagong Netum Anishinabek	Email	Distribution of the capacity budget proposal to ANA. GBR provided an explanation in response to the distribution of the proposed budget regarding various different categories. Further discussion was made regarding the assumptions, along with an invitation for further discussion acknowledging the sensitivity of the timing and need for funding.	Confidential engagement
C-09988	24/07/03	Asubpeeschoseewagong Netum Anishinabek	Email	GBR providing the sample invoicing from a permitting consultant in order to provide an example to ANA. GBR also discussed internal policies regarding how they would prefer to deliver the funds and what information will be needed. GBR also offered for ANA to discuss how to invoice items for the	Confidential engagement

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Ref. no.	Date	Organizations	Communication Type	Summary	Attachment ID
C-09156	24/07/07	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association	Letter	ANA submission to MECP Client Services and Permissions Branch regarding the GBR ECA ISW submission and previously submitted letters to IAAC and Mines. In the letter regarding GBR ECA ISW, ANA requests that the MECP reject the GBR application for ECA ISW due to the previously sent letters concerning riverbank mercury methylation from May 14, 2024, the response to the WSP memo dated June 27, 2024, a letter from researchers dated July 5, 2024, which critiqued the lack of sulphate monitoring in the ECA application which researchers state could continue the impact on methylmercury, a 2003 guideline on mercury published in the Canadian Water Quality Guidelines for the Protection of Aquatic Life, The Ministry of Environment for the Province of British Columbia's Ambient Water Quality Guidelines for Sulphate Technical Appendix from 2013, the April 25th, 2024 ANA letter to IAAC, Mines, and GBR, and ANA's review of the ECA application. The new July 7, 2024 letter stated reasons behind the decision citing believed inadequacies behind the scientific and technical documents supporting the application, Ontario red tape reduction which repealed provincial mining effluent limits, the lack of consistency in the ECA proposal and how it was developed with the MECP's Statement of Environmental Values, along with citing the past conduct of Kinross and/or its wholly owned subsidiaries in other jurisdictions which they state will afford ANA with reasonable grounds to believe that applicants will not engage in activities in accordance with the EPA, the Ontario Water Resources Act, or regulations made under either of these acts. A legal proceeding between Kinross and the Okanogan Highlands Alliance and State of Washington	Engagement not related to Project
C-09583	24/07/09	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Environment and Climate Change Canada	Letter	GBR July 9, 2024, Letter response to IAAC regarding the June 17 letter sent from ANA to IAAC in regards to the request for the review panel. The letter establishes the Minister's decision criteria, how mining activity in Red Lake is common and the effects are well understood, the support of local Indigenous communities if their interests are met, and that the location, nature and scale of the Project will not create a potential for adverse impacts which would warrant the Review Panel.	GNFN_070924_01.pdf
C-09989	24/07/16	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Ministry of Energy & Mines (MOEM) Ontario Ministry of Environment, Conservation and Parks (MECP)	Email	GBR response to MoM and MECP Ministers regarding ANA's request to designate the Great Bear Project for a Provincial Environmental Assessment under the Environmental Assessment Act. GBR outlines the ongoing consultation with ANA, and highlights the ongoing review from WFN and LSFN and MoM. The concerns regarding water quality are also taken into account, with further commitments to water quality previously made in the ISW application previously sent, along with the testing results showing a below detection level of mercury in cell test results. GBR also notes that the Project will be subject to a comprehensive federal review, and will follow leading industry practice.	
C-09990	24/07/25	Asubpeeschoseewagong Netum Anishinabek Crown-Indigenous Relations and Northern Affairs Canada Environment and Climate Change Canada Indigenous Services Canada Ontario Ministry Indigenous Affairs & First Nations Economic Reconciliation (IAFNER) Ontario Ministry of Energy & Mines (MOEM) Ontario Ministry of Environment, Conservation and Parks (MECP) Ontario Ministry of Natural Resources (MNR)	Letter	GBR response to ANA's comments on the Great Bear Closure plans from the June 30th, 2024, letter sent to Mines. GBR responded to the responses from Dr. Branfireun regarding the Mercury Methylation study, along with a further attachment of a memorandum which further details responses pertaining to water quality previously highlighted. Additionally, GBR responded to the comments from Dr. Morin surrounding closure, and PAG rock.	Engagement not related to Project
C-12926	24/07/31	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Ministry of Environment, Conservation and Parks (MECP)	Email	GBR providing a response to the letter from ANA’s counsel dated June 16, 2024, regarding Great Bear’s Permit to Take Water application.	Engagement not related to Project

Appendix C Record of Consultation: Asubpeeschoseewagong Netum Anishinabek (Jan 1, 2022 to Jan 16, 2026)

Ref. no.	Date	Organizations	Communication Type	Summary	Attachment ID
C-09991	24/08/01	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Ministry of Environment, Conservation and Parks (MECP)	Email	GBR's response to the ANA comments made on the Industrial Sewage Works Proposal for the AEX Project. GBR responded to the comments previously made and had reiterated that they have provided comprehensive and timely information in support of its AEX permit applications and committed to following leading industry practices and applicable regulatory requirements. GBR also highlights the irrelevance of the comments to the project regarding the recent changes to Ontario's metal mining effluent regulations, and the GBR discharge permit in Washington state, and stated that the MECP should disregard comments on this point.	Engagement not related to Project
C-09994	24/08/01	Asubpeeschoseewagong Netum Anishinabek	Email	ANA distributing the amended draft funding agreement documents, with ANA's edits indicated by track changes in order to reflect previous conversations. ANA states that they would be eager to meet further in order to go over the proposed amendments.	Confidential engagement
C-09995	24/08/01	Asubpeeschoseewagong Netum Anishinabek	Email	ANA re-sending the proposed Workplan and Budget for Capacity funding with updated track changes.	Confidential engagement
C-09996	24/08/01	Asubpeeschoseewagong Netum Anishinabek	Email	GBR acknowledging the receipt of the updated ANA capacity funding agreement. GBR stated they will review internally prior to responding the ANA.	Confidential engagement
C-09998	24/08/02	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Ministry of Energy & Mines (MOEM)	Email	GBR distributing the SharePoint link to the Final updated Advanced Exploration Closure Plan dated August 1, 2024 to ANA, along with a concordance table to identify minor additions.	Engagement not related to Project
C-09999	24/08/02	Asubpeeschoseewagong Netum Anishinabek	Email	ANA response to GBR's updated AEX Closure Plan. ANA states that the initial review suggests significant changes and additional information which will require time to review. ANA reiterates their concern based on previous Closure Plan submissions, and states that they will be in communication with MINES to advise them that they will need approximately 90 days' time to consult and respond to the Closure Plan and Great Bear's reply to submission. ANA states that it would be unreasonable, dangerous and contrary to the Crown's duty to engage to approve this amended Closure Plan before ANA has had a meaningful opportunity to respond.	Engagement not related to Project
C-09671	24/08/06	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Ministry of Energy & Mines (MOEM)	Email	Distribution of the Record of Consultation for the Great Bear AEX Project to ANA. MoEM is also copied on the email.	Engagement not related to Project
C-09992	24/08/06	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Ministry of Environment, Conservation and Parks (MECP)	Letter	Letter from ANA to the MECP requesting a pause to be taken for an unspecified period of time prior to any further decisions on the ECA ISW application in order to have the time for ANA to continue to have the time in order to respond to GBR's previous response to comments.	Engagement not related to Project
C-12930	24/08/07	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Ministry of Environment, Conservation and Parks (MECP)	Letter	ANA has reviewed GBR's response to their comments on the proposed Permit to Take Water (PTTW) and disagrees with GBR's claim of adequately addressing their concerns. They argue that GBR's summary charts do not address substantive issues, and the revised proposal for a smaller water taking is seen as a "bait and switch." ANA requests a re-opening of the public comment period and emphasizes that the original PTTW application was incomplete. They have also asked for the project to be designated under the Environmental Assessment Act, making it inappropriate to issue the PTTW until this request is resolved. ANA urges the Ministry to refrain from approving any water takings proposed by GBR.	
C-12937	24/08/07	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Ministry of Environment, Conservation and Parks (MECP)	Email	MECP confirming receipt of email response from ANA in response to GBR's letter in regard to comments on the PTTW.	
C-12938	24/08/12	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Ministry of Environment, Conservation and Parks (MECP)	Email	ANA thanks the Ministry's for the acknowledgement of receipt and advises that the ANA August 7th email to the Ministry constitutes ANA's preliminary response to GBR's July 31st correspondence, and that ANA will be submitting detailed expert and other submissions on the deficiencies within the PTTW application and on the new "scoped" water taking proposal.	
C-09997	24/08/15	Asubpeeschoseewagong Netum Anishinabek	Email	ANA requesting GBR's response to the latest iteration of the capacity support documents regarding changes made. ANA believes that the changes made were only minor and that they were consistent with the discussions previously had. ANA stated that there are a large number of permitting and IA processes underway, and ANA has yet to receive meaningful capacity support, and that funding remains a major capacity barrier to ANA.	Confidential engagement
C-10982	24/08/28	Asubpeeschoseewagong Netum Anishinabek	Email	GBR response to ANA regarding the previously discussed budget and funding agreement. GBR notes assumptions regarding the funding timeline and responses to previously discussed items. GBR also notes they are willing to connect again to discuss outstanding points.	Confidential engagement
C-10983	24/08/28	Asubpeeschoseewagong Netum Anishinabek	Email	ANA response to GBR regarding the draft budget proposal. ANA states that while they feel closer to finalizing, there are some items which may require a discussion in order to ensure GBR and ANA are on the same page. ANA provides a date and time to meet and discuss.	
C-10984	24/08/28	Asubpeeschoseewagong Netum Anishinabek	Email	Confirmation from GBR that the date and time proposed to meet regarding the ANA draft budget proposal works for the team, as well as a further inquiry regarding the possibility of meeting sooner.	

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Ref. no.	Date	Organizations	Communication Type	Summary	Attachment ID
C-11322	24/09/03	Asubpeeschoseewagong Netum Anishinabek Environment and Climate Change Canada Headwaters LLP Impact Assessment Agency of Canada (IAAC) Lac Seul First Nations Wabauskang First Nation Woodward and company	Letter	Letter from GBR to ECCC and IAAC regarding the ANA request for a review panel. GBR further reiterates that for reasons previously set out in the Great Bear letter dated 9 July 2024, GBR maintains that a Review Panel will not be required for this Project. GBR also notes that they understand that LSFN and WFN have filed or will file a submission which states why they believe that this review panel would be unnecessary. GBR also notes that LSFN and WFN have designed an Anishinaabe-led Assessment (ALIA) process which complements an Agency-led review of the Great Bear Project, rather than a panel review. GBR also states that they have agreed to assist LSFN and WFN on this ALIA, and will	ANA_090324_01.pdf
C-10556	24/09/06	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Crown-Indigenous Relations and Northern Affairs Canada Environment and Climate Change Canada Great Bear Gold Project Projet Aurifère Great Bear Indigenous Services Canada Ontario Ministry Indigenous Affairs & First Nations Economic Reconciliation (IAFNER) Ontario Ministry of Energy & Mines (MOEM) Ontario Ministry of Environment, Conservation and Parks (MECP) Ontario Ministry of Natural Resources (MNR)	Letter	Distribution of letter from ANA regarding the Great Bear Project's application for Approval of Closure Plan. The letter restated previous items brought to MINES in discussions surrounding the Closure Plan which had been addressed by GBR, such as PAG and NPAG, and methylmercury. The letter further discusses ANA's concerns with the adaptive management plan, and the consultation process, specifically surrounding the provincial government. ANA brought up a lack of capacity support, and other applications associated with the GBR such as the ECA PTTW. ANA stated that approving this would be dangerous to ANA, and would cause more pollution, as well as attaching two reports dated September 5, 2024 which respond to the ECA ISW, and the AEX Closure Plan and ECA PTTW.	Engagement not related to Project
C-10540	24/09/10	Asubpeeschoseewagong Netum Anishinabek	Email	Distribution of the Preliminary Economic Assessment press release for the Great Bear Project to ANA. GBR also noted that an updated mineral resource estimate was released which provided an increase to the inferred resource estimate. GBR noted that if there were any questions to contact the team, or join the conference call on September 10, 2024 at 9:00 am	GNFN_091024_01.pdf
C-10985	24/09/12	Asubpeeschoseewagong Netum Anishinabek	Email	ANA ~~noting they are excited~~ to discuss the capacity agreement as scheduled for the upcoming afternoon. ANA have attached proposed revisions and comments on areas for discussion.	
C-10297	24/09/17	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Environment and Climate Change Canada Lac Seul First Nations Wabauskang First Nation Woodward and company	Email	Response from ANA's legal team regarding the July 9, 2024 and September 3, 2024 letters sent by GBR. ANA states that they have reviewed the correspondence from GBR and LSFN and WFN and state that they believe there is no compelling factual, legal, technical, or scientific reasons against referring the project to the Review Panel. ANA states that the GBR letter added nothing new to previous claims, and that the joint letter from WFN and LSFN regarding their Indigenous Led assessment do not have enough details, and that the proposed regulations are not in existence and are not available for the federal government to enter into an assessment agreement at this time. ANA further stated that this would not satisfy the duty to consult ANA, and that they have different interests as ANA is the only community downstream from the project. ANA also states that GBR should not be against the review panel if they have the credibility in their report that they state. ANA requests that no weight should be given to the submitted letters, and the review panel request is still relevant,	
C-10307	24/09/20	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Environment, Conservation and Parks (MECP)	Email	GBR reiterating that concerns about water quality, specifically sulfate levels, raised by ANA are outside the scope of the PTTW application, which deals with water taking. Water quality issues are addressed under a discharge permit. MECP and the Ministry of Mines have reviewed these issues extensively and found no problems related to sulfate levels. Great Bear will comply with the mobile ECA for water discharge. The consultation record is comprehensive, and there is no need to expand the PTTW review to include out-of-scope issues.	
C-10986	24/09/27	Asubpeeschoseewagong Netum Anishinabek	Email	GBR issuing the blackline of the funding agreement and budget regarding language regarding rights mentioned, proposed language around the circumstances to trigger a re-evaluation of funding amounts, and drafting around the use of government funding.	Confidential engagement
C-10987	24/10/01	Asubpeeschoseewagong Netum Anishinabek	Email	Budget discussion from ANA to GBR regarding funding from additional government sources. ANA proposes to re-word part of the budget and delete the item in order to align with ANA's recommendation.	Confidential engagement
C-10993	24/10/01	Asubpeeschoseewagong Netum Anishinabek	Email	GBR confirming they are alright with the changes proposed to the draft budget agreement by ANA. GBR also distributed an updated version of the draft budget which aligns with these changes, and notes that they will need to set-up ANA in the system in order to process payments, and they may need to speak with ANA's finance department.	Confidential engagement
C-10994	24/10/01	Asubpeeschoseewagong Netum Anishinabek	Email	ANA notes there should be a change to the Workplan and Budget document as well, and shared a version with edits in track change for GBR review.	Confidential engagement
C-10995	24/10/01	Asubpeeschoseewagong Netum Anishinabek	Email	GBR noting to ANA that the edit was appended to the agreement, and they will update the standalone Workplan and Budget as well to reflect the requested changes.	Confidential engagement
C-10996	24/10/03	Asubpeeschoseewagong Netum Anishinabek	Email	ANA following up with GBR regarding the agreement and asking when GBR anticipates sending over a signed	
C-10997	24/10/03	Asubpeeschoseewagong Netum Anishinabek	Email	GBR providing ANA with their signature on the ANA draft budget proposal.	
C-10998	24/10/04	Asubpeeschoseewagong Netum Anishinabek	Email	Distribution of the fully executed agreement for the ANA draft budget agreement. ANA also requests that the paperwork GBR previously referenced regarding financial paperwork to submit before receipt of invoices.	Confidential engagement

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Ref. no.	Date	Organizations	Communication Type	Summary	Attachment ID
C-11085	24/10/24	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Energy & Mines (MOEM)	Email	GBR providing a link to ANA in order to access applications and plans for GBR's upcoming Early Exploration activities related to the Great Bear Project. GBR notes it welcomes any feedback relating to the information provided.	Engagement not related to Project
C-11811	24/10/28	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Energy & Mines (MOEM)	Email	Confirmation of successful submission of the Early Exploration Permit # PR-24-0002165 to the Mining Lands Administration System.	Engagement not related to Project
C-11109	24/11/04	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Great Bear Gold Project Projet Aurifère Great Bear Ontario Ministry of Citizenship and Multiculturalism (MCM) Ontario Ministry of Energy & Mines (MOEM) Ontario Ministry of Environment, Conservation and Parks (MECP) Ontario Ministry of Labour, Immigration, Training and Skills Development (MLITSD) Ontario Ministry of Natural Resources (MNR) Ontario Ministry of Northern Economic Development and Growth (MNEDG)	Email	Letter received from the Honourable Minister of Mines surrounding Aboriginal Consultation. The Minister notes that MINES has reviewed the consultation materials including Plan for Consultation, Interim Consultation Reports, Consultation Report, Record of Consultation and Letters of Support. The Minister states that they are satisfied that appropriate consultation with Indigenous communities has been carried out. The Minister also notes this was concluded due to the fact that the final consultation report indicates issues idedntified regarding impacts to Aboriginal and Treaty rights are proposed to be mitigated through the specific aspects of the Closure Plan submission. It was also determined that the Closure Plan for the Great Bear Project can now be submitted.	Engagement not related to Project
C-11911	24/11/12	Asubpeeschoseewagong Netum AnishinabekLac Seul First Nations Ontario Ministry of Citizenship and Multiculturalism (MCM) Ontario Ministry of Energy & Mines (MOEM) Ontario Ministry of Environment, Conservation and Parks (MECP) Ontario Ministry of Natural Resources (MNR) Ontario Ministry of Transportation (MTO) Wabauskang First Nation	Email	ANA response to the distribution of the Letter from the Honourable Minister of Mines regarding the Closure Plan, with ANA requesting that a copy of the filed Closure Plan is sent to ANA.	Engagement not related to Project
C-12829	24/11/12	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Northern Economic Development and Growth (MNEDG)	Letter	Distribution of Letter from the Minister of Mines to Indigenous Communities and government agencies regarding the Great Bear Resources Project's Closure Plan and Aboriginal Consultation. The Minister notes that MINES has reviewed the consultation materials including Plan for Consultation, Interim Consultation Reports, Consultation Report, Record of Consultation and Letters of Support. The Minister states that they are satisfied that appropriate consultation with Indigenous communities has been carried out. The Minister also notes this was concluded due to the fact that the final consultation report indicates issues identified regarding impacts to Aboriginal and Treaty rights are proposed to be mitigated through the specific aspects of the Closure Plan submission. It was also determined that the Closure Plan for the Great Bear Project can now be submitted.	Engagement not related to Project
C-11912	24/11/14	Asubpeeschoseewagong Netum Anishinabek Lac Seul First Nations Ontario Ministry of Citizenship and Multiculturalism (MCM) Ontario Ministry of Energy & Mines (MOEM) Ontario Ministry of Environment, Conservation and Parks (MECP) Ontario Ministry of Natural Resources (MNR) Ontario Ministry of Transportation (MTO) Wabauskang First Nation	Email	GBR providing ANA with the filed Closure Plan as previously requested.	Engagement not related to Project
C-12833	24/11/27	Asubpeeschoseewagong Netum Anishinabek	Email	ANA writing to GBR, noting that they are continuing their work in reviewing permits and IA documents. ANA requests if GBR can provide a comprehensive GIS package which shows all past, present, and proposed activities related to the Great Bear Project, including roads, trails, lines, drill holes, stripped areas, pits, and related infrastructure.	
C-12834	24/12/10	Asubpeeschoseewagong Netum Anishinabek	Email	ANA following up with GBR regarding their November 27, 2024 request if GBR can provide a comprehensive GIS package which shows all past, present, and proposed activities related to the Great Bear Project, including roads, trails, lines, drill holes, stripped areas, pits, and related infrastructure.	
C-11780	24/12/12	Asubpeeschoseewagong Netum Anishinabek	Email	GBR distributing a letter to ANA's land protection team which outlines an offer for assistance to progressing the items outlined in an attached workplan, in accordance with the Funding Agreement. GBR also notes that they would like to meet to discuss plans for the Preliminary Land Use and Occupancy Study.	Confidential engagement

Appendix C Record of Consultation: Asubpeeschoseewagong Netum Anishinabek (Jan 1, 2022 to Jan 16, 2026)

Ref. no.	Date	Organizations	Communication Type	Summary	Attachment ID
C-12835	24/12/19	Asubpeeschoseewagong Netum Anishinabek	Email	GBR responding to ANA's request for a GIS package including past, present, and proposed Great Bear activities, by distributing the GBR Shapefile Package and providing a link. GBR also notes that they have further broken down the request and provided packages based on Future Considerations, including plans to date (AEX, DPD, and Early Exploration Test Pit Permit), Post KGC illustrating what has been conducted to date, and Pre KGC, which details the impacts inherited. GBR also noted that they attached their proposed methylmercury study plan and noted that the preparation of this study plan was included in the Project's Tailored Impact Statement Guidelines, noting it's open for review and comment by applicable Indigenous communities including ANA, with the cutoff date for comments being January 30, 2025. GBR also noted the water study was not settled in the funding agreement, noting they are open to funding an expert/consultant in order to assist with the review of the proposed study. GBR asked for ANA to let GBR know if there are any questions regarding the material sent.	Engagement not related to Project
C-14523	24/12/20	Asubpeeschoseewagong Netum Anishinabek	Email	ANA thanking GBR for the distribution of the GIS packages, but notes that they do appear to be limited to the AEX. ANA requested shapefiles which would show all the included works in the IA process. ANA also notes that they will require assistance from their expert team in order to review the methylmercury study plan, and that given their availability the January 30th deadline proposed is not feasible.	Engagement not related to Project
C-14524	24/12/23	Asubpeeschoseewagong Netum Anishinabek	Email	GBR responding to ANA"s request for further shapefiles which describe the main project. GBR notes that the file package sent to ANA on December 19, 2024, contained a map with future considerations for the main project portion.	
C-12836	24/12/30	Asubpeeschoseewagong Netum Anishinabek GeoPraxis	Email	ANA requesting access to the materials GBR shared regarding GIS for their GIS and mapping consultant. ANA notes that the external consultant does not have access to the WSP site which the materials were uploaded to, and requests access.	
C-12837	24/12/31	Asubpeeschoseewagong Netum Anishinabek GeoPraxis WSP	Email	GBR asking WSP if ANA's consultant can have access to the GBR GIS files sent. ANA was copied on the communication.	
C-12284	25/01/02	Asubpeeschoseewagong Netum Anishinabek	Email	ANA requesting access to a SharePoint that includes comprehensive GIS package that shows all past, present and proposed activities related to GBR. GBR provided access to all documents related to past, present and proposed activities including the proposed Methylmercury Study Plan. Following some access issues, ANA can now download documents and begin review.	Engagement not related to Project
C-12838	25/01/02	Asubpeeschoseewagong Netum Anishinabek GeoPraxis WSP	Email	WSP confirming to ANA and GBR that the ANA GIS consultant should have access to the distributed files on the SharePoint.	Engagement not related to Project
C-12839	25/01/02	Asubpeeschoseewagong Netum Anishinabek GeoPraxis	Email	ANA's GIS consultant confirming that access had been granted to WSP's SharePoint and noting that the GIS files had been downloaded without problem. GBR also sharing the shapefile data for PR-24-000245.	Engagement not related to Project
C-12282	25/01/03	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Ministry of Environment, Conservation and Parks (MECP)	Email	ANA's legal counsel distributing the OLT Appeal Form 1A to GBR following their submission to the OLT regarding the Leave to Appeal PTTW 3438-D7RQRJT.	Engagement not related to Project
C-12830	25/01/03	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Land Tribunal Ontario Ministry of Environment, Conservation and Parks (MECP)	Letter	CELA acting on behalf of ANA as counsel in relation to the ANA EBR Application for Leave to Appeal PTTW. CELA notes that pursuant to Sections 38 to 48 of the Environmental Bill of Rights, they have submitted a Cover Letter dated January 3, 2025, ANA's Application for Leave to Appeal PTTW 3438-D7RQJT, as well as the Applicant's Book of Documents to the Ontario Land Tribunal. GBR was copied on this communication.	Engagement not related to Project
C-12831	25/01/03	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Land Tribunal	Letter	OLT emailing ANA's legal counsel to confirm that the documents send to OLT regarding the Application for Leave to Appeal of the PTTW has been received.	Engagement not related to Project
C-12814	25/01/08	Asubpeeschoseewagong Netum Anishinabek	Email	Email response from ANA regarding the December 12, 2024, letter GBR sent to ANA's land protection team regarding an offer of assistance for progressing items detailed in the workplan. ANA responded to the offer with progressing the Land Use and Occupancy study, noting the Lands Team has the work in-hand and do not require assistance apart from assurance that submitted invoices will be paid promptly, and not subject to mis-readings of the funding agreement. ANA also notes that the funding agreement was only completed a short while ago, and the work has only just begun and will take some time to complete. ANA also suggests that GBR should take care to not proceed with the IA work that should be informed by the study, and reiterates that ANA demands that the work to be paused in order to allow ANA to catch up.	Confidential engagement

Appendix C Record of Consultation: Asubpeeschoseewagong Netum Anishinabek (Jan 1, 2022 to Jan 16, 2026)

Ref. no.	Date	Organizations	Communication Type	Summary	Attachment ID
C-12828	25/01/13	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Crown-Indigenous Relations and Northern Affairs Canada Environment and Climate Change Canada Great Bear Gold Project Projet Aurifère Great Bear Indigenous Services Canada Ontario Ministry Indigenous Affairs & First Nations Economic Reconciliation (IAFNER) Ontario Ministry of Energy & Mines (MOEM) Ontario Ministry of Environment, Conservation and Parks (MECP) Ontario Ministry of Natural Resources (MNR)	Letter	The letter from ANA to Minister of the Environment, Conservation, and Parks raises significant concerns regarding the approval of a scoped Permit to Take Water (PTTW) for the Great Bear Advanced Exploration Project. ANA emphasizes the need to address substantial environmental risks and procedural deficiencies in the permitting and consultation processes. The community highlights concerns about potential impacts on water systems, particularly Dixie Creek and the English River, which are integral to their ecosystem and way of life. ANA notes its experts assert that the water extraction proposed under the permit could harm fish and aquatic life, particularly during drought conditions. ANA states that the removal of soil and overburden is also flagged as a source of contamination, with runoff and groundwater flow potentially introducing pollutants such as methylmercury, sulfate, and dissolved metals into the watershed. ANA restates that the baseline studies and proposed mitigation measures are insufficiently robust, with gaps in critical data and deficiencies in the design and capacity of the proposed water treatment systems. The letter also raises procedural concerns, asserting that the consultation process has been inadequate and fails to meet the Crown's obligations to engage meaningfully with the First Nations. ANA indicates that key decisions and agreements were made without their knowledge or consent, and that Ontario's consultation framework disregards their governance and legal processes. Limited resources for reviewing technical documents, along with delays and incomplete information, have compounded their concerns about the transparency and	Engagement not related to Project
C-12840	25/01/13	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Ministry of Environment, Conservation and Parks (MECP)	Letter	ANA sharing materials pursuant to sections 38 to 48 of the Environmental Bill of Rights, in support of the application for leave to appeal of the PTTW. ANA attached a cover letter from CELA dated January 3, 2025, ANA's application for Leave to Appeal PTTW 3438-D7RQJT, and the applicant's Book of Documents. ANA also attached the OLT Appeal Form 1A regarding the ANA application for leave to appeal PTTW 3438-	Engagement not related to Project
C-12893	25/01/14	Asubpeeschoseewagong Netum Anishinabek	Email	Email response from GBR to ANA regarding the December 12, 2024, letter GBR sent to ANA's land protection team regarding an offer of assistance for progressing items detailed in the workplan. GBR noted that they provided the capacity funding so ANA would have reasonable resources to participate in the Impact Assessment in a reasonable and timely way. The funding agreement was executed on October 3rd, 2024 and GBR believes there has been sufficient time to advance the studies beyond the preliminary stages. GBR mentioned that they will not pause our work on the Impact Assessment because but must adhere to the IA timelines and would like insight on the progress of the Lands Protection Team's study work and requests an estimated completion date. It emphasizes the importance of adhering to the Impact Assessment timelines and integrating findings as they become available. The allocated funding for the land use study is confirmed. GBR also requests input on the Methylmercury Monitoring Plan was by January 30, 2025. Additionally, the GBR expresses openness to funding costs for ANA's review of the plan and asks for an estimate to amend the funding	Confidential engagement
C-12957	25/01/23	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Energy & Mines (MOEM)	Letter	ANA response to GBR letters dated November 13, December 20, and December 30, 2024, on early exploration permits. ANA has expressed concerns to MINES and the proponent regarding proposed mining activities in their Interim Core Area of Interest, particularly the Great Bear Gold Project. They have communicated potential impacts on their waters, lands, and wildlife, as well as their Aboriginal and Treaty rights, since March 2024. Despite this, they were not consulted about exploration permits until now. The project area is upstream of their community and affects local wildlife, including walleye, moose, and caribou. The proposed mechanized land clearing poses health risks to the environment and the community.	Engagement not related to Project
C-12962	25/01/23	Asubpeeschoseewagong Netum Anishinabek Lac Seul First Nations Ontario Ministry of Energy & Mines (MOEM) Wabauskang First Nation	Letter	Mines distributing the PR-24-000262 Early Exploration Permit.	Engagement not related to Project
C-12970	25/01/23	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Energy & Mines (MOEM)	Email	The Ministry of Mines is addressing concerns about community capacity and consultation processes related to an early exploration permit application. While capacity support is not deemed necessary for permitting to date, Ontario is open to funding a Mineral Development Advisor for the community. The permit allows specific exploration activities, with strict regulations to protect the environment, including a 30-meter buffer from water bodies. Concerns about impacts on local wildlife, such as walleye and moose, are acknowledged, but the Ministry believes risks are minimal. The proponent must adhere to environmental regulations, including proper handling of hazardous materials and waste. The Ministry is willing to engage further with the community regarding any additional concerns or impacts on Aboriginal and treaty rights. The Ministry has made the decision to issue an early exploration permits in response to the Applications, with the additional term and condition	Engagement not related to Project
C-14525	25/01/27	Asubpeeschoseewagong Netum Anishinabek	Email	ANA responding to GBR noting that the GIS package did not include data for an Early Exploration proposal for application PR-24-000245, noting that ANA would like to know why the permit was excluded and if there are other omissions in the data package. ANA further notes they require this GIS data as well as additional data in order to assess potential impacts.	Engagement not related to Project

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Ref. no.	Date	Organizations	Communication Type	Summary	Attachment ID
C-14508	25/01/31	Asubpeeschoseewagong Netum Anishinabek Great Bear Gold Project Projet Aurifère Great Bear Impact Assessment Agency of Canada (IAAC)	Letter	ANA's legal team distributing ANA's preliminary comments on the proposed Mercury and Methylmercury study plan, as well as preliminary reports from Dr Branfireun and Dr. Morin. ANA reiterates that they will be requiring more time in order to complete a fulsome and meaningful review of the document with further expert review and request a 90-day extension to provide comments. Three response letters were attached, with the first being a response letter from ANA noting that concerns have been raised regarding the quality and quantity of baseline data and monitoring completed. ANA addresses several concerns noting their request for extension to provide comments, noting they have provided preliminary comments. ANA states the reliance from GBR on achieving water quality which complies with PWQO and Canadian Council of Ministers of the Environment (CCME) water quality guidelines is inappropriate when it comes to mercury and methylmercury. ANA further states that they believe the background data is insufficient in order to detect if the Project will have a measurable impact on fish mercury levels. ANA also notes they believe the metal leaching and acid rock drainage prediction methods are improper, and that the assimilative capacity of the receiving waters as a mitigation strategy for excess sulphate loading is not supported by data available. Lastly, in the response letter ANA states that the proposed model GBR plans to use cannot technically deliver on outcomes related to sulphate changes, mercury and methylmercury concentrations in downstream activities, and mercury concentration in fish. The January 27, 2025, letter from Dr. Branfireun contained a study regarding sulfate-reducing bacteria in constructed wetlands, the Ambient Water	ANA_013125_01.pdf ANA_013125_02.pdf ANA_013125_03.pdf
C-14535	25/01/31	Asubpeeschoseewagong Netum Anishinabek	Email	GBR distributing the TK Secondary Sources Memos for ANA to review and ensure that the sources used can be utilized to understand community context for ANA. GBR notes that in order to support the traditional land and resource use baseline conditions in the Impact Statement for the Great Bear Project, asking for the TK sources and information to be validated by the Nation as required by the TISG for the Project received from IAAC. GBR also further notes that they are requesting written permission from the Nations for the use of all secondary sources of traditional knowledge, as detailed in the attachment in order to be incorporated into the Impact Statement. GBR requests ANA responds by February 14th, and notes for ANA to reach out of there are any further	Confidential engagement
C-15133	25/01/31	Asubpeeschoseewagong Netum Anishinabek	Email	Secondary source letter sent to ANA and MNO. The memo details the secondary sources that are anticipated to be utilized to understand community context.	Confidential engagement
C-12884	25/02/05	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Ministry of Environment, Conservation and Parks (MECP)	Letter	GBR distributing a letter response to additional technical comments made by ANA on Great Bear's ECA ISW application. GBR notes this letter will respond to written feedback received from Dr. Brian Branfireun on behalf of ANA regarding water quality, hydrological, and geochemical aspects. GBR noted the maximum discharge rate to the Chukuni River. The comments received discuss the adaquecy of the baseline water quality dataset, and bring up concerns about mercury in the water, as well as methylmercury and noting preceived inadaquecies within the program, as well as questions surrounding sulphate. GBR responded and reiterated that the water quality results do not operate randomly or lack utility as implied in the October 7, 2024, letter noting the water samples were using industry approvd methods at accredited laboratories, noting that the sulphate effluent is not at risk for exceeding the limits as ore milling will take place off site, which is the main cause for high sulphate effluent in mining operations. GBR also responded regarding the concern of further mercury and the formation of methylmercury downstream, noting that mixing of sulphate at a higher quantity than the Chukuni currently has is not anticipated to be from the Project. The MECP was also copied	Engagement not related to Project
C-14552	25/02/06	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Ministry of Environment, Conservation and Parks (MECP)	Letter	GBR distributing additional technical comments on the Great Bear Resources ECA ISW Application. The response letter provides detailed responses to the October 10, 2024, letter received from Dr. Branfireun, where GBR reiterates that the water quality results are conducted using industry-approved methods at accredited laboratories, and sulphate and mercury monitoring have been undertaken, with GBR having sufficient data for their baseline water quality. GBR also restates that they have provided approximate conservative models to show concentrations of sulphate in the Chukuni River, with modelling being adequate. GBR also states that their models show that the concentration of sulphate will not deviate far from existing conditions, and notes that they acknowledge the issue of methylation downstream but continues to note that this is not anticipated.	Engagement not related to Project
C-14514	25/02/08	Asubpeeschoseewagong Netum AnishinabekGreat Bear Gold Project Projet Aurifère Great Bear Impact Assessment Agency of Canada (IAAC)	Email	GBR responding to ANA's preliminary comments and request for a 90-day review extension on the Great Bear Mercury and Methylmercury Study Plan. GBR notes that the review period is open until February 28, 2025, noting that GBR believes the additional time is substantial and that the comments received from ANA appear substantial and comprehensive, noting that other communities consulted on the plan have completed their review and submitted final comments within the requested deadline. GBR reiterates that they understand the importance of this issue for ANA, and will accept the impacts on project scheduling in order to accommodate this request, and that they are willing to provide reasonable capacity support funding in order to support this review.	

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Ref. no.	Date	Organizations	Communication Type	Summary	Attachment ID
C-12934	25/02/11	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Ministry of Environment, Conservation and Parks (MECP)	Email	MECP communication to ANA and CELA noting that the Ministry has received updated materials for Great Bear Resources Ltd.'s Environmental Compliance Approval application (Ref. No. 9390-D49KGX). MECP informs ANA that GBR previously shared the application in May 2024. MECP issued the Mine Water Holding Pond memorandum and updated Design Brief for reference. The Ministry reiterates they remain committed to ongoing consultation with ANA and will consider all comments received. Ongoing invitation for questions or feedback provided to ANA and CELA. GBR was not copied, but MECP forwarded GBR the email.	
C-14526	25/02/14	Asubpeeschoseewagong Netum Anishinabek	Email	ANA following up with GBR regarding GIS data requested for Early Exploration Permit PR-24-000245. ANA notes that MINES stated GBR will be providing this information, but ANA still has yet to receive it.	Engagement not related to Project
C-13104	25/02/18	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Energy & Mines (MOEM)	Email	GBR provided GIS Data to ANA on the Sharepoint site.	
C-13106	25/02/18	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Energy & Mines (MOEM)	Letter	ANA sharing their preliminary comments in response to Great Bear's early exploration permit application. It was noted that significant information remains outstanding, and the GIS data requested from the proponent was only received this morning. On February 4, 2025, MINES informed GBR that the proponent indicated that it would provide them with the information that they requested on January 27, 2025, including GIS data for this application which the proponent had previously omitted from its data package. However, despite their attempts to access this information from the proponent, they only received the GIS data this morning. GBR require additional time to review, map, and assess this new data and its impacts on ANA's rights, and to provide more fulsome comments following this review. GBR trust that ANA will provide them with additional time to complete this review and to provide additional comments on this application.	Engagement not related to Project
C-14527	25/02/18	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Energy & Mines (MOEM)	Email	GBR distributing the requested shapefile data for Early Exploration PR-24-000245 to ANA, with MOEM copied.	Engagement not related to Project
C-14540	25/02/19	Asubpeeschoseewagong Netum Anishinabek	Email	GBR following-up on the previously sent TK Secondary Sources Memo sent to ANA regarding the requested review process. GBR further notes that they are requesting written permission from all Nations regarding the use of all secondary sources of traditional knowledge, as detailed in the previously attached memo in order to be incorporated into the Impact	Confidential engagement
C-20778	25/02/19	Asubpeeschoseewagong Netum Anishinabek	Email	ANA requesting a 90-day extension to respond to the TK Secondary Sources.	Confidential engagement
C-13123	25/02/21	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Ministry of Environment, Conservation and Parks (MECP)	Letter	CELA sending GBR comments and 12 attachments for the ANA Comments on GBR new PTTW application - ERO Number 025-0078. ANA attached a letter from ANA on concerns of the Great Bear scoped Permit to Take Water, a letter from Dr Morin with MDAG comments on submission of the respondent Great Bear Resources, a letter outlining ANA comments on PTTW, letter from Dr Morin on responses to ANA concerns for AEX, a letter from Dr Branfireun on reponse to PTTW leave of Appeal, a letter from Dr Branfireun on response to GBR ECA, a letter from Dr. Branfireun on GB ECA ISW, a reply letter from Dr. Branfireun on the WSP memo, a technical report from Dr. Branfireun on the Riverbank Mercury Methylation, a letter from Dr Morin on the review of the ECA Application documents for AEX, a letter on ANA's concerns on the closure plan and ECA, and a letter from Dr Freed on the source review of the GB scoped PTTW leave to appeal.	Engagement not related to Project
C-13115	25/02/24	Asubpeeschoseewagong Netum Anishinabek	Email	GBR reaching out to ANA asking for the attached memo on secondary sources be validated by their Nation. Please note that this is a requirement noted in the TISG that Great Bear has received from IAAC. They are requesting written permission from the Nations for use of all secondary sources of traditional knowledge, as detailed in the attached, to be incorporated into the Impact Statement. ANA informing they will need more time to review the memo. They have asked for a 90 day extension. GBR wrote back indicating the ANA letter on March 6, 2024 include some references on the relevant topics, so those are already incorporated. Given ANA's review and submissions to date on the Project on these topics, your request for 90 days is not reasonable in relation to a review of the SLR memo. Also, the secondary source information will be further informed by the Traditional Land and Resource Use report that we anticipate receiving from ANA in April 2025 to inform the Impact Statement.	Engagement not related to Project
C-14541	25/02/24	Asubpeeschoseewagong Netum Anishinabek	Email	ANA responding to GBR regarding the TK Secondary Sources Memo distributed, noting that they request an extension of 90 days in order to respond to the request for ANA review. ANA also further notes that the use of the sources, if permission is given by ANA, will not replace the need for an ethnohistorical report and fulsome land use and occupancy study.	Confidential engagement

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Ref. no.	Date	Organizations	Communication Type	Summary	Attachment ID
C-14544	25/02/24	Asubpeeschoseewagong Netum Anishinabek	Email	GBR responding to ANA's request for a 90-day extension to review the TK Secondary Sources Memo. GBR notes that the memo consists of five public documents, with one being an ANA letter and is two pages long. GBR further notes that the document details public information available relating to ANA, and that if there are any additional resources which ANA would like to share that they would be grateful to receive. GBR specifically notes that they are looking for information on items such as trapping, fishing, plant gathering, cultural/heritage areas and Indigenous governance systems which would be helpful. GBR notes that they do not require permission to utilize public documents in the report but will respect any confidential information which ANA may wish to share. GBR also notes that the ANA letter received March 6, 2024, includes reference to important topics and noted that those were incorporated. GBR notes that given previous ANA submissions to date on these topics, the request for a 90-day review period is not reasonable in relation to the memo. GBR also further responds to the note from ANA regarding the ethnohistorical report, and notes that the secondary source information will be further informed by the Traditional Land and Resource Use Report anticipated from ANA in April of 2025 to further inform the Impact Statement.	Confidential engagement
C-12903	25/02/27	Asubpeeschoseewagong Netum Anishinabek Great Bear Gold Project Projet Aurifère Great Bear Impact Assessment Agency of Canada (IAAC)	Letter	ANA providing Preliminary Comments on Great Bear Resources Mercury Study Plan. ANA distributed 3 letters responding to the study plan. The first letter responds to the Study Plan noting the TISG requirement to submit the mercury study plan with sufficient time to review with a detailed and robust analysis in order for ANA to assess any effects on Aboriginal and Treaty rights. ANA requested an extension to provide comments in line with IAAC's statement that the study plan should have sufficient time for review by experts and interested parties, noting that preliminary comments were provided. The two additional letters were penned by Dr. Morin and Dr. Branfireun, with Dr. Morin noting concerns regarding geochemical characterization regarding federal standards, lack of groundwater modelling and the possible effects from groundwater drawn, and the water quality modelling methods used, noting that there is uncertainty regarding their quality. Dr. Branfireun notes opinions regarding on- and off-site water quality guidelines are inaccurate when dealing with mercury/methylmercury in regard to mercury concentration in wildlife, and that further data collection should take place in order to better understand information. Dr. Branfireun also notes that the water quality model used for fish and biota concentration will be inadequate in assessing the concentration in addition to the frequency of sampling which occurs quarterly. Both note that they believe the Study Plan is misleading for the prediction of mercury/sulphate accumulation and expect further accuracy in determining metal or mineral leaching	ANA_022725_01.pdf
C-13153	25/02/27	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Energy & Mines (MOEM)	Email	ANA's legal team reaching out on behalf of ANA in response to the data GBR has shared with ANA on the SharePoint filesharing site. ANA's legal team notes that the files provided do not include the proposed road and trail locations to the drill collars and asks for this to be provided as well.	
C-14515	25/02/27	Asubpeeschoseewagong Netum Anishinabek Great Bear Gold Project Projet Aurifère Great Bear Impact Assessment Agency of Canada (IAAC)	Email	ANA's response to GBR's extension for the Great Bear Mercury and Methylmercury Study Plan. ANA noted that the extension to February 28, 2025, is inadequate and requests more time, noting submission can be expected for March 28, 2025. ANA reiterates their decades long experience with mercury contamination and noted that their experts are well positioned to provide important and helpful comments on the proposed study plan, but that ANA is still experiencing a mercury crisis and the cumulative impacts which creates barriers to meaningful engagement. ANA further reiterates that that their needs are different than those of other communities and that ANA needs more time to review and assess this proposal and provide comments.	
C-14529	25/02/27	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Energy & Mines (MOEM)	Email	ANA responding to GBR regarding the shapefiles distributed for Early Exploration PR-24-000245. ANA notes that the shapefiles do not include a proposed road and trail location to the drill collars as indicated within the application and request a shapefile which reflects their anticipated location.	Engagement not related to Project
C-21148	25/03/03	Asubpeeschoseewagong Netum Anishinabek	Email	Great Bear Resources request to complete on-reserve socio-economic interviews to collect data with service providers.	
C-13611	25/03/10	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Land Tribunal Ontario Ministry of Environment, Conservation and Parks (MECP)	Letter	Ontario Land Tribunal issuing a decision regarding ANA's application for the subject to leave appeal regarding the MECP decision to issue a Permit to Take Water (PTTW) ECA for GBR to take water for the Great Bear Gold Project's AEX program. The OLT spoke to the application ANA submitted, and the support given in favor of the application including letters from Dr. Branfireun and Dr. Morin regarding mercury and ML-ARD in relation to the MECP's precautionary principal approach. OLT notes that the MECP did not take the precautionary principal in granting the PTTW as there is scientific uncertainty noted in the ANA materials, and specifically the sensitivity within the Dixie Creek to methylation, and methylmercury production cited by Dr. Branfireun. OLT concludes based on the evidence ANA has provided, the Tribunal finds that there is good reason to believe no reasonable person could have made the decision to approve the permit, noting the additional environmental condition in the area, and further sensitivity to methylmercury. OLT noted that there is onus on the Applicant to satisfy the Tribunal and show that this permit would pass the significant harm test. The Tribunal ruled in favor of ANA regarding the leave to appeal	Engagement not related to Project

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Ref. no.	Date	Organizations	Communication Type	Summary	Attachment ID
C-13171	25/03/12	Asubpeeschoseewagong Netum Anishinabek	Email	GBR reaching out to ANA Lands Protection team informing that SLR will be collecting community-specific information from on-reserve service providers to determine what, if any impact the great bear project could have on regional residents. Outlined the two different approaches for how to collect this data and asked the team if they would prefer to collect the data internally. They need to respond by March 10th indicating what their preferred approach is. Cavalluzzo contacted GBR indicating they are still considering the proposal. Also indicated, SLR should not reach out to on-reserve service providers until you hear from us.	
C-21145	25/03/17	Asubpeeschoseewagong Netum Anishinabek	Email	Great Bear Resources confirmed that they will not reach out to on-reserve social-service providers and the Impact Statement will proceed without socio-economic data unless ANA chooses to provide it.	
C-13753	25/03/27	Asubpeeschoseewagong Netum Anishinabek	Email	GBR sharing with ANA legal team a link to the Lakes and Rivers Improvement Act (LRIA) application prepared in support of the proposed treated effluent discharge structure within the Chukuni River, associated with the Great Bear Advanced Exploration Program.	Engagement not related to Project
C-14717	25/04/03	Asubpeeschoseewagong Netum Anishinabek Lac Seul First Nations Ontario Ministry of Energy & Mines (MOEM) Wabauskang First Nation	Email	MINES emailed GBR to provide the early exploration permit on behalf of the Director of Exploration NW.	
C-14756	25/04/10	Asubpeeschoseewagong Netum Anishinabek	Email	GBR provided ANA the link for information related to potential fish offsetting compensation. GBR requested feedback.	ANA_041025_01.pdf
C-15005	25/04/10	Asubpeeschoseewagong Netum Anishinabek Deputy Minister's Office Ontario Ministry of Energy & Mines (MOEM) Ontario Ministry of Environment, Conservation and Parks (MECP) Ontario Ministry of Natural Resources (MNR)	Letter	This letter from the Asubpeeschoseewagong Netum Anishinabek (ANA) to Great Bear Resources Ltd. informs the company that they hold claims, leases, or other mining tenures within the ANA Interim Core Area of Interest for Mining. The ANA expresses concern that Great Bear Resources Ltd. has staked or acquired claims within this Core Area and on their Territory without informing the First Nation of their plans. The letter emphasizes the longstanding connection of the ANA's community to the claimed area, their practice of the Anishinaabe way of life, and the importance of the area for exercising their Treaty rights. The ANA also highlights the cumulative effects of past industrial impacts on their community and territory, including mercury pollution, damming, industrial logging, and mining activity, which have caused significant harm. The letter asserts ANA's Treaty rights, the potential impact of mining claims on their Treaty Land Entitlement claim, and ongoing litigation related to Crown failures to protect their rights. It also raises concerns about unmet legal duties and the need for the Crown and industry to respect ANA's laws and rights. The ANA calls on Great Bear Resources Ltd. to halt all staking and mineral exploration activities in the Core Area, commit to obtaining free, prior, and informed consent for any activities, and engage with the community to address their concerns.	Engagement not related to Project
C-15138	25/04/10	Asubpeeschoseewagong Netum Anishinabek	Email	GBR provided a link to share informaiton related to potential fish offsetting compensation plans for the Project. GBR noted that they would appreciate the opportunity to meet and discuss further.	
C-21150	25/04/11	Asubpeeschoseewagong Netum Anishinabek	Letter	ANA provided comments on the MeHg Study Plan.	
C-21151	25/04/14	Asubpeeschoseewagong Netum Anishinabek	Letter	ANA opposing the MECP granting a 5 year PTTW.	
C-14947	25/04/23	Asubpeeschoseewagong Netum Anishinabek Cavalluzzo Crown-Indigenous Relations and Northern Affairs Canada Deputy Minister's Office Environment and Climate Change Canada Fisheries and Oceans Canada (DFO) Great Bear Gold Project Projet Aurifère Great Bear Impact Assessment Agency of Canada (IAAC) Indigenous Affairs and First Nations Economic Reconciliation Indigenous Services Canada Ministry of Energy and Electricification Ontario Ministry Indigenous Affairs & First Nations Economic Reconciliation (IAFNER) Ontario Ministry of Energy & Mines (MOEM) Ontario Ministry of Environment, Conservation and Parks (MECP) Ontario Ministry of Natural	Email	On April 22, 2025, Asubpeeschoseewagong Netum Anishinabek (ANA) submitted a letter to the Ontario Minister of Natural Resources opposing Great Bear's request for Lakes and Rivers Improvement Act (LRIA) location approval to install a treated effluent discharge pipeline and diffuser into the Chukuni River. ANA objects to the Crown's delegation of consultation responsibilities to Great Bear, emphasizing that consultation with a treaty partner must remain a direct Crown duty under the nation-to-nation relationship established through Treaty 3. ANA asserts that the LRIA application is premature, as Great Bear does not yet have the required environmental permits — including a Permit to Take Water and an Environmental Compliance Approval — necessary for discharging effluent. ANA raises serious concerns that the proposed discharge would exacerbate mercury and methylmercury contamination in the English-Wabigoon River System, harming the health, cultural practices, and Treaty 3-protected rights of ANA community members. Furthermore, ANA strongly criticizes Ontario's scoping of consultation at the low end of the duty to consult spectrum, arguing that a cumulative impacts approach is necessary to properly assess industrial activities in their territory. ANA further explains that a cumulative impacts analysis demonstrates that its free, prior, and informed consent is required for LRIA approval. ANA provides evidence of its long-standing connection to the Red Lake area, citing historical reports, fur trade records, church records, and ethnological work documenting traditional activities such as hunting, fishing, trapping, gathering, gardening, spiritual practices, and trading	Engagement not related to Project
C-15036	25/04/23	Asubpeeschoseewagong Netum Anishinabek	Email	ANA response letter to Great Bear Resources Request for "Lakes and Rivers Improvement Act" Location Approval. The letter highlighted consultation requirements and the need for ANA's consent.	Engagement not related to Project
C-15037	25/04/25	Asubpeeschoseewagong Netum Anishinabek	Email	~~Emailed~~ to GBR to thank them for the presentation and noted that ANA requires additional information before they can consider the proposal. They noted that the presentation refers to background materials ANA has not received and requested the baseline reports and associated data, habitat assessments, sampling data, and designs for the offset	

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Ref. no.	Date	Organizations	Communication Type	Summary	Attachment ID
C-15139	25/04/25	Asubpeeschoseewagong Netum Anishinabek	Email	Email to GBR to note that ANA requires additional information before they can consider the proposal and requested the baseline information referenced in the presentation. Cavalluzzo also noted that ANA will need 120 days to review the information before they can consider meeting and providing feedback.	
C-15400	25/04/25	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Ministry of Environment, Conservation and Parks (MECP)	Email	ANA's legal team distributing a response letter to GBR regarding the proposal for Environmental Compliance Approval for Industrial Sewage Treatment Works and suggesting to the MECP that they should reject the submission from GBR. ANA cites a lack of consistency with the MEND 2009 sampling approach and geochemistry testing methods, the Project potential to contribute to methylmercury formation in area water bodies due to the release of sulphate. The ANA legal team cites these reasons for the MECP to not approve the application, noting that this would be reckless and dangerous to ANA, and has the ability to add further harm to	Engagement not related to Project
C-14911	25/04/28	Asubpeeschoseewagong Netum Anishinabek	Email	ANA formally advised GBR that all engagement regarding the proposed Great Bear Gold Project must occur through the ANA Land Protection Team, which holds the mandate from Chief and Council to represent the community. ANA expresses concern that GBR representatives have been approaching individual ANA members and trapline holders directly. The letter emphasizes that Aboriginal and Treaty rights are collective rights held by the community, and therefore consultation must respect the collective authority of Chief and Council. ANA expects GBR to cease direct engagement with individuals and work exclusively through the authorized Land	ANA_042825_01.pdf
C-15140	25/04/29	Asubpeeschoseewagong Netum Anishinabek	Email	GBR provided a link to the completed baseline reports for the Project. GBR noted that some reports are interim and advised that they will provide notice when the reports are finalized.	
C-14927	25/04/30	Asubpeeschoseewagong Netum Anishinabek	Email	GBR emailed ANA to advise that the Archeological reports were included in the baseline reports that were previously	
C-14928	25/04/30	Asubpeeschoseewagong Netum Anishinabek	Email	ANA emailed GBR to request the documents related to the archeological assessments.	
C-15085	25/04/30	Asubpeeschoseewagong Netum Anishinabek	Email	ANA communicates that it was not included in the Stage 2 Archaeological Assessment conducted by Great Bear or in the planning or discussions related to the Stage 3 Assessment for culturally significant sites. The community has not received any related documentation. ANA is requesting full disclosure of all archaeological assessment materials associated with the Great Bear Project, including background studies, field notes, planning documents, site details, inspection reports, maps, and related records.	
C-15086	25/04/30	Asubpeeschoseewagong Netum Anishinabek SLR Consulting	Email	Great Bear provides notice to ANA that archaeological reports are included in baseline link issued on April 29th	
C-15148	25/04/30	Asubpeeschoseewagong Netum Anishinabek	Email	GBR email to note that archaeological reports are included in the baseline reports that were previously provided.	
C-15087	25/05/02	Asubpeeschoseewagong Netum Anishinabek	Email	ANA expressed concern over delays in receiving baseline and archaeological reports, noting that the community has been requesting this information for some time. They emphasized that GBR committed to timely sharing of such materials and providing opportunities for input prior to work being undertaken—commitments they feel have not been met. ANA stated that GBR proceeded with archaeological investigations and reporting without their involvement, despite potential cultural and historical significance. They have requested that all archaeological work be halted until they have reviewed and responded to the information and that any activities potentially affecting archaeological sites also cease. ANA further requested immediate notice of any outstanding documents and that the significance of any shared materials be clearly communicated.	
C-15149	25/05/02	Asubpeeschoseewagong Netum Anishinabek	Email	Email to GBR to note their frustrations with the timing of receiving the archaeological reports. Noted that it is ANA expectation that the reports are provided immediately. They also noted their frustration with not being included in the assessment or reporting.	
C-15088	25/05/06	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Fisheries and Oceans Canada (DFO) Indigenous Affairs and First Nations Economic Reconciliation Indigenous Services Canada Ministry of Energy and Electricification Ontario Ministry of Energy & Mines (MOEM) Ontario Ministry of Environment, Conservation and Parks (MECP) Ontario Ministry of Natural Resources (MNR)	Email	ANA raised concerns about the integrity of the Impact Assessment process for the Great Bear Project, citing a lack of trust in IAAC and the exclusion of their selected experts from the External Technical Review (ETR). They objected to experts proposed without their input and submitted alternative candidates for consideration. ANA also emphasized their loss of faith in Ontario's permitting system, particularly following the scoped Permit to Take Water (PTTW) approval—later revoked after their successful appeal—which they believe demonstrates the province's inability to protect the environment or Indigenous rights. ANA reiterated that the Advanced Exploration (AEX) phase must be included in the federal assessment due to its potential impacts on their lands and waters. Additionally, they objected to being excluded from discussions on the Environmental Compliance Approval (ECA) and demanded full transparency and participation in future decisions affecting their territory. ANA requested a pause in the assessment process until they have reviewed key technical information, including baseline data and the ML-ARD report. They reaffirmed that no project activities should proceed without their free, prior, and informed consent.	

Appendix C Record of Consultation: Asubpeeschoseewagong Netum Anishinabek (Jan 1, 2022 to Jan 16, 2026)

Ref. no.	Date	Organizations	Communication Type	Summary	Attachment ID
C-14738	25/05/13	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Energy & Mines (MOEM) Ontario Ministry of Environment, Conservation and Parks (MECP) Ontario Ministry of Natural Resources (MNR)	Email	ANA emailed GBR to provide a letter and map regarding the GBR Project. The letter outlined the following: Area Subject to ANA Interests, Area Subject to Cumulative Effects, Area Subject to Treaty Land Entitlement Claim, Area Subject to Litigation, Area Subject to Unmet Legal Duties, ANA law and rights, and request to meet and identify any third party interests.	ANA_051325_01.pdf ANA_051325_02.pdf
C-15089	25/05/22	Asubpeeschoseewagong Netum Anishinabek Cavalluzzo Environment & Climate Change Canada (ECCC) Fisheries and Oceans Canada (DFO)Ontario Ministry of Environment, Conservation and Parks (MECP) Ontario Ministry of Natural Resources (MNR)	Email	ANA reiterated that Great Bear has not responded to their January 31, 2025 concerns regarding the proposed Mercury Study Plan. They emphasized the need for additional time to consult with experts and submitted a third expert report from Source Environmental Associates, which identified further deficiencies. Key concerns include non-alignment with the Tailored Impact Statement Guidelines, lack of mapping and cumulative effects analysis, exclusion of historically contaminated downstream areas, and weaknesses in baseline methodology. ANA called for more comprehensive and frequent sampling, improved site selection, and justification for omissions, including unnamed waterbodies. They continue to seek meaningful revisions before the study proceeds.	ANA_052225_01.pdf
C-15169	25/05/22	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Great Bear Gold Project Projet Aurifère Great Bear Impact Assessment Agency of Canada (IAAC)	Email	ANA highlighted the need for more time and support to meaningfully participate in the Impact Assessment process for the Great Bear Gold Project. They noted that short response timelines have limited their ability to fully engage, conduct internal reviews, consult with experts, and carry out necessary studies, including those related to land use, social conditions, and baseline environmental data. ANA emphasized the importance of ensuring community-led processes that reflect their lived experience, including the impacts of historical mercury contamination. They requested additional time—specifically, 180 days—to prepare a submission on social impacts and to review secondary sources of traditional knowledge. ANA also recommended that revisions to the Mercury Study Plan be completed in consultation with their experts and reviewed by the upcoming IAAC Expert Technical Review group. They asked GBR to consider a pause in the process to allow for more collaborative engagement and requested written confirmation that the project team will support ANA's ability to participate meaningfully at all stages.	ANA_052225_02.pdf
C-15617	25/05/29	Asubpeeschoseewagong Netum Anishinabek Environment and Climate Change Canada Impact Assessment Agency of Canada (IAAC) Ministry of Energy and Electricification Ontario Ministry of Energy & Mines (MOEM) Ontario Ministry of Environment, Conservation and Parks (MECP) Ontario Ministry of Natural Resources (MNR)	Email	ANA provided an update on its Preliminary Land Use and Occupancy Study. While full studies typically take three to ten years, the team is working to produce a preliminary report within six to eight months due to the accelerated Impact Assessment timelines. ANA emphasized that this information is critical for informed decision-making and requested that the assessment process allow sufficient time to incorporate land use data. They also urged that no project activities proceed that could affect ANA's land use until this information is properly considered. Communication also included an overview of the approach by a consultant anthropologist supporting ANA. The communication notes that she is assisting with the preparation of a Preliminary Land Use and Occupancy Study focused on ANA's Interim Core Area of Interest for Mining, particularly areas potentially affected by the proposed Great Bear Mine. The consultant, a tenured professor at Ohio State University with expertise in Anishinaabe land use and environmental relationships, noted that full land use studies typically require 3–10 years. Given the compressed timelines of the Impact Assessment process, ANA is working as efficiently as possible to produce a preliminary report, which is expected to take an additional 6–8 months. Initial findings confirm both historic and ongoing traditional land use in the vicinity of the proposed mine, including hunting, fishing, trapping, gathering, and travel. The study has also documented strong community concerns regarding potential water contamination from mining and industrial activities. It is closed with a note that further updates will be provided as work progresses.	ANA_052925_01.pdf ANA_052925_02.pdf
C-15154	25/06/03	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Ministry of Environment, Conservation and Parks (MECP)	Letter	The Canadian Environmental Law Association, on behalf of ANA, submitted a formal response opposing the Environmental Compliance Approval (ECA) application by Great Bear Resources (GBR) for the proposed Great Bear Advanced Exploration Project. ANA maintains that GBR has failed to meaningfully address the substantive concerns previously raised. The company's February 2025 response merely highlighted past commentary without offering any new or responsive information. Independent expert reviews—particularly from Dr. Kevin Morin and Dr. Brian Branfireun—identified fundamental technical deficiencies in GBR's approach. Dr. Morin concluded that GBR's methods for assessing metal leaching and acid rock drainage (ML-ARD) do not align with the 2009 federal MEND guidelines, and that GBR has failed to produce the comprehensive geochemical assessments required for such projects. Dr. Branfireun found that GBR's treatment of sulphate and mercury data was flawed, with inaccurate data handling and unreliable analytical techniques that undermine the integrity of mercury risk assessments. The communication notes that ANA has also raised concerns that effluent discharge limits, accepted by the Ministry of the Environment, Conservation and Parks (MECP) in 2023 without notice to the community, are inadequate and do not protect against risks from pollutants such as methylmercury and sulphate. These limits do not account for the unique environmental conditions and cumulative industrial impacts already affecting the ANA watershed. The proposed treatment system is viewed as vague and incapable of removing the pollutants that threaten water quality and fish safety. ANA emphasized that GBR's application fails to	Engagement not related to Project

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Ref. no.	Date	Organizations	Communication Type	Summary	Attachment ID
C-15457	25/06/12	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Ministry of Environment, Conservation and Parks (MECP)	Email	GBR submitted issues a formal response to technical concerns raised by the Canadian Environmental Law Association (CELA) and ANA regarding GBR's application for an Environmental Compliance Approval (ECA) for industrial sewage treatment works at the Great Bear Advanced Exploration Project (ERO No. 019-8718). GBR confirms that its methodologies for acid rock drainage (ARD) and metal leaching (ML) are consistent with MEND 2009 and Ontario Regulation 240/00, and have been implemented by qualified experts with independent third-party review. GBR rejects allegations of non-compliance or inadequate data and affirms that mitigation measures exceed regulatory requirements, including conservative design elements to eliminate off-site risk. GBR maintains that its baseline data, analytical methods, and interpretation meet applicable scientific and regulatory standards, and that concerns raised represent differences of professional opinion rather than deficiencies in the technical record. GBR cautions against misrepresentation of its submissions and reiterates its commitment to compliance and environmental protection.	Engagement not related to Project
C-15456	25/06/17	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Natural Resources (MNR)	Email	On June 17, 2025, the Ontario Ministry of Natural Resources (MNR) issued a written response to ANA (Asubpeeschoseewagong Netum Anishinabek) regarding concerns about the MNR's authorization for the Great Bear Resources Project. The letter confirms that procedural consultation responsibilities for the Lakes and Rivers Improvement Act location approval have been delegated to the proponent, who has the technical expertise to address community questions. The MNR affirms that ultimate consultation responsibility remains with the Crown, which will maintain oversight and participate in meetings as required. The Ministry acknowledges ANA's broader concerns about multiple approvals and has directed its district office to provide additional written follow-up. The community was encouraged to continue liaising directly with the Red Lake–Sioux Lookout District Manager to address ongoing matters.	
C-15597	25/06/18	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Ministry of Environment, Conservation and Parks (MECP)	Email	GBR emailed to provide their responses to the comments received from ANA dated February 21, 2025 (preliminary submission) and April 11, 2025 (proposed permit to take water). GBR's response highlights significant differences between the 2025 application and previous drafts, particularly regarding water quantity and quality assessments. GBR argues that the 2025 application focuses on water management and hydrologic function, while water quality issues are addressed under separate environmental compliance regulations. The response also critiques the reliance on preliminary reports and emphasizes the importance of final, certified documents for regulatory approval. Concerns about groundwater modeling, potential contamination from exploration drill holes, and the adequacy of water quality monitoring are raised, with GBR asserting that their studies comply with regulatory standards. GBR further emphasizes that water quality is managed under a separate Environmental Compliance Approval and that they have incorporated feedback from community consultation. Overall, Great Bear Resources states that they will continue to align with regulatory standards while ensuring environmental protection.	Engagement not related to Project
C-16144	25/07/02	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Ministry of Environment, Conservation and Parks (MECP)	Email	Great Bear Resources Ltd. (GBR) has provided detailed responses to comments submitted by ANA and associated experts concerning its Permit to Take Water (PTTW) application (ERO No. 025-0579) for the Advanced Exploration Project submitted on July 2nd, 2025 by CELA. The company maintains that the scope of water taking under the PTTW is distinct from discharge activities, which are regulated under the Environmental Compliance Approval (ECA). All water discharge will be governed by the ECA, with strict conditions requiring water quality parameters, including sulphate concentrations, to meet natural background levels within the Chukuni River. GBR emphasizes that this approach reflects a precautionary and adaptive management framework intended to prevent environmental harm and that potential concerns about methylmercury generation have been addressed through these proactive measures. GBR rejects assertions that the data supporting the PTTW are incomplete or inadequate, stating that the baseline studies—initiated in 2022—are comprehensive, have undergone third-party laboratory analysis, and were reviewed by the Ministry of the Environment, Conservation and Parks (MECP). The company notes that adjustments to the mixing zone and flow statistics were made in response to regulatory input. GBR also clarified the sequencing and evolution of its PTTW submissions, indicating that the current application consolidates prior water-taking volumes and activities into a single streamlined proposal, with no overlap between project phases. Concerns regarding untreated water or reliance on mobile treatment systems were addressed by confirming that the	Engagement not related to Project

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Ref. no.	Date	Organizations	Communication Type	Summary	Attachment ID
C-16204	25/07/07	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Ministry of Environment, Conservation and Parks (MECP)	Email	CELA submission on behalf of ANA, dated July 7, 2025, consolidates expert evidence indicating that the proposed ECA for the Great Bear Advanced Exploration Project (ERO No. 019-8718) must be rejected in the opinion of ANA and CELA. Drawing on technical assessments from Dr. Kevin Morin (MDAG), Dr. Brian Branfireun (Western University), and Source Environmental Associates Inc., the submission outlines and asserts multiple critical deficiencies in GBR'S application and supporting documentation, particularly in relation to predicted contamination, sulphate discharge, and the failure to adhere to best practices as outlined in the federal ML-ARD Prediction Manual. Dr. Kevin Morin's MDAG report highlights significant and unresolved deficiencies regarding the prediction and mitigation of metal leaching and acid rock drainage (ML-ARD). Despite ongoing exploration activity since 2021, GBR has failed to submit a comprehensive ML-ARD assessment as required under federal guidance. Dr. Morin asserts that the limited, outdated, and laboratory-constrained data submitted to date are insufficient for full-scale predictive modelling, and consequently, render the current detailed engineering design invalid. Notably, the proportion of potentially acid-generating (PAG) rock is now estimated at 70%, double the initial estimate, yet no redesign of the AEX plan has been proposed. Further, the water treatment plant (WTP) proposed by GBR is found to be inadequate; the design omits effective sulphate removal and relies on dilution in the Chukuni River, a strategy that is non-protective and contrary to standard environmental safeguards. The MDAG report also identifies that basal liners	Engagement not related to Project
C-16251	25/07/07	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Environment, Conservation and Parks (MECP)	Letter	On July 7, 2025, ANA submitted comments on Great Bear Resources Ltd.'s (GBR) proposed Environmental Compliance Approval (ECA) for sewage works associated with the Advanced Exploration Project (AEX Project). The submission reiterated a series of previously raised technical concerns relating primarily to metal leaching and acid rock drainage (ML-ARD), water treatment design and performance, sulphate discharge levels, and baseline environmental data sufficiency. GBR responded by referencing and affirming the adequacy of its earlier submissions, notably those dated February 5, May 28, June 12, and July 3, 2025. In response to concerns about increased volumes of potentially acid-generating rock and ML-ARD predictions, GBR clarified that interpretations based on humidity cell testing were inaccurate and that mine rock proportions were calculated using a block model. Regarding treatment design, GBR maintained that the effluent treatment plant (ETP) design is appropriate for the scale and duration of the exploration program and that sulphate levels will meet background concentrations at the end of the approved mixing zone, as supported by its May 29 supplemental mixing study. GBR also clarified that generated sludge would be safely stored on lined rock pads in geo-tube bags. On broader concerns regarding methylmercury formation and sulphate loading raised by Dr. Brian Branfireun, GBR disagreed with the application of local riverbank study results to the entire downstream watershed. It further stated that sulphate discharge limits under the proposed ECA are protective and developed in accordance with Ontario's	Engagement not related to Project
C-16435	25/07/15	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Environment, Conservation and Parks (MECP)	Email	GBR emailed MECP to provide their responses to ANA comments sent July 7th. Comments addressed concerns related to water quality, ETP design and surface water monitoring plan.	Engagement not related to Project
C-21154	25/07/24	Asubpeeschoseewagong Netum Anishinabek	Letter	ANA submitted comments regarding the AEX PTTW submission from Great Bear Resources.	
C-21156	25/07/28	Asubpeeschoseewagong Netum Anishinabek	Letter	Great Bear Resources provided responses to ANA's July 24th, 2025 comments on the PTTW application.	
C-16600	25/07/30	Asubpeeschoseewagong Netum Anishinabek	Email	GBR emailed to request the raw data from the Riverbank Study including method blanks, matrix spikes, and all raw data for the parameters tested.	
C-17202	25/09/05	Asubpeeschoseewagong Netum Anishinabek	Letter	MECP forwarded two letters from ANA regarding the PTTW and ECA applications dated August 19th, and August 20th, to GBR for response.	
C-17212	25/09/08	Asubpeeschoseewagong Netum Anishinabek	Email	GBR emailed ANA links to provide comments on the Land Use Permit for monitoring well installation and forestry clearing permit application. GBR sent a follow up email to note an error with the links and provided updated links.	Engagement not related to Project
C-17187	25/09/09	Asubpeeschoseewagong Netum Anishinabek	Email	GBR emailed ANA to provide a link with information regarding Early Exploration Test Pits and Geophysics for the Project.	Engagement not related to Project
C-17248	25/09/10	Asubpeeschoseewagong Netum Anishinabek	Email	GBR emailed ANA to provide a link for the following information; Methylmercury Predictive Modelling, Introduction to Water Management, Fish and Fish Habitat, and Migratory Birds.	
C-17303	25/09/16	Asubpeeschoseewagong Netum Anishinabek	Email	GBR followed up on a previous email to ANA providing information on Methylmercury Predictive Modelling, Introduction to Water Management, Fish and Fish Habitat, and Migratory Birds, also extending an invitation to meet and discuss any of the topics.	
C-17386	25/09/22	Asubpeeschoseewagong Netum Anishinabek	Email	GBR distributing the First Phase of the Great Bear Gold Project Impact Statement Submission submitted to IAAC to ANA which was submitted on September 18th, 2025. GBR notes that as previously discussed the IS will be provided in multiple phases, and further highlighted their commitment to providing information to ANA as it becomes available. GBR notes for ANA to reach out if they have any questions or would like to meet to discuss.	

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Ref. no.	Date	Organizations	Communication Type	Summary	Attachment ID
C-17426	25/09/23	Asubpeeschoseewagong Netum Anishinabek Cavalluzzo	Email	Cavalluzzo requested user activation to accesses the GBR IAAC Impact Submission folder link, as they assist ANA with file management.	
C-21158	25/09/25	Asubpeeschoseewagong Netum Anishinabek	Letter	MECP shares two emails including letters from Source Environmental with Great Bear Resources, September 9th letter on ECA application, September 13th letter on PTTW	
C-17845	25/09/30	Asubpeeschoseewagong Netum Anishinabek	Email	GBR reaching out to ANA in order to request a status update on the progress of ANA's land use and occupancy study to date, noting they are available to meet with ANA in order to discuss any information that ANA would like to share regarding the Land Use and Occupancy Study.	Confidential engagement
C-18280	25/10/01	Impact Assessment Agency of Canada (IAAC) Asubpeeschoseewagong Netum Anishinabek	Email	GBR distributing the comments provided from ANA and GBR's responses to IAAC in response to their earlier request to receive comments received and GBR's response regarding the 2024 Mercury Study Plan. GBR provided the initial comment and responses received on the plan, as well as further letter responses from Doctors on behalf an ANA issued January 27, 2025, and January 31, 2025. A January 31, 2025 letter from ANA was also provided in addition to a memo summarizing comments which was provided on May 2, 2025.	ANA_100125_01.pdf ANA_100125_02.pdf ANA_100125_03.pdf ANA_100125_04.pdf ANA_100125_05.pdf ANA_100125_06.pdf
C-18340	25/10/03	Asubpeeschoseewagong Netum Anishinabek	Email	GBR distributing the Fish Habitat Offsetting and Compensation Plan (FHCOP) as well as the draft Mine Waste Alternatives report for ANA's review and comment. GBR notes that they welcome a meeting with ANA to further discuss the documents	
C-18343	25/10/03	Asubpeeschoseewagong Netum Anishinabek	Email	GBR distributing the Methylmercury Modelling Approach report for ANA's review and comment. GBR notes that they welcome a meeting with ANA to further discuss the documents	ANA_100325_01.pdf
C-18380	25/10/07	Asubpeeschoseewagong Netum Anishinabek Ontario Ministry of Natural Resources (MNR)	Email	GBR emailed ANA to address concerns in ANA's letter regarding GBR's application for a Land Use Permit under the Public Lands Act. GBR noted that the request for a permit to install monitoring wells and drive points along Dixie Creek was at the request of the MECP to monitor ground and surface water around the AEX site. The permit for these wells will enhance environmental monitoring, and will not result in taking or treating water or infrastructure development. GBR noted they have entered into a capacity funding agreement with ANA for engagement, and will follow all permit conditions and environmental protection measures.	Engagement not related to Project
C-18373	25/10/08	Asubpeeschoseewagong Netum Anishinabek	Email	GBR provided access to the Great Bear Gold Project Impact Statement Technical Supporting Documents, which include assessments on ambient light, GHG, net zero plans, best practices, vibration, economic modeling, climate risk, noise, and viewshed. These documents are shared for early review and input before the official Phase 2 filing. Additional documents will be provided as they become available, and feedback is welcomed.	
C-18371	25/10/10	Asubpeeschoseewagong Netum Anishinabek Cavalluzzo Ontario Ministry of Energy & Mines (MOEM)	Email	ANA responds to a September 11, 2025 notice regarding Great Bear Resources' proposed early exploration activities. ANA formally objects to the activities—geophysical surveys, mechanized drilling, stripping, and line cutting—due to their contribution to cumulative industrial impacts already affecting the community, including mercury pollution and other environmental harms. The response calls for recognition of ANA's rights and the need for genuine, respectful engagement aligned with reconciliation. GBR addresses concerns regarding the Great Bear Test Pits and Geophysics Project, clarifying that the proposed activities are low-impact and short-duration, with minimal environmental effects. GBR has provided funding support for project review and engagement, sharing detailed information and remaining available for further discussions.	Engagement not related to Project
C-18427	25/10/14	Asubpeeschoseewagong Netum Anishinabek Cavalluzzo Ontario Ministry of Natural Resources (MNR)	Email	GBR email response to the letter sent by ANA on September 23, 2025, which was addressed to the MNR and GBR. GBR responded to comments and clarified points regarding the AEX clearing application for the substation and distribution line. GBR responded to comments from ANA which stated that it is premature to approve additional tree clearing as the Project lacks permitting stating that the work in the AEX clearing application is part of an approved AEX program which has received an approved Closure Plan, and Endangered Species Act Permit. GBR further responded to a comment from ANA which noted concern that these activities will add to cumulative impacts which ANA has been subjected to, and this cannot be considered in isolation from other historical, current, and proposed Projects. GBR responded to this comment and noted that the request is limited to land-based clearing activities already authorized under the closure plan, noting that there is no water taking, water movement, or water treatment associated with this activity and disagree that this will contribute to cumulative downstream activities. GBR further responded to ANA comments which noted that issuing this approval would allow for infrastructure for the Project to be built for a Project which may not be approved. GBR responded to this comment and stated that the Closure Plan requires progressive reclamation and noting that any areas cleared will be stabilized and restored. GBR further responded to the comment made by ANA which notes that there is no rationale provided for the early issuance of this approval which would justify the potential adverse and cumulative impacts. GBR responded and noted that the rationale is that the clearing is necessary to prepare infrastructure for the AEX Program and	Engagement not related to Project
C-18531	25/10/24	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Ministry of Environment, Conservation and Parks (MECP)	Email	GBR emailed MECP to provide GBR's responses to ANA letters and comments. GBR also noted it does not intend to continue responding to ANA comment letters, as ANA experts do not accept the data or agree with the responses and communications are becoming repetitive. GBR requested MECP make a decision on the permits based on the provided information.	ANA_102425_01.pdf ANA_102425_02.pdf ANA_102425_03.pdf ANA_102425_04.pdf

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Ref. no.	Date	Organizations	Communication Type	Summary	Attachment ID
C-18586	25/10/31	Asubpeeschoseewagong Netum Anishinabek	Email	GBR emailed ANA requesting when the results of the Traditional Knowledge and Land Use Study will be available to share with GBR. GBR also provided a link to the FNFNES Ontario Regional Report and requested ANA validate the secondary source information, as they will be used to inform country food consumption rates.	Confidential engagement
C-18742	25/11/06	Asubpeeschoseewagong Netum Anishinabek	Email	GBR provided ANA with technical supporting documents for the Mine Site Water Balance, the Receiver Water Balance and the Air Quality Assessment.	
C-21302	25/11/19	Asubpeeschoseewagong Netum Anishinabek	Virtual	Meeting between Grassy Narrows First Nation and Kinross. Dialogue on free, prior and informed consent. Technical discussion on sulphate discharge, water management and environmental commitments. Data sharing and next steps in consultation were also discussed.	ANA_111925_01.pdf
C-19132	25/12/02	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Ontario Ministry of Energy & Mines (MOEM) Ontario Ministry of Environment, Conservation and Parks (MECP)	Email	MECP emailed the ANA Chief to provide updates on GBR's Advanced Exploration Program. MECP provided details in a letter and shared a link to the: Groundwater Monitoring and Supplementation Trigger Plan Metal Leaching and Acid Rock Drainage Assessment Report Metal Leaching and Acid Rock Drainage Monitoring Plan Mine Rock and Overburden Management and Monitoring Plan Effluent Mixing Zone and Validation Plan Hydrometric Monitoring Plan Surface Water Monitoring Plan MECP requested that any comments of feedback be provided by ANA within 60 days.	Engagement not related to Project
C-19570	25/12/05	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Great Bear Gold Project Projet Aurifère Great Bear Ontario Ministry of Energy & Mines (MOEM) Ontario Ministry of Environment, Conservation and Parks (MECP)	Email	Email to GBR, IAAC, MOEM and MECP to provide a memo prepared by the ANA Lands Protection team in response to GBR's fish consumption risk assessment feedback request. Requested the memo be shared with the IAAC External Technical Review experts. Provided an expert report on mercury exposure and human health.	ANA_120525_01.pdf ANA_120525_02.pdf
C-19578	25/12/18	Asubpeeschoseewagong Netum Anishinabek	Email	GBR emailed ANA to provide the link to the Second Phase Impact Statement submission that was sent to IAAC. GBR noted the Impact Statement is being provided in multiple phases, and they are available to meet to review this approach and any previously shared information.	
C-20359	26/01/16	Asubpeeschoseewagong Netum Anishinabek Canadian Environmental Law Association Great Bear Gold Project Projet Aurifère Great Bear Ontario Ministry of Energy & Mines (MOEM) Ontario Ministry of Environment, Conservation and Parks (MECP)	Email	GBR responded to concerns raised by ANA regarding fish consumption risks related to mercury contamination. GBR acknowledges the need for a comprehensive risk assessment that reflects historical fish consumption rates and the unique health risks faced by ANA due to past mercury exposure. The response emphasizes the importance of including ANA in the technical review process and highlights the community's treaty rights to fish. GBR plans to use updated methodologies for health risk assessments, focusing on traditional consumption rates and the need for remediation of mercury levels in fish. The ANA response also critiques the reliance on outdated studies and stresses that any increase in mercury levels from the project would be unacceptable. Overall, GBR commits to ensuring that the project does not exacerbate existing mercury contamination and supports the community's right to restore their traditional fishing practices.	Confidential engagement

Asubpeeschoseewagong
Netum Anishinabek
GRASSY NARROWS, ONTARIO P0X 1B0 • PHONE: (807) 925-2201 • FAX: (807) 925-2649

September 13, 2023

Great Bear Gold Project
Impact Assessment Agency of Canada
55 York Street, 6th Floor
Toronto, Ontario M5J 1R7
Telephone: 416-952-1576
Email: GreatBear@iaac-aeic.gc.ca

Dear Impact Assessment Agency of Canada,

RE: Failure to notify ANA and to provide capacity support for IAAC review of Great Bear Project

I am writing as Chief of Asubpeeschoseewagong Anishinabek (Grassy Narrows) to express my concern about the Impact Assessment Agency of Canada's (IAAC) process with respect to Kinross Gold Corporation's proposed Great Bear Project.

The Grassy Narrows village is the first community downstream of the Great Bear Project Site. As well, our people have historically used, and continue to use, the Great Bear Project area, and the areas downstream, downwind, and down migration from there. We have already experience intense cumulative impacts from hydro dams, mercury contamination and poisoning, clearcut logging, and mining related activity. We are deeply concerned about the proposal to build this mine. We have alerted both the proponent and the Ontario Ministry of MINES to these concerns and expect that they would have made you aware of this.

Grassy Narrows' communication protocol with respect to Lands and Environment related matters, including resource extraction proposals, is that all communications should be sent to our Land Protection Team (copied here), while important communications should also be copied to the Chief, who holds the Lands portfolio. This protocol has been communicated to Ontario, including the Ministry of MINES, Canada, Great Bear Resources, and Kinross many times. The Land Protection Team will deal with this matter under the direction of Grassy Narrows Chief and Council. Any notices or correspondence that have not been sent to our Land Protection Team were not sent properly and you should assume that they have not been received. Unlike the Ministry or a large corporation, we do not have staff who can manage our correspondence and monitor it for messages that have not been sent to the right people. Our communication protocol must be followed.

As far as I and the Lands Protection Team are aware, Grassy Narrows has not been notified about the IAAC assessment of the Great Bear Project. As a result, I am very concerned about the fairness and sincerity of this process. While MINES and Kinross staff mentioned that an IAAC submission was

expected, no one informed us that it had been submitted nor posted for comments. One of our advisors stumbled upon the IAAC request for comments yesterday purely by chance while performing a Google search. (https://iaac-aeic.gc.ca/050/evaluations/proj/85832?culture=en-CA)

This raises a number of concerns, and requires a number of corrective actions.

1. IAAC has not communicated with Grassy Narrows about your assessment.

   ACTION REQUIRED: Provide written reasons why we were not communicated with, apologize, and include the Grassy Narrows Land Protection Team in all communications about this project.

2. Grassy Narrows was not engaged by your agency at the Pre-Planning stage of your assessment. Your literature indicates that the agency's role in the Pre-Planning stage is:

   • Informs Indigenous groups about the impact assessment process to support them in understanding how they can participate in the process

   • Learns the views and contexts of the Indigenous groups, including potential effects and how they wish to be engaged.

   This was not done.

   ACTION REQUIRED: Freeze the assessment process, return to the start of the Pre-Planning stage, reach agreement with Grassy Narrows on reasonable capacity support for the Pre-Planning stage, and then fulfill your role with respect to Grassy Narrows at the pre-planning stage. This should include reviewing the process and reaching agreement with Grassy Narrows on any customization of the process that is required to make it fair in our unique circumstances.

3. Yesterday we found out by chance that on August 17th you posted a request for comments from Indigenous groups on the summary of the Initial Project Description. The deadline is September 18, only one month from when you posted this complex technical document and only five days from when we discovered the call for comments. This is not a fair process.

   ACTION REQUIRED: Once the Pre-Planning stage is completed correctly, reach agreement with Grassy Narrows providing reasonable capacity support for the Planning stage, then re-post the revised Initial Project Description with a reasonable review period for Grassy Narrows' circumstances, and any other agreed modifications to the process (to be agreed upon during pre-planning stage).

4. Yesterday, we found out by chance that on August 20th you posted an invitation for capacity support requests from Indigenous groups for the review and preparation of comments on the Initial Project Description. The deadline for applications is September 21. This deadline is after the deadline for submission of comments. Grassy Narrows is an impoverished First Nation with even fewer financial resources than the average First Nation in Canada due to the ongoing impacts of our mercury crisis. To date, Grassy Narrows has received no capacity support from

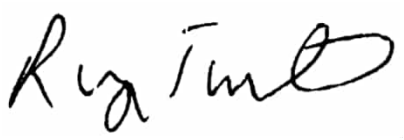
Ontario, nor from any other source for work on the Great Bear Project. We cannot carry out the work require to engage fairly in this complex and technical process until after agreed upon capacity support has been provided.

ACTION REQUIRED: Provide reasonable capacity support (in mutually agreed amounts) in advance of the start of any work on this assessment, including engagement, review of materials, community meetings, governance, and preparation of comments/submissions.

We are deeply concerned about the way that this project has been pursued by Great Bear Resources, Kinross, and the Ministry of MINES. We are also deeply concerned about the way in which this assessment is being carried out. It appears that the conclusion is already foregone, and that everyone has decided, without us, that a gold mine will be built. This gold mine would add to the many risks, impacts, and fears that we have endured for many generations.

We hope that you will correct your transgressions and that your agency will carry out an assessment that is fair to us, takes our concerns seriously, respects our rights, and does not have a foregone conclusion.

Awsa,



Chief Rudy Turtle

Cc:

Joseph Fobister, Land Protection Team Lead (jbfobister@gmail.com)

Mike Fobister, Land Protection Team Coordinator (mike.fobister@googlemail.com)

Jackie Esmonde, Land Protection Team Legal Counsel (jesmonde@cavalluzzo.com)

Dan Mossip-Balk-Balkwill Land Protection Team Advisor (dan.mossip.balkwill@gmail.com)

David Sone Land Protection Team Advisor (david.sone@gmail.com)

Honourable Minister Steven Guilbeault (steven.guilbeault@parl.gc.ca) (Minister of Environment and Climate Change)

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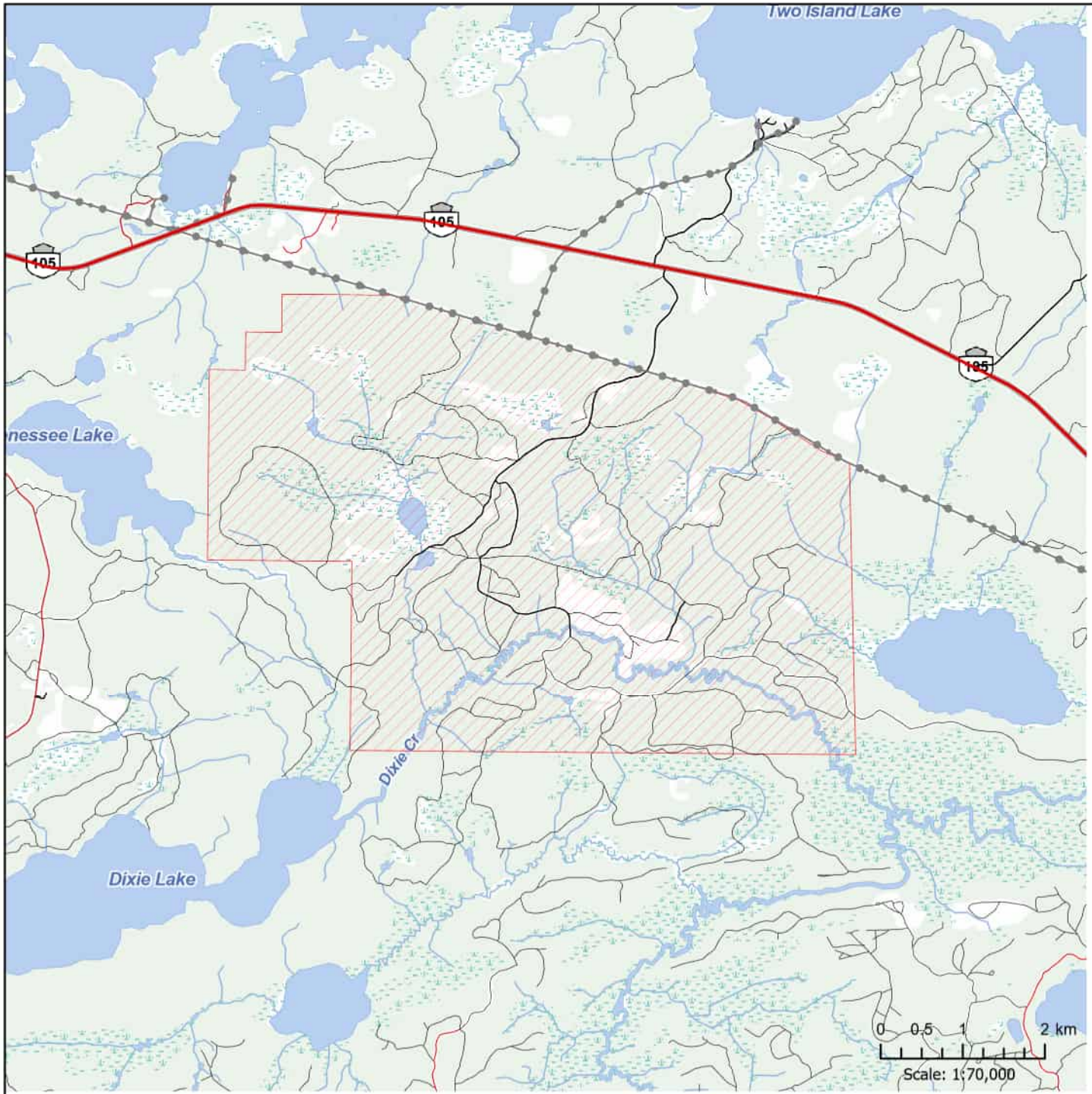
Patrick Barnes (patrick.m.barnes@ontario.ca) (MINES Consultation and Aboriginal Treaty Rights Advisor)

Neal Bennett (neal.bennett@ontario.ca) (MINES Acting Regional Manager Thunder Bay Office)

Teri McDonald (teri.mcdonald@ontario.ca) (MINES Indigenous Consultation and Partnerships Branch)

Aaron MacDonnell (aaron.macdonell@kinross.com) (Kinross Director of Environmental Services)

Mac Potter (mac.potter@kinross.com) (Kinross External Relations Manager)



Kinross - Red Lake Forest

Hydro Line
Highway
Primary Road
Branch Road
Operational Road
Crosshatched/Restricted Zone

Attention Hunters
No Hunting or Discharge of Firearms Area 2023.
Crosshatched Areas in Red Lake District Closed From Oct 7th to Dec 15th.
Please Observe and Obey All Signs.

Ontario Government Notice: Attention hunters. Portion of Tuzyk's Road in Ear Falls and Red Lake areas will be closed to "NO HUNTING OR DISCHARGE OF FIREARMS" from OCT 7th, 2023 to DEC 15th, 2023 inclusive.

Firearms must be encased when traveling through cross-hatched area when signs are present.

The areas will be clearly signed and hunters are requested to obey these signs.
Maps showing the exact closed areas will be available for viewing in the MNRF office Red Lake and at gas stations or major issuers of hunting licenses in the Ear Falls and Red Lake areas.
All closures are made under the authority of subsection 10(2) of the Fish and Wildlife Conservation Act, R.S.O. 1997, Chapter 41, for the purposes of safety of Kinross employees.
For Further Information Contact: Ian Russell - Site Manager, Great Bear Resources Ltd.
Mobile: (807) 728-3882
ian.russell@kinross.com
104 Howey Street,
Red Lake ON, Canada, P0V 2M0

Map Projection: NAD 83 UTM Zone 15N
Date: September 13, 2023
Produced By: Ministry of Natural Resources and Forestry - Regional Information and Analysis Unit
This map is illustrative only. Do not rely on it as being a precise indicator of routes, locations of features, the extent of parcel areas, existence of navigable bodies of water, nor as a guide to navigation.
The Government of Ontario accepts no responsibility or liability for any errors, inaccuracies, and/or omissions in the data.
Data Source - Ontario Ministry of Natural Resources and Forestry District Files, compiled from field survey data, historical records, stakeholder information, reports from the public, other information of record with the Ministry of Energy, Northern Development and Mines, The Ministry of Indigenous Affairs, Natural Resources Canada and LIO (Land Information Ontario Warehouse).
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Ontario

Ministry of Natural Resources and Forestry

Red Lake Sioux Lookout District

227 Howey Street
PO Box 5003
Red Lake, ON P0V 2M0

Ministère des Richesses naturelles et des Forêts

Red Lake Sioux Lookout District

Tel : 807-727-2253
Fax: 807-727-2861

https://www.ontario.ca/mnrf

September 15, 2023

SUBJECT: Notice of No Hunting or Discharge of Firearms Area

The Ministry of Natural Resources and Forestry (MNRF) Red Lake Sioux Lookout District would like to advise you of a No Hunting or Discharge of Firearm Restriction on a portion of Tuzyk's Road in the Ear Falls and Red Lake Area. The Restriction will take place from October 7, 2023, to December 15, 2023. Please see enclosed map.

The areas will be clearly signed, and hunters are requested to obey these signs. Maps showing the exact closed areas will be available for viewing in the MNRF Red Lake office and at gas stations or major hunting licenses issuers in the Ear Falls and Red Lake area.

The public is permitted to travel through the area. However, **firearms must be encased when traveling through cross-hatched area (see map) when signs are present.**

All closures are made under the authority of subsection 10(2) of the Fish and Wildlife Conservation Act, R.S.O.1997, Chapter 41, for the purpose of safety of Kinross employees.

For further information regarding the request for temporary closure and ongoing operations please contact Ian Russell, Site Manager, Great Bear Resources Ltd. by phone at (807) 728-3882 or by email at ian.russell@kinross.com. Should you have any comments or concerns regarding this temporary closure please contact Tyson Kan, Integrated Resource Management Technical Specialist by phone at (807) 728- 1941 or by email at Tyson.Kan@ontario.ca with the MNRF by October 5, 2023.

Sincerely,

Myles Perchuk

Digitally signed by Myles Perchuk
Date: 2023.09.15 16:37:28 -05'00'

Myles Perchuk
Red Lake Sioux Lookout District Manager
Ministry of Natural Resources and Forestry

Enclosure

Great Bear Resources Ltd.
A Kinross Company
104 Howey Street
Red Lake, ON
P0V 2M0

September 26, 2023

Chief and Council
General Delivery c/o Asubpeeschoseewagong Netum Anishinabek Band Office
Grassy Narrows, ON
P0X 1B0
Attention: Lands Protection Team

Dear Chief Turtle and the Lands Protection Team,

In response to Asubpeeschoseewagong Netum Anishinabek's communication to the Impact Assessment Agency of Canada, we at Kinross would like to offer our apologies for the misstep in communication. Previous communications from Kinross have been directed and shared with the Mercury Justice Team.

Further to the letter previously sent out, our goal remains to foster open and productive discussions regarding our Project. To this end, we would like to restate our offer to discuss capacity funding to be provided by Kinross to Asubpeeschoseewagong Netum Anishinabek and the Lands Protection Team, to facilitate and support technical review of environmental and regulatory documents related to the Great Bear Advanced Exploration Permitting and Main Mine Project Impact Assessment. The Kinross team welcomes and can facilitate an in-person meeting as per the direction of the Lands Protection Team and leadership of Asubpeeschoseewagong Netum Anishinabek. Kinross as part of the development of the Great Bear Project is committed to robust mitigation and protection measures designed not only to meet regulatory standards but also to ensure the ongoing safeguarding of water resources. This commitment underscores our firm dedication to this vital principle.

The Kinross team would welcome the opportunity to discuss capacity funding, a pathway forward with the Lands Protection Team and to explore opportunities for review and dialogue. The previous steps and the establishment of a SharePoint documentation portal provide the relevant information for the Lands Protection Team. We will ensure that all those identified are provided access. Kinross looks forward to continuing to explore this option with the team, as this platform not only facilitates the progression and evaluation of advanced exploration activities but also federal regulatory needs ahead. Kinross sees this as a continuing dynamic resource to facilitate and inform dialogue.

Kinross and the Great Bear team look forward to engaging in meaningful conversations with the Community. We are eager to identify potential synergies between the community's interests and the objectives of the Great Bear Project. Through this collaborative approach, we aim to create a positive and mutually beneficial impact, contributing to community well-being.

We extend our gratitude for your continued engagement and support.

Regards,

Mac Potter
External Relations Manager
Great Bear Resources Ltd., *A Kinross Gold Company*

cc.

Aaron MacDonell, Director, Environmental Services, Great Bear Resources Ltd., *A Kinross Company*
Ian Russell, Site Manager, Great Bear Resources Ltd., *A Kinross Company*
Joseph Fobister, Land Protection Team Lead, Asubpeeschoseewagong Netum Anishinabek
Mike Fobister, Land Protection Team Coordinator, Asubpeeschoseewagong Netum Anishinabek
Jackie Esmonde, Land Protection Team Legal Counsel, Asubpeeschoseewagong Netum Anishinabek
Dan Mossip- Balkwill, Land Protection Team Advisor, Asubpeeschoseewagong Netum Anishinabek
David Sone, Land Protection Team Advisor, Asubpeeschoseewagong Netum Anishinabek

Asubpeeschoseewagong
Netum Anishinabek
GRASSY NARROWS, ONTARIO P0X 1B0 • PHONE: (807) 925-2201 • FAX: (807) 925-2649

October 19, 2023

Great Bear Gold Project
Impact Assessment Agency of Canada
55 York Street, 6th Floor
Toronto, Ontario M5J 1R7
Telephone: 416-952-1576
Email: GreatBear@iaac-aeic.gc.ca

Dear Impact Assessment Agency of Canada,

RE: Great Bear Gold Project

I am writing to you on behalf of Grassy Narrows as the Lead Negotiator for Land Protection. I am very concerned by your recent response to my letter and to the previous letter from Chief Turtle.

We have clearly told you that we need time, capacity, and a respectful mutually agreed process to meaningfully engage. We have explained to you some of the extreme challenges that our First Nation faces and we have explained the fear, anxiety, and harm that industrial proposals cause to our people who are already overburdened.

Instead of respecting us, you are forging ahead with a very fast, one-size-fits all process that was determined unilaterally by you before talking to us. This process does not consider our unique circumstances and we are unable to engage in a meaningful way. For example, we have recently buried multiple community members who passed away too young. Your timelines leave no space for our burial process and our grieving.

It appears the IAAC prioritizes advancing this project quickly without care for its impacts on us. This is despite the fact that we have informed you that we are the first community downstream of the project and that we already have suffered harms that go far past the point of any reasonable impact to our health, way of life, society, environment, and rights. The result is that we are being left behind in the Impact Assessment of a project that places us at tremendous and irreversible harm.

In spite of the many important concerns that we have raised, our exclusion from IAAC's pre-planning phase (and many other aspects of this project), the absence of sufficient capacity funding in place for meaningful engagement, and our calls for corrective action, the IAAC is moving ahead without us. When we write to the companies and to the Crown we often have to wait years for responses. If Kinross wants an extension on any step in the process you will grant it. When we say that we need more time you grant us one additional week and then forge ahead without us. And yet we are the party in this process that lacks capacity due to the impacts of colonization and industry.

While you say that you will take our input seriously if we submit it later, this is hard to believe. First, you attempted to contacted us in a way that does not respect our protocols and only at the very last minute at the same time as you gave notice to the general public online. Second, when we became aware of your assessment by chance, we clearly communicated our concerns and solutions, but you have largely ignored the substance of the concerns that we have raised to date. Third the process is already moving forward quickly without us, completing foundational steps (such as deciding who will be engaged and identifying the issues) which will determine the nature of the rest of the process. This has been done without our input.

It is unclear how it will be possible to take our input into account retroactively after so many important decisions have been made. At the current pace you may soon decide that an Impact Assessment is not needed before we are even able to review the hundreds of pages of technical documents which we have received, nor talk to our Elders, landusers, women, and youth, receive expert, legal, policy, and other advice, carry out our governance process, and make relevant submissions to you. How would our input be meaningfully considered then?

How can we trust that you will take our concerns seriously and carry out a fair process when you have ignored the concerns that we have raised so far? How can we trust that you will take our concerns seriously when you forge ahead without us and offer only vague assurances that our concerns will somehow be taken into account later after foundational decisions have already been made without us.

We call on IAAC to terminate this process and to restart the process, if warranted, at a later date.

The main reasons for this include:

1. **The launch of the IA process is premature.**

The launch of the IA is premature because Kinross has not established that a credible and viable project exists. For example, the economic and technical feasibility studies are not yet complete. Before initiating the Impact Assessment, the proponent should be required to present an analysis based on an economically and technically credible mine plan; and supported by an independent, rigorous economic and ecological analysis of the alternatives.

The premature launch of the IA creates hardship for ANA by creating undue burden on ANA's strained capacity which is required to address the intense crisis in Grassy Narrows, and by creating stress and fear for ANA people who are already suffering from hardship including a child and youth suicide crisis.

The IAAC must ensure that only credible and viable projects are allowed to initiate the IA process. Otherwise, ANA (and others) could be burdened unnecessarily by this process at the whim of any over eager proponent seeking to get a head start on their regulatory timelines.

2. **Strategic issues unresolved.**

The Crown has unresolved obligations to Grassy Narrows. including obligations related to Treaty 3 and obligations arising from the commitment to increase Grassy Narrows' control over local lands and resources as part of addressing the damage that mercury has done to the environment on which Grassy Narrows depends.

These obligations are not yet fulfilled and require reaching a new, mutually agreeable arrangement with respect to land ownership, jurisdiction, decision making, landuse designations, protected areas, cumulative effects, source water protection, remediation, monitoring, and other related matters.

The Ministry of MINES has indicated that they will finally come to the table with ANA, and CIRNAC has indicated that they would join a table if Ontario is present. However, ANA continues to await a response from the Minister of MINES on which of ANA's issues Ontario is willing to have on the table. The table has yet to be established, but we have hope that it will resolve the unresolved issues.

Proceeding with a unilateral regulatory process for a specific gold mining proposal conflicts with the commitment to resolve in good faith the matters identified in the 1978 MOU between Grassy Narrows, Ontario and Canada, and the duty of the Crown to act honourably and the Crown's fiduciary obligations towards Grassy Narrows. It further prejudices and makes more intractable the successful resolution of these important issues between Grassy Narrows and the Crown.

3. **The foundational steps of the IA process were fatally flawed**

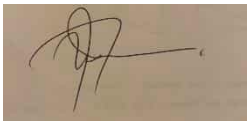
ANA was excluded from the pre-planning phase. As a result, ANA's preferred way of engaging on this project has not been identified nor implemented by IAAC. Instead, a one-size-fits all process has been used that has made meaningful engagement by ANA impossible and has left ANA behind.

Key decisions, such as the process, and the identification of the issues, have been carried out without ANA. A very preliminary read of the issues indicates that issues important to ANA are omitted and a number of ANA specific issues raised by Indigenous Services Canada are also omitted. Issues specific to ANA's unique circumstances, history, cumulative impacts, and location downstream of the project are not sufficiently reflected.

The Great Bear IA should be terminated. Once the project has reached the appropriate stage, and the strategic issues have been resolved between ANA and the Crown, the pre-planning process should be re-started with ANA's involvement from the outset (with sufficient capacity support provided in advance). The pre-planning process has no time limit associated with it and should be carried out in a respectful way until there is a satisfactory outcome in the context of ANA's unique circumstances.

I urge you not to continue with this fatally flawed process. It is not too late to start again and to do it properly.

Awsa,



_____

Joseph Fobister

Grassy Narrows Lead Negotiator for Land Protection

Cc:

Mike Fobister, Land Protection Team Coordinator (mike.fobister@googlemail.com)

Jackie Esmonde, Land Protection Team Legal Counsel (jesmonde@cavalluzzo.com)

Dan Mossip-Balk-Balkwill Land Protection Team Advisor (dan.mossip.balkwill@gmail.com)

David Sone Land Protection Team Advisor (david.sone@gmail.com)

Honourable Minister Steven Guilbeault (steven.guilbeault@parl.gc.ca) (Minister of Environment and Climate Change)

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Neal Bennett (neal.bennett@ontario.ca) (MINES Acting Regional Manager Thunder Bay Office)

Teri McDonald (teri.mcdonald@ontario.ca) (MINES Indigenous Consultation and Partnerships Branch)

Aaron MacDonnell (aaron.macdonell@kinross.com) (Kinross Director of Environmental Services)

Mac Potter (mac.potter@kinross.com) (Kinross External Relations Manager)

BUILDING A LEGACY IN RED LAKE, ONTARIO

Great Bear Project

Proposed Underground and Open Pit Gold Mine

Asubpeeschoseewagong Netum Anishinabek
November 10, 2023

KINROSS

We are honored to be working
in the traditional territory of the collective members of the Anishinaabe Nation in Treaty #3

We and all our contractors recognize and respect
the inherent and treaty rights of the Indigenous Nations on whose traditional territory we operate.

We are committed to meaningful dialogue
and working with Indigenous peoples, learning from Indigenous Knowledge and applying those learnings to our work across the organization.

Agenda

1. Great Bear Project
   A. Our Commitments
2. Federal Approval Process
   A. Status
   B. General Arrangement
   C. Timeline
3. Advanced Exploration
   A. Introduction to Advanced Exploration
   B. Community Led Technical Review and Participation
   C. AEX Features and Permits
   D. Water Management Approach
4. Pathway Forward

KINROSS

Our Vision for Great Bear

Strong Partnerships
With local Indigenous communities, rightsholders, and communities in which we operate

Long Life OP & UG Mine

Low Emissions Mine
Via electrification and clean Ontario grid power

Local Employment
700 – 1,000 potential direct jobs created

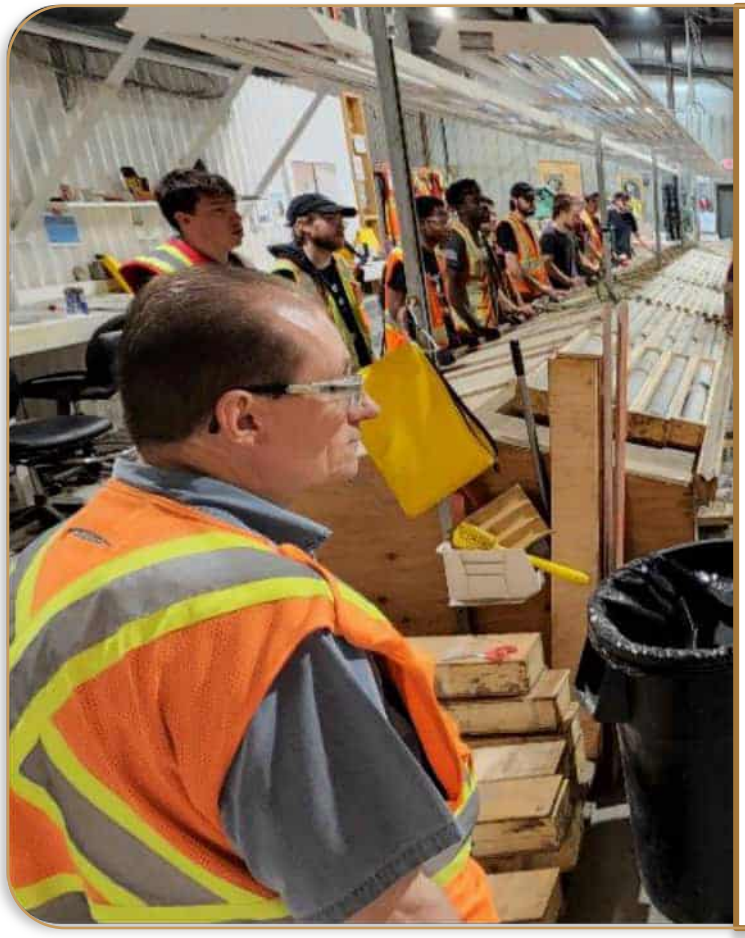
Best in Class Mine
Driven by workforce skill, design, efficiency and automation

Creating a Lasting Legacy in Red Lake, Ontario

KINROSS

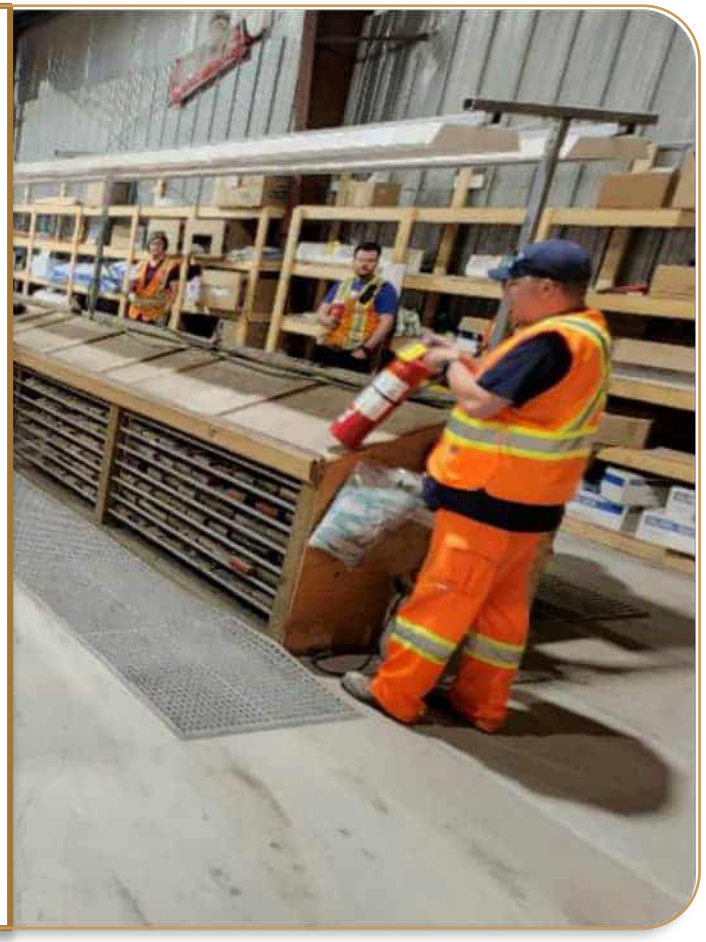
Committed to Operating Responsibly

Focus on prioritizing health and safety above all else



We value the health and safety of our workforce above all other priorities

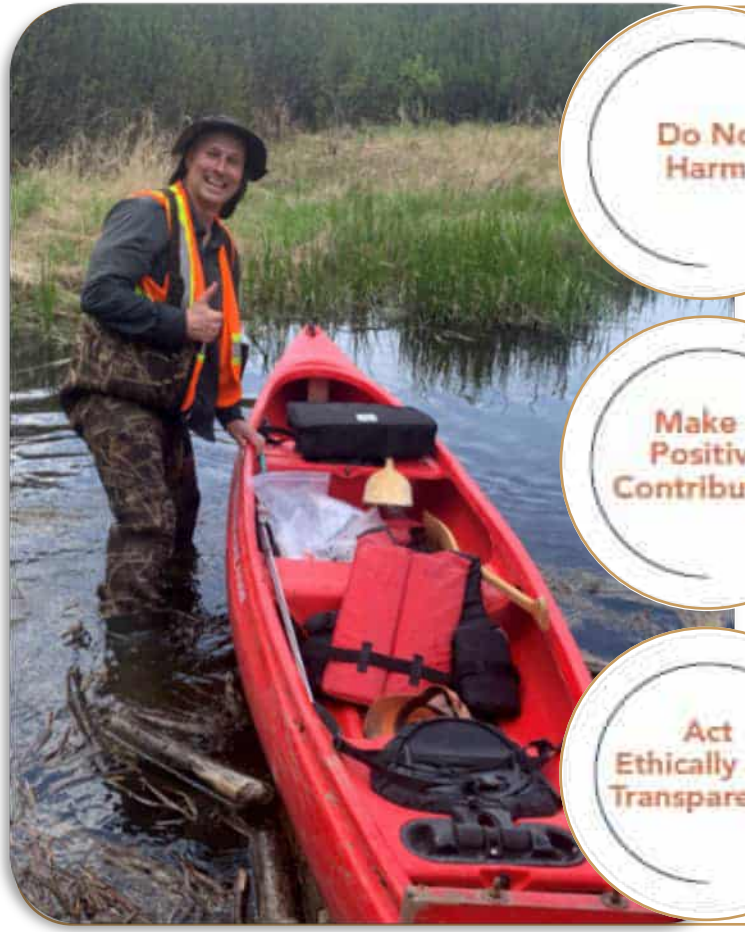
We implement risk controls, training, and leadership to ensure a culture of safe work at all sites at all times



KINROSS

Committed to Operating Responsibly

Our approach to sustainability



Do No Harm

We work to protect our workforce, environment and host communities from negative impacts

Make a Positive Contribution

We aim to provide meaningful livelihoods for employees, opportunities for suppliers and improvements in our host communities

Act Ethically and Transparently

We operate with respect for human rights and we engage with our stakeholders

Continuous Improvement

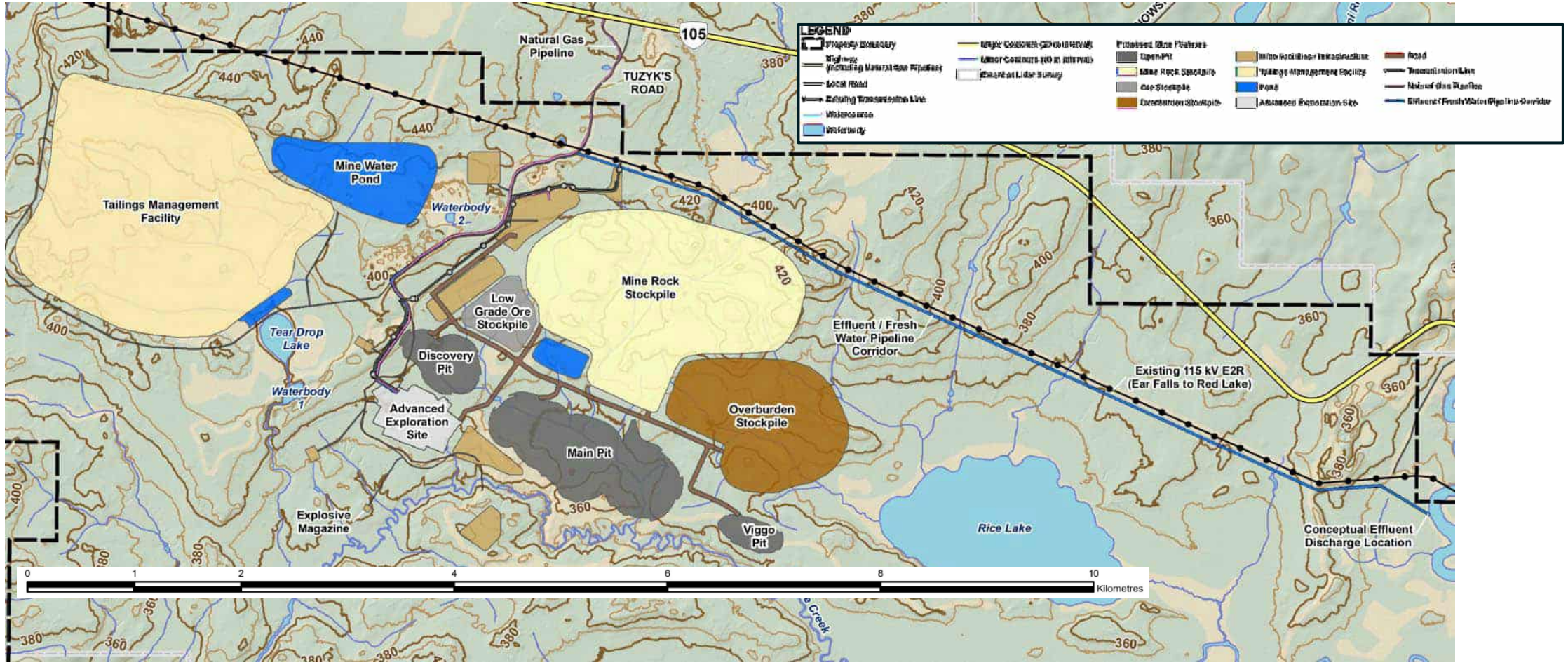
We strive to improve our approach to corporate responsibility practices

BUILDING A LEGACY IN RED LAKE, ONTARIO
Main Project
Impact Assessment
KINROSS

IAAC Process (as of October 13th, 2023) – Planning Phase

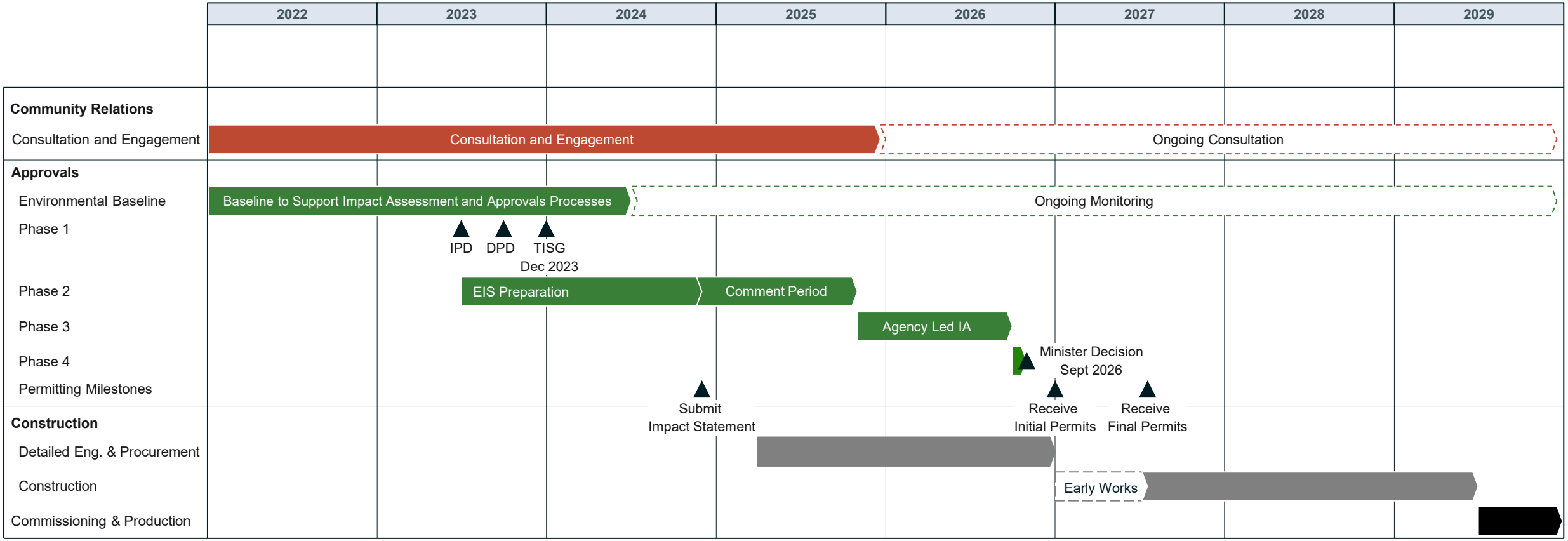
- Objective of Phase 1:
  - Identify issues of importance to communities including opportunities for collaboration and cooperation. Identify pathways to set the stage for meaningful engagement and consultation throughout the process
  - Formally determine whether an impact assessment is required and receive tailored Impact Statement Guidelines
  - Plan the Impact Assessment and prepare plans that establish the process for participants
- Status:
  - The Agency posted the Initial Project Description (IPD) for public and Indigenous review (August 17, 2023)
  - The Agency has compiled a Summary of Issues detailing concerns they have heard during their engagement (provided to Kinross on September 29, 2023)
  - Kinross preparing its responses to issues raised during IAAC engagement within its Detailed Project Description (DPD)
- Next Steps:
  - After accepting DPD, Agency determines whether an Impact Assessment is required
  - Agency develops several planning documents, and the assessment moves to Phase 2 (preparation of the Impact Statement)

Main Project – General Arrangement



KINROSS

Timeline within IAAC Process



BUILDING A LEGACY IN RED LAKE, ONTARIO

Advanced Exploration

KINROSS

Overview and Approach

- The purpose of Advanced Exploration is to obtain additional information on:
  - Mineralized zones through underground drilling
  - Extract a bulk sample of up to 60,000 tonnes by underground mining methods
- Bulk sample will be transported up an underground ramp to surface by truck for crushing, sorting, sampling and stored in stockpiles. Samples will be transported by truck to test facility off site
- Testing provides a better understanding of grade and metallurgical recoveries to support a viable commercial production scenario

KINROSS

Community Led Technical Review and Participation

- The team at Wabauskang First Nation and Lac Seul First Nation has been an active participant in baseline activities, inspections, and technical reviews on draft applications for the advanced exploration permitting
- Technical reviews have been led by Dillion/SOAR, and Sapo'nuk Sustainability, with input and guidance from staff and leadership
- Wabauskang, Lac Seul and Kinross have formed an environmental committee to help review work, and ensure community input going forward
- As part of our partnership, notice is provided of upcoming business opportunities, employment, and has provided training to Wabauskang and Lac Seul staff working on the Project

Sapo'nuk Sustainability

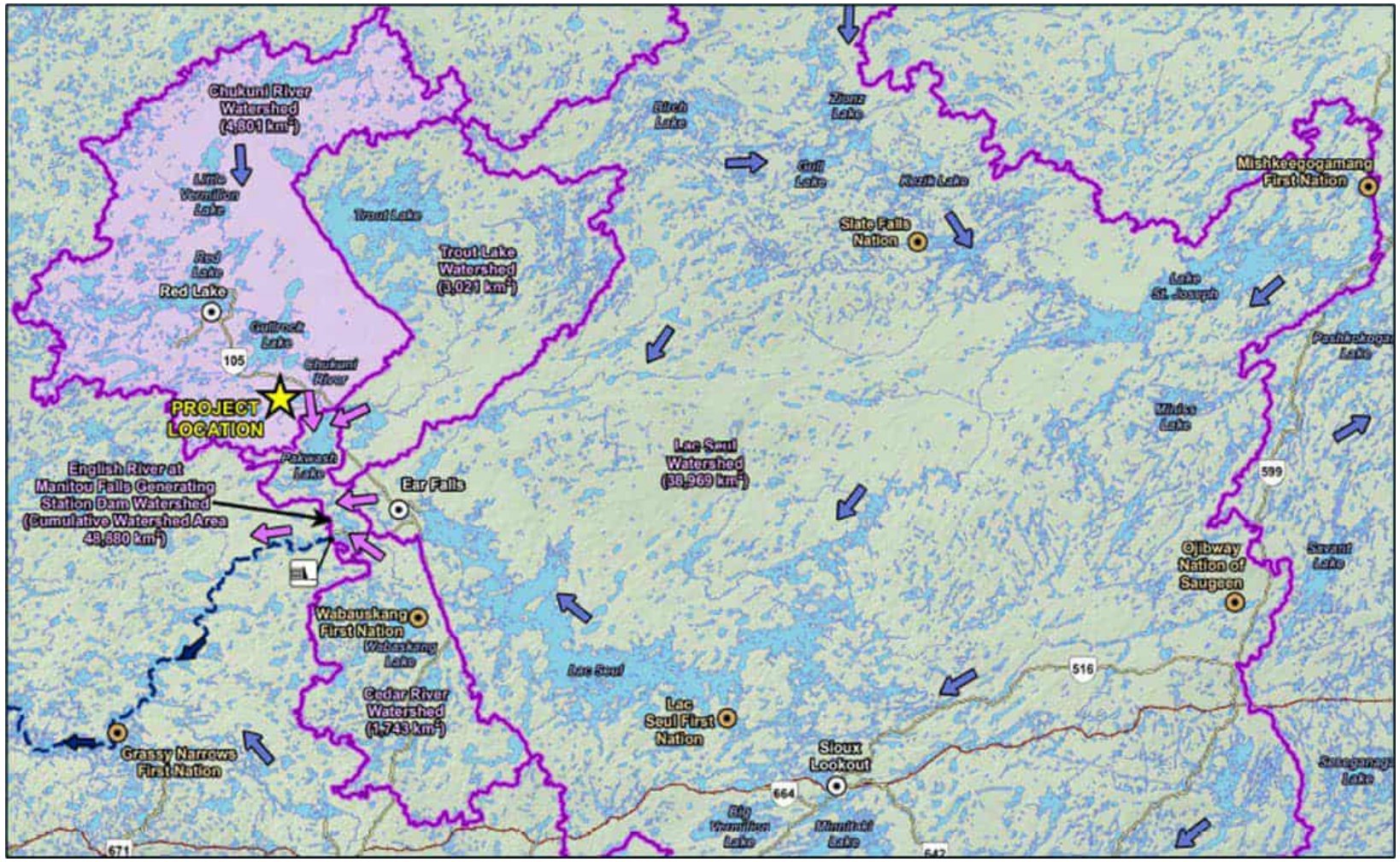
DILLON CONSULTING

SOAR Professional Services

KINROSS

Watershed Focus

- The Great Bear Project is located in the Chukuni River watershed
- Water from the Chukuni River flows into Pakwash Lake and English River
- Our local watersheds have driven the approach to surface water sampling, hydrology assessments, and our aquatics programs



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Features and Overview

Area	Design	Justification
Twin Declines	• Twin portals and ramps	• Safety is first priority at Kinross. Show this by Safety in Design • Creating secondary egress from Day 1
Underground Development	• ~9,000 m of development to access the deposit. Incl. ventilation, utilities, dewatering, etc.	• 3 deposits targeted (LP, Hinge and Limb) • Need to get down to >600m vertical depth to drill deeper sections of the deposit more efficiently
Power	• Natural gas power generation for start up of activities. Transition to grid power during AEX program if possible • Diesel generation is for backup and the construction stage	• Power connection timelines uncertain. Transition when possible
Camp	• 100 person camp on property	• Temporary influx of personnel into region • Limits fatigue as camp nearby and provides personnel oversight
Rock – Mine Rock Management	• Separate PAG and NAG storage • Return PAG underground at closure • Sampling programing during AEX	• Best mine rock management practices • Potential re-use of NAG for aggregate or construction
Water Treatment	• Robust water treatment design	• Striving for high-standard of water treatment and management. Priority for Kinross
Water Management	• Collection of all runoff with appropriate treatment and storage	• Water management is critical to project and Kinross
Effluent Discharge	• Chukuni river via pipeline (potentially to Dixie Creek at start)	• Water will be treated prior to discharge and all regulatory requirements will be met (water quality and flows)

Advanced Exploration Permits

Agency	Permit	Comments
Ministry of Mines	Closure Plan (Final Filing)	▪ A written plan on how the site will be rehabilitated ▪ Financial assurance required prior to construction start
Ministry of Environment and Parks	Class EA Temporary Power (construction)	▪ Required for temporary diesel power between 1 and up to 5 MW during the construction phase of the AEX project. ▪ Assess the operation of diesel generator and identify mitigation measures
	Environmental Compliance Approval (ECA) Air (Operations)	▪ Required for air emissions related to all activities for AEX including noise for AEX Operations
	Permit to Take Water (PTTW) Underground and Surface	▪ Required for all water taking and or transfers. Includes underground dewatering and construction front activities that require the movement of water. ▪ Required to initiate AEX footprint construction activities
	ECA Industrial Water Management	▪ Required to manage and discharge treated water back to the environment. All water that flows through or on the site will need to be collected and treated prior to discharging to the environment. ▪ Required to initiate AEX footprint construction activities
Ministry of Natural Resources and Forestry	Crown Resource Class EA Screening	▪ Required to assess the potential impacts of timber clearing activities.
	Forestry Resource License	▪ Required to remove any timber from crown land, obtained after the Class EA Screening is complete
	Land Use Permits	▪ Required for any activity on Crown land that has not been brought to lease. A large section of the WTP effluent pipeline is anticipated to be on crown land. ▪ A portion of the Natural Gas pipeline may also require a land use permit for AEX

KINROSS

FOR DISCUSSION PURPOSES ONLY- PRIVILEGED & CONFIDENTIAL

Permit to Take Water

- A key component of AEX activities is control, management, and protection of water resources. To ensure proper management Kinross will need to both actively manage surface water (including creek systems) but also dewater the underground workings
- Kinross has taken a conservative approach in pumping to ensure safety for staff underground in the case of an unexpected event like a power outage

Table 4-1: Requested Water Takings

No.	Source Name / Description	Source Type	Taking Specific Purpose	Taking Major Category	Maximum Taken (m^3/min)	Maximum Number of Hours Taken per Day	Maximum Taken per day in m^3	Maximum Number of Days Taken per Year	Location (Easting / Northing)
1	Underground Portal	Groundwater	Dewatering	Industrial	1.39	24	2,000	365	455377 / 5634568
2	Underground Dewatering, Uncertainty Event (Contingency) [1]	Groundwater	Dewatering	Industrial	3.13	24	4,500	30	455377 / 5634568
3	4 Pond Excavations [2]	Surface water	Dewatering	Industrial	0.12	24	170	365	455340 / 5634390
4	4 Pond Excavations	Groundwater	Dewatering	Industrial	0.54	24	783	365	455340 / 5634390
5	Dixie Creek	Surface Water	Other-Industrial	Industrial	0.17	24	250	365	455994 / 5633961
						Total Requested Water Taking	**7703**		

Notes:
[1] In support contingency planning with respect to underground dewatering, Kinross is also requesting pumping at higher rates to remove water after an interruption in pumping, as required (for example, due to a power failure or some other unexpected events)
[2] Combined estimate for dug-out Mine Water Pond 1, Mine Water Pond 2, Settling Pond and Polishing Pond.

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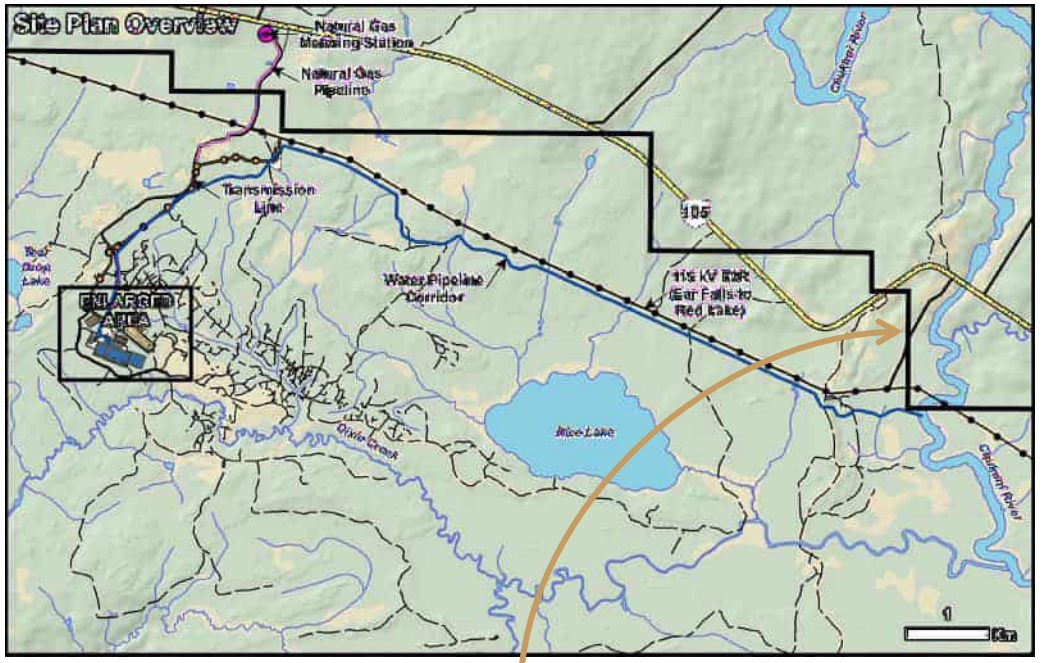
Environmental Compliance Approval (ECA)
Water Management and Permit to Take Water



Water management design, structure, control, and mitigation is **key** to our approach to AEX and future operations. **We are committed** to an approach that is **protective of human, plant, and animal life** in the Chukuni River watershed

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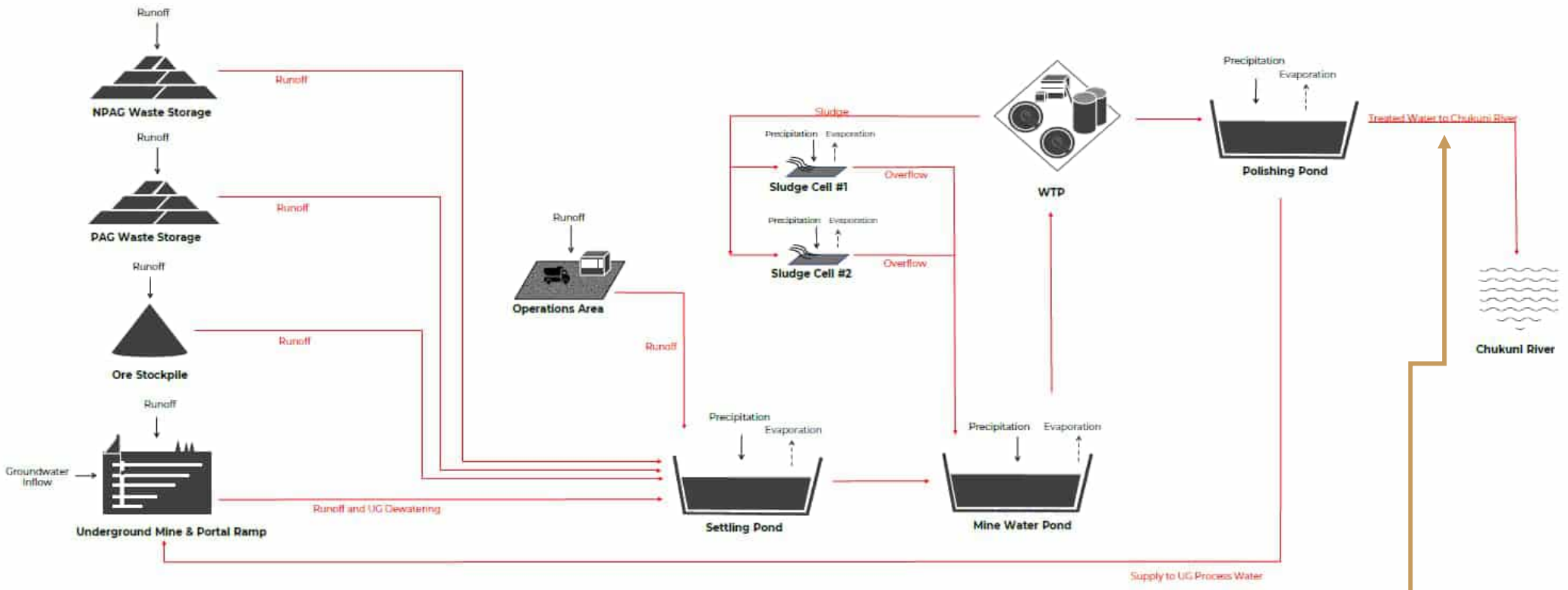
Water Balance



All collected water discharged to the Chukuni River will be managed to protect the environment and achieve regulatory requirements. All water set to be released will be subject to water treatment

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Water Treatment

- Contact water discharged to the Chukuni River will be managed to achieve regulatory requirements.
- This includes a multi-stage treatment process that includes:
  - Ammonia Treatment – Moving Bed Biofilm Reactor (MBBR)
  - pH adjustment, clarification
  - Additional ultrafiltration
- Kinross is committed to applying adaptive management practices in the development of the approach to water management on site. This includes sharing trending data, duplicate sampling, and ongoing transparent dialogue with Indigenous communities

Table 5-6: Proposed Discharge Limits

Parameter	Calculated Limits [1]	Proposed Discharge Limits [1]	
		Maximum Monthly Average Concentration	Maximum (Daily) Concentration
pH	-	pH of discharge maintained between 6.5 and 8.5, inclusive, at all times	
Total Suspended Solids	-	15	30
Arsenic	0.009	0.009	0.018
Copper	0.103	0.1	0.2
Lead	0.303	0.08	0.16
Nickel	0.73	0.25	0.5
Zinc	0.34	0.34	0.68
Un-ionized Ammonia	0.32	0.32	0.64
Phosphorus	0.22	0.22	0.24

Notes:
All units are mg/L, save pH (unitless)
[1] The Chukuni River is a large receiver, with high assimilative capacity for most parameters. Where the back-calculated monthly average limits were greater than MDMER criteria, the calculated limits were subsequently reduced to MDMER specified effluent criteria, as applicable

Our discharge approach is to meet the lower of the monthly average limits on a daily frequency, ensuring ongoing protection of the aquatic environment, and downstream users.

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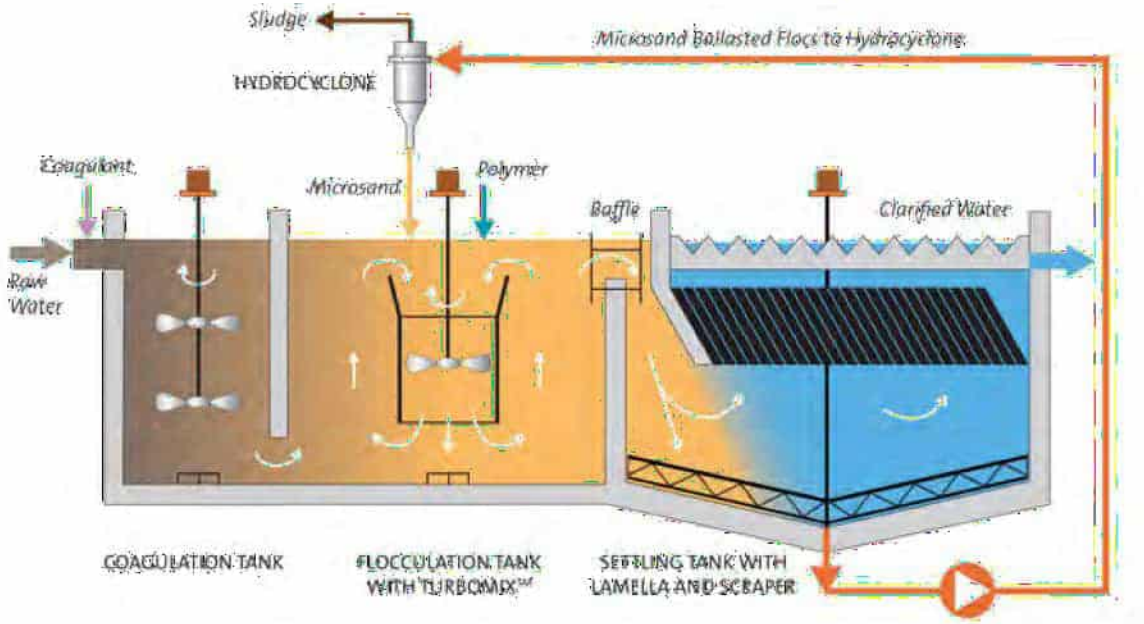
Water Treatment – Ammonia, Clarification, and Filtration

- The system proposed has been used successfully in local and regional operations across northwestern Ontario
- Ammonia Treatment – Moving Bed Biofilm Reactor (MBBR)
  - Uses small plastic carriers that allow microorganisms to grow and break down the ammonia.
  - Allows natural breakdown and consumption of ammonia
- Actiflo System – Supporting pH adjustment, clarification, and filtration
  - Increase solids contact to initiate precipitation. Solids fall to bottom of the tank and are removed.
  - Clean water is forced upwards and is clarified.
  - Ultra filtration (not shown in image) will be applied to further remove contaminants creating world class treatment system

MBBR Reactors in Northern Quebec Gold Mine



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BUILDING A LEGACY IN RED LAKE, ONTARIO
Path Forward
KINROSS

Input and Path Forward with Asubpeeschoseewagong Netum Anishinabek

- Kinross remains open to discussing capacity funding to be provided by Kinross to Asubpeeschoseewagong Netum Anishinabek and the Lands Protection Team, to facilitate and support technical review of environmental and regulatory documents related to the Great Bear Advanced Exploration Permitting and Main Mine Project Impact Assessment
- Kinross also remains open to discuss ongoing procurement and business opportunities with those businesses partnered with Asubpeeschoseewagong Netum Anishinabek
- Kinross is open to working with Asubpeeschoseewagong Netum Anishinabek and the Lands Protection Team to determine a path to establish independent community water monitoring

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BUILDING A LEGACY IN RED LAKE, ONTARIO
Appendix
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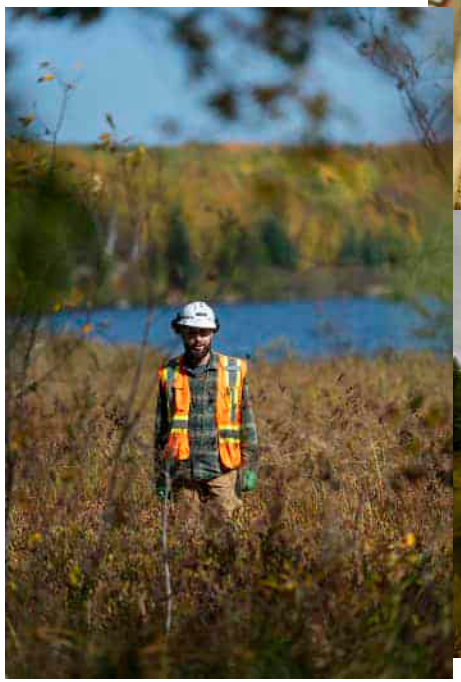
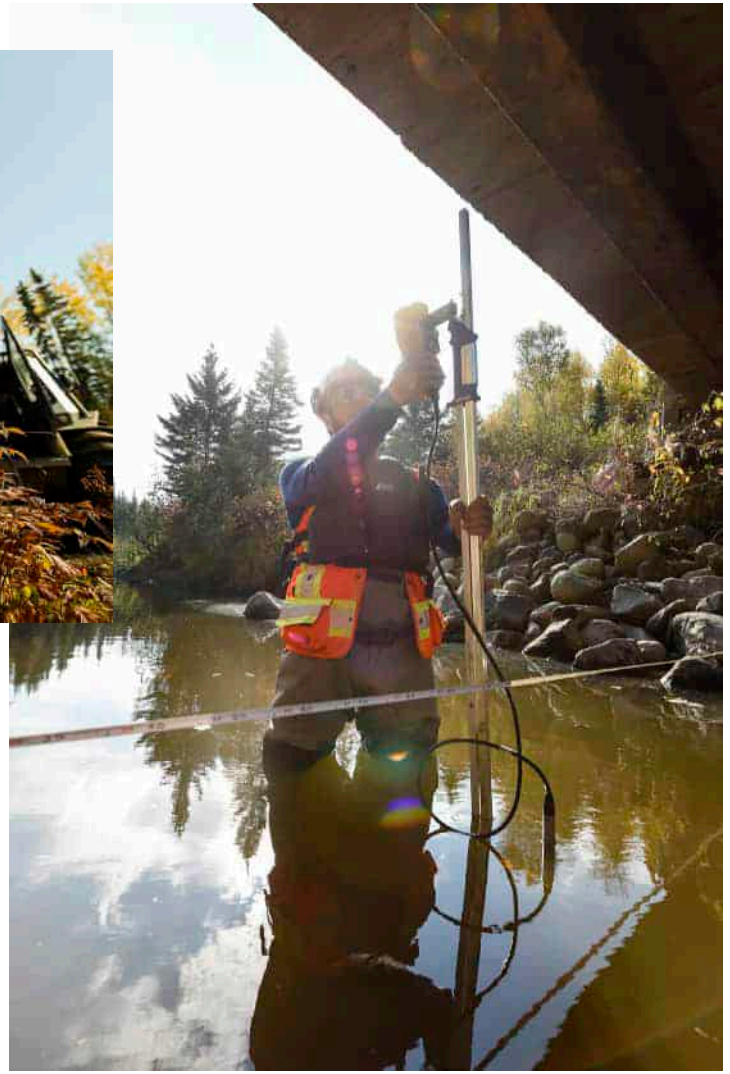
Monitoring Plans

1. Surface Water Quality
2. Hydrology
3. Aquatics
4. Hydrogeology





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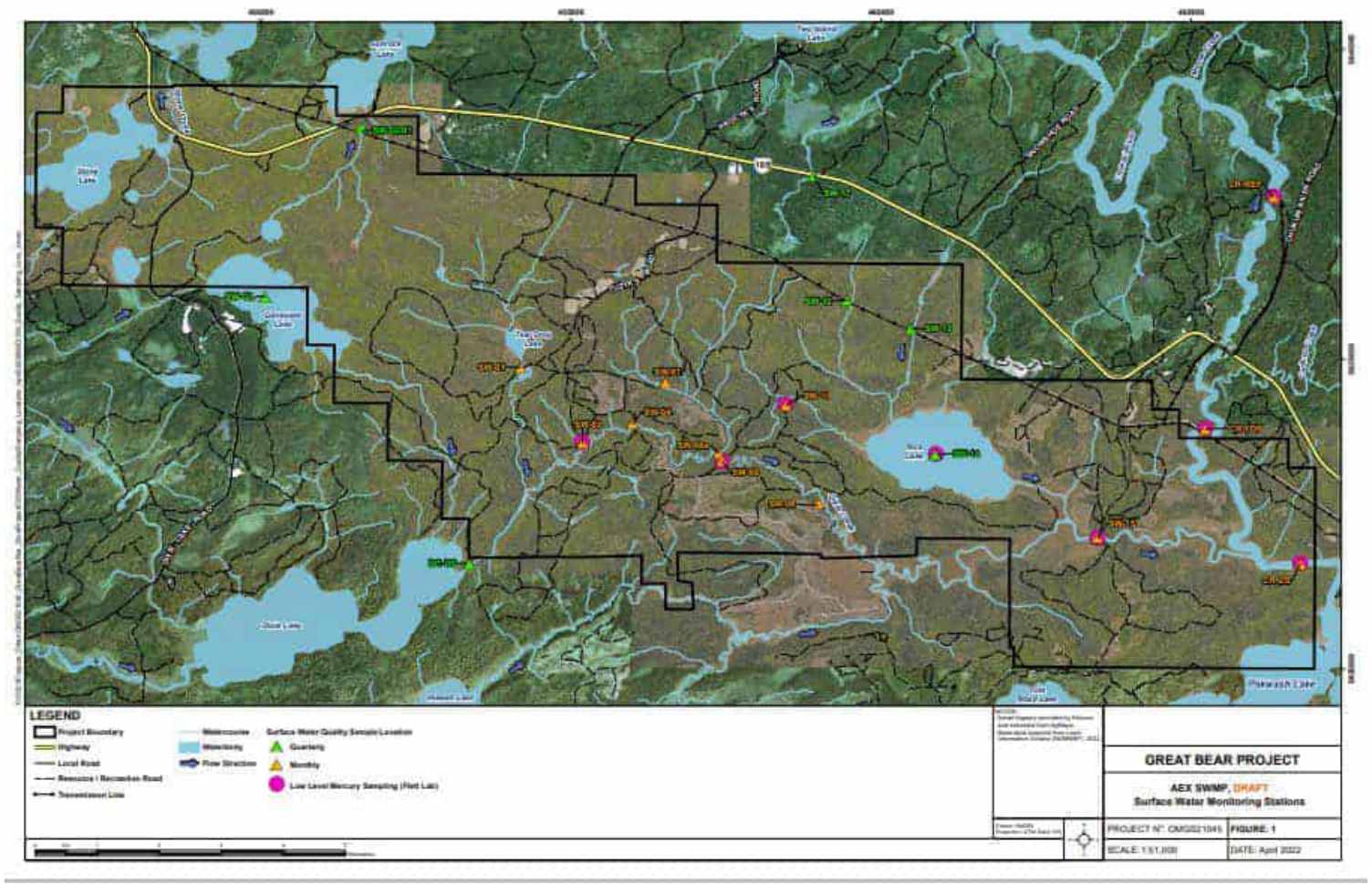
Surface Water Quality



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Hydrometric Monitoring Site

Table 2-2: Hydrometric Monitoring Rationale

ID	Station Name	Rationale for Selection
Off-site Stations		
HF-01	Dixie Creek at Tote Road	Measure flows and levels on Dixie Creek downstream of all project development.
HF-02	Rice Lake Outflow above Dixie Creek	Characterize seasonal behaviour of Rice Lake, contributions to Dixie Creek from Rice Lake Trib.
HF-03	Dixie Creek DS of LP Trib	Measure flows through Dixie Creek, estimate contributions from second order tributaries along Dixie Creek.
HF-04	LP Fault Trib US of Dixie Creek	Characterize flows through Tributary 3 and the defined drilling area.
HF-06	Tear Drop Lake Outflow	Characterize seasonal behaviour of Tear Drop Lake, contributions to Dixie Creek from Tear Drop Lake Trib.
HF-07	Dixie Lake Outflow	Measure flows and levels on Dixie Creek, upstream of any project development.
HF-08	Genessee Lake Trib towards Dixie Lake	Characterize flows out of Genessee Lake, contributions to Dixie Lake from Genessee Lake Trib.
HF-10	Stone Lake Outflow	Measure flows and levels from Stone Lake to Gullrock Lake, watershed potentially impacted by project development.
HL-01	Genessee Lake	Characterize seasonal behaviour of Genessee Lake.
HL-02	Gullrock lake	Characterize seasonal behaviour of Gullrock Lake.
HL-03	Chukuni River	Estimate potential tailwater conditions on Dixie Creek caused by Chukuni River levels.
On-site Stations		
-	Settling Pond	Pumping to Mine Water Pond(s); Primary AEX water management surge pond, used to provide TSS and residual ammonia management, and to moderate the effluent feed rate to the Effluent Treatment Plant
-	Mine Water Storage Ponds	Pumping to Effluent Treatment Plant; Holding pond, represents influent to Effluent Treatment Plan
-	Effluent Treatment Plant	Pumping to Polishing Pond; Removal of metals and potentially other contaminants from AEX effluent prior to discharge to the Chukuni River
-	Polishing Pond	Final Compliance Point, discharge to Chukuni River via pipeline and diffuser

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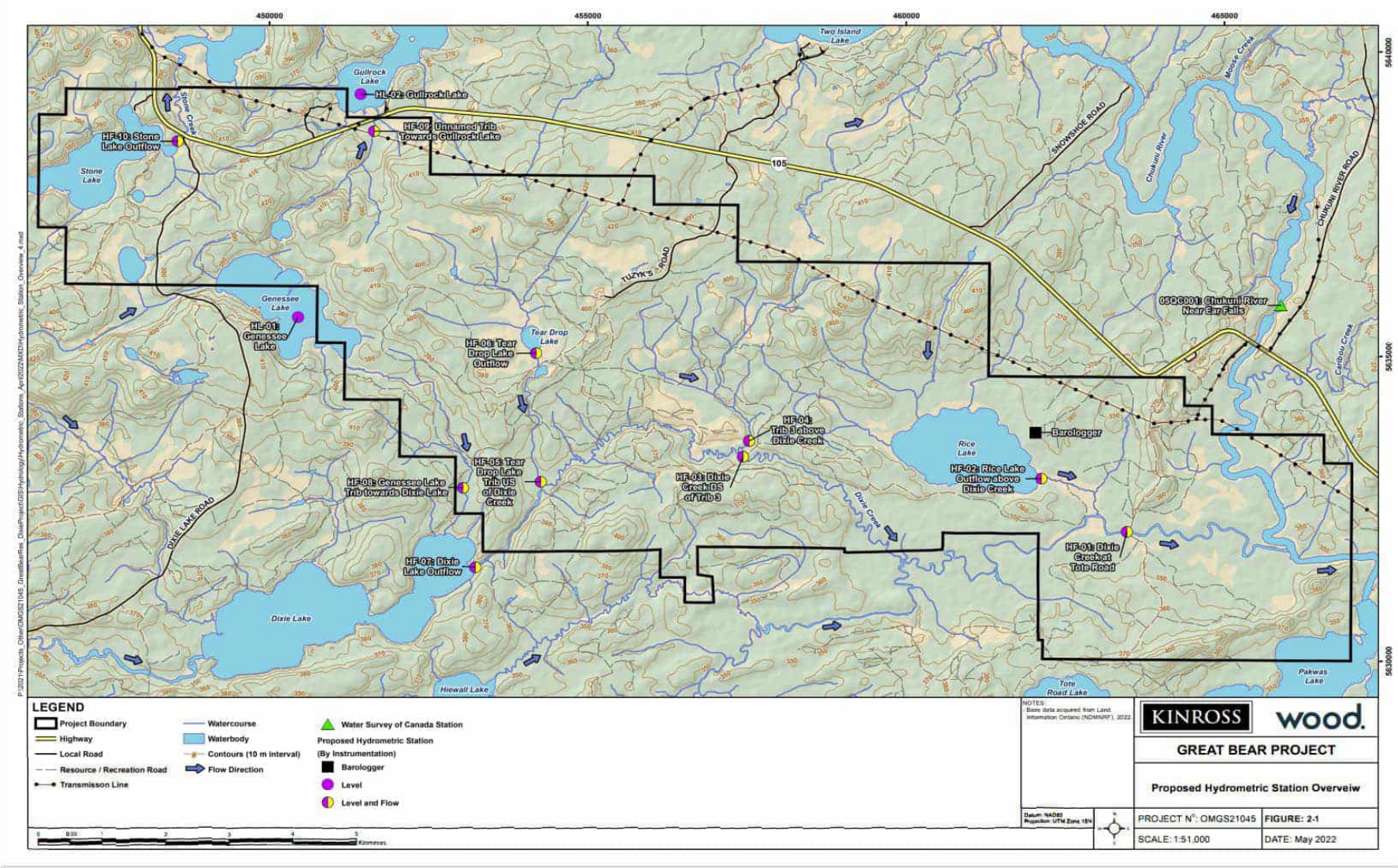
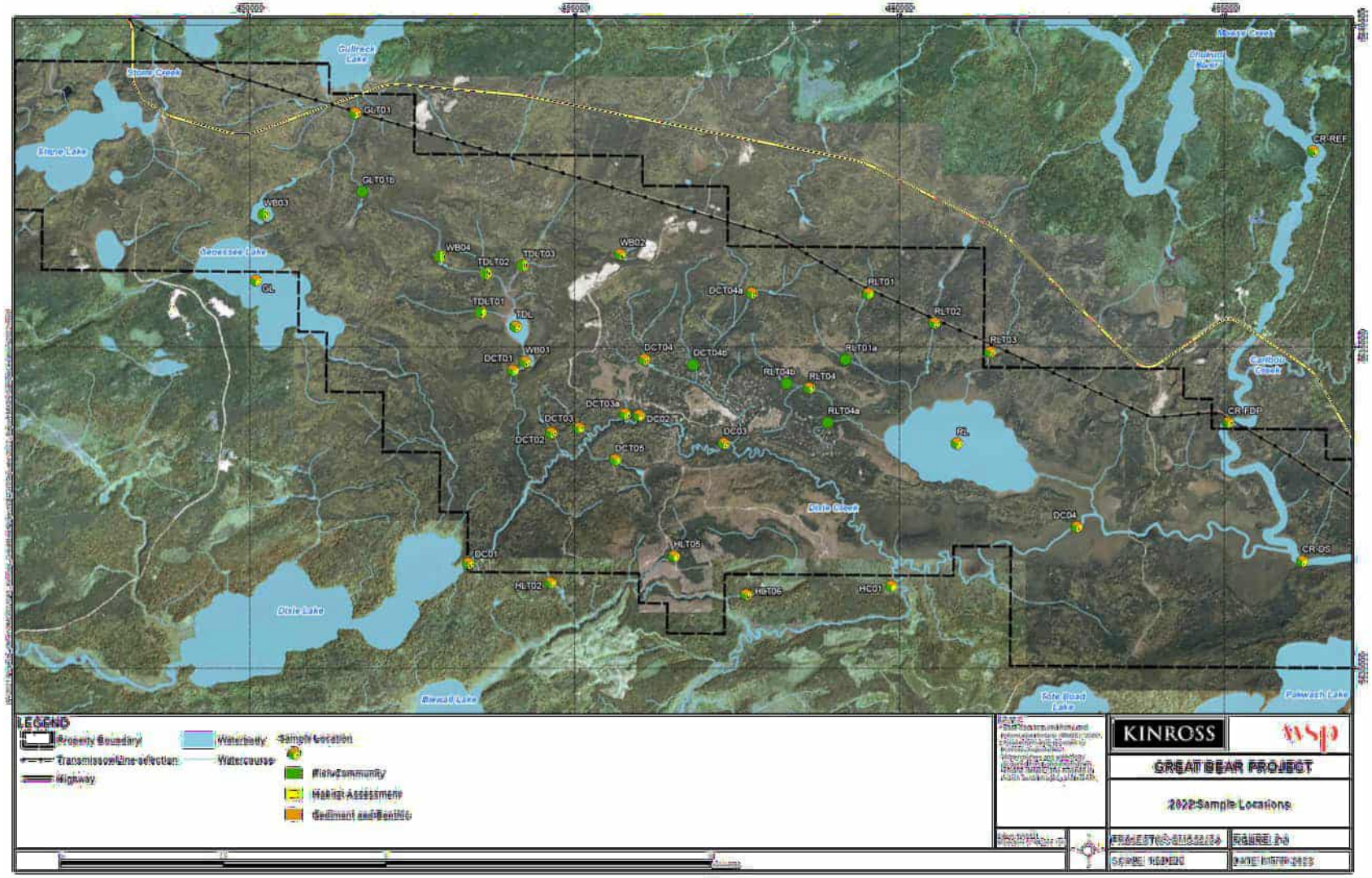
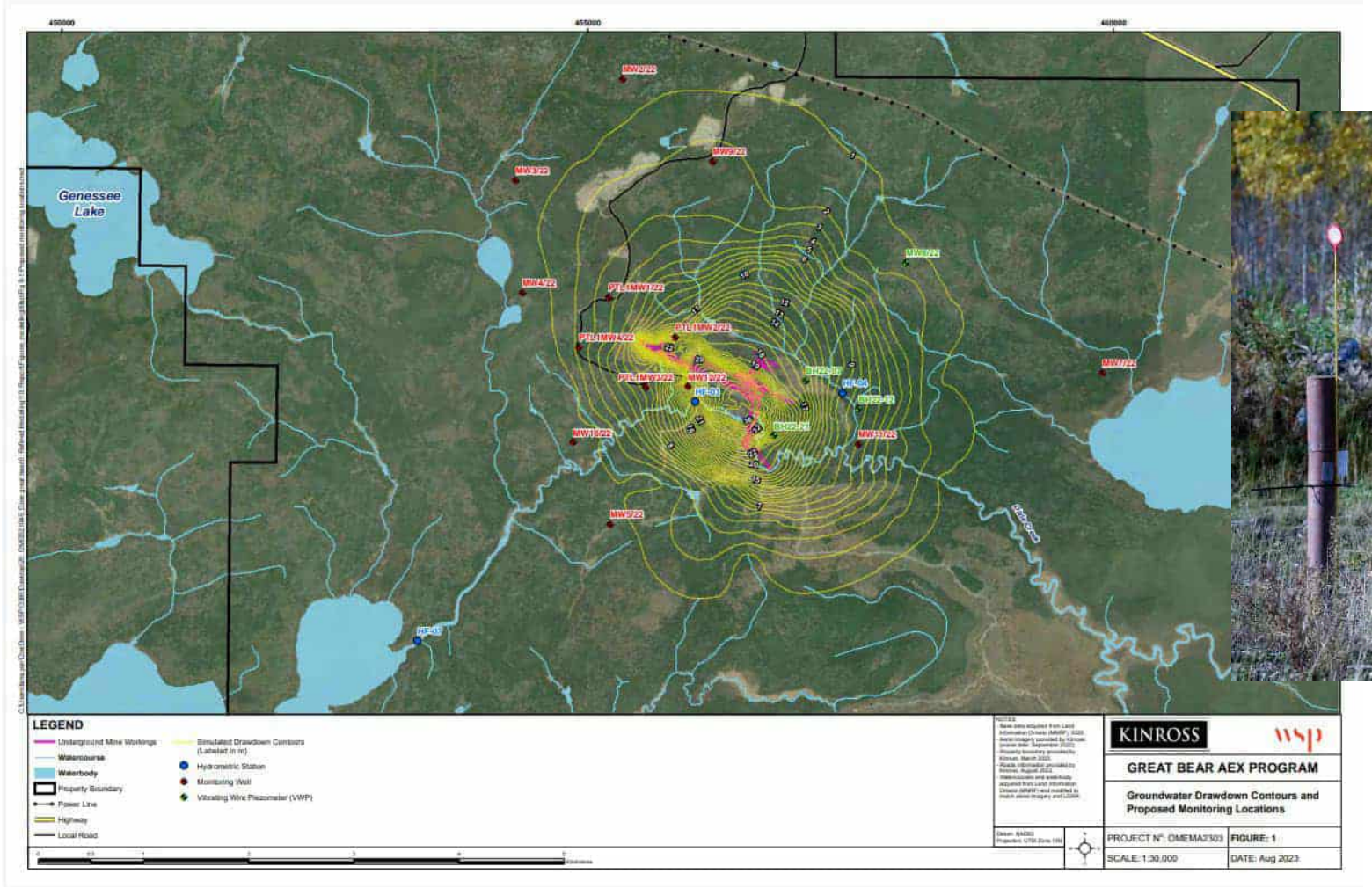
Hydrometric Flow Monitoring



Aquatics


LEGEND
Property Boundary
Transmission Line Selection
Highway
Waterbody
Watercourse
Sample Location
Fish Community
Habitat Assessment
Sediment and Benthic
KINROSS
GREAT BEAR PROJECT
2022 Sample Locations

Groundwater Monitoring



Grassy Narrows – Kinross – IAAC Joint Meeting

1. **Executive Summary**

Client Name	Kinross Gold Corporation	**Project No:**	**TBD**
Project Name	Great Bear Project		
Meeting Type:	In-Person [ ]	Virtual [X]	Hybrid [X]
Location:	Virtual		
Time:	12:00 PM CT – 1:30 PM CT		
Date:	November 10, 2023		
Executive Summary:	Meeting between representation of Grassy Narrows First Nation, Kinross Gold, and the Impact Assessment Agency of Canada. IAAC provided presentation materials ahead of meeting to support, note GNFN provided notice that review of Kinross provided materials will not be completed at this time. Principal dialogue occurred between representatives of Kinross and GNFN. Request from GNFN to apply a pause to all activities until former protocol agreement can be put in place to ensure information sharing. Noted commitment to affirm follow up meeting timing to address actions, including consideration to pause. Kinross staff reaffirmed Company commitment to provide capacity to support informed dialogue. Key concerns articulated included a focus on community dialogue and integration of that knowledge over the course of the Project, lack of consultation to date, requirement for an appropriate protocol, and illustrating concerns that the Project presents an ongoing risk to the communities Aboriginal and Treaty Rights.		
Key Actions:	a. Kinross and GNFN Lands Protection Team to confirm follow up meeting timing. b. Kinross as part of follow up meeting to affirm decision on protocol agreement, and consideration to a pause as requested by Lands Protection Team.		

2. **Attendance**
    a. Kinross
        i. Ian Russell
        ii. Mac Potter
        iii. Nathan Longnecker
        iv. Luke Crosby
        v. Aaron MacDonell
        vi. Ashley Moncrief
    b. Grassy Narrows First Nation
        i. Jospeh Fobister
        ii. Mike Fobister
        iii. Jackie Esmonde
            1. Legal Counsel
        iv. David Sone
            1. Advisor
        v. David Mossip-Balkwill
            1. Advisor
    c. IAAC
        i. Ian Lindsay

ii. Owais Khurdis
iii. Natalie Boyd

3. Agenda and Attachments

1) Introductions
2) Grassy Narrows concerns with the relationship to date
3) Pausing the process
4) Need for a Process Agreement
5) Capacity Supports

Kinross-Grassy Narrows Project Upda

Note that presentation was provided by IAAC to GNFN, GNFN provided direction to the Agency that they were not amendable to a Project update as part of the meeting.

4. Minutes

a. Opening Prayer and Remarks
   i. The meeting was opened with a prayer and comments from community member and Lands Protection Lead from GNFN. They spoke to their connection to the land, and ongoing concern with the process. They noted that it was only recently that they became aware of the Project, and it must be considered.
   ii. GNFN noted that the historical conditions, residential schools, movement of the community, and historical legacy of the mill have challenged the community.
   iii. GNFN noted that they need to be involved in the work in the territory, especially with those Projects interconnected via the watershed. Our community needs to understand how the activity will impact us, and that requires a clear process forward. They noted GNFN success in challenging industrial activity and logging. If there is no action they have had success using protest, the legal system and the media in ensuring our peoples protection.
   iv. GNFN spoke to ongoing communication with GNFN, and that all received to date is ungenuine in nature. She raised that GNFN reached out to GBR historical to no response, and Kinross has expressed a similar pattern. GNFN noted that it is clear that Kinross has engaged with the other Nations in the area and have ignore GNFN, and that from our meeting in June 2023 these concerns have been ignored.
   v. GNFN noted the continued lack of capacity to support activities and review of work. The Lands Protection Team strongly disagrees that concerns have been met, and this reflects the shortcomings of Kinross.

b. Discussion
   i. GNFN asked why has GBR/Kinross not engaged with GNFN since 2018?
      1. GBR noted that communication and dialogue has occurred and they are seeking a pathway forward not a reflection of the work in the past, and prior to Kinross acquiring the Project
      2. GBR noted that prior to March 2022 activities of Great Bear were governed under the previous ownership.

ii. GNFN noted that our primary concerns are those contaminants of concern, including mercury and the impact to the people. They are trying to ensure they protect those people.
    1. GNFN noted it is imperative that they understand and agree on a process. They want to understand value, address concerns, ceremony, and ensure that if applicable design measures to meet the community's health crisis. GNFN added that decision and direction have been made without dialogue with the community, they spoke to the agreements in place with other communities and the lack of action is a sign of insincerity by Kinross. They cannot go back but to ensure steps forward they need to determine a protocol and process.

iii. GNFN stated that as part of this process, our request is to Kinross to pause all activities until this can be determined.
    1. GNFN spoke to lack of defined capacity funding, and that this action is by way of the historical approach of the Company. If Kinross is sincere and would like to advance things a pause is required to ensure they meet that. Grassy has agreements of similar nature with the Crown to meet items such as this.
    2. GNFN noted that they need to reset the relationship, and this covers all things. If no action on Kinross these deadlines will pass and the Community will take action to protect its rights. GNFN affirmed prior statement by that the community will take action via protest or other form to protect its interest.

iv. GNFN restated if Kinross is open to pause?
    1. GBR noted that they are in the planning process for the Project, and that decisions are not final with either the Provincial or Federal Crown at this point. They welcome the opportunity to continue this dialogue and develop an appropriate process forward. GBR confirmed that a decision on accepting a pause cannot be made at this time. However, they reaffirmed that they are serious about funding capacity. Kinross is focused to ensure proper capacity is in place, they are not breaking ground tomorrow, information and dialogue is the key.

v. GNFN responded that the approach and is an excuse and commitment to shareholders is not our concern. Our community seeks to be involved, and our community members have little to no understanding of the Project.
    1. This direction was reinforced by other GNFN participants, noted lack of resources limits any ability to participate.
    2. GNFN noted that if agreement is required it would take approximately 3 weeks at a minimum to review and ensure it aligns. Leadership then will have to discuss, community, and then instruction to execute has to be levied.
        a. GNFN reiterated previous message on health crisis, and concerns in the community. That is the priority for our leaders.
        b. GNFN acknowledged that Kinross has provided a significant amount of information about the Project but they have no capacity to review in an informed manner.
            i. GBR noted that they can commit to that process and timelines and they understand and acknowledge the hardships. A protocol is important as is structure dialogue supporting it.

vi. GNFN responded that will Kinross discuss a pause, before speaking key terms required within a Process Agreement. GNFN noted that these is no template and they will have to discuss terms. They need to ensure this process is engaged as soon as possible as these things take time.

1. GBR noted that they are committed to process and going forward. GBR inquired to group on meeting date to discuss terms. No response issued by group.
2. GBR reiterated question on timing, noting historical offers by Kinross have not been received or considered by GNFN to date.
    a. **ACTION**
        i. GNFN response that GNFN does not have the capacity to respond but affirmed that they will provide meeting times in follow up, and Kinross will coordinate with GNFN on timing.

vii. GNFN asked Kinross for timing on a response on a pause for the Project.
1. GBR noted that ultimatums are not functional and noted decision to defer with IAAC. He noted the importance of discussion and accommodating interest.
    a. GNFN noted that lecturing GNFN is not supportive of dialogue ahead.
    b. GNFN noted that the current pathway is an ultimatum to the Community.
2. **ACTION**
    a. Noted dialogue acknowledging that the expectations will be a response on consideration for pause, in addition to initial draft of protocol agreement for consideration.

viii. GNFN inquired on current dialogue with MINES?
1. GBR noted that MINES have delegated the process to us.
    a. GNFN inquired when this decision was made?
        i. GBR confirmed April 6, 2023.
            1. **ACTION**
                a. Kinross to reach out to MINES to reissue communication to Lands Protection Group

ix. Dialogue between Kinross staff and GNFN advisory members on interaction and connection of AEX work, and IAAC process. Noted that the process is separate.
1. IAAC affirmed that integration of the Provincial Crown in the IAAC process is critical and that they provide comment on the IS. Noted that several operational permits are required following the completion of a Federal IS.

x. GNFN raised that GNFN is seeking a table with MINES to discuss current issues and impacts on the land.

5. Action Items

a. Kinross and GNFN Lands Protection Team to confirm follow up meeting timing.
b. Kinross as part of follow up meeting to affirm decision on protocol agreement, and consideration to a pause as requested by Lands Protection Team.
c. Kinross to reach out to MINES to reissue communication related to Delegation to Consult with GNFN provided previously on April 6, 2023.

Dated: November 18, 2023

Great Bear Resources Ltd.
A Kinross Company
104 Howey Street
Red Lake, ON
P0V 2M0

November 15, 2023

General Delivery c/o Asubpeeschoseewagong Netum Anishinabek Band Office
Grassy Narrows, ON
P0X 1B0
Attention: Lands Protection Team

Lands Protection Team,

Thank you for meeting with the Great Bear / Kinross team on November 10th, 2023. These meetings are important to us since we want to understand your interests and explain ours.

We value good relations with all local communities. As the project proponent, Great Bear takes guidance from the Ministry of Mines on the communities that it should consult to determine the interests of those communities and how our project may affect them.

Great Bear has engaged with ANA based on the Ministry's guidance (see the attached list of communications) and will continue to engage with your community to keep you informed and to receive your input. You have explained that you want deeper engagement on the project, and we want to respond to that interest.

We suggest a follow up meeting to discuss how to proceed on a positive footing. We would like to establish a Process Protocol with Asubpeeschoseewagong Netum Anishinabek to define and facilitate our discussions on the Great Bear Project and Asubpeeschoseewagong Netum Anishinabek's interests. We can also review the overall project timeline, related permitting and your request for a pause on all activities. In brief, we want our relationship to be constructive and are ready to work through the issues with you.

We followed up with the Ministry regarding the Delegation to Consult as it relates to the proposed Great Bear Advanced Exploration Program. The Ministry has confirmed that they will reissue this communication to the Asubpeeschoseewagong Netum Anishinabek Lands Protection Team.

Our team is available at any time between November 20th through November 24th, November 27th to December 1st or a date of your convenience to meet again and continue the dialogue. We can arrange for the meeting to occur in-person, by telephone or virtually.

We look forward to your response.

Regards,

Mac Potter
External Relations Manager
Great Bear Resources Ltd., *A Kinross Gold Company*

cc.

Aaron MacDonell, Director, Environmental Services, Great Bear Resources Ltd., *A Kinross Company*
Ian Russell, Site Manager, Great Bear Resources Ltd., *A Kinross Company*
Luke Crosby, Vice President, General Counsel and Corporate Secretary, Kinross Gold
Nathan Longenecker, Senior Vice President, General Counsel, Global Operations and Major Permitting, Kinross Gold
Joseph Fobister, Land Protection Team Lead, Asubpeeschoseewagong Netum Anishinabek
Mike Fobister, Land Protection Team Coordinator, Asubpeeschoseewagong Netum Anishinabek
Jackie Esmonde, Land Protection Team Legal Counsel, Asubpeeschoseewagong Netum Anishinabek
Dan Mossip- Balkwill, Land Protection Team Advisor, Asubpeeschoseewagong Netum Anishinabek
David Sone, Land Protection Team Advisor, Asubpeeschoseewagong Netum Anishinabek

Grassy Narrows – Record of Engagement

Date	Organizations	Communication Type	Summary	File name
20/2/25	**Grassy Narrows**	**Letter**	Letter communication from Grassy Narrows First Nation to Great Bear Resources speaking to IPCA consideration, respect to the Land Declaration, identification of any interests that potentially could have off-site impacts, and commit to resolve those conflicts.	
20/10/01	**Grassy Narrows**	**Letter**	Letter communication from Grassy Narrows First Nation with series of questions posed to Great Bear Resources to respond to, relating to ongoing exploration efforts at the Great Bear Project.	
22/8/8	**Grassy Narrows Ministry of Mines**	**Email**	Communications from MINES that consultation list for Early Exploration includes Grassy Narrows First Nation.	
22/8/17	**Grassy Narrows Ministry of Mines**	**Email**	Communication with MINES on clarification on Grassy Narrows First Nation inclusion in the consultation list for Early Exploration.	
22/8/29	**Grassy Narrows**	**Letter**	Introductory letter issued to Grassy Narrows First Nation by Kinross.	
22/8/29	**Grassy Narrows**	**Email**	Email response issued by Grassy Narrows stating that they do not wish to meet stating that Grassy Narrows prefer our land to continue its healing journey which in turn our people will heal from the land. Grassy Narrows communicates that they do not wish to meet. Request that Kinross take your proposal to other areas of the Province. Grassy Narrows provides its thanks for respecting our position and stand to keep our territory clean.	
22/9/17	**Grassy Narrows**	**Email**	Kinross provides communication to Grassy Narrows First Nation with all relevant documentation related to Early Exploration aspects including permit forms, maps, and GIS data.	
22/9/15	**Grassy Narrows**	**Letter**	Letter communication from Grassy Narrows First Nation speaking to IPCA consideration, respect to the Land Declaration, identification of any interests that potentially could have off-site impacts, and commitment to resolve those conflicts.	
22/11/11	**Grassy Narrows**	**Phone Call**	Kinross placed phone call with newly elected Chief from Grassy Narrows First Nation. Kinross and Chief speak to introductory details about the Company and Project, communication of permits in process, prior communication records, and confirmation of contact details.	
22/11/11	**Grassy Narrows**	**Email**	Email communication sent to newly elected Grassy Narrows Chief with introduction, project location map relative to Indigenous Nations and Forestry Management Areas, further detailed provided on permits in progress and invitation to reach out or visit project at any time.	
23/05/15	**Grassy Narrows Ministry of**	**Email**	Questions received from Asubpeeschoseewagong Netum Anishinabek (Grassy Narrows First Nation – "ANA") - on April 21st MINES staff prepared draft responses to ANA's questions and shared that material	<External> RE: Follow up.eml

Date	Organizations	Communication Type	Summary	File name
	Mines		with Kinross so that the company could add in the project specific information. If Kinross would like to discuss the draft responses, including any further support required from MINES we would be happy to do so.	
23/06/22	**Grassy Narrows**	**Teleconference**	Introduction meeting and discussion with Grassy Narrows FN, detailing their history and involvement in community, the practices have on the land. The communication detailed concern about previous mining activity and the previous suffering which has happened in the community due to mining activity. The meeting stated commitment to early engagement and continuation of one-on- one meetings and concerns regarding prior lack of communication. A request to follow-up with another meeting to learn more about Kinross and the project and approach was also given from Grassy Narrows FN at this meeting.	Kinross_GBR_Minutes_Indigenous_Grassy Narrows_June 22 they 2023.docx

Date	Organizations	Communication Type	Summary	File name
23/06/27	**Grassy Narrows**	**Email - Outgoing**	Meeting planning between Kinross and Grassy Narrows Land Protection Team, along with follow up regarding questions about consultation, and ensuring that the Initial Project Description be shared prior to submission to the Impact Assessment Agency to initiate review.	
23/07/24	**Grassy Narrows**	**Email - Outgoing**	Kinross providing an update Asubpeeschoseewagong Netum Anishinabek and access to the SharePoint.	
23/08/15	**Grassy Narrows Rimini Exploration**	**Email - Outgoing**	Introduction of External Relations Manager from Kinross to the Grassy Narrows FN and sharing the AEX Environmental Compliance Approval Industrial Sewage Works Technical Support Document via SharePoint site. This document includes essential components such as supporting maps, technical data concerning discharge limits, the assimilative capacity of the Chukuni River ecosystem, a preliminary monitoring program, and the proposed treatment methodology. This document has been provided to Lac Seul First Nation, Wabauskang First Nation, and to the Ministry of Environment, Conservation and Parks, with the aim of seeking valuable input and insights. The opportunity to meet at their convenience was also presented.	GBP_AEX ECA ISW Technical Support Document_25Jul2023_draft.pdf
23/09/01	**Grassy Narrows Impact Assessment Agency of Canada**	**Email - Outgoing**	Kinross and the Great Bear Team express enthusiasm and extend thanks about further progressing with the Grassy Narrows First and as such welcome and reiterate the previous offer of capacity funding.	Kinross-ANA Letter - Capacity, Great Bear Project (9).pdf Nation

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Date	Organizations	Communication Type	Summary	File name
23/09/07	**Grassy Narrows**	**Email - Outgoing**	Kinross provides details of the attached Great Bear Advanced Exploration Program Reclamation Strategy Memorandum. Document was prepared to summarize the reclamation strategy for the AEX program. The purpose of this memorandum is to seek input from Indigenous communities regarding the proposed closure strategy for the AEX Program. This document has been provided to Lac Seul First Nation, and Wabauskang First Nation, with the aim of seeking valuable input and insights. The opportunity to arrange a meeting with Kinross has also been offered, with reiterated position that Kinross is amendable to discussing capacity needs for Grassy Narrows First Nation.	GBR_AEX_Closure_Strategy_Memo_5Sep2023.pdf
23/09/07	**Grassy Narrows**	**Email - incoming**	Communication from GNFN expressing that at this moment there is limited capacity to review the AEX Closing Strategy memo at Grassy Narrows, and that due to the reduced capacity emails, reviews, and other communications might take longer than usual. This is in reply to the receipt of the AEX Closure Strategy Memorandum.	
23/09/14	**Grassy Narrows** **Ministry of Mines**	Letter	Communication directed to the IAAC, mentioning notable concerns relating to capacity, Indigenous rights, and lack of actions taken by the federal government. Notable concerns were also related to protocol raised by community.	2023 09 14 ANA Letter to Impact Assessment Agency of Canada 4875-2190-3231 2.pdf
23/09/19	**Grassy Narrows** **Lac Seul** **Wabauskang** **Metis Nation of Ontario** **Ministry of Natural Resources and Forestry**	**Letter**	MNRF providing Kinross with letters and map sent to stakeholders and Indigenous communities regarding hunting closures needed for safety considerations of staff in designated area. The restriction is not intended to abrogate or restrict any rightsholder who is wishing to harvest.	2023-09-13-FWCA-GreatBear-HuntingRestriction- Wabauskang.pdf, 2023-09-13-FWCA-GreatBear-HuntingRestriction-Lac Seul.pdf, RestrictedHuntFinal.pdf, Kinross hunting closure notice_signed.pdf
23/09/20	**Grassy Narrows** **Ministry of Mines**	**Email - incoming**	Attached correspondence to IAAC from Grassy Narrows concerning the Great Bear Gold Project and issues that the Grassy Narrows First Nation have raised. Issues include a lack of inclusion of protocol for communications with the GNFN, a lack of compliance in understanding the GNFN views and context, and concern in the level of engagement as expressed by Indigenous Services Canada.	2023 09 20 ANA Letter to IAAC Gold Bear Project 4881-7177- 8177 3.pdf

Date	Organizations	Communication Type	Summary	File name
23/09/26	**Grassy Narrows**	**Letter**	Follow up to previous communication and in response to Asubpeeschoseewagong Netum Anishinabek's recent communication to the Impact Assessment Agency of Canada, the Kinross and Great Bear team would like to reiterate its commitment to meeting with the Community and the Land Protection Team. Our goal remains to foster open and productive discussions regarding our Project, and we welcome discussion on capacity and participation considerations. Reiteration that the Kinross team is open to arranging in-person, or virtual meetings at your convenience. Kinross and the Great Bear team look forward to engaging in meaningful conversations with the Community. Kinross expresses an eagerness to identify potential synergies between the community's interests and the objectives of the Great Bear Project. Through this collaborative approach, our aim is to create a positive and mutually beneficial impact, contributing to community well-being.	Kinross-ANA Letter - Capacity, Meeting Request Great Bear Project (9).pdf
23/09/08	**Grassy Narrows**	**Email – Outgoing**	Kinross provides details of the attached Great Bear Industrial Sewage Works Application Draft, and Great Bear ISW Aquatic Resources Monitoring Plan Draft supporting the Advanced Exploration (AEX) Program. Noted that both documents have been uploaded to the SharePoint site (links below). The Industrial Sewage Works and Aqautics application documents contain details related to: • Environmental se□ng • AEX Program project descrip□on • AEX Program water management plan • Assimila□on Study, including CORMIX modelling • Proposed discharge limits to the Chukuni River (the proposed • receiving environment) • Dra□ surface water monitoring programs • Dra□ aqua□c monitoring programs The Kinross team invites comment and input from the Land Protection Team. Kinross reiterates that as part of the development of the Great Bear Project and the AEX Program is committed to robust mitigation and protection measures designed not only to meet regulatory standards but also to ensure the ongoing safeguarding of water resources. Kinross requests the opportunity to arrange an in-person, brief call or virtual meetings at your convenience, in addition to dialogue on capacity and resources to support review.	GBP_AEX ECA ISW Technical Support Document_25Jul2023_draft.pdf, GBR_AEX_AquaticsMonitoring_18Sep23.pdf
23/09/28	**Grassy Narrows**	**Email - Outgoing**	In follow up to our earlier communication we are happy to share with you the details of the attached Great Bear Environmental Compliance Approval for Air and Noise Draft, Emission Summary and Dispersion Modelling Report, Fugitive Dust Best Management Practices Plan supporting the Advanced Exploration (AEX) Program. All the documents have been uploaded to the SharePoint site (links	GBP_AEX_ESDM Report_19Sep2023_Final Draftcompressed. pdf, GBP_AEX_ECA_Air_Application Coverletter_19Sep2023_Final

Date	Organizations	Communication Type	Summary	File name
			below).The Kinross team welcomes comment and input from the Lands Protection Team. Consistent with our prior communication we the opportunity to arrange an in-person, call or virtual meeting at your convenience, in addition to dialogue on capacity and resources to support review. The summary and cover letter are attached.	Draft (1) (1).pdf
23/09/28	**Grassy Narrows**	**Email - Outgoing**	Providing the Fugitive Dust Management Practices Plan for consideration and review and by the Lands Protection Team including welcoming the opportunity to discuss in-person, via phone, or virtually at our convenience and welcoming the opportunity to discuss capacity considerations to support technical review, and community input.	GBP_AEX_ECA_AIR_BMPP for Fugitive Dust_19Sep2023_Final Draft.pdf, GBP_AEX_ESDM Report_19Sep2023_Final Draftcompressed. pdf, GBP_AEX_ECA_Air_Application Coverletter_19Sep2023_Final Draft (1).pdf
23/10/06	**Grassy Narrows**	**Email - incoming**	Grassy Narrows First Nation is unable to access AEX PTTW Dewatering documentation.	
23/10/06	**Grassy Narrows**	**Email - Outgoing**	Kinross provides details of the attached Great Bear Advanced Exploration Program, Permit to Take Water Application for Dewatering for draft input and review. The Kinross team looks forward to your comments and ongoing input from the Lands Protection Team. As refelcted in the communication Kinross offers to arrange an in-person, phone call or virtual meetings at your convenience. The Kinross team welcomes the opportunity to discuss dialogue on resources to support ongoing input and review needs for advanced exploration documentation, and federal approvals for the Great Bear Project.	GBP_AEX_PTTW_for_Dewatering_3Oct2023_Final Draft.pdf
23/10/19	**Grassy Narrows**	**Letter**	Reception of letter from Grassy Narrows FN Land Protection Team regarding their comments on the ANA Letter and IAAC concerns to be addressed. The letter calls for the Great Bear IA to be terminated as concerns were not addressed by technical feasibility studies as they had not yet been finished, obligations from the Crown to Grassy Narrows have not been resolved in a timely manner, and the IAAC have not been courteous to impacts on Grassy Narrows, nor have they resolved concerns on other projects.	2023 10 19 ANA Ketter to IAAC re Great Bear Gold Project 4862-2003-7255 4.pdf

29 Nov 2023

PROJECT ENGAGEMENT PROTOCOL

THIS PROTOCOL ("**Protocol**") is effective as of 1 December 2023 ("**Effective Date**"),

B E T W E E N :

Asubpeeschoseewagong Netum Anishinabek (Grassy Narrows First Nation)

("**ANA**")

– and –

Great Bear Resources Ltd.

("**Great Bear**")

A. ANA holds and exercises Treaty and Aboriginal rights in its traditional Anishinaabe territory within the Treaty 3 region in northwestern Ontario ("**Traditional Territory**").

B. In 2018, ANA enacted its Land Declaration to define its approach to land use decisions within its Traditional Territory based on ANA Anishinaabe tradition and law.

C. Great Bear is engaged in exploration activities to support the development of its Great Bear Gold Project ("**Project**") located near Red Lake, Ontario, which is within the boundaries of Treaty 3.

D. ANA's community is downstream of the Project and ANA has an interest in understanding the potential impacts of the Project on its community and Traditional Territory.

E. Great Bear wishes to conduct its activities related to Project ("**Activities**") in accordance with good practice that respects ANA Aboriginal Rights.

F. The Parties are entering into this Protocol to establish respectful communications to understand each other's interests and how those interests may be reconciled and aligned.

NOW THEREFORE, the Parties agree as follows:

1. DEFINITIONS

1.1 In this Protocol:

"Aboriginal Rights" means aboriginal and treaty rights that are recognized and affirmed under section 35(1) of the *Constitution Act, 1982*.

"Activities" means any Great Bear activities related to the Project that may affect ANA Aboriginal Rights or other interests.

"**Communications Representative**" means the person designated under section 3.1 to be the primary representative for communications for a Party.

"**Disclosing Party**" means a Party that has disclosed Confidential Information to another Party.

"**Land Protection Team**" means the representatives that ANA appoints to its Land Protection Team.

"**Liaison Committee**" means the Communication Representatives from each Party that are assigned the responsibilities under section 3.

"Protocol" means this communication and engagement protocol.

"Quarter" means a period of three calendar months ending on March 31, June 30, September 30, or December 31.

"**Receiving Party**" means a Party that receives Confidential Information from another Party.

"**Representatives**" means, regarding any Party, its Affiliates and each of their respective directors, officers, Councillors, employees, investors, potential investors, financial, legal and accounting and advisors who have a need to know the Confidential Information

"**Regulatory Application**" means an application by Great Bear for a Regulatory Approval.

"**Regulatory Approval**" means a government approval necessary to construct and operate the Project.

"Senior Representatives" means the ANA Chief or a senior member of ANA Council and a senior executive of Great Bear.

"**Work Plan**" means the work plan and budget agreed to by the Parties in accordance with section 4.1.

2. Objectives OF THIS PROTOCOL

2.1 The objectives of this Protocol are to:

(a) establish and maintain a positive relationship based on sincere communication, understanding, trust and respect,

(b) define the appropriate framework for communication between the Parties on Regulatory Applications,

(c) share information about Great Bear's Activities, Project timeline, related Regulatory Approvals, and related ANA interests,

(d) consult with ANA on Great Bear Activities and Regulatory Approvals that may affect ANA Aboriginal Rights and other interests and any changes to those Activities,

(e) identify any potential impacts of Great Bear Activities on ANA Aboriginal Rights and interests,

(f) collaborate on risk management and mitigation measures to resolve concerns,

(g) work together to understand and reconcile each other's interests,

(h) identify opportunities for alignment of interests and mutual benefit, and

(i) facilitate the negotiation and implementation of future agreements.

3. Communication – Liaison Committee

3.1 Within 15 days of the Effective Date, each Party will appoint a Communication Representative to be its primary representative for the purpose of this Protocol and any related communications.

3.2 Each Party's Communication Representative will have the authority to speak for the Party on communications relating to the Project, and the other Party may rely on that authority.

3.3 Together, the Parties' representatives will form the Liaison Committee for this Protocol and will manage the communications under this Protocol, including establishing the following administrative details: a) the procedures for meetings; b) the format of meetings (in-person or virtual); and c) recording the items discussed and follow up actions.

3.4 The Liaison Committee will communicate not less than once a Quarter or as often as reasonably necessary to:

(a) update each other on significant developments related to:

(i) Great Bear Activities,

(ii) the status of Regulatory Approvals related to Great Bear Activities,

(iii) issues or requirements regarding the Activities, conduct or procedures of the other Party, and

(iv) ANA Aboriginal Rights and other interests related to Great Bear Activities and Regulatory Approvals,

(b) comply with their respective commitments set out in this Protocol and those related to Great Bear Activities,

(c) attempt in good faith to resolve any concerns related to Great Bear Activities or other matters affecting the Parties' relationship, and

(d) identify opportunities for alignment of interests and mutual benefit.

3.5 The Senior Representatives of the Parties will communicate at least once every six months, or more often if needed, to review the relationship and effectiveness of the Protocol, the relationship of the Parties and identify opportunities for improvement.

4. Engagement on Regulatory Approvals

4.1 Within 30 days of the Effective Date, the Liaison Committee will meet to review Great Bear planned Activities and Regulatory Approvals for the next 12 months.

(a) Great Bear will give ANA's Communication Representative and Land Protection Team a list and description of the Regulatory Approvals ("**Permit List**") and expected application dates for the upcoming year. Great Bear will update the Permit List at the end of each Quarter.

(b) ANA's Communication Representative will review the Permit List to identify and notify Great Bear of the Regulatory Permits that may:

(i) affect ANA Aboriginal Rights and other interests and will require further review by the Land Protection Team, and

(ii) require less review because of their minor nature.

(c) The Liaison Committee will establish a work plan ("**Work Plan**") and budget ("**Budget**") for the review of Regulatory Approvals that require attention and will review and adjust the work plan and budget each quarter, as needed.

4.2 For any Great Bear proposed Regulatory Application that may affect ANA Aboriginal Rights and other interests, Great Bear will:

(a) notify ANA's Communication Representative and Land Protection Team of the proposed Regulatory Application in advance of filing it with the regulatory agency,

(b) give ANA's Communication Representative and Land Protection Team a copy of the Regulatory Application and its supporting information once the draft application is ready for review,

(c) answer ANA's Communication Representative and Land Protection Team questions and provide further reasonable information requested by ANA about the Regulatory Application in a timely and transparent manner,

(d) receive input from ANA related to the potential effects of the Regulatory Application on ANA Aboriginal Rights and other interests, and

(e) review with ANA's Communication Representative and Land Protection Team reasonable measures to avoid or mitigate any adverse effects that are identified by ANA.

5. FUNDING

5.1 If ANA engages with Great Bear in accordance with this Protocol, Great Bear will contribute to the reasonable costs incurred by the ANA related to the Protocol activities, based on Work Plan and Budget established under section 4.1(c).

5.2 ANA will send Great Bear itemized monthly invoices of all reasonable expenses incurred in accordance with the Budget, along with relevant receipts. Great Bear may seek clarification on supporting documentation, but otherwise Great Bear will pay all undisputed amounts in such invoices within 30 days of receipt of an invoice.

5.3 The Budget represents the Parties' reasonable expectations of the capacity requirements of the ANA to carry out the activities of this Protocol. The Parties will adjust the Budget as reasonable and necessary to align with the activity under the Protocol, by agreement in advance of ANA incurring additional expenses.

6. TERM AND TERMINATION

6.1 This Protocol commences on the Effective Date and will remain in force until the earlier of:

(a) Great Bear's decision to cease the Activities permanently;

(b) this Protocol is replaced by a subsequent agreement; or

(c) following 30 days written notice from either Party the other.

6.2 ANA will submit their final invoices relating to negotiation expenses incurred within 20 days of the date of termination.

7. CONFIDENTIALITY

7.1 A Receiving Party will keep confidential and not disclose any Confidential Information to a third party, other than their Representatives, without first obtaining the written consent of the Disclosing Party.

7.2 The Receiving Party will:

(a) direct its Representatives who receive Confidential Information to comply with the obligations in section 6 this Protocol; and

(b) notify a Disclosing Party in writing of any breach of the obligations in section 6 of this Protocol, promptly after learning of a breach.

7.3 A Receiving Party and its Representatives will not use any Confidential Information for:

(a) its own benefit or the benefit of any other Person; or

(b) any purpose that is inconsistent with the objectives of this Protocol.

7.4 All proprietary rights in and to the Confidential Information remain the property of the Disclosing Party.

7.5 If a Receiving Party or its representative must by law disclose any Confidential Information, that Party will promptly notify the Disclosing Party so that compliance with the terms of this Protocol may be waived. The Party required to disclose Confidential Information will disclose only such Confidential Information as its legal counsel advises is legally required to be disclosed and will exercise all reasonable efforts to obtain reliable assurance that confidential treatment will be accorded the disclosed Confidential Information.

7.6 At any time upon the request of a disclosing Party, the receiving Party will return or destroy all copies of Confidential Information received from the disclosing Party, except to the extent the receiving Party may be required by law to retain information.

8. DISPUTE RESOLUTION

8.1 If a dispute arises in connection with this Protocol, the Parties will refer the matter to the Senior Representatives of the Parties by providing written notice to the other Party of a meeting request.

8.2 Following receipt of such request, the Senior Representatives will meet within 10 business days to try to resolve the dispute, in good faith, to respect each Party's interests.

8.3 If the Senior Representatives are unable to resolve to the dispute after 20 days, then the Parties may by agreement seek to resolve the dispute through mediation with the assistance of a mediator that both parties agree on.

8.4 Nothing in this Section limits the right of either Party to pursue any available legal remedies.

9. GENERAL

9.1 Any notices required pursuant to this Protocol must be in writing and delivered personally, by prepaid courier, or email to the applicable Party at the address set out below:

To:	Grassy Narrows First Nation
With a copy to:	Land Protection Team
Address:	P.O. Box 180, Grassy Narrows, ON, P0X 1B0
Attention:	Chief and Council
Email:	[EMAIL]

To:	Great Bear Resources Ltd
Address:	25 York Street, 17th floor, Toronto, ON M5J
Attention:	General Counsel and Corporate Secretary
Email:	Legal.Notices@Kinross.com

9.2 Nothing in this Protocol will abrogate or derogate from

(a) any Aboriginal Rights ANA may have or assert, or

(b) the Crown's legal duties to ANA, including the duty to consult and accommodate.

9.3 This Protocol will be construed in accordance with the applicable laws of Ontario and Canada.

9.4 Any amendments to this Protocol must be in writing and executed by the Parties.

IN WITNESS WHEREOF the Parties have executed this Protocol as of the Effective Date.

Asubpeeschoseewagong Netum Anishinabek (Grassy Narrows First Nation)

_____

Name: Rudy Turtle
Title: Chief, Asubpeeschoseewagong Netum Anishinabek
Date: __ December 2023

Great Bear Resources Ltd.

_____

Name: Luke Crosby
Title: Director
Date: __ December 2023

February 1, 2024

Provincial Mining Recorder
Ministry of Northern Development, Mines, Natural Resources and Forestry
pro.ddm@ontario.ca

Via e-mail only

Dear Mining Recorder,

Great Bear Resources Ltd. – Notice of Intent to Lease Mining Claims (Stage #4 ML3)

Great Bear Resources Ltd. (GBR), a subsidiary of Kinross Gold Corporation, is continuing to explore and develop the Great Bear Project. In order to facilitate future development, please accept this application to lease selected mining claims, pursuant to Section 81 of the Mining Act. Background information related to this application is provided below.

- A single lease with perimeter survey is requested for the claims listed in Schedule A.
- The Lease request is for both the surface rights and mining rights covering the claims listed in Schedule A and in accordance with the Location Map 1 also attached.
- The minimum five (5) units of assessment work have been completed for the claims.
- The undersigned is an officer and Vice President of Great Bear Resources Ltd.
- GBR holds a 100% interest in the claims.
- GBR has engaged Mr. Peter deHaan at TBT Engineering, Ontario Land Surveyor.
  Tel: 807.632.7594 pdehaan@tbte.ca
- The claims for the requested Lease abuts Crown owned surface rights and claims that are held by GBR, there are no mining rights or surface rights that are held by a third party within or abutting the requested Lease. The requested Lease is not in a municipality.

We can confirm that there are no privately held lands within and contiguous to the requested lease area (including patent, leasehold and licenced interests). Due to this, we will not be providing block maps or PINs for the requested lease area. As no surface rights parcels exist within the requested lease area, no surface rights compensation agreement(s) will be required. It is our understanding that a 120-metre surface rights reservation will be imposed along the shore of Dixie Creek and Rice Lake (see Location Map 2).

Thank you for your consideration of this matter. Please contact Bruno Almeida at 647-206-5946 if there are any clarifications required or if GBR can do anything to be of assistance.

Sincerely,

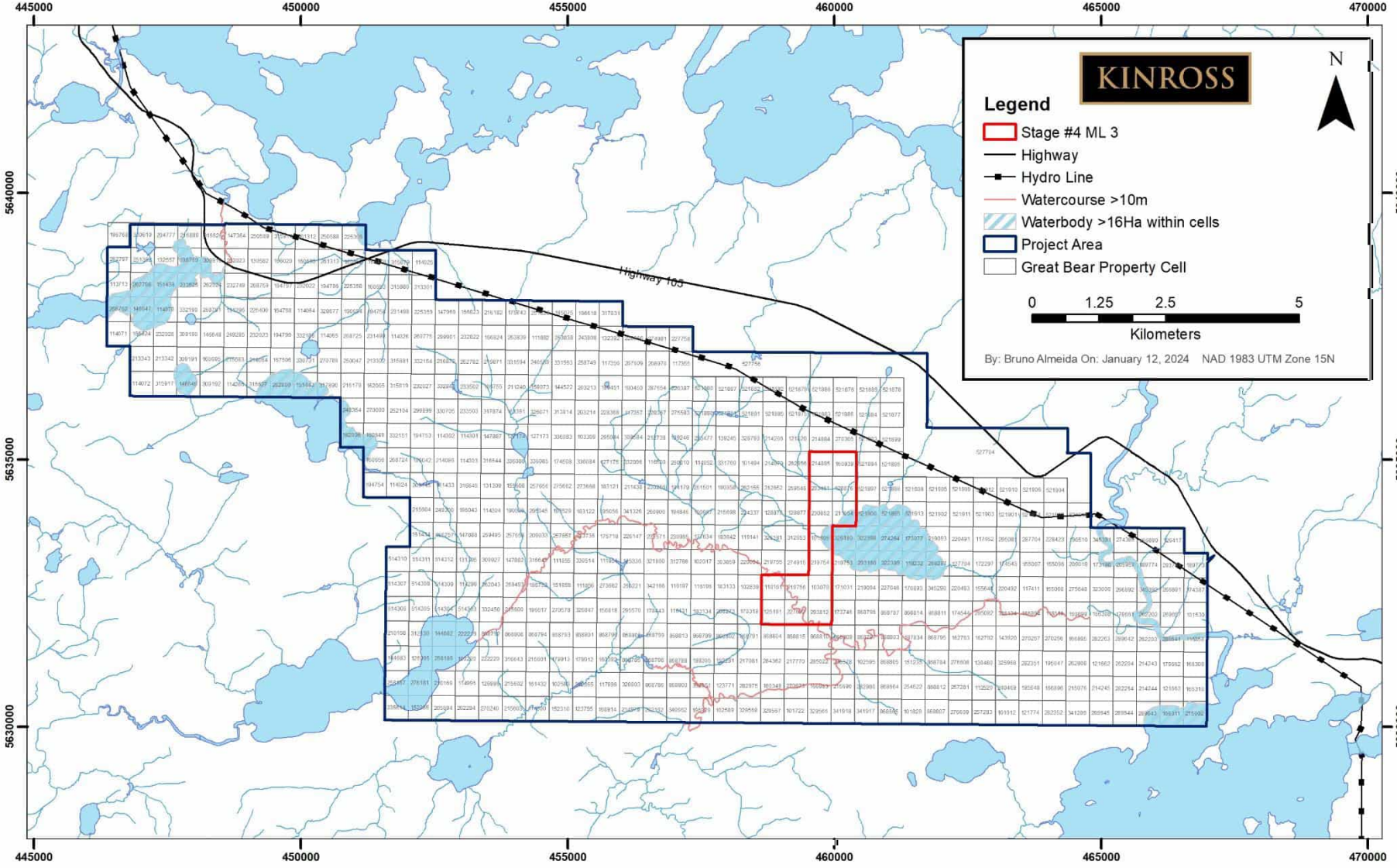
Luke Jalsevac

Vice President and Project Director
Great Bear Resources Ltd.

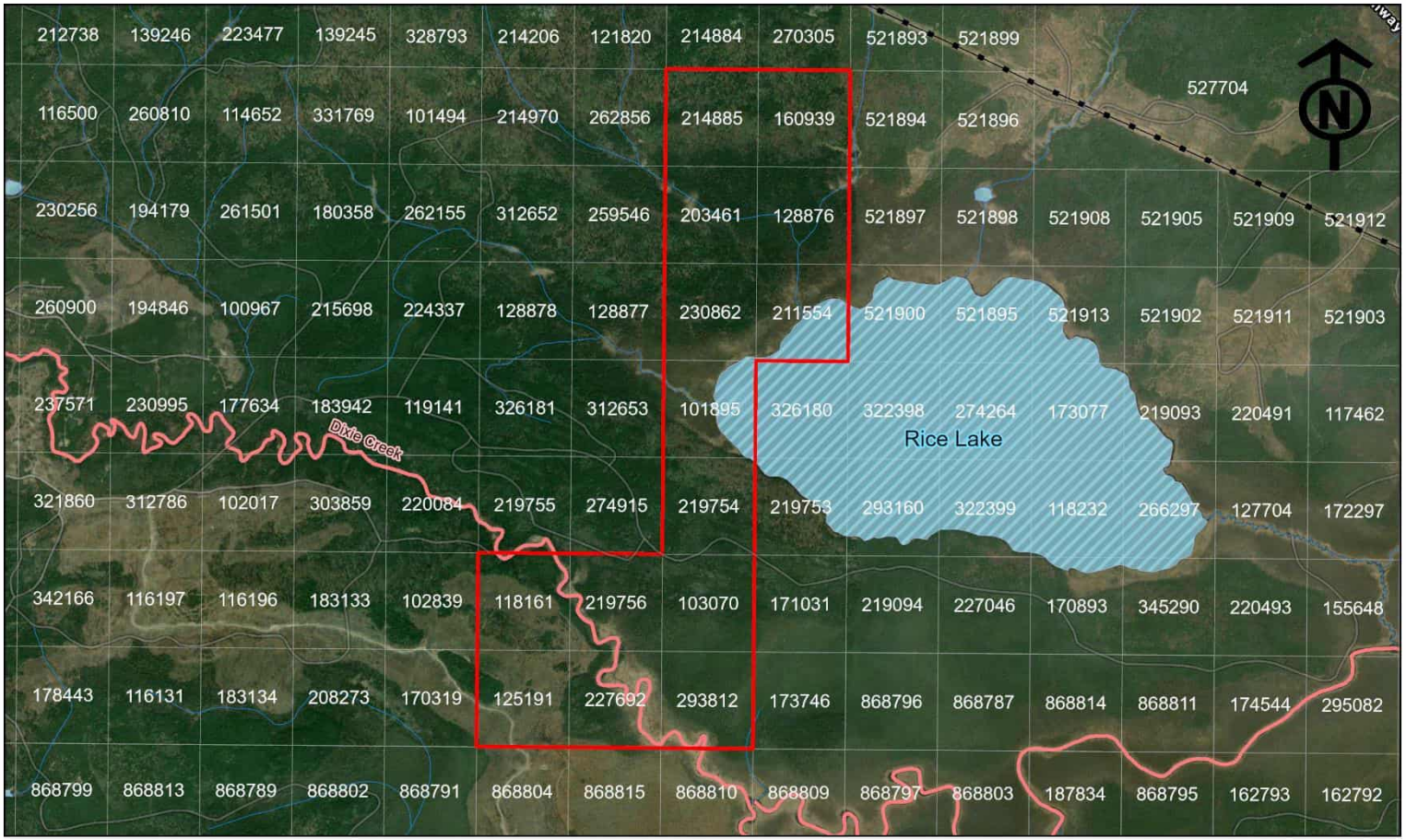
Encl. Location Map 1: Lease boundary with claims (Stage #4 ML3)
Location Map 2: Existing Surface Rights (Stage #4 ML3)
Schedule A: 14 mining claims to be leased (Stage #4 ML3)

cc: Bruno Almeida, Senior Land Manager - GBR

Location Map 1: Lease boundary with claims (Stage #4 ML3)



Location Map 2: Existing Surface Rights (Stage #4 ML3)



Legend

- Stage #4 ML3
- Project Area
- Great Bear Property Cell
- Highway
- Rivers
- Waterbody >16Ha
- Lakes
- Hydro Line
- Aggregate Site Authorized

0 0.5 1
Kilometers

Service Layer Credits: Earthstar Geographics, Province of Ontario, Esri Canada, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, US Census Bureau, USDA, NRCan, Parks Canada

Schedule A :
14 mining claims to be leased (Stage #4 ML3)

N.	TENURE_NUM	TITLE_TYPE	ISSUE_DATE	ANNIVERSARY	TENURE_STATUS	HOLDER
1	101895	Single Cell Mining Claim	2018-04-10	2028-08-04	Active	(100) GREAT BEAR RESOURCES LTD.
2	103070	Single Cell Mining Claim	2018-04-10	2028-08-04	Active	(100) GREAT BEAR RESOURCES LTD.
3	118161	Single Cell Mining Claim	2018-04-10	2028-08-04	Active	(100) GREAT BEAR RESOURCES LTD.
4	125191	Single Cell Mining Claim	2018-04-10	2028-08-04	Active	(100) GREAT BEAR RESOURCES LTD.
5	128876	Single Cell Mining Claim	2018-04-10	2028-02-05	Active	(100) GREAT BEAR RESOURCES LTD.
6	160939	Single Cell Mining Claim	2018-04-10	2028-02-05	Active	(100) GREAT BEAR RESOURCES LTD.
7	203461	Single Cell Mining Claim	2018-04-10	2028-02-05	Active	(100) GREAT BEAR RESOURCES LTD.
8	211554	Single Cell Mining Claim	2018-04-10	2028-01-05	Active	(100) GREAT BEAR RESOURCES LTD.
9	214885	Single Cell Mining Claim	2018-04-10	2028-02-05	Active	(100) GREAT BEAR RESOURCES LTD.
10	219754	Single Cell Mining Claim	2018-04-10	2028-08-04	Active	(100) GREAT BEAR RESOURCES LTD.
11	219756	Single Cell Mining Claim	2018-04-10	2028-08-04	Active	(100) GREAT BEAR RESOURCES LTD.
12	227692	Single Cell Mining Claim	2018-04-10	2028-08-04	Active	(100) GREAT BEAR RESOURCES LTD.
13	230862	Single Cell Mining Claim	2018-04-10	2028-01-05	Active	(100) GREAT BEAR RESOURCES LTD.
14	293812	Single Cell Mining Claim	2018-04-10	2028-08-04	Active	(100) GREAT BEAR RESOURCES LTD.

February 1, 2024

Provincial Mining Recorder
Ministry of Northern Development, Mines, Natural Resources and Forestry
pro.ddm@ontario.ca

Via e-mail only

Dear Mining Recorder,

Great Bear Resources Ltd. – Notice of Intent to Lease Mining Claims (Stage #4 ML4)

Great Bear Resources Ltd. (GBR), a subsidiary of Kinross Gold Corporation, is continuing to explore and develop the Great Bear Project. In order to facilitate future development, please accept this application to lease selected mining claims, pursuant to Section 81 of the Mining Act. Background information related to this application is provided below.

- A single lease with perimeter survey is requested for the claims listed in Schedule A.
- The Lease request is for both the surface rights and mining rights covering the claims listed in Schedule A and in accordance with the Location Map 1 also attached.
- The minimum five (5) units of assessment work have been completed for the claims.
- The undersigned is an officer and Vice President of Great Bear Resources Ltd.
- GBR holds a 100% interest in the claims.
- GBR has engaged Mr. Peter deHaan at TBT Engineering, Ontario Land Surveyor.
  Tel: 807.632.7594 pdehaan@tbte.ca
- The claims for the requested Lease abuts Crown owned surface rights and claims that are held by GBR, there are no mining rights or surface rights that are held by a third party within or abutting the requested Lease. The requested Lease is not in a municipality.

We can confirm that there are no privately held lands within and contiguous to the requested lease area (including patent, leasehold and licenced interests). Due to this, we will not be providing block maps or PINs for the requested lease area. It is our understanding that a surface rights reservation will be imposed over an Aggregate Permit 13799, as well a 120-metre surface rights reservation along the shore of Genessee Lake and a 50-metre-wide reservation over the Hydro Line (see Location Map 2).

Thank you for your consideration of this matter. Please contact Bruno Almeida at 647-206-5946 if there are any clarifications required or if GBR can do anything to be of assistance.

Sincerely,

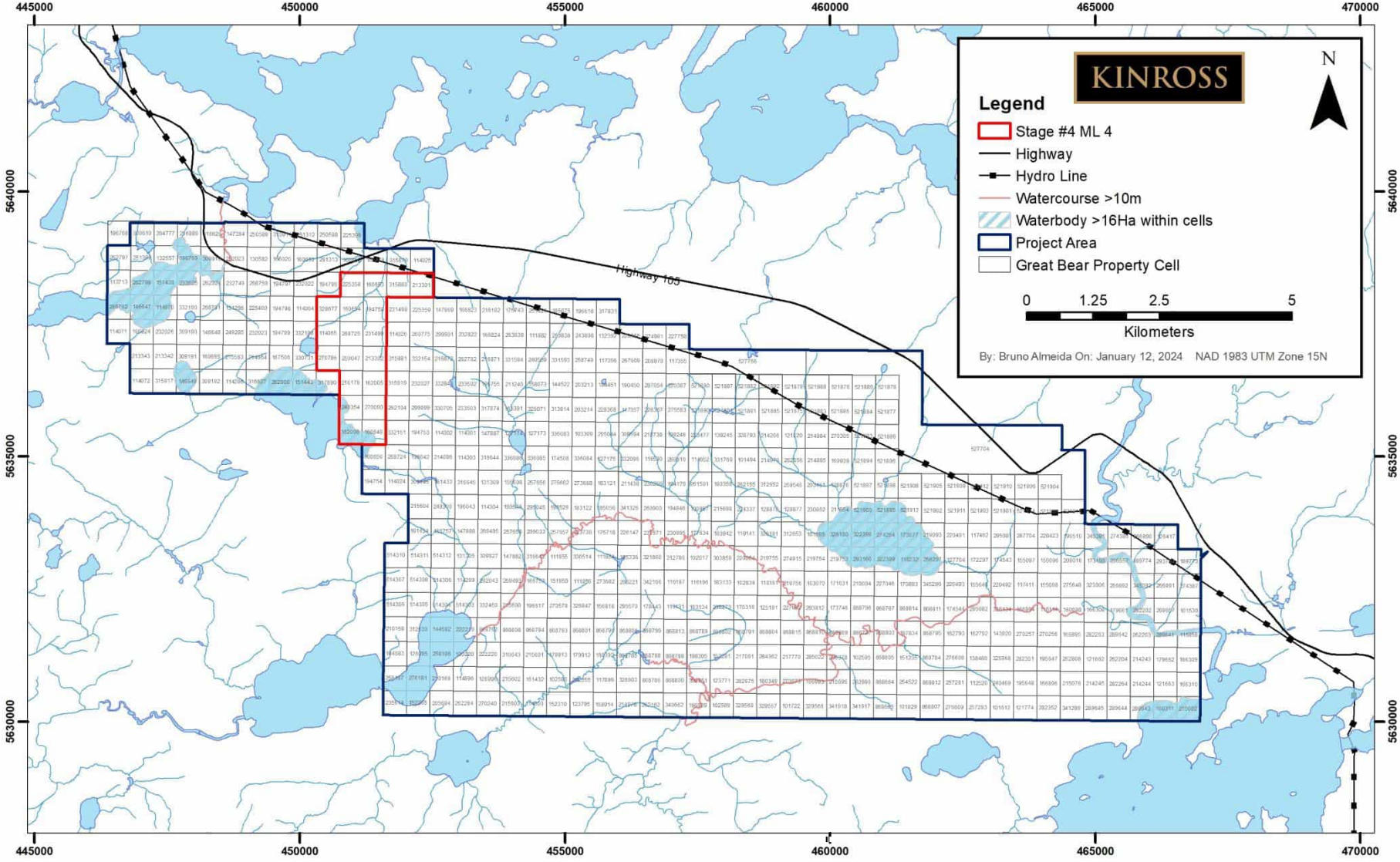
Luke Jalsevac

Vice President and Project Director
Great Bear Resources Ltd.

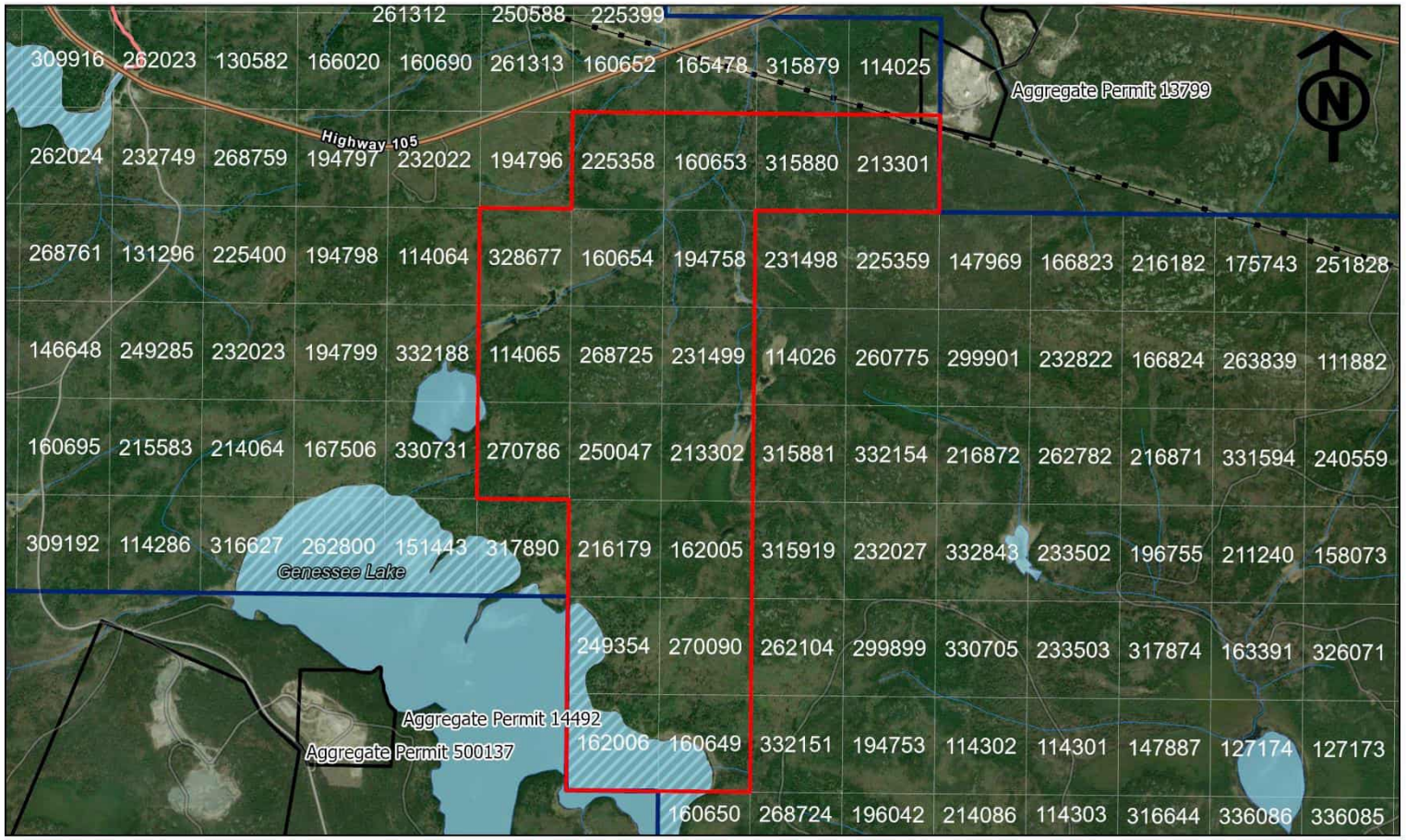
Encl. Location Map 1: Lease boundary with claims (Stage #4 ML4)
Location Map 2: Existing Surface Rights (Stage #4 ML4)
Schedule A: 19 mining claims to be leased (Stage #4 ML4)

cc: Bruno Almeida, Senior Land Manager - GBR

Location Map 1: Lease boundary with claims (Stage #4 ML4)



Location Map 2: Lease boundary with claims (Stage #4 ML4)



Legend

- Stage #4 ML4
- Project Area
- Great Bear Property Cell
- Rivers
- Waterbody >16Ha
- Lakes
- Highway
- Hydro Line
- Aggregate Site Authorized

0 0.25 0.5 1
Kilometers

Service Layer Credits: Earthstar Geographics, Province of Ontario, Esri Canada, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, US Census Bureau, USDA, NRCan, Parks Canada

Schedule A :
19 mining claims to be leased (Stage #4 ML4)

N.	TENURE_NUM	TITLE_TYPE	ISSUE_DATE	ANNIVERSAR	TENURE_STA	HOLDER
1	114065	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
2	160649	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
3	160653	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
4	160654	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
5	162005	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
6	162006	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
7	194758	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
8	213301	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
9	213302	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
10	216179	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
11	225358	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
12	231499	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
13	249354	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
14	250047	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
15	268725	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
16	270090	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
17	270786	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
18	315880	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
19	328677	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.

February 1, 2024

Provincial Mining Recorder
Ministry of Northern Development, Mines, Natural Resources and Forestry
pro.ddm@ontario.ca

Via e-mail only

Dear Mining Recorder,

Great Bear Resources Ltd. – Notice of Intent to Lease Mining Claims (Stage #4 ML2)

Great Bear Resources Ltd. (GBR), a subsidiary of Kinross Gold Corporation, is continuing to explore and develop the Great Bear Project. In order to facilitate future development, please accept this application to lease selected mining claims, pursuant to Section 81 of the Mining Act. Background information related to this application is provided below.

- A single lease with perimeter survey is requested for the claims listed in Schedule A.
- The Lease request is for both the surface rights and mining rights covering the claims listed in Schedule A and in accordance with the Location Map 1 also attached.
- The minimum five (5) units of assessment work have been completed for the claims.
- The undersigned is an officer and Vice President of Great Bear Resources Ltd.
- GBR holds a 100% interest in the claims.
- GBR has engaged Mr. Peter deHaan at TBT Engineering, Ontario Land Surveyor.
  Tel: 807.632.7594 pdehaan@tbte.ca
- The claims for the requested Lease abuts Crown owned surface rights and claims that are held by GBR, there are no mining rights or surface rights that are held by a third party within or abutting the requested Lease. The requested Lease is not in a municipality.

We can confirm that there are no privately held lands within and contiguous to the requested lease area (including patent, leasehold and licenced interests). Due to this, we will not be providing block maps or PINs for the requested lease area. It is our understanding that a surface rights reservation will be imposed over the Highway, the Aggregate Permits 500311 and 20063, as well as a 50-metre-wide reservation over the Hydro Line and a 120-metre surface rights along the shore of Chukuni River and Rice Lake (see Location Map 2).

Thank you for your consideration of this matter. Please contact Bruno Almeida at 647-206-5946 if there are any clarifications required or if GBR can do anything to be of assistance.

Sincerely,

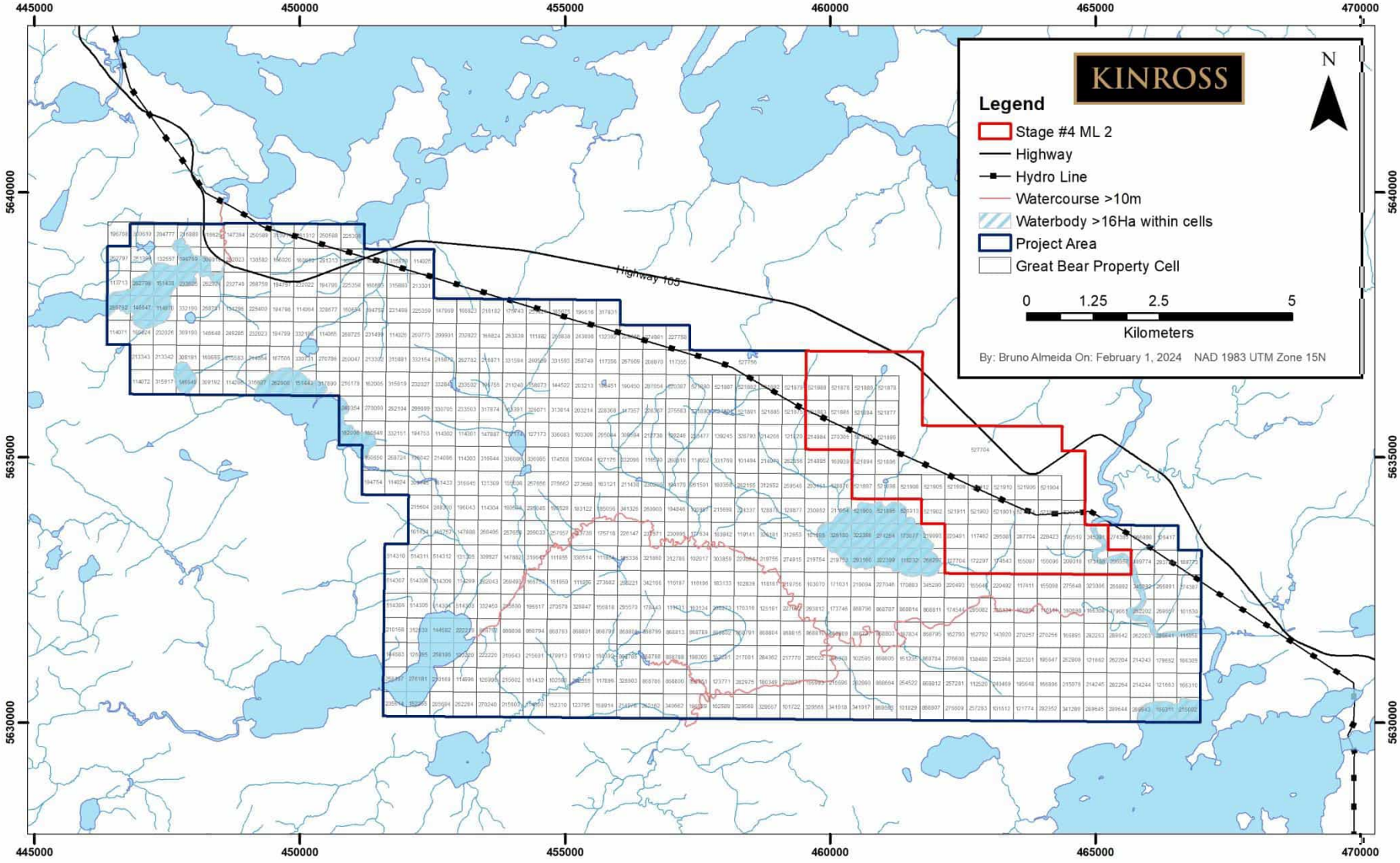
Luke Jalsevac

Vice President and Project Director
Great Bear Resources Ltd.

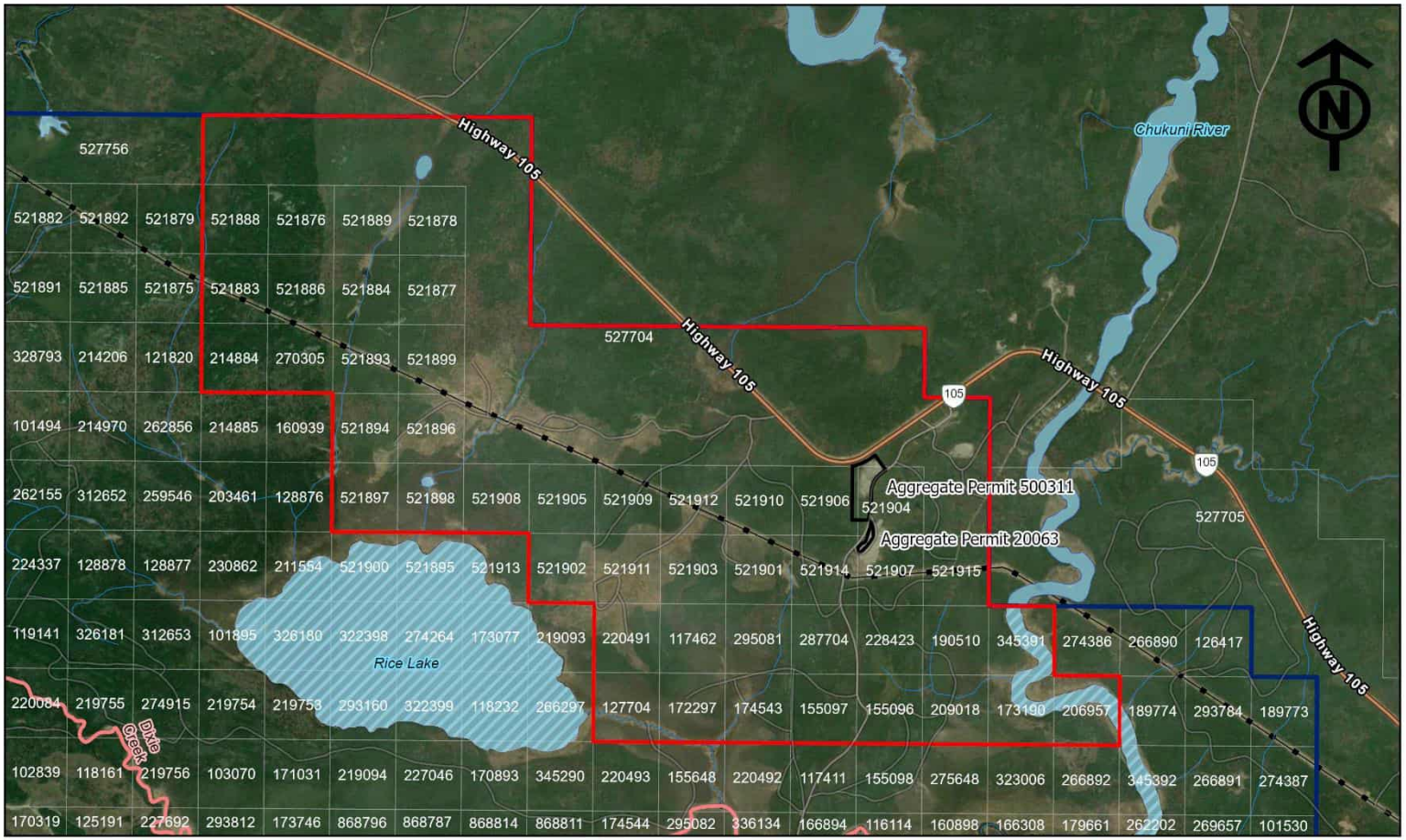
Encl. Location Map 1: Lease boundary with claims (Stage #4 ML2)
Location Map 2: Existing Surface Rights (Stage #4 ML2)
Schedule A: 46 mining claims to be leased (Stage #4 ML2)

cc: Bruno Almeida, Senior Land Manager - GBR

Location Map 1: Lease boundary with claims (Stage #4 ML2)



Location Map 2: Existing Surface Rights (Stage #4 ML2)



Legend

- Stage #4 ML2
- Project Area
- Great Bear Property Cell
- Highway
- Rivers
- Waterbody >16Ha
- Lakes
- Hydro Line
- Aggregate Site Authorized

0 0.5 1
Kilometers

Service Layer Credits: Province of Ontario, Esri Canada, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, US Census Bureau, USDA, NRCan, Parks Canada, Maxar

Schedule A :
46 mining claims to be leased (Stage #4 ML2)

N.	TENURE_NUM	TITLE_TYPE	ISSUE_DATE	ANNIVERSARY	TENURE_STATUS	HOLDER
1	117462	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
2	127704	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
3	155096	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
4	155097	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
5	172297	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
6	173190	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
7	174543	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
8	190510	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
9	206957	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
10	209018	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
11	214884	Single Cell Mining Claim	2018-04-10	2028-02-05	Active	(100) GREAT BEAR RESOURCES LTD.
12	220491	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
13	228423	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
14	270305	Single Cell Mining Claim	2018-04-10	2028-02-05	Active	(100) GREAT BEAR RESOURCES LTD.
15	287704	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
16	295081	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
17	345391	Single Cell Mining Claim	2018-04-10	2028-08-03	Active	(100) GREAT BEAR RESOURCES LTD.
18	521876	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
19	521877	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
20	521878	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
21	521883	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
22	521884	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
23	521886	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
24	521888	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
25	521889	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
26	521893	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
27	521894	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
28	521896	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
29	521897	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
30	521898	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
31	521899	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
32	521901	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
33	521902	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
34	521903	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
35	521904	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
36	521905	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
37	521906	Multi-cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
38	521907	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.

N.	TENURE_NUM	TITLE_TYPE	ISSUE_DATE	ANNIVERSARY	TENURE_STATUS	HOLDER
39	521908	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
40	521909	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
41	521910	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
42	521911	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
43	521912	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
44	521914	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
45	521915	Single Cell Mining Claim	2018-05-22	2028-05-22	Active	(100) GREAT BEAR RESOURCES LTD.
46	527704	Multi-cell Mining Claim	2018-08-20	2028-08-20	Active	(100) GREAT BEAR RESOURCES LTD.

February 1, 2024

Provincial Mining Recorder
Ministry of Northern Development, Mines, Natural Resources and Forestry
pro.ddm@ontario.ca

Via e-mail only

Dear Mining Recorder,

Great Bear Resources Ltd. – Notice of Intent to Lease Mining Claims (Stage #4 ML1)

Great Bear Resources Ltd. (GBR), a subsidiary of Kinross Gold Corporation, is continuing to explore and develop the Great Bear Project. In order to facilitate future development, please accept this application to lease selected mining claims, pursuant to Section 81 of the Mining Act. Background information related to this application is provided below.

- A single lease with perimeter survey is requested for the claims listed in Schedule A.
- The Lease request is for both the surface rights and mining rights covering the claims listed in Schedule A and in accordance with the Location Map 1 also attached.
- The minimum five (5) units of assessment work have been completed for the claims.
- The undersigned is an officer and Vice President of Great Bear Resources Ltd.
- GBR holds a 100% interest in the claims.
- GBR has engaged Mr. Peter deHaan at TBT Engineering, Ontario Land Surveyor.
  Tel: 807.632.7594 pdehaan@tbte.ca
- The claims for the requested Lease abuts Crown owned surface rights and claims that are held by GBR, there are no mining rights or surface rights that are held by a third party within or abutting the requested Lease. The requested Lease is not in a municipality.

We can confirm that there are no privately held lands within and contiguous to the requested lease area (including patent, leasehold and licenced interests). Due to this, we will not be providing block maps or PINs for the requested lease area. It is our understanding that a 50-metre-wide surface rights reservation will be imposed over the Hydro Line (see Location Map 2).

Thank you for your consideration of this matter. Please contact Bruno Almeida at 647-206-5946 if there are any clarifications required or if GBR can do anything to be of assistance.

Sincerely,

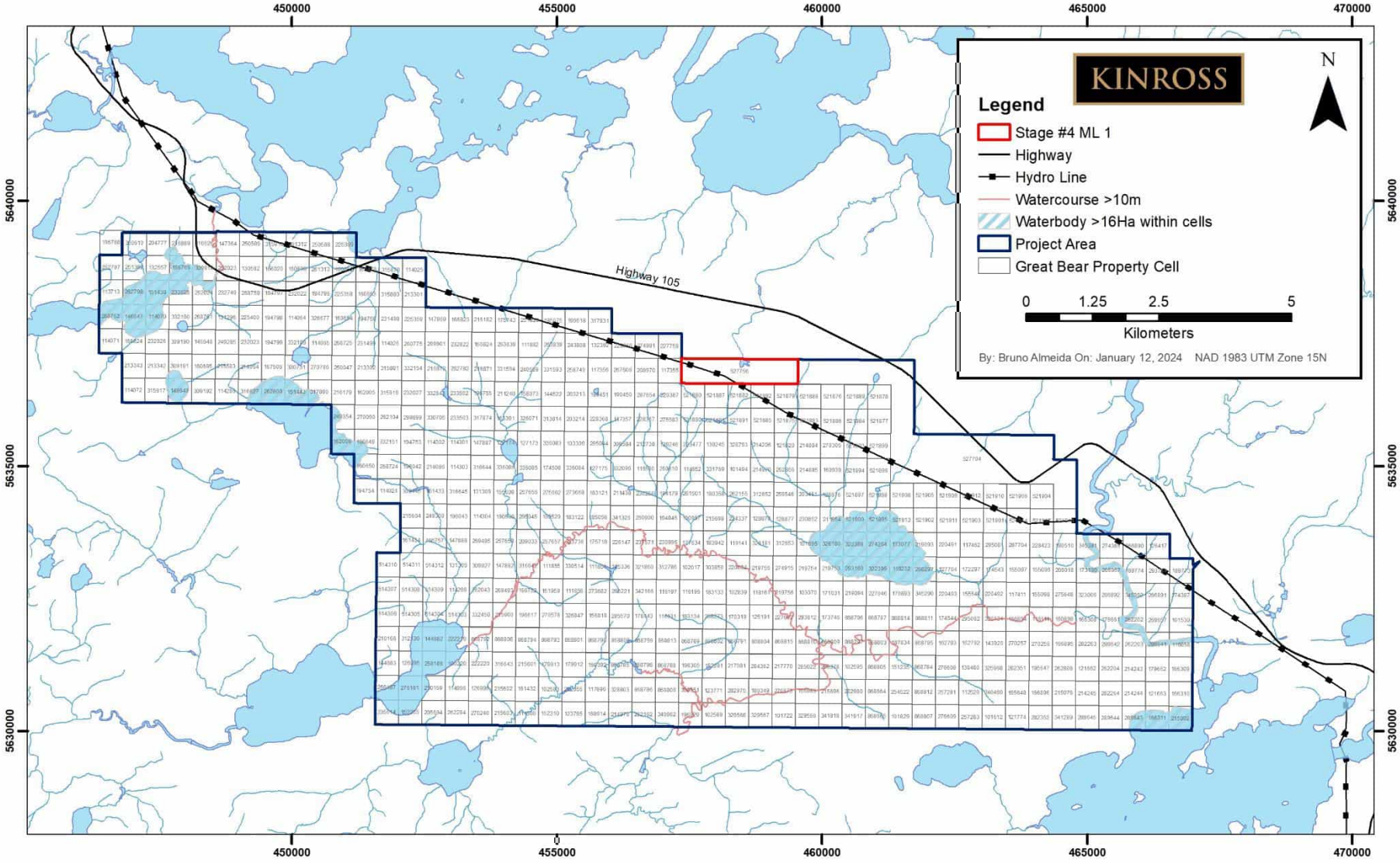
Luke Jalsevac

Vice President and Project Director
Great Bear Resources Ltd.

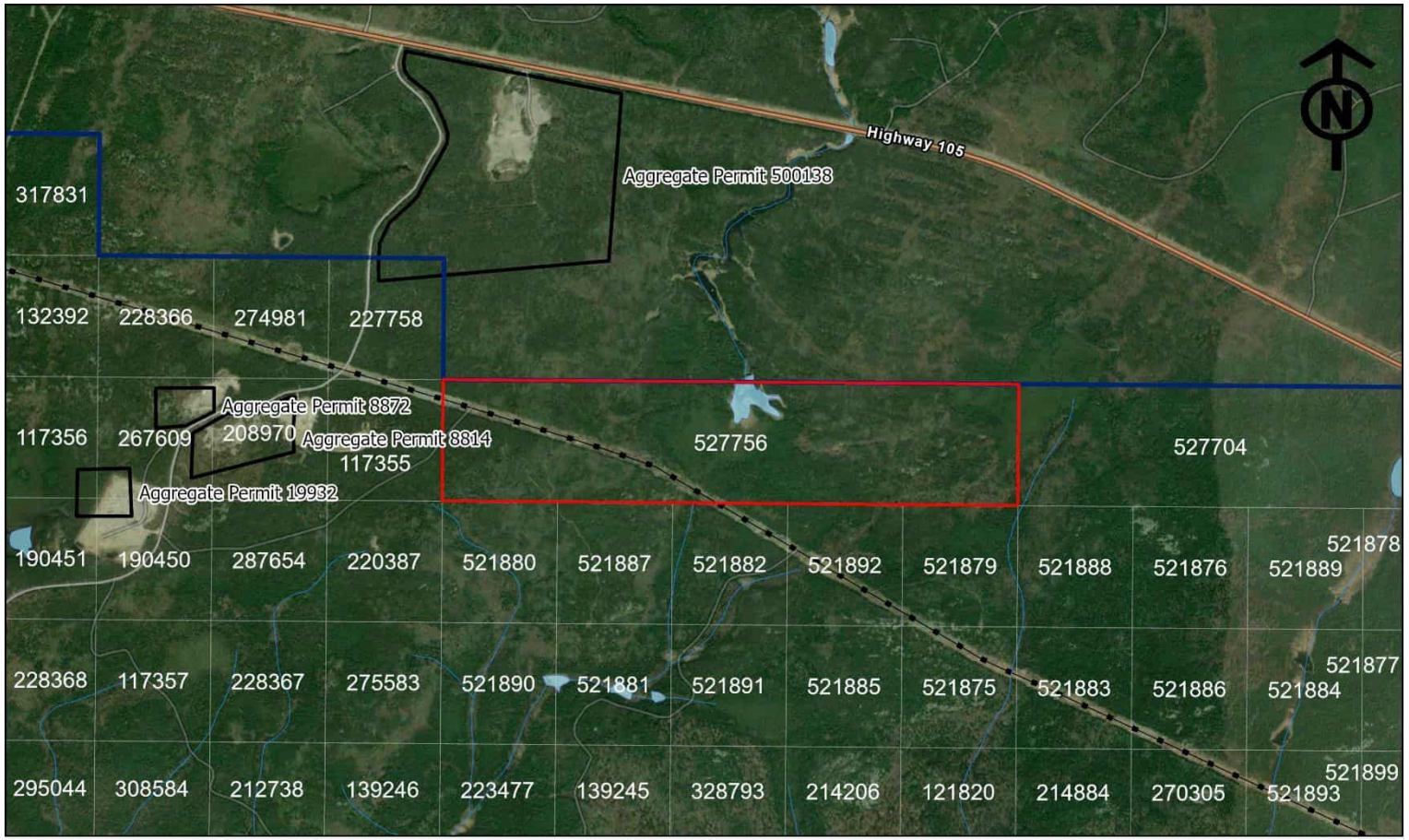
Encl. Location Map 1: Lease boundary with claims (Stage #4 ML1)
Location Map 2: Existing Surface Rights (Stage #4 ML1)
Schedule A: One mining claim to be leased (Stage #4 ML1)

cc: Bruno Almeida, Senior Land Manager - GBR

Location Map 1: Lease boundary with claims (Stage #4 ML1)



Location Map 2: Existing Surface Rights (Stage #4 ML1)



Legend

- Stage #4 ML1
- Project Area
- Great Bear Property Cell
- Highway
- Rivers
- Lakes
- Hydro Line
- Aggregate Site Authorized

0 0.25 0.5 1
Kilometers

Service Layer Credits: Province of Ontario, Esri Canada, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, US Census Bureau, USDA, NRCan, Parks Canada, Maxar

Schedule A :
One mining claim to be leased (Stage #4 ML1)

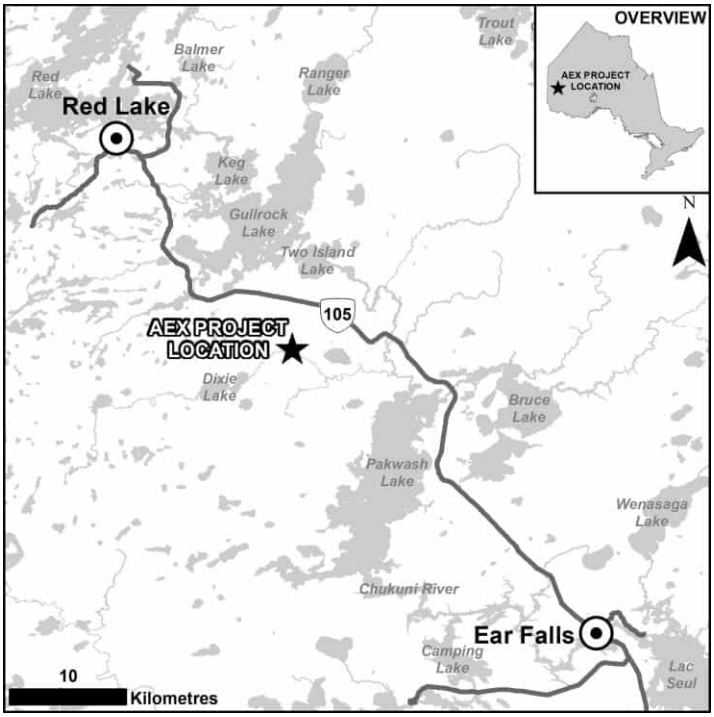
N.	*TENURE_NUM*	*TITLE_TYPE*	*ISSUE_DATE*	*ANNIVERSARY*	*TENURES_STATUS*	*HOLDER*
1	527756	Multi-cell Mining Claim	2018-08-23	2028-08-23	Active	(100) GREAT BEAR RESOURCES LTD.

Notice of Commencement of a Screening

Great Bear Temporary Power Project

The Study

This Notice of Commencement is provided to inform the public, Indigenous communities and interested parties that Great Bear Resources Ltd., a wholly owned subsidiary of **Kinross Gold Corporation (Kinross)** is beginning an environmental study to determine the potential environmental effects of the installation of between 1 megawatts and 5 megawatts of diesel-fired generation (the **Temporary Power Project**) at the Great Bear property.



Background

The Great Bear advanced exploration program is located approximately 25 kilometres southeast of Red Lake in northwestern Ontario. The advanced exploration program requires a reliable power supply to support onsite activities early in the program. The **Temporary Power Project** will provide temporary power to be replaced with a more favourable power supply option once it can be established.

The Process

The study will be carried out in accordance with the Ministry of the Environment, Conservation and Parks Environmental Screening Process for Category B Projects set out in Ontario Regulation 116/01 (the *Electricity Projects Regulations*).

On completion of the study, an Environmental Screening Report will be completed and made available for a 30-day public review period.

A Notice of Completion will advise interested parties of the locations where the report can be reviewed.

Comments

Members of the public, Indigenous communities and other interested persons are encouraged to actively participate in the planning process. Notice of all upcoming consultation events will be advertised in local papers and radio. Alternatively, all members of the public, Indigenous communities and other interested persons seeking to review supporting materials for the application can speak to Great Bear staff directly at 104 Howey Street, Red Lake, Ontario.

Please direct any inquiries, comments or requests regarding the **Temporary Power Project** to:

Aaron MacDonell, Director, Environmental Services
Great Bear Resources / Kinross Gold Corporation
25 York Street, Suite 15th Floor, Toronto Ontario
M5J 2V5
M: 807-620-8573
Email: aaron.macdonell@kinross.com

All personal information included in a submission – such as name, address, telephone number and property location – is collected, maintained and disclosed by the Ministry of the Environment, Conservation and Parks for the purpose of transparency and consultation. The information is collected under the authority of the *Environmental Assessment Act* or is collected and maintained for the purpose of creating a record that is available to the general public as described in s.37 of the *Freedom of Information and Protection of Privacy Act*. Personal information you submit will become part of a public record that is available to the general public unless you request that your personal information remain confidential. For more information, please contact the Project Officer or the Ministry of the Environment and Climate Change's Freedom of Information and Privacy Coordinator at (416) 327-1434.

Asubpeeschoseewagong
Netum Anishinabek
GRASSY NARROWS, ONTARIO P0X 1B0 • PHONE: (807) 925-2201 • FAX: (807) 925-2649

March 6, 2024

Attention: Minister George Pirie (Minister of Mines) (minister.mines@ontario.ca)
99 Wellesley Street West
Room 5630, Whitney Block
Toronto, Ontario M7A 1W3

Attention: Anjala Puvanathan (Director, Ontario Region) (greatbear@iaac-aeic.gc.ca)
Impact Assessment Agency of Canada
Ontario Region
600-55 York Street
Toronto, Ontario M5J 1R7

Attention: Aaron MacDonell, Director of Environmental Services
(aaron.macdonell@kinross.com)
Mac Potter, External Relations Manager (mac.potter@kinross.com)
Great Bear Resources Ltd. A Kinross Company
104 Howey Street
Red Lake, Ontario P0V 2M0

Boozhoo MINES, IAAC, Kinross and Great Bear Resources:

RE: The Great Bear Gold Mine Project

On behalf of Asubpeeschoseewagong Anishinabek ("ANA" or "Grassy Narrows First Nation"), we write to share with you Grassy Narrows' preliminary position with respect to your activities in relation to the Great Bear Gold Project.

The Project will have an adverse impact and requires an impact assessment

Grassy Narrows is deeply concerned by the Great Bear Gold Project being pursued by Kinross and Great Bear Resources with support from the Ministry of MINES as well as the process recently begun by the Impact Assessment Agency of Canada (IAAC).

Decades of industrial activity, authorized and encouraged by Ontario and contrary to Grassy Narrows' will, have led to well-documented and extensive harm to our Territory, our way of life, our rights, and our health. As a result, our people suffer intensely from impacts including premature death, disease, poverty, and suicide.

The Great Bear Gold Project falls within the area that Grassy Narrows people have historically and currently use for the exercise of our rights and way of life. It is also upstream from our community. Pollutants in the water and impacts on the surrounding land, fish and wildlife will have a direct impact upon us and could also exacerbate mercury contamination in our waterways.

ANA has repeatedly and clearly communicated with the Crown and the mining industry that our people are in crisis, the environment which supports us is severely impacted, our health is failing. The cumulative impacts continue to significantly interfere with our treaty, Aboriginal and inherent rights.

The Great Bear Gold Project will have an impact upon areas that Canada claims as within federal jurisdiction, such as species at risk, fisheries, waterways and Indigenous peoples. Grassy Narrows asserts that the IAAC must conduct an impact assessment in the circumstances.

The Crown's outstanding obligations to Grassy Narrows should be resolved in a nation-to-nation process.

For many years, ANA has written to Ontario to invite the Crown to a government-to- government table to address fundamental issues between us, including the Crown's unmet obligations to us about our rights, our land, our self-determination, and the impacts of industry and government policy on our land and people. These issues have been unresolved between our governments for many decades. Reaching agreement in good faith through a government-to-government table is the way to resolve these important issues and to put in place effective measures to protect us from further harm.

Ontario and Canada have yet to accept this invitation. Most recently, by letter dated November 27, 2023, Ontario explicitly refused to participate in a table to discuss "jurisdictional issues" raised and rejected nearly all of the issues proposed by ANA including most of those related to mining.

Instead, Ontario has explicitly recommended that mining companies explore on and around our Territory, has unilaterally granted roughly 6,000 mining claims on our Indigenous Protected and Conserved Area, and allowed companies to pursue increasingly advanced work towards mines that pose a serious threat to Grassy Narrows. This activity has occurred without our consent, without meaningful consultation and accommodation, and usually without even prior notice under the antiquated "free entry" mining regime.

Grassy Narrows' concerns about the process

Until recently, the Crown and the companies associated with the Great Bear Gold Project have shown little willingness to meet with us, nor respond substantively to many of our communications. Indeed, we have only recently learned that the Crown and companies provided notice to other Indigenous Nations of permit applications concerning the Great Bear Gold Project

as early as 2017 and have signed Advanced Exploration Agreements with Wabauskang and Lac Seul First Nations. In contrast, Ontario approved a number of permits without notice of any kind to Grassy Narrows.

Now that gold has been found, the Crown and Kinross are suddenly interested in giving the appearance of consulting with us, but only to the extent that it furthers the already advanced plans, made without Grassy Narrows' involvement, to develop an industrial gold mine in our headwaters.

Even if Ontario had complied with its own laws, Ontario's "free entry" mining exploration and mine development process is not the correct way to make key decisions between our two governments. This process is deeply unfair and biased in the favour of multi-billion-dollar mining companies. It ignores our laws, our vision for our land and people, and our processes for making decisions affecting our territories.

Our ongoing and urgent crisis leaves us unable to meaningfully engage about mining. To make matters worse, we receive no support from Ontario to inform ourselves, gain technical and legal advice, and to engage in a fair way about mining. The IAAC has offered a mere $5,000 in capacity funding to respond to a 100-page technical Initial Project Description and the funding was made available only after the submission deadline for comments has passed.

The path to reconciliation

We are on a healing journey to recover from the extreme damage that colonization, and attempted forced assimilation have done to our people, including through the imposition of Crown policy and regulatory schemes related to residential schools, dams, relocation, mercury contamination, child apprehension, industrial logging, and mining. We need to allow the land to heal because healthy land will help to heal our people. This is what reconciliation means to Grassy Narrows. Let us protect our land and water so that we can heal our people.

The boom in mining exploration in our area is causing great anxiety and fear among our people. It is setting back our healing. If the Crown decides to allow mining, and the risk of further pollution and other impacts, there will be more heartache, sickness and loss for our people. This mining activity will only lead to more grassroots resistance, litigation, and public controversy over conflict minerals. It will take the relationship between the Crown and Grassy Narrows further away from the path of healing and reconciliation.

Grassy Narrows says 'no' to the Great Bear mine and related activities.

We strongly urge the Crown and your companies to reconsider your unilateral and bullying approach to pushing mining activity on our First Nation. We urge you to seize this opportunity to set a course for a future that is free of conflict over mining in Ontario.

We call on the Crown and your companies to respect the healing path for Grassy Narrows and not to further impair the exercise of our constitutionally protected Aboriginal and treaty rights, our inherent Indigenous rights, our health, and wellbeing.

Grassy Narrows provides preliminary comment on the project under duress

We know that Ontario and Canada will move ahead with approvals for damaging mining activity if we do not speak up. For that reason, we are writing to you under duress to express our preliminary concerns about this project before it advances any further. These serious concerns with both how the project has been pursued and the impacts on our rights and interests, are set out in the attached document. These submissions are by necessity preliminary in the absence of capacity and support to conduct our own studies and obtain expert technical advice.

Please ensure that you copy our Land Protection Team on all communications on this and related matters.

Awsa,

Asubpeeschoseewagong Anishinabek (Grassy Narrows First Nation) Chief and Council (quorum of three)

Chief Rudy Turtle

Councillor Sherry Ackabee

Councillor Bear Copenace

Councillor John C. Kokopenace

Councillor Arnold Pahpasay

cc:

Grassy Narrows Lands Protection Team
Joseph Fobister, Lead Negotiator (jbfobister@gmail.com)
Mike Fobister, Supervisor (mike.fobister@googlemail.com)
Dan Mossip-Balkwill, Advisor (dan.mossip.balkwill@gmail.com)

David Sone, Advisor (david.sone@gmail.com)
Jackie Esmonde, Legal Counsel (jesmonde@cavalluzzo.com)

Ontario Ministry of Mines
Susanna Laaksonen-Craig (deputy.mines@ontario.ca) (Deputy Minister, MINES)
Patrick Barnes (patrick.m.barnes@ontario.ca) (MINES Consultation and Aboriginal Treaty Rights Advisor)
Neal Bennett (neal.bennett@ontario.ca) (MINES Acting Regional Manager Thunder Bay Office)
Teri McDonald (teri.mcdonald@ontario.ca) (MINES Indigenous Consultation and Partnerships Branch)

Ontario Ministry of Natural Resources and Forestry
Minister Graydon Smith (minister.mnrf@ontario.ca)
Drew Vanderduim (deputy.mnrf@ontario.ca) (Deputy Minister MNRF)

Ontario Ministry of Indigenous Affairs
Minister Greg Rickford (minister.indigenousaffairs@ontario.ca)
Shawn Batise (shawn.batise@ontario.ca) (Deputy Minister, Ontario Ministry of Indigenous Affairs)
Emily Vassos (Emily.vassos@ontario.ca) (Chief of Staff, Minister's Office, Ontario Ministry of Indigenous Affairs)
Candice Telfer (Candice.telfer@ontario.ca) (Acting Assistant Deputy Minister, Negotiations and Reconciliation Division)

Ontario Ministry of Environment Conservation and Parks
Minister Andrea Khanjin (minister.mecp@ontario.ca)
Serge Imbrogno (serge.imbrogno@ontario.ca) (Deputy Minister)

Crown-Indigenous Relations
Minister Gary Anandasangaree (gary.anandasangaree@rcaanc-cirnac.gc.ca)
Valerie Gideon (valerie.gideon@rcaanc-cirnac.gc.ca) (Deputy Minister)
Rob Wright (rob.wright@rcaanc-cirnac.gc.ca) (Associate Deputy Minister)

Indigenous Services Canada
Minister Patty Hajdu (ministresa-ministeris@sac-isc.gc.ca)
Gina Wilson (gina.wilson@sac-isc.gc.ca) (Deputy Minister)
Michelle Kovacevic (michelle.kovacevic@sac-isc.gc.ca) (Associate Deputy Minister)
Julia Gregory (julia.gregory@sac-isc.gc.ca) (ISC, Policy Analyst; Lands and Economic Development)

Canada - Ministry of Environment and Climate Change
Minister Steven Guilbeault (steven.guilbeault@parl.gc.ca) (Minister of Environment and Climate Change)
Jean-Francois Tremblay (JF.Tremblay@ec.gc.ca) (Deputy Minister)
Lawrence Hanson (Lawrence.Hanson@ec.gc.ca) (Associate Deputy Minister)

Impact Assessment Agency Canada
Natalie Boyd (greatbear@iaac-aeic.gc.ca) (IAAC, Project Manager)
Ian Lindsay (greatbear@iaac-aeic.gc.ca) (IAAC, a/Senior Consultation Analyst)

Kinross / Great Bear
Aaron MacDonnell (aaron.macdonell@kinross.com) (Kinross Director of Environmental Services)

ANA PRELIMINARY CONCERNS ABOUT THE GREAT BEAR GOLD PROJECT

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I. The Context

Who is Grassy Narrows

Asubpeeschoseewagong Anishinabek (Grassy Narrows First Nation) is an Anishinaabe First Nation with traditional territory in what is called northwestern Ontario. Grassy Narrows people exercise inherent Indigenous rights, and Aboriginal and Treaty rights. We have cared for and lived on our lands for countless generations. Grassy Narrows people hunt, trap, fish and practice our Anishinaabe way of life to provide for ourselves, our families and community.

We exercise our inherent right to self-determination and law-making powers. Our inherent rights are given to us by the Creator. In addition to our inherent rights, Grassy Narrows people exercise Aboriginal rights and established Treaty 3 rights which are protected by section 35 of the *Constitution Act, 1982*.

In 1873, the Anishinaabe adhered to Treaty 3. The Treaty 3 Commissioner promised the Anishinaabe that the Treaty promises would protect our harvesting practices forever, which would allow our people to hunt, fish, trap, gather, and harvest throughout the Territory as they had before "as long as the sun shone and the waters flowed." This promise was more than a continuation of our pre-existing harvesting rights. The Anishinaabe did not agree to the erosion of our harvesting rights.[1]

Our territory is located in the Boreal Shield ecoregion in a mixed forest transition zone from the Great Lakes St Lawrence Forest to the Boreal Forest. The Whiskey Jack Forest is the English name of the forest that covers a large portion of the Territory; the English-Wabigoon River System is a central waterway in the Territory. The land and waterways of the Territory sustain Grassy Narrows peoples' way of life.

Grassy Narrows' Territory is the foundation of who Grassy Narrows people are as Anishinaabe people. We follow the teachings of the Elders to be responsible for the Territory and to *Manaachitootaa Aki* (protect the land).

Social and Cultural Impacts of Crown Law and Policy.

Despite these sacred promises, for many generations the Crown has imposed harmful law and policy on us, including through the *Indian Act*, the banning of our ceremonies, regulation of our hunting and trapping, residential schools, regulation of the wild rice, relocation, the 60s scoop, the underfunding of our schools, inadequate health care, and the ongoing removal of our children from the community.

These policies have caused grave harm to our people and impaired the exercise of our rights. They have undermined our strong society and way of life and have left us more

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[1] *Keewatin v Minister of Natural Resources*, 2011 ONSC 4801 [*Keewatin* ONSC], rev'd 2013 ONCA 1158, aff'd 2014 SCC 48 ["*Keewatin* litigation"].

vulnerable to the impacts of industry.

The Cumulative Effects of the Mercury Crisis and Industrial Activities Impacts.

Starting in at least 1962, a chlor-alkali plant in Dryden, Ontario, began discharging mercury into the English-Wabigoon River system. Approximately 9,000 kilograms of mercury were discharged into the river system that flows through our Territory and is a lifeline for Grassy Narrows people. Our live-giving river became a source of invisible poison.

The impacts of the mercury contamination have been devastating to the people of Grassy Narrows and our Territory. The presence of mercury led to the methylmercury contamination of the fish and Grassy Narrows people. The local commercial fishery shut down; Grassy Narrows' economy collapsed; Grassy Narrows people descended into poverty; Grassy Narrows people suffered, as they continue to do, from debilitating health symptoms and premature death; and our Anishinaabe way of life was gravely threatened and changed when we could no longer safely eat fish and exercise our fishing practices as we had before.

In the 1970s and 1980s, Grassy Narrows called on Ontario to respond to the mercury crisis by taking concrete action, including by agreeing that Grassy Narrows would control our Territory. As the river was poisoned, we wanted to have more control over our Territory and the natural resources in it to be able to protect and benefit from the part of our Territory that was still healthy – the land. Instead, Ontario authorized extensive clearcut logging in the Territory from roughly 1980 to 2008, which likely released new, or additional, sources of mercury into the watershed, and increased methyl mercury contamination of fish.

Multiple expert reports and publications have detailed the impacts of mercury contamination on the health of Grassy Narrows people, including the following, which are enclosed:

- 2015 Expert Report of Dr. Donna Mergler
- Grassy Narrows Community Health Assessment Summary Reports, 2018
- Philibert et. al. (2020), "Mercury exposure and premature mortality in the Grassy Narrows First Nation community: a retrospective longitudinal study", *The Lancet: Planetary Health* Vol. 4(4), E141-E148
- Philibert et. al. (2022), "Past mercury exposure and current symptoms of nervous system dysfunction in adults of a First Nation community (Canada)" *Environmental Health* 21:34.
- Mergler. D. et. al. (2023), "The Contribution across Three Generations of Mercury Exposure to Attempted Suicide among Children and Youth in Grassy Narrows First Nation, Canada: An Intergenerational Analysis" *Environmental Health Perspectives* 131(7).

These reports highlight the grave impacts of mercury on the health and wellbeing of

Grassy Narrows. They establish that Grassy Narrows people cannot withstand further impacts from the release of new mercury into Grassy Narrows' land, lakes, rivers, fish, and people, nor an increase in the net methylation of existing mercury. Our rights have already been highly compromised by the mercury crisis. Our nation cannot withstand further infringements of rights. No further impairment of our rights, our health, and our wellbeing can be justified.

Our fish in the Wabigoon River remain the most mercury contaminated in the province. Our people of all ages continue to suffer from mercury related diseases and loss of wellbeing. Our employment remains far below what it was in the 1960s following the collapse of our subsistence, sport, and commercial fishery due to mercury.

The mercury crisis is but one in a long series of industrial attacks which have been imposed on us against our will. These include the damming of our rivers, industrial logging, and mining activity. Each of these industrial attacks has had grave impacts on its own. In addition, each of these industrial attacks has compounded the existing harm that remains from previous attacks, creating unbearable cumulative impacts, thereby prolonging, and exacerbating our inter-generational crisis.

These extreme and compounding industrial impacts have been authorized and encouraged by the Crown without any serious consideration of their cumulative effects on Grassy Narrows and the exercise of Grassy Narrows' rights. We have raised clear concerns since at least the 1970s that our environment, rights, way of life, and our health, were at or beyond, the breaking point due to the impacts of industry on the resources on which we have heavily relied for our wellbeing, livelihood and the viability of our community. In the 1980s, and again in 2007, we declared moratoria on further industry on our Territory so that we could heal our people and rebuild our independence and wellness.

And yet, to this day, with respect to our Territory and vicinity, Ontario has failed to increase our control and use, failed to conduct a collaborative Landuse Plan; failed to complete a source water protection plan; failed to carry out a comprehensive environmental assessment; and failed to undertake an assessment of cumulative effects. The repeated failures of the Crown to act honourably to resolve the crisis have resulted in serious, compounding adverse impacts over time, including:

(1) Severe cumulative impacts on our territory and Treaty harvesting, hunting and fishing rights, making these rights impossible to exercise in a meaningful way;

(2) Severe adverse health effects and death, including, as found in recent scientific research, high rates of conditions impacting learning in children, disease, suicide attempts, and the premature death of our people; and

(3) Extreme poverty, food insecurity, loss of Anishinaabe way of life, and other poor socio-economic indicators of wellbeing which are ranked significantly worse than average Indigenous communities in Ontario and Canada.

(4) Collective impacts to our society and community.

Ontario ignored our pleas and our moratoria and continued to allow industrial activity, including the granting of mining claims on our Territory against our will, and advancement of mines all around us, without considering how mining activities add to, compound, exacerbate, and prolong previous harms. The cumulative impacts of industry have been devastating. The impacts include, but are not limited to:

- Our river that gives us life remains poisoned.
- Our walleye are unsafe to eat.
- Our sturgeon are rare.
- Our moose are scarce.
- Our caribou are nearly extirpated.
- Our pine marten habitat is depleted.
- Our forests are fragmented.
- Our medicines are tainted.
- Our sacred landscape is desecrated and scarred and traplines have been clear cut.
- Our way of life is diminished.
- Our people suffer from poverty, food insecurity, disease, premature death, and suicide.
- Our inherent, aboriginal, and treaty rights are impaired
- Our health has been harmed.
- We have been discriminated against.

II. Ongoing Breaches of Crown Obligations: The 1978 Memorandum of Understanding, Honour of the Crown, and Fiduciary Duty

Ontario and Canada (collectively, the "Crown") are our treaty partners. As elaborated below, through the treaty relationship and Crown actions over time, including entering into legal agreements following the start of the mercury crisis, the Crown assumed obligations and duties owing to Grassy Narrows. The Crown must uphold the treaty promises, uphold terms of its agreements, and act honourably in its dealings with Grassy Narrows.

Authorizing and permitting mining activities in our territory without our consent violates Ontario's and Canada's outstanding obligations and duties to Grassy Narrows and violates the Crown's duty to act honourably in all its dealings with Grassy Narrows.

1978 MOU and Dishonourable Conduct.

In 1978, Ontario and Canada signed a Memorandum of Understanding with Grassy Narrows in which the Crown committed to resolve in good faith the impacts of mercury on the environment that Grassy Narrows people rely upon for the viability of our community, and the related health, social, economic, cultural, and environmental impacts on the people of Grassy Narrows ("1978 MOU"). It was agreed that the issues would be resolved through a combination of financial compensation and land, and

furthermore in a manner that would enhance Grassy Narrows' self-determination, self-sufficiency, and control over local affairs wherever possible.

Some agreements were reached that partially implemented some of the 1978 commitments. For example, agreements were reach with Canada in 1984 and with Canada, Ontario and the mercury polluters in 1985.

However, the Crown has outstanding obligations owing under the 1978 MOU. These outstanding obligations include (but are not limited to) increasing Grassy Narrows' access to, protection of, and control over lands and natural resources in our Territory.

Moreover, the Crown has engaged in a course of dishonourable conduct before, during the negotiations, and since, and has consequently failed to meaningfully support Grassy Narrows' recovery from the mercury crisis.

The Crown's unmet fiduciary duties

The Crown and Grassy Narrows have a *sui generis* fiduciary relationship, and our treaty rights attract fiduciary obligations. In the time since the Crown and Grassy Narrows entered into a treaty relationship, the Crown seized functional management and control of our lands and water. The Crown assumed a duty to Grassy Narrows when exercising that control over our Indigenous interests including our pre-existing legal interests in exercising our fishing, hunting and trapping rights and other traditional practices such as medicine gathering and wild rice picking.

Grassy Narrows has been at the mercy of the exercise of Ontario's imposed fiduciary decision-making over our land as Ontario unilaterally authorized industrial activity, and otherwise has made decisions that affect the land, water and other natural resources of our area which we rely on to exercise our rights, practice our way of life, and maintain our health.

Under imposed Crown management and discretionary control, the health of our land and our people have seriously declined, our way of life has been degraded, and the exercise of our treaty rights has been impaired.

The Crown's abandonment of negotiations required by the 1978 MOU

From the outset of our discussions under the 1978 MOU, Grassy Narrows was clear that to recover from the impacts of mercury and other harms, we need Crown recognition of Grassy Narrows' ownership, control, and protection of a large part of Territory, which will allow Grassy Narrows to make decisions with respect to our land that support our way of life and our livelihood. In the 1970s, 1980s, and 1990s Ontario committed to negotiate increased Grassy Narrows control over our lands, in addition to providing meaningful compensation for our people.

In the 1980s, and since, we called for a moratorium on industrial activity in our Territory until our negotiations with Ontario were concluded. However, rather than honour this moratorium, the treaty promises, and the 1978 MOU obligations, Ontario unilaterally

abandoned the negotiations in the mid 1990s and exercised its imposed control in a way that further unleashed industry on our area to our detriment.

Ontario has repeatedly acted unilaterally to encumber and degrade our Territory against our will, including by granting industrial logging licenses and nearly 6,000 mining claims; industrially logging our forests; and constructing industrial access roads and bridges (e.g. The Separation Lake Road and bridge) to facilitate further resource extraction and environmental degradation. Canada has stood by and watched, allowing our lands, waters, rights, and way of life to be trampled.

The Crown's dishonourable conduct and abandonment of its fiduciary obligations continue. Ontario's Ministry of Mines has granted thousands of mining claims against our will, including granting mining exploration permits without any prior notice to us.

Ontario has failed to accurately identify the ANA Area of Interest on mining activities.

The Ontario Ministry of Mines has never meaningfully addressed the question of the extent of Grassy Narrows' area of interest with respect to mining.

In the 1980s, the Ontario Ministry of Natural Resources created its own map to identify a Grassy Narrows Traditional Land Use Area (the "1980s TLUA Map") for the purposes of mediated negotiations between Grassy Narrows and Ontario with respect to a section of the Territory required by Grassy Narrows to restore its economic self-sufficiency. The map used straight lines, which are not reflective of the boundaries of the full Territory and does not include the northern portion of the Territory.

Between 2008 and 2017 Grassy Narrows and Ontario engaged in discussions on forestry pursuant to the Grassy Narrows Ontario Process Agreement (the "Process Agreement"). As part of that process, Grassy Narrows submitted a map of the "Grassy Narrows area of interest for forestry", which included areas that are outside the 1980s TLUA Map boundaries.

When Grassy Narrows passed our Land Declaration in 2018, we shared a map of an area we have identified as the "Indigenous Protected and Conservation Area" (IPCA). The IPCA boundaries mirror part of the area of interest for forestry. The IPCA boundaries have always been provisional, as Grassy Narrows continues to engage in a process of reviewing the knowledge of our historical and current land use. In addition, the western notion of linear boundaries on maps conflicts with our Indigenous knowledge systems, which are based on relationships and complex webs of protection, use, kinship, sharing, travel and trade that do not begin and end at a line.

Shockingly, Ontario relied on the 1980s TLUA Map as the consultation area for mining, despite having knowledge that the map was not accurate.

Grassy Narrows is currently pursuing litigation challenging nine mining exploration permits (not related to the Great Bear Gold Project) that Ontario approved without

notice to Grassy Narrows.[2]

Among other relief, Grassy Narrows seeks the following remedies in the litigation:

> a declaration that Ontario cannot consider mining activities in the subject area of the Territory, including issuing exploration permits, until the parties negotiate and reach agreement on **timely enforceable mechanisms to assess and manage the cumulative impacts of mining, logging, hydro-electricity projects, other industrial development, mercury contamination, and governmental policies or programs that may infringe Grassy Narrows' treaty rights, and to ensure that these constitutional rights are respected**;

These mechanisms are not yet in place and the judicial review remains unresolved.

As further described below, Grassy Narrows has only very recently learned that the Ministry of MINES approved a number of permits for the Great Bear Gold mine with no notice to Grassy Narrows.

It is only in very recent times, and after much conflict, that Ontario has begun to ask Grassy Narrows about what our area of interest for mining is. After many years of advocacy by Grassy Narrows, Ontario's Minister responsible for mines finally responded on November 1, 2022 with a new map that Ontario proposed as the area for consultation on mining related activities.

Ontario's proposed consultation area on mining appeared to deliberately carve out the Great Bear Project Area. The information provided by Ontario to explain how they arrived at the proposed boundaries was cursory and insufficient for understanding how the boundaries were arrived at. Grassy Narrows informed the Ministry that their proposed map is not complete and requested capacity support to do the work necessary to respond. However, no support has been provided to date.

On November 2, 2023, Grassy Narrows provided two versions of a map setting out our Interim "Area of Interest" for mining. The maps differed in scale only. The map was provided with the following cautions:

- The maps are an interim product created under duress arising from the escalation of imposed mining activity by the Crown and industry and for the sole purpose of identifying an interim area for negotiations on mining related activity.

- The maps are not a complete representation of Grassy Narrows' area of interest. Due to the unique circumstances and capacity constraints, Grassy Narrows has not completed comprehensive studies required to fully determine its area of interest including, but not limited to, land use and occupancy, ethnohistory, archaeology, biology, and hydrology. For example, rights and interests

[2] Grassy Narrows First Nation v. Director of Exploration, Ministry of Northern Development, Mines, Natural Resources and Forestry, Ontario Divisional Court File No. 881/21.

associated with air quality, migratory birds, travel routes, marten, lake sturgeon, wolves, eastern cougar, landscape intactness, climate resilience, biodiversity, genetic diversity, and many other factors are not reflected in these maps.

- In addition, linear boundaries are an imposed non-Indigenous concept that do not accord with the nature of Grassy Narrows' relationship with the land which includes extensive interconnectedness, reciprocity, travel, sharing, and trade.

- These maps do not limit any claims by Grassy Narrows people to assert their rights and interests throughout their territory and to protect themselves from harm to their health, rights, way of life, livelihood, society, and environment. Grassy Narrows people have Treaty rights, and practice them, throughout the Treaty 3 area. Grassy Narrows people also have inalienable inherent rights given by the Creator, some of which are affirmed in international law and instruments. The Grassy Narrows people are the true experts about their land, rights, and interests.

<u>The Great Bear project area falls within the core area of Grassy Narrows' Interim Area of Interest for Mining map.</u>

Despite Grassy Narrows' efforts to further these negotiations, there is no agreed upon area for consultation on mining activities.

Sharing of information about our Homeland is a sensitive topic that requires deep trust. After so many decades of having our trust, our vulnerability, and our lands abused by Ontario, many of our knowledge holders do not consent to sharing sensitive lands information with Ontario. Trust must be rebuilt to meaningfully engage on this topic.

Grassy Narrows Laws Have Not Been Respected.

Neither the Crown nor the companies have formally acknowledged and respected Grassy Narrows' moratorium and Land Declaration. The Crown has not joined us to harmonize Crown law with Grassy Narrows law and to find a path forward towards reconciliation that provides space for Grassy Narrows' inherent Indigenous rights and constitutionally protected Aboriginal and treaty rights to be meaningfully realized and protected.

We have written many times to request that the Crown come to a senior negotiation table with Grassy Narrows to address the wrongs committed against our people, the effects of which continue to this day, and to prevent further damage. We call on Ontario to return to the mediation process first established in 1978 in response to the mercury disaster to finally reach an honourable agreement regarding the control and protection of our Territory and fair compensation for Grassy Narrows people.

Instead of coming to the table to honourably resolve outstanding issues and obligations, Ontario has unilaterally granted mining claims and permits and now is supporting the development of a gold mine in our headwaters.

III. The Crown Must Address Capacity Barriers

Grassy Narrows has repeatedly advised both the Crown and the Companies that it cannot meaningfully engage in negotiations while it faces significant and unique barriers.

1) Insufficient information: Upon learning of the Great Bear Gold project, Grassy Narrows immediately requested additional information about the project and the extent to which our Laws had been taken into account and its adverse impacts considered. This information is essential for us to understand and respond to any efforts at engagement. After a lengthy delay, the Ministry recently provided responses that can only be characterized as preliminary and partial.

2) Capacity funding: The process of evaluating proposed mining activities and engaging with MINES, the IAAC, and mining companies comes at an expense to ANA. We must hire staff, engage our community, carry out our governance process, and obtain professional support from experts, lawyers, and advisors to engage in a meaningful way.

Grassy Narrows is even more impoverished than our First Nation peers due to the ongoing impacts of mercury poisoning. We lack the funds required to engage in an informed and fair way.

During the summer of 2023, MINES staff indicated that, after many years of requests, MINES will fund some ANA capacity needs. We provided MINES with a document summarizing the kinds of capacity supports that we would need in order to meaningfully engage on mining, including compensation for staff and to hire experts. After many months of awaiting an update, on November 27, 2023 MINES clarified that its promises of capacity supports amount only to funding in an unspecified amount for a “Mineral Development Advisor”, a position that Grassy Narrows has never requested funding for.

No funding is currently in place. MINES must come to the table on our issues and commit to funding ANA’s reasonable costs of engaging in an informed and fair way.

While IAAC offered $5,000 in capacity funding to ANA, this funding was offered after the deadline for submissions on the List of Issues. The amount offered is insufficient to meaningfully review lengthy technical documents that engage many areas of expertise, to engage with our people, to carry out our governance process, and to prepare a response. This is the same on-size-fits-all funding offered to other First Nations, NGOs, and other ‘stakeholders’. It does not consider our unique circumstances nor our position as an Indigenous nation.

3) Pandemic Considerations: COVID-19 infection rates, as well as other respiratory illnesses in this region of Ontario are high again. Our people are especially vulnerable to disease because of our high pre-existing rates of co-morbidity, crowded and inadequate housing, inadequate nutrition due to food insecurity, and the immune impacts of mercury. The health of our people is our priority. We are informing you that, in addition to our other concerns, mining exploration proposals are unwelcome during outbreaks

and other public health emergencies.

4) Mercury Crisis and Industrial Impacts: Our territory has already experienced a great deal of harm from industrial activities including mercury, damming, industrial logging, and mining. The cumulative effects of these industrial impacts have already passed the point of an unreasonable, unjustifiable impact on the exercise of our Treaty rights, and on our health and wellbeing. As a result, our community suffers from unusually high rates of conditions including poverty, food insecurity, disease, neurological conditions, conditions affecting learning, premature death, and child and youth suicide. The social conditions created by mercury poisoning and the cumulative impacts of industry place us in an ongoing extreme crisis. As a result, we are unable to meaningfully engage on mining exploration in the absence of the necessary supports to resolve and recover from the ongoing mercury crisis.

5) Fundamental outstanding issues must be addressed before meaningful engagement can occur: As described above, many fundamental issues remain unresolved between Grassy Narrows and the Crown including unmet obligations, broken promises, conflicting laws, cumulative impacts, violated trust, justice owed, and outstanding reconciliation. These are upstream strategic issues to which individual mining projects are subsidiary. We cannot address one mining project meaningfully, when the fundamental questions are not addressed. These questions include:

- How will the Crown respect Grassy Narrows' inherent rights and rights recognized under international law and related instruments?
- How can the Treaty relationship between the Crown and Grassy Narrows be respected and restored?
- How can the written text of the Treaty be reconciled with the oral and written histories, and Ontario Superior Court findings, that the taking up clause and the cede and surrender clause were never discussed nor agreed to?
- Who has decision making authority over lands and resources in our area?
- How can Grassy Narrows law and Crown law be harmonized with respect to the land?
- What lands should be open to mining and what lands should be protected?
- How will the Crown's unmet obligations arising from the Treaty, the 1978 MOU, and other sources be fulfilled?
- How will Grassy Narrows' ownership, control, and use of our lands be increased as promised?
- How can the damage already done to our land and our water be restored?
- How can the harm to our sacred landscape, our spirituality, and our relations be repaired?
- How can we assess and prevent the cumulative impacts of industrial activity from further harming us?
- How can the collective damage to our society, our community, and our families be reversed?
- How can our health, our wellness and our way of life be returned to its former status?

- How can our self-determination, our independence, and our self-sufficiency be rebuilt?
- Is it possible to reconcile while the harm continues, while we bury our youth?

For many years we have been seeking to resolve important issues with the Crown that relate to mining. A summary list of some of these issues can be found at **APPENDIX A**.

The Crown apparently has little interest in these questions and little willingness to address them with us, to act honourably, nor even to come to the table with us about them. When we meet with senior officials from MINES and MNRF, they tell us that they have no mandate to discuss these issues, but they will bring them to the Minister.

After years of seeking a meeting with the Minister our then Chief and Council finally met with then MNDMNRF Minister Rickford in Toronto on November 18, 2021. At the long-awaited meeting Minister Rickford refused to discuss our mining concerns but promised to come to Grassy Narrows soon to discuss mining at an open forum in our community. Neither Minister Rickford nor his successors have honoured this promise.

In a largely analogous situation where Grassy Narrows and the Crown had a conflict over a different form or resource extraction, the 2004-2009 Whiskey Jack Independent Forest Audit found that:

> There are fundamental differences in the viewpoints between GNFN and MNR regarding forest management principles and practices. It is the audit team's opinion that these differences cannot be resolved without the Province setting aside many of the requirements to manage the Whiskey Jack Forest under the CFSA and the FMPM, and relinquishing significant authority to the First Nation to manage portions of the Whiskey Jack Forest according to the desires of the GNFN community. The audit team further believes that the forest management planning process did not anticipate, nor was it designed to resolve the type of dispute currently being experienced on the Whiskey Jack Forest.

Similarly, the *Mining Act* and its regulations and the IAAC regulations did not anticipate, nor were they designed to resolve the serious grievances, outstanding obligations, and the type of dispute currently being experienced over mining around Grassy Narrows. Resolving this dispute will require sincere, honourable, government-to-government engagement on the fundamental issues that have brought us to this point. Only once that occurs, can we meaningfully engage about specific permits and projects without repeating and exacerbating the legacy of past and ongoing harms.

IV. The Great Bear Gold Project: The Crown's failure to inform, meaningfully consult, and gain our consent for project activities.

The Great Bear Gold Project falls within Grassy Narrows' Interim Area of Interest for Mining

We have enclosed a copy of Grassy Narrows' map of our Interim Area of Interest for Mining, which is described above.

The limited preliminary research that we have been able to conduct confirms that the Great Bear Gold Project is within the area where Grassy Narrows people have historically, and continue to, practice our way of life and our Treaty rights.

There is strong ethno-historical evidence that Grassy Narrows has a longstanding connection to this area dating back to the time of the Treaty and before. This includes historical reports, fur trade records, ethnological work, and other records. Grassy Narrows First Nation historically hunted, fished, trapped, collected plants, gardened and conducted spiritual practices in and around the Red Lake fur trading routes, and traded products obtained in the area.

There are Grassy Narrows families with continuing family ties to this area and the surrounding areas. Grassy Narrows people, including the Chief, continue to practice our inherent and Treaty rights in this area, including the moose hunt. The moose hunt is extremely important to our way of life and sustenance. Due to the precipitous decline in moose elsewhere in our area, the area south of Red Lake is one of the only remaining productive moose hunting grounds that our people use.

The Great Bear Gold Project falls within moose, wolverine and caribou habitat that ranges within our IPCA. In addition, walleye within the project area migrate to the waterways on which Grassy Narrows exercises its treaty rights to fish and on which the community reliese for food. The project area is also within nearby quatermary watersheds that flow into the IPCA.

Grassy Narrows people fish extensively on the English River around Grassy Narrows. Grassy Narrows people also fish on the English River and its tributaries near the inflow of the Chukuni River. We are aware that the fish that we eat swim a distance of 30 km, or more, up and downstream in the course of their lifecycle and are exposed to, and bioaccumulate, toxins throughout their travels. In particular, our walleye travel long distances upstream in order to spawn.

Caribou are an important clan animal to Grassy Narrows and used to be seen throughout our Territory. The Great Bear Gold Project area is within the range of the Sydney Caribou herd, the last remaining herd in our Territory. This range is already degraded beyond the threshold at which it is able to sustain Caribou in the long term, unless its intactness is restored. All of the habitat within the range is considered critical.

As noted above and confirmed by the Supreme Court, the Treaty 3 Commissioner promised the Anishinaabe that the Treaty promises would protect our harvesting practices forever which would allow our people to hunt, fish, trap, gather, and harvest throughout the Territory as they had before “as long as the sun shone and the waters flowed”. The Anishinaabe did not agree to an increasing erosion of our harvesting rights that would significantly interfere with the exercise of our rights.[3]

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[3] *Keewatin v Minister of Natural Resources*, 2011 ONSC 4801 [*Keewatin* ONSC], rev’d 2013 ONCA 1158, aff’d 2014 SCC 48 [“*Keewatin* litigation”].

Grassy Narrows has a communal connection, right, and interest in this area. It is possible that other First Nations do too, but that does not in any way diminish our own connection, rights and interests nor the Crown's obligations to us.

In addition, Grassy Narrows must be consulted on activities that may have off-site impacts on our territory, such as downstream, downwind, or migratory species impacts. Grassy Narrows continues to document the full extent of its Territory and the "ANA Preliminary Area of Interest With Respect to Mining" is without prejudice to the determination of the full geographical extent of Grassy Narrows' Territory.

The Crown requires Grassy Narrows' consent for the Great Bear Gold Project

The standard that correctly applies to this project is the right to say 'no', also known as the right to give or withhold "free prior and informed consent."

Under Grassy Narrows law, we are the first people of this land. The Creator gave us this land and only the Creator can take it away. We live in relationship with the land; we care for it and the land provides for us. We must take care of the land and not disrupt this balance. Nothing that threatens this balance may take place on the land without our permission. We say no to mining.

The United Nations has recognized this right in the *UN Declaration on the Rights of Indigenous Peoples* and in other international laws and instruments to which Canada is a signatory.

The *Declaration on the Rights of Indigenous Peoples* requires States to consult and cooperate in good faith with the indigenous peoples concerned through their own representative institutions in order to obtain their free, prior and informed consent before adopting and implementing legislative or administrative measures that may affect them (article 19). This includes:

- The adoption of legislation or administrative policies that affect indigenous peoples (article 19)
- The undertaking of projects that affect indigenous peoples' rights to land, territory and resources, including mining and other utilization or exploitation of resources (article 32).

The principle of free, prior and informed consent is linked to treaty norms, including the right to self-determination affirmed in common Article 1 of the International Human Rights Covenants. When affirming that the requirement flows from other rights, including the right to develop and maintain cultures, under article 27 of the International Covenant on Civil and Political Rights (ICCPR) and article 15 of the International Covenant on Economic Social and Cultural Rights (ICECSR), the treaty bodies have framed the requirement also in light of the right to self-determination.

Canada is bound by international law to these abide by these standards.

While Crown law has often failed to adequately implement international human rights standards, and often seeks to take a reductionist view of its international obligations to us, even under Crown law our consent is required for this project for reasons including, but not limited to:

a) The cumulative impacts of Crown policy and industry on our people already exceed any reasonable threshold of impact on our rights, our way of life, our people, and our environment. No further impacts can be made without consent.

b) The Companies' goal is to open a gold mine. A recent study demonstrated the extensive impacts of metal mining contamination on rivers and floodplains across the world, with an estimated 23 million people believed to be affected by potentially dangerous concentrations of toxic waste.[4] Gold mines have high risk of impact to our well established and strong rights, including our rights under Treaty #3. Our waters are already contaminated with mercury. Therefore, we are at the high end of the consultation spectrum where consent is required.

c) The "taking up" clause and the "cede and surrender" clause which the Crown relies on for its asserted legal authority were never explained, translated, discussed, nor agreed to, during the negotiation of Treaty #3. This is reflected consistently in the multiple, independent, written records of the Treaty negotiations. To the contrary, Treaty Commissioner Simon Dawson informed the legislature that "As an inducement to the Indians to sign the Treaty, the commissioners pointed out to them that, along with the land reserves and money payments, they would forever have the use of their fisheries. The point was strongly insisted upon and it had great weight with the Indians, who for some years previously had persistently refused to enter into any Treaty" (NA RG 10 vol 3800 file 48542, 28 May 1888). The Ontario Court of Justice found that the Indigenous signatories to Treaty 3 were not advised and did not understand that the Crown could authorize land uses inconsistent with Harvesting Rights and pass legislation to extinguish or limit Harvesting rights. They expected that Canada would protect their harvesting rights away from the Dawson Route or CPR right or way, not limit, extinguish or ignore them.[5] No court of appeal, including the Supreme Court of Canada has overturned this finding of fact.

Beyond the requirements under Grassy Narrows Law, International Law, and Crown Law to obtain consent in these circumstances, there is the simple practical requirement for consent in today's business, investment, and political environment.

The business case for obtaining consent is reflected in the mining industry's own trade association policies through the International Council on Mining & Metals (ICMM) position statement on Indigenous Peoples and Mining, which states that "[t]he outcome

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[4] Phys.Org (September 21, 2023), "Global study reveals extensive impact of mining contamination on rivers and floodplains."

[5] Keewatin v. Minister of Natural Resources, 2011 ONSC 4801 (CanLII), at para 865, <https://canlii.ca/t/fmzc4#par865>, retrieved on 2023-09-23

is that Indigenous Peoples can give or withhold their consent to a project, through a process that strives to be consistent with their traditional decision-making processes while respecting internationally recognised human rights and is based on good faith negotiation."[6]

Even Barrick Gold, infamous for their violations of human rights internationally, stated in their $100M statement of claim against Red Lake Gold when addressing the need to for Grassy Narrows' consent that:

> Virtually all successful mining ventures in Canada require a strong and genuine working relationship with local communities, including First Nations. Without such a relationship, it can be extraordinarily difficult, if not impossible, to proceed with a mining venture beyond early stage exploration work and into development work (e.g., by constructing a working mine).
>
> Strong, genuine and reliable relationships with First Nations are built on mutual trust and respect. Any perceived or actual breach of that trust or respect can have devastating consequences for a mining venture or company, and these commercial and reputational consequences can extend well beyond any particular project or First Nation group.[7]

No large mine has opened in Canada for decades without Indigenous consent. It is simply too difficult and risky to carry out such an expensive and intensive project without all relevant First Nations on board.

As a First Nation living immediately downstream from this project, we will live with the consequences for many generations to come. It is our children who will drink the water, eat the fish, pick the wild rice, swim, and learn what it means to be *Asubpeeschoseewagong Anishinabek* on this river whose waters will carry the effluent from this gold mine if it is built. It is our people who will search in vain for moose and caribou to hunt on the landscape that has had its forests fragmented and degraded by access roads, clearcuts, seismic lines, pits, trenches, clearings, and mines. It is our people who will be impacted if the tailings dam fails. It is our people who will be poisoned if toxics leach into the water. It is our people whose fear and anxiety, already far to high and fatal due to the mercury crisis, will be heightened by the threat this mining project poses to our wellbeing.

We know, and everyone in Canada who has cared to learn our story knows, that decisions made and activities carried out upstream can have a devastating impact on us. The chlor-alkali plant in Dryden that discharged mercury into the Wabigoon River was 150 km upstream of our village. But the flow of the river does not obey any human boundaries. The distance did not stop the mercury from being carried downstream,

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[6] International Council on Mining & Metals (May 16, 2013), "Indigenous Peoples and Mining: Position Statement".
[7] Barrick Statement of Claim against Red Lake Gold, 2022/23, p. 20, 21.

bioaccumulating in the fish that we eat, destroying our livelihood, poisoning our people, and dramatically disrupting our way of life. More than 50 years after the discharge of mercury was ordered halted, our mercury crisis rages on. There is no end in sight to the contamination of our river and to the intergenerational impacts of mercury.

The correct standard for this project, which threatens to impact Grassy Narrows' future for many generations, is consent. Grassy Narrows has not given its consent. Grassy Narrows says 'no'.

Far from seeking consent, Ontario has approved numerous permits for the Great Bear Gold Project with no notice to Grassy Narrows

With respect to the Great Bear Gold Project, there has been a failure to inform, to consult meaningfully with ANA and to gain our consent, even though the ANA village site is the first community downstream from the project site. In spite of the infamous pre-existing impacts on the English River and Grassy Narrows from hydro damming, mercury pollution, and clearcut logging, and Grassy Narrows' well knowns concerns about mining exploration. The fact that Grassy Narrows is downstream of this project, potentially impacted, and likely concerned should be evident to any diligent person with access to Google.

Exploration permits for this project date back to January 2017, including permits for extensive exploration work, drilling, stripping of the land, and taking of water. The following permits were authorized without notice to Grassy Narrows and, for the most part, prior to any communications from either the Crown or the companies with our First Nation:

- January 6, 2017: PR-16-10995 – permit for mineral exploration
- April 11, 2019: PR-18-000295 – permit for mineral exploration
- November 22, 2019: PR-19-000264 – permit for mineral exploration
- November 27, 2019: PR-19-000227 – permit for mineral exploration
- July 16, 2020: PR20-000178 – permit for mineral exploration
- October 13, 2020: PR20-000276 – permit for mineral exploration
- July 13, 2021: PR-21-000190 – permit for mineral exploration
- October 4, 2021: PR-21-000258 – permit for mineral exploration
- August 15, 2022: 5115-CJ9QRR – permit to take water
- September 15, 2022: Permit 5115-CJ9QRR to take water

The failure to take the minimal step of giving notice to Grassy Narrows about any of the above permits is all the more shocking because while this extensive work was being done on the Great Bear Gold Project, Grassy Narrows was writing to Ontario and to the companies seeking to share information and initiate negotiations about protection for Grassy Narrows' lands, waters, and people. Grassy Narrows has written to Ontario repeatedly about land protection concerns for decades, and most recently in a long series of official letters dating back to 2018 requesting a government-to-government table to resolve Lands issues including mining.

The history of communications between Grassy Narrows, Great Bear Resources, Kinross and Ontario's Ministry of Mines demonstrates that none of these parties have demonstrated a genuine intention to meaningfully engage with Grassy Narrows. This summary is current to December 15, 2023:

- **February 25, 2020:** Having learned about Great Bear Resource's presence in the area, but unaware of the permit applications and authorizations, Grassy Narrows Chief and Council wrote to Great Bear Resources to notify the Company about ANA's mining concerns and to ask if Great Bear Resources had any proposed work that would put Grassy Narrows at risk and conflict with our laws. There was no response. Indeed, Great Bear Resources has never responded to Grassy Narrows' communications.

- **October 1, 2020:** Upon learning of Kinross's presence in the area, Grassy Narrows Chief and Council wrote to Kinross Gold Corp. with a request to meet and a list of questions about their work.

- **October 6, 2020:** Chief and Council wrote to Great Bear Resources.

- **October 7, 2020:** Chief and Council wrote to follow up with Kinross.

- **November 2, 2020:** Kinross responded to acknowledge our letter but did not provide any substantive response to our questions, make any mention of the Great Bear Project, nor accept our request to meet. We did not hear from Kinross again for almost two years.

- **December, 2021:** Kinross reached an agreement with Great Bear Resources.

- **August 29, 2022:** Kinross sent a letter of introduction to our Chief.

- **September 15, 2022:** Less than three weeks later, Kinross submitted an exploration permit to Ontario claiming to have consulted with Aboriginal communities.

- **October 4, 2022:** Grassy Narrows wrote again to Great Bear Resources.

- **October 6, 2022:** Grassy Narrows received its first notice of an application for an exploration permit related to this project from Ontario (PR-22-000284). Ontario gave Grassy Narrows only one month to provide comment on the application.

- **November 18, 2022:** With no capacity, and in the midst of the COVID-19 pandemic, Grassy Narrows wrote back to advise Ontario that we intended to respond but could not do so substantively within the time provided.

- **November 24, 2022:** MINES notified Grassy Narrows that Kinross's application (PR-22-000284) had been approved with the exception of 44 claims that were

being held pending further comment from Grassy Narrows but offering no capacity supports.

- **December 28, 2022:** MINES notified Grassy Narrows of seven mining lease applications and advised that MINES would proceed if it did not receive comments by February 26, 2023.

- **January 19, 2023:** MINES notified Grassy Narrows that it was considering granting the mining permit for the 44 claims that had been held, pending comments from Grassy Narrows by February 3, 2023. Again, no capacity supports were offered.

- **February 6, 2023:** Grassy Narrows wrote to MINES to reiterate the barriers to participation that had been communicated over many years; in the absence of addressing those barriers Grassy Narrows cannot engage or comment substantively to the permit applications.

- **February 14, 2023:** MINES gives Grassy Narrows until February 28, 2023 to respond with comments.

- **February 27, 2023:** Grassy Narrows official writes to MINES indicating that Grassy Narrows does want to comment but that further time is required to review the information, and that the company has yet to respond to the questions that ANA has sent them.

- **March 3, 2023:** Grassy Narrows sent a follow up letter to MINES regarding the seven proposed mining leases and Grassy Narrows' requests for a government-to-government negotiation table.

- **March 10, 2023:** MINES wrote to Grassy Narrows to ask for a copy of the questions posed to the companies in 2020.

- **March 20, 2023:** Grassy Narrows wrote to Great Bear and Kinross to request a meeting about the Great Bear Gold Project in early April and for an answer to the questions posed to the company in 2020.

- **March 21, 2023:** MINES followed up on its request for a copy of the questions posed to the companies in 2020.

- **March 31, 2023:** Grassy Narrows followed up with Great Bear Resources and Kinross to request a meeting in early April and to obtain answers to the questions posed in 2020.

- **April 12, 2023:** Grassy Narrows repeated its request for a meeting with MINES and answer to questions concerning Great Bear Resources and Kinross.

- **April 24, 2023:** Kinross finally responds to the request to meet.

- **June 22, 2023:** Kinross attended an introductory meeting with Grassy Narrows. The meeting was not a consultation on the project. Kinross representatives stated that MINES would be providing answers to the questions posed in 2020. Grassy Narrows raised serious concerns about the project, including capacity constraints and concerns about impacts.

- **June 27, 2023:** Kinross wrote to confirm that MINES would be providing answers to the questions posed in 2020. MINES did in fact provide a partial and incomplete response to the questions posed in 2020. MINES gives Grassy Narrows two weeks to provide comment on the 44 outstanding claims.

- **July 12, 2023:** MINES gives Grassy Narrows a further extension to July 27, 2023.

- **July 24, 2023:** Kinross wrote to invite Grassy Narrows to a meeting to learn about the project and to advise that it was setting up a Sharepoint site to share information about the project. The Sharepoint link was not provided. Kinross further advised that the federal impact assessment process had been initiated.

- **July 28, 2023:** MINES wrote to advise Grassy Narrows that Ontario will not provide capacity support for consultation and asked for comments on the 44 claims by August 10, 2023.

- **August 11, 2023:** MINES approves the mining exploration permit for the 44 claims.

- **August 12, 2023:** Kinross provided a copy of Great Bear industrial Sewage Works documentation. Grassy Narrows does not have capacity to analyze or respond to this technical document.

- **September 7, 2023:** Kinross provided a copy of the Great Bear Advanced Exploration Reclamation Strategy for comment. Grassy Narrows does not have capacity to analyze or respond to this technical document.

- **September 13, 2023:** Chief Turtle writes to the IAAC to advise that Grassy Narrows has learned that Kinross and Great Bear have initiated the interim assessment process. Grassy Narrows was not provided notice in accordance with its protocols and demanded that the process recommence in accordance with procedural requirements.

- **September 14, 2023:** Grassy Narrows sent a follow up inquiry to the IAAC.

- **September 15, 2023:** IAAC provided a two-week extension to respond to Kinross's Initial Project Description.

- **September 20, 2023:** Grassy Narrows responded to IAAC by reiterating that the IAAC had not complied with procedural requirements for the pre-planning stage and repeating its demand to recommence the process.

- **September 26, 2023:** Kinross wrote to Grassy Narrows to request a meeting to discuss capacity funding.

- **September 28, 2023:** Kinross wrote to Grassy Narrows to provide two technical documents for comment (AEX Industrial Sewage Application and Aquatics Monitoring Plan; AEX ECA Air and Noise, Emissions Modelling and Dust Management). Kinross offered to meet and provide capacity support.

- **October 4, 2023:** Kinross wrote to Grassy Narrows about a draft permit to take water application.

- **October 6, 2023:** Grassy Narrows Lands Protection Team was given access to the Great Bear Sharepoint site, with extensive technical documents that were not shared previously. IAAC also provided its Summary of Issues for comment and offered to meet.

- **October 20, 2023:** Kinross provided its groundwater monitoring plan for the project and its preliminary mine rock management and monitoring plan.

- **November 3, 2023:** Kinross provided its draft closure plan for comment.

- **November 10, 2023:** Kinross provided its Detailed Project Description for comment. Grassy Narrows met with Kinross and IAAC. Grassy Narrows asked Kinross to pause the impact assessment process until an engagement protocol could be put in place along with capacity supports.

- **November 14, 2023:** Ontario wrote to Grassy Narrows with belated notice that in or around April 2023 it had delegated the “procedural” aspects of consultation on certain matters relating to the Great Bear Gold Project to Great Bear Resources. Ontario’s letter to this effect dated April 6, 2023 was sent to the Chief and not pursuant to Grassy Narrows consultation protocols. Ontario takes the position that the duty to consult is at the “low end” of the spectrum.”

- **November 20, 2023:** Kinross wrote to Grassy Narrows concerning participation in a Stage 3 Archaeological Assessment.

- **December 15, 2023:** Kinross meets with Grassy Narrows and refuses to pause its activities for any length of time to accommodate Grassy Narrows’ unique circumstances.

As the foregoing chronology demonstrates, the companies and Crown left Grassy Narrows in the dark for years about the Great Bear Gold Project. Since September 2023, Grassy Narrows has been flooded with technical documents, belated offers of capacity support, none of which has flowed, and impossible deadlines for engagement.

Kinross spent billions to buy the project and has clearly already decided to build a gold mine regardless of Grassy Narrows' wishes. Failing to engage with Grassy Narrows on this project for more than four and half years was not an error of omission, but rather a deliberate decision not to engage, and to withhold, information about this project from Grassy Narrows. The fact that other First Nations, who are located far upstream of the project, but who have a reputation for welcoming mining activity, were engaged far earlier (as early as 2017), raises the question of whether a decision was made not to engage Grassy Narrows because of Grassy Narrows' well-known concerns about mining exploration.

It took Ontario and the companies nearly three and half years to provide initial responses to questions posed by Grassy Narrows to Great Bear Resources in February of 2020. And yet, within 60 days of providing those initial responses, without providing any capacity support to review them, and without addressing Grassy Narrows' many other barriers and fundamental issues, the Ministry approved further work on the project in spite of Grassy Narrows' request for capacity support and time.

Even Indigenous Services Canada flagged concern about Kinross's level of engagement to date with Grassy Narrows in its comment to the IAAC:

> The perception of contamination to the land, water, traditional food sources and Indigenous Peoples by industrial development may be a serious concern for the identified Indigenous Nations, especially for Grassy Narrows ... During the late 1990s and early 1970s, the English-Wabigoon River system was contaminated with inorganic mercury from a pulp mill located upstream in Dryden, Ontario. This discharge of inorganic mercury contaminated their water and traditional food sources (i.e. fish) and lead to cases of mercury poisoning and intergenerational challenges. The proponent, Kinross Gold Corporation, started engaging with Grassy Narrows First Nation in 2022, whereas their engagements with Wabuskang First Nation and Lac Seul First Nation began in 2017. Due to Grassy Narrows First Nation's negative and detrimental experience with industrial development, it is recommended that more engagement take place. The Indigenous Nations need to gain a greater understanding of the contaminants that may be released into the environment. They should be provided an opportunity to express concerns or uncertainties about potential exposure to chemicals used in the gold mining process, such as cyanide and heavy metals.[8]

Given this history, including the Crown's outstanding obligations to Grassy Narrows, it is highly inappropriate for Ontario to delegate any aspect of consultation to Great Bear

[8] Indigenous Services Canada, Federal Authority Advice Record – Great Bear Gold Project, p. 5.

Resources. Grassy Narrows does not agree that the Crown can delegate its duty to consult with a treaty nation to a third party. Nor does Grassy Narrows agree, given Grassy Narrows' strong rights, existing cumulative impacts, and the companies' intention to open large gold mines upstream from the community, that the duty is at the low end of the spectrum.

The IAAC has failed to consult as required with Grassy Narrows

According to the attached IAAC document summarizing the impact assessment process, the process begins with Phase 0 (Pre-Planning), a phase that requires engagement by both the Proponent and the Agency with Indigenous groups. None of the required pre-planning steps with respect to Grassy Narrows have been complied with.

The Proponent was required to engage Grassy Narrows to present the project, learn Grassy Narrows' views, including potential effects and how we wish to be engaged and to incorporate this information into the Initial Project Description. Grassy Narrows has expressed, both in writing and in meetings on June 22, 2023, and November 10, 2023 with representatives from Kinross, our significant concerns about potential impacts upon our community, which are not reflected in the Initial Project Description. Grassy Narrows also provided Kinross with our communications protocol, which includes communication with the Lands Protection Team. That protocol was not included in the Initial Project Description.

The Agency was aware, based on the Initial Project Description, that Grassy Narrows may be affected by the project. In the pre-planning phase, the Agency was required to inform Grassy Narrows about the impact assessment process to support us in understanding how we can participate. The Agency was obligated to learn Grassy Narrows' views and context, including potential effects and how we wish to be engaged. The Agency did not comply with these requirements of the pre-planning stage.

Crown and Company efforts to engage Grassy Narrows since 2022 have been performative and do not meet the standards required for engagement

The decisions to open our land to mineral staking and exploration, to carry out extensive exploration, and to build a gold mine, have already been made, and billions of dollars spent towards that end, all behind Grassy Narrows' back. In this context, it is hard to believe that requests for belated input at this late stage are sincere. Clearly, the companies and Ontario have already decided to build a gold mine if investors will support it and we are an afterthought.

Kinross is now flooding us with technical documents created by highly paid experts, while knowing that we have no capacity support to engage experts to review the technical documents, nor to engage our community about them. When we sought a pause in the process to gain capacity support, retain experts, complete a process agreement, and engage in our governance process, we are refused. In this context it is hard to believe that anything Grassy Narrows says will be taken seriously and will have

the potential to meaningfully influence the major decisions that have been made.

We live downstream, our established rights and our health are at stake, and we are concerned. Under Crown law the Crown clearly had a duty to meaningfully consult and meaningfully accommodate us at every stage of this project, including during the strategic level upstream decisions (such as land use planning, land use designation, tenure, etc.) as well as the more minor decisions which flow from them (such as specific exploration permits, water takings, leases, etc.). As a First Nation whose Treaty rights and health have already been severely impacted by the cumulative impacts of industry and government decisions our consent is required. Under our inherent rights, Anishaabe law, and International law our consent is also required.

Ontario has failed for many years in their duty to consult on this project and we call for an immediate freeze on all project activities until sufficient capacity support has been provided to allow Grassy Narrows to complete an ethno-historical report, land use and occupancy study, archaeological assessment of the area and study into cumulative impacts, and until we have been meaningfully engaged and our free, prior and informed consent obtained.

V. Adverse Impacts: ANA Preliminary Specific Concerns

As Asubpeeschoseewagong Anishinabek we have a holistic, interconnected, and spiritual relationship to our sacred landscape. We are the land and the land is us. What happens to the land happens to us and to our children for many generations.

This is an area where our ancestors have practiced, and we currently practice our Anishinaabe way of life; a way of life that relies on a healthy environment and is central to our identity, health, wellness, and livelihood. This area is part of the whole that forms the sacred landscape which gives us life and which we are in relationship within every aspect of our lives, hearts, spirits, and dreams.

While some areas may appear to an outside observer to be on the periphery of our Territory, this is a grave misperception. All our territory is core to our way of life and connection to the land. For example, we have always traveled to hunt. A moose that is harvested a few days' travel from our village site will still feed a family for many weeks and be shared with Elders, relatives, and friends. The dramatic decline in the moose population near our village means that the area around Red Lake is even more critical to our moose hunt. These areas are deeply embedded in our memories, our lives, and our hearts. We are strongly tied to this land.

We know that MINES, IAAC and the companies do not respect this relationship and seek to reduce it to a series of finite, bounded sites of 'values'. Our concerns are disregarded unless they are expressed in extremely specific and reductionist terms that ties adverse impacts to particular pieces of the land that are viewed in isolation from the whole. MINES and IAAC want us to engage in an exercise of, for example, identifying a specific hole that is a specific distance from a specific cabin and thus should be moved a bit to the west. Or, this type of machinery produces noise that will make hunting

difficult in this specific blind during this month, so please do not use it in October. Or, this wastewater discharge site is next to that fishing hole, so please put it a bit further downstream.

This approach fails to see the forest for the trees. What use is a remote cabin retreat without the serenity of the surrounding area from which we draw our physical and spiritual sustenance? How can we use it for healing and to teach our children their way of life while over the ridge heavy machinery encroaches ever closer and non-native users buzz around us in ATVs and motorboats? What use is a hunting site if the ancestral moose trails have been destroyed, there is no winter refuge, and unmanaged access routes have allowed non-native hunters to deplete the population precipitously? What use is a fishing spot if the fish has absorbed a dangerous burden of toxins from its food sources everywhere it swims throughout its life, including those carried from upstream? How can we carry out our ceremonies when the spirits who live in the rocks have been disturbed by drilling and blasting. What point is there in commenting on a small drill program in isolation, when everyone knows that your plan is to open a huge open pit and underground gold mine?

In spite of this fundamental difference in world view, the barriers, unresolved fundamental issues, and concerns noted above, we know that MINES, the Companies and IAAC will try to proceed with this project unless we raise specific concerns. In the absence of the necessary supports, Grassy Narrows cannot substantively respond to the technical information provided to date about the Great Bear Gold Project. We provide these preliminary concerns under protest and based upon the limited research we can undertake, which should not be taken as a complete overview of our concerns.

Industrial disturbances will release even more mercury into our ecosystem and further impair our Treaty rights.

The Great Bear Gold Project will require industrial mining exploration, access roads, clearing of trees, modification to water levels and other activity within the English River watershed. The waters from those areas flow into the English River in short order via the Chukuni River. They flow into the areas where we fish, boat, camp, and practice our way of life, and directly past our community.

The scientific literature establishes that industrial activity in the boreal forest releases mercury into local lakes and rivers.

Building machine tracks, trails, and roads is a common part of mining exploration and mine development work. However, simply driving heavy machinery through the boreal forest can contribute to the release of mercury. In one documented instance, a temporary machine track was inadvertently placed across a small, long-term reference catchment. This disturbance increased outputs of MeHg by a factor of over five for more than a decade.[9]

[9] J. Munthe and H. Hultberg (2004), “Mercury and Methylmercury in Runoff from a Forested Catchment -

Clearing the forest has also been found to release mercury into local water bodies where it bioaccumulates in fish to dangerous levels. The foremost study on this subject was completed in Quebec by Dr. Carignan. The study found that 100% of lakes with clearcut watersheds had walleye and pike with mercury levels that exceeded the World Health Organization advisory limit for human consumption. Meanwhile, only 18% of unlogged lakes, and only one burned lake exceeded the limit.[10]

In the only field study on the topic done by Ontario of which we are aware, there was roughly a doubling of mercury exported from a watershed near Thunder Bay via a stream after logging activity. This release of mercury occurred even though all the required regulatory measures, including those with respect to riparian buffers, were followed.

Despite these findings, Ontario does no downstream monitoring of actual industrial operations to monitor or assess mercury impacts.[11]

Both the Carignan and Ontario studies concluded that that the increase in mercury export is largely due to changes in local watershed level hydrology from the loss of tree cover. Mining exploration and mining activity also involve the clearing of trees from the land and risk similar impacts to local hydrology (e.g., Lower evapotranspiration rates, changes to snow and rain interception, etc.) and therefore leads to similar increases in mercury export to local logging.

Mining exploration and mining activities often have the effect of artificially changing water levels. This can happen through water takings, water discharges, dewatering of areas, and other industrial processes. Studies have found that the artificial lowering and raising of water levels in boreal water bodies often causes the release of mercury. Monitoring studies of the De Beers Victor Diamond Mine have found increased levels of mercury in fish in water bodies downstream.

For a more detailed discussion of the science on mercury and boreal forest clearing please refer to our enclosed evidentiary record filed with the Divisional Court in our 2015 Judicial Review Application, and the associated expert reports by Dr. Carignan, Dr. Podur, Dr. Mergler, and Dr. Willow.

Mining exploration and mining activities also risk altering water quality in ways that increase the methylation of existing mercury in downstream watersheds. This can be through the addition of sulfate, change in acidity, water colour, temperature, and other parameters. In Grassy Narrows, where mercury levels are already elevated by emissions from Dryden, any increase in net methylation is intolerable.

Concentrations, Fluxes, and Their Response to Manipulations", Vol. 4 at 607-618.

[10] Globe and Mail (March 12, 2001), "Mercury levels tied to logging practices."

[11] Toronto Star (September 14, 2016), "Ontario environment officials concerned that clear-cut logging releases mercury."

The Crown still has no remediation plan for the mercury that remains in the English-Wabigoon River system from discharges in the 1960s and 1970s. Mercury released into the watershed or methylated as a result of mining activity, especially dissolved mercury, will eventually find its way into the English River and further raise the mercury levels in fish and poison our people, exacerbating and prolonging our mercury crisis.

This is not acceptable. We cannot tolerate any additional mercury.

New releases of mercury or increased methylation will unjustifiably impair Grassy Narrows' treaty rights, health and wellbeing, and are discriminatory. This is an intolerable outcome for our treaty partner to impose on us against our will in the absence of consent.

Adverse impacts on Grassy Narrows' Treaty Land Entitlement Claim.

Grassy Narrows has an active Treaty Land Entitlement Claim (TLE) that has been accepted by the Crown and is under negotiation for resolution. Part of the resolution of the claim will include an addition to Grassy Narrows' reserve lands, and compensation for lost use. Grassy Narrows is currently engaged in a process to select its additional reserve lands. All the area around Grassy Narrows is currently potential reserve lands additions under consideration.

The Crown has asserted that lands which have encumbrances, such as mining claims and leases, will be more challenging to designate as additional reserve lands. This means that your mining claims and leases adversely impact our ability to select reserve land additions and are an impediment to the successful resolution of our TLE.

Further, lands which have been impacted by mining exploration such as cutting lines, pitting, trenching, stripping, and drilling, decline in ecological health, experience a degradation of their intactness, and therefore become less suitable as additional reserve lands.

Lands which are downstream of industrial projects also have their value, and suitability as additional reserve lands degraded. Lands along the shores of the English River and its tributaries have been core to our people for countless generations and are prime candidates for our reserve lands additions. If you were selecting lands for your home, your cottage, or your reserve, would you want a huge industrial gold mine to be opened up stream of them? No one would.

Over the last few decades vast parts of our Territory have been encumbered and degraded through industrial actions imposed on Grassy Narrows and upstream of Grassy Narrows. This has severely restricted the available suitable additional reserve lands.

Grassy Narrows has been clear that there should be no new encumbrances on our area, and no new degradation to our area (including from upstream), as this would unfairly further reduce the available suitable additional reserve lands (in addition to other impacts outlined elsewhere). This would impair the ability to correct the injustice

that was done to us by having been denied a fairly sized reserve for over a century.

On-site Impacts

According to the Ontario Auditor General "Mining activities can have a significant impact on the surrounding environment. They can affect groundwater and surface water, aquatic life, soil, vegetation, wildlife and air quality. The changes mining makes to the environment can have serious implications for public safety and health."[12]

While we are unable to meaningfully review the thousands of pages of technical documents that have been sent to us, it appears that the on-site impacts of the project will be extreme.

Large parts of the site will be deforested for decades at least. Three open pit mines will be created along with three underground mines, large tailings holding areas will be created, and a large ore processing facility will be built.

The project area will effectively be completely removed for the foreseeable future from the land base that is accessible to us to live our way of life and to practice our rights.

It also appears that water bodies including lakes and creeks on the site will be at extremely risk because they will be located immediately adjacent to and downstream / downgradient of heavy industrial operations including mining, ore processing, and tailings storage. We are concerned that the on-site water bodies will be damaged and we know that once they are damaged it can be hundreds, if not thousands of years before they are safe again.

Downstream / wind / migration impacts

We know far too well that industry can have impacts far beyond the industrial site itself. The chlor-alkali plant in Dryden that discharged mercury into the Wabigoon River was 150 km upstream of our village. The distance did not stop the mercury from being carried downstream, bioaccumulating in the fish that we eat, destroying our livelihood, poisoning our people, and dramatically disrupting our way of life. More than 50 years after the discharge of mercury was ordered halted, our mercury crisis rages on.

We fear that the impacts from the Great Bear Gold Project site will extend far beyond the mine site itself, further disrupting the balance of the environment that the Creator has established for us and which gives us what we need for a good life.

Impacts from industrial sites can propagate off site in many far-reaching ways and we cannot list them all here. Pollutants can be carried hundreds of kilometers downstream. Water quality changes that may appear innocuous in themselves, and which are not regulated, can alter the cycling of pollutants, nutrients, and other aquatic processes in damaging ways. For example, dissolved organic carbon (DOC), sulphate, and other

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[12] Auditor General of Ontario (2015), "2015 Annual Report: chapter 3.11: Mines and Minerals Program."

substances are a naturally occurring part of aquatic ecosystems and are not considered toxic. However, they known to play a strong role in mercury cycling affecting mercury speciation, solubility, mobility, and toxicity in the aquatic environment. Alteration of water chemistry can have serious consequences.

The wind can carry pollutants and other chemicals long distances before they are breathed by our people and deposited on the ground and in the water. For example, PCBs generated in the industrial centers can be deposited in the arctic and bioaccumulate to levels that are dangerous for subsistence consumers. Acid rain created by the Sudbury mines killed hundreds of lakes for scores of kilometers downstream and the area has yet to fully recover many decades later. We fear that the operation of the mine, including heavy machinery, blasting, and ore processing, will create airborne pollution and changes that can be carried long distances throughout our Territory and beyond, and will compound the existing impacts of other sources of airborne pollution including the Dryden and Kenora mills, other mines, and municipalities.

Off-site impacts can also happen through animals, fish, and birds and other forms of life that travel. If moose can no long find winter refuge on the project site, or if roads, trails and clearings created associated with the project increase access and success for non-native hunters and predators, then fewer moose will be available to hunt. That impact will not be restricted to the boundary of the project site but will extend as far as a moose would range from the project site, or conversely the area from which moose would range into the project site and face predation, hunting, and lack of suitable habitat.

Other animals like wolverine, wolf, bear and cougar travel even further distances. Impacts to their populations, their travel routes, and their hunting success in turn influence the populations of the moose, caribou, rabbits, and other animals that are important to us.

We know that walleye travel large distances throughout their lifespan, especially when they are spawning. Throughout their travels they breath the water, eat the local food sources, and are exposed to local toxins. Many of these toxins stay in the walleye for a very long time and accumulate throughout their lifespan, which can be decades long. As a result, walleye that are not at the project site, nor even within a downstream area impacted by the project site, may migrate into impacted areas and accumulate toxins which we are exposed to when we eat them. In turn, otters, eagles, pelicans and other beings eat the fish and then travel further distances, carrying the toxins with them.

Landscape impacts (e.g. intact forests)

Beyond the on-site and off-site impacts, the project will have landscape-level impacts. Looking at each site in isolation fails to see that the landscape as a whole and its many processes and functions that sustain life. The many parts of the landscape work together, each playing their part. If one is disturbed, then all are disturbed. If too many are disturbed, then the landscape's ability to sustain our good Anishinaabe way of life can be severely undermined.

For example, intact forest landscapes “are critical for stabilizing terrestrial carbon storage, harboring biodiversity, regulating hydrological regimes, and providing other ecosystem functions.”[13] Many species rely on intact forests. For example, the Government of Canada believes that once a landscape exceeds 35% disturbance it crosses a threshold beyond which the landscape becomes unable to reliably sustain a population of woodland caribou and extirpation becomes likely.

Indeed, this is what we experienced in the southern part our Territory where no single project alone caused the local extinction of caribou, but rather it was a death of a thousand cuts as more and more impacts over time made the landscape unable to sustain caribou. We know that the landscape in the range of the Sydney Caribou herd already exceeds this disturbance threshold and is need of recovery. The Gold Bear Gold project will add further disturbance, making the local extinction of caribou even more likely.

Caribou are a sentinel species whose fate is an indicator of the health of the landscape and a range of species and values that rely on intact forests.

Although they behave very differently, moose also rely on a healthy landscape. When there is too much industry, the dense mature conifer forests that moose require for winter shelter become too small, fragmented, and scattered to support moose. When too may roads are put in, outside hunters gain easier access, and when clearings are made those hunters have higher kill rates. When the forest becomes too disturbed, the deer move in, and with them comes sicknesses that hurt the moose.

Again, no one project alone can be blamed for the loss of our moose. But taken together the many industrial changes to our landscape have led to the near elimination of our once healthy moose population.

In spite of our many requests, Ontario refuses to work with us to plan at a landscape level to ensure that our health and way of life can be maintained and recovered. Instead, Ontario allows more and more disturbances to compound each other, further and further degrading the landscape that we rely on. The Great Bear Gold project will further undermine the forest landscape.

Spiritual Impacts

Spiritual impacts are a sensitive topic because it involves some of our deepest and most personal aspects of our selves. It is also sensitive and difficult to share because, not long ago, our spiritual practices were outlawed and we suffered persecution for them. To this day our spirituality is mis-represented, misunderstood, and disrespected by government and industry. For these reasons, this information is only the tip of the iceberg pointing to the presence of a deep and far larger concern.

Our people believe that may aspects of a human being are important to health,

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[13] Intact Forests, “Intact Forest Landscapes”.

wellness, and the good way of life. A critical aspect is spirituality. The landscape and our way of life are connected and sacred. We have a spiritual relationship of reciprocity with the landscape that requires us to take care of the land so that the land can continue to provide for us. This is a sacred responsibility given to us by the Creator.

Our sacred relationship and responsibility is with the landscape as a whole, and with all of its parts. It is not restricted to a finite set of point values such as ceremony sites, burial sites, and medicine patches. Although those are important, they are focal points in a far broader and all-encompassing spiritual fabric. Our spirituality emanates from, and is infused by the entire landscape. It is practiced throughout the landscape and supported by the entire landscape.

Without the spiritual landscape intact, the spiritual sites are desecrated and cannot function. The medicines do not work if they grow in a clearcut, or if herbicides and pollution have drifted on the wind towards them. How can the ceremony summon a spirit who has fled from the noise of machinery and blasting? How can an offering be made to a spirit-being whose trails and territory have been destroyed? How can the prayer for the success of our hunters be answered when our industrially transformed landscape is nearly empty of moose? How can we fulfill our responsibilities to our clan animals Atik (woodland caribou) and Numeh (sturgeon) when they are extirpated or at risk in much of our Territory? How can we fulfill our duties and ceremonies to the water when it has been polluted, dammed, and an invisible remains within it? How can we identify our grave sites when our people have been laid to rest throughout this land for countless generations?

In addition to our broader sacred relationship with the landscape, there are spirit beings who inhabit the landscape and who have relationships with the Anishinaabe and important roles in the landscape. We have duties to carry out in our relationships with these beings and if we do not fulfill our duties there can be negative repercussions. Some of these important spirit beings live in the rocks. When the are disturbed, hammered, drilled, bulldozed, blasted, or extracted, these spirit beings are impacted, and the spiritual realm is disrupted.

Past government policies and industrial activities have already deeply disrupted our spirituality and the spiritual dimensions of our way of life and wellness. If the Great Bear gold mine, and associated work, goes ahead, then it will have a further intense spiritual impact.

Spiritual impacts lead to bad things for our people. When we cannot fulfill our sacred duties it causes feelings of sadness, anxiety, loss of identity, loss of meaning, depression, and helplessness. When the spiritual realm and relationships are disrupted, it can cause fear, accidents, discord, conflict, bad harvest, unsuccessful hunts, drought, floods, hunger, ill health, and other terrible things.

We understand that the government and industry have a different way of seeing things, and that you see the natural world as separate from you, inanimate, spiritless, and there for the taking. We know that you always tell us that you know best and that the industrial

activities you plan will only cause minor, contained, short term impacts and that we need not worry. And yet, we are suffering from all the terrible consequences that our ancestors warned us would come from your industry and your violation of our spiritual landscape including illness, poverty, hunger, depression, suicide, and conflict.

Our way of understanding the world deserves respect. It is not right for you to force your worldview and all its impacts on us while we suffer the consequences.

Long-term risks – Tailings

We are particularly and deeply concerned by the long-term nature of the changes that you are making to the landscape and the risks that you are creating.

On August 13, 1970, a few months after closing the fisheries due to mercury pollution, the Ontario Minister of the Environment, George Kerr, declared that the Wabigoon River would recover on its own, without a cleanup or intervention. He said it would happen naturally in 12 weeks.[14] More than five decades later, our walleye in the Wabigoon River remain the most mercury contaminated in all of Ontario and it is unsafe to eat even one meal. Recent studies indicate that it will take many hundreds, if not thousands, of years for river sediment to recover on its own. Many sites are not recovering at all, and some are getting worse.

Some of the long-term risks that you are proposing to create include the creation of huge piles of waste rock that contains acid, heavy metals, the creation of new lakes in former open pit mines and tunnelling deep underground. These activities create long-term risks of leaching, groundwater contamination, dam failure, cave ins and falls, among many other things. We know that the impacts of industry can last many generations and for thousands of years.

And yet, our Treaty is only 150 years old. In that time the Crown has shown little ability to plan for the long term in a way that is not disastrous for us. How can we believe that the risks that you are creating will be safely taken care of for longer than Canada has existed as country, for longer than the time that Europeans have been in contact with us? How can we know that Canada, Ontario, Kinross, or Great Bear Resources will even exist in the timeframe that these risks will exist, let alone fulfil your responsibilities to take care of these risks in a way that you never have before?

You say that you will contain, monitor, and prevent these risks from impacting us, our water, and our landscape. But Ontario's own Auditor General has repeatedly found a failure to effectively remediate and monitor mining risks (see the section on failure to regulate below). Senior officials in the provincial government have noted the urgent and dangerous gaps in Ontario's regulatory ability to ensure the safety of tailings dams. You cannot safely carry out these duties now. Who will maintain the tailings dams in 100

[14] The Guardian (October 16, 2018), "The Warrior Society rises: how a mercury spill in Canada inspired a movement."

years? Who will monitor in 200 years?

We, the people living downstream, do not accept these risks.

Impacts to relationship with the Crown

The Great Bear Gold project is a massive one, with great risks to Grassy Narrows and that can have a major impact on many aspects of Grassy Narrows' relationship with the Crown including our Treaty, the honour of the Crown, fiduciary duties, outstanding obligations, unmet duties, and reconciliation.

Yet, the Crown refuses to come to the table with us about the major issues from which all these problems flows. At the same time, Ontario is attempting to delegate nearly all aspects of our relationship with the Crown to a gold mining company that is not party to our Treaty and that is primarily accountable to creating profits for its shareholders. A gold mining company has no ability to address our important issues with the Crown. We do not accept a gold mining company stepping into the shoes of our Treaty partner.

Adding insult to injury, Ontario has informed the company that the duty to consult on this project is at the low end of the spectrum. This is incorrect. For many reasons, even under Crown law, we are at the high end of the spectrum where consent is required. The reasons include but are not limited to the significant potential adverse impacts of the proposed project on our rights and health, the strength of our rights, the cumulative impacts of past industry, the outstanding Crown obligations and unmet duties towards us, the honour of the Crown, and fiduciary duties.

The failures of the Crown have led to a situation where we have been notified of this project only after the land was designated as "general use" and open to mineral exploration, after cumulative impacts of industry had been allowed to severely impact our rights and our health, after mining claims to the land were registered, after five years of exploration work had taken place, after over a billion dollars had been spent to purchase the property, and after the company had decided to open up a huge gold mine here.

The Great Bear Gold project is a runaway train, and we have no meaningful opportunity to shape decisions that will forever impact our people and our land. These decisions include: determining what parts of the landscape should be protected and what should be exploited; the threshold for industrial impacts that can occur before our rights are infringed and our health is harmed; the process for making decisions among Treaty partners; the role of third parties seeking to profit in the Treaty relationship; how to repair harms created in the past but impacting the present; how to prevent future harms; how to reconcile the relationship between the Crown and Grassy Narrows.

The Crown acts as though Grassy Narrows has no say in these decisions. The Crown seems to think that we should accept that a massive gold mine is a foregone conclusion and we should only have a say in things like where the effluent pipe discharges, where the tailings piles are located, and where the processing plant should be sited. We disagree.

This project, the failure of the relationship with the Crown which has allowed the project to become so advanced without our involvement and consent, is having, and threatens to have further major impacts to our relationship with the Crown. Rather than taking a minimal and reductionist view of the minimum that the Crown can do in this situation, a robust understanding of the duties is required, as well as an appreciation for the unique circumstances and history of Grassy Narrows. Only involvement of senior representatives of the Crown can resolve this problem.

Federally Regulated Impacts

Federal involvement is required because of the numerous areas of claimed federal jurisdiction that will be affected by the Great Bear Gold project, including the completion of a Federal Impact Assessment.

Some, but not all, of these areas of claimed federal authority are listed here:

Species at Risk: The Federal Crown claims authority within the Constitutional division of powers over Species at Risk. Although we have not been able to carry out a thorough assessment due to the lack of capacity supports, the project site has a strong potential to impact the following species at risk:

- Woodland Caribou – the project site is within the range of the Sydney Caribou Herd. The range of the Sydney Caribou Herd is currently approximately 64% disturbed (likely higher due to recent fires in Woodland Caribou Provincial Park). This amount of disturbance exceeds the threshold above which the range becomes unlikely to be able to support a viable caribou population. The range is in need of recovery to lower the level of disturbance and therefore the entire range is considered critical habitat. The project will add disturbance, further degrading the ability of the range to sustain caribou and increasing the likelihood that Woodland Caribou, a threatened species, will be extirpated from this area. Caribou is an important clan animal for Grassy Narrows.

  It should be noted that while Ontario does have a *Species at Risk Act*, it has exempted mining and logging from the applicability of that Act. The provincial government cannot be counted on to ensure that the Great Bear Gold project proceeds in a manner that protects species at risk.

- Wolverine – Wolverine play an important and unique role in our ecosystem and in the balance of life. The company has indicated that wolverine have been observed on the project site using trail cameras. Direct observation of wolverines is a rare. Wolverine avoid humans and human impacted areas. The project is almost certain to permanently displace the wolverine that have been observed at the site and to destroy any wolverine dens, trails, habitat, and food sources that are on the site.

  The Committee on the Status of Endangered Wildlife in Canada (“COSEWIC”) reports that wolverines prefer ecologically intact areas and avoid disturbance.

According to COSEWIC "[a] study of the cumulative effects of developments on Arctic wildlife (Johnson et al. 2005) found that mines and other major developments had the largest negative effect on species occurrence, followed by exploration activities, and outfitter camps."[15]

Due to past degradation of southern habitats, wolverine left Grassy Narrows' area. However, our success in stopping logging has resulted in the beginning of a return of wolverine. Grassy Narrows is now near the southern edge of the currently occupied range of wolverine. If the project goes ahead, wolverine will leave our area and may not come back, further disrupting the balance of the landscape.

- Sturgeon – Sturgeon are an important clan animal in Grassy Narrows an important food source for the Anishinaabe of the Treaty 3 area. The damming of the English River has had a big impact on sturgeon. A small and delicate population remains in the river, which we are trying to protect and recover. Sturgeon live for many years, are sensitive to industrial disturbances, and can accumulate large amounts of toxins in their bodies.

There are many other species at risk that may be affected by the Great Bear Gold project, including bats, birds, turtles, Eastern Cougar, American Badger, and others. Each have a role to play in the web of life.

Fisheries: The Federal Government claims jurisdiction over inland fisheries, the prevention of harm to fish from pollution, and the protection of their habitat.

While the Federal Government has cooperative agreements with Ontario for licensing of fisheries the Federal Government maintains jurisdiction and responsibility for prevention of harm and protection of fish habitat.

Under Crown law, even the construction of a small water crossing can trigger the need to apply to the Department of Fisheries and Oceans for permits. In contrast, Ontario does not require a provincial impact assessment before a mine is opened.

We are a river people and fish have always played an extremely important role in our way of life, our sustenance, and our livelihood.

The companies propose to take water from our river system, use it in the industrial gold extraction process, and then return it to our river. The companies propose to create three open pit mines, three underground mines, store large amounts of waste rock and operate an industrial ore processing facility, all in close proximity to water bodies and streams that flow into our river system. Finally, the companies propose to create three new lakes in the empty open pits created by gold mine, and to allow water to flow out of those pits and into other local water bodies. All these activities, and others, put our fish

[15] Government of Canada, "Wolverine (Gulo gulo): COSEWIC assessment and status report 2014" (date modified: January 6, 2015).

at risk.

The Crown has failed to protect our fish for many decades from the impacts of mercury and this has had grave consequences for the rights, health and wellbeing of our people. Given the Crown's failure, and its ongoing impacts, all levels of the Crown should be diligent and alert in carrying out their duty to protect our fish from further harm.

Indigenous Peoples: The Federal Government claims jurisdiction over Indigenous Peoples and the lands reserved for them. This jurisdiction includes claimed authority over our health, culture, and wellbeing, responsibility for environmental contaminants and their impacts on Indigenous traditional foods and on the health of Indigenous Peoples.

The Great Bear Gold project has potential to impact Grassy Narrows' relationship with the Crown, the safety of our traditional foods, and our health, culture, and wellbeing. The project also has the potential to impact waters that flow into and through our reserve and which can impact our reserve.

Due to the Crown's longstanding and ongoing failures to meet its duties to Grassy Narrows, all levels of the Crown should be diligent and alert in carrying out their duty to protect us, our health, our traditional foods, and our further harm.

There are further areas of Federal claimed authority that likely apply here as well and that are at risk in this project, including but not limited to migratory birds, transboundary waters, transboundary air pollutants, international laws and instruments.

Due to the many important areas of claimed Federal authority that are at serious risk in this project, it is essential that a robust and comprehensive Federal Impact Assessment is carried out.

Grassy Narrows seeks to engage with the Federal Government and our consent is required to the form that the Impact Assessment will take.

Site-specific parameters and guidance levels needed

In its Initial Project Description, Kinross states that water, effluent, tailings leachate, and other substances will be tested and will be released back into the environment after they meet guideline levels. However, the Initial Project Description does not identify the guideline levels that will be used. Guideline levels are a very important and complex topic that must be explored in far more detail. Our discussion here is intended to illuminate that there is a serious problem.

Although there are many substances of concern here, we are most familiar with mercury and so we will use it as an example.

There are many guidelines that we have seen applied upstream of our community for allowable mercury levels. Some of these guidelines are wildly inappropriate, but all of them are insufficient.

According to the Government of Canada "(m)ercury is a toxic element and serves no beneficial physiological function in man; a maximum acceptable concentration of 0.001 mg/L (1 µ g/L) in drinking water has therefore been established."[16]

A concentration of 0.001 mg/L corresponds to **1000 ng/L** (nanograms per liter), which is the unit we will use here.

One might think that if the mercury level is good for drinking, then it would be fine to put in our river, but that is not the case. Provincial Water Quality Objectives ("PWQO") are numerical and narrative criteria that serve as chemical and physical indicators representing a satisfactory level for surface waters (i.e. lakes and rivers) and, where it discharges to the surface, the ground water of the Province.

The PWQO guideline level for mercury in surface water is **200 ng/L.**

The PWQO guideline has historically been applied to mercury contaminated groundwater seeping out of the banks of the Wabigoon River next to the Dryden mill to claim that it is safe. However, this too, is irresponsible.

The Canadian Council for Ministers of the Environment (CCME) provides guidelines for mercury levels in freshwater bodies that attempt to account for the risk to fish and wildlife through exposure to mercury.

The CCME guideline level for mercury in surface water is **26 ng/L.**

One might think that if this level of mercury in water is safe for the fish and wildlife, it must be safe to put water with that level of mercury into Grassy Narrows' river. However, the CCME guideline does not consider bioconcentration of mercury as it moves up through the food chain.

As the Government of Canada explains "[t[he presence of mercury in water has become a source of concern because of the finding that organic mercury is bioconcentrated by fish. Elevated mercury levels have been found in all freshwater fish taken from areas with suspected mercury contamination and frequently render the fish unacceptable for human consumption."[17]

The mercury levels that are found in predatory fish like the walleye, can commonly be a million times the level that is found in the water that they swim in.

Recent monitoring studies of the Wabigoon River upstream from the Dryden mill show that **baseline level of mercury in the Wabigoon River is around 1 ng/L.** Even at those baseline levels of mercury in water, large adult walleye in Wabigoon Lake often exceed 0.5 ppm mercury, the level above which the commercial sale of fish for human

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[16] Health Canada (1986), "Healthy Living: Water and Mercury."
[17] Health Canada (1986), "Healthy Living: Water and Mercury."

consumption is banned.

If the level of mercury in the River is raised to **2 ng/L**, then mercury levels in adult walleye will approximately double, making them far more dangerous to eat. If other chemicals that stimulate net methylation in the environment are added as well, then the effect will be even more grave.

That means that river water with 2 ng/L of mercury will have serious impacts on the health of Grassy Narrows people's ability to safely practice their right to fish, even though this level is less than 10% of the level allowed by the CCME guideline, the most restrictive of the guidelines we are aware of.

A similarly broad range of guidelines exist and are applied for mercury levels in fish safe for human consumption.

The Ontario Ministry of the Environment "Guide to Sportfish Consumption" allows for some consumption of fish by the non-sensitive population (adult men and women who are not of child bearing age) if the fish have mercury levels below **1.8 ppm.**

On the other hand, the sale of fish for human consumption in Canada is banned if the fish have mercury levels over **0.5 ppm**. Grassy Narrows fishermen have been charged for selling their catch based on this rule.

In the 1980s, Canada established **0.2 ppm** as the guideline limit for safe consumption of fish by Grassy Narrows and other Indigenous subsistence eaters of fish.

The US Environmental Protection Agency ("EPA") lists **0.1 ppm** as their guideline level for Indigenous subsistence eaters of fish.

Renowned mercury expert Dr. Mergler has written in expert reports (some of which are enclosed), all of which have been provided to Ontario, that among these guidelines the US EPA level is most relevant to Grassy Narrows. However, she notes that all these guidelines are based on safe levels for a lifetime of exposure in a regular population. Mercury impacts are cumulative throughout the lifespan. None of these guidelines take into account the high, and far above guideline, levels of exposure that many Grassy Narrows people have already been exposed to. She writes that Grassy Narrows people have generally already been exposed to too much mercury and cannot safely be exposed to any additional mercury.

Clearly, off-the-shelf guidelines are not sufficient. It is necessary to develop and apply in close collaboration with Grassy Narrows locally specific guidelines that take into account the local background levels, ecology, food chain, cultural practices, and cumulative impacts from other industry, and history of exposure.

Other specific concerns

Given the constraints that we have noted, it is not possible to provide a comprehensive list of concerns here. However, some further concerns that we have identified to date,

which will require future elaboration, include:

- The contamination of the water within our Territory and water that flows into our Territory from effluents, discharges, by-products, leaching (including of metals), and changes in mercury cycling
- The creation of acid rock drainage and other forms of toxic drainage
- Changes to the flow, level, and quality of our water from water takings and discharges.
- The contamination of our air and air that flows into our Territory
- The loss of our caribou and moose, and of those who travel into and out of our Territory through impacts including habitat degradation and outside hunting pressure
- Disrupting the delicate balance of animals, predators, prey, and the web of life that supports us.
- The contamination and loss of our fish for food, commercial fishing, sport fishing, and way of life, including fish that migrate in and out of our Territory
- The loss and contamination of our birds and insects including migratory birds
- The loss of our valuable fur bearing animals including marten and otter
- The fragmentation and degradation of our forests and the loss of intact forest landscapes and old growth forest areas
- The changing of mercury exports and mercury cycling, including methylation
- The creation of additional anxiety, fear, depression, disempowerment, and despair among our people
- The further disruption of our society, our culture, and our way of life.
- The exacerbation of our suicide crisis
- The desecration of our sacred landscape
- The disturbing of spirits and beings that live in the rocks
- The tainting of our medicines
- The disruption of our people who are out on the land living their way of life
- The loss of peace and quiet for our people who are out on the land

- The loss of the ability to use the land as a healing place for our people
- The loss of our ability to teach our kids our way of life, identity, knowledge, and ways of wellness
- Impacts to our individual and collective health and wellbeing
- The loss of our ability to make a living in a way that is harmonious with our culture
- The violation of our Indigenous laws and jurisdiction
- The violation of our Treaty rights, our Treaty relationship
- The violation of the honour of the Crown and Fiduciary duties.

Other harmful impacts of industry on ANA people and Territory include, but are not limited to, the following:

- Impacts to game animal populations and their habitat including moose, and caribou which are central to our hunt and an important part of our way of life, our sustenance, our livelihood, and the exercise of our Treaty rights;
- Impacts to fur bearing animal populations and their habitat including pine marten which are central to our trapping and an important part of our way of life, our sustenance, our livelihood, and the exercise of our Treaty rights;
- Changes in forest composition including a shift from extensive coniferous dominated stands to fragmented deciduous dominated stands;
- Failure to regenerate forests or failure to regenerate to their previous composition;
- Loss of productive land base through tertiary roads, machine trails, landings, mines, tailings, buildings, erosion, etc.;
- Loss of species and genetic diversity;
- Loss of shrubs, including berries and medicines including through the use of herbicides;
- Tainting of our medicines and rendering areas unfit for sacred medicine harvesting and ceremony;
- degradation of forest soils, including compaction, rutting, scarification, and erosion;

- Disruption of nutrient cycles including the depletion of calcium in our watersheds, leading to calcium deficiency in aquatic biota;

- Increased competition with non-Indigenous hunters and fishers using forest access roads and associated depletion of animal and fish populations;

- Increased road traffic and danger of collision of people and wildlife with forest industry vehicles;

- Loss of traditional travel routes, sacred places, heritage, and archaeological sites;

- Negative impacts on water quality, fish habitat, fish populations, and fish contaminants;

- Risk of increased violence against ANA people, including gender-based violence, from an influx in workers coming into the Territory to log, and the potential establishment of man camps;

- Lack of recognition of cultural Anishinaabe way of being;

- Violation of our inherent, Treaty, and Aboriginal rights; and

- Violation of ANA Law and the will of our people.

Failure to Effectively Regulate and Remediate

According to the Government of Ontario, there "are over 5,700 abandoned mine sites in Ontario that have over 17,000 mine features, known as hazards… Deaths due to mine hazards in Ontario are rare, but deaths happen in North America every year."[18]

As of 2015, only four mines were listed as fully closed out. Only three are identified as undergoing remediation. On the other hand, there were 56 abandoned mines with 629 contaminated sites meeting provincial criteria for liability recognition. A further 306 abandoned mines had over 3,000 contaminated sites that do not meet the criteria for liability recognition.[19]

There are already many abandoned mine sites in our Interim Area of Interest for Mining, mostly in the Red Lake Area, many of which have been left in an unremediated state for decades. A number are classified as dangerous by the Ministry.

According to the Ontario Auditor 2015 report, the Ministry of Mines has not estimated

[18] Ontario, "Abandoned mines hazards" (last updated February 17, 2023).
[19] Auditor General of Ontario (2015), "2015 Annual Report: chapter 3.11: Mines and Minerals Program."

the total cost of rehabilitating the 4,400 abandoned mine sites in Ontario since 1993 and therefore does not know the current cost for doing so. It also does not have a long-term plan for rehabilitating these sites. These sites may pose risks to public health and safety and the environment.[20]

The Auditor General found that the "Ministry conducts minimal inspection and follow-ups on abandoned mines."[21] In the five years before the audit "the Ministry has inspected only about 6% (248) of abandoned mines to ensure that they do not pose a risk to public health and the environment."[22]

The Crown often assures us that despite the legacy of past bad practices, mining regulation is done safely now. To the contrary, the Auditor General found many glaring flaws in Ontario's regulatory regime for current mining, including that "Ontario is the only province in Canada that does not require a provincial environmental assessment to be performed for mining projects."[23] The Auditor General's report further explained that "in Ontario, the *Mining Act* only requires mining companies to submit closure plans prior to the development of the mine… In other provinces in Canada, larger mining projects automatically trigger a provincial environmental assessment."[24]

The Auditor General found that the closure plan process lacks sufficient funding, is subject to pro-industry bias, plans are not updated, and inspections are insufficient to ensure safety.

As of 2022, the government had not inspected nearly half of Ontario's operational mines since 2011.[25] The news media has also reported that Ontario senior officials are highly concerned that following several recent tailings dam failures "there is little to no legislative authority to prevent similar situations from occurring in Ontario."[26] According to the media the regulatory gap is outlined in a section of a briefing binder for Minister Pirie dedicated to "critical decisions. Senior bureaucrats, who told Minister Pirie that the gap in offline tailings dam rules was a "high-risk gap in the regulatory framework that requires urgent attention."

Far from improving the overall mining regulatory situation, the Government of Ontario has recently watered down its regulations with respect to requirements for closure planning and closure funding through the *Build More Mines Act*. The Act gives the Minister extremely broad discretion over nearly all aspects of mining including closure planning and funding. Under the new rules the position of Director of Mine Rehabilitation

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[20] Auditor General of Ontario (2015), "2015 Annual Report: chapter 3.11: Mines and Minerals Program" at p. 444.
[21] Auditor General of Ontario (2015), "2015 Annual Report: chapter 3.11: Mines and Minerals Program."
[22] Auditor General of Ontario (2015), "2015 Annual Report: chapter 3.11: Mines and Minerals Program."
[23] Auditor General of Ontario (2015), "2015 Annual Report: chapter 3.11: Mines and Minerals Program."
[24] Auditor General of Ontario (2015), "2015 Annual Report: chapter 3.11: Mines and Minerals Program."
[25] The Narwhal (June 24, 2023), "Ontario minister was privately urged to fix 'high-risk gap' to avoid mining disaster."
[26] The Narwhal (June 24, 2023), "Ontario minister was privately urged to fix 'high-risk gap' to avoid mining disaster."

was removed, Ministry staff no longer review closure plans and instead industry staff may carry out the review, contrary to the Auditor's 2015 recommendations.

Given this context, Grassy Narrows does not trust that the appropriate regulations are in place to ensure mining sites will be kept safe for many generations to come. You have not earned our trust.

Lack of Protected Areas, Need for Regional Balance.

There is an imbalance in the region because nearly all forests south of Red Lake are open to industrial mining. For example, much of our Territory is in ecodistrict 4S-2 where only 4.1% of the ecodistrict is protected. Part of our Territory is in ecodistrict 4S-3 where only 3.3% of the ecodistrict is protected. The lack of protection for our landscape is the clear outcome of an unbalanced landuse designation process that did not involve us meaningfully and ignored our rights and interests.

In contrast, conservation biology generally dictates that at least half of an ecosystem must be protected to avoid loss of biodiversity and ecosystem functions. Ontario has committed to community-based land use planning in the Far North based on a joint planning process between the First Nations and the province.[27] It committed to protecting 50% of the landbase in partnership with First Nations following First Nations-led landuse planning.

Canada has committed to protecting 30% of the land in Canada by 2030 in partnership with First Nations. Respecting ANA's efforts to protect our environment will contribute to the maintenance and recovery of biodiversity and ecosystem functions and will support a balance in this region, where the vast majority of forests have been open to industrial logging and mining.

Nature Based Climate Change Solutions

Climate change and biodiversity loss are major threats to Grassy Narrows and to the world. Nature based solutions have been identified as an important part of preventing and mitigating both problems. The boreal forest is one of the world's largest storehouses of carbon. After logging or clearing of the land for mining, much of this carbon is released from the forest, plants and soils, contributing to climate change. On the other hand, protecting forests helps to keep the carbon safely stored and safeguards biodiversity. These are important ecosystem-based services that contribute to mitigating climate change and that have a significant value.

Fighting climate change and biodiversity loss are important priorities for Grassy Narrows and for Canada and respecting Grassy Narrows' land protection will contribute to progress on these priorities.

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[27] *Far North Act, 2010*, SO 2010, c 18.

VI. Mining activity without Grassy Narrows' consent risks conflict

Barrick writes that "[a]ny perceived or actual breach of … trust or respect can have devastating consequences for a mining venture or company, and these commercial and reputational consequences can extend well beyond any particular project or First Nation group." In so writing, Barrick raises the spectre of conflict minerals, also commonly knowns as blood minerals.

Global concerns about unethical practices by mining companies, including Canadian gold mining companies, have led to increased scrutiny of the social, environmental, and ethical practices of mining companies. For the mining industry, the problem with conflict minerals is that no one wants them. Conflict minerals are hard to market, and they increase corporate risks and uncertainties associated with investment, timelines, regulatory approvals, litigation, social conflict, and brand damage.

As a consequence, Ontario and Canada have sought to market themselves as stable, safe, ethical, jurisdictions from which to source conflict-free, or ethical minerals. While there are cheaper jurisdictions in which to operate, the conflict-free reputation of Ontario and Canadian minerals is a significant competitive advantage relative to many of other global mining jurisdictions.

However, as Barrick noted, for the mining industry and a mining jurisdiction, trust is hard to gain and easy to lose. It only takes one high profile conflict to taint an entire company, a sector and an entire jurisdiction and to undermine decades of marketing.

Ontario learned this lesson in the analogous conflict with Grassy Narrows over unwanted logging. After decades of unliterally forcing clearcuts on Grassy Narrows against their will, the First Nation turned to protests, boycotts, media campaigns, public education, litigation, and grassroots blockades. Within six years, major sourcing contracts were being threatened and shortly afterwards Abitibi, the world's largest newsprint producer, withdrew from Grassy Narrows Territory.

The City of Kenora, in their 2009 report to the Ontario Good Roads Association / Rural Ontario Municipalities Association, wrote that "[t]he issue with Grassy Narrows on the Whiskey Jack Forest must be resolved... Without resolution of these issues, **the wood coming off the Whiskey Jack Forest cannot be sold**. **There is no current customer willing to accept wood products from a forest unit which is involved in a perceived controversy."** (emphasis added)

This dynamic is beginning now with respect to mining. A long and growing list of mining companies, including Barrick, Trillium, Bounty, and Kenorland have voluntarily committed not to explore without consent or have left the area. Their withdrawal reflects an enduring reality in the mining industry where compliance with international law, third party certification standards, customer, investor, and shareholder expectations, and social license preclude the use of conflict minerals.

The Crown would be wise to avoid instigating conflict with Grassy Narrows again by approving unwanted mining. Controversy with Grassy Narrows about one mine could

taint the reputation of Ontario as a conflict-free place to mine. It could give the entire regional industry a stain that heightens risk and uncertainty and discourages investment throughout the supply and production chain.

The entire region and industry benefit from an environment free of conflict. It is in the interest of Ontario and industry to resolve, not inflame, the conflict with Grassy Narrows.

VII. Gold does not justify the impact to Grassy Narrows

Gold does not serve an essential and irreplaceable function in society. The largest use of gold by far is for jewelry, followed by investment and central banks demand. Technology, a distance fourth, used only six percent of gold production in 2022 (309t out of 4,721t produced globally). Much of that technology is electronics with short life spans and abysmal recycling rates.

Because gold is not essential, but is valuable, the rationale for mining gold by Great Bear and Kinross is purely financial. Shareholders demand a return on their investment, but Ontario need not repeat the mistake of sacrificing Grassy Narrows' rights and wellbeing for the interests of corporate shareholders.

The flow of resource wealth has been used to justify the damming of our river, dumping of mercury, logging of our trees, and now proposed gold mining. The impacts we have suffered from this approach are extreme and ongoing. The mine is projected to operate for a mere 25 years, but we will be here for many generations. No longer can the Crown and third-party companies seek to sacrifice our health, way of life, livelihood, rights, and environment for short term shareholder gains. Enough is enough.

It is important to remember that it is tourism, recreation and services – not resource extraction – that now forms the backbone of Kenora's employment. This shift is not due to a lack of available wood or minerals, but rather reflects increasing mechanization and marginal profitability in the extractive sector in contrast to the growing demand and labour intensiveness of the non-extractive sector. Grassy Narrows' work to protect our landscape and our environment have helped to foster Kenora's greatest economic strength.

The Kenora and Red Lake area enjoy substantial benefits for tourism, wildlife, hunters, fishers, trappers, recreational users, and non-extractive industries. According to the municipal website "[t]he City of Kenora has transitioned from a pulp and paper mill town to a destination and lifestyle community."[28]

The tourism and services industries are Kenora's largest employers by far. The visitor and cottager sectors contribute $300 million annually to the Kenora economy. In contrast, it is estimated that the Weyerhaeuser mill contributes $60 million to the local economy, even when counting indirect economic benefits throughout the region.

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[28] City of Kenora, "Key Industries" (accessed January 23, 2021)

Kenora's tourism labour force makes up 38% (3,314 jobs) of Kenora's total employment, while Tourism related occupations account for 51.5% (4,405 jobs) of Kenora's total employment.[29] The growth of this industry is key to Kenora's economic plans.

According to the current Whiskey Jack Forest Management Plan ("FMP"), "[t]here are numerous tourist operators in the Whiskey Jack Forest. The recreational activities provided by these outfitters include options for fishing, hunting, camping and other eco-tourism opportunities. The number of individuals, residents and non-residents, procuring services from these tourist establishments are numerous, and they contribute a significant amount of economic resources to local communities ... The Sunset Country Economic Study reports that in 2001, 443 operators provided employment to 3,785 persons of which 1,221 were located in the Whiskey Jack Forest".[30]

In contrast, the Evolution gold mine in Red Lake employs 740 people, only a sixth of the number employed in tourism related jobs in Kenora and is chronically at risk of shutting down if profitability cannot be increased for its Australian owner.[31]

As set out in the Lake of the Woods Tourism Sector Report, "[o]ngoing investments in tourist services and resources only compliment the pristine natural environment that has attracted visitors to Lake of the Woods for over a century."[32]

The current FMP notes that "public and municipal officials should be aware that provincial parks help to make their communities attractive for business as well as for tourists and retirees. The retirement community brings in pension income, which is often indexed to inflation and is "recession proof'.[33]

Respecting and supporting Grassy Narrows' efforts to protect the landscape would contribute to the region's tourism economy and maintain opportunities to grow that economy as well as to become a leader in the conservation economy through future protected areas and associated eco-tourism attractions. A conservation economy creates long-term sustainable employment potential for local and regional residents by maximizing existing skills and knowledge.

VIII. A Choice, an Opportunity

Our youth are crying out. They want to see the land protected so that we can use it to heal our people and our spirits. This is reconciliation for us. They deserve to see the light at the end of the tunnel. We do not want to have to fight, again and again, to protect out land.

However, the community of Grassy Narrows is strong. We know our history, our rights,

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[29] LOTW Tourism Sector Report (2017), pp. 37, 38.
[30] Whiskey Jack Forest FMP 2012-2022, p 95.
[31] CKDR 927 FM Dryden (June 19, 2020), "114 Layoffs at Red Lake Evolution Mine."
[32] LOTW Tourism Sector Report, 2017.
[33] Whiskey Jack Forest FMP 2012-2022, p 98.

our language, our teachings, and our way of life. We have allies across the country and across the world. The days of forcing harm on us against our will are over.

Respecting Grassy Narrows' land protection is the best available way to minimize conflict and move towards a path of reconciliation and respect for our inherent, Aboriginal and Treaty rights in compliance with international Indigenous rights standards.

Grassy Narrows has borne the brunt of the impacts of industry in the region, while our voice has long been ignored by Crown and industry decision makers. Part of the outcome of this mistreatment has been conflict over logging and one of Canada's most infamous environmental poisoning sagas. As a consequence, the region, and the country, has a stain on its honour, its reputation and credibility.

Times have changed. It is no longer acceptable, nor viable for the Crown to approve extractive industrial activities without Indigenous parties' consent. Across Canada there is a commitment and an expectation for reconciliation. We have an opportunity now to learn from the mistakes of the past and to heed the voice of Grassy Narrows. In the process, we can move from conflict to cooperation, from destruction to restoration, from harm to hope. Grassy Narrows invites the Crown to join us in righting this historical wrong. Respecting Grassy Narrows' land protection would be an important show of good faith that would be a positive step on the path towards reconciliation.

The Crown is at a crossroads.

On the one hand, the companies are proposing to open a large and toxic gold mine upstream from us against our will. If implemented, the mine risks irreparable harm to Grassy Narrows' rights and interests including, but not limited to, harms caused by cumulative effects, neglected obligations, Treaty infringement, harm to our health, release of mercury, and loss of way of life and livelihood. This harm would be immoral, unjustified, unreasonable, dishonourable, and a breach of Ontario's fiduciary duties to Grassy Narrows.

On the other hand, respecting Grassy Narrows land protection would have a beneficial impact on the exercise of Treaty rights and on the environment, cause no harm to anyone's health, and be beneficial for the growing non-extractive economy. There is an opportunity for calm that will allow ANA and the Crown to focus on long-term resolution of our issues and that will help ANA return to the health, self-determination, and prosperity that we once enjoyed.

We are inviting you to walk with us on the path of protection, healing and reconciliation. Will you work with us, or against us?

APPENDIX A

INTERIM Issues for Negotiation/Engagement/Consultation with MINES

August 18, 2023

1. Recognition and respect for ANA inherent, aboriginal and Treaty rights
2. Recognition and respect for the ANA Land Declaration
3. Recognition and respect for the ANA IPCA
4. Harmonization of Crown Law and ANA Law with respect to mining related activities
5. Repairing the Crown – ANA relationship with respect to mining related activities
6. Outstanding Ontario obligations to ANA including those arising out of the 1978 MOU and subsequent commitments such as increased ANA control and ownership over its land base
7. Land-use redesignation of the ANA IPCA
8. Interim measures including the withdrawal of the ANA IPCA from staking
9. Suspension of all mining exploration activities on the ANA IPCA and vicinity
10. Resolution of existing third-party mining interests on the ANA IPCA created by the Crown
11. Issuing a Notice of Caution for mining related activities on lands where ANA rights and interests could be impacted
12. MINES Minister's unfulfilled commitment of November 2021 to visit Grassy Narrows to discuss mining issues in an open forum.
13. Cumulative impacts of past mining related activities on ANA
14. Cumulative impacts of mining activities and other industrial and crown policy impacts on ANA including mercury
15. Resolution of issues arising from past mining related activities which have occurred without ANA consent (restoration, compensation, apology, etc.)
16. Ending Free Entry mining exploration and resolving the issues it has created
17. ANA concerns re off-site impacts and risks of existing mining activity (e.g. at Red Lake and Goliath mines, Red Lake and Separation Rapids exploration) on ANA
18. ANA concerns and MINES failure to take into account risk of off-site impacts of proposed mining exploration and other mining related activity on ANA (including downstream, migratory, downwind, landscape level, and other impacts)
19. Addressing ANA concerns re: Changes to the Mining Act
20. Addressing ANA concerns re: Regulation and enforcement of tailings management
21. Impacts of mining related activity on mercury mobilization and cycling
22. Impacts of mining related activity on Intact Forest Landscapes and associated values and ecosystem functions
23. Impacts of mining related activity on source water protection and source water planning and management
24. Impacts of mining related activity on moose, caribou, marten, fish, and other wildlife
25. Impacts of mining related activity on ANA sacred landscape, spirituality, ceremonies, medicines

26. Impacts of mining related activity on ANA land based healing
27. Impacts of mining related activity on ANA travel routes, camp sites, occupancy sites, burials, etc.
28. Impacts of mining related activity on ANA archaeological and historical values
29. Impacts of mining related activity on ANA safety, and risk of racial and gender based violence including man camps.
30. Unanswered correspondence from ANA to MINES and Ontario
31. Barriers to meaningful ANA engagement including the ongoing Mercury Crisis, housing crisis, water crisis suicide crisis
32. Reimbursement of past ANA expenses for unfunded engagement with the Crown and mining companies.
33. Capacity support required by ANA to begin meaningful engagement
34. ANA Consultation Area with respect to mining
35. Proposed and existing mining exploration and other mining related permits

Asubpeeschoseewagong
Netum Anishinabek
GRASSY NARROWS, ONTARIO P0X 1B0 • PHONE: (807) 925-2201 • FAX: (807) 925-2649

March 6, 2024

Attention: Minister George Pirie (Minister of Mines) (minister.mines@ontario.ca)
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Attention: Anjala Puvanathan (Director, Ontario Region) (greatbear@iaac-aeic.gc.ca)
Impact Assessment Agency of Canada
Ontario Region
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Great Bear Resources Ltd. A Kinross Company
104 Howey Street
Red Lake, Ontario P0V 2M0

Boozhoo MINES, IAAC, Kinross and Great Bear Resources:

RE: The Great Bear Gold Mine Project

On behalf of Asubpeeschoseewagong Anishinabek ("ANA" or "Grassy Narrows First Nation"), we write to share with you Grassy Narrows' preliminary position with respect to your activities in relation to the Great Bear Gold Project.

The Project will have an adverse impact and requires an impact assessment

Grassy Narrows is deeply concerned by the Great Bear Gold Project being pursued by Kinross and Great Bear Resources with support from the Ministry of MINES as well as the process recently begun by the Impact Assessment Agency of Canada (IAAC).

Decades of industrial activity, authorized and encouraged by Ontario and contrary to Grassy Narrows' will, have led to well-documented and extensive harm to our Territory, our way of life, our rights, and our health. As a result, our people suffer intensely from impacts including premature death, disease, poverty, and suicide.

The Great Bear Gold Project falls within the area that Grassy Narrows people have historically and currently use for the exercise of our rights and way of life. It is also upstream from our community. Pollutants in the water and impacts on the surrounding land, fish and wildlife will have a direct impact upon us and could also exacerbate mercury contamination in our waterways.

ANA has repeatedly and clearly communicated with the Crown and the mining industry that our people are in crisis, the environment which supports us is severely impacted, our health is failing. The cumulative impacts continue to significantly interfere with our treaty, Aboriginal and inherent rights.

The Great Bear Gold Project will have an impact upon areas that Canada claims as within federal jurisdiction, such as species at risk, fisheries, waterways and Indigenous peoples. Grassy Narrows asserts that the IAAC must conduct an impact assessment in the circumstances.

The Crown's outstanding obligations to Grassy Narrows should be resolved in a nation-to-nation process.

For many years, ANA has written to Ontario to invite the Crown to a government-to- government table to address fundamental issues between us, including the Crown's unmet obligations to us about our rights, our land, our self-determination, and the impacts of industry and government policy on our land and people. These issues have been unresolved between our governments for many decades. Reaching agreement in good faith through a government-to-government table is the way to resolve these important issues and to put in place effective measures to protect us from further harm.

Ontario and Canada have yet to accept this invitation. Most recently, by letter dated November 27, 2023, Ontario explicitly refused to participate in a table to discuss "jurisdictional issues" raised and rejected nearly all of the issues proposed by ANA including most of those related to mining.

Instead, Ontario has explicitly recommended that mining companies explore on and around our Territory, has unilaterally granted roughly 6,000 mining claims on our Indigenous Protected and Conserved Area, and allowed companies to pursue increasingly advanced work towards mines that pose a serious threat to Grassy Narrows. This activity has occurred without our consent, without meaningful consultation and accommodation, and usually without even prior notice under the antiquated "free entry" mining regime.

Grassy Narrows' concerns about the process

Until recently, the Crown and the companies associated with the Great Bear Gold Project have shown little willingness to meet with us, nor respond substantively to many of our communications. Indeed, we have only recently learned that the Crown and companies provided notice to other Indigenous Nations of permit applications concerning the Great Bear Gold Project

as early as 2017 and have signed Advanced Exploration Agreements with Wabauskang and Lac Seul First Nations. In contrast, Ontario approved a number of permits without notice of any kind to Grassy Narrows.

Now that gold has been found, the Crown and Kinross are suddenly interested in giving the appearance of consulting with us, but only to the extent that it furthers the already advanced plans, made without Grassy Narrows' involvement, to develop an industrial gold mine in our headwaters.

Even if Ontario had complied with its own laws, Ontario's "free entry" mining exploration and mine development process is not the correct way to make key decisions between our two governments. This process is deeply unfair and biased in the favour of multi-billion-dollar mining companies. It ignores our laws, our vision for our land and people, and our processes for making decisions affecting our territories.

Our ongoing and urgent crisis leaves us unable to meaningfully engage about mining. To make matters worse, we receive no support from Ontario to inform ourselves, gain technical and legal advice, and to engage in a fair way about mining. The IAAC has offered a mere $5,000 in capacity funding to respond to a 100-page technical Initial Project Description and the funding was made available only after the submission deadline for comments has passed.

The path to reconciliation

We are on a healing journey to recover from the extreme damage that colonization, and attempted forced assimilation have done to our people, including through the imposition of Crown policy and regulatory schemes related to residential schools, dams, relocation, mercury contamination, child apprehension, industrial logging, and mining. We need to allow the land to heal because healthy land will help to heal our people. This is what reconciliation means to Grassy Narrows. Let us protect our land and water so that we can heal our people.

The boom in mining exploration in our area is causing great anxiety and fear among our people. It is setting back our healing. If the Crown decides to allow mining, and the risk of further pollution and other impacts, there will be more heartache, sickness and loss for our people. This mining activity will only lead to more grassroots resistance, litigation, and public controversy over conflict minerals. It will take the relationship between the Crown and Grassy Narrows further away from the path of healing and reconciliation.

Grassy Narrows says 'no' to the Great Bear mine and related activities.

We strongly urge the Crown and your companies to reconsider your unilateral and bullying approach to pushing mining activity on our First Nation. We urge you to seize this opportunity to set a course for a future that is free of conflict over mining in Ontario.

We call on the Crown and your companies to respect the healing path for Grassy Narrows and not to further impair the exercise of our constitutionally protected Aboriginal and treaty rights, our inherent Indigenous rights, our health, and wellbeing.

Grassy Narrows provides preliminary comment on the project under duress

We know that Ontario and Canada will move ahead with approvals for damaging mining activity if we do not speak up. For that reason, we are writing to you under duress to express our preliminary concerns about this project before it advances any further. These serious concerns with both how the project has been pursued and the impacts on our rights and interests, are set out in the attached document. These submissions are by necessity preliminary in the absence of capacity and support to conduct our own studies and obtain expert technical advice.

Please ensure that you copy our Land Protection Team on all communications on this and related matters.

Awsa,

Asubpeeschoseewagong Anishinabek (Grassy Narrows First Nation) Chief and Council (quorum of three)

Chief Rudy Turtle

Councillor Sherry Ackabee

Councillor Bear Copenace

Councillor John C. Kokopenace

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cc:

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ANA PRELIMINARY CONCERNS ABOUT THE GREAT BEAR GOLD PROJECT

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I. The Context

Who is Grassy Narrows

Asubpeeschoseewagong Anishinabek (Grassy Narrows First Nation) is an Anishinaabe First Nation with traditional territory in what is called northwestern Ontario. Grassy Narrows people exercise inherent Indigenous rights, and Aboriginal and Treaty rights. We have cared for and lived on our lands for countless generations. Grassy Narrows people hunt, trap, fish and practice our Anishinaabe way of life to provide for ourselves, our families and community.

We exercise our inherent right to self-determination and law-making powers. Our inherent rights are given to us by the Creator. In addition to our inherent rights, Grassy Narrows people exercise Aboriginal rights and established Treaty 3 rights which are protected by section 35 of the *Constitution Act, 1982*.

In 1873, the Anishinaabe adhered to Treaty 3. The Treaty 3 Commissioner promised the Anishinaabe that the Treaty promises would protect our harvesting practices forever, which would allow our people to hunt, fish, trap, gather, and harvest throughout the Territory as they had before "as long as the sun shone and the waters flowed." This promise was more than a continuation of our pre-existing harvesting rights. The Anishinaabe did not agree to the erosion of our harvesting rights.[1]

Our territory is located in the Boreal Shield ecoregion in a mixed forest transition zone from the Great Lakes St Lawrence Forest to the Boreal Forest. The Whiskey Jack Forest is the English name of the forest that covers a large portion of the Territory; the English-Wabigoon River System is a central waterway in the Territory. The land and waterways of the Territory sustain Grassy Narrows peoples' way of life.

Grassy Narrows' Territory is the foundation of who Grassy Narrows people are as Anishinaabe people. We follow the teachings of the Elders to be responsible for the Territory and to *Manaachitootaa Aki* (protect the land).

Social and Cultural Impacts of Crown Law and Policy.

Despite these sacred promises, for many generations the Crown has imposed harmful law and policy on us, including through the *Indian Act*, the banning of our ceremonies, regulation of our hunting and trapping, residential schools, regulation of the wild rice, relocation, the 60s scoop, the underfunding of our schools, inadequate health care, and the ongoing removal of our children from the community.

These policies have caused grave harm to our people and impaired the exercise of our rights. They have undermined our strong society and way of life and have left us more

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[1] *Keewatin v Minister of Natural Resources*, 2011 ONSC 4801 [*Keewatin* ONSC], rev'd 2013 ONCA 1158, aff'd 2014 SCC 48 ["*Keewatin* litigation"].

vulnerable to the impacts of industry.

The Cumulative Effects of the Mercury Crisis and Industrial Activities Impacts.

Starting in at least 1962, a chlor-alkali plant in Dryden, Ontario, began discharging mercury into the English-Wabigoon River system. Approximately 9,000 kilograms of mercury were discharged into the river system that flows through our Territory and is a lifeline for Grassy Narrows people. Our live-giving river became a source of invisible poison.

The impacts of the mercury contamination have been devastating to the people of Grassy Narrows and our Territory. The presence of mercury led to the methylmercury contamination of the fish and Grassy Narrows people. The local commercial fishery shut down; Grassy Narrows' economy collapsed; Grassy Narrows people descended into poverty; Grassy Narrows people suffered, as they continue to do, from debilitating health symptoms and premature death; and our Anishinaabe way of life was gravely threatened and changed when we could no longer safely eat fish and exercise our fishing practices as we had before.

In the 1970s and 1980s, Grassy Narrows called on Ontario to respond to the mercury crisis by taking concrete action, including by agreeing that Grassy Narrows would control our Territory. As the river was poisoned, we wanted to have more control over our Territory and the natural resources in it to be able to protect and benefit from the part of our Territory that was still healthy – the land. Instead, Ontario authorized extensive clearcut logging in the Territory from roughly 1980 to 2008, which likely released new, or additional, sources of mercury into the watershed, and increased methyl mercury contamination of fish.

Multiple expert reports and publications have detailed the impacts of mercury contamination on the health of Grassy Narrows people, including the following, which are enclosed:

- 2015 Expert Report of Dr. Donna Mergler
- Grassy Narrows Community Health Assessment Summary Reports, 2018
- Philibert et. al. (2020), "Mercury exposure and premature mortality in the Grassy Narrows First Nation community: a retrospective longitudinal study", *The Lancet: Planetary Health* Vol. 4(4), E141-E148
- Philibert et. al. (2022), "Past mercury exposure and current symptoms of nervous system dysfunction in adults of a First Nation community (Canada)" *Environmental Health* 21:34.
- Mergler. D. et. al. (2023), "The Contribution across Three Generations of Mercury Exposure to Attempted Suicide among Children and Youth in Grassy Narrows First Nation, Canada: An Intergenerational Analysis" *Environmental Health Perspectives* 131(7).

These reports highlight the grave impacts of mercury on the health and wellbeing of

Grassy Narrows. They establish that Grassy Narrows people cannot withstand further impacts from the release of new mercury into Grassy Narrows' land, lakes, rivers, fish, and people, nor an increase in the net methylation of existing mercury. Our rights have already been highly compromised by the mercury crisis. Our nation cannot withstand further infringements of rights. No further impairment of our rights, our health, and our wellbeing can be justified.

Our fish in the Wabigoon River remain the most mercury contaminated in the province. Our people of all ages continue to suffer from mercury related diseases and loss of wellbeing. Our employment remains far below what it was in the 1960s following the collapse of our subsistence, sport, and commercial fishery due to mercury.

The mercury crisis is but one in a long series of industrial attacks which have been imposed on us against our will. These include the damming of our rivers, industrial logging, and mining activity. Each of these industrial attacks has had grave impacts on its own. In addition, each of these industrial attacks has compounded the existing harm that remains from previous attacks, creating unbearable cumulative impacts, thereby prolonging, and exacerbating our inter-generational crisis.

These extreme and compounding industrial impacts have been authorized and encouraged by the Crown without any serious consideration of their cumulative effects on Grassy Narrows and the exercise of Grassy Narrows' rights. We have raised clear concerns since at least the 1970s that our environment, rights, way of life, and our health, were at or beyond, the breaking point due to the impacts of industry on the resources on which we have heavily relied for our wellbeing, livelihood and the viability of our community. In the 1980s, and again in 2007, we declared moratoria on further industry on our Territory so that we could heal our people and rebuild our independence and wellness.

And yet, to this day, with respect to our Territory and vicinity, Ontario has failed to increase our control and use, failed to conduct a collaborative Landuse Plan; failed to complete a source water protection plan; failed to carry out a comprehensive environmental assessment; and failed to undertake an assessment of cumulative effects. The repeated failures of the Crown to act honourably to resolve the crisis have resulted in serious, compounding adverse impacts over time, including:

(1) Severe cumulative impacts on our territory and Treaty harvesting, hunting and fishing rights, making these rights impossible to exercise in a meaningful way;

(2) Severe adverse health effects and death, including, as found in recent scientific research, high rates of conditions impacting learning in children, disease, suicide attempts, and the premature death of our people; and

(3) Extreme poverty, food insecurity, loss of Anishinaabe way of life, and other poor socio-economic indicators of wellbeing which are ranked significantly worse than average Indigenous communities in Ontario and Canada.

(4) Collective impacts to our society and community.

Ontario ignored our pleas and our moratoria and continued to allow industrial activity, including the granting of mining claims on our Territory against our will, and advancement of mines all around us, without considering how mining activities add to, compound, exacerbate, and prolong previous harms. The cumulative impacts of industry have been devastating. The impacts include, but are not limited to:

- Our river that gives us life remains poisoned.
- Our walleye are unsafe to eat.
- Our sturgeon are rare.
- Our moose are scarce.
- Our caribou are nearly extirpated.
- Our pine marten habitat is depleted.
- Our forests are fragmented.
- Our medicines are tainted.
- Our sacred landscape is desecrated and scarred and traplines have been clear cut.
- Our way of life is diminished.
- Our people suffer from poverty, food insecurity, disease, premature death, and suicide.
- Our inherent, aboriginal, and treaty rights are impaired
- Our health has been harmed.
- We have been discriminated against.

II. Ongoing Breaches of Crown Obligations: The 1978 Memorandum of Understanding, Honour of the Crown, and Fiduciary Duty

Ontario and Canada (collectively, the "Crown") are our treaty partners. As elaborated below, through the treaty relationship and Crown actions over time, including entering into legal agreements following the start of the mercury crisis, the Crown assumed obligations and duties owing to Grassy Narrows. The Crown must uphold the treaty promises, uphold terms of its agreements, and act honourably in its dealings with Grassy Narrows.

Authorizing and permitting mining activities in our territory without our consent violates Ontario's and Canada's outstanding obligations and duties to Grassy Narrows and violates the Crown's duty to act honourably in all its dealings with Grassy Narrows.

1978 MOU and Dishonourable Conduct.

In 1978, Ontario and Canada signed a Memorandum of Understanding with Grassy Narrows in which the Crown committed to resolve in good faith the impacts of mercury on the environment that Grassy Narrows people rely upon for the viability of our community, and the related health, social, economic, cultural, and environmental impacts on the people of Grassy Narrows ("1978 MOU"). It was agreed that the issues would be resolved through a combination of financial compensation and land, and

furthermore in a manner that would enhance Grassy Narrows' self-determination, self-sufficiency, and control over local affairs wherever possible.

Some agreements were reached that partially implemented some of the 1978 commitments. For example, agreements were reach with Canada in 1984 and with Canada, Ontario and the mercury polluters in 1985.

However, the Crown has outstanding obligations owing under the 1978 MOU. These outstanding obligations include (but are not limited to) increasing Grassy Narrows' access to, protection of, and control over lands and natural resources in our Territory.

Moreover, the Crown has engaged in a course of dishonourable conduct before, during the negotiations, and since, and has consequently failed to meaningfully support Grassy Narrows' recovery from the mercury crisis.

The Crown's unmet fiduciary duties

The Crown and Grassy Narrows have a *sui generis* fiduciary relationship, and our treaty rights attract fiduciary obligations. In the time since the Crown and Grassy Narrows entered into a treaty relationship, the Crown seized functional management and control of our lands and water. The Crown assumed a duty to Grassy Narrows when exercising that control over our Indigenous interests including our pre-existing legal interests in exercising our fishing, hunting and trapping rights and other traditional practices such as medicine gathering and wild rice picking.

Grassy Narrows has been at the mercy of the exercise of Ontario's imposed fiduciary decision-making over our land as Ontario unilaterally authorized industrial activity, and otherwise has made decisions that affect the land, water and other natural resources of our area which we rely on to exercise our rights, practice our way of life, and maintain our health.

Under imposed Crown management and discretionary control, the health of our land and our people have seriously declined, our way of life has been degraded, and the exercise of our treaty rights has been impaired.

The Crown's abandonment of negotiations required by the 1978 MOU

From the outset of our discussions under the 1978 MOU, Grassy Narrows was clear that to recover from the impacts of mercury and other harms, we need Crown recognition of Grassy Narrows' ownership, control, and protection of a large part of Territory, which will allow Grassy Narrows to make decisions with respect to our land that support our way of life and our livelihood. In the 1970s, 1980s, and 1990s Ontario committed to negotiate increased Grassy Narrows control over our lands, in addition to providing meaningful compensation for our people.

In the 1980s, and since, we called for a moratorium on industrial activity in our Territory until our negotiations with Ontario were concluded. However, rather than honour this moratorium, the treaty promises, and the 1978 MOU obligations, Ontario unilaterally

abandoned the negotiations in the mid 1990s and exercised its imposed control in a way that further unleashed industry on our area to our detriment.

Ontario has repeatedly acted unilaterally to encumber and degrade our Territory against our will, including by granting industrial logging licenses and nearly 6,000 mining claims; industrially logging our forests; and constructing industrial access roads and bridges (e.g. The Separation Lake Road and bridge) to facilitate further resource extraction and environmental degradation. Canada has stood by and watched, allowing our lands, waters, rights, and way of life to be trampled.

The Crown's dishonourable conduct and abandonment of its fiduciary obligations continue. Ontario's Ministry of Mines has granted thousands of mining claims against our will, including granting mining exploration permits without any prior notice to us.

Ontario has failed to accurately identify the ANA Area of Interest on mining activities.

The Ontario Ministry of Mines has never meaningfully addressed the question of the extent of Grassy Narrows' area of interest with respect to mining.

In the 1980s, the Ontario Ministry of Natural Resources created its own map to identify a Grassy Narrows Traditional Land Use Area (the "1980s TLUA Map") for the purposes of mediated negotiations between Grassy Narrows and Ontario with respect to a section of the Territory required by Grassy Narrows to restore its economic self-sufficiency. The map used straight lines, which are not reflective of the boundaries of the full Territory and does not include the northern portion of the Territory.

Between 2008 and 2017 Grassy Narrows and Ontario engaged in discussions on forestry pursuant to the Grassy Narrows Ontario Process Agreement (the "Process Agreement"). As part of that process, Grassy Narrows submitted a map of the "Grassy Narrows area of interest for forestry", which included areas that are outside the 1980s TLUA Map boundaries.

When Grassy Narrows passed our Land Declaration in 2018, we shared a map of an area we have identified as the "Indigenous Protected and Conservation Area" (IPCA). The IPCA boundaries mirror part of the area of interest for forestry. The IPCA boundaries have always been provisional, as Grassy Narrows continues to engage in a process of reviewing the knowledge of our historical and current land use. In addition, the western notion of linear boundaries on maps conflicts with our Indigenous knowledge systems, which are based on relationships and complex webs of protection, use, kinship, sharing, travel and trade that do not begin and end at a line.

Shockingly, Ontario relied on the 1980s TLUA Map as the consultation area for mining, despite having knowledge that the map was not accurate.

Grassy Narrows is currently pursuing litigation challenging nine mining exploration permits (not related to the Great Bear Gold Project) that Ontario approved without

notice to Grassy Narrows.[2]

Among other relief, Grassy Narrows seeks the following remedies in the litigation:

> a declaration that Ontario cannot consider mining activities in the subject area of the Territory, including issuing exploration permits, until the parties negotiate and reach agreement on **timely enforceable mechanisms to assess and manage the cumulative impacts of mining, logging, hydro-electricity projects, other industrial development, mercury contamination, and governmental policies or programs that may infringe Grassy Narrows' treaty rights, and to ensure that these constitutional rights are respected**;

These mechanisms are not yet in place and the judicial review remains unresolved.

As further described below, Grassy Narrows has only very recently learned that the Ministry of MINES approved a number of permits for the Great Bear Gold mine with no notice to Grassy Narrows.

It is only in very recent times, and after much conflict, that Ontario has begun to ask Grassy Narrows about what our area of interest for mining is. After many years of advocacy by Grassy Narrows, Ontario's Minister responsible for mines finally responded on November 1, 2022 with a new map that Ontario proposed as the area for consultation on mining related activities.

Ontario's proposed consultation area on mining appeared to deliberately carve out the Great Bear Project Area. The information provided by Ontario to explain how they arrived at the proposed boundaries was cursory and insufficient for understanding how the boundaries were arrived at. Grassy Narrows informed the Ministry that their proposed map is not complete and requested capacity support to do the work necessary to respond. However, no support has been provided to date.

On November 2, 2023, Grassy Narrows provided two versions of a map setting out our Interim "Area of Interest" for mining. The maps differed in scale only. The map was provided with the following cautions:

- The maps are an interim product created under duress arising from the escalation of imposed mining activity by the Crown and industry and for the sole purpose of identifying an interim area for negotiations on mining related activity.

- The maps are not a complete representation of Grassy Narrows' area of interest. Due to the unique circumstances and capacity constraints, Grassy Narrows has not completed comprehensive studies required to fully determine its area of interest including, but not limited to, land use and occupancy, ethnohistory, archaeology, biology, and hydrology. For example, rights and interests

[2] Grassy Narrows First Nation v. Director of Exploration, Ministry of Northern Development, Mines, Natural Resources and Forestry, Ontario Divisional Court File No. 881/21.

associated with air quality, migratory birds, travel routes, marten, lake sturgeon, wolves, eastern cougar, landscape intactness, climate resilience, biodiversity, genetic diversity, and many other factors are not reflected in these maps.

- In addition, linear boundaries are an imposed non-Indigenous concept that do not accord with the nature of Grassy Narrows' relationship with the land which includes extensive interconnectedness, reciprocity, travel, sharing, and trade.

- These maps do not limit any claims by Grassy Narrows people to assert their rights and interests throughout their territory and to protect themselves from harm to their health, rights, way of life, livelihood, society, and environment. Grassy Narrows people have Treaty rights, and practice them, throughout the Treaty 3 area. Grassy Narrows people also have inalienable inherent rights given by the Creator, some of which are affirmed in international law and instruments. The Grassy Narrows people are the true experts about their land, rights, and interests.

<u>The Great Bear project area falls within the core area of Grassy Narrows' Interim Area of Interest for Mining map.</u>

Despite Grassy Narrows' efforts to further these negotiations, there is no agreed upon area for consultation on mining activities.

Sharing of information about our Homeland is a sensitive topic that requires deep trust. After so many decades of having our trust, our vulnerability, and our lands abused by Ontario, many of our knowledge holders do not consent to sharing sensitive lands information with Ontario. Trust must be rebuilt to meaningfully engage on this topic.

Grassy Narrows Laws Have Not Been Respected.

Neither the Crown nor the companies have formally acknowledged and respected Grassy Narrows' moratorium and Land Declaration. The Crown has not joined us to harmonize Crown law with Grassy Narrows law and to find a path forward towards reconciliation that provides space for Grassy Narrows' inherent Indigenous rights and constitutionally protected Aboriginal and treaty rights to be meaningfully realized and protected.

We have written many times to request that the Crown come to a senior negotiation table with Grassy Narrows to address the wrongs committed against our people, the effects of which continue to this day, and to prevent further damage. We call on Ontario to return to the mediation process first established in 1978 in response to the mercury disaster to finally reach an honourable agreement regarding the control and protection of our Territory and fair compensation for Grassy Narrows people.

Instead of coming to the table to honourably resolve outstanding issues and obligations, Ontario has unilaterally granted mining claims and permits and now is supporting the development of a gold mine in our headwaters.

III. The Crown Must Address Capacity Barriers

Grassy Narrows has repeatedly advised both the Crown and the Companies that it cannot meaningfully engage in negotiations while it faces significant and unique barriers.

1) Insufficient information: Upon learning of the Great Bear Gold project, Grassy Narrows immediately requested additional information about the project and the extent to which our Laws had been taken into account and its adverse impacts considered. This information is essential for us to understand and respond to any efforts at engagement. After a lengthy delay, the Ministry recently provided responses that can only be characterized as preliminary and partial.

2) Capacity funding: The process of evaluating proposed mining activities and engaging with MINES, the IAAC, and mining companies comes at an expense to ANA. We must hire staff, engage our community, carry out our governance process, and obtain professional support from experts, lawyers, and advisors to engage in a meaningful way.

Grassy Narrows is even more impoverished than our First Nation peers due to the ongoing impacts of mercury poisoning. We lack the funds required to engage in an informed and fair way.

During the summer of 2023, MINES staff indicated that, after many years of requests, MINES will fund some ANA capacity needs. We provided MINES with a document summarizing the kinds of capacity supports that we would need in order to meaningfully engage on mining, including compensation for staff and to hire experts. After many months of awaiting an update, on November 27, 2023 MINES clarified that its promises of capacity supports amount only to funding in an unspecified amount for a “Mineral Development Advisor”, a position that Grassy Narrows has never requested funding for.

No funding is currently in place. MINES must come to the table on our issues and commit to funding ANA’s reasonable costs of engaging in an informed and fair way.

While IAAC offered $5,000 in capacity funding to ANA, this funding was offered after the deadline for submissions on the List of Issues. The amount offered is insufficient to meaningfully review lengthy technical documents that engage many areas of expertise, to engage with our people, to carry out our governance process, and to prepare a response. This is the same on-size-fits-all funding offered to other First Nations, NGOs, and other ‘stakeholders’. It does not consider our unique circumstances nor our position as an Indigenous nation.

3) Pandemic Considerations: COVID-19 infection rates, as well as other respiratory illnesses in this region of Ontario are high again. Our people are especially vulnerable to disease because of our high pre-existing rates of co-morbidity, crowded and inadequate housing, inadequate nutrition due to food insecurity, and the immune impacts of mercury. The health of our people is our priority. We are informing you that, in addition to our other concerns, mining exploration proposals are unwelcome during outbreaks

and other public health emergencies.

4) Mercury Crisis and Industrial Impacts: Our territory has already experienced a great deal of harm from industrial activities including mercury, damming, industrial logging, and mining. The cumulative effects of these industrial impacts have already passed the point of an unreasonable, unjustifiable impact on the exercise of our Treaty rights, and on our health and wellbeing. As a result, our community suffers from unusually high rates of conditions including poverty, food insecurity, disease, neurological conditions, conditions affecting learning, premature death, and child and youth suicide. The social conditions created by mercury poisoning and the cumulative impacts of industry place us in an ongoing extreme crisis. As a result, we are unable to meaningfully engage on mining exploration in the absence of the necessary supports to resolve and recover from the ongoing mercury crisis.

5) Fundamental outstanding issues must be addressed before meaningful engagement can occur: As described above, many fundamental issues remain unresolved between Grassy Narrows and the Crown including unmet obligations, broken promises, conflicting laws, cumulative impacts, violated trust, justice owed, and outstanding reconciliation. These are upstream strategic issues to which individual mining projects are subsidiary. We cannot address one mining project meaningfully, when the fundamental questions are not addressed. These questions include:

- How will the Crown respect Grassy Narrows' inherent rights and rights recognized under international law and related instruments?
- How can the Treaty relationship between the Crown and Grassy Narrows be respected and restored?
- How can the written text of the Treaty be reconciled with the oral and written histories, and Ontario Superior Court findings, that the taking up clause and the cede and surrender clause were never discussed nor agreed to?
- Who has decision making authority over lands and resources in our area?
- How can Grassy Narrows law and Crown law be harmonized with respect to the land?
- What lands should be open to mining and what lands should be protected?
- How will the Crown's unmet obligations arising from the Treaty, the 1978 MOU, and other sources be fulfilled?
- How will Grassy Narrows' ownership, control, and use of our lands be increased as promised?
- How can the damage already done to our land and our water be restored?
- How can the harm to our sacred landscape, our spirituality, and our relations be repaired?
- How can we assess and prevent the cumulative impacts of industrial activity from further harming us?
- How can the collective damage to our society, our community, and our families be reversed?
- How can our health, our wellness and our way of life be returned to its former status?

- How can our self-determination, our independence, and our self-sufficiency be rebuilt?
- Is it possible to reconcile while the harm continues, while we bury our youth?

For many years we have been seeking to resolve important issues with the Crown that relate to mining. A summary list of some of these issues can be found at **APPENDIX A**.

The Crown apparently has little interest in these questions and little willingness to address them with us, to act honourably, nor even to come to the table with us about them. When we meet with senior officials from MINES and MNRF, they tell us that they have no mandate to discuss these issues, but they will bring them to the Minister.

After years of seeking a meeting with the Minister our then Chief and Council finally met with then MNDMNRF Minister Rickford in Toronto on November 18, 2021. At the long-awaited meeting Minister Rickford refused to discuss our mining concerns but promised to come to Grassy Narrows soon to discuss mining at an open forum in our community. Neither Minister Rickford nor his successors have honoured this promise.

In a largely analogous situation where Grassy Narrows and the Crown had a conflict over a different form or resource extraction, the 2004-2009 Whiskey Jack Independent Forest Audit found that:

> There are fundamental differences in the viewpoints between GNFN and MNR regarding forest management principles and practices. It is the audit team's opinion that these differences cannot be resolved without the Province setting aside many of the requirements to manage the Whiskey Jack Forest under the CFSA and the FMPM, and relinquishing significant authority to the First Nation to manage portions of the Whiskey Jack Forest according to the desires of the GNFN community. The audit team further believes that the forest management planning process did not anticipate, nor was it designed to resolve the type of dispute currently being experienced on the Whiskey Jack Forest.

Similarly, the *Mining Act* and its regulations and the IAAC regulations did not anticipate, nor were they designed to resolve the serious grievances, outstanding obligations, and the type of dispute currently being experienced over mining around Grassy Narrows. Resolving this dispute will require sincere, honourable, government-to-government engagement on the fundamental issues that have brought us to this point. Only once that occurs, can we meaningfully engage about specific permits and projects without repeating and exacerbating the legacy of past and ongoing harms.

IV. The Great Bear Gold Project: The Crown's failure to inform, meaningfully consult, and gain our consent for project activities.

The Great Bear Gold Project falls within Grassy Narrows' Interim Area of Interest for Mining

We have enclosed a copy of Grassy Narrows' map of our Interim Area of Interest for Mining, which is described above.

The limited preliminary research that we have been able to conduct confirms that the Great Bear Gold Project is within the area where Grassy Narrows people have historically, and continue to, practice our way of life and our Treaty rights.

There is strong ethno-historical evidence that Grassy Narrows has a longstanding connection to this area dating back to the time of the Treaty and before. This includes historical reports, fur trade records, ethnological work, and other records. Grassy Narrows First Nation historically hunted, fished, trapped, collected plants, gardened and conducted spiritual practices in and around the Red Lake fur trading routes, and traded products obtained in the area.

There are Grassy Narrows families with continuing family ties to this area and the surrounding areas. Grassy Narrows people, including the Chief, continue to practice our inherent and Treaty rights in this area, including the moose hunt. The moose hunt is extremely important to our way of life and sustenance. Due to the precipitous decline in moose elsewhere in our area, the area south of Red Lake is one of the only remaining productive moose hunting grounds that our people use.

The Great Bear Gold Project falls within moose, wolverine and caribou habitat that ranges within our IPCA. In addition, walleye within the project area migrate to the waterways on which Grassy Narrows exercises its treaty rights to fish and on which the community reliese for food. The project area is also within nearby quatermary watersheds that flow into the IPCA.

Grassy Narrows people fish extensively on the English River around Grassy Narrows. Grassy Narrows people also fish on the English River and its tributaries near the inflow of the Chukuni River. We are aware that the fish that we eat swim a distance of 30 km, or more, up and downstream in the course of their lifecycle and are exposed to, and bioaccumulate, toxins throughout their travels. In particular, our walleye travel long distances upstream in order to spawn.

Caribou are an important clan animal to Grassy Narrows and used to be seen throughout our Territory. The Great Bear Gold Project area is within the range of the Sydney Caribou herd, the last remaining herd in our Territory. This range is already degraded beyond the threshold at which it is able to sustain Caribou in the long term, unless its intactness is restored. All of the habitat within the range is considered critical.

As noted above and confirmed by the Supreme Court, the Treaty 3 Commissioner promised the Anishinaabe that the Treaty promises would protect our harvesting practices forever which would allow our people to hunt, fish, trap, gather, and harvest throughout the Territory as they had before “as long as the sun shone and the waters flowed”. The Anishinaabe did not agree to an increasing erosion of our harvesting rights that would significantly interfere with the exercise of our rights.[3]

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[3] *Keewatin v Minister of Natural Resources*, 2011 ONSC 4801 [*Keewatin* ONSC], rev’d 2013 ONCA 1158, aff’d 2014 SCC 48 [“*Keewatin* litigation”].

Grassy Narrows has a communal connection, right, and interest in this area. It is possible that other First Nations do too, but that does not in any way diminish our own connection, rights and interests nor the Crown's obligations to us.

In addition, Grassy Narrows must be consulted on activities that may have off-site impacts on our territory, such as downstream, downwind, or migratory species impacts. Grassy Narrows continues to document the full extent of its Territory and the "ANA Preliminary Area of Interest With Respect to Mining" is without prejudice to the determination of the full geographical extent of Grassy Narrows' Territory.

The Crown requires Grassy Narrows' consent for the Great Bear Gold Project

The standard that correctly applies to this project is the right to say 'no', also known as the right to give or withhold "free prior and informed consent."

Under Grassy Narrows law, we are the first people of this land. The Creator gave us this land and only the Creator can take it away. We live in relationship with the land; we care for it and the land provides for us. We must take care of the land and not disrupt this balance. Nothing that threatens this balance may take place on the land without our permission. We say no to mining.

The United Nations has recognized this right in the *UN Declaration on the Rights of Indigenous Peoples* and in other international laws and instruments to which Canada is a signatory.

The *Declaration on the Rights of Indigenous Peoples* requires States to consult and cooperate in good faith with the indigenous peoples concerned through their own representative institutions in order to obtain their free, prior and informed consent before adopting and implementing legislative or administrative measures that may affect them (article 19). This includes:

- The adoption of legislation or administrative policies that affect indigenous peoples (article 19)
- The undertaking of projects that affect indigenous peoples' rights to land, territory and resources, including mining and other utilization or exploitation of resources (article 32).

The principle of free, prior and informed consent is linked to treaty norms, including the right to self-determination affirmed in common Article 1 of the International Human Rights Covenants. When affirming that the requirement flows from other rights, including the right to develop and maintain cultures, under article 27 of the International Covenant on Civil and Political Rights (ICCPR) and article 15 of the International Covenant on Economic Social and Cultural Rights (ICECSR), the treaty bodies have framed the requirement also in light of the right to self-determination.

Canada is bound by international law to these abide by these standards.

While Crown law has often failed to adequately implement international human rights standards, and often seeks to take a reductionist view of its international obligations to us, even under Crown law our consent is required for this project for reasons including, but not limited to:

a) The cumulative impacts of Crown policy and industry on our people already exceed any reasonable threshold of impact on our rights, our way of life, our people, and our environment. No further impacts can be made without consent.

b) The Companies' goal is to open a gold mine. A recent study demonstrated the extensive impacts of metal mining contamination on rivers and floodplains across the world, with an estimated 23 million people believed to be affected by potentially dangerous concentrations of toxic waste.[4] Gold mines have high risk of impact to our well established and strong rights, including our rights under Treaty #3. Our waters are already contaminated with mercury. Therefore, we are at the high end of the consultation spectrum where consent is required.

c) The "taking up" clause and the "cede and surrender" clause which the Crown relies on for its asserted legal authority were never explained, translated, discussed, nor agreed to, during the negotiation of Treaty #3. This is reflected consistently in the multiple, independent, written records of the Treaty negotiations. To the contrary, Treaty Commissioner Simon Dawson informed the legislature that "As an inducement to the Indians to sign the Treaty, the commissioners pointed out to them that, along with the land reserves and money payments, they would forever have the use of their fisheries. The point was strongly insisted upon and it had great weight with the Indians, who for some years previously had persistently refused to enter into any Treaty" (NA RG 10 vol 3800 file 48542, 28 May 1888). The Ontario Court of Justice found that the Indigenous signatories to Treaty 3 were not advised and did not understand that the Crown could authorize land uses inconsistent with Harvesting Rights and pass legislation to extinguish or limit Harvesting rights. They expected that Canada would protect their harvesting rights away from the Dawson Route or CPR right or way, not limit, extinguish or ignore them.[5] No court of appeal, including the Supreme Court of Canada has overturned this finding of fact.

Beyond the requirements under Grassy Narrows Law, International Law, and Crown Law to obtain consent in these circumstances, there is the simple practical requirement for consent in today's business, investment, and political environment.

The business case for obtaining consent is reflected in the mining industry's own trade association policies through the International Council on Mining & Metals (ICMM) position statement on Indigenous Peoples and Mining, which states that "[t]he outcome

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[4] Phys.Org (September 21, 2023), "Global study reveals extensive impact of mining contamination on rivers and floodplains."

[5] Keewatin v. Minister of Natural Resources, 2011 ONSC 4801 (CanLII), at para 865, <https://canlii.ca/t/fmzc4#par865>, retrieved on 2023-09-23

is that Indigenous Peoples can give or withhold their consent to a project, through a process that strives to be consistent with their traditional decision-making processes while respecting internationally recognised human rights and is based on good faith negotiation."[6]

Even Barrick Gold, infamous for their violations of human rights internationally, stated in their $100M statement of claim against Red Lake Gold when addressing the need to for Grassy Narrows' consent that:

> Virtually all successful mining ventures in Canada require a strong and genuine working relationship with local communities, including First Nations. Without such a relationship, it can be extraordinarily difficult, if not impossible, to proceed with a mining venture beyond early stage exploration work and into development work (e.g., by constructing a working mine).
>
> Strong, genuine and reliable relationships with First Nations are built on mutual trust and respect. Any perceived or actual breach of that trust or respect can have devastating consequences for a mining venture or company, and these commercial and reputational consequences can extend well beyond any particular project or First Nation group.[7]

No large mine has opened in Canada for decades without Indigenous consent. It is simply too difficult and risky to carry out such an expensive and intensive project without all relevant First Nations on board.

As a First Nation living immediately downstream from this project, we will live with the consequences for many generations to come. It is our children who will drink the water, eat the fish, pick the wild rice, swim, and learn what it means to be *Asubpeeschoseewagong Anishinabek* on this river whose waters will carry the effluent from this gold mine if it is built. It is our people who will search in vain for moose and caribou to hunt on the landscape that has had its forests fragmented and degraded by access roads, clearcuts, seismic lines, pits, trenches, clearings, and mines. It is our people who will be impacted if the tailings dam fails. It is our people who will be poisoned if toxics leach into the water. It is our people whose fear and anxiety, already far to high and fatal due to the mercury crisis, will be heightened by the threat this mining project poses to our wellbeing.

We know, and everyone in Canada who has cared to learn our story knows, that decisions made and activities carried out upstream can have a devastating impact on us. The chlor-alkali plant in Dryden that discharged mercury into the Wabigoon River was 150 km upstream of our village. But the flow of the river does not obey any human boundaries. The distance did not stop the mercury from being carried downstream,

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[6] International Council on Mining & Metals (May 16, 2013), "Indigenous Peoples and Mining: Position Statement".
[7] Barrick Statement of Claim against Red Lake Gold, 2022/23, p. 20, 21.

bioaccumulating in the fish that we eat, destroying our livelihood, poisoning our people, and dramatically disrupting our way of life. More than 50 years after the discharge of mercury was ordered halted, our mercury crisis rages on. There is no end in sight to the contamination of our river and to the intergenerational impacts of mercury.

The correct standard for this project, which threatens to impact Grassy Narrows' future for many generations, is consent. Grassy Narrows has not given its consent. Grassy Narrows says 'no'.

Far from seeking consent, Ontario has approved numerous permits for the Great Bear Gold Project with no notice to Grassy Narrows

With respect to the Great Bear Gold Project, there has been a failure to inform, to consult meaningfully with ANA and to gain our consent, even though the ANA village site is the first community downstream from the project site. In spite of the infamous pre-existing impacts on the English River and Grassy Narrows from hydro damming, mercury pollution, and clearcut logging, and Grassy Narrows' well knowns concerns about mining exploration. The fact that Grassy Narrows is downstream of this project, potentially impacted, and likely concerned should be evident to any diligent person with access to Google.

Exploration permits for this project date back to January 2017, including permits for extensive exploration work, drilling, stripping of the land, and taking of water. The following permits were authorized without notice to Grassy Narrows and, for the most part, prior to any communications from either the Crown or the companies with our First Nation:

- January 6, 2017: PR-16-10995 – permit for mineral exploration
- April 11, 2019: PR-18-000295 – permit for mineral exploration
- November 22, 2019: PR-19-000264 – permit for mineral exploration
- November 27, 2019: PR-19-000227 – permit for mineral exploration
- July 16, 2020: PR20-000178 – permit for mineral exploration
- October 13, 2020: PR20-000276 – permit for mineral exploration
- July 13, 2021: PR-21-000190 – permit for mineral exploration
- October 4, 2021: PR-21-000258 – permit for mineral exploration
- August 15, 2022: 5115-CJ9QRR – permit to take water
- September 15, 2022: Permit 5115-CJ9QRR to take water

The failure to take the minimal step of giving notice to Grassy Narrows about any of the above permits is all the more shocking because while this extensive work was being done on the Great Bear Gold Project, Grassy Narrows was writing to Ontario and to the companies seeking to share information and initiate negotiations about protection for Grassy Narrows' lands, waters, and people. Grassy Narrows has written to Ontario repeatedly about land protection concerns for decades, and most recently in a long series of official letters dating back to 2018 requesting a government-to-government table to resolve Lands issues including mining.

The history of communications between Grassy Narrows, Great Bear Resources, Kinross and Ontario's Ministry of Mines demonstrates that none of these parties have demonstrated a genuine intention to meaningfully engage with Grassy Narrows. This summary is current to December 15, 2023:

- **February 25, 2020:** Having learned about Great Bear Resource's presence in the area, but unaware of the permit applications and authorizations, Grassy Narrows Chief and Council wrote to Great Bear Resources to notify the Company about ANA's mining concerns and to ask if Great Bear Resources had any proposed work that would put Grassy Narrows at risk and conflict with our laws. There was no response. Indeed, Great Bear Resources has never responded to Grassy Narrows' communications.

- **October 1, 2020:** Upon learning of Kinross's presence in the area, Grassy Narrows Chief and Council wrote to Kinross Gold Corp. with a request to meet and a list of questions about their work.

- **October 6, 2020:** Chief and Council wrote to Great Bear Resources.

- **October 7, 2020:** Chief and Council wrote to follow up with Kinross.

- **November 2, 2020:** Kinross responded to acknowledge our letter but did not provide any substantive response to our questions, make any mention of the Great Bear Project, nor accept our request to meet. We did not hear from Kinross again for almost two years.

- **December, 2021:** Kinross reached an agreement with Great Bear Resources.

- **August 29, 2022:** Kinross sent a letter of introduction to our Chief.

- **September 15, 2022:** Less than three weeks later, Kinross submitted an exploration permit to Ontario claiming to have consulted with Aboriginal communities.

- **October 4, 2022:** Grassy Narrows wrote again to Great Bear Resources.

- **October 6, 2022:** Grassy Narrows received its first notice of an application for an exploration permit related to this project from Ontario (PR-22-000284). Ontario gave Grassy Narrows only one month to provide comment on the application.

- **November 18, 2022:** With no capacity, and in the midst of the COVID-19 pandemic, Grassy Narrows wrote back to advise Ontario that we intended to respond but could not do so substantively within the time provided.

- **November 24, 2022:** MINES notified Grassy Narrows that Kinross's application (PR-22-000284) had been approved with the exception of 44 claims that were

being held pending further comment from Grassy Narrows but offering no capacity supports.

- **December 28, 2022:** MINES notified Grassy Narrows of seven mining lease applications and advised that MINES would proceed if it did not receive comments by February 26, 2023.

- **January 19, 2023:** MINES notified Grassy Narrows that it was considering granting the mining permit for the 44 claims that had been held, pending comments from Grassy Narrows by February 3, 2023. Again, no capacity supports were offered.

- **February 6, 2023:** Grassy Narrows wrote to MINES to reiterate the barriers to participation that had been communicated over many years; in the absence of addressing those barriers Grassy Narrows cannot engage or comment substantively to the permit applications.

- **February 14, 2023:** MINES gives Grassy Narrows until February 28, 2023 to respond with comments.

- **February 27, 2023:** Grassy Narrows official writes to MINES indicating that Grassy Narrows does want to comment but that further time is required to review the information, and that the company has yet to respond to the questions that ANA has sent them.

- **March 3, 2023:** Grassy Narrows sent a follow up letter to MINES regarding the seven proposed mining leases and Grassy Narrows' requests for a government-to-government negotiation table.

- **March 10, 2023:** MINES wrote to Grassy Narrows to ask for a copy of the questions posed to the companies in 2020.

- **March 20, 2023:** Grassy Narrows wrote to Great Bear and Kinross to request a meeting about the Great Bear Gold Project in early April and for an answer to the questions posed to the company in 2020.

- **March 21, 2023:** MINES followed up on its request for a copy of the questions posed to the companies in 2020.

- **March 31, 2023:** Grassy Narrows followed up with Great Bear Resources and Kinross to request a meeting in early April and to obtain answers to the questions posed in 2020.

- **April 12, 2023:** Grassy Narrows repeated its request for a meeting with MINES and answer to questions concerning Great Bear Resources and Kinross.

- **April 24, 2023:** Kinross finally responds to the request to meet.

- **June 22, 2023:** Kinross attended an introductory meeting with Grassy Narrows. The meeting was not a consultation on the project. Kinross representatives stated that MINES would be providing answers to the questions posed in 2020. Grassy Narrows raised serious concerns about the project, including capacity constraints and concerns about impacts.

- **June 27, 2023:** Kinross wrote to confirm that MINES would be providing answers to the questions posed in 2020. MINES did in fact provide a partial and incomplete response to the questions posed in 2020. MINES gives Grassy Narrows two weeks to provide comment on the 44 outstanding claims.

- **July 12, 2023:** MINES gives Grassy Narrows a further extension to July 27, 2023.

- **July 24, 2023:** Kinross wrote to invite Grassy Narrows to a meeting to learn about the project and to advise that it was setting up a Sharepoint site to share information about the project. The Sharepoint link was not provided. Kinross further advised that the federal impact assessment process had been initiated.

- **July 28, 2023:** MINES wrote to advise Grassy Narrows that Ontario will not provide capacity support for consultation and asked for comments on the 44 claims by August 10, 2023.

- **August 11, 2023:** MINES approves the mining exploration permit for the 44 claims.

- **August 12, 2023:** Kinross provided a copy of Great Bear industrial Sewage Works documentation. Grassy Narrows does not have capacity to analyze or respond to this technical document.

- **September 7, 2023:** Kinross provided a copy of the Great Bear Advanced Exploration Reclamation Strategy for comment. Grassy Narrows does not have capacity to analyze or respond to this technical document.

- **September 13, 2023:** Chief Turtle writes to the IAAC to advise that Grassy Narrows has learned that Kinross and Great Bear have initiated the interim assessment process. Grassy Narrows was not provided notice in accordance with its protocols and demanded that the process recommence in accordance with procedural requirements.

- **September 14, 2023:** Grassy Narrows sent a follow up inquiry to the IAAC.

- **September 15, 2023:** IAAC provided a two-week extension to respond to Kinross's Initial Project Description.

- **September 20, 2023:** Grassy Narrows responded to IAAC by reiterating that the IAAC had not complied with procedural requirements for the pre-planning stage and repeating its demand to recommence the process.

- **September 26, 2023:** Kinross wrote to Grassy Narrows to request a meeting to discuss capacity funding.

- **September 28, 2023:** Kinross wrote to Grassy Narrows to provide two technical documents for comment (AEX Industrial Sewage Application and Aquatics Monitoring Plan; AEX ECA Air and Noise, Emissions Modelling and Dust Management). Kinross offered to meet and provide capacity support.

- **October 4, 2023:** Kinross wrote to Grassy Narrows about a draft permit to take water application.

- **October 6, 2023:** Grassy Narrows Lands Protection Team was given access to the Great Bear Sharepoint site, with extensive technical documents that were not shared previously. IAAC also provided its Summary of Issues for comment and offered to meet.

- **October 20, 2023:** Kinross provided its groundwater monitoring plan for the project and its preliminary mine rock management and monitoring plan.

- **November 3, 2023:** Kinross provided its draft closure plan for comment.

- **November 10, 2023:** Kinross provided its Detailed Project Description for comment. Grassy Narrows met with Kinross and IAAC. Grassy Narrows asked Kinross to pause the impact assessment process until an engagement protocol could be put in place along with capacity supports.

- **November 14, 2023:** Ontario wrote to Grassy Narrows with belated notice that in or around April 2023 it had delegated the “procedural” aspects of consultation on certain matters relating to the Great Bear Gold Project to Great Bear Resources. Ontario’s letter to this effect dated April 6, 2023 was sent to the Chief and not pursuant to Grassy Narrows consultation protocols. Ontario takes the position that the duty to consult is at the “low end” of the spectrum.”

- **November 20, 2023:** Kinross wrote to Grassy Narrows concerning participation in a Stage 3 Archaeological Assessment.

- **December 15, 2023:** Kinross meets with Grassy Narrows and refuses to pause its activities for any length of time to accommodate Grassy Narrows’ unique circumstances.

As the foregoing chronology demonstrates, the companies and Crown left Grassy Narrows in the dark for years about the Great Bear Gold Project. Since September 2023, Grassy Narrows has been flooded with technical documents, belated offers of capacity support, none of which has flowed, and impossible deadlines for engagement.

Kinross spent billions to buy the project and has clearly already decided to build a gold mine regardless of Grassy Narrows' wishes. Failing to engage with Grassy Narrows on this project for more than four and half years was not an error of omission, but rather a deliberate decision not to engage, and to withhold, information about this project from Grassy Narrows. The fact that other First Nations, who are located far upstream of the project, but who have a reputation for welcoming mining activity, were engaged far earlier (as early as 2017), raises the question of whether a decision was made not to engage Grassy Narrows because of Grassy Narrows' well-known concerns about mining exploration.

It took Ontario and the companies nearly three and half years to provide initial responses to questions posed by Grassy Narrows to Great Bear Resources in February of 2020. And yet, within 60 days of providing those initial responses, without providing any capacity support to review them, and without addressing Grassy Narrows' many other barriers and fundamental issues, the Ministry approved further work on the project in spite of Grassy Narrows' request for capacity support and time.

Even Indigenous Services Canada flagged concern about Kinross's level of engagement to date with Grassy Narrows in its comment to the IAAC:

> The perception of contamination to the land, water, traditional food sources and Indigenous Peoples by industrial development may be a serious concern for the identified Indigenous Nations, especially for Grassy Narrows ... During the late 1990s and early 1970s, the English-Wabigoon River system was contaminated with inorganic mercury from a pulp mill located upstream in Dryden, Ontario. This discharge of inorganic mercury contaminated their water and traditional food sources (i.e. fish) and lead to cases of mercury poisoning and intergenerational challenges. The proponent, Kinross Gold Corporation, started engaging with Grassy Narrows First Nation in 2022, whereas their engagements with Wabuskang First Nation and Lac Seul First Nation began in 2017. Due to Grassy Narrows First Nation's negative and detrimental experience with industrial development, it is recommended that more engagement take place. The Indigenous Nations need to gain a greater understanding of the contaminants that may be released into the environment. They should be provided an opportunity to express concerns or uncertainties about potential exposure to chemicals used in the gold mining process, such as cyanide and heavy metals.[8]

Given this history, including the Crown's outstanding obligations to Grassy Narrows, it is highly inappropriate for Ontario to delegate any aspect of consultation to Great Bear

[8] Indigenous Services Canada, Federal Authority Advice Record – Great Bear Gold Project, p. 5.

Resources. Grassy Narrows does not agree that the Crown can delegate its duty to consult with a treaty nation to a third party. Nor does Grassy Narrows agree, given Grassy Narrows' strong rights, existing cumulative impacts, and the companies' intention to open large gold mines upstream from the community, that the duty is at the low end of the spectrum.

The IAAC has failed to consult as required with Grassy Narrows

According to the attached IAAC document summarizing the impact assessment process, the process begins with Phase 0 (Pre-Planning), a phase that requires engagement by both the Proponent and the Agency with Indigenous groups. None of the required pre-planning steps with respect to Grassy Narrows have been complied with.

The Proponent was required to engage Grassy Narrows to present the project, learn Grassy Narrows' views, including potential effects and how we wish to be engaged and to incorporate this information into the Initial Project Description. Grassy Narrows has expressed, both in writing and in meetings on June 22, 2023, and November 10, 2023 with representatives from Kinross, our significant concerns about potential impacts upon our community, which are not reflected in the Initial Project Description. Grassy Narrows also provided Kinross with our communications protocol, which includes communication with the Lands Protection Team. That protocol was not included in the Initial Project Description.

The Agency was aware, based on the Initial Project Description, that Grassy Narrows may be affected by the project. In the pre-planning phase, the Agency was required to inform Grassy Narrows about the impact assessment process to support us in understanding how we can participate. The Agency was obligated to learn Grassy Narrows' views and context, including potential effects and how we wish to be engaged. The Agency did not comply with these requirements of the pre-planning stage.

Crown and Company efforts to engage Grassy Narrows since 2022 have been performative and do not meet the standards required for engagement

The decisions to open our land to mineral staking and exploration, to carry out extensive exploration, and to build a gold mine, have already been made, and billions of dollars spent towards that end, all behind Grassy Narrows' back. In this context, it is hard to believe that requests for belated input at this late stage are sincere. Clearly, the companies and Ontario have already decided to build a gold mine if investors will support it and we are an afterthought.

Kinross is now flooding us with technical documents created by highly paid experts, while knowing that we have no capacity support to engage experts to review the technical documents, nor to engage our community about them. When we sought a pause in the process to gain capacity support, retain experts, complete a process agreement, and engage in our governance process, we are refused. In this context it is hard to believe that anything Grassy Narrows says will be taken seriously and will have

the potential to meaningfully influence the major decisions that have been made.

We live downstream, our established rights and our health are at stake, and we are concerned. Under Crown law the Crown clearly had a duty to meaningfully consult and meaningfully accommodate us at every stage of this project, including during the strategic level upstream decisions (such as land use planning, land use designation, tenure, etc.) as well as the more minor decisions which flow from them (such as specific exploration permits, water takings, leases, etc.). As a First Nation whose Treaty rights and health have already been severely impacted by the cumulative impacts of industry and government decisions our consent is required. Under our inherent rights, Anishaabe law, and International law our consent is also required.

Ontario has failed for many years in their duty to consult on this project and we call for an immediate freeze on all project activities until sufficient capacity support has been provided to allow Grassy Narrows to complete an ethno-historical report, land use and occupancy study, archaeological assessment of the area and study into cumulative impacts, and until we have been meaningfully engaged and our free, prior and informed consent obtained.

V. Adverse Impacts: ANA Preliminary Specific Concerns

As Asubpeeschoseewagong Anishinabek we have a holistic, interconnected, and spiritual relationship to our sacred landscape. We are the land and the land is us. What happens to the land happens to us and to our children for many generations.

This is an area where our ancestors have practiced, and we currently practice our Anishinaabe way of life; a way of life that relies on a healthy environment and is central to our identity, health, wellness, and livelihood. This area is part of the whole that forms the sacred landscape which gives us life and which we are in relationship within every aspect of our lives, hearts, spirits, and dreams.

While some areas may appear to an outside observer to be on the periphery of our Territory, this is a grave misperception. All our territory is core to our way of life and connection to the land. For example, we have always traveled to hunt. A moose that is harvested a few days' travel from our village site will still feed a family for many weeks and be shared with Elders, relatives, and friends. The dramatic decline in the moose population near our village means that the area around Red Lake is even more critical to our moose hunt. These areas are deeply embedded in our memories, our lives, and our hearts. We are strongly tied to this land.

We know that MINES, IAAC and the companies do not respect this relationship and seek to reduce it to a series of finite, bounded sites of 'values'. Our concerns are disregarded unless they are expressed in extremely specific and reductionist terms that ties adverse impacts to particular pieces of the land that are viewed in isolation from the whole. MINES and IAAC want us to engage in an exercise of, for example, identifying a specific hole that is a specific distance from a specific cabin and thus should be moved a bit to the west. Or, this type of machinery produces noise that will make hunting

difficult in this specific blind during this month, so please do not use it in October. Or, this wastewater discharge site is next to that fishing hole, so please put it a bit further downstream.

This approach fails to see the forest for the trees. What use is a remote cabin retreat without the serenity of the surrounding area from which we draw our physical and spiritual sustenance? How can we use it for healing and to teach our children their way of life while over the ridge heavy machinery encroaches ever closer and non-native users buzz around us in ATVs and motorboats? What use is a hunting site if the ancestral moose trails have been destroyed, there is no winter refuge, and unmanaged access routes have allowed non-native hunters to deplete the population precipitously? What use is a fishing spot if the fish has absorbed a dangerous burden of toxins from its food sources everywhere it swims throughout its life, including those carried from upstream? How can we carry out our ceremonies when the spirits who live in the rocks have been disturbed by drilling and blasting. What point is there in commenting on a small drill program in isolation, when everyone knows that your plan is to open a huge open pit and underground gold mine?

In spite of this fundamental difference in world view, the barriers, unresolved fundamental issues, and concerns noted above, we know that MINES, the Companies and IAAC will try to proceed with this project unless we raise specific concerns. In the absence of the necessary supports, Grassy Narrows cannot substantively respond to the technical information provided to date about the Great Bear Gold Project. We provide these preliminary concerns under protest and based upon the limited research we can undertake, which should not be taken as a complete overview of our concerns.

Industrial disturbances will release even more mercury into our ecosystem and further impair our Treaty rights.

The Great Bear Gold Project will require industrial mining exploration, access roads, clearing of trees, modification to water levels and other activity within the English River watershed. The waters from those areas flow into the English River in short order via the Chukuni River. They flow into the areas where we fish, boat, camp, and practice our way of life, and directly past our community.

The scientific literature establishes that industrial activity in the boreal forest releases mercury into local lakes and rivers.

Building machine tracks, trails, and roads is a common part of mining exploration and mine development work. However, simply driving heavy machinery through the boreal forest can contribute to the release of mercury. In one documented instance, a temporary machine track was inadvertently placed across a small, long-term reference catchment. This disturbance increased outputs of MeHg by a factor of over five for more than a decade.[9]

[9] J. Munthe and H. Hultberg (2004), “Mercury and Methylmercury in Runoff from a Forested Catchment -

Clearing the forest has also been found to release mercury into local water bodies where it bioaccumulates in fish to dangerous levels. The foremost study on this subject was completed in Quebec by Dr. Carignan. The study found that 100% of lakes with clearcut watersheds had walleye and pike with mercury levels that exceeded the World Health Organization advisory limit for human consumption. Meanwhile, only 18% of unlogged lakes, and only one burned lake exceeded the limit.[10]

In the only field study on the topic done by Ontario of which we are aware, there was roughly a doubling of mercury exported from a watershed near Thunder Bay via a stream after logging activity. This release of mercury occurred even though all the required regulatory measures, including those with respect to riparian buffers, were followed.

Despite these findings, Ontario does no downstream monitoring of actual industrial operations to monitor or assess mercury impacts.[11]

Both the Carignan and Ontario studies concluded that that the increase in mercury export is largely due to changes in local watershed level hydrology from the loss of tree cover. Mining exploration and mining activity also involve the clearing of trees from the land and risk similar impacts to local hydrology (e.g., Lower evapotranspiration rates, changes to snow and rain interception, etc.) and therefore leads to similar increases in mercury export to local logging.

Mining exploration and mining activities often have the effect of artificially changing water levels. This can happen through water takings, water discharges, dewatering of areas, and other industrial processes. Studies have found that the artificial lowering and raising of water levels in boreal water bodies often causes the release of mercury. Monitoring studies of the De Beers Victor Diamond Mine have found increased levels of mercury in fish in water bodies downstream.

For a more detailed discussion of the science on mercury and boreal forest clearing please refer to our enclosed evidentiary record filed with the Divisional Court in our 2015 Judicial Review Application, and the associated expert reports by Dr. Carignan, Dr. Podur, Dr. Mergler, and Dr. Willow.

Mining exploration and mining activities also risk altering water quality in ways that increase the methylation of existing mercury in downstream watersheds. This can be through the addition of sulfate, change in acidity, water colour, temperature, and other parameters. In Grassy Narrows, where mercury levels are already elevated by emissions from Dryden, any increase in net methylation is intolerable.

Concentrations, Fluxes, and Their Response to Manipulations", Vol. 4 at 607-618.

[10] Globe and Mail (March 12, 2001), "Mercury levels tied to logging practices."

[11] Toronto Star (September 14, 2016), "Ontario environment officials concerned that clear-cut logging releases mercury."

The Crown still has no remediation plan for the mercury that remains in the English-Wabigoon River system from discharges in the 1960s and 1970s. Mercury released into the watershed or methylated as a result of mining activity, especially dissolved mercury, will eventually find its way into the English River and further raise the mercury levels in fish and poison our people, exacerbating and prolonging our mercury crisis.

This is not acceptable. We cannot tolerate any additional mercury.

New releases of mercury or increased methylation will unjustifiably impair Grassy Narrows' treaty rights, health and wellbeing, and are discriminatory. This is an intolerable outcome for our treaty partner to impose on us against our will in the absence of consent.

Adverse impacts on Grassy Narrows' Treaty Land Entitlement Claim.

Grassy Narrows has an active Treaty Land Entitlement Claim (TLE) that has been accepted by the Crown and is under negotiation for resolution. Part of the resolution of the claim will include an addition to Grassy Narrows' reserve lands, and compensation for lost use. Grassy Narrows is currently engaged in a process to select its additional reserve lands. All the area around Grassy Narrows is currently potential reserve lands additions under consideration.

The Crown has asserted that lands which have encumbrances, such as mining claims and leases, will be more challenging to designate as additional reserve lands. This means that your mining claims and leases adversely impact our ability to select reserve land additions and are an impediment to the successful resolution of our TLE.

Further, lands which have been impacted by mining exploration such as cutting lines, pitting, trenching, stripping, and drilling, decline in ecological health, experience a degradation of their intactness, and therefore become less suitable as additional reserve lands.

Lands which are downstream of industrial projects also have their value, and suitability as additional reserve lands degraded. Lands along the shores of the English River and its tributaries have been core to our people for countless generations and are prime candidates for our reserve lands additions. If you were selecting lands for your home, your cottage, or your reserve, would you want a huge industrial gold mine to be opened up stream of them? No one would.

Over the last few decades vast parts of our Territory have been encumbered and degraded through industrial actions imposed on Grassy Narrows and upstream of Grassy Narrows. This has severely restricted the available suitable additional reserve lands.

Grassy Narrows has been clear that there should be no new encumbrances on our area, and no new degradation to our area (including from upstream), as this would unfairly further reduce the available suitable additional reserve lands (in addition to other impacts outlined elsewhere). This would impair the ability to correct the injustice

that was done to us by having been denied a fairly sized reserve for over a century.

On-site Impacts

According to the Ontario Auditor General "Mining activities can have a significant impact on the surrounding environment. They can affect groundwater and surface water, aquatic life, soil, vegetation, wildlife and air quality. The changes mining makes to the environment can have serious implications for public safety and health."[12]

While we are unable to meaningfully review the thousands of pages of technical documents that have been sent to us, it appears that the on-site impacts of the project will be extreme.

Large parts of the site will be deforested for decades at least. Three open pit mines will be created along with three underground mines, large tailings holding areas will be created, and a large ore processing facility will be built.

The project area will effectively be completely removed for the foreseeable future from the land base that is accessible to us to live our way of life and to practice our rights.

It also appears that water bodies including lakes and creeks on the site will be at extremely risk because they will be located immediately adjacent to and downstream / downgradient of heavy industrial operations including mining, ore processing, and tailings storage. We are concerned that the on-site water bodies will be damaged and we know that once they are damaged it can be hundreds, if not thousands of years before they are safe again.

Downstream / wind / migration impacts

We know far too well that industry can have impacts far beyond the industrial site itself. The chlor-alkali plant in Dryden that discharged mercury into the Wabigoon River was 150 km upstream of our village. The distance did not stop the mercury from being carried downstream, bioaccumulating in the fish that we eat, destroying our livelihood, poisoning our people, and dramatically disrupting our way of life. More than 50 years after the discharge of mercury was ordered halted, our mercury crisis rages on.

We fear that the impacts from the Great Bear Gold Project site will extend far beyond the mine site itself, further disrupting the balance of the environment that the Creator has established for us and which gives us what we need for a good life.

Impacts from industrial sites can propagate off site in many far-reaching ways and we cannot list them all here. Pollutants can be carried hundreds of kilometers downstream. Water quality changes that may appear innocuous in themselves, and which are not regulated, can alter the cycling of pollutants, nutrients, and other aquatic processes in damaging ways. For example, dissolved organic carbon (DOC), sulphate, and other

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[12] Auditor General of Ontario (2015), "2015 Annual Report: chapter 3.11: Mines and Minerals Program."

substances are a naturally occurring part of aquatic ecosystems and are not considered toxic. However, they known to play a strong role in mercury cycling affecting mercury speciation, solubility, mobility, and toxicity in the aquatic environment. Alteration of water chemistry can have serious consequences.

The wind can carry pollutants and other chemicals long distances before they are breathed by our people and deposited on the ground and in the water. For example, PCBs generated in the industrial centers can be deposited in the arctic and bioaccumulate to levels that are dangerous for subsistence consumers. Acid rain created by the Sudbury mines killed hundreds of lakes for scores of kilometers downstream and the area has yet to fully recover many decades later. We fear that the operation of the mine, including heavy machinery, blasting, and ore processing, will create airborne pollution and changes that can be carried long distances throughout our Territory and beyond, and will compound the existing impacts of other sources of airborne pollution including the Dryden and Kenora mills, other mines, and municipalities.

Off-site impacts can also happen through animals, fish, and birds and other forms of life that travel. If moose can no long find winter refuge on the project site, or if roads, trails and clearings created associated with the project increase access and success for non-native hunters and predators, then fewer moose will be available to hunt. That impact will not be restricted to the boundary of the project site but will extend as far as a moose would range from the project site, or conversely the area from which moose would range into the project site and face predation, hunting, and lack of suitable habitat.

Other animals like wolverine, wolf, bear and cougar travel even further distances. Impacts to their populations, their travel routes, and their hunting success in turn influence the populations of the moose, caribou, rabbits, and other animals that are important to us.

We know that walleye travel large distances throughout their lifespan, especially when they are spawning. Throughout their travels they breath the water, eat the local food sources, and are exposed to local toxins. Many of these toxins stay in the walleye for a very long time and accumulate throughout their lifespan, which can be decades long. As a result, walleye that are not at the project site, nor even within a downstream area impacted by the project site, may migrate into impacted areas and accumulate toxins which we are exposed to when we eat them. In turn, otters, eagles, pelicans and other beings eat the fish and then travel further distances, carrying the toxins with them.

Landscape impacts (e.g. intact forests)

Beyond the on-site and off-site impacts, the project will have landscape-level impacts. Looking at each site in isolation fails to see that the landscape as a whole and its many processes and functions that sustain life. The many parts of the landscape work together, each playing their part. If one is disturbed, then all are disturbed. If too many are disturbed, then the landscape's ability to sustain our good Anishinaabe way of life can be severely undermined.

For example, intact forest landscapes “are critical for stabilizing terrestrial carbon storage, harboring biodiversity, regulating hydrological regimes, and providing other ecosystem functions.”[13] Many species rely on intact forests. For example, the Government of Canada believes that once a landscape exceeds 35% disturbance it crosses a threshold beyond which the landscape becomes unable to reliably sustain a population of woodland caribou and extirpation becomes likely.

Indeed, this is what we experienced in the southern part our Territory where no single project alone caused the local extinction of caribou, but rather it was a death of a thousand cuts as more and more impacts over time made the landscape unable to sustain caribou. We know that the landscape in the range of the Sydney Caribou herd already exceeds this disturbance threshold and is need of recovery. The Gold Bear Gold project will add further disturbance, making the local extinction of caribou even more likely.

Caribou are a sentinel species whose fate is an indicator of the health of the landscape and a range of species and values that rely on intact forests.

Although they behave very differently, moose also rely on a healthy landscape. When there is too much industry, the dense mature conifer forests that moose require for winter shelter become too small, fragmented, and scattered to support moose. When too may roads are put in, outside hunters gain easier access, and when clearings are made those hunters have higher kill rates. When the forest becomes too disturbed, the deer move in, and with them comes sicknesses that hurt the moose.

Again, no one project alone can be blamed for the loss of our moose. But taken together the many industrial changes to our landscape have led to the near elimination of our once healthy moose population.

In spite of our many requests, Ontario refuses to work with us to plan at a landscape level to ensure that our health and way of life can be maintained and recovered. Instead, Ontario allows more and more disturbances to compound each other, further and further degrading the landscape that we rely on. The Great Bear Gold project will further undermine the forest landscape.

Spiritual Impacts

Spiritual impacts are a sensitive topic because it involves some of our deepest and most personal aspects of our selves. It is also sensitive and difficult to share because, not long ago, our spiritual practices were outlawed and we suffered persecution for them. To this day our spirituality is mis-represented, misunderstood, and disrespected by government and industry. For these reasons, this information is only the tip of the iceberg pointing to the presence of a deep and far larger concern.

Our people believe that may aspects of a human being are important to health,

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[13] Intact Forests, “Intact Forest Landscapes”.

wellness, and the good way of life. A critical aspect is spirituality. The landscape and our way of life are connected and sacred. We have a spiritual relationship of reciprocity with the landscape that requires us to take care of the land so that the land can continue to provide for us. This is a sacred responsibility given to us by the Creator.

Our sacred relationship and responsibility is with the landscape as a whole, and with all of its parts. It is not restricted to a finite set of point values such as ceremony sites, burial sites, and medicine patches. Although those are important, they are focal points in a far broader and all-encompassing spiritual fabric. Our spirituality emanates from, and is infused by the entire landscape. It is practiced throughout the landscape and supported by the entire landscape.

Without the spiritual landscape intact, the spiritual sites are desecrated and cannot function. The medicines do not work if they grow in a clearcut, or if herbicides and pollution have drifted on the wind towards them. How can the ceremony summon a spirit who has fled from the noise of machinery and blasting? How can an offering be made to a spirit-being whose trails and territory have been destroyed? How can the prayer for the success of our hunters be answered when our industrially transformed landscape is nearly empty of moose? How can we fulfill our responsibilities to our clan animals Atik (woodland caribou) and Numeh (sturgeon) when they are extirpated or at risk in much of our Territory? How can we fulfill our duties and ceremonies to the water when it has been polluted, dammed, and an invisible remains within it? How can we identify our grave sites when our people have been laid to rest throughout this land for countless generations?

In addition to our broader sacred relationship with the landscape, there are spirit beings who inhabit the landscape and who have relationships with the Anishinaabe and important roles in the landscape. We have duties to carry out in our relationships with these beings and if we do not fulfill our duties there can be negative repercussions. Some of these important spirit beings live in the rocks. When the are disturbed, hammered, drilled, bulldozed, blasted, or extracted, these spirit beings are impacted, and the spiritual realm is disrupted.

Past government policies and industrial activities have already deeply disrupted our spirituality and the spiritual dimensions of our way of life and wellness. If the Great Bear gold mine, and associated work, goes ahead, then it will have a further intense spiritual impact.

Spiritual impacts lead to bad things for our people. When we cannot fulfill our sacred duties it causes feelings of sadness, anxiety, loss of identity, loss of meaning, depression, and helplessness. When the spiritual realm and relationships are disrupted, it can cause fear, accidents, discord, conflict, bad harvest, unsuccessful hunts, drought, floods, hunger, ill health, and other terrible things.

We understand that the government and industry have a different way of seeing things, and that you see the natural world as separate from you, inanimate, spiritless, and there for the taking. We know that you always tell us that you know best and that the industrial

activities you plan will only cause minor, contained, short term impacts and that we need not worry. And yet, we are suffering from all the terrible consequences that our ancestors warned us would come from your industry and your violation of our spiritual landscape including illness, poverty, hunger, depression, suicide, and conflict.

Our way of understanding the world deserves respect. It is not right for you to force your worldview and all its impacts on us while we suffer the consequences.

Long-term risks – Tailings

We are particularly and deeply concerned by the long-term nature of the changes that you are making to the landscape and the risks that you are creating.

On August 13, 1970, a few months after closing the fisheries due to mercury pollution, the Ontario Minister of the Environment, George Kerr, declared that the Wabigoon River would recover on its own, without a cleanup or intervention. He said it would happen naturally in 12 weeks.[14] More than five decades later, our walleye in the Wabigoon River remain the most mercury contaminated in all of Ontario and it is unsafe to eat even one meal. Recent studies indicate that it will take many hundreds, if not thousands, of years for river sediment to recover on its own. Many sites are not recovering at all, and some are getting worse.

Some of the long-term risks that you are proposing to create include the creation of huge piles of waste rock that contains acid, heavy metals, the creation of new lakes in former open pit mines and tunnelling deep underground. These activities create long-term risks of leaching, groundwater contamination, dam failure, cave ins and falls, among many other things. We know that the impacts of industry can last many generations and for thousands of years.

And yet, our Treaty is only 150 years old. In that time the Crown has shown little ability to plan for the long term in a way that is not disastrous for us. How can we believe that the risks that you are creating will be safely taken care of for longer than Canada has existed as country, for longer than the time that Europeans have been in contact with us? How can we know that Canada, Ontario, Kinross, or Great Bear Resources will even exist in the timeframe that these risks will exist, let alone fulfil your responsibilities to take care of these risks in a way that you never have before?

You say that you will contain, monitor, and prevent these risks from impacting us, our water, and our landscape. But Ontario's own Auditor General has repeatedly found a failure to effectively remediate and monitor mining risks (see the section on failure to regulate below). Senior officials in the provincial government have noted the urgent and dangerous gaps in Ontario's regulatory ability to ensure the safety of tailings dams. You cannot safely carry out these duties now. Who will maintain the tailings dams in 100

[14] The Guardian (October 16, 2018), "The Warrior Society rises: how a mercury spill in Canada inspired a movement."

years? Who will monitor in 200 years?

We, the people living downstream, do not accept these risks.

Impacts to relationship with the Crown

The Great Bear Gold project is a massive one, with great risks to Grassy Narrows and that can have a major impact on many aspects of Grassy Narrows' relationship with the Crown including our Treaty, the honour of the Crown, fiduciary duties, outstanding obligations, unmet duties, and reconciliation.

Yet, the Crown refuses to come to the table with us about the major issues from which all these problems flows. At the same time, Ontario is attempting to delegate nearly all aspects of our relationship with the Crown to a gold mining company that is not party to our Treaty and that is primarily accountable to creating profits for its shareholders. A gold mining company has no ability to address our important issues with the Crown. We do not accept a gold mining company stepping into the shoes of our Treaty partner.

Adding insult to injury, Ontario has informed the company that the duty to consult on this project is at the low end of the spectrum. This is incorrect. For many reasons, even under Crown law, we are at the high end of the spectrum where consent is required. The reasons include but are not limited to the significant potential adverse impacts of the proposed project on our rights and health, the strength of our rights, the cumulative impacts of past industry, the outstanding Crown obligations and unmet duties towards us, the honour of the Crown, and fiduciary duties.

The failures of the Crown have led to a situation where we have been notified of this project only after the land was designated as "general use" and open to mineral exploration, after cumulative impacts of industry had been allowed to severely impact our rights and our health, after mining claims to the land were registered, after five years of exploration work had taken place, after over a billion dollars had been spent to purchase the property, and after the company had decided to open up a huge gold mine here.

The Great Bear Gold project is a runaway train, and we have no meaningful opportunity to shape decisions that will forever impact our people and our land. These decisions include: determining what parts of the landscape should be protected and what should be exploited; the threshold for industrial impacts that can occur before our rights are infringed and our health is harmed; the process for making decisions among Treaty partners; the role of third parties seeking to profit in the Treaty relationship; how to repair harms created in the past but impacting the present; how to prevent future harms; how to reconcile the relationship between the Crown and Grassy Narrows.

The Crown acts as though Grassy Narrows has no say in these decisions. The Crown seems to think that we should accept that a massive gold mine is a foregone conclusion and we should only have a say in things like where the effluent pipe discharges, where the tailings piles are located, and where the processing plant should be sited. We disagree.

This project, the failure of the relationship with the Crown which has allowed the project to become so advanced without our involvement and consent, is having, and threatens to have further major impacts to our relationship with the Crown. Rather than taking a minimal and reductionist view of the minimum that the Crown can do in this situation, a robust understanding of the duties is required, as well as an appreciation for the unique circumstances and history of Grassy Narrows. Only involvement of senior representatives of the Crown can resolve this problem.

Federally Regulated Impacts

Federal involvement is required because of the numerous areas of claimed federal jurisdiction that will be affected by the Great Bear Gold project, including the completion of a Federal Impact Assessment.

Some, but not all, of these areas of claimed federal authority are listed here:

Species at Risk: The Federal Crown claims authority within the Constitutional division of powers over Species at Risk. Although we have not been able to carry out a thorough assessment due to the lack of capacity supports, the project site has a strong potential to impact the following species at risk:

- Woodland Caribou – the project site is within the range of the Sydney Caribou Herd. The range of the Sydney Caribou Herd is currently approximately 64% disturbed (likely higher due to recent fires in Woodland Caribou Provincial Park). This amount of disturbance exceeds the threshold above which the range becomes unlikely to be able to support a viable caribou population. The range is in need of recovery to lower the level of disturbance and therefore the entire range is considered critical habitat. The project will add disturbance, further degrading the ability of the range to sustain caribou and increasing the likelihood that Woodland Caribou, a threatened species, will be extirpated from this area. Caribou is an important clan animal for Grassy Narrows.

  It should be noted that while Ontario does have a *Species at Risk Act*, it has exempted mining and logging from the applicability of that Act. The provincial government cannot be counted on to ensure that the Great Bear Gold project proceeds in a manner that protects species at risk.

- Wolverine – Wolverine play an important and unique role in our ecosystem and in the balance of life. The company has indicated that wolverine have been observed on the project site using trail cameras. Direct observation of wolverines is a rare. Wolverine avoid humans and human impacted areas. The project is almost certain to permanently displace the wolverine that have been observed at the site and to destroy any wolverine dens, trails, habitat, and food sources that are on the site.

  The Committee on the Status of Endangered Wildlife in Canada (“COSEWIC”) reports that wolverines prefer ecologically intact areas and avoid disturbance.

According to COSEWIC "[a] study of the cumulative effects of developments on Arctic wildlife (Johnson et al. 2005) found that mines and other major developments had the largest negative effect on species occurrence, followed by exploration activities, and outfitter camps."[15]

Due to past degradation of southern habitats, wolverine left Grassy Narrows' area. However, our success in stopping logging has resulted in the beginning of a return of wolverine. Grassy Narrows is now near the southern edge of the currently occupied range of wolverine. If the project goes ahead, wolverine will leave our area and may not come back, further disrupting the balance of the landscape.

- Sturgeon – Sturgeon are an important clan animal in Grassy Narrows an important food source for the Anishinaabe of the Treaty 3 area. The damming of the English River has had a big impact on sturgeon. A small and delicate population remains in the river, which we are trying to protect and recover. Sturgeon live for many years, are sensitive to industrial disturbances, and can accumulate large amounts of toxins in their bodies.

There are many other species at risk that may be affected by the Great Bear Gold project, including bats, birds, turtles, Eastern Cougar, American Badger, and others. Each have a role to play in the web of life.

Fisheries: The Federal Government claims jurisdiction over inland fisheries, the prevention of harm to fish from pollution, and the protection of their habitat.

While the Federal Government has cooperative agreements with Ontario for licensing of fisheries the Federal Government maintains jurisdiction and responsibility for prevention of harm and protection of fish habitat.

Under Crown law, even the construction of a small water crossing can trigger the need to apply to the Department of Fisheries and Oceans for permits. In contrast, Ontario does not require a provincial impact assessment before a mine is opened.

We are a river people and fish have always played an extremely important role in our way of life, our sustenance, and our livelihood.

The companies propose to take water from our river system, use it in the industrial gold extraction process, and then return it to our river. The companies propose to create three open pit mines, three underground mines, store large amounts of waste rock and operate an industrial ore processing facility, all in close proximity to water bodies and streams that flow into our river system. Finally, the companies propose to create three new lakes in the empty open pits created by gold mine, and to allow water to flow out of those pits and into other local water bodies. All these activities, and others, put our fish

[15] Government of Canada, "Wolverine (Gulo gulo): COSEWIC assessment and status report 2014" (date modified: January 6, 2015).

at risk.

The Crown has failed to protect our fish for many decades from the impacts of mercury and this has had grave consequences for the rights, health and wellbeing of our people. Given the Crown's failure, and its ongoing impacts, all levels of the Crown should be diligent and alert in carrying out their duty to protect our fish from further harm.

Indigenous Peoples: The Federal Government claims jurisdiction over Indigenous Peoples and the lands reserved for them. This jurisdiction includes claimed authority over our health, culture, and wellbeing, responsibility for environmental contaminants and their impacts on Indigenous traditional foods and on the health of Indigenous Peoples.

The Great Bear Gold project has potential to impact Grassy Narrows' relationship with the Crown, the safety of our traditional foods, and our health, culture, and wellbeing. The project also has the potential to impact waters that flow into and through our reserve and which can impact our reserve.

Due to the Crown's longstanding and ongoing failures to meet its duties to Grassy Narrows, all levels of the Crown should be diligent and alert in carrying out their duty to protect us, our health, our traditional foods, and our further harm.

There are further areas of Federal claimed authority that likely apply here as well and that are at risk in this project, including but not limited to migratory birds, transboundary waters, transboundary air pollutants, international laws and instruments.

Due to the many important areas of claimed Federal authority that are at serious risk in this project, it is essential that a robust and comprehensive Federal Impact Assessment is carried out.

Grassy Narrows seeks to engage with the Federal Government and our consent is required to the form that the Impact Assessment will take.

Site-specific parameters and guidance levels needed

In its Initial Project Description, Kinross states that water, effluent, tailings leachate, and other substances will be tested and will be released back into the environment after they meet guideline levels. However, the Initial Project Description does not identify the guideline levels that will be used. Guideline levels are a very important and complex topic that must be explored in far more detail. Our discussion here is intended to illuminate that there is a serious problem.

Although there are many substances of concern here, we are most familiar with mercury and so we will use it as an example.

There are many guidelines that we have seen applied upstream of our community for allowable mercury levels. Some of these guidelines are wildly inappropriate, but all of them are insufficient.

According to the Government of Canada "(m)ercury is a toxic element and serves no beneficial physiological function in man; a maximum acceptable concentration of 0.001 mg/L (1 µ g/L) in drinking water has therefore been established."[16]

A concentration of 0.001 mg/L corresponds to **1000 ng/L** (nanograms per liter), which is the unit we will use here.

One might think that if the mercury level is good for drinking, then it would be fine to put in our river, but that is not the case. Provincial Water Quality Objectives ("PWQO") are numerical and narrative criteria that serve as chemical and physical indicators representing a satisfactory level for surface waters (i.e. lakes and rivers) and, where it discharges to the surface, the ground water of the Province.

The PWQO guideline level for mercury in surface water is **200 ng/L.**

The PWQO guideline has historically been applied to mercury contaminated groundwater seeping out of the banks of the Wabigoon River next to the Dryden mill to claim that it is safe. However, this too, is irresponsible.

The Canadian Council for Ministers of the Environment (CCME) provides guidelines for mercury levels in freshwater bodies that attempt to account for the risk to fish and wildlife through exposure to mercury.

The CCME guideline level for mercury in surface water is **26 ng/L.**

One might think that if this level of mercury in water is safe for the fish and wildlife, it must be safe to put water with that level of mercury into Grassy Narrows' river. However, the CCME guideline does not consider bioconcentration of mercury as it moves up through the food chain.

As the Government of Canada explains "[t[he presence of mercury in water has become a source of concern because of the finding that organic mercury is bioconcentrated by fish. Elevated mercury levels have been found in all freshwater fish taken from areas with suspected mercury contamination and frequently render the fish unacceptable for human consumption."[17]

The mercury levels that are found in predatory fish like the walleye, can commonly be a million times the level that is found in the water that they swim in.

Recent monitoring studies of the Wabigoon River upstream from the Dryden mill show that **baseline level of mercury in the Wabigoon River is around 1 ng/L.** Even at those baseline levels of mercury in water, large adult walleye in Wabigoon Lake often exceed 0.5 ppm mercury, the level above which the commercial sale of fish for human

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[16] Health Canada (1986), "Healthy Living: Water and Mercury."
[17] Health Canada (1986), "Healthy Living: Water and Mercury."

consumption is banned.

If the level of mercury in the River is raised to **2 ng/L**, then mercury levels in adult walleye will approximately double, making them far more dangerous to eat. If other chemicals that stimulate net methylation in the environment are added as well, then the effect will be even more grave.

That means that river water with 2 ng/L of mercury will have serious impacts on the health of Grassy Narrows people's ability to safely practice their right to fish, even though this level is less than 10% of the level allowed by the CCME guideline, the most restrictive of the guidelines we are aware of.

A similarly broad range of guidelines exist and are applied for mercury levels in fish safe for human consumption.

The Ontario Ministry of the Environment "Guide to Sportfish Consumption" allows for some consumption of fish by the non-sensitive population (adult men and women who are not of child bearing age) if the fish have mercury levels below **1.8 ppm.**

On the other hand, the sale of fish for human consumption in Canada is banned if the fish have mercury levels over **0.5 ppm**. Grassy Narrows fishermen have been charged for selling their catch based on this rule.

In the 1980s, Canada established **0.2 ppm** as the guideline limit for safe consumption of fish by Grassy Narrows and other Indigenous subsistence eaters of fish.

The US Environmental Protection Agency ("EPA") lists **0.1 ppm** as their guideline level for Indigenous subsistence eaters of fish.

Renowned mercury expert Dr. Mergler has written in expert reports (some of which are enclosed), all of which have been provided to Ontario, that among these guidelines the US EPA level is most relevant to Grassy Narrows. However, she notes that all these guidelines are based on safe levels for a lifetime of exposure in a regular population. Mercury impacts are cumulative throughout the lifespan. None of these guidelines take into account the high, and far above guideline, levels of exposure that many Grassy Narrows people have already been exposed to. She writes that Grassy Narrows people have generally already been exposed to too much mercury and cannot safely be exposed to any additional mercury.

Clearly, off-the-shelf guidelines are not sufficient. It is necessary to develop and apply in close collaboration with Grassy Narrows locally specific guidelines that take into account the local background levels, ecology, food chain, cultural practices, and cumulative impacts from other industry, and history of exposure.

Other specific concerns

Given the constraints that we have noted, it is not possible to provide a comprehensive list of concerns here. However, some further concerns that we have identified to date,

which will require future elaboration, include:

- The contamination of the water within our Territory and water that flows into our Territory from effluents, discharges, by-products, leaching (including of metals), and changes in mercury cycling
- The creation of acid rock drainage and other forms of toxic drainage
- Changes to the flow, level, and quality of our water from water takings and discharges.
- The contamination of our air and air that flows into our Territory
- The loss of our caribou and moose, and of those who travel into and out of our Territory through impacts including habitat degradation and outside hunting pressure
- Disrupting the delicate balance of animals, predators, prey, and the web of life that supports us.
- The contamination and loss of our fish for food, commercial fishing, sport fishing, and way of life, including fish that migrate in and out of our Territory
- The loss and contamination of our birds and insects including migratory birds
- The loss of our valuable fur bearing animals including marten and otter
- The fragmentation and degradation of our forests and the loss of intact forest landscapes and old growth forest areas
- The changing of mercury exports and mercury cycling, including methylation
- The creation of additional anxiety, fear, depression, disempowerment, and despair among our people
- The further disruption of our society, our culture, and our way of life.
- The exacerbation of our suicide crisis
- The desecration of our sacred landscape
- The disturbing of spirits and beings that live in the rocks
- The tainting of our medicines
- The disruption of our people who are out on the land living their way of life
- The loss of peace and quiet for our people who are out on the land

- The loss of the ability to use the land as a healing place for our people
- The loss of our ability to teach our kids our way of life, identity, knowledge, and ways of wellness
- Impacts to our individual and collective health and wellbeing
- The loss of our ability to make a living in a way that is harmonious with our culture
- The violation of our Indigenous laws and jurisdiction
- The violation of our Treaty rights, our Treaty relationship
- The violation of the honour of the Crown and Fiduciary duties.

Other harmful impacts of industry on ANA people and Territory include, but are not limited to, the following:

- Impacts to game animal populations and their habitat including moose, and caribou which are central to our hunt and an important part of our way of life, our sustenance, our livelihood, and the exercise of our Treaty rights;
- Impacts to fur bearing animal populations and their habitat including pine marten which are central to our trapping and an important part of our way of life, our sustenance, our livelihood, and the exercise of our Treaty rights;
- Changes in forest composition including a shift from extensive coniferous dominated stands to fragmented deciduous dominated stands;
- Failure to regenerate forests or failure to regenerate to their previous composition;
- Loss of productive land base through tertiary roads, machine trails, landings, mines, tailings, buildings, erosion, etc.;
- Loss of species and genetic diversity;
- Loss of shrubs, including berries and medicines including through the use of herbicides;
- Tainting of our medicines and rendering areas unfit for sacred medicine harvesting and ceremony;
- degradation of forest soils, including compaction, rutting, scarification, and erosion;

- Disruption of nutrient cycles including the depletion of calcium in our watersheds, leading to calcium deficiency in aquatic biota;

- Increased competition with non-Indigenous hunters and fishers using forest access roads and associated depletion of animal and fish populations;

- Increased road traffic and danger of collision of people and wildlife with forest industry vehicles;

- Loss of traditional travel routes, sacred places, heritage, and archaeological sites;

- Negative impacts on water quality, fish habitat, fish populations, and fish contaminants;

- Risk of increased violence against ANA people, including gender-based violence, from an influx in workers coming into the Territory to log, and the potential establishment of man camps;

- Lack of recognition of cultural Anishinaabe way of being;

- Violation of our inherent, Treaty, and Aboriginal rights; and

- Violation of ANA Law and the will of our people.

Failure to Effectively Regulate and Remediate

According to the Government of Ontario, there "are over 5,700 abandoned mine sites in Ontario that have over 17,000 mine features, known as hazards… Deaths due to mine hazards in Ontario are rare, but deaths happen in North America every year."[18]

As of 2015, only four mines were listed as fully closed out. Only three are identified as undergoing remediation. On the other hand, there were 56 abandoned mines with 629 contaminated sites meeting provincial criteria for liability recognition. A further 306 abandoned mines had over 3,000 contaminated sites that do not meet the criteria for liability recognition.[19]

There are already many abandoned mine sites in our Interim Area of Interest for Mining, mostly in the Red Lake Area, many of which have been left in an unremediated state for decades. A number are classified as dangerous by the Ministry.

According to the Ontario Auditor 2015 report, the Ministry of Mines has not estimated

[18] Ontario, "Abandoned mines hazards" (last updated February 17, 2023).
[19] Auditor General of Ontario (2015), "2015 Annual Report: chapter 3.11: Mines and Minerals Program."

the total cost of rehabilitating the 4,400 abandoned mine sites in Ontario since 1993 and therefore does not know the current cost for doing so. It also does not have a long-term plan for rehabilitating these sites. These sites may pose risks to public health and safety and the environment.[20]

The Auditor General found that the "Ministry conducts minimal inspection and follow-ups on abandoned mines."[21] In the five years before the audit "the Ministry has inspected only about 6% (248) of abandoned mines to ensure that they do not pose a risk to public health and the environment."[22]

The Crown often assures us that despite the legacy of past bad practices, mining regulation is done safely now. To the contrary, the Auditor General found many glaring flaws in Ontario's regulatory regime for current mining, including that "Ontario is the only province in Canada that does not require a provincial environmental assessment to be performed for mining projects."[23] The Auditor General's report further explained that "in Ontario, the *Mining Act* only requires mining companies to submit closure plans prior to the development of the mine… In other provinces in Canada, larger mining projects automatically trigger a provincial environmental assessment."[24]

The Auditor General found that the closure plan process lacks sufficient funding, is subject to pro-industry bias, plans are not updated, and inspections are insufficient to ensure safety.

As of 2022, the government had not inspected nearly half of Ontario's operational mines since 2011.[25] The news media has also reported that Ontario senior officials are highly concerned that following several recent tailings dam failures "there is little to no legislative authority to prevent similar situations from occurring in Ontario."[26] According to the media the regulatory gap is outlined in a section of a briefing binder for Minister Pirie dedicated to "critical decisions. Senior bureaucrats, who told Minister Pirie that the gap in offline tailings dam rules was a "high-risk gap in the regulatory framework that requires urgent attention."

Far from improving the overall mining regulatory situation, the Government of Ontario has recently watered down its regulations with respect to requirements for closure planning and closure funding through the *Build More Mines Act*. The Act gives the Minister extremely broad discretion over nearly all aspects of mining including closure planning and funding. Under the new rules the position of Director of Mine Rehabilitation

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[20] Auditor General of Ontario (2015), "2015 Annual Report: chapter 3.11: Mines and Minerals Program" at p. 444.
[21] Auditor General of Ontario (2015), "2015 Annual Report: chapter 3.11: Mines and Minerals Program."
[22] Auditor General of Ontario (2015), "2015 Annual Report: chapter 3.11: Mines and Minerals Program."
[23] Auditor General of Ontario (2015), "2015 Annual Report: chapter 3.11: Mines and Minerals Program."
[24] Auditor General of Ontario (2015), "2015 Annual Report: chapter 3.11: Mines and Minerals Program."
[25] The Narwhal (June 24, 2023), "Ontario minister was privately urged to fix 'high-risk gap' to avoid mining disaster."
[26] The Narwhal (June 24, 2023), "Ontario minister was privately urged to fix 'high-risk gap' to avoid mining disaster."

was removed, Ministry staff no longer review closure plans and instead industry staff may carry out the review, contrary to the Auditor's 2015 recommendations.

Given this context, Grassy Narrows does not trust that the appropriate regulations are in place to ensure mining sites will be kept safe for many generations to come. You have not earned our trust.

Lack of Protected Areas, Need for Regional Balance.

There is an imbalance in the region because nearly all forests south of Red Lake are open to industrial mining. For example, much of our Territory is in ecodistrict 4S-2 where only 4.1% of the ecodistrict is protected. Part of our Territory is in ecodistrict 4S-3 where only 3.3% of the ecodistrict is protected. The lack of protection for our landscape is the clear outcome of an unbalanced landuse designation process that did not involve us meaningfully and ignored our rights and interests.

In contrast, conservation biology generally dictates that at least half of an ecosystem must be protected to avoid loss of biodiversity and ecosystem functions. Ontario has committed to community-based land use planning in the Far North based on a joint planning process between the First Nations and the province.[27] It committed to protecting 50% of the landbase in partnership with First Nations following First Nations-led landuse planning.

Canada has committed to protecting 30% of the land in Canada by 2030 in partnership with First Nations. Respecting ANA's efforts to protect our environment will contribute to the maintenance and recovery of biodiversity and ecosystem functions and will support a balance in this region, where the vast majority of forests have been open to industrial logging and mining.

Nature Based Climate Change Solutions

Climate change and biodiversity loss are major threats to Grassy Narrows and to the world. Nature based solutions have been identified as an important part of preventing and mitigating both problems. The boreal forest is one of the world's largest storehouses of carbon. After logging or clearing of the land for mining, much of this carbon is released from the forest, plants and soils, contributing to climate change. On the other hand, protecting forests helps to keep the carbon safely stored and safeguards biodiversity. These are important ecosystem-based services that contribute to mitigating climate change and that have a significant value.

Fighting climate change and biodiversity loss are important priorities for Grassy Narrows and for Canada and respecting Grassy Narrows' land protection will contribute to progress on these priorities.

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[27] *Far North Act, 2010*, SO 2010, c 18.

VI. Mining activity without Grassy Narrows' consent risks conflict

Barrick writes that "[a]ny perceived or actual breach of … trust or respect can have devastating consequences for a mining venture or company, and these commercial and reputational consequences can extend well beyond any particular project or First Nation group." In so writing, Barrick raises the spectre of conflict minerals, also commonly knowns as blood minerals.

Global concerns about unethical practices by mining companies, including Canadian gold mining companies, have led to increased scrutiny of the social, environmental, and ethical practices of mining companies. For the mining industry, the problem with conflict minerals is that no one wants them. Conflict minerals are hard to market, and they increase corporate risks and uncertainties associated with investment, timelines, regulatory approvals, litigation, social conflict, and brand damage.

As a consequence, Ontario and Canada have sought to market themselves as stable, safe, ethical, jurisdictions from which to source conflict-free, or ethical minerals. While there are cheaper jurisdictions in which to operate, the conflict-free reputation of Ontario and Canadian minerals is a significant competitive advantage relative to many of other global mining jurisdictions.

However, as Barrick noted, for the mining industry and a mining jurisdiction, trust is hard to gain and easy to lose. It only takes one high profile conflict to taint an entire company, a sector and an entire jurisdiction and to undermine decades of marketing.

Ontario learned this lesson in the analogous conflict with Grassy Narrows over unwanted logging. After decades of unliterally forcing clearcuts on Grassy Narrows against their will, the First Nation turned to protests, boycotts, media campaigns, public education, litigation, and grassroots blockades. Within six years, major sourcing contracts were being threatened and shortly afterwards Abitibi, the world's largest newsprint producer, withdrew from Grassy Narrows Territory.

The City of Kenora, in their 2009 report to the Ontario Good Roads Association / Rural Ontario Municipalities Association, wrote that "[t]he issue with Grassy Narrows on the Whiskey Jack Forest must be resolved... Without resolution of these issues, **the wood coming off the Whiskey Jack Forest cannot be sold**. **There is no current customer willing to accept wood products from a forest unit which is involved in a perceived controversy."** (emphasis added)

This dynamic is beginning now with respect to mining. A long and growing list of mining companies, including Barrick, Trillium, Bounty, and Kenorland have voluntarily committed not to explore without consent or have left the area. Their withdrawal reflects an enduring reality in the mining industry where compliance with international law, third party certification standards, customer, investor, and shareholder expectations, and social license preclude the use of conflict minerals.

The Crown would be wise to avoid instigating conflict with Grassy Narrows again by approving unwanted mining. Controversy with Grassy Narrows about one mine could

taint the reputation of Ontario as a conflict-free place to mine. It could give the entire regional industry a stain that heightens risk and uncertainty and discourages investment throughout the supply and production chain.

The entire region and industry benefit from an environment free of conflict. It is in the interest of Ontario and industry to resolve, not inflame, the conflict with Grassy Narrows.

VII. Gold does not justify the impact to Grassy Narrows

Gold does not serve an essential and irreplaceable function in society. The largest use of gold by far is for jewelry, followed by investment and central banks demand. Technology, a distance fourth, used only six percent of gold production in 2022 (309t out of 4,721t produced globally). Much of that technology is electronics with short life spans and abysmal recycling rates.

Because gold is not essential, but is valuable, the rationale for mining gold by Great Bear and Kinross is purely financial. Shareholders demand a return on their investment, but Ontario need not repeat the mistake of sacrificing Grassy Narrows' rights and wellbeing for the interests of corporate shareholders.

The flow of resource wealth has been used to justify the damming of our river, dumping of mercury, logging of our trees, and now proposed gold mining. The impacts we have suffered from this approach are extreme and ongoing. The mine is projected to operate for a mere 25 years, but we will be here for many generations. No longer can the Crown and third-party companies seek to sacrifice our health, way of life, livelihood, rights, and environment for short term shareholder gains. Enough is enough.

It is important to remember that it is tourism, recreation and services – not resource extraction – that now forms the backbone of Kenora's employment. This shift is not due to a lack of available wood or minerals, but rather reflects increasing mechanization and marginal profitability in the extractive sector in contrast to the growing demand and labour intensiveness of the non-extractive sector. Grassy Narrows' work to protect our landscape and our environment have helped to foster Kenora's greatest economic strength.

The Kenora and Red Lake area enjoy substantial benefits for tourism, wildlife, hunters, fishers, trappers, recreational users, and non-extractive industries. According to the municipal website "[t]he City of Kenora has transitioned from a pulp and paper mill town to a destination and lifestyle community."[28]

The tourism and services industries are Kenora's largest employers by far. The visitor and cottager sectors contribute $300 million annually to the Kenora economy. In contrast, it is estimated that the Weyerhaeuser mill contributes $60 million to the local economy, even when counting indirect economic benefits throughout the region.

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[28] City of Kenora, "Key Industries" (accessed January 23, 2021)

Kenora's tourism labour force makes up 38% (3,314 jobs) of Kenora's total employment, while Tourism related occupations account for 51.5% (4,405 jobs) of Kenora's total employment.[29] The growth of this industry is key to Kenora's economic plans.

According to the current Whiskey Jack Forest Management Plan ("FMP"), "[t]here are numerous tourist operators in the Whiskey Jack Forest. The recreational activities provided by these outfitters include options for fishing, hunting, camping and other eco-tourism opportunities. The number of individuals, residents and non-residents, procuring services from these tourist establishments are numerous, and they contribute a significant amount of economic resources to local communities ... The Sunset Country Economic Study reports that in 2001, 443 operators provided employment to 3,785 persons of which 1,221 were located in the Whiskey Jack Forest".[30]

In contrast, the Evolution gold mine in Red Lake employs 740 people, only a sixth of the number employed in tourism related jobs in Kenora and is chronically at risk of shutting down if profitability cannot be increased for its Australian owner.[31]

As set out in the Lake of the Woods Tourism Sector Report, "[o]ngoing investments in tourist services and resources only compliment the pristine natural environment that has attracted visitors to Lake of the Woods for over a century."[32]

The current FMP notes that "public and municipal officials should be aware that provincial parks help to make their communities attractive for business as well as for tourists and retirees. The retirement community brings in pension income, which is often indexed to inflation and is "recession proof'.[33]

Respecting and supporting Grassy Narrows' efforts to protect the landscape would contribute to the region's tourism economy and maintain opportunities to grow that economy as well as to become a leader in the conservation economy through future protected areas and associated eco-tourism attractions. A conservation economy creates long-term sustainable employment potential for local and regional residents by maximizing existing skills and knowledge.

VIII. A Choice, an Opportunity

Our youth are crying out. They want to see the land protected so that we can use it to heal our people and our spirits. This is reconciliation for us. They deserve to see the light at the end of the tunnel. We do not want to have to fight, again and again, to protect out land.

However, the community of Grassy Narrows is strong. We know our history, our rights,

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[29] LOTW Tourism Sector Report (2017), pp. 37, 38.
[30] Whiskey Jack Forest FMP 2012-2022, p 95.
[31] CKDR 927 FM Dryden (June 19, 2020), "114 Layoffs at Red Lake Evolution Mine."
[32] LOTW Tourism Sector Report, 2017.
[33] Whiskey Jack Forest FMP 2012-2022, p 98.

our language, our teachings, and our way of life. We have allies across the country and across the world. The days of forcing harm on us against our will are over.

Respecting Grassy Narrows' land protection is the best available way to minimize conflict and move towards a path of reconciliation and respect for our inherent, Aboriginal and Treaty rights in compliance with international Indigenous rights standards.

Grassy Narrows has borne the brunt of the impacts of industry in the region, while our voice has long been ignored by Crown and industry decision makers. Part of the outcome of this mistreatment has been conflict over logging and one of Canada's most infamous environmental poisoning sagas. As a consequence, the region, and the country, has a stain on its honour, its reputation and credibility.

Times have changed. It is no longer acceptable, nor viable for the Crown to approve extractive industrial activities without Indigenous parties' consent. Across Canada there is a commitment and an expectation for reconciliation. We have an opportunity now to learn from the mistakes of the past and to heed the voice of Grassy Narrows. In the process, we can move from conflict to cooperation, from destruction to restoration, from harm to hope. Grassy Narrows invites the Crown to join us in righting this historical wrong. Respecting Grassy Narrows' land protection would be an important show of good faith that would be a positive step on the path towards reconciliation.

The Crown is at a crossroads.

On the one hand, the companies are proposing to open a large and toxic gold mine upstream from us against our will. If implemented, the mine risks irreparable harm to Grassy Narrows' rights and interests including, but not limited to, harms caused by cumulative effects, neglected obligations, Treaty infringement, harm to our health, release of mercury, and loss of way of life and livelihood. This harm would be immoral, unjustified, unreasonable, dishonourable, and a breach of Ontario's fiduciary duties to Grassy Narrows.

On the other hand, respecting Grassy Narrows land protection would have a beneficial impact on the exercise of Treaty rights and on the environment, cause no harm to anyone's health, and be beneficial for the growing non-extractive economy. There is an opportunity for calm that will allow ANA and the Crown to focus on long-term resolution of our issues and that will help ANA return to the health, self-determination, and prosperity that we once enjoyed.

We are inviting you to walk with us on the path of protection, healing and reconciliation. Will you work with us, or against us?

APPENDIX A

INTERIM Issues for Negotiation/Engagement/Consultation with MINES

August 18, 2023

1. Recognition and respect for ANA inherent, aboriginal and Treaty rights
2. Recognition and respect for the ANA Land Declaration
3. Recognition and respect for the ANA IPCA
4. Harmonization of Crown Law and ANA Law with respect to mining related activities
5. Repairing the Crown – ANA relationship with respect to mining related activities
6. Outstanding Ontario obligations to ANA including those arising out of the 1978 MOU and subsequent commitments such as increased ANA control and ownership over its land base
7. Land-use redesignation of the ANA IPCA
8. Interim measures including the withdrawal of the ANA IPCA from staking
9. Suspension of all mining exploration activities on the ANA IPCA and vicinity
10. Resolution of existing third-party mining interests on the ANA IPCA created by the Crown
11. Issuing a Notice of Caution for mining related activities on lands where ANA rights and interests could be impacted
12. MINES Minister's unfulfilled commitment of November 2021 to visit Grassy Narrows to discuss mining issues in an open forum.
13. Cumulative impacts of past mining related activities on ANA
14. Cumulative impacts of mining activities and other industrial and crown policy impacts on ANA including mercury
15. Resolution of issues arising from past mining related activities which have occurred without ANA consent (restoration, compensation, apology, etc.)
16. Ending Free Entry mining exploration and resolving the issues it has created
17. ANA concerns re off-site impacts and risks of existing mining activity (e.g. at Red Lake and Goliath mines, Red Lake and Separation Rapids exploration) on ANA
18. ANA concerns and MINES failure to take into account risk of off-site impacts of proposed mining exploration and other mining related activity on ANA (including downstream, migratory, downwind, landscape level, and other impacts)
19. Addressing ANA concerns re: Changes to the Mining Act
20. Addressing ANA concerns re: Regulation and enforcement of tailings management
21. Impacts of mining related activity on mercury mobilization and cycling
22. Impacts of mining related activity on Intact Forest Landscapes and associated values and ecosystem functions
23. Impacts of mining related activity on source water protection and source water planning and management
24. Impacts of mining related activity on moose, caribou, marten, fish, and other wildlife
25. Impacts of mining related activity on ANA sacred landscape, spirituality, ceremonies, medicines

26. Impacts of mining related activity on ANA land based healing
27. Impacts of mining related activity on ANA travel routes, camp sites, occupancy sites, burials, etc.
28. Impacts of mining related activity on ANA archaeological and historical values
29. Impacts of mining related activity on ANA safety, and risk of racial and gender based violence including man camps.
30. Unanswered correspondence from ANA to MINES and Ontario
31. Barriers to meaningful ANA engagement including the ongoing Mercury Crisis, housing crisis, water crisis suicide crisis
32. Reimbursement of past ANA expenses for unfunded engagement with the Crown and mining companies.
33. Capacity support required by ANA to begin meaningful engagement
34. ANA Consultation Area with respect to mining
35. Proposed and existing mining exploration and other mining related permits

Impact Assessment Agency of Canada | Agence d'évaluation d'impact du Canada

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March 22, 2024 **Sent by email**

Chief Rudy Turtle
Grassy Narrows First Nation
General Delivery c/o Grassy Narrows Band Office
Grassy Narrows ON P0X 1B0

Subject: Notice of Opinion that a Federal Impact Assessment is Warranted for the Proposed Great Bear Gold Project and Next Steps

Dear Chief Rudy Turtle:

Thank you for your participation in the Planning Phase of the federal impact assessment process for the Great Bear Gold Project (the Project) as proposed by Kinross Gold Corporation (the Proponent). The Agency acknowledges receipt of your correspondence dated March 7, 2024, and will review and consider the information in the development of the forthcoming materials.

The purpose of this letter is to:

- inform you of the Impact Assessment Agency of Canada's (the Agency) opinion that a federal impact assessment is warranted for the Project;
- provide advance notice that a comment period on the planning documents, including the draft Tailored Impact Statement Guidelines and the draft Indigenous Engagement and Partnership Plan will be announced in the coming weeks;
- invite your community to comment on whether the Project should be referred to an independent review panel or continue as an Agency-led impact assessment;
- remind your community of the **$5,000.00** participant grant fund to support your review of the draft documents; and
- invite your community to meet with the Agency prior to and during the upcoming comment period.

…/2

As noted in our correspondence dated December 28, 2023, the Supreme Court of Canada (SCC) issued its decision on the constitutionality of the *Impact Assessment Act* (the IAA) on October 13, 2023. Following this decision, the Government of Canada released the Statement on the Interim Administration of the *Impact Assessment Act* Pending Legislative Amendments[1] on October 26, 2023.

The SCC's decision does not change the duty of the Government of Canada to consult with Indigenous Peoples on the impacts of major projects. Further, the Agency remains committed to the United Nations Declaration on the Rights of Indigenous Peoples, including the need for meaningful engagement with Indigenous Peoples.

Agency's Opinion on Impact Assessment
The Agency reviewed the Proponent's Detailed Project Description received on February 23, 2024, which includes the responses to the Agency's Summary of Issues. Based on the Agency's review of the Detailed Project Description and the responses to the Summary of Issues, along with the consideration of other factors, including comments received to date from Indigenous communities, federal authorities, provincial ministries, and the public, the Agency is of the opinion that a federal impact assessment is warranted for the Project.

The Summary of Issues, Detailed Project Description including the Proponent responses to the Summary of Issues, and the Agency's Notice of Opinion is available at: *https://iaac-aeic.gc.ca/050/evaluations/proj/85832*

Advanced Notice of a Comment Period on Impact Assessment Planning Documents
The Agency is currently developing guidelines and a series of plans to define the scope, content, and conduct of the impact assessment.

The Agency anticipates holding a **comment period** on the following documents:

- draft Tailored Impact Statement Guidelines
- draft Indigenous Engagement and Partnership Plan
- draft Public Participation Plan
- draft Permitting Plan
- draft Cooperation Plan

For a description of each of these required Planning Phase documents, please see the Agency's Practitioner's Guide to Federal Impact Assessments.[2]

…/3

[1] *https://www.canada.ca/en/impact-assessment-agency/news/2023/10/government-of-canada-releases-interim-guidance-on-the-impact-assessment-act.html*
[2] *https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/practitioners-guide-impact-assessment-act.html*

In the coming weeks, I will notify you of a comment period on the above-noted documents and specifically seek input from your community on the draft Tailored Impact Statement Guidelines and the draft Indigenous Engagement and Partnership Plan.

As the Consultation Lead for the Project, I welcome the opportunity to work collaboratively with your community in developing the Indigenous Engagement and Partnership Plan. In addition, I also invite you to identify features of a consultation process that would best suit your community.

Views about Referring to a Review Panel
Please note, the Minister of Environment and Climate Change Canada may refer the impact assessment of the Project to an independent review panel no later than 45 days after the end of the Planning Phase. If you have views on this aspect, you are welcome to provide them by the end of the forthcoming comment period at *GreatBear@iaac-aeic.gc.ca*.

Participant Grant Funding
As a reminder, to support Grassy Narrows First Nation's continued participation in the Planning Phase of the impact assessment process, including the review and comment on the draft documents listed above, a subsequent grant of **$5,000.00** will be available during the comment period. Thank you for confirming your interest in grant funding. An overview of eligible activities and expenses is enclosed (**Enclosure 1**). Following the Planning Phase, you will be able to apply for contribution funding to facilitate your community's participation throughout the subsequent phases of the federal impact assessment process. Additional grants may also be made available to support your participation during the assessment process.

Invitation to Meet with the Agency
If you are interested, the Agency wishes to schedule two meetings with your community:

- A virtual meeting in early-April 2024, in advance of the upcoming comment period, to introduce the concepts and purposes of the Tailored Impact Statement Guidelines and Indigenous Engagement and Partnership Plan, and to answer any questions you may have to prepare for the upcoming comment period. The Agency will follow up promptly to schedule this meeting.
- A virtual or in-person meeting during the forthcoming comment period, for a detailed discussion about the Tailored Impact Statement Guidelines and Indigenous Engagement and Partnership Plan, in relation to potential impacts on your community. The Agency encourages you to begin considering your community's availability and will contact you in the coming weeks to schedule this meeting.

…/4

Integration of Crown Consultation into the Impact Assessment Process
To support an appropriately scaled, resourced and flexible Crown consultation process, the Agency, on behalf of the Government of Canada, will form a Crown Consultation Team involving all relevant federal authorities who may have expertise to provide to inform the federal impact assessment.

In my role coordinating the Government of Canada's consultation process, I will:

- serve as point of contact within the Government of Canada for Indigenous communities in the federal impact assessment process;
- ensure project-related comments and concerns from Indigenous communities, federal authorities and the public are shared with the Proponent; and
- maintain an ongoing two-way dialogue and collaborative working relationship with Grassy Narrows First Nation focused on finding solutions to issues of concern.

More information on participation opportunities can be found in the Practitioner's Guide to Federal Impact Assessments on the Agency's website at: *https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/practitioners-guide-impact-assessment-act.html.*

IMPORTANT NOTE
Information submitted to the Agency to inform this project assessment may be posted online to the Canadian Impact Assessment Registry[3] (Reference #85832) subject to certain exceptions related to privacy, security or confidentiality. The Agency's Submission Policy[4] describes what submitted information can be shared publicly, and what should remain private. For more information on how we protect your privacy, please refer to the Privacy Notice[5]. If you wish to provide comments or documents containing sensitive information that you believe should not be disclosed to the public, please contact the Agency before submitting them.

Should you wish to provide confidential Indigenous Knowledge, note that such Knowledge can be protected as described in our guidance about confidential Indigenous Knowledge[6], but that it must not be submitted via the Registry, and you need to discuss confidentiality arrangements with the Agency prior to submitting any Indigenous Knowledge.

…/5

[3] *https://www.aeic-iaac.gc.ca/050/evaluations?culture=en-CA*
[4] *https://iaac-aeic.gc.ca/050/evaluations/participation/conditions*
[5] *https://www.iaac-aeic.gc.ca/050/evaluations/protection?culture=en-CA*
[6] *https://www.canada.ca/en/impact-assessment-agency/services/policy-guidance/practitioners-guide-impact-assessment-act/protecting-confidential-indigenous-knowledge-under-the-impact-assessment-act.html*

If you have any questions or concerns, please do not hesitate to contact me at 365-292-4819 or by email at *GreatBear@iaac-aeic.gc.ca*. If there are specific times in the coming weeks that your community will be available for a meeting, please inform me at your earliest convenience.

Sincerely,

Jenny Espitia Contreras
Crown Consultation Coordinator
Impact Assessment Agency of Canada

Enclosures:

#1 – Overview of Eligible Expenses and Activities

c.c.: Aaron MacDonell, Kinross Gold Corporation
Joseph Fobister, Grassy Narrows Lands Protection Team
Mike Fobister, Grassy Narrows Lands Protection Team
Jackie Esmonde, Grassy Narrows Lands Protection Team
Dan Mossip-Balkwill, Grassy Narrows Lands Protection Team
David Sone, Grassy Narrows Lands Protection Team

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The Contribution across Three Generations of Mercury Exposure to Attempted Suicide among Children and Youth in Grassy Narrows First Nation, Canada: An Intergenerational Analysis

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Background: For 60 y, the people of Asubpeeschoseewagong Anishinabek (Grassy Narrows First Nation) have endured the effects of massive mercury (Hg) contamination of their river system, central to their traditions, culture, livelihood, and diet. In the years following the Hg discharge into the English–Wabigoon River system by a chloralkali plant in the early 1970s, there was a dramatic increase in youth suicides. Several authors attributed this increase solely to social disruption caused by the disaster.

Objective: This research examined the possible contribution of Hg exposure across three generations on attempted suicides among today's children (5–11 y old) and youth (12–17 y old), using a matrilineal intergenerational paradigm.

Methods: Information from the 2016–2017 Grassy Narrows Community Health Assessment (GN-CHA) survey was merged with Hg biomonitoring data from government surveillance programs (1970–1997). Data from 162 children/youth (5–17 years of age), whose mothers ($n = 80$) had provided information on themselves, their parents, and children, were retained for analyses. Direct and indirect indicators of Hg exposure included *a*) grandfather had worked as a fishing guide, and *b*) mother's measured and estimated umbilical cord blood and childhood hair Hg and her fish consumption during pregnancy with this child. Structural equation modeling (SEM) was used to examine significant links from grandparents (G0) to mothers' exposure and mental health (G1) and children/youth (G2) risk for attempted suicide.

Results: Mothers' (G1) median age was 33 y, 86.3% of grandmothers (G0) had lived in Grassy Narrows territory during their pregnancy, and 52.5% of grandfathers (G0) had worked as fishing guides. Sixty percent of children (G2) were <12 years of age. Mothers reported that among teenagers (G2: 12–17 years of age), 41.2% of girls and 10.7% of boys had ever attempted suicide. The SEM suggested two pathways that significantly linked grandparents (G0) to children's (G2) attempted suicides: *a*) through mothers' (G1) prenatal and childhood Hg exposure and psychological distress, and *b*) through maternal fish consumption during pregnancy (G1/G2), which is an important contributor to children's emotional state and behavior.

Discussion: Despite minimal individual information on G0 and G1 past life experiences, the findings support the hypothesis that Hg exposure over three generations contributes to the mental health of today's children and youth. The prevalence of Grassy Narrows youth ever having attempted suicide is three times that of other First Nations in Canada. https://doi.org/10.1289/EHP11301

Introduction

Since the first public evidence, 52 y ago, of the extent of the mercury (Hg) discharge into the English–Wabigoon River system by a chloralkali plant in Dryden, Ontario (Canada), much has been written about the Asubpeeschoseewagong Anishinabek (Grassy Narrows First Nation) and how the contamination of their waterways disrupted their culture, traditions, and economy.[1–8] For generations, fish provided people of Grassy Narrows with "meaning, social cohesion, and pride."[9] In the early 1960s, a large majority were gainfully employed in fish-based industries.[1–9] Approximately 80% of the households in Grassy Narrows had a least one family member who worked as a fishing guide and many were involved in commercial fishing; employment was 85%–90%.[1–3] During the tourist fishing season, all Grassy Narrows fishing guides reported eating fish every day as part of the customary shore meal for anglers, and almost all (92%) brought fish home to their family.[1]

In 1970, very high Hg levels were reported in fish in the English–Wabigoon River system; inorganic Hg released by the chloralkali plant was being converted into methylmercury (MeHg), a highly toxic compound that bioaccumulates and biomagnifies in the aquatic food chain.[5,10] Hg concentrations in fish reached up to 24 μg/g, almost 50 times the upper limit considered safe for human consumption.[10] Communities received contradictory messages about whether or not they should continue to eat fish. Some lodge owners downplayed the importance of Hg contamination and continued the practice of shore meals, thereby placing fishing guides into the situation of choosing between their health and their livelihood.[1] In 1975, the main fishing lodge had shut down and the commercial fisheries were closed.[1] Over time, fish Hg concentrations declined, stabilizing by around 1985,[10,11] but they have remained to this day higher than in other Ontario lakes and rivers.[12]

In the early 1970s, Canadian government biomonitoring programs for total Hg in hair, blood, and umbilical cord blood were initiated in the First Nation communities affected by the discharge into the English–Wabigoon River system.[13,14] In 1976, annual average individual peak blood total Hg was 23.8 μg/L, with concentrations ranging from 1.5 to 322.9 μg/L.[13] Fishing guides and their families were identified as the groups the most at risk; the highest blood total Hg concentration (660 μg/L) among Indigenous communities in Canada was reported for a Grassy Narrows fishing guide.[15] The biomonitoring programs continued into the 1990s, when average Hg biomarker concentrations declined below the Canadian Hg guidelines, mirroring the decline in fish Hg concentrations.[13,16]

The years following 1970 saw the loss of livelihood and were fraught with social upheaval.[1–5] There was an 8-fold increase of violent deaths from pre- to post-1970 and the prevalence of alcoholism was high.[1–4] Several authors have attributed the social crisis to the loss of traditional lifestyle and the destruction of the very foundation of their society.[1,2,4–6] In Grassy Narrows First Nation, the trauma of cultural dispossession and loss of livelihood was compounded by Hg poisoning from fish consumption. However, the possible direct contribution of high Hg exposure to the

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psychopathology was not considered, despite reports of psychiatric disorders among patients with organic Hg poisoning. As early as 1971, Eyl[17] noted that the symptoms of organic Hg poisoning included a lack of interest in home and work, emotional instability with fits of anger, depression, or rage. In 1968, Tatetsu (cited in Ekino et al. 2007[18]) described the psychiatric profile of many patients with Minamata disease, who had been exposed to MeHg from the consumption of fish and shellfish, contaminated by the wastewater discharge from a chemical plant into the Minamata Bay: "They were egocentric, selfish, and paid little attention to the advice of others. Loss of inhibition was another feature of the disease's personality characteristics. They were often impolite, too friendly to others, easily burst into anger, restless, euphoric, and childish. Some of them spent money as much as they were given and threw away change."

Prior to 1970, no suicide had ever been recorded in Grassy Narrows.[2] Between 1974 and 1978, three of the four persons who took their life were teenagers, and in 1977–1978, 26 young persons between 11 and 19 years of age attempted suicide.[4] Between 1970 and 1977, the incidence of suicide was 3.6 times higher compared with another First Nation community, selected for its pre-1970 socioeconomic similarities to Grassy Narrows.[1] Neurological examinations, carried out in Grassy Narrows in the 1970s, focused primarily on motor and sensory functions, with results that appeared to be "elusive," although there were several signs and symptoms similar to those reported for patients with Minamata disease.[15] In 2010, Harada et al. examined 73 persons from Grassy Narrows using the protocol for the diagnosis of Minamata disease in Japan: 42 (57.4%) were diagnosed with Minamata disease or suspected Minamata disease, 15 (20.5%) exhibited emotional disturbances, and 10 (13.6%) showed intellectual deficits.[19] A recent study in Grassy Narrows reported a positive association between umbilical cord blood total Hg concentration and clustered symptoms of affect/mood disorders in adults.[20]

For the people of Grassy Narrows, the problems associated with Hg exposure may be compounded by the intergenerational consequences of the trauma caused by the Indian Residential School system.[21–24] Children were taken from their communities and sent to government-financed boarding schools, administered by Christian churches. Many children from Grassy Narrows were sent to these schools.[25,26] In 1953, the principal of the Presbyterian school in Kenora, Ontario, wrote: "We must face realistically the fact that the only hope for the Canadian Indian is eventual assimilation into the white race."[26] Mental health issues, particularly emotional well-being, are the most frequently identified intergenerational impacts of residential schools on Indigenous health and well-being in Canada.[27]

Little is known about the consequences of environmental exposures across generations. Depression in parents has been consistently found to be associated with children's behavioral problems and lower cognitive/intellectual/academic performance.[28] During pregnancy, maternal consumption of Hg-laden fish exposes the developing fetus; MeHg is actively transported across the placental barrier and umbilical cord blood MeHg is approximately twice that of maternal blood.[29] Studies of Inuit children in Canada report increased risk for borderline intellectual disability[30] and adolescent anxiety[31] in relation to umbilical cord blood total Hg.

By 2016, >90% of the adult population of Grassy Narrows were born since the beginning of the disaster in 1962[32]; most were exposed to Hg *in utero* and their parents experienced the immediate impact of the disaster. Today's children and youth live with this legacy. The present study seeks to explore intergenerational effects of Hg contamination in Grassy Narrows on children's emotions, behavior and attempted suicide, using a maternal-lineage transmission paradigm.

Materials and Methods

Study Design

Between December 2016 and March 2017, Grassy Narrows First Nation carried out a community health assessment, the Grassy Narrows Community Health Assessment (GN-CHA) survey. Participants provided information on themselves, their parents, and their children (0–17 years of age). Information from the GN-CHA on grandparents (G0), mothers (G1), and their children (G2) was merged with a database constructed from archived biomarkers of Hg exposure from a government monitoring program carried out between 1970 and 1997.[16]

GN-CHA Survey

The GN-CHA survey used a systematic house-to-house sampling strategy on-reserve, and convenience sampling off-reserve. Two coordinators from Grassy Narrows devised and supervised the field work, assisted by nine local surveyors. The questionnaire was web-based and participants could fill it out on their own, or with, when needed, the assistance of the surveyor.

The GN-CHA adult (≥18 years of age) survey included 266 questions covering the following areas: demographics, education, generational attendance of residential school, work activities and income, diet, general health status (including diabetes care), mental health and well-being, disabilities, injuries, health care access, physical activity, smoking, drinking and drug use, and participation in community activities. Most questions were taken from the First Nation Regional Health Survey 2008/2010,[33] providing a basis for comparison with other First Nation communities in Canada. Further questions addressed local fish consumption at different periods, as well as specific illnesses and symptoms that have been associated with Hg exposure. The large majority of adult participants filled it out on their own. Those who did not fill it out on their own were older persons for whom English was not their first language. Translation in Anishinabek was available.

Similar to the adult survey, the GN-CHA survey for children and youth included the same questions as the First Nation Regional Health Survey 2008/2010,[33] as well as questions on local fish consumption during mother's pregnancy and the child's current fish consumption (174 questions). Parents or caregivers provided the information on children. In some instances, the youth was present when the questionnaire was being filled out; some youth ≥15 years of age filled out the child questionnaire on their own.

On-reserve, 83.6% of the 213 houses were surveyed (302 persons); 89 persons (22.8%) living off-reserve, from 66 households were likewise surveyed. Data were collected for 391 adult Grassy Narrows Registered Band members and 353 children (0–17 years of age). The age and sex distributions of participants were similar to their distribution in the 2016 Statistics Canada Aboriginal Household Survey.[32] GN-CHA results were presented to and discussed with community members during several small group and community meetings. The final reports were approved by the Chief and Council and made public on 24 May 2018 for adults and on 5 December 2018 for children.

For the present study, we retained information provided for children between 5 and 17 years of age ($n = 162$) and their mothers ($n = 80$). All mothers had filled out the adult and child/youth questionnaires on their own; 17 youth (26.2%), between 13 and 17 years of age, were present when their mother filled out the child/youth questionnaire. The GN-CHA questions retained in the present statistical analyses are classified by generation as described below.

- **Children (G2):** Mothers provided information about each of their children for the following variables: age, sex, physical and mental health status (on a five-point Likert scale), current fish consumption, and diagnosed nervous system

disorders [yes/no for at least one of the following: cognitive or mental disabilities, attention-deficit and attention-deficit/hyperactivity disorder (ADD/ADHD), learning disabilities, speech/language difficulties, visual problems that cannot be corrected by glasses, hearing impairment, cerebral palsy, Bell's palsy and movement disorders]. Fetal alcohol spectrum disorder (FASD) was included in the questionnaire, but it was excluded from the list of at least one diagnosed nervous system disorder. Further questions asked whether in the past 6 months the child had more emotional or behavioral problems compared with other children of the same age and sex (yes/no) and whether the child had ever attempted suicide (yes/no). Children's school performance was grouped into three categories: very good/excellent, good, and fair/unsatisfactory.

Several questions addressed the mother's pregnancy with this child. The questions were worded: "If you are the birth mother, did you have …?" Gestational diabetes, hypertension, prematurity and difficulties during childbirth were grouped into yes/no. Questions likewise asked, "If you are the birth mother, did you drink a lot or take drugs during pregnancy?" (yes/no). The child's prenatal Hg exposure was based on mother's reported local fish consumption during her pregnancy with this child, grouped into three categories (less than once a month, once a month, at least once a week).

- **Mothers (G1):** The following variables were retained: age, education (years of education and having received a high school diploma), school success (five-point Likert scale from poor to excellent), having attended a residential school (yes/no), currently working (yes/no), reasons for not working, social support (yes/no), struggle to pay for food over the past 12 months (at least once a month vs. less), current smoking (yes/no), current heavy drinking as defined by the 2008/2010 Regional Health Survey[33] as five drinks in one drinking occasion at least once a month in the past 12 months (yes/no), and obesity categorized using body mass index $\geq 30\,kg/m^2$ (yes/no). Diagnosed nervous system disorders included at least one of the following conditions diagnosed by a health professional: ADHD, Alzheimer's disease, blindness or visual problems that cannot be corrected by glasses, Bell's palsy, cerebral palsy, cognitive/mental disorder, epilepsy, Kennedy's disease, learning disability, muscular dystrophy, Parkinsonism, psychological/nervous disorders, and senile dementia.

  Psychological distress was assessed using the Kessler Psychological Distress Scale (K10)[34] for symptoms of anxiety or depression experienced in the previous month and scored on a scale of 0–40 (0–5: low distress, 6–19: moderate distress, and ≥20: high psychological distress).[34] Several GN-CHA questions were about suicidal ideation and attempted suicide; here we retained the answers to the following questions: "In the past 12 months, has a close friend or family member died by suicide?" (yes/no), "Have you ever thought about committing suicide?" (yes/no), and "Have you ever attempted suicide?" (yes/no). "When did the suicide attempt occur?" [during the past year, as an adult, as an adolescent (aged 12–17 y old), as a child (<12 y old)].
- **Grandparents (G0):** From the information mothers (G1) filled out about their parents (G0), the following questions were retained for the present analyses: "Was your father a fishing guide when you were a child"? (yes/no) and "Did (your mother, father, grandmother, grandfather, other family members) attend a residential school?" (yes/no). Mothers provided further information about where their mother (G0) lived when she was pregnant with them and their place of birth.

For all questions, the GN-CHA survey provided the choices of "I do not know" and "Refused." Although few persons refused to answer, a substantial number of answers were "I do not know," which we considered as missing data.

Biomarkers of Hg Exposure

At the request of the Grassy Narrows Chief and Council, the First Nation and Inuit Health Branch of Indigenous Services, Canada, provided the authors with individual retrospective Hg biomarker data, collected by governmental biomonitoring programs for blood and hair (1970–1997) and umbilical cord blood (1970–1992).[13,16] Blood Hg concentrations were transformed into hair equivalent measures using a hair-to-blood Hg ratio of 1:250.[35] A 28-y Hg biomarker database was created using the highest measurement of equivalent hair Hg concentration for each year sampled (657 persons) and umbilical cord blood Hg concentration (201 persons).[20]

Year-based equivalent hair Hg data were available for 208 individuals of the 391 participants in the GN-CHA (53.2%); 137 had at least one Hg hair sample taken during childhood (between 5 and 15 years of age). Umbilical cord blood Hg concentrations were available for 99 persons, making up (48.5%) of the GN-CHA participants born at the local hospital within the time period.

G0/G1 prenatal exposure. For the 80 mothers retained for the present study, direct umbilical cord blood Hg measurements were used where available. For the missing umbilical cord blood data, we estimated Hg concentration from the complete umbilical cord blood Hg database ($n = 201$). For those born between 1970 and 1992, the umbilical cord blood Hg–predicted arithmetic mean for their year of birth was attributed as described in Philibert et al. (2022).[20] For those born between 1962 and 1970, the predicted arithmetic mean cord blood Hg in 1970 was used (65.1 μg/L). For women whose mother had spent her pregnancy and delivered elsewhere, umbilical cord blood Hg was set at 1.0 μg/L, which corresponded to the lowest 2.5th percentile of measured cord blood values. The correlation between measured and estimated values for umbilical cord blood Hg concentrations was rho = 0.22; $p = 0.023$.[20]

G1 childhood Hg exposure. Direct hair Hg concentration measurements, taken between 5 and 15 years of age, were available for 39 mothers. For the remaining mothers, childhood estimated Hg was derived from the overall arithmetic mean hair Hg in the year in which they turned 10 y old and then adjusted on the basis of reported child fish consumption and having attended a residential school, as previously described.[20] The correlation between measured and estimated childhood hair Hg concentrations was rho = 0.73; $p < 0.001$.[20]

No Hg measurements were available for the G0 or G2 generations. For the former, the G1 answer to the question: "Was your father a fishing guide when you were a child?" was used as an indicator of higher Hg exposure, and for children (G2), mother's fish consumption during this pregnancy (G1/G2) and child's current fish consumption, were used.

Statistical Analyses

Complex networks with causal pathways between variables are the essence of intergenerational analyses. Structural equation modeling (SEM) provides an appropriate framework for illustrating pathways and testing statistical associations. SEM allows for simultaneous consideration of multiple exposures and outcomes[36] while providing direct and indirect relations and flexibility in modeling covariances.[37–40] The SEM path diagrams

illustrate and quantify the contribution of variables and transmission of effects.

Using SEMs, we tested the pathways relevant to Hg exposure between G0, G1, and G2 with respect to the final outcomes of children and youth's emotional status and behavior and attempted suicide. The correlations between error terms of the different variables were verified and taken into account in the models. The pathways used a time order based on the premise of chronological occurrences (causes precede their effects). To control for confounding, we ensured that all backdoor paths on the SEM were closed (adjustment of covariates). Covariates along pathways were kept in the model at a $p \leq 0.10$ or if they substantively altered the model ($\geq 20\%$ change). Based on underlying assumptions, mediation (i.e., the chain of events) was tested by examining direct and indirect effects. The moderating effects of mothers' age or age at birth were tested.

Model goodness of fit was verified using the comparative fit index (CFI),[39,41] Tucker–Lewis index (TLI),[40] and global fit index (GFI),[38] as well as chi-square divided by the degrees of freedom ($\chi 2/\mathrm{df}$), root mean square error of approximation (RMSEA),[39,41] standardized root mean square residual (SRMR),[42] and Schwarz's Bayesian information criterion (BIC).[39,41,43] To improve goodness of fit, we tested the addition/deletion of variables, using modification indices (MIs).[39] The sequence of initial fit, modification, and refitting were repeated until we obtained the SEM with the best fit.

To support the SEM, in parallel, a series of directed acyclic graphs (DAGs) were performed to confirm the structure of relations between variables and to prevent misspecification or misinterpretation from possible biases. DAGs are useful for representing conditional independency among variables by evaluating data consistency and for controlling backdoor paths with minimal sufficient adjustment sets.[43,44] To support the nature and size of the relationship between two variables along the SEM pathways, a series of logistic regression models were used to examine the direct associations and provide an indication of the magnitude of effects.

Given the potential for errors associated with creating Hg exposure estimates from data based on surveillance programs with no precise sampling strategy,[13] as well as the inherent variance in blood to hair conversion[45,46] where possible, we examined the associations between measured Hg concentrations and reported fish consumption. We reran the SEM using reported G1 fish consumption during childhood in the place of estimated Hg exposure during childhood.

To ensure that the database of 80 mothers and their 162 children was sufficient to run SEM, two types of power analyses were performed: *a*) to detect model misspecification, and *b*) to detect target effects between associations.[39,41,43] Post hoc power analyses were run to detect model misspecification based on likelihood-ratio (LR) chi-square and RMSEA tests of close and not-close fit.[47–51] The power for detecting specific target effect for direct and indirect pathways was determined with simulated data in SEM for 100 and 500 simulations on the 162 children.[51] Because some children shared the same mother, we tested the nonindependent sample using clustering (mother), with the lavaan.survey R package.[52]

To reduce bias introduced by missing data, the full-information maximum likelihood (FIML) technique in the lavaan R package was used to handle missing data.[39,53] Even though several authors[54,55] consider that logit FIML can accommodate missing categorical data with unbiased errors and fit parameters, we verified the model with the weighted least squares (WLS) mean- and variance-adjusted chi-square test of model fit (WLSMV) estimator, which handles nonnormal and categorical variables, based on complete cases after multiple imputation.[39,56] When using FIML, we ran the maximum likelihood with robust standard errors (MLR), as well as the maximum likelihood estimation with Huber–White standard errors (Hubert–White sandwich), because it supports complete and incomplete data.[39]

Hg estimates for umbilical cord blood and childhood hair concentrations were calculated from exposure prediction models,[20] which included averaged year-based measured Hg exposure. Our assumption was that true Hg exposure varied randomly around the year-based average (Berkson type error). The Berkson type error would have the effect of lowering the power of analyses.[57] To control for this, we corrected with bootstrap confidence intervals (CIs) for relative risks.

Bootstrap standard errors and *p*-values analyses were carried out to increase SEM accuracy and its reliability (lavaan R package). The Bollen.stine technique, where data is first transformed such that the null hypothesis holds exactly in the resampling space, was verified to extract fit parameters from a fitted lavaan object.[58,59] We used the false discovery rate (FDR) measure for controlling type I error of multiple comparisons.[60]

We compared the performance of SEM by comparing the fit parameters, point estimates, and standard errors to the complex sampling design (cluster-based), which takes into account multiple children. In the case of small differences between non clustered-based and cluster-based analyses, we preferred to use the conventional analysis using FIML[53] rather than data imputation as required by the mother-clustered–based model (lavaan.survey R package).[39,61]

Variables with a skewed distribution were log (base 10) transformed. Threshold of statistical significance in all analyses was set at $p \leq 0.05$.

Database management and descriptive statistical analyses were performed using JMP Professional (version 16.0; Statistical Analysis Hardware; SAS Institute Inc.). All other analyses used the R statistical software (version 3.6.1; R Development Core Team). SEMs were computed with the lavaan R package.[39,62] Further analyses with DAGs used dagitty and ggdag R packages. Power analyses for model misspecification were computed using the semPower R package. An online tool[51] was used to assess power for detecting target effects. The clustering (mother) effect was tested with the lavaan.survey R package along with mice and mitools R packages for data imputation.

Results

The characteristics reported by mothers ($n = 80$) for themselves (G1) and their parents (G0) are presented in Table 1. The large majority of grandmothers (G0) resided in Grassy Narrows territory during their pregnancy ($n = 69$), and half of grandfathers (G0; $n = 42$) had been fishing guides. Many grandparents (G0) had attended residential schools; for all mothers (G1) ≥ 35 years of age ($n = 31$), at least one parent (G0) had been taken to a residential school.

Mothers' (G1; $n = 80$) median age was 33 y old, ranging from 23 to 55 [interquartile range (IQR): 29–37 y]. Most mothers (G1; $n = 77$) had some high school education, but only 21% ($n = 17$) had received a high school diploma (Table 1). At the time of the survey, approximately half of the mothers (G1; $n = 41$) were working; those who were not looking for work at the time of the survey were either an at-home parent, in poor health or disabled, or a student. The most prevalent nonneurologic chronic health conditions were allergies ($n = 25$; 33%), eczema ($n = 19$; 24%), arthritis ($n = 11$; 15%), and diabetes ($n = 11$; 15%). Diagnosed neurologic disorders were reported by 14 mothers (Table 1); all scored in the moderate/high K10 Psychological Distress Scale compared with 56% ($n = 34$) of those who reported no diagnosis.

A third of mothers ($n = 27$) reported that a family member or close friend had committed suicide, and half ($n = 40$) reported

Table 1. Descriptive characteristics for grandparents (G0) and mothers (G1) as reported by mothers (G1) in the Grassy Narrows Community Health Assessment (GN-CHA) survey; $n = 80$.

Characteristics	Yes [n (%)]	No [n (%)]	Missing [n (%)][a]
Generation grandparents (G0)			
Grandmother pregnant in GN territory	69 (86.25)	8 (10.00)	3 (3.75)
Grandfather a fishing guide	42 (52.50)	24 (30.00)	14 (17.50)
Grandmother attended a residential school	47 (58.75)	29 (36.25)	4 (5.00)
Grandfather attended a residential school	46 (57.50)	25 (31.25)	9 (11.25)
Generation mother (G1)			
Age <35 y	46 (57.50)	34 (42.50)	0
Education (high school diploma)	17 (21.25)	61 (76.25)	2 (2.50)
School success (very good/excellent)	28 (35.00)	49 (61.25)	3 (3.75)
Childhood fish consumption (≥several times a week)	38 (47.50)	36 (45.00)	6 (7.50)
Currently working	41 (51.25)	37 (46.25)	2 (2.50)
Unemployed but looking for work	19 (51.35)	16 (43.24)	2 (5.41)
Struggle to pay for food (at least once a month)	43 (53.75)	27 (33.75)	10 (12.50)
Health perception: thriving (very good/excellent)	17 (21.25)	63 (78.75)	0
At least one chronic health condition	56 (70.00)	23 (28.75)	1 (1.25)
At least one diagnosed nervous system disorder	14 (17.50)	65 (81.25)	1 (1.25)
Obesity ≥30 kg/m^2	44 (55.00)	34 (42.50)	2 (2.50)
Current heavy drinker	44 (55.00)	32 (40.00)	4 (5.00)
Family or close friend has died from suicide last 12 months	27 (33.75)	48 (60.00)	5 (6.25)
Suicidal ideation	40 (50.00)	34 (42.50)	6 (7.50)
Ever attempted suicide	31 (38.75)	43 (53.75)	6 (7.50)
K10 (moderate/high)	49 (61.25)	27 (33.75)	4 (5.00)

[a]For each question in the GN-CHA, persons could provide the reply "I don't know," "I can't recall," or "Refused", which were grouped as "Missing."

that they themselves had thought about suicide (Table 1). Among those who had ever thought about suicide, 31 (77.5%) had attempted suicide at least once in their lives; for over half of these ($n = 19$; 61.2%), the first suicide attempt occurred during childhood/adolescence. More mothers who had thought about suicide scored in the moderate-high range of the K10 Psychological Distress Scale compared with those who had not ($n = 31$; 81.6% vs. $n = 13$; 40.6% LR chi-square = 12.82; Fisher exact test: $p < 0.001$).

Some mothers (G1) did not know whether their father (G0) had been a fishing guide or not ($n = 14$; 17.5%). Comparison of the characteristics of mothers who reported that their father had been a fishing guide ($n = 42$) and those who reported that their father had not been a fishing guide ($n = 24$) are presented in Table S1. No difference was observed with respect to their parents (G0) having been placed a residential school; however, all mothers (G0) of the 42 women whose father had been a fishing guide, resided on Grassy Narrows territory during their pregnancy, compared with 75% for the mothers of the 24 women whose father had not been a fishing guide (Table S1).

For the mothers who knew whether their father had been a fishing guide (G1) ($n = 66$), no significant differences were observed with respect to the father (G0) having been a fishing guide or not for sociodemographic and health characteristics (Table S1), with the exception of diagnosed neurologic disorders: 23.8% ($n = 10$ of 42) of those who knew that their father had been a fishing guide and none of those who knew that he had not been a fishing guide (Table S1). Childhood fish consumption and suicidal ideation were higher among the women who reported that their father had been a fishing guide ($n = 24$; $n = 25$ of 42, respectively), but the difference was just above the significance threshold (Table S1). More women whose father had been a fishing guide scored in the high range of the K10 Psychological Distress Scale ($n = 11$; 26.8%) compared with only one for the others.

Table 2 contains the measured and estimated mean, median, and IQR values for mothers' umbilical cord blood and hair Hg. There was no difference in measured umbilical cord Hg between mothers who reported that their father had been a fishing guide compared with those who indicated that their father had not been a fishing guide [median = 8.5 μg/L; 75th percentile: 8.7 μg/L ($n = 17$) vs. median = 5.7 μg/L; 75th percentile: 17.5 μg/L ($n = 7$); Wilcoxon/Kruskal–Wallis tests (rank sums): $S = 108$; $p = 0.204$], but their measured childhood hair Hg was significantly higher [median = 0.77 μg/g; 75th percentile: 1.1 μg/g vs. median = 0.5 μg/g; 75th percentile: 0.7 μg/g; Wilcoxon/Kruskal–Wallis tests (rank sums): $S = 140$; $p = 0.045$], paralleling their reported fish consumption.

Table 3 contains information, reported by the mothers, for each pregnancy and the child's health and well-being (G2; $n = 162$). Mothers filled out the questionnaire for an average of two children, ranging from one to seven children. For almost 20% of children ($n = 31$), mothers reported eating fish at least once a week during their pregnancy (Table 3). Mothers' fish consumption during pregnancy reflected her own childhood fish consumption [Kendall's Tau-b: 0.46 (95% CI: 0.33, 0.57) Fisher's exact test: $p < 0.001$] and was higher among those whose father (G0) was a fishing guide [Kendall's Tau-b: 0.355 (95% CI: 0.210, 0.510) Fisher's exact test: $p < 0.001$]. Indeed, 21 mothers (28.4%), whose father (G0) had been a fishing guide reported eating fish at least once a week or more compared with only 2 (4.5%) among those whose father had not been a fishing guide (LR chi-square: 20.78; Fisher exact test: $p < 0.001$). No associations were observed for mothers' age, maternal age at pregnancy, or child's age with respect to G1/G2 fish consumption during pregnancy [Wilcoxon/Kruskal–Wallis tests (rank sums) one-way test chi-square = 3.39, $p = 0.188$; 2.15, $p = 0.342$; and 1.97, $p = 0.374$, respectively].

Table 2. Measured and estimated mothers' (G1) umbilical cord blood and childhood hair mercury (Hg).

	n	Mean	Median	IQR	Min–max
Measured umbilical cord blood Hg (μg/L)	29	7.65	5.70	2.35–8.80	1.5–35.7
Estimated umbilical cord blood Hg (μg/L)	51	15.15	5.25	3.59–16.86	1.0–65.2
Measured childhood hair Hg (μg/g)	39	1.50	0.50	0.50–0.90	0.50–11.4
Estimated childhood hair Hg (μg/g)	38	1.52	0.92	0.72–2.60	0.50–5.64

Note: IQR, interquartile range; max, maximum; min, minimum.

Table 3. Descriptive characteristics for pregnancy (G1/G2) and children/youth (G2), as reported by mothers (G1) in the Grassy Narrows Community Health Assessment (GN-CHA) survey: $n = 162$.

Characteristics	Yes [n (%)]	No [n (%)]	Missing [n (%)][a]
Pregnancy (G1/G2)			
Mother's age at birth of child (≥22 y)	93 (57.41)	69 (42.59)	0
Maternal fish consumption during pregnancy (≥once a week)	31 (19.14)	125 (77.16)	6 (3.70)
Problems during pregnancy/childbirth	33 (20.37)	125 (77.16)	4 (2.47)
Mother's drinking/drugs during pregnancy	24 (14.81)	134 (82.72)	4 (2.47)
Generation children/youth (G2)			
Age (≥12 y)	66 (40.74)	96 (59.26)	0
Sex (girls)	89 (54.94)	73 (45.06)	0
Grandfather was a fishing guide	74 (45.68)	49 (30.24)	39 (24.07)
Fish consumption past year (often)	25 (15.40)	121 (74.69)	16 (9.88)
Overall health (very good/excellent)	129 (79.63)	33 (20.37)	0
Mental health (very good/excellent)	98 (60.49)	62 (38.27)	2 (1.23)
Speech/language disorder	17 (10.49)	139 (85.80)	6 (3.70)
Anxiety or depression	16 (9.88)	134 (82.72)	12 (7.40)
Emotional or behavioral problems	42 (25.93)	102 (62.96)	18 (11.11)
Emotional or behavioral problems (12–17 y)	24 (36.36)	31 (49.97)	11 (16.67)
Ever attempted suicide (all children)	22 (13.58)	133 (82.10)	7 (4.32)
Ever attempted suicide (12–17 y)	17 (27.42)	45 (72.58)	4 (6.45)

[a]For each question in the GN-CHA, persons could provide the reply "I don't know," "I can't recall," or "Refused", which were grouped as "Missing."

Seventeen mothers (21.3%) reported drinking or taking drugs for 24 pregnancies (Table 3), representing 15.1% of pregnancies for which this information was available ($n = 158$). Mothers who reported drinking alcohol or taking drugs during pregnancy for their child (G0/G1) were significantly younger at childbirth compared with those who reported not drinking or taking drugs (median = 19 y; IQR: 18–21 y and median = 23 y; IQR: 20–27 y, respectively; Wilcoxon/Kruskal–Wallis chi-square: 11.83; Fisher exact test: $p = 0.001$). The proportion of pregnancies for which the mother reported drinking or taking drugs was higher for those whose father (G0) had been a fishing guide compared with those who reported that their father had not been a fishing guide ($n = 14$, 19.7% vs. $n = 2$, 4.2%). No association was observed between drinking or taking drugs during pregnancy and the mother's current drinking habits (LR chi-square: 0.06; Fisher exact test: $p = 0.801$). Few children ($n = 4$, 2.5%) had a diagnosis of FASD.

GN-CHA mothers' (G1) reports about their children (G2) are presented in Table 3. Children's median age was 10 y (IQR: 8–14). For almost one quarter ($n = 39$), their mothers did not know if their grandfather had worked as a fishing guide. Most children (74.7%; $n = 121$) had not eaten local fish often over the year prior to the survey (Table 3). The First Nations Regional Health Survey 2008/2010 defined a measure for conditions that "may have an impact on learning ability" as at least one of the following diagnosed conditions: cognitive or mental disabilities, ADD/ADHD, learning disabilities, speech/language difficulties[33]; 24 children (14.8%) fell into this category. No difference was observed between boys ($n = 14$) and girls ($n = 10$) (LR chi-square: 2.27; Fisher exact test: $p = 0.132$).

Mothers' perceived the mental health of almost 40% ($n = 62$) of their children as less than very good or excellent (Table 3), and for 25% of children, the mother reported that the child had more emotional or behavioral problems compared with other children of the same age and sex (Table 3). The prevalence of emotional or behavioral problems was twice as high in youth (≥12 years of age) compared with younger children (36.7%; $n = 24$ vs. 18.8%; $n = 18$; LR chi-square: 8.87; Fisher exact test: $p = 0.003$). Among younger children (<12 years of age), no difference was observed between boys and girls [$n = 9$ of 41 (22.95%) vs. $n = 9$ of 48 (18.75%), respectively; LR chi-square: 4.65; Fisher exact test: $p = 0.794$]. However, more adolescent girls (≥12 years of age) presented emotional or behavioral problems compared with boys [$n = 17$ of 30 (56.67%) vs. $n = 7$ of 25 (28.00%), respectively; LR chi-square: 4.65; Fisher exact test: $p = 0.031$].

Mothers reported that 13% ($n = 22$) of children/youth had attempted suicide, but the percentage rose to 27% ($n = 17$) when considering only those ≥12 years of age (Table 3). Among adolescents (≥12 years of age), suicide attempts were higher among girls ($n = 14$ of 34; 41.18%) compared with boys ($n = 3$ of 28; 10.71%; Fisher exact test LR chi-square: 7.70; $p = 0.006$). None of the children with a diagnosis of FASD had attempted suicide.

The SEM in Figure 1 presents the intergenerational pathways for children and youth attempted suicide, with the corresponding fit parameters in Table 4 and estimates of sequential mediations in Table 5. The pathways began with mothers' year of birth, which represented not only her age, but also accounted for the change in Hg exposure over time. Different pathways linked G0 through G1 with an increased risk for G2 attempted suicide.

One modeled pathway originated from mothers' umbilical cord blood Hg (G0/G1), a reflection of (G0) grandmothers' fish consumption, as well as maternal prenatal exposure, and grandfather having worked as a fishing guide (G0), both of which are seen to contribute to mothers' childhood Hg (G1) (Figure 1). Mothers' childhood Hg (G1) was then associated with her being diagnosed with at least one neurological disorder, which in turn, was associated with current psychological distress, to which suicidal ideation, over her lifetime, also contributed. The model further suggested an association between mothers' K10 psychological distress score (G1) and child's mental health status (G2), which was linked to the child's emotional state and behavioral problems, which, in turn, may contribute to an increased risk for attempted suicide, particularly among older girls.

A second modeled pathway lead from the father as a fishing guide (G0) (Figure 1) to daughters' fish consumption during pregnancy (G1) and consequently her children's prenatal Hg exposure (G1/G2). Maternal fish consumption during pregnancy (G1/G2) contributed to children's (G2) poor mental health and emotional and behavioral problems, the latter of which was directly associated to attempted suicide.

Another pathway showed associations between the grandfather having been a fishing guide (G0) and mothers' drinking or taking drugs during pregnancy (G1/G2) (Figure 1). The association between mothers' drinking and drugs during pregnancy and child's emotional and behavioral problems was not significant ($p = 0.14$).

For the SEM (Figure 1), power analyses on model misspecification showed that a sample size of 162 children was associated with a power of 71.8%, which was acceptable. Table 4 shows the SEM fit parameters for the final model and the sensitivity analyses

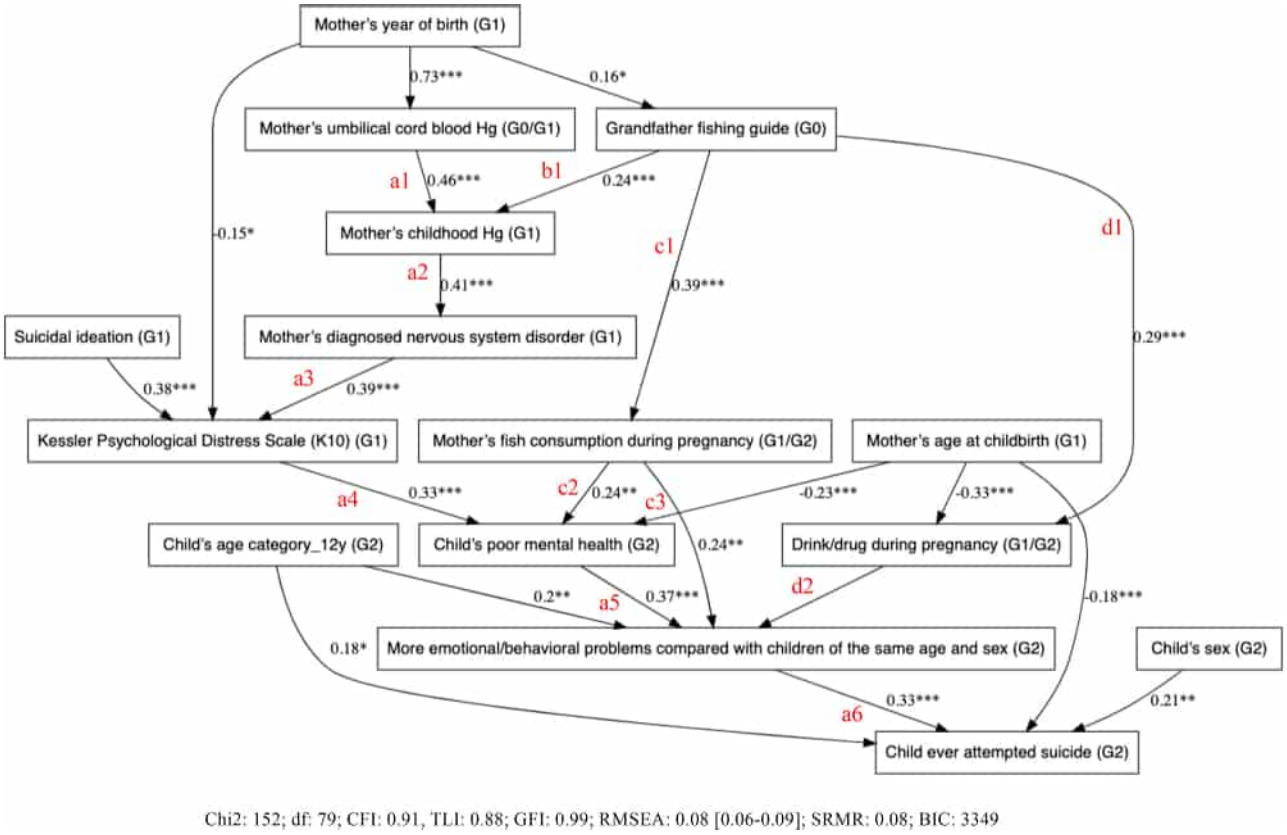

Figure 1. Structural equation model pathway diagram on the psychological impact of Hg exposure through a matrilineal lens across three generations. Intergenerational information, provided by mothers ($n = 80$) for the Grassy Narrows Community Health Assessment provided for 162 children. Mothers' umbilical cord Hg and childhood hair Hg concentrations were estimated from a 1970–1997 biomarker database. Note: BIC, Schwarz's Bayesian information criterion; CFI, comparative fit index; Chi2, chi-square; df, degrees of freedom; GFI, global fit index; Hg, mercury; RMSEA, root mean square error of approximation; SRMR, standardized root mean square residual; TLI, Tucker–Lewis index. *p*-Values: significance of pathway coefficient estimates: $^{*}p \le 0.05$; $^{**}p \le 0.01$; $^{***}p \le 0.001$.

using maternal childhood fish consumption and a mother-clustered–based model. The performance of the SEM models that *a*) replaced estimated maternal childhood Hg exposure by her reported fish consumption at ~10 years of age (G1), and *b*) used a mother-clustered–based model, with imputation, were similar.

Estimates of sequential mediation at different stages in the SEM pathways are presented in Table 5, with target effects power analyses simulation for each link. For all pathways toward children and youth (G2) attempted suicide, effects diminished over generations, but remained significant (Table 5). The strongest contributions passed through fish consumption during pregnancy. The pathway that passed through mothers' drinking or taking drugs during pregnancy (d1 × d2 × a6 in Figure 1) to children's attempted suicide was not significant (coefficient estimate = 0.01; $p = 0.17$).

Finally, children's risk of attempting suicide was significantly influenced by mothers' age at childbirth (Figure 1). The median age at childbirth for mothers of children who attempted suicide was 19.5 y (75th percentile: 22 y), whereas the median age at childbirth of mothers whose child had never attempted suicide was 23 y (75th percentile: 27 y) (Wilcoxon/Kruskal–Wallis chi-square: 12.2; $p = 0.001$).

Tables 1 and 3 include several characteristics that were tested in the SEM, but which were not retained in the final model. For G0, residential school attendance (grandmother and grandfather) did not enter the model ($p > 0.1$). A total of 59 mothers (78.7%) reported that at least one of their parents had attended a residential school; these mothers were significantly older than those whose parents had not been taken to a residential school [median = 36 y (IQR: 31–39 y) vs. median = 28.5 y (IQR: 25–30 y); Wilcoxon chi-square = 19.7; $p < 0.0001$]. For G1, the following variables were tested but did not enter the model ($p > 0.1$): education and school success, currently working, struggle to pay for food, heavy drinking, general health, obesity, at least one chronic health condition, and current fish consumption; for G1/G2: health issues during pregnancy, prematurity, and difficulties during childbirth; for G2: physical health, fish consumption over the past year, and school performance.

Table 4. SEM Fit parameters for the final model, the model with maternal childhood fish consumption and the mother-clustered–based model.

SEM model	Chi2	df	CFI	TLI	GFI	RMSEA (95% CI)	SRMR	BIC
Final model (Figure 1)	161	80	0.90	0.87	0.99	0.08 (0.06, 0.10)	0.09	3,352
Maternal childhood fish consumption	153	80	0.90	0.88	0.99	0.08 (0.06, 0.10)	0.09	3,793
Mother-clustered	201	80	0.86	0.82	0.99	0.10 (0.08, 0.11)	0.09	3,753

Note: BIC, Schwarz's Bayesian information criterion; CFI, comparative fit index; Chi2, chi-square; CI, confidence interval; df, degrees of freedom; GFI, global fit index; RMSEA, root mean square error of approximation; SEM, structural equation model; SRMR, standardized root mean square residual; TLI, Tucker–Lewis index.

Table 5. Estimates of sequential mediation in SEM pathways for Hg exposure across three generations to attempted suicide in children and youth.

	Pathways	Estimate	(95% CI)	p-Value	Power target simulations	
					$n = 100$	$n = 500$
Toward psychological distress (G1)						
Umbilical cord blood Hg (G0/G1)	a1 × a2 × a3	0.07	(0.02, 0.12)	0.017	1.00	1.00
Childhood Hg (G1)	a2 × a3	0.16	(0.07, 0.25)	0.000	1.00	1.00
Father fishing guide (G0)	b1 × a2 × a3	0.04	(0.01, 0.06)	0.000	0.87	0.91
Toward decreased child's mental health (G2)						
Umbilical cord blood Hg (G0/G1)	a1 × a2 × a3 × a4	0.02	(0.01, 0.04)	0.017	0.99	0.99
Childhood Hg (G1)	a2 × a3 × a4	0.05	(0.02, 0.09)	0.000	0.99	0.99
Fish consumption during pregnancy (G1/G2)	c2	0.24	(0.09, 0.39)	0.000	0.95	0.96
Father fishing guide (G0)	(b1 × a2 × a3 × a4) + (c1 × c2)	0.11	(0.03, 0.18)	0.000	0.90	0.92
Toward child's emotional or behavioral issues (G2)						
Umbilical cord blood Hg (G0/G1)	a1 × a2 × a3 × a4 × a5	0.01	(0.00, 0.02)	0.000	0.95	0.95
Childhood Hg (G1)	a2 × a3 × a4 × a5	0.02	(0.00, 0.04)	0.028	0.96	0.97
Fish consumption during pregnancy (G1/G2)	(c2 × a5) + c3	0.33	(0.15, 0.50)	0.000	0.99	0.99
Father fishing guide (G0)	(b1 × a2 × a3 × a4 × a5) + (c1 × c2 × a5) + (d1 × d2) + c3	0.17	(0.07, 0.27)	0.000	0.99	0.99
Toward child's attempted suicide (G2)						
Umbilical cord blood Hg (G0/G1)	a1 × a2 × a3 × a4 × a5 × a6	0.00	(0.00, 0.01)	0.010	0.73	0.77
Childhood Hg (G1)	a2 × a3 × a4 × a5 × a6	0.01	(0.00, 0.01)	0.044	0.83	0.85
Fish consumption during pregnancy (G1/G2)	(c2 × a5 × a6) + (c3 × a6)	0.11	(0.03, 0.19)	0.017	0.96	0.97
Father fishing guide (G0)	(b1 × a2 × a3 × a4 × a5 × a6) + (c1 × c2 × a5 × a6) + (d1 × d2 × a6) + (c1 × c3 × a6)	0.06	(0.01, 0.10)	0.017	0.97	0.99

Note: Pathways with "a" originated from mothers' umbilical cord blood Hg; Pathways with "b," "c," or "d" originated from grandfather a fishing guide. Hg, mercury; SEM, structural equation modeling. p-Values adjusted on bootstrap: significance of pathway coefficient estimates: $^{*}p \le 0.05$; $^{**}p \le 0.01$; $^{***}p \le 0.001$.

Table S2 presents a series of multiple regression models for the various components of the SEM pathways, without mediating variables. The results support the direct associations computed by the SEM.

Discussion

This study, which examined a matrilineal linkage over three generations, suggests an intergenerational impact of Hg exposure on Grassy Narrows First Nation children's emotions and behavior and attempted suicides. Mothers who participated in the GN-CHA provided information on their parents and children. Most of these women, born between 1962 and 1993, were exposed to Hg prenatally and as children, teenagers, and adults. During the years when Hg exposure was at its highest, their families suffered the dramatic consequences of the loss of their Indigenous culture and values, as well as their traditional food and livelihood.[1–6] In the absence of information on exposure of the grandparent generation (G0), we used the maternal father's occupation as a fishing guide as a proxy for grandfathers' high Hg exposure, based on biomonitoring data.[13,14] Maternal umbilical cord blood Hg (G0/G1) reflected grandmothers' Hg exposure through fish consumption during pregnancy.

The point of departure for the study was the prevalence of attempted suicide among today's children and youth. Mothers reported that 27.4% of adolescents ($n = 17$) had attempted suicide at least once: girls ($n = 14$; 41.2%) and boys ($n = 3$; 10.7%). These prevalences are considerably higher than those reported in the most recent First Nation and Regional Health Survey,[63] administered to 4,639 First Nation youth at the same period as the GN-CHA, in which 10.3% reported ever attempting suicide (15.6% of girls and 5.2% of boys).

In the SEM of the present study, several pathways linked grandparents (G0) Hg to an increased risk of attempted suicide for G2 children and youth. The pathway through mothers' (G1) childhood Hg exposure was mediated by her umbilical cord blood Hg concentration (G0/G1) and having a father a fishing guide (G0), both of which likely reflect grandparents fish consumption and Hg exposure. Mothers' (G1) childhood Hg exposure was directly associated with having at least one nervous system disorder, which, in turn, was associated with her current psychological distress. These findings are consistent with studies that have examined Hg exposure and psychological distress. Using the General Health Questionnaire (GHQ), a study in Japan reported a high prevalence of psychological distress among 86% of 133 women ≥40 years of age living in the Minamata area, where they were exposed to Hg as children.[64] In a recent study of an Indigenous community in the Brazilian Amazon, hair Hg among persons 12–72 years of age [mean age 27.4 y ($n = 109$)] was associated with depressive symptoms, as assessed with the Geriatric Depression Scale Short Form; persons with hair Hg ≥10 μg/g were 1.8 times more likely to manifest depressive symptoms.[65] In the GN-CHA, one mother in five reported a high level of psychological distress on the Kessler Psychological Distress Scale. This is consistent with Harada's observations in 2010 where 20% of 73 Grassy Narrows examinees manifested signs and symptoms of emotional disturbances.[19] In the present study, maternal psychological distress score was associated with child's poorer health. This association has been observed in many studies that have linked mothers' psychological distress to their children's mental health status.[66,67]

Based on the SEM, the strongest contribution of G0 on G2 was through grandfather's influence on mothers' fish consumption during pregnancy, suggesting that the tradition of fish consumption is passed on from father to daughter. Indeed, women who consumed fish as children, tended to consume fish as adults. Grassy Narrows elder J.D.S., co-investigator on the present study, notes that: "fish has always played a vital role in Anishinaabek natal traditions. The grandmothers used to say, 'Eat fish broth, and the breast milk will come out.'" In 2005, Chan et al.[68] reported a very high correlation between local fish consumption and hair Hg concentrations in Grassy Narrows; for women of

child-bearing age (18–40 y), the average fish intake varied by season and was highest during the summer months ($\sim$28 g/d) and lowest during the winter months ($\sim$2 g/d). In 2010, Neff et al.,[10] who analyzed Hg concentrations in fish in the English–Wabigoon River system, indicated that they had not declined significantly since the mid-1980s and may still present a potential health risk to humans.

In the SEM, maternal fish consumption during pregnancy (G1/G2), an indicator of prenatal MeHg exposure, was the major contributor to children's mental health and emotional state and behavior, suggesting that at recent fish Hg concentrations, MeHg was affecting fetal development. MeHg is actively transported across the placenta and its concentration in umbilical cord blood has been measured to be $\sim$1.7 times (95th percentile: 3.4) that of maternal blood.[29,69,70] Several studies have reported an association between prenatal Hg exposure and anxiety-related symptoms in children or adolescents.[18,31,71–73] These findings are supported by recent imaging studies of prefrontal brain areas of Inuit adolescents.[74] For the children and youth in the present study, there was a direct association between emotional state and behavioral problems and attempted suicide.

The SEM results suggested that despite the absence of specific information on G0 or about the trauma suffered by mothers (G1) during their own childhood or adolescence, a pathway linked grandfather having been a fishing guide to mothers' drinking or taking drugs during pregnancy. The vivid descriptions of life in Grassy Narrows in the years of the highest Hg exposures and the socioeconomic and cultural trauma suggest that the context in which these women were raised would be an important determinant of their adolescent and early adult behavior. Negative childhood experiences have been associated with early alcohol drinking.[75] In the present study, drinking alcohol or taking drugs was more prevalent during pregnancies at a younger age [$\leq$20 years of age; $n=14$ of 44 (31.82%)], compared with 10 of 114 (8.8%) for pregnancies at an older age. Although the GN-CHA did not specify the quantity of alcohol or drugs absorbed during pregnancy, the percentage of children whose mother drank or took drugs during her pregnancy (15.2%, $n=24$) was inferior to the prevalence for First Nations' pregnancies in Canada, estimated in a systematic review of six studies[76]: 36.5% for drinking and 22.1% for binge drinking during pregnancy.

The possible interaction between MeHg and ethanol has been examined in animal models.[77–80] In one study, ethanol lowered Hg accumulation in the prefrontal and motor cortex of mice that were administered chronic low doses of MeHg and ethanol equivalent to binge drinking; the authors suggest that ethanol intake could reduce central nervous system Hg levels associated with psychiatric and cognitive disorders in MeHg-intoxicated individuals.[80] Future studies in communities with high Hg exposure might consider addressing whether drinking might relieve or aggravate Hg-related symptoms.

In the present study, an inverse relation was observed between mothers' age at childbirth and children's attempted suicide. This is consistent with the findings of a systematic review and meta-analysis of attempted suicide in relation to *in utero* and perinatal factors, in which teenage pregnancy was identified as an important risk factor.[81] The review did not include environmental toxic exposures.

The GN-CHA focused primarily on current health, socioeconomic conditions, and well-being and as a result, no specific information was available on each mother's (G1) possible adverse experiences earlier in her life. The descriptions of psychological suffering in this community following the Hg discharge[1–9] resemble those of other environmental disasters, such as the *Deepwater Horizon* spill, where an increase in domestic partner fights, depression, memory loss, and inability to concentrate was reported for wives of clean-up workers 2 y after the spill.[82] Palinkas et al.[83] reported that the decline in subsistence activities was an important risk factor for post-traumatic stress disorder in Alaska Natives affected by the *Exxon Valdez* oil spill. Furthermore, children who lived closer to the *Hebei Spirit* oil spill in Korea, presented a higher prevalence of depressive symptoms compared with those who lived farther away.[84] The authors mention that adult suicides increased following the spill and suggested that parent psychopathology subsequent to a disaster influences children's psychological health.[84]

At the time of the GN-CHA, Statistics Canada reported that suicide risk among First Nation adults was three times higher than among the non-Indigenous population.[62] The GN-CHA use of the same questions as the First Nations Regional Health Survey 2008/2010,[33] administered to 11,043 First Nation adults from 216 communities in Canada, allowed us to compare Grassy Narrows with other First Nation communities. In the First Nations Regional Health Survey 2008/2010,[33] 11.8% of participants reported that a close friend or family member had committed suicide in the previous year. In the GN-CHA, 27 (36%) of the 75 mothers (G1) who answered this question responded in the affirmative. The prevalence of both suicidal ideation and attempted suicide during one's lifetime for mothers in the present study was also considerably higher compared with those of other First Nations in Canada who were 18–39 y old at the time of the survey[33]: Fifty percent ($n=40$) among the mothers of Grassy Narrows, compared with 22% in First Nation communities in Canada, and 40% ($n=32$) vs. 13.1%, respectively.[33]

Although prenatal Hg exposure was associated with emotional and behavioral problems and attempted suicide in today's children and youth (G2), this relation was not observed for their mothers (G1). Several reasons possibly explain this difference. For the mothers (G1), no individual information was available for other lifetime factors that could have contributed to suicidal ideation or attempted suicide, notably the breakdown of the mother's family in the years following the discharge; some families would have had more difficulty coping than others. Many historic descriptions of Grassy Narrows underline the high prevalence of successful suicides,[1,2,4,5] but no studies were performed on their possible relation to prenatal or childhood Hg exposure or whether their fathers (G0) had been fishing guides. A previous study in Grassy Narrows has linked higher lifetime Hg exposure with premature death ($n=154$ of 222).[16] It is possible that women with higher exposures may have died prior to the GN-CHA.

Although we cannot go back in time, we can certainly ask about the possible contribution of very high concentrations of prenatal and childhood Hg to the dramatic increase in youth suicide during the 10–12 y following the discharge of extremely high levels of Hg. Erikson,[4] who visited Grassy Narrows in 1979, reported that in the 11 months between 1977 and 1978, 26 young people between the ages of 11 and 19 years had attempted suicide.[4] In the same chapter, he provided a description of Hg poisoning that included "depression and apathy, memory loss and ... explosive shifts in mood", but then went on to explain how alcohol and "the way in which the Ojibway raise their children" accounted for the striking disorder in this community. In all the accounts of social disruption in the Grassy Narrows disaster, no one seriously considered whether Hg exposure may be a contributing factor, and no one considered whether drinking might relieve or aggravate Hg-related symptoms.

In the present study, we examined the possible contribution of family members having been placed in a residential school, but these variables were not retained in the SEM pathways. This may be due to the lack of variance given that almost 80% ($n=59$) of 75 mothers reported that at least one of their parents had attended

a residential school and they were significantly older than those whose parents had not been placed in a residential school.

There are important limitations to the present study owing to limited data availability. Generational SEM is inherently complex and, in the present study, this was compounded by the small size of the population, paucity of information on G0 and G1's early childhood experiences, and missing data. This is, indeed, a relatively small community; the census data for 2016 indicates that in Grassy Narrows, there were 160 women between the ages of 20 and 54 y and 175 children 5–19 years of age.[32] No specific information was available on individual grandfather's (G0) Hg exposure and behavior in the years following the discharge, and we relied on published reports and descriptions.[1–6,14] Information on mothers' childhood (G1) was limited to her childhood fish consumption, her father working as a fishing guide, and schooling and school performance. Missing Hg exposure data were handled using estimates, based on larger measurements.[16,20] Children's mental health was not assessed, but relied on mothers' perception. All of these factors contributed to limiting model performance. To ensure the performance of the SEM, we used a series of statistical techniques to address different types of error, and power analyses. We tested the reliability of the pathways, using a different childhood exposure variable (maternal fish consumption at 10 years of age) and mother-clustered–based modeling. The strengths of the associations were verified using logistic regression models without mediating variables. Although not perfect, the final SEM provided a plausible portrait of the contribution of Hg effects over three generations.

Although social disruption certainly played an important role in the psychological well-being of the people of Grassy Narrows First Nation following the disaster,[1–6] the findings of the present study suggest that Hg exposure over three generations likewise contributed to their mental health. However, to our knowledge, no study has carefully addressed the possible positive psychological impact on this community's fortitude and resilience over the past decades. In the mid-1970s, Grassy Narrows initiated demonstrations and then legal proceedings to obtain compensation for the harm that was done to their community.[1–3] In 1975, community members worked with M. Harada and his team from Japan to document their neurological health,[19] and since that time the community has maintained close relations with the Japanese physicians, who have carried out several series of examinations.[85] Over the past 50 y, successive Chiefs and Council and grassroots Grassy Narrows people have worked with scientists for Hg remediation[86,87] and protection of their territory.[9] Their actions are marked by memoirs to federal and provincial parliaments, demonstrations, a hunger strike, and the longest blockade in Canada to stop logging on their territory.[79] Willow, writing about the blockade, stated: "The story of the Grassy Narrows blockade cannot be understood apart from the community's multigenerational struggle to endure in the face of political, cultural, and environmental colonization."[88]

After several years of community lobbying of government ministries, Grassy Narrows First Nation obtained funding for their community health assessment, as well as access to their own historic Hg exposure data. This study was only possible through the leadership of Grassy Narrows First Nation and collaboration with an academic research team, based on the principles of ownership, control, access, and possession of First Nations' data [OCAP, a registered trademark of the First Nations Information Governance Centre (FNIGC)].[89] Several authors have aptly pointed out that Indigenous leadership throughout the research process is key to decolonizing health research.[90,91]

Understanding the intergenerational harm that was done to the people of Grassy Narrows should serve to support efforts to restore the health and well-being that this community enjoyed prior to the discharge of Hg into the river system of their traditional territory. From a public health perspective, a community-based interdisciplinary approach[92,93] would be useful to understand and act upon the social, economic, historical, cultural, physiological, and psychological consequences of this and other environmental disasters.

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Ethics approval for the GN-CHA was obtained from the Manitoulin Anishinaabek Research Review Committee (MARRC), who issued an ethics certificate on 11 November 2016. The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the institutional review board of the Université du Québec à Montréal (2016_e_1350; 6 September 2016) and Health Canada Research Ethics Board (REB 2017–0006; 3 August 2017).

Informed consent forms were signed by all participants. Consent included survey participation and the linking of the information from the GN-CHA to data obtained from previous surveillance programs or studies of Hg exposure.

The data sets generated and analyzed in the present study are the property of the Grassy Narrows First Nation. Permission for use of the data lies with the Grassy Narrows Chief and Council.

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EXPERT REPORT

Grassy Narrows First Nation and Sherry Fobister, William Fobister, Senior, Simon Fobister and Chief Roger Fobister, Senior on their own behalf and on behalf of all other members of Grassy Narrows First Nation v. Minister of Natural Resources and Forestry (Ontario) and Minister of the Environment and Climate Change (Ontario), and the Attorney General of Ontario

Ontario Superior Court of Justice
(Divisional Court)

Prepared for
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GRASSY NARROWS
GENERAL MERCURY AND HEALTH FACTS

prepared by

Donna Mergler PhD
Professor Emerita
Université du Québec à Montréal

Date: November 6, 2015 _____
Donna Mergler

This is Exhibit A referred to in the affidavit of Donna Mergler
sworn before me this 6th day of November 2015

_____
Barbara Creary, lawyer, member of the Quebec Bar #183138-1

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Appendix A – Curriculum Vita

INTRODUCTION

I am a professor emerita at the *Université du Québec à Montréal* (UQAM), where I was a professor in the Department of Biological Sciences from 1970 to 2006. I hold a doctorate in physiology from McGill University. I am a former chair of the department (1982-1984), head of the doctoral program in environmental sciences (1993) and chair of the UQAM Institute for Environmental Sciences (2001-2003). I founded the Center for Interdisciplinary Research on Well-being, Health, Environment and Society (CINBIOSE) in 1985, and was director at different periods until 2000. From 1998 to 2013, I was director of the CINBIOSE World Health Organization-Pan American Health Organization Collaborating Center for the Prevention of Work and Environment-related illnesses. I was co-coordinator of the Latin American Community of Practice in Ecosystem Approaches to Human Health (2005-2013). Since 2008, I head the pan-Canadian research team on Gender, Environment and Health. I have been a member of the Quebec Council for Science and Technology (1984-1989) and the Science Advisory Board of the International Joint Commission of the Great Lakes (2001-2011). My teaching, research and writing have focused on the early neurotoxic effects in humans of environmental pollutants generally, including mercury. In 2006, I chaired an international scientific group that wrote a consensus document on mercury and human health. I have authored over 150 peer-reviewed scientific articles, including 50 scientific papers on the subject of mercury exposure and effects in freshwater fish-eating populations. I have given keynote addresses on mercury and human health at major international conferences and numerous presentations on the subject at national and international meetings, including the Office of Science and Technology Policy of the United States' White House (1988). I have written reports on mercury and health as it relates to the members of Grassy Narrows First Nation. My curriculum vita appears in Appendix A of this Expert Report.

I have been asked by Joseph F. Castrilli and Richard D. Lindgren of the Canadian Environmental Law Association on behalf of Grassy Narrows First Nation to prepare an expert report that responds to several questions. I am solely responsible for the preparation of this report.

QUESTIONS

1. For the documents referred to below, please indicate if the views expressed in those documents that relate to the subject matter of this expert report, and/or that are attributed to you, are accurate in every material respect? If not, please indicate in your expert report the corrections, if any, that should be made with respect thereto.

A. The Grassy Narrows-Earthroots request, dated January 2014, of the Ministry of the Environment for an individual environmental assessment (IEA) on the Whiskey Jack Forest Management Plan (2012-2022), and the supplementary submissions made to the Ministry dated May, July, September and November 2014 insofar as they relate to your area of expertise and the subject matter for your report.

B. Literature Review of the Mercury Disability Board, dated September 2010. This document (consisting of two reviews) is referred to in the September 2014 submission.

1.1 For the documents referred to below, please indicate your views on them to the extent they relate to the subject matter of your expert report and are within your area of expertise:

C. The article by Harada, et al. entitled "Mercury Poisoning in First Nations Groups in Ontario: 35 Years of Minamata Disease in Canada" (translated from the Japanese version published in the Journal of Minamata Studies in 2011).

D. The article by Takaoka, et al. entitled "Signs and Symptoms of methylmercury contamination in a First Nations community in Northwestern Ontario, Canada" published in the journal Science of the Total Environment in 2014.

2. Regarding the subject of mercury and human health:

a. Is mercury toxic to humans? If so, on the scale of toxic substances in the environment, where does mercury rank in terms of overall toxicity risk to humans?
b. If so, what are the clinical human health impacts of mercury?
c. Does exposure to mercury increase the risk of other health problems developing and, if so, identify those other health problems?

3. At what levels of exposure to mercury have adverse clinical health impacts on adults been documented in the scientific literature?

4. Does exposure to mercury affect the development of foetuses and children and, if so, what are the effects, and for what duration of time, if any, will those effects persist? At what exposure levels have these developmental effects been documented in the scientific literature?

5. Are there sub-clinical effects:

a. *In a community where mercury-related neurologic clinical disorders are present, could there be other persons with sub-clinical signs and symptoms?*
b. *What is the nature of these effects at each exposure level that have been documented in the scientific literature; and*
c. *Are developmental effects of mercury exposure affected by low socio-economic status based on such factors as education, income, etc.?*

6. *What are the sub-clinical population level effects, if any, of exposure to mercury? Compare these effects to individual clinical effects and to the mercury levels at which they are found? Comment on the nature and severity of the effect of these impacts at a community level?*

7. *Does mercury bio-concentrate across the placenta and, if so, what is the average concentration factor? What is the concentration factor at the 95th percentile?*

8. *Is there a delay in the manifestation of health effects following exposure to mercury? How do mercury impacts change with aging?*

9. *What evidence is there, if any, that mercury changes the rate or severity of degenerative neurological conditions such as Alzheimer, ALS, etc.?*

10. *What is the most important source of mercury in humans? How would you characterize the levels of mercury, if any, in piscivorous wildlife, such as ducks, loons, and otters? What effect, if any, do dental fillings have on human mercury body burden? How would you characterize the risk of methylmercury exposure from eating wild fish alone compared to the total mercury risk in an Aboriginal population that also eats ducks, otters, store fish, and has dental fillings?*

11. *What is the Health Canada – World Health Organization recommended fish mercury content limit (measured in parts per million – ppm) for subsistence eaters? What is the mercury limit measured in ppm for legal possession of lake fish meant for sale in Ontario?*

12. *In general, what is a reference dose? Compare the Canadian reference dose for preventing fetal neurotoxicity and developmental impacts with the reference dose adopted by the Environmental Protection Agency in the United States ("USEPA")? What caveats, if any, come with using the USEPA reference dose? Which of the two reference doses, in your professional opinion, is more appropriate and safe to use (1) for the general population, and (2) at Grassy Narrows, and why?*

13. *How does the USEPA reference dose, if at all, account for bio-concentration across the placenta? If it does not account for bio-concentration, how would it need to be modified in order to do so? How does the Canadian reference dose, if at all, account for bio-concentration across the placenta?*

14. *What are the health benefits, if any, of eating fish? What are the health benefits, if any, of the practice of fishing?*

15. *If there are health benefits to eating fish what, in your professional opinion and in the scientific literature of which you are aware, should be done with respect to practices that lead to the bio-accumulation of mercury in fish? How would this principle apply at Grassy Narrows?*

16. *How would you characterize the appropriateness of the health guidance contained in the Ontario Guide for Sport Fish Eaters for indigenous communities who eat fish? Which reference dose is used in developing the Guide?*

17. *Compare with the general population, the level of sensitivity of those who already have experienced elevated mercury exposure, or show symptoms of mercury poisoning, upon further exposure? Comment on the appropriateness of intake guidelines designed for the general population when applied to people exhibiting symptoms consistent with mercury poisoning?*

Grassy Narrows

18. *For document B listed above, and if not already addressed in response to question 1, please indicate the following:*

    a. *What role, if any, did you play in the preparation of document B?*
    b. *Are the findings and conclusions contained in document B still valid today? If not, indicate what material changes have occurred since the release of document B that would cause the need for significant revisions in its findings and conclusions?*
    c. *What would be the revised findings and conclusions, if any?*

19. *If not otherwise answered in response to question 1, above, please indicate if the statements are accurate that are contained in the first six pages of the September 2014 supplementary submission listed in item A that are attributed to your document B report?*

20. *Are you aware of a more thorough long-term study than that of Dr. Harada and his colleagues from Japan (including Takaoka and Fujino, et al.), on the issue of mercury exposure and effects at Grassy Narrows?*

21. *What risks, if any, do current mercury levels in pike and walleye present to the people of Grassy Narrows who eat fish caught from local waters?*

22. What risk is there, if any, to the health of people at Grassy Narrows who eat fish caught from local waters if mercury levels were to increase? How low an increase in fish mercury level would pose a health risk, if any?

ORGANIZATION OF EXPERT REPORT

The Expert Report is organized into two parts. Part 1 provides short summary answers to the questions listed above.

Part 2 updates the review of the scientific literature presented in the document entitled *Literature Review: The Impact of Mercury on Human Health* prepared by Dr. H.M. Chan and myself for the Mercury Disability Board in 2009, and in 2010 with a review of Dr. Harada's studies (Document B). Taken together, these provide the greater context and scientific background for the summary answers provided in Part 1.

PART 1

SUMMARY ANSWERS TO QUESTIONS

Question 1:

1. For the documents referred to below, please indicate if the views expressed in those documents that relate to the subject matter of this expert report, and/or that are attributed to you, are accurate in every material respect? If not, please indicate in your expert report the corrections, if any, that should be made with respect thereto.

> ***A. The Grassy Narrows-Earthroots request, dated January 2014, of the Ministry of the Environment for an individual environmental assessment (IEA) on the Whiskey Jack Forest Management Plan (2012-2022), and the supplementary submissions made to the Ministry dated May, July, September and November 2014 insofar as they relate to your area of expertise and the subject matter for your report.***

Answer to Question 1A: The information contained in these documents as concerns my expertise on mercury exposure and human health are accurate, with the following details

- **[IEA request, supplemental information, September, 2014 p. 3]** I verified this information with a colleague at the Minamata Institute, Dr. Mineshi Sakamoto, who informed me that the diagnostic criteria for Minamata disease have not changed. These

are the same diagnostic criteria that Dr. Harada used in Grassy Narrows. In Japan, a Law Concerning Special Measures to Provide Relief to Minamata Disease Victims, passed in 2009 was enacted in April, 2010[1]. On May 1, 2010, then Prime Minister Hatoyama attended and gave prayers at the Memorial Service for the Victims of Minamata Disease and was the first prime minister to do so. On the same day, the acceptance of applications for relief started, and eligible persons began to receive a lump sum payment in October 2010. By 2012, there were 48,327 applications for lump-sum payment and 16,824 applications for Minamata Disease Victims' Passbook. It is noteworthy that as early as 1977, the Japanese Ministry of the Environment initiated dredging because "even though the discharge of the methylmercury compound was stopped, the residual presence of mercury in the substratum of nearby waters could still cause the contamination of water and marine lives, making it necessary to remove the contaminated base sediment"[2].

- **[IEA request, supplemental information, September, 2014 p. 8]** The information written up in the Toronto Star (2003) was, in part, in error. I verified this information with Dr. Laurie Chan. While Dr. Chan did express his alarm at the high prevalence of persons still suffering from neurological symptoms after 30 years, he did not head a Health Canada financed study of neurological effects in Grassy Narrows. He did examine mercury in fish, fish consumption patterns and human exposure in Grassy Narrows[3].

- **[IEA request. Supplemental information, November, 2014]** While the psychological, social and economic impacts, cited in the Donnan 1986 report, are accurate, they do not do justice to the overall impact of mercury contamination and the ensuing reduced consumption of fish on the physical and mental health and well-being within the Grassy Narrow community.

- **[IEA request. Supplemental information, November, 2014; p. 13]** More precisely, the value for fish advisories at 0.049 µg/g is the EPA screening value for fish; it was derived specifically for subsistence fishers[4]. (see answer to Question 11)

- **[IEA request. Supplemental information, November, 2014; p. 13]** More precisely, as indicated in the text, the 0.2 µ/g wet weight was a recommendation made by the Medical Services Branch of Health and Welfare Canada for Grassy Narrows and White Dog in 1979.

[1] Japan Ministry of the Environment. Lessons from Minamata Disease and Mercury Management in Japan, (2013)
[2] Japan Ministry of the Environment Lessons from Minamata Disease and Mercury Management in Japan, (2013) p. 15
[3] Chan (2005)
[4] EPA Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories Volume 2 Risk Assessment and Fish Consumption Limits Third Edition, p. 1-6 (2000)

- **[IEA request. Supplemental information, November, 2014; p. 15]** I would rephrase the term 'the scientific literature recommends' in the following terms: There is scientific evidence to support that the EPA RfD, based on cord blood, may be too high since cord blood contains 60-70% more mercury than maternal blood, and approximately 100% higher for the upper 5% and recent studies have observed neurotoxic effects in children at these levels of prenatal exposure (see question 7 and Part 2; section 4).

B. Literature Review of the Mercury Disability Board, dated September 2010. This document (consisting of two reviews) is referred to in the September 2014 submission

Answer to Question 1B:

I was co-author of these reports and the information contained in these reports is still timely. Studies since that time further support and confirm the conclusions of these reports.

Question 1.1: For the documents referred to below, please indicate your views on them to the extent they relate to the subject matter of your expert report and are within your area of expertise:

C. The article by Harada, et al. entitled "Mercury Poisoning in First Nations Groups in Ontario: 35 Years of Minamata Disease in Canada" (translated from the Japanese version published in the Journal of Minamata Studies in 2011).

Answer to question 1.1 C.

In the article, Dr. Harada describes his experience over the past 35 years in the diagnosis of Minamata Disease in Grassy Narrows and White Dog. Dr. Harada was a clinical neurologist, with world-renowned expertise on Minamata Disease. He began examining patients with Minamata disease in 1961 and was the first to describe Fetal Minamata Disease from prenatal mercury exposure.

He relates in this article that since 1975 he has examined persons from Grassy Narrows and White Dog for signs and symptoms of Minamata Disease. Over the years, he has diagnosed many cases of Minamata Disease in these two communities. The studies up to 2004 are reviewed in our report to the Mercury Disability Board (see Document B).

In 2010, he lead a team, which included 5 neurologists/psychiatrists and internal medicine specialists in neurology. In Grassy Narrows, they examined 73 persons above the age of 20 years on the basis of the diagnostic criteria applied in Japan since 1975 for Minamata Disease. The

team identified 30 persons with Minamata Disease and a further 12 persons with "suspected Minamata Disease", among whom there were 5 cases reminiscent of Minamata developmental disorders from fetal exposure. Dr. Harada notes in this report that "fetal influence remains to be studied … there is no plan of investigation as of now."

The article reflects a great degree of thoughtfulness and care on the part of the physicians involved and, as Dr. Harada so aptly stated, ".. the undoubtable fact that Minamata Disease occurred in the corresponding districts in Canada, based on [their] long term investigation result."

D. The article by Takaoka, et al. entitled "Signs and Symptoms of methylmercury contamination in a First Nations community in Northwestern Ontario, Canada" published in the journal Science of the Total Environment in 2014.

Answer to question 1.1D.

In this article Takaoka and co-authors describe a comparison of signs and symptoms of 80 residents from Grassy Narrows above the age of 16 years with 88 mercury exposed Japanese residents and 164 Japanese non-exposed control residents. The group from Grassy Narrows was divided into 2 groups according to age: the older group from 45 years old to 76 years old and the younger (less than 45 years of age). The age of the two Japanese groups were similar to the older Grassy Narrows group. Their findings were:

- Although the Japanese exposed group reported more subjective symptoms, the more specific mercury related complaints were similar for the Japanese exposed and the Grassy Narrows older group.

- Neurological findings and quantitative sensory measurements were similar in the Grassy Narrows Older and Japanese Exposed groups than in the Japanese Control group.

- The results for the younger Grassy Narrows group fell between those of the Grassy Narrow Older and the Japanese Control groups.

- The authors mention the limitations of such a comparison due primarily to different living conditions and cultures, but emphasize the diagnostic validity of the examination.

- The authors conclude that the data collected from methylmercury-exposed indigenous residents of Grassy Narrows suggest that they were poisoned by methylmercury. The health abnormalities also appear to exist in a milder form in the younger generations from Grassy Narrows.

The findings of this study are consistent with the scientific literature on mercury poisoning. In

the absence of an epidemiologic study on neurotoxic effects of mercury exposure in Grassy Narrows, the study presents an innovative way of examining similarities and differences in signs and symptoms in communities who have been exposed to mercury. Ideally, it would have been useful to examine the signs and symptoms in Grassy Narrow residents with respect to past and present exposure and use a local reference group.

Question 2: Regarding the subject of mercury and human health:

a. Is mercury toxic to humans? If so, on the scale of toxic substances in the environment, where does mercury rank in terms of overall toxicity risk to humans?

Answer to Question 2a

Mercury is definitely toxic to humans. Every few years, the United States Agency for Toxic Substances establishes a Priority List of Hazardous Substances, which includes substances that have been determined to be of greatest public health concern to persons at or near National Priority List sites[12]. While this list considers aspects other than toxicity, it includes a measure of toxicity. The 2013, Registry[3] gives mercury the highest attributable toxicity points, at the same levels as arsenic and polychlorinated biphenyls (PCBs) and ranks mercury ranks third (after arsenic and lead) on the overall priority scoring list of 785 hazardous substances. It is noteworthy that mercury has held this ranking since 1991, when the first list was established.

b. If so, what are the clinical human health impacts of mercury?

The most severe clinical impacts of fetal and adult exposure to methylmercury are the neurodegenerative diseases: Fetal Minamata Disease and Minamata Disease, respectively.

Clinical effects in adults : Gait disturbance, loss of balance, speech disturbance constriction of visual fields, sensory disturbances (numbness, loss of feeling or tingling in extremities and around the mouth), hearing disturbances, muscle weakness, muscle cramps.

Clinical effects of in utero exposure: severe cerebral palsy-like symptoms, even when their mothers have mild or no manifestation of the poisoning: mental retardation, cerebellar ataxia (coordination and balance problems), primitive reflexes (present in infants, which normally disappear in adulthood), dysarthria (muscle speech disorders), and hyperkinesia (uncontrolled muscular movements).

[1] Agency for Toxic Substances Registry (http://www.atsdr.cdc.gov/spl/)
[2] It should be noted that this priority list is not a list of "most toxic" substances, but rather a prioritization of substances based on a combination of their frequency, toxicity, and potential for human exposure at NPL sites ((http://www.atsdr.cdc.gov/spl/))
[3] Agency for Toxic Substances Registry. Support Document to the 2013 list of hazardous substances that will be the subject of toxicological profiles.

c. Does exposure to mercury increase the risk of other health problems developing and, if so, identify those other health problems?

Mercury has been shown to increase the risk for learning disabilities in children and, in adults, the risk for cardiovascular disorders, such as myocardial infarction and hypertension. There is some evidence of an association between mercury exposure and metabolic syndrome, diabetes and autoimmune disorders, but more studies are required to confirm or not these associations (see Part 2, section 1)

Question 3: At what levels of exposure to mercury have adverse clinical health impacts on adults been documented in the scientific literature? What are the reported adverse clinical health effects in adults at these levels?

Answer to Question 3:

For clinical neurological effects in adults, there are case reports of moderate to severe neurological symptoms in patients with blood mercury concentrations from 12 – 38 µg/L[1,2].

It should be noted that, for adults, it is difficult to establish a level of exposure since mercury-related subtle neurological alterations may have existed since conception and the biomarkers of mercury exposure (hair and blood) only represent recent exposure. Thus, adults who have been prenatally exposed to mercury, with continued exposure through childhood and early adulthood, may suffer clinical effects that are not related to their current mercury exposure, but to their past exposure. Furthermore, the large majority of studies on adults include persons who eat marine fish, which have considerably higher concentrations of beneficial nutrients such as omega-3 fatty acids and selenium, compared to freshwater fish.

Question 4: Does exposure to mercury effect the development of foetuses and children and, if so, what are the effects, and for what duration of time, if any, will those effects persist? At what exposure levels have these developmental effects been documented in the scientific literature?

Answer to Question 4:

There is a very substantial scientific literature showing prenatal and early childhood exposure to mercury is associated with a decrease in children's intellectual capacities. This has been

[1] Silbernagel et al. (2011)
[2] Groth (2008)

confirmed in animal studies and in brain imaging and electrophysiological examinations (see Part 2; sections 5 and 6).

Follow-up studies of mercury-exposed children indicate that these deficits persist over time. For example, a study of Canadian Inuit children at 8 years of age, exposed prenatally to mercury, showed that 17.2% of the children whose cord blood mercury was above 7.5µg/L were below the clinical cut-off for learning disabilities compared to 4.3% for the others[1].

A 22-year follow-up study of children of mothers with high mercury exposure[2] shows that there are still deficits in major domains of brain function as well as general intelligence in relation to their cord blood mercury concentrations; the geometric mean of their current blood mercury concentrations was 2.53µg/L and hair mercury 0.68µg/g.

The lowest reference dose for the protection of foetus and children is the US EPA reference dose (5.8 µg/L blood mercury; 1 µg/g hair mercury), which includes a tenfold uncertainty factor[3]. However, since the mercury in the cord blood is higher than in mother's blood, it may be too high (see part 2, section 4).

Question 5: Are there sub-clinical effects:

a. *In a community where mercury-related neurologic clinical disorders are present, could there be other persons with sub-clinical signs and symptoms?*
b. *Nature of these effects at each exposure level that have been documented in the scientific literature; and*
c. *Developmental effects of mercury, if any, in children in families with low socio-economic status based on such factors as education, income, etc.?*

Answer to Question 5a:

Clinical manifestations of mercury poisoning constitute the tip of the iceberg with respect to the harmful health effects of mercury exposure. In a contaminated environment, for every person with clinical manifestations, there are many more with sub-clinical signs and symptoms and even more with symptoms of decreased well-being, which affect a person's physical, mental and social capacities.

Answer to Question 5b:

[1] Jacobson et al. (2005)
[2] Debes et al. (2015)
[3] Rice (2004)

In adults, the tip of the iceberg is composed of people with the most severe classical symptoms of mercury poisoning (described in answer to question 2b), a higher number of mercury-exposed persons present signs and symptoms that are less severe, but debilitating, such as poorer cognition, motor deficits, vision problems and cataracts. Cognitive deficits have been observed in freshwater fish-eating communities with hair mercury concentrations that ranged from 0.56 to 13.6 µg/g, with half of the participants having levels below 6 µg/g.

For cardiovascular effects, an analysis of existing studies by an expert committee indicate a twofold increased risk for myocardial infarction at equivalent hair concentrations less than 1.66µg/L[1] (see Part 2, section 1)

In children, the most severe classical symptoms of mercury exposure in their development years are described in question 2b. Many more children are exposed to lesser concentrations.

There is consensus on the fact that mercury exposure is associated with delayed learning, shortened attention span, memory deficits, delayed language acquisition, poorer motor control or coordination (see part 2, sections 5 and 6)

Even at very low concentrations of prenatal and early childhood exposures (maternal mean hair mercury 0. 0.53 (range 0–2.3) µg/g)[2], some of these effects are present in the developing child and the frequency and severity of these problems increases with the exposure dose.

In the study of Inuit children mentioned above, mothers' hair mercury at birth ranged from 1.4µg/g – 15 µg/g.

Electrophysiological and neuro-imaging techniques have confirmed altered brain activity in children with prenatal exposure to mercury.

Answer to Question 5c.

In addition to mercury exposure, children's development can be affected by other factors, such as poor nutrition and housing, pre-existing diseases and parents' unhealthy lifestyle, little access to health care, poor schooling, minimal parental stimulation (see Part 2, section 6).

Developmental mercury exposure can compound the effects of these conditions, resulting in, for example, a larger percentage of children with learning disabilities (see Part 2, Section 6, Figures 4,5 and 6)).

Question 6: What are the sub-clinical population level affects, if any, of exposure to mercury? Comment on the nature and severity of the effect of these impacts at a community level?

[1] Guallar et al. (2002)
[2] Oken et al. (2008)

What are the levels of mercury exposure documented in the scientific literature at which these effects can occur?

Answer to Question 6:

For adults, sub-clinical effects include poorer cognitive functions, poorer vision, poor motor function and earlier age-related cataracts. These affect people's capacity to earn their living and carry out daily activities (see part 2 sections 5, 6 and 7). Overall the community's capacity to develop is hindered. In some studies, cardiovascular and metabolic changes have been reported in relation to mercury exposure, but results are inconsistent and co-factors, such as nutritional status and lifestyle, may play a role (see Part 2, sections 1 and 2).

For children, even a small decrease in average cognitive function has striking repercussions for the community. For example, an average decrease of 5 IQ points, among exposed children means that in a community twice as many children have severe learning difficulties and half as many children are gifted (see Part 2, sections 5 and 6).

When other harmful factors (poor nutrition, lack of stimulation, poor education) are present, the effects of mercury may be greater (see Part 2, section 6). In a study of an Inuit community, an average loos of 4.8 IQ points resulted in over four times more children with learning disability[1]. (Part 2, section 6)

The loss of cognitive function has life-long effects for these children who do less well in school. Educational level is an important determinant of later-life earning capacity and health status.

Question 7: Does mercury bio-concentrate across the placenta and, if so, what is the average concentration factor? What is the concentration factor at the 95th percentile?

Answer to question 7:

Throughout pregnancy, the placenta concentrates methylmercury and blood mercury concentration in the umbilical cord, which nourishes the foetus, is higher than in the mother's blood.

At birth, the average cord mercury blood concentration is almost double that of the mother, while for one in twenty, that concentration is over three and a half times higher. (see part 2, section 4)

[1] Jacobson (2015)

Question 8: Is there a delay in the manifestation of health effects following exposure to mercury? How do mercury impacts change with aging?

Answer to Question 8:

Minamata Disease is a progressive disorder and some infants, who had a normal appearance at birth, slowly developed the disease over time.[1]

Studies of persons from the Minamata region show that even those that do not have the diagnosed disease show more signs of aging compared to persons from other regions (see Part 2, section 7 and Figure 6).

The aging brain is more sensitive to toxic assault and studies of aging fish-eaters exposed to mercury have shown mercury-related progressive visual disorders, even when exposure was reduced, and a higher prevalence of age-related cataracts. (see Part 2, section 7)

Question 9: What evidence is there, if any, that mercury changes the rate or severity of degenerative neurological conditions such as Alzheimer, ALS, etc.?

Answer to Question 9:

To my knowledge, there is no evidence of a higher prevalence of Alzheimer disease or amyotrophic lateral sclerosis (ALS). The features of fetal Minamata Disease are similar to cerebral palsy. However, because of the pervasive neurologic effects of mercury exposure, there may be misdiagnoses.

Question 10: What is the most important source of mercury in humans? How would you characterize the levels of mercury, if any, in piscivorous wildlife, such as ducks, loons, and otters? What effect, if any, do dental fillings have on human mercury body burden? How would you characterize the risk of methylmercury exposure from eating wild fish alone compared to the total mercury risk in an Aboriginal population that also eats ducks, otters, store fish, and has dental fillings?

Answer to Question 10:

The most important source of mercury exposure in humans is from the consumption of fish and fish-eating animals (see Part 2, section 8).

[1] Maruyama et al, (2012)

Mercury is accumulated and biomagnified through the food chain; the process is initiated through the action of bacteria that transform inorganic mercury, present in the water, to methylmercury.

Larger fish eat many small fish, incorporating all of their mercury. Fowl and mammals that eat fish will likewise accumulate mercury in the same way.

At the top of the food chain are humans. The risk depends on the total amount of mercury from each of the foods.

The risk for mercury exposure in Aboriginal populations that eat fish and fish-eating animals has been shown to be considerably higher than in other populations

A study of adult dietary practices among 7 Eeyou Istchee (Cree) communities in the James Bay area showed that blood mercury concentrations 3 – 20 times higher than those reported in the Canadian Health Measures Survey (CHMS) [1], which did not include Aboriginal communities living on reserves. (see Part 2, section 9).

In the study of the Cree community mentioned above, the geometric mean for blood mercury of persons with the highest traditional food intake was 5.3µg/L, for those who consumed the least traditional food, it was 3µg/L,[2] while for the general adult Canadian population, it is approximately 0.8 µg/L[3].

A further source of methylmercury exposure may come from wild rice that grows in sediments that have been contaminated with mercury.

Mercury in dental amalgams is inorganic mercury that can be measured in blood and urine, but not in hair. In the Canadian Health Measures Survey, blood mercury concentrations increased with the number of dental amalgams. The geometric mean for those with no mercury-based dental amalgams is 0.6 µg/L, while for those who have over 26 amalgams, it is 1.24µg/L[4].

Question 11: What is the Health Canada – World Health Organization recommended fish mercury content limit (measured in parts per million – ppm) for subsistence eaters? What is the mercury limit measured in ppm for legal possession of lake fish meant for sale in Ontario?

Answer to Question 11:

[1] Johnson-Down et al. (2015)
[2] Johnson-Down et al. (2012)
[3] Lye et al. (2013)
[4] Lye et al. (2013)

There are different types of recommended limits concerning fish consumption: (i) amount of mercury in the fish (expressed in mg/kg, µg/g or ppm); (ii) the amount of mercury considered safe to consume on a daily basis, considering persons' weight (µg/kg/day) over a lifetime; (iii) the average amount of fish that should be eaten (g/day or fish meals/month), based on a risk assessment of risks and benefits. Table 1 contains some of these recommendations from different agencies.

Table 1 Recommendations by different national and international agencies for limits for mercury on fish, mercury consumption and fish consumption

	Canada	Ontario	US-EPA	WHO/FAO
MERCURY IN FISH				
Commercial sale	0.5 ppm[a]			
Fishing for sale				
Recreational			0.4 ppm[c]	
Women of child-bearing age and children under 15		0.26 ppm[b] Do not eat: 0.52 ppm		
Others		0.61 ppm[b] Do not eat: 1.84 ppm		
Subsistence	0.2 ppm[h]		0.049 ppm[c]	
METHYLMERCURY IN THE PLATE				
Intake dose	0.2µg/kg body weight/day[d]		0.1µg/kg body weight/day[e]	0.23µg/kg body weight/day[f]
FISH CONSUMPTION				
General				
1-4 year old	10g/day[g]			
5-11 year old	14g/day[g]			
Adults	22g/day[g]			
Subsistence fishing				
1-4 year old	20g/day[g]			
5-11 year old	33g/day[g]			
Adults	40g/day[g]			

a. There are some exceptions to this for a few marine fish, with higher concentrations
b. These are the values used by the *Ontario Guide for Sport Fisher Eaters (2013-2014)* to

provide information on fish consumption for anglers (and their families) who consume moderate quantities of fish. The consumption advice is intended to protect individuals who follow the advice in the guide and consume no more than 8 meals per month of the fish they catch. Specific information is available for each lake.

c. Screening value from US Environmental Protection Agency *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories Volume 2 Risk Assessment and Fish Consumption Limits Third Edition (2000)*
d. Canadian Total Daily Intake Value Health Canada
e. EPA website http://www.epa.gov/iris/subst/0073.htm;
f. A recent review of these guidelines by the European Food Safety Authority (2012) proposed that it be reduced to 0.19 µg/kg/body weight
g. Daily fish consumption recommended in the document *Human Health Risk Assessment of Mercury in Fish and Health Benefits of Fish Consumption.* Bureau of Chemical Safety Food Directorate Health Products and Food Branch, Health Canada (2007)
h. Health and Welfare Canada recommendation for Grassy Narrows and White Dog in 1979.

Question 12: In general, what is a reference dose? Compare the Canadian reference dose for preventing fetal neurotoxicity and developmental impacts with the reference dose adopted by the Environmental Protection Agency in the United States ("USEPA")? What caveats, if any, come with using the USEPA reference dose? Which of the two reference doses, in your professional opinion, is more appropriate and safe to use (1) for the general population, and (2) at Grassy Narrows, and why?

Answer to Question 12:

The US-EPA uses the term Reference Dose (RfD), defined as ''an estimate of a daily exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious effects during a lifetime.''[1] Some scientists have raised the issue that this RfD may be too high because it is based on cord blood and does not take into account methylmercury accumulation in the placenta[2].

Canada uses Toxicity Reference Values (TRVs) to derive Total Daily Intake, (TDI) defined as "the maximum amount of a chemical that can be ingested on a daily basis over a lifetime without increased risk of adverse health effects.

As indicated in the table above, for methylmercury, the US-EPA RfD is 0.1µg/kg body weight/day, while the Canadian TDI is 0.2µg/kg body weight/day.

My opinion is that the US-EPA reference offers better protection against the harmful effects of

[1] cited in Rice (2004)
[2] Stern (2005)

exposure to methylmercury to all populations. Mercury intake for most of the general Canadian population is well below this intake.

In 2003, Chan[1] calculated the intake of mercury in the Grassy Narrow community and estimated mercury intake from fish consumption using the actual values that were measured in fish species from the various lakes and the reported portion size per fish meal.

In Grassy Narrows, in 2003, the average mercury intake over the year was 0.2µg/kg body weight/day, with men having higher average intakes compared to women (0.3 µg/kg body weight/day vs. 0.1µg/kg body weight/day). The average intakes included people who don't eat fish; if the analysis had included only fish-eaters, the average mercury intake would have been higher.

By season, the highest mercury intake was by men in summer and spring (3.7 µg/kg body weight/day). Approximately 25% had estimated intakes above the Canadian TDI and 41% were above the US-EPA RfD.

The average mercury intake for Grassy Narrows women in 2003 was above the US-EPA RfD of 0.1 µg/kg body weight/day. It should be noted that this includes all women who were surveyed, including those that don't eat fish.

Cord blood data from Grassy Narrows between 1978 and 1992 shows that the concentration mercury was much higher, particularly in the earlier period (see Part 2, section 14a and Figure 8). Today, these persons are between the ages of 23 and 37 years old.

Given the information on estimated methylmercury intake from past and present exposures in Grassy Narrows, there are already effects on their health and well-being from mercury exposure and the EPA RfD would be more suitable for the Grassy Narrows population. However, this does not take into account the health, social and economic benefits of fishing and fish consumption.

Question 13: How does the USEPA reference dose, if at all, account for bio-concentration across the placenta? If it does not account for bio-concentration, how would it need to be modified in order to do so? How does the Canadian reference dose, if at all, account for bio-concentration across the placenta?

Answer to Question 13:

The US-EPA reference dose, which is based on cord blood, does not take into account bio-concentration across the placenta. It is based on a cord blood concentration of 58 µ/L and then

[1] Chan (2005)

uses a tenfold security factor to arrive at a cord blood concentration of 5.8µg/L from which mercury intake is derived as 0.1µg/kg body weight/day. Mahaffey, who was one of the committee members who set the EPA RfD, suggests that it should be based on a value of 3.5 µg/L to take into account bioconcentration[1]. The relation between maternal mercury intake and cord blood is not necessarily linear[2] and what one can say at this point is that it would be lower than 0.1µg/kg body weight/day.

The Canadian Total Daily Intake is based on maternal hair at birth[3] and did not take into account placental bioconcentration and thus did not account for the fact that hair mercury concentrations decrease over pregnancy (see Part 2; figure 2).

Question 14: What are the health benefits, if any, of eating fish? What are the health benefits, if any, of the practice of fishing?

Answer to Question 14:

Fish is a highly nutritious food, providing a wide variety of nutrients, including omega-3 fatty acids (see Part 2, section 11).

In utero and throughout lifespan, omega-3 fatty acids are likewise positive physical and mental health outcomes, including children's neurodevelopment, visual functions, blood pressure, cardiac function, vascular reactivity and lipids

Studies of children exposed to mercury through fish consumption show the negative effects of mercury exposure and the positive effects of omega-3 fatty acids on neurodevelopment. Studies of adults, as well, have shown the opposing effects of mercury and omega-3 fatty acids and visual function, as well as for the risk of myocardial infarction (Part 2, section 11, Figure 7)

The US-EPA advisory for subsistence fishing was developed in collaboration with representatives from Native American tribes. It indicates: "EPA recognizes, however, that Native American subsistence fishers are a unique subsistence fisher population that needs to be considered separately. For Native American subsistence fishers, eating fish is not simply a dietary choice that can be completely eliminated if chemical contamination reaches unacceptable levels; rather eating fish is an integral part of their lifestyle and culture. This traditional lifestyle is a living religion that includes values about environmental responsibility and community health as taught by elders and tribal religious leaders. Therefore, methods for balancing benefits and risks from eating contaminated fish must be evaluated differently than for the general fisher

[1] Mahaffey (2009)
[2] Stern (2003)
[3] Legrand et al (2010)

population"[1]."

Question 15: If there are health benefits to eating fish what, in your professional opinion and in the scientific literature of which you are aware, should be done with respect to practices that lead to the bio-accumulation of mercury in fish? How would this principle apply at Grassy Narrows?

Answer to Question 15:

In my professional opinion, based on the existing scientific literature, fish-eating practices should seek to maximize the nutritional benefits from fish consumption and minimize the toxic risk from mercury and other contaminants.

The Grassy Narrows community has been exposed to high concentrations mercury in fish for many years and individuals and the community are suffering the effects. **It would only add toxic insult to toxic injury to further expose this population to mercury**

While the community needs the nutrition from the fish, their intake of mercury needs to be minimal. To achieve this there needs to be a comprehensive plan:

- to reduce mercury at the source in the lake sediments;
- to never increase the mercury load in this environment;
- to eat more fish with little mercury;
- to initiate schooling and health programs to address the issue of mercury poisoning in this community.

Question 16: How would you characterize the appropriateness of the health guidance contained in the Ontario Guide for Sport Fish Eaters for indigenous communities who eat fish? Which reference dose is used in developing the Guide?

Answer to Question 16:

The Ontario Guide for Sport Fish Eaters is designed for "anglers (and their families) who consume moderate quantities of fish. The consumption advice is intended to protect individuals who follow the advice in the guide and consume no more than 8 meals per month of the fish they catch." The Guide notes that the advisory is based on the Canadian TDI. Their fish advisory recommends that "for women of child-bearing age and children under 15 years old, restrictions on consuming sport fish containing mercury begin at levels of 0.26 parts per million. Complete restriction (i.e., do not eat) is advised for levels above 0.52 parts per million. For the general population, consumption restrictions begin at levels above 0.61 parts per million. Complete

[1] US Environmental Protection Agency *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories Volume 2 Risk Assessment and Fish Consumption Limits Third Edition (2000) p. 16*

restriction is advised for levels above 1.84 parts per million."[1]

The guide clearly indicates that it is not for heavy fish eaters. In Grassy Narrows, using the 2003 information on fish consumption from Chan, approximately 16% of persons eat more than 9 fish meals/month, and the average mercury content for several of the fish species in many of the lakes is above 0.52 ppm.

Question 17: Compare with the general population, the level of sensitivity of those who already have experienced elevated mercury exposure, or show symptoms of mercury poisoning, upon further exposure? Comment on the appropriateness of intake guidelines designed for the general population when applied to people exhibiting symptoms consistent with mercury poisoning?

Answer to Question 17:

There is ample evidence from animal and human studies that mercury modifies normal functioning of many systems, and in particular, the nervous system. While some of these changes result in symptoms and signs of damage, many remain undetectable because of the body's capacity to adapt. There is, however, a limit to this physiological adaptation and further exposure will build on the damage already present.

The guidelines for mercury intake refer to "over a lifetime". If exposures have been higher in the past than at present, the intake guidelines do not apply since over the lifespan, one's intake will be higher than those recommended by the guidelines.

Grassy Narrows

Question 18: For document B listed above, and if not already addressed in response to question 1, please indicate the following:

- ***a. What role, if any, did you play in the preparation of document B?***
- ***b. Are the findings and conclusions contained in document B still valid today? If not, indicate what material changes have occurred since the release of document B that would cause the need for significant revisions in its findings and conclusions?***
- ***c. What would be the revised findings and conclusions, if any?***

Answer to Question 18a:

I prepared document B in collaboration with Dr. Laurie Chan, Professor and holder of the Canada Research Chair in Toxicology and Environmental Health.

[1] Ontario Ministry of the Environment. 2013-2014 Guide to Eating Ontario Sport Fish, p. 16,

Answer to Question 18b:

The findings and conclusion of document B, which was submitted to the Mercury Disability Board in 2010, are still valid today. Since that time the science of mercury exposure and its effects on human health has continued to advance substantially and Part 2 of the present document updates the scientific evidence since that time. Studies published since 2010 on the effects of mercury on health and well-being, confirm the conclusions contained in Document B.

Answer to Question 18c:

The more recent studies indicate effects of mercury exposure are present at lower levels than previously thought and that they are long-lasting.

Question 19: If not otherwise answered in response to question 1, above, please indicate if the statements are accurate that are contained in the first six pages of the September 2014 supplementary submission listed in item A that are attributed to your document B report?

Answer to Question 19:

The statements are accurate and the scientific literature of the past 5 years provides strong confirmation. One further update: The law Concerning Special Measures to Provide Relief to Minamata Disease Victims, passed in 2009 was enacted in April, 2010 (see question 1 above).

Question 20: Are you aware of a more thorough long-term study than that of Dr. Harada and his colleagues from Japan (including Takaoka and Fujino, et al.), on the issue of mercury exposure and effects at Grassy Narrows?

Answer to Question 20:

Dr. Harada was a clinical neurologist, with world-renowned expertise on Minamata Disease, who began examining patients with Minamata Disease in 1961. He carried out a most thorough study of clinical manifestations of Minamata Disease in Grassy Narrows. No other group of scientists have carried extensive health studies with this community, although, as we indicated in the MDB report and Dr. Harada mentions in his 2011 report, there is a need for studies on the long-term effects of fetal exposure and the overall impact of mercury exposure on the physical and mental well-being of this community.

Question 21: What risks, if any, do current mercury levels in pike and walleye present to the people of Grassy Narrows who eat fish caught from local waters?

Answer to Question 21:

According to the 2005 report by Chan[1], the average mercury concentration in walleye in the lakes that are around Grassy Narrows (Ball Lake, Garden Lake and Indian Lake) are above almost all fish advisories guidelines for consumption. They are between twelve to twenty times higher than the US-EPA screening value for subsistence fish-eating. Northern Pike from these lakes are twelve to eighteen times higher than the screening value. Using the Ontario Fish advisories, all of the walleye and northern pike from these lakes are above the 'do not eat' concentration for women of child-bearing age and children (0.52 µg/g), while for the others, there would be restrictions for Ball and Indian Lake since the average mercury concentration in fish is above 0.62 µg/g).

Historical data from the English-Wabigoon River system from 1975 onwards show that there were much higher exposures in the past. While these high concentrations for walleye and northern pike declined rapidly from 1975 to 1985, the decline was much less and often stable until 2010[2].

When estimating the risk for mercury poisoning in Grassy Narrows, it is necessary to take into account past exposures (including prenatal exposure), as well as present exposures,. Even without actual data, it is clear that the risk for mercury poisoning is very high for walleye and northern pike fish-eaters.

It should also be mentioned that particularly for *in utero* exposures, immediately after ingestion of the fish, there would be a very large peak of mercury exposure at a critical moments in fetal development. Prenatal effects may differ depending upon the moment of this peak exposure during fetal development.

Question 22: What risk is there, if any, to the health of people at Grassy Narrows who eat fish caught from local waters if mercury levels were to increase?

Answer to Question 22:

There is no question that the mercury already present in the Grassy Narrow area poses important risks to health and well-being to the community and that any further addition of

[1] Chan (2005)
[2] Neff et al. (2012)

mercury would increase that risk. It would, indeed be adding insult to injury. In my opinion, based on the scientific literature and Dr. Harada's work, it would be shameless, and I would call it irresponsible, to add more mercury to this mercury-laden environment. The health and well being of this community has already been harmed not only through mercury poisoning of those who continue to eat fish, but also and by depriving important nutrients to those who reduced their fish consumption because of the mercury.

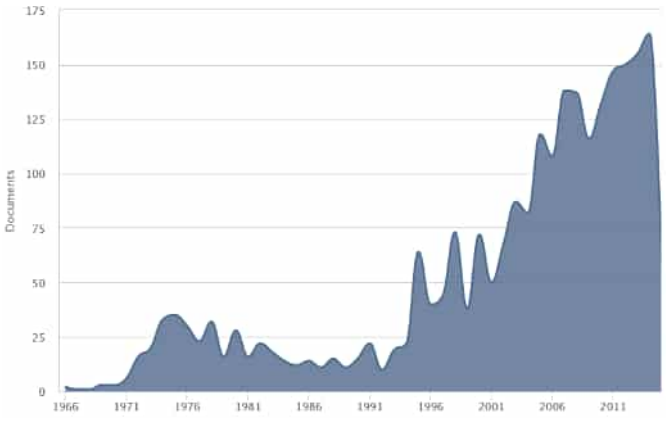
PART 2

OVERVIEW

> *"At first, methylmercury research was impaired by inappropriate attention to narrow case definitions and uncertain chemical speciation. It also ignored the link between ecotoxicity and human toxicity. As a result, serious delays affected the recognition of methylmercury as a cause of serious human poisonings in Minamata, Japan. Developmental neurotoxicity was first reported in 1952, but despite accumulating evidence, the vulnerability of the developing nervous system was not taken into account in risk assessment internationally until approximately 50 years later. Imprecision in exposure assessment and other forms of uncertainty tended to cause an underestimation of methylmercury toxicity and repeatedly led to calls for more research rather than prevention."*
>
> *Grandjean et al, 2010*

This review on general mercury and health facts sought to provide the most up-to-date information on mercury and human health, building on the information contained in the document entitled *Literature Review: The Impact of Mercury on Human Health* prepared by Dr. H.M. Chan and myself for the Mercury Disability Board in 2009, updated in 2010 with a review of Dr. Harada's studies. The two documents provide the scientific background for the answers to the questions above. Since 2010, over 800 articles have been published on methylmercury and fish, with half in the medical domain. Figure 1 shows the evolution of articles on methylmercury and fish since 1966. Approximately half of these are on health issues.

Figure 1 Evolution of scientific articles on methylmercury and fish since 1966



The literature review, here, is not exhaustive and serves to provide background for the questions that were posed. Relevant published scientific reviews and studies, since we wrote the report for the Mercury Disability Board in 2010 were identified, and where, possible, an

emphasis placed on those that examined methylmercury exposure and health effects in Canadian First Nation and Inuit communities.

The studies of the past years, reviewed here, support the following conclusions:

- There is no doubt that at the levels of exposure experienced in Grassy Narrows, the community has suffered and continues to suffer from mercury poisoning, individually and collectively.
- The scientific literature continues to provide evidence for Dr. Masazumi Harada and colleagues' clinical findings, reviewed by Chan and Mergler for the MDB[1] on the similarities between the neurologic signs and symptoms of persons from Grassy Narrows and White Dog and Minamata Disease in Japan. Using the diagnostic criteria for Minamata Disease, in Harada's 2010 he diagnosed Minamata Disease in 30 people from Grassy Narrows and 12 persons with 'suspected MInamata Disease.' (see question 1 C).
- The reduction of consumption of local fish and wildlife resulting from mercury pollution of the area deprived the people of Grassy Narrows of healthful nutrients, which have been shown to be beneficial for a large number of physiological functions and to be preventive for many and diseases.
- It is surprising that although the Japanese neurologists have identified many cases of Minamata Disease in Grassy Narrows and many persons have illnesses that have been associated with mercury intoxication, there has never been a scientifically sound epidemiologic study of the impact of pre and post natal mercury exposure on the health and well-being of this community.
- Any increase of exposure to this already 'sensitive' community to mercury contamination from sources, such as mining, logging and reservoirs, would further compound the harm to the health and well-being of the present and future generations.

1. Mercury is highly toxic to human health. Impacts include fetal and child development, neurological disorders and cardiovascular changes.

The effects of mercury from fish consumption on the nervous system has been extensively studied since the Minamata disaster and there is consensus on mercury neurotoxicity and its harmful neurologic effects during fetal and child development and in adults. Epidemiologic studies of exposed populations show increased risk for neurodevelopmental deficits, loss of cognitive and motor functions and visual deficits[2]. Changes in brain functioning in methylmercury-exposed persons have been confirmed in electrophysiological[3] and brain

[1] Chan and Mergler (2010)
[2] Grandjean et al. (2010)
[3] Ethier et al, (2012)

imaging[1] studies. Experimental studies with mercury-exposed animals provide extensive information on the mechanisms that underlie mercury toxicity[2].

More recently, the possible effects of mercury on other health endpoints have been examined. In 2011, the Environmental Protection Agency of the United States convened a workshop of experts on methylmercury exposure and cardiovascular endpoints[3]. The authors concluded that there was strong evidence for the relation between biomarkers of mercury exposure, measures in toenails or hair and myocardial infarction (MI). It is noteworthy that the range of the equivalent hair mercury exposure of the studies reviewed by this committee was from 0.34µg/g to 1.66µg/g[4]. Among the studies, upon which their conclusions were based, was an international study that showed a doubling of the risk for a first myocardial infarction for men in the highest quintile of hair mercury.

In addition, several studies have shown associations between biomarkers of methylmercury exposure and other cardiovascular disorders**,** including hypertension and changes in heart rate variability profiles[5]. In a study of Cree adults[6], the authors observed a positive association between altered heart rate variability parameters and blood mercury, after considering fish nutrients (omega-3 fatty acids and selenium) and other contaminants (lead and polychlorinated biphenyls) that are also present in the traditional diet of this population.

There is some evidence that mercury exposure increases the risk for Type II diabetes, but it is inconsistent. A recent 18-year follow-up study[7] of 3875 young United States' adults (20-32 years old), free of diabetes at the onset of the study, showed that those with the highest mercury exposure (equivalent of 1.2 – 1.5 µg/g hair mercury) had an elevated risk for diabetes compared to those with the lowest exposure, while another follow-up study of 2 cohorts did not show an association of incident cases of Type 2 diabetes and toenail mercury concentrations[8]. An analysis of data from the Korean National Health and Nutrition Examination Survey showed and increased risk for metabolic syndrome in men with respect to blood mercury, but not in women[9].

A recent study used the data from the United States' National Health and Nutrition Evaluation on 1352 women of reproductive age women (16 – 49 years) to examine biomarkers of the immune system. Low levels of blood and hair mercury, generally considered safe, were

[1] White et al. (2011)
[2] Fretham et al. (2012)
[3] Roman et al. (2011)
[4] Guallar et al, (2002)
[5] Houston (2011)
[6] Valera et al (2011)
[7] He et al (2013)
[8] Mozaffarian et al. (2013)
[9] Chung et al, (2014)

associated with subclinical autoimmunity among reproductive-age females.[1]. The authors put forward that methylmercury exposure may be relevant to future autoimmune disease risk.

2. Adults can be impacted at levels well below the old threshold level for risk of 50 µg/g in hair.

With the increasing information from research on risks of methylmercury exposure and the evolution in our understanding of how subtle functional alterations in many individuals can translate into important risks for a community (see Part 2, section 5), regulatory agencies continue to revise recommended threshold levels for risk.

In Canada in the 1970's, the agency that later became the First Nation and Inuit Health Branch of Health Canada considered blood mercury levels below 20 µg/L (or 6 mg/kg in hair) as being "acceptable" and levels greater than 100 µg/L in blood (or 30 mg/kg in hair) as "at risk" based on the knowledge at that time and the unusually high mercury concentrations observed in Grassy Narrows and Whitedog[2]. Today, Health Canada provides different threshold levels for risk depending on age and sex. Legrand and co-authors[3] summarized existing Health Canada methylmercury blood guidance values for the general population and expanded them to include a harmonized provisional interim blood guidance value. The threshold action levels for pregnant women, women from birth to 49 years and men less than 18 years was reduced but those for women above 50 years and men over 18 years, they are the same as in the 1970s. The table below is adapted from the table in the article by Legrand et al. in 2010 entitled:

Table 2 Overview of Health Canada Existing and Harmonized Blood Methylmercury Guidance Values

	Blood mercury threshold action levels			
	1	2	3	4
• pregnant women • women from birth to 49 years • men less than 18 years	less than 8 µg/L	8 – 40 µg/L	above 40 µg/L	
• women above 50 years • men above 18	less than 20 µg/L	20 -100 µg/L		
• women and men all ages				above 100µg/L

[1] Somers et al. (2015)
[2] Legrand et al. (2010)
[3] Legrand et al. (2010)

Action levels:

1. No follow-up required
2. Repeat blood/hair test in 6 months; provide dietary advice
3. Repeat blood/hair test immediately; schedule an appointment with a public health professional to review exposure history to identify sources of mercury exposure; provide dietary advice;
4. Repeat blood/hair test immediately; schedule an appointment with a public health professional to review exposure history to identify sources of mercury exposure; provide dietary advice; refer study participant to a physician or medical toxicologist for assessment and follow-up in terms of checking basic neurological signs and symptoms and making a decision concerning appropriateness of any therapeutic intervention

Other regulatory agencies have one reference dose for all, based on the studies of prenatal exposure and effects. The US-EPA reference dose for oral exposure to methylmercury is 0.1µg/kg body weight/day, which corresponds to mercury concentration of 5.8 µg/L (1 µg/g hair mercury)[1]. The Joint Expert Committee on Food Additives and Contaminants (JECFA) of the Food and Agriculture Organization (FAO) and the World Health Organization (WHO) proposed 1.6µ/kg body weight/ week (0.23µg/kg body weight/day)[2]. However, a recent review of the JEFCA guidelines by the European Food Safety Authority (EFSA)[3], published in 2012 and based on European data for fish consumption, proposed that the tolerable weekly intake be reduced to 1.3 µg/kg/week (0.19µg/kg body weight/day).

It is difficult to propose a threshold value for adults since few studies have focused on adult men and non-pregnant women since the developing foetus and child are more vulnerable to toxics and mercury is actively transported from the mother to the foetus. Moreover, the results on the studies on adults are inconsistent, probably due to the fact that the adults under study have different life histories (including prenatal exposure), life styles and nutrition (including difference in consumption of marine and fresh-water fish). The Health Canada guidelines in the Table above consider blood mercury of 20µg/L, which is approximately 10µg/g hair mercury.

A study of Taiwanese 240 adults (36 – 70 years old), who had lived in the region of a chloralkali plant that had been in operation between 1942 and 1985, was undertaken in 2005[4]. Mean total blood mercury was 17.3 ± 10.9 µg/L, with 90% methylmercury. Comparison of those in the 75th percentile (greater or equal to 19.2µg/L; mean 27.1 ± 10.9) to the others (mean 11.6 ± 4.7 µg/L) showed higher abnormality rates for tests of remote memory, mental manipulation, orientation and verbal fluency, but not for tests covering recent memory, attention, abstract thinking, language and drawing. The authors indicate that they do not have information on historic exposures.

[1] http://www.epa.gov/iris/subst/0073.htm (referenced May 5, 2015)
[2] JECFA (2004)
[3] EFSA (2012)
[4] Chang et al. (2008)

3. Foetuses and children can be impacted at far lower levels than adults.

There is now a very large number of studies on prenatal exposure to mercury and adverse health effects, most notably on children's neurodevelopment. In their review of the literature, EFSA[1] identified 34 articles of children's neurodevelopment in relation to prenatal exposure since 2003; the results of these studies motivated their recommendation to reduce the threshold for intake from 1.6µ/kg body weight/week to 1.3 µ/kg body weight/week, which would correspond to a decrease in blood mercury from 12 µg/L to 9.6 µg/L. As noted above, Health Canada considers a guidance level for blood mercury of 8 µg/L (hair mercury 2µg/g considering a ratio of 250:1) for pregnant women and women of reproductive age.

The lowest reference dose for the protection of foetus and children is the US EPA reference dose, which was based on three cohort studies of fish-eating populations[2]. It was derived by taking the lower limit of the benchmark dose[3] for cord blood and dividing it by an uncertainty factor of ten to account for variability in elimination half-life and pharmacodynamics variability[4]. It does not take into account bioaccumulation of mercury across the placenta (see section 4 below). Recent studies, however, suggest that measurable neurobehavioral effects may be present at cord blood concentrations near the US EPA reference dose.[5,6,7]

It is noteworthy that the birth cohort studies of mother-child pairs in the Seychelles[8] Islands continue to show little or no effects of mercury exposure despite concentrations similar and even higher than those which have demonstrated mercury-related effects on performance on neuropsychological tests and on electrophysiological and imaging. However, the authors of the Seychelles' studies note that the benchmark dose estimates that serve as the basis for regulatory decision-making have been largely comparable across the Seychelles, Faroese and New Zealand studies. Several hypotheses have been proposed to explain the differences between this fish-eating population and others, such as nutrients in the ocean fish in this area and possible genetic heritage factors. Indeed, in longitudinal analysis of young children's development, positive effects of omega-3 fatty acids were observed as well as small negative effects of prenatal mercury[9] and a study of school achievement showed a slight negative association with postnatal mercury in boys[10].

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[1] EFSA (2012)
[2] Rice (2004)
[3] The Benchmark Dose Level is the lower 95th percentile of the dose that corresponds to a specific change in an adverse response.
[4] Rice (2004)
[5] Bellinger (2013)
[6] Koren et al. (2010)
[7] Orenstein et al. (2014)
[8] van Wijngaarden et al. (2013)
[9] Stokes-Riner et al. (2011)
[10] Davidson et al. (2010)

4. Mercury is bio-concentrated across the placenta.

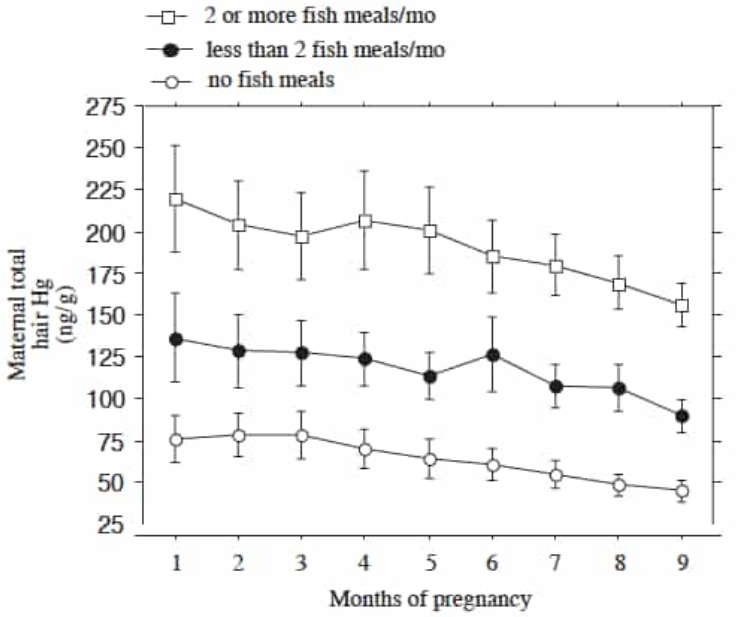
Throughout pregnancy, the placenta concentrates methylmercury and blood mercury concentration in the umbilical cord, which nourishes the foetus, is higher than in the mother's blood. A recent meta-analysis of cord to maternal blood ratios for methylmercury from 10 studies, using different modeling techniques, shows a mean cord to maternal blood ratio of 1.89 with the uppermost 95th percentile of 3.63.[1]. Thus, at birth, the average cord mercury blood concentration will be almost double that of the mother, while for one in twenty that concentration can be over three and a half times more.

Because methylmercury is concentrated across the placenta, biomarkers of maternal methylmercury decrease throughout pregnancy as the placenta takes up the methylmercury. Figure 2 shows the decline in hair mercury concentrations during pregnancy for women with different frequencies of fish consumption[2].

For biomonitoring purposes, blood mercury concentrations are measured in women of childbearing age and not in cord blood. In the study illustrated in the figure below mean maternal blood methylmercury in the first trimester was 0.48 µg/L and at birth 0.26 µg/L. Mean cord blood concentrations (0.45 µg/L) were similar to mothers' blood methylmercury concentrations in early pregnancy.

[1] Ou et al. (2014)
[2] Morrissette et al (2004)

Figure 2. Decline in Hair Mercury Concentrations During Pregnancy for Women with Different Frequencies of Fish Consumption



from Morrissette et al. (2004)

5. Population level impacts can be found at much lower levels of exposure than clear individual impacts (e.g. lower IQ). These can have major impacts at a community level.

The threshold concentrations of all of the above-mentioned agencies were based on neurobehavioral outcomes and not on illnesses. These statistically significant but individually subtle effects can greatly impact a community.

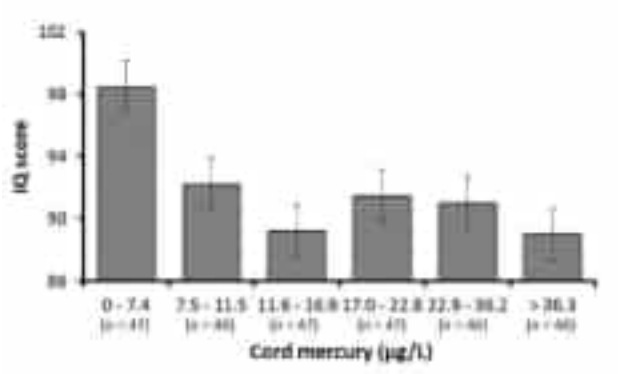
A recent video made by Dr. Bruce Lanphear of Simon Fraser University entitled 'Little Things Matter' (https://www.youtube.com/watch?v=E6KoMAbz1Bw) well describes the impact of very small quantities of toxic substances on children's neurodevelopment. Even **a small decrease in the learning capacity of children in a community has striking repercussions for the community**[1]. For example, an average decrease of 5 IQ points, among exposed children means that, in this community, twice as many children have severe learning difficulties and half as many children are gifted. The effects are amplified if the children have other problems, including poor nutrition, low intellectual stimulation or other toxicant exposures.

In a study of school-age Inuit children from 14 villages in Artic Quebec, children with **cord blood mercury equal to or greater than ≥ 7.5 µg/L were four times as likely to have an IQ score**

[1] Lanphear B. (2015)

below 80, the clinical cut-off for borderline intellectual disability[1], compared to those with lower cord mercury. It is noteworthy that since some of the IQ sub-tests are culturally sensitive, for this study, these tests were modified and validated for this population. The scores ranged from 61 – 125.

Figure 3. Test scores with respect to cord blood mercury in Inuit children 8-14 years old



from Jacobson et al, 2015

6. Developmental impacts of mercury have life-long impacts.

There is increasing evidence that prenatal exposure to mercury has lifelong effects. Subsequent to the Minamata disaster, many children born to asymptomatic mothers with high concentrations of methylmercury during pregnancy, appeared normal at birth but developed a progressive neurological disorder called Minamata fetal disease[2]. At lower levels, prenatal exposure to methylmercury is associated with a decrease in children's later cognitive functions, affecting their learning capacity and success in school and in later life.

Recent studies which have examined long term effect of low-level prenatal exposure on brain activity**,** using electrophysiological or neuro-imaging techniques, have confirmed altered brain activity in children with prenatal exposure to mercury[3,4,5,6]

In the United States, researchers have calculated that neurodevelopmental effects of

[1] Jacobson et al. (2015)
[2] Grandjean et al. (2010)
[3] White et al. (2011)
[4] Ethier et al. (2012)
[5] Yorifuji et al. (2013)
[6] Boucher et al. (2010)

methylmercury in that country accounts for a loss of $8.7 billion dollars annually in earning capacity[1]. The authors of the above-mentioned study of prenatal exposure and cognitive effects in Inuit children point out that intellectual disability on school-age IQ is a measure that is predictive of occupational success in adulthood.

In the above-mentioned study of Inuit children, the adjusted[1] mean IQ of the **lowest exposure group was 4.8 points (5%) higher than the others**. However comparing the percentage below 80, the clinical cut-off for borderline intellectual disability: **only 4.3% of the lowest exposure group** were in this category compared to **17.2% for the more exposed.**

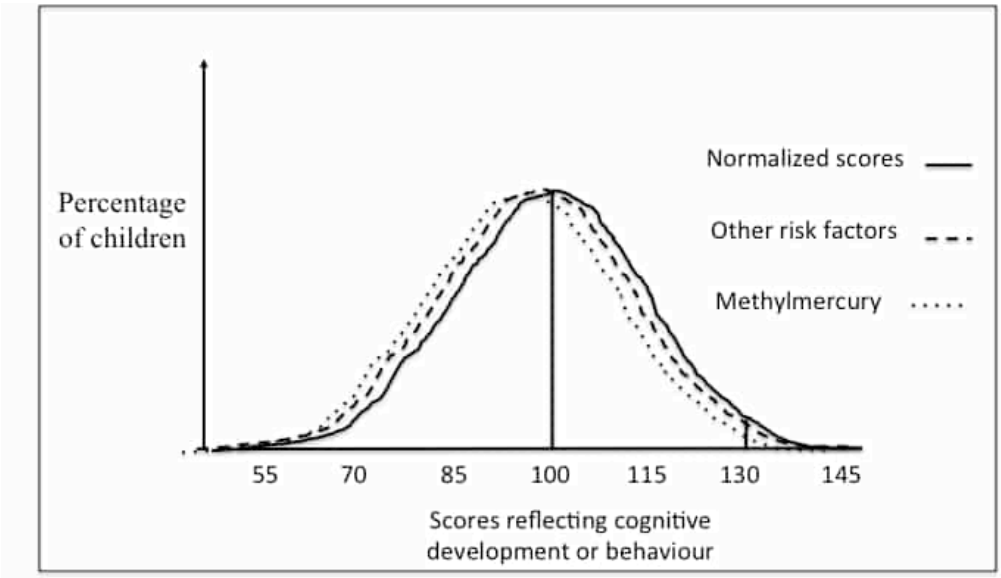
In addition, some studies suggest that there may be associations between attention deficits and/or impulsive or hyperactive behaviour in relation to methylmercury exposure. The birth cohort study of **8 – 14 year old Inuit children** shows that **problems of attention and teacher reported symptoms of attention deficits/hyperactive disorders (ADHD) were associated with higher prenatal mercury concentrations, but not current exposures**[2]. In a study in the United States of 8 year old children living near a contaminated site (superfund site), increased risk for inattention impulsive/hyperactive behaviour for boys, but not for girls, was associated with maternal hair mercury, measured close to child's birth, equal to or above 1µg/g.

Several authors have raised the issue of the combined effects of toxic exposures on children's development in communities with other risk factors, such as poor nutrition and housing, pre-existing diseases and parents' unhealthy lifestyle. Weiss and Bellinger[3] refer to the "social ecology of children's vulnerability to environmental pollutants". The impact of toxic exposures on children who are vulnerable because of other risk factors is greater on the community.

Figure 4 below shows how methylmercury compounds the effects of other risk factors on intellectual capacities. Children's average cognitive capacities or behaviour are influenced by factors such as poor nutrition and housing, pre-existing diseases and parents' unhealthy lifestyle, pushing the normal curve towards the left, with more children suffering from learning difficulties. Methylmercury exposure further pushes the curve towards the left.

[1] In this study, to assess the contribution of mercury, IQ scores were adjusted for cord lead, current PCB153, cord DHA, cord selenium, social environment
[2] Boucher et al. (2012)
[3] Weiss and Belanger (2006)

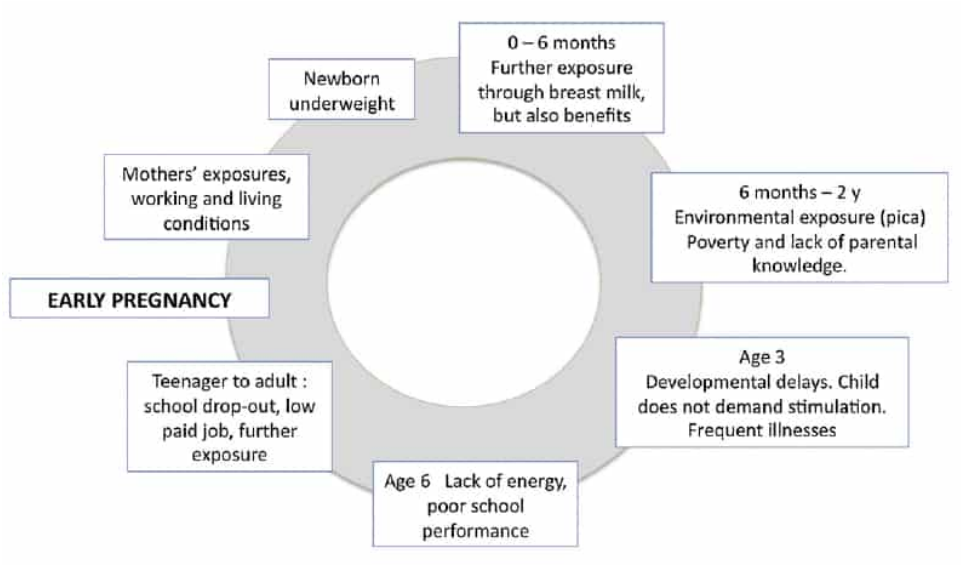
Figure 4 Estimated distribution of intellectual capacities with methylmercury exposure combined with other factors. The normal curve moves towards the left, towards lower scores.



The impact of exposure may also be passed on from one generation to the next[1], not only through the fetal environment, but also through the care that parents, who function less well because of their exposure, are able to give to their children. It can become a vicious circle, as shown in Figure 5. The way in which boys and girls experience these effects may differ[2]. Boys and girls who drop out of school may occupy poorer jobs or no jobs and act out their dissatisfaction in different ways. For girls, early pregnancy may be a further consequence. Although associations between early pregnancy and school achievement, living conditions and income have been studied in aboriginal and non-aboriginal communities[3], the possible contribution of exposure to contaminants to these situations has not been examined.

[1] Mergler (2012)
[2] Mergler (2012)
[3] Garner et al. (2013)

Figure 5 Impact of Environmental Exposure from One Generation to the Next



from Mergler (2012)

7. The health impacts of mercury exposure in adults can take a long time to manifest and can be long lasting and degenerative.

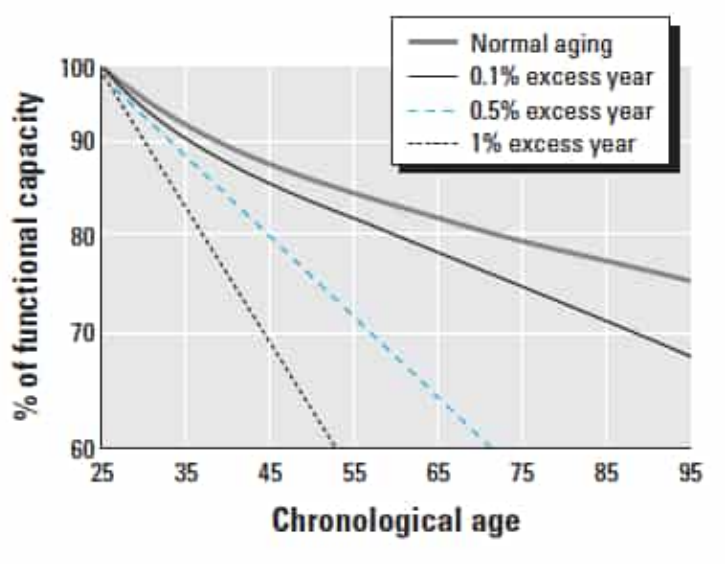
Adverse effects of methylmercury exposure in adults can result from pre-natal and childhood exposure and/or exposure during adulthood. However, the harm may not be immediately evident. Even with high exposures during adulthood, such as those that occurred in Iraq and in Minamata, there was often a delay between exposure and mild to severe neurological effects exposure, varying from weeks to years[1]. A study in Japan[2] compared the subjective complaints and activities of daily living (ADL score) of a randomly chosen sample of 750 persons, classified into three groups with respect to estimated previous exposure to methylmercury; all had lived in their current residence for over 40 years. While no difference was observed between exposure categories for the 40-49 year olds, as they got older there was a strong dose-effect relation, with those in the higher group showing the worst scores. Further data from Minamata and the surrounding areas suggest that, in later life, exposed persons display a higher prevalence of psychiatric problems[3], hypertension[4] and lower urinary tract disorders[5].

[1] Weiss et al. (2002)
[2] Ushijima et al. (2012)
[3] Yorifuji et al. (2011)
[4] Yorifuji et al. (2009)
[5] Hara et al. (2013)

In adult subsistence fish-eaters of the Brazilian Amazon region, hair mercury concentrations have been associated with deficits in visual functions[1] and motor performance[2]. Age-related decrease in near visual acuity and the prevalence of age-related cataracts were higher among those with higher exposures to mercury[3,4]. In a follow-up study of persons in this region, who continued to eat the same amount of fish, but preferentially those with less mercury, the resulting decrease in hair mercury was associated with an improvement in motor functions, but visual functions continued to decrease in relation to their past exposure levels[5].

Studies of non-human primates dosed with methylmercury, the latency period for signs and symptoms increased as the dose decreased[6]. In Figure 6, taken from Weiss (2002), the impact of slight increases in loss of functional capacity with age is illustrated. Like with small decrements in IQ in children, which have a large impact on society, small decrements in functional capacity with age likewise impact the aging process. Again with poor nutrition, living conditions and access to health facilities, the decrease in functional capacities is greater.

Figure 6 Impact of Slight Increases in Loss of Functional Capacity with Age



From Weiss (2002)

[1] Fillion et al. (2013)
[2] Fillion et al. (2011a)
[3] Fillion et al. (2011b)
[4] Lemire et al. (2010)
[5] Fillion et al. (2011a)
[6] Weiss (2002)

To better understand the mechanisms involved in adult exposure to methylmercury, researchers have examined the brains of animals chronically exposed to methylmercury over a period of time. These studies show extensive alterations in the cortical regions of the brain[1,2] Autopsies performed on the brains of children and adults from the Minamata disaster show different patterns of mercury related impairment, more diffuse in children and more concentrated in specific areas in adults[3].

Methylmercury from fish consumption has also been associated with chronic conditions in adults although the contribution of previous prenatal and/or postnatal exposure vs. current exposure is difficult to determine. In the study cited above of a Taiwanese population living near a deserted chloralkali plant, there was no historical data and the researchers were unable to determine the contribution of past exposures to their neurologic deficits, which were associated with current exposure concentrations. In this same population, the authors found that current mercury blood concentrations were associated with increased risk of insulin resistance[4].

8. Fish is the most important source of mercury in humans. Other sources of mercury in humans include fish eating wildlife (ducks, otters, etc.), dental fillings, etc. Estimates of mercury impacts based on MeHg or fish alone may underestimate the total impact.

Humans are exposed to both inorganic mercury and organic mercury (usually in the form of methylmercury). Exposure to inorganic mercury is usually through mercury vapours from occupational and industrial sources; mercury amalgams in dental fillings can also be a source of exposure to inorganic mercury. When inhaled or swallowed, this form of mercury passes passively into the blood and is excreted through the urine. Contrary to methylmercury, tissues, such as the brain or the placenta, do not actively take it up and the concentration in mother's blood is similar to that in cord blood[5].

Methylmercury has been used in industrial processes; the methylmercury poisoning disaster in Iraq in the early seventies was due to the methylmercury containing fungicide that was consumed by humans[6]. However, outside of accidental exposures, human exposure to methylmercury is very largely through fish consumption and to a lesser extent through consumption of fish-eating birds and mammals.

To estimate the total intake of methylmercury, one needs to consider the entire diet, including

[1] Dasari et al. (2010)
[2] Kong et al. (2012)
[3] Eto et al. (2010)
[4] Chang et al . (2011)
[5] Morisette et al. (2004)
[6] Grandjean et al. (2010)

fish-eating birds and mammals. The Environment Canada website on mercury in the food chain, updated in 2013 well describes how mercury accumulates through the food chain (https://www.ec.gc.ca/mercure-mercury/default.asp?lang=En&n=D721AC1F-1).

Some salient points are made in this document:

- *Because mercury is a persistent substance, it can build up, or bioaccumulate, in living organisms, inflicting increasing levels of harm on higher order species such as predatory fish and fish eating birds and mammals through a process know as "biomagnification".*
- *In the environment, particularly lakes, waterways and wetlands, mercury can be converted to a highly toxic, organic compound called methylmercury through biogeochemical interactions.*
- *The most important pathway for mercury bioaccumulation is through the food chain. In the water, plants and small organisms like plankton take up mercury through passive surface absorption or through food intake. … Methylmercury biomagnifies through the food chain as predators eat other organisms and absorb the contaminants that their food sources contained.*
- *Over time, an individual who consumes plants or prey contaminated with methylmercury will acquire levels greater than in either its habitat or its food. As a result, top predators acquire greater body burdens of mercury than the fish they consume.*
- *In some cases, methylmercury levels in carnivorous fish, such as freshwater bass, walleye and pike … bioaccumulate up to a million times greater than in the surrounding water.*
- *Piscivorous (fish eating) predators such as loons, merganser ducks, osprey, eagles, herons, and kingfishers, generally have very high concentrations of mercury.*
- *In addition, mercury has been found in predatory mammals such as otters from south central Ontario.*

9. In 1979 the Health and Welfare Canada recommended a limit of 0.2 ppm in fish as a fish consumption limit for Grassy Narrows and White Dog. The limit for possession of fish for sale is 0.5 ppm wet weight.

In 1973, a Task Force on Organic Mercury in the Environment was established by the Minister of National Health and Welfare (currently Health Canada) "in order to respond to the problem of high and unusual mercury levels in relation to the health and well-being of residents of Grassy Narrows and Whitedog, Ontario"[1]. A biomonitoring program was initiated. In 1979, The Health and Welfare Canada recommended a limit of 0.2 ppm in fish for consumption in Grassy Narrows and Whitedog.

[1] cited in Legrand et al. (2010)

The Canadian limit of fish for commercial purposes of 0.5 ppm wet weight is based on the fact that in the general population, fish consumption is not very high. Data from the 2007-2009 Canadian Health Measures Survey (CHMS), which does not include people living on reserves or in remote regions, show that most Canadians eat (82.6%) eat less than three meals of fish and/or shellfish per week. Overall blood mercury levels are low, with median values at 0.81µg/L and the 95th percentile 4.70 µg/L. Blood mercury levels increase with fish consumption. Among pregnant women, 98% are below the Health Canada guideline for blood mercury (8µg/L).

In contrast, a study of diet among 7 Istchee (Cree) communities in the James Bay area showed that blood mercury concentrations 3 – 20 times higher than those reported in the CHMS; blood mercury increased with inland traditional food intake[1]. Another study of persons from the Wapekeka and Kasabonika communities[2] showed hair mercury concentrations 1.5 times higher in persons who ate more than 1 meal of wildlife/week (age adjusted hair mercury concentration (2.96 ± 0.3 µg/g)

10. The Canadian reference dose for preventing fetal neurotoxicity and developmental impacts is double that recommended by US EPA.

In section 2, the different guidelines for mercury exposures are presented. The guidelines were developed to recommend **tolerable daily intake (TDI) or weekly intake (TWI)** of mercury. The Canadian provisional tolerable daily intake for pregnant women, women of reproductive age and infants of 0.2µg/kg body weight/day is twice the US EPA of 0.1µg/kg body weight/day and slightly higher than the proposed revision of the FAO/WHO reference dose (0.19µg/kg body weight/day) (see section 2). The US EPA reference dose is based on **cord blood concentrations**, while the JECFA and Canadian recommendations are based on **hair concentrations**. The Canadian recommendation used a 5-fold uncertainty factor to account for inter-individual variability[3]. The studies that support this recommendation used maternal hair mercury concentrations at birth that are lower than those at the beginning of pregnancy due to placental accumulation (see figure 2 in section 4). All of these reference doses are high for Grassy Narrow since the population has already been exposed to levels that are higher, and in many cases, considerably higher than these.

11. Eating fish has a number of important health benefits. Serious efforts should be made to avoid practices that lead to bio-accumulation of mercury in fish so that the health benefits of fish can be enjoyed while minimizing health impacts from mercury.

Fish is a highly nutritious food, providing a wide variety of nutrients, including omega-3 fatty

[1] Johnson-Down et al. (2015)
[2] Seabert et al. (2014)
[3] Legrand et al. (2010)

acids. In a review of the cardio vascular benefits of omega-3 fatty acids, Mori[1] writes: "Many clinical and epidemiological studies have shown that the polyunsaturated n-3 fatty acids EPA and DHA from fish and fish oils, provide cardiovascular protection, particularly in the setting of secondary prevention. Omega-3 fatty acids beneficially influence a number of cardiometabolic risk factors including blood pressure, cardiac function, vascular reactivity and lipids, as well as having anti-platelet, anti-inflammatory and anti-oxidative actions". Omega-3 fatty acids are likewise positively associated with neuropsychological and neurophysiological outcomes throughout the lifespan.[2,3] Indeed, **today, most studies of mercury toxicity from consumption of fish and fish-eating animals take into account the positive effects of omega-3 fatty acids.**

An article describing a study of myocardial infarction in a Swedish and Finnish cohort well illustrates the benefits associated with omega-3 fatty acids and risks associated with methylmercury from fish consumption[4]. Their model of risk, presented in Figure 7, shows that at lower concentrations of methylmercury, even a small increase in omega-3 fatty acids can have an important impact in reducing the risk of myocardial infarction, but at higher concentrations of methylmercury, the beneficial effects are counteracted.

[1] Mori (2014)
[2] Bernard et al (2013)
[3] Virtanen et al. (2013)
[4] Wennberg et al (2012)

Figure 7. Risk for Myocardial Infarction with respect to hair mercury concentrations and the percentage of omega -3 fatty acids (s-PUFA) in blood

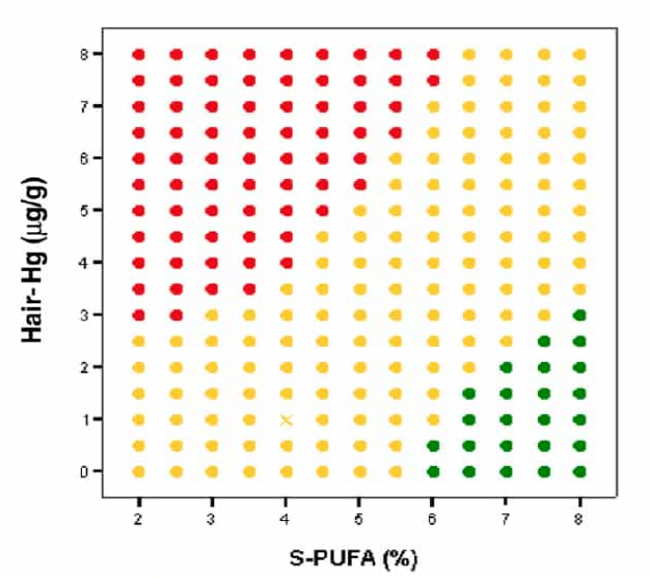


FIGURE 3. Associations of concentrations of long-chain n−3 S-PUFA and Hair-Hg with risk reduction (green circles; upper 95% CI limit for model-based RR <1.0) or increased risk of myocardial infarction (red circles; lower 95% CI limit RR >1.0), with the reference point (RR = 1.0; yellow X) set to S-PUFA = 4.0% and Hair-Hg = 1.0 µg/g; yellow circles denote no statistical evidence of an effect. Hair-Hg, amount of mercury in hair; S-PUFA, PUFAs in serum.

From Wennberg et al. (2012)

Like in many other birth cohort studies, the studies of Inuit children described above, which showed negative effects of prenatal mercury exposure on school-aged children's performance on neurobehavioral tests[1,2], likewise show positive effects of **cord blood DHA**; the benefits and risks are likewise reflected in electrophysiological measurements[3.]

In adult freshwater fish eaters from the Brazilian Amazon, although omega-3 fatty acid concentrations are low compared to consumers of marine fish and mammals, positive effects of omega-3 fatty acids have been observed with better visual functions[4]

The serum omega-3 fatty acids in First Nation inland communities increases with proportion of

[1] Boucher et al, (2011)
[2] Jacobson et al. (2015)
[3] Boucher et al (2011)
[4] Fillion et al, (2011)(2013)

traditional diet meals[1,2]

12. The Ontario Guide for Sport Fish Eaters is not appropriate for Indigenous communities who eat fish as part of their cultural practice. It assumes that fish are eaten relatively infrequently.

The Ontario Guide for Sport Fisher Eaters (2013-2014) indicates: "The advice in this guide is designed for anglers (and their families) who consume moderate quantities of fish. The consumption advice is intended to protect individuals who follow the advice in the guide and consume no more than 8 meals per month of the fish they catch. This maximum recommended consumption frequency was based on the results of surveys indicating that most anglers do not consume sport fish more frequently than 8 meals per month. However, many of these fish can be safely consumed more frequently. Anyone who consumes sport fish more frequently than 8 meals per month is advised to contact the Sport Fish Contaminant Monitoring Program (416-327-6816 or 1-800-820-2716, sportfish.moe@ontario.ca." [3]

The US-EPA developed a guide for subsistence fishing with the collaboration of representatives from Native American tribes. It indicates: "EPA recognizes, however, that Native American subsistence fishers are a unique subsistence fisher population that needs to be considered separately. For Native American subsistence fishers, eating fish is not simply a dietary choice that can be completely eliminated if chemical contamination reaches unacceptable levels; rather eating fish is an integral part of their lifestyle and culture. This traditional lifestyle is a living religion that includes values about environmental responsibility and community health as taught by elders and tribal religious leaders. Therefore, methods for balancing benefits and risks from eating contaminated fish must be evaluated differently than for the general fisher population"[4].

13. People who have already experienced elevated mercury exposure, or are showing symptoms of mercury poisoning, may be more sensitive to further exposure than the general population.

Both animal and human studies have shown long latency effects of methylmercury exposure.[5] Adding further toxic exposure can add further harm to systems that have already been affected. A large number of human and animal studies have shown neuronal and metabolic changes in the absence of manifest signs and symptoms. Persons whose systems have already been altered by previous exposures are more sensitive than the general population.

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[1] Seabert et al (2014)
[2] Johnson-Down (2015)
[3] The Ontario Guide for Sport Fisher Eaters (2013-2014) p. 7
[4] US Environmental Protection Agency *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories Volume 2 Risk Assessment and Fish Consumption Limits Third Edition (2000) p. 16*
[5] Newland et al. (2015)

14. CONCLUSIONS WITH RESPECT TO GRASSY NARROWS

This updated analysis of the scientific literature provides substantial further support and confirm the Chan and Mergler conclusions in the report to the Mercury Disability Board (MDB) in 2009[1]:

14a There is no doubt that at the levels of exposure experienced in Grassy Narrows, many people have suffered and are suffering from mercury poisoning.

- Further scientific knowledge of the past 6 years informs us that damage occurs at concentrations much lower than those previously considered harmless, with important impacts not only for individuals but also on the entire community.
- A growing number of birth cohort studies show that the foetus is particularly sensitive to methylmercury neurotoxicity and even very low concentrations of exposure can affect future cognitive capacity and behaviour.
- In 1996, the Research and Development, Environmental Contaminants, Medical Services Branch of Health Canada presented a report on the mercury and child development research project for the Grassy Narrows Band Council[2]. Although the report has numerous methodological problems as regards data analyses[3] and data presentation is confusing, there is information on children's exposure:
    - For the 139 children included in the study, the authors report that between 1978 and 1990 average cord blood concentrations was 8.67 µg/L, with a maximum value of 78.5 µg/L and 10% above 20 µg/L.
    - One child born in 1979, who was not included in the study, had a cord blood mercury concentration above 120 µg/g, while another born in 1978 had over 80 µg/g.
    - Overall, there was an important decrease in cord blood mercury concentrations between 1978 and 1991, however, in 1992, there appears to be an increase.
    - The mean hair mercury concentration of the participants at the time of the study was 3.90 µg/g with the maximum at 26 µg/g.
    - Figure 8, taken from this report, shows the cord mercury concentrations measured in Grassy Narrows over time.

[1] Chan and Mergler (2009)

[2] Research and Development, Environmental Contaminants, Medical Services Branch of Health Canada (1996)

[3] The analyses that were carried out were insufficient to arrive at any conclusions and particularly the conclusion that there were no effects.

- **At these cord blood concentrations, there is consensus from the current scientific literature that there would be effects on children's neurodevelopment.**

Figure 8 Umbilical cord blood levels/year measured in Grassy Narrows

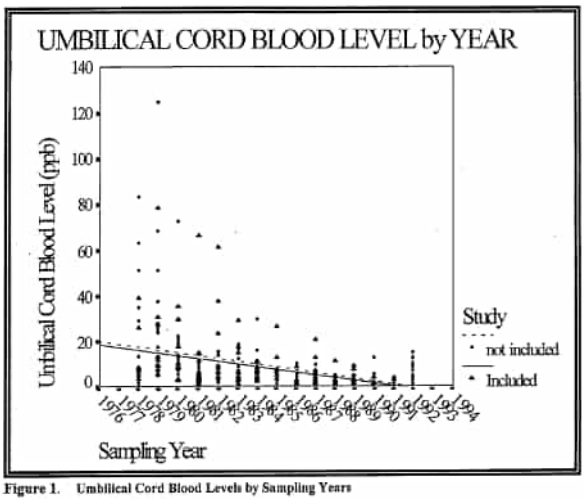

Figure 1. Umbilical Cord Blood Levels by Sampling Years

From the Mercury and Child Development Research Project, Grassy Narrows, Research and Development, Environment Contaminants, Medical Services Branch, Health Canada (1996)

- In a history of Minamata Disease published in 1995[1], Harada describes the diagnosis of the initial cases in 1956. He recounts that by 1960, "while the number of grave cases with acute Minamata Disease in the initial stage was decreasing, the numbers of chronic Minamata patients who manifested symptoms gradually over an extended period of time was on the increase."
- Recent studies from MInamata, supported by findings from animal research, show that methylmercury accelerates the aging process.
- A large number of animal studies and several human electrophysiological and imaging studies are elucidating the mechanistic basis for mercury neurotoxicity.
- While the nervous system is the primary target organ for methylmercury, studies indicate that the cardiovascular system and metabolic pathways may also be affected by methylmercury.

[1] Harada (1995)

14 b. The scientific literature continues to support Dr. Masazumi Harada and colleagues' clinical findings, reviewed by Chan and Mergler for the MDB[1] on the similarities between the neurologic signs and symptoms of persons from Grassy Narrows and White Dog and Minamata Disease in Japan.

- In their early reports[2,3], Harada and colleagues had examined 89 persons from Grassy Narrows and Whitedog and indicated that no one presented all of the classical signs and symptoms of Minamata Disease, although many persons presented one or more classical signs of the disease. Although they did not carry out statistical analyses, they provide evidence of dose-effect relations.

- In 2002[4], the same neurologists examined 57 persons of whom 9 had been examined in 1975. The authors classified 11 of the 57 persons with Minamata Disease, 12 with Minamata Disease and other complications and 22 with "light Minamata Disease".

- None of the persons Harada found with levels over 50 in 1975 survived to be re-tested in 2002. Of the 9 who were re-examined none fell into the Minamata Disease category, but for 7 of the 9, symptoms and signs had worsened.

- In 2004, this team examined 187 persons, among whom they identified 60 of Minamata Disease and 54 cases of the disease with complications. Twenty-seven had participated as well in 1975. In their review of Dr. Harada's follow-up studies (1975 - 2004)[5], the **Chan and Mergler report point outs that the most valuable information of this report was the evolution of neurologic signs and symptoms consistent with mercury poisoning in those that were tested in the two periods.**

- In 2011, Harada and his co-workers[6] wrote a review of the work that they had carried out in Grassy Narrows and White Dog since 1975, including a further study carried out in 2010. In 2010, they performed neurologic assessments of 73 persons from Grassy Narrows and 87 from White Dog over 20 years old. The report indicated that under the diagnostic criteria used in Minamata City, 33.7% of the group that they examined were diagnosed as Minamata Disease patients; and 25.0% as suspected Minamata Disease cases (see more details in answer to question 1.1 c).

[1] Chan and Mergler (2010)
[2] Harada et al. (1976)
[3] Harada et al. (1977)
[4] Harada et al. (2005)
[5] Harada et al. (unpublished report)
[6] Harada et al. (2011)

- Using the findings from the 2010 examinations, Takoaka and coworkers[1] compared the neurologic signs and symptoms of 80 volunteers aged 16 to 76 from Grassy Narrows and Japanese exposed and control groups. From the observed similarities, particularly between the Grassy Narrows older group and the Japanese exposed group, the authors conclude that "clinical signs and symptoms of the residents of Grassy Narrows are almost the same as those recorded for Minamata disease in Japan." (see more details in answer to question 1.1 d)
- It should be noted that Dr. Harada and his team sought to determine whether persons exposed to mercury in Grassy Narrows and White Dog presented a neurological clinical profile similar to Minamata Disease. While they identified cases and possible cases using the Minamata Disease criteria, they did not examine the possible contribution of mercury into other disorders or the impact of more subtle changes of nervous system functions, particularly during fetal exposure and childhood, which occur at lower concentrations of exposure. .
- Both Harada et al (2011) and Takaoka et al (2014) mention that the participants in their studies presented a high prevalence of several health disorders, including hypertension and diabetes among the participants, **but the possible contribution of mercury to these conditions has not been examined.**

14 c. Because of mercury contamination in the region, the people of Grassy Narrows were obliged to reduce their consumption of local fish and wildlife and were thus deprived of healthful nutrients, which have been shown to be beneficial for a large number of physiological functions and to be preventive for many and diseases.

- The historically high mercury concentrations in fish forced the community to greatly decrease their fish and wildlife consumption, depriving them of the nutritional and social benefits[2] of a traditional diet.
- In a 2003 study of 87 persons from Grassy Narrows[3], 61% reported that they currently fish in the surrounding area, 31% reported that they used to but no longer had fished in the area, and 8% reported they have never fished in the area. Of these participants, 9% reported eating more traditional food compared to 10 years ago, 55% reported eating about the same, and 36% reported eating less. Reasons provided for a decrease in the consumption of traditional foods included:
    - changes in the family structure;
    - decreased hunting and fishing practices;
    - decreased availability;

[1] Takaoka et al. (2014)
[2] Wheatley and Wheatley (2000)
[3] Chan (2005)

  - concerns about the safety/contamination of the food;
  - the convenience of market foods.

- Although there has been marked decrease in mercury in fish in the English-Wabigoon River system,[1] recent concentrations of mercury in fish[2] and fish-eating wildlife[3] oblige the community to limit consumption of fish and wildlife.
- Kinghorn et al[4] analyzed fish mercury concentrations in 4 fish species from seven lakes in the Grassy Narrows territory and describe the relation between fish length with respect to mercury concentration. They note that the fish harvested from Grassy Narrows lakes show stronger associations between fish length and mercury compared to those from the Wabaseemong territory. The authors indicate that this may be because "these lakes are closest to the Dryden spill site. Higher levels of mercury in the sediment of these lakes may affect the rate of uptake of mercury in the fish that live predominantly within them."
- For a report in 2005, Chan calculated mercury intake and hair concentrations for 87 persons from Grassy Narrows and 55 from Wabaseemoong measured in 2003. In Grassy Narrows, the average yearly local fish consumption in Grassy Narrows was 20g/day, but in older men (+61 years of age) it averaged 60g/day. When all of the hair segments were analyzed, mean hair mercury was 1.3 µg/g with a maximum of 7.1 µg/g. The highest individual hair segment was 15.5 µg/g. Hair mercury increased with mercury intake from fish consumption. In 2004, Harada reported that one person had a concentration of 25 µg/g and in 2003, Chan reported that persons from the White Dog area had hair concentrations of 60µg/g.
- The 2012 report on fish Contaminant Monitoring near Grassy Narrows First Nation by the Environmental Monitoring and Reporting Branch Ontario Ministry of the Environment[5] shows elevated mercury in the 50 km area around Grassy Narrows in walleye and much lower concentrations in Whitefish. For walleye, with the exception of one site where the report indicates that fish can be eaten with restriction, all the other sites indicate DO NOT EAT. Whitefish present much lower concentrations, which may still pose a risk to subsistence eaters.
- The 2012 above-mentioned report presents separate values for sensitive populations, defined as women of child-bearing age and children under 15 years old, and for the general population. Given the recent information on mercury reviewed above, a population that has already suffered effects from mercury contamination and other harmful risk factors for poor health may also be considered 'sensitive'.

[1] Neff et al. (2012)
[2] Kinghorn et al. (2007)
[3] Sellers et al. (2010)
[4] Kinghorn et al (2007)
[5] Ontario Ministry of the Environment (2012)

Grassy Narrows: a sensitive population

- Prior to the events and poisoning that occurred due to mercury contamination, the Grassy Narrows community had undergone important upheaval that negatively impacted their lives and lifestyle.[1,2,3] The toxic effects of mercury would compound the effects of these stresses on the nervous system and their health status.

- Because of the high prevalence of disease, coupled to mercury intoxication, in the communities of Grassy Narrows and White Dog, in the 2010 MDB report, Chan and Mergler point out " It is paramount that members of the two communities receive the necessary medical care and support. In contrast, residents in Minamata, Japan enjoy superb health care from neurologists and therapists even they had not officially been classified as victims of Minamata Disease".

- It is surprising that although the Japanese neurologists have identified many cases of Minamata Disease in Grassy Narrows and many persons have illness that have been associated with mercury intoxication, there has never been a scientifically sound epidemiologic study of the impact of pre and post natal mercury exposure on the health and well-being of this community.

- There are many sources of mercury contamination. The river and lake systems around Grassy Narrows have been polluted by industrial activities; hydro-electric reservoirs and logging can also contribute to the mercury burden in this ecosystem. Any increase of exposure to this already 'sensitive' community would further compound the harm to the health and well-being of the present and future generations.

[1] Vecsey (1987)
[2] Etken D. (2015)
[3] Ilnyak (2014)

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APPENDIX A – CURRICULUM VITAE

Asubpeeschoseewagong Netum Anishinabek
Community Health Assessment Report

Part 2: Children and Youth Report

Executive Summary and Recommendations

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This report is for the young people of Grassy Narrows who wish to be "more than mercury".

It is dedicated to the memory of Steve Fobister Sr. (1952 – 2018).

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Introduction

Background

The present report is the second part of the Asubpeeschoseewagong Netum Anishinabek (ANA; Grassy Narrows First Nation) Community Health Assessment (CHA) survey. The Grassy Narrows CHA stems from a request by Grassy Narrows to better understand the health and wellness of the community and its determinants, with the view to improving the community's wellbeing. All aspects were led by the community. This report presents the results of the Grassy Narrows Child and Youth Survey.

The survey was filled out for 353 children and youth. It included 173 questions for specific age ranges (0 – 3 years of age; 4 – 11 years of age; 12 years and over). Many of the questions were taken from the First Nations Regional Health Survey 2008/2010[1], which allowed us to compare the prevalence of different outcomes in Grassy Narrows with children and youth in First Nation communities in Canada and in Ontario[2]

To extend the statistical analyses and explore the associations between indicators of child health and well-being with respect to the mother's or household situation, we merged the child/youth and the adults' databases. The resulting adult/child database included 327 pairs. From this database, we extracted different sub-groups, depending upon the issue under study. For example, for comparisons with other First Nation communities, only Band member respondents who live in Grassy Narrows were included.

Similar to the adult report, **the health and wellness of the children and youth of Grassy Narrows cannot be understood without considering the impact of the major disaster that occurred in this community,** initiated in the 1960's by the discharge of mercury into Wabigoon-English River system. The resulting loss of culture, livelihood, physical and mental health and a highly nutritious food source greatly impacted the community. Recent evidence has shown that although mercury concentration in fish in the river system has decreased over time, during these children's lifetime, it is still high and has not decreased since the mid 1980's.[3]

The present report clearly shows that **fish consumption, particularly mothers' fish consumption during pregnancy, negatively affects the health and well-being of the children and youth of this community.** The findings are consistent with the large number

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[1] First Nations Information Governance Centre (FNIGC) (2012). First Nations Regional Health Survey (RHS) 2008/10: National report on adults, youth and children living in First Nations communities. Ottawa (FNRHS Canada).

[2] The data from the FNRHS Canada was analyzed for First Nations in Ontario and published in the report First Nations Regional Health Survey Phase 2 (2008/10) Ontario Final Region Report by the Chiefs of Ontario in 2012 (FNRHS Ontario).

[3] Neff et al, Long-term changes in fish mercury levels in the historically impacted English-Wabigoon River system (Canada). Journal of Environmental Monitoring 2012 ; 14, 2327-2336

of studies that describe the risks associated with prenatal mercury exposure on children and youth's development and health and more recently on behaviour.

The health and well-being of children and youth is also affected by the **intergenerational consequences of mercury contamination of the fish resources in their community, with harmful effects on physical and mental health, behaviour and school performance.**

The young people of Grassy Narrows are nationally known for their ability and persistence in organizing events that seek to further their culture and traditions and improve the well-being of their community. The most well-known are the long-standing blockade against clear-cut logging on their territory and the river runs, but there are many others. The survey shows that more than two-thirds of children/youth participate in community organized cultural events and half of the youth participate in events to recognize Grassy Narrows' rights.

In a recent newspaper article, the young people of Grassy Narrows passionately state: **"We are more than mercury"**[4], and that despite difficulties and hardships, they continue to move forward and **build on the strengths of their community**. By documenting their current situation and demonstrating how mercury poisoning is still affecting their health and wellness, this report serves to identify the physical and mental health care services, schooling, and social and economic conditions, that need to be improved for the health and well-being of the present and future generations.

Major findings

- **Mothers' fish consumption during pregnancy is associated with poorer overall physical health**, notably for specific chronic conditions, such as visual problems, ear infections, speech/language disorders, learning disability and nervous system disorders (Chapter 8 and 9).

- **Mothers' fish consumption during pregnancy is associated with children's poorer mental health**, particularly more emotional and behavioural problems compared to children of the same age and sex, which in turn is associated with a higher prevalence of attempted suicide (Chapter 8 and 9).

- **Mothers' fish consumption during pregnancy is associated with at least one condition that may impact children's school performance** and with more difficulties in school, notably poorer attention span (Chapter 8 and 9).

- Many aspects of Grassy Narrows children and youth's physical health are similar to other First Nation communities in Canada and in Ontario, but **compared to other**

[4] https://www.thestar.com/news/canada/2018/10/21/we-are-more-than-mercury-the-youth-from-a-place-known-for-poisoned-land-and-water-are-sending-a-message.html

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First Nation communities, they present a higher prevalence of the chronic conditions and emotional and behavioural issues that are associated with maternal fish consumption during pregnancy (Chapter 11).

- **The most striking difference between Grassy Narrows youth and First Nations' youth in Ontario and Canada is attempted suicide rate.** The Band member respondents, living in Grassy Narrows, indicate that 27% of youth have attempted suicide compared to 7% of First Nations' youth in Ontario and 6% in Canada in 2008/2010 (10% in 2015/2016) (Chapter 11)

- The most recent statistics from the First Nations Regional Health Survey (2015-2016)[5] report that the attempted suicide rate among First Nations teenage girls has risen from 10% in the previous survey to 16%. **The Band member respondents, living in Grassy Narrows, report that half (50%) of the girls over 12 years of age have attempted suicide** – three times more than the percentage of girls in other First Nations in Canada. (Chapter 11).

- **Many of Grassy Narrows's children and youth have been in the care of Child and Family Services.** Forty-one children (12% of all children/youth in the survey) were in care of Child and Family Services outside of Grassy Narrows at the time of the survey; 107 children/youth (32%) have at one time been in the care of Child and Family Services (Chapter 10).

- For 22% of the children, who had ever been in care, the person who filled out the questionnaire (respondent) considered that the intervention was **damaging to the child** and 29% felt it was **damaging to the family**. There is an important **gender difference** in the results: for 41% of girls who had ever been in care, the respondent considered that it was damaging to the child, while this was the case for only 16% of boys (Chapter 2).

- **The likelihood of currently or ever being in care of Child and Family Services is higher among children whose maternal grandfather had been a fishing guide**, independently of other factors that are associated with being in care, suggesting intergenerational consequences of the disaster that hit this community.

These findings support the need for urgent action to improve the health and well-being of the children and youth of Grassy Narrows.

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[5] https://fnigc.ca/news/final-volume-landmark-report-explores-health-care-language-culture-food-security-first-nations

Executive Summary

The Grassy Narrows' Child and Youth Community Health Assessment sought to provide a portrait of the situation of the children and youth of this community. To achieve this, it covered a wide range of aspects: their mental and physical health, their schooling, their physical and sedentary activities, their food consumption and being in the care of Children and Family Services. Questions were likewise asked about factors that could influence these outcomes, such as maternal health and mercury exposure during pregnancy. Merging of the adult and child questionnaires allowed us to examine associations between the parents' and children's situation. The key findings for the chapters are summarized here.

General health and chronic health conditions

Overall, the health of 78% of girls and 70% of boys is rated very good or excellent (thriving). The most prevalent diagnosed chronic health conditions are:

- Visual problems requiring glasses;
- Ear infections;
- Allergies;
- Asthma;
- Eczema or dermatitis;
- Language and/or and speech disorders

In addition, at least 10% of youth (12 years old and more) suffer from:

- Anxiety and/or depression;
- Learning disability;
- Attention Deficit Disorder or Attention Deficit Hyperactivity Disorder (ADD/ADHD)
- Anemia

Seven percent (7%) of children and youth have a diagnosed **neurologic disorder.** The details of these findings are in Chapter 6.

The First Nations Regional Health Survey (2008/2010) uses a measure of **diagnosed chronic health conditions that may have a negative impact on learning ability** (having at least one of the following: cognitive or mental disability, a learning disability, ADD/ADHD or speech and language difficulties)[6]. In the present survey, 16% of children and youth between the ages of 4 and 17 fulfill these criteria (Chapter 5). The measure is indeed reflected in school performance of the children and youth in the Grassy Narrows survey as shown in the graph below.

[6] FNRHS, Canada p. 374.

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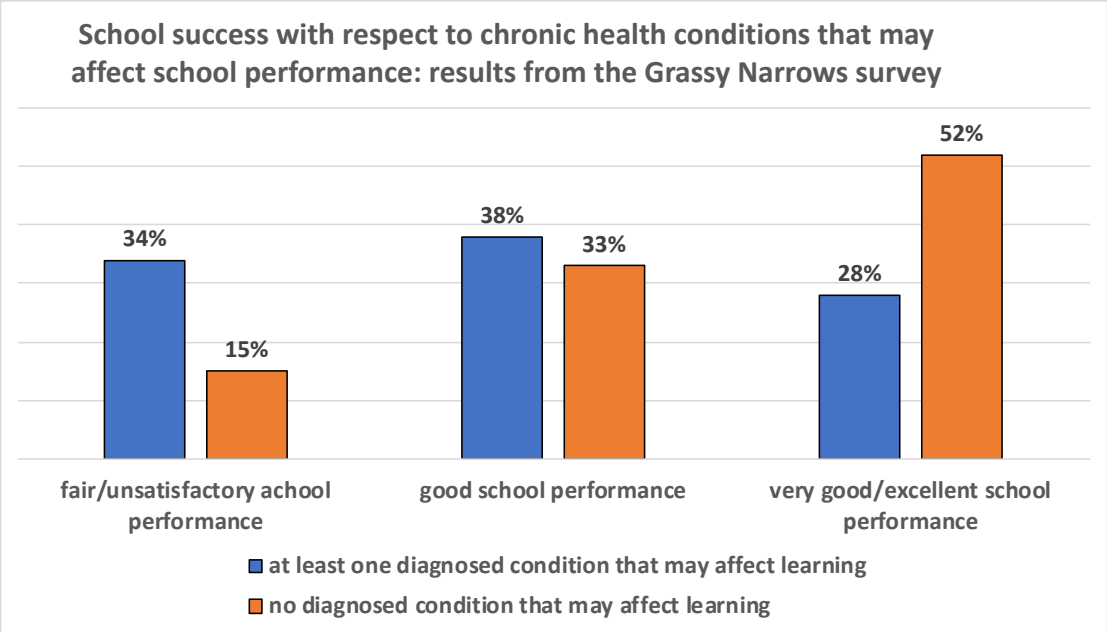

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Mental and emotional health and behaviour

Over half of respondents indicate that the child/youth mental health is very good or excellent. Children whose mental and health was reported as very good or excellent were more likely to have very good or excellent physical health.

In answer to the question: ***"Did this child/youth have more emotional or behavioural problems over the past 6 months compared to others of the same age and sex?",*** 28% responded in the affirmative. Among younger children (4 - 12 years of age), the prevalence is higher for boys (27%) compared to girls (17%); for the older children, the prevalence is higher for girls (50%) compared to boys (23%).

The percentage of children/youth who have **attempted suicide** is high. For all respondents, 27 children (10%) between the ages of 4 and 17 have attempted suicide, with proportionally more girls compared to boys.

- For all respondents 12 years of age and over, 39% of girls and 6% of boys have attempted suicide.

- For respondents who are Band members and who live in Grassy Narrows, 27% of youth have attempted suicide; 50% of girls.

Compared to other children of the same age or sex, those who have attempted suicide have more **emotional or behavioural problems over the past 6 months**. Sixty percent (60%) of youth who report **anxiety and/or depression have attempted suicide**.

Three-quarters of children/youth who have **attempted suicide** have been in **the care of Child and Family Services.** Among the children who have been in care, it represents one out of four. For children who have been in the care of Child and Family Services and who have attempted suicide, 50% of respondents indicate that the intervention from Child and Family Services had been damaging to the child and 60% indicated that it had been damaging to the family.

The details of the findings on mental and emotional health and behaviour are in Chapter 7.

Contribution of prenatal fish consumption to children's development

The Grassy Narrows' CHA had a question about mother's fish consumption during her pregnancy with the child: 52% of mothers never or hardly ever ate fish during their pregnancy, 27% ate fish once a month and 21% ate fish at least once a week.

Mothers who lived in Grassy Narrows during their pregnancy (68% of all pregnancies) consumed more fish compared to those who lived elsewhere during her pregnancy. A description of fish consumption and other characteristics during pregnancy is presented in Chapter 2.

Maternal health during pregnancy

Women who ate at least one fish meal a month during pregnancy were twice as likely to have maternal health problems during pregnancy, such as high blood pressure, gestational diabetes. This finding is independent of "drinking a lot or taking drugs during pregnancy", which was also a predictor of gestational and/or birthing difficulties (Chapters 8 and 9).

Children's physical health

Mothers' fish consumption during pregnancy negatively impacts the child's health. The table below indicates the likelihood (Odds Ratio) for children 4 years and over of having a diagnosed health chronic condition with respect to maternal fish consumption during pregnancy. The results are independent of other potential determinants (age and sex of the child, health problems during pregnancy and/or difficulties during childbirth, and drinking a lot or taking drugs during pregnancy) which, in some cases, were also predictors (Chapter 8. Tables 5a and 5b).

The findings in the table below are presented for different levels of fish consumption during pregnancy. The numbers compare **the likelihood for having this problem by comparing the children of mothers who ate fish never or hardly ever, with those who ate fish once a month or once a week or more.** For example, a higher likelihood of visual problems and chronic ear infections is observed among children whose mother ate at least one fish meal a month (both boxes show numbers), while not thriving, learning disability,

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conditions that may impact school performance and at least one nervous system disorder are observed among children whose mother ate at least one fish meal a week, but not among those who less fish. For these conditions, there was no significant difference between those who ate one fish meal and month and those who hardly or never ate fish during their pregnancy.

The likelihood of child/youth (4 -17 years) having a diagnosed health condition with respect to maternal fish consumption (comparison to those who hardly ever or never ate fish during pregnancy)

	Maternal fish consumption during pregnancy	
	One fish meal a month	One fish meal a week or more
Visual problems	2x	2x
Chronic ear infections	3x	3x
Health less than very good or excellent (not thriving)		3x
Learning disability		4x
Conditions that may impact school performance		4x
At least one nervous system disorder		4x

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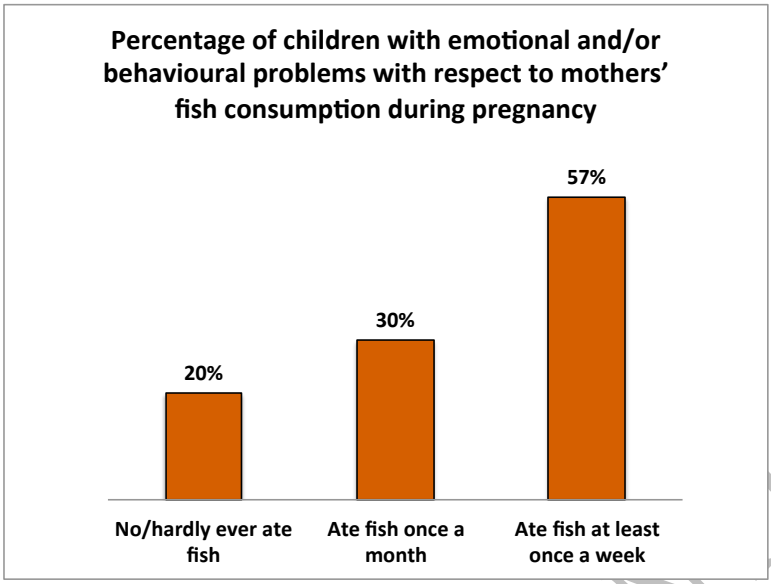
Children's mental health and behaviour

Among children and youth 4 to 17 years of age, the percentage of children with *"more **emotional or behavioural problems** over the past 6 months compared to those of the same sex and age"*, **increases with increased maternal consumption of fish during pregnancy.**

The table below indicates the proportion of children and youth with emotional or behavioural problems for all the children in the survey and the Grassy Narrows' Band mother/child pairs.



Emotional or behavioural problems is a predictor of **attempted suicide.** Analyses showed that, independently of other child and maternal factors. Behaviour is a mediator for the relation between maternal fish consumption during pregnancy and attempted suicide, that is: **the likelihood of attempted suicide increases with emotional or behavioural problems, which in turn increases with maternal consumption of fish during pregnancy.**

Mercury Disability Board Claims

One or several claims have been made to the **Mercury Disability Board** for a monthly mercury disability benefit for 21 children; half (a total of 11) were accepted. **There is a positive association between maternal fish-eating during pregnancy and a claim being made for the child:** 16% of children whose mother ate fish at least once a week; 6% of children whose mother ate fish once a month and 3% of those whose mother hardly ever/never ate fish.

Intergenerational fish consumption and fishing practices

Fishing and fish consumption have been traditional and cultural practices of the people of Grassy Narrows for hundreds, if not thousands of years. Walleye, a high end predator that bioaccumulates mercury was central to their lives. The discharge of mercury into the river system left the community "to deal with the loss of their traditional economy, unemployment

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and a mysterious new ailment that was rampant among members of their community – mercury poisoning"[7].

To examine intergenerational fishing practices, we analyzed the responses of mothers who currently live in Grassy Narrows, who lived in Grassy Narrows during their pregnancy with each child, and who answered the question about their fish consumption during their pregnancy. A total of 125 mother/child pairs meet these criteria.

- With respect to fish consumption during pregnancy, there is no difference in the mother's age, the mother's age at birth or the child's age, **indicating that there has been no change in fish consumption during pregnancy since 1999.**
- There is **a positive correlation between maternal fish-eating during pregnancy and mother's father (child's grandfather) being a fishing guide**: 92% of children whose mother ate fish at least once a week had a grandfather who was a fishing guide, compared to 80% of those whose mother ate fish once a month and 54% of those whose mother hardly ever or never ate fish during pregnancy.
- **The positive correlation with mothers' fish consumption during pregnancy is likewise observed for mothers' fish consumption as a child, current consumption of walleye and for practicing fishing.**
    - 90% of children's mothers who report that they ate fish at least once a week during their pregnancy likewise report that they practice fishing.
    - Over half of children of whose mother ate fish at least once a week, practice fishing and ate walleye at least once a month during the past year.

The intergenerational analyses show that from grandfather to mother to child, the tradition and culture of fishing and fish consumption have been passed down from one generation to the next. However, since the 1970's, so, too, has the loss of the traditional economy, unemployment and sickness. Fishing guides and their families were the most highly exposed to mercury[8] and the first to lose their jobs.

Comparison of Grassy Narrows' children and youth's physical and mental health with other First Nations in Canada

The First Nations Regional Health Survey 2008/2010, which surveyed persons from First Nation communities living on reserve, included sections on children and youth. Mothers responded for children 0-11 years of age and youth (12 years and over) responded on their own. For comparison purposes, in this report, for children 0 – 11 years of age, we limited the analyses to mother's responses. (Chapter 11).

[7] http://freegrassy.net/learn-more/grassy-narrows/history/
[8] Wheatley B and Paradis S. Exposure of Canadian Aboriginal peoples to methyl mercury. Water, Air and Soil Pollution, 80:3-11; 1995.

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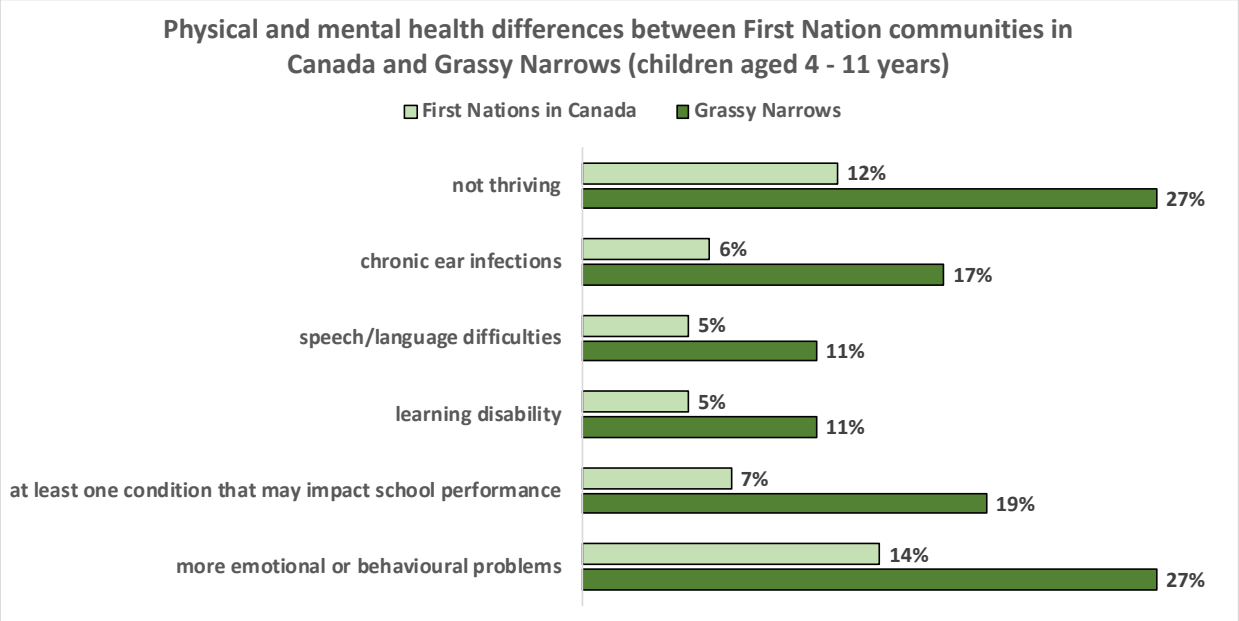
Although different methods were used with youth for the Grassy Narrows survey (an adult filled out the large majority of the questionnaires) and the First Nations Regional Health Survey 2008/2010, youth survey (youth filled out the questionnaire), we compared the responses for certain outcomes for youth 12 – 17 years of age, living at home.

For the children (0 – 11 years of age), Grassy Narrows children have **a higher prevalence of the diagnosed conditions that are associated with prenatal fish consumption, but not for the other conditions.**



For the youth, the major differences between Grassy Narrows youth and the First Nations Youth Regional Health Survey (2008/2010) were for **chronic ear infections** (23% vs 3%), **dermatitis** (14% vs. 4%) **conditions that may impact school performance** (16% vs 7%) and **attempted suicide** (27% vs 6%).

Schooling

97% of children and 92% of youth attend school; 15% are in pre-kindergarten or kindergarten, 54% in elementary school and 31% in high school (Chapter 5). School success is reported to be better in elementary than in high school; in elementary school 52% are in the very good/excellent category compared to 33% in high school, and 14% are in the fair/unsatisfactory category compared to 34%.

Overall, girls have better success in school compared to boys among both children and youth. With respect to specific difficulties, in elementary school, more boys than girls have difficulty

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with mathematics and a short attention span, while in high school, more boys have a short attention span compared to girls and more girls have difficulty understanding the teacher compared to boys.

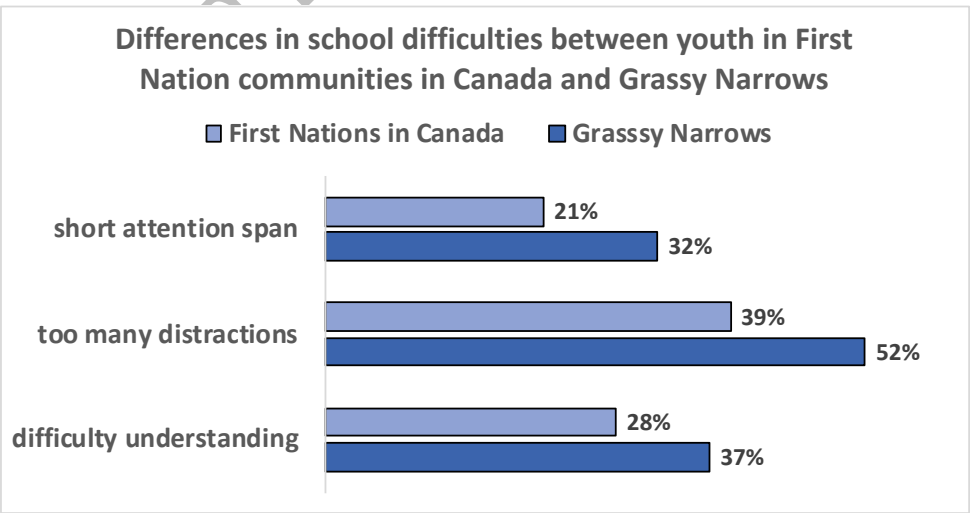
The proportion of children and youth **with poor/unsatisfactory performance in school** is:

- Higher among children and youth with **more emotional and behaviour problems** over the past 6 months compare to others of their age and sex: For boys: 55% vs. 20%; for girls: 29% vs. 9%;
- Higher among those with **neurologic disorders**;
- Higher among children and youth who have **diagnosed health conditions that may impact school performance.**

It is noteworthy that all of the above conditions are associated with maternal fish consumption during pregnancy.

School performance in comparison with other First Nation communities

For children 6 – 11 years of age, there is no difference between Grassy Narrows and other First Nation communities with respect to school performance. For youth, there are **proportionally more who have difficulties in school compared to First Nation communities in Canada** (52% vs. 39%), most notably a short attention span, too many distractions and difficulty understanding.



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Children and youth's activities outside of school

In these analyses, only children 6 years and older are considered. The details of these findings are in Chapter 3.

Physical activities

The large majority of children (88%) engage in physical activities; the proportion is similar between age categories and sex, with the exception of children 9-11 years of age, with girls more active than boys. Regardless of age, the most popular physical activities are walking, swimming, running or jogging, fishing and bicycle riding/mountain biking.

There was no association between participating in physical activities and being overweight, with the exception of weight-lifting in boys, where no one is overweight.

Compared to other First Nations' children (6-11 years of age), more girls in Grassy Narrows practice swimming and aerobics/fitness; fewer boys walk, cycle, skate, garden or are involved in competitive sports. Fishing is practiced by more girls and boys compared to girls and boys of other First Nation communities. We did not compare the youth because of the differences in the survey methods.

Sedentary activities

With the exception of watching television, the proportion of sedentary activities increases with age; by gender, reading increases with age for girls, and video games and working on computer for boys. Around 60% of boys 6-8 years of age play video games for over one hour a day; for those 12 and over, it is 88%. On the other hand, approximately half of the girls work on computers, for at least one hour a day, at all ages.

Approximately half of the children watch television for one hour or more/day. For boys, watching TV is associated with being overweight for their age.

Overall, for children/youth over 6 years of age, 24% read for fun every day; girls spend more time reading for fun compared to boys. The figure below shows the percentage of girls and boys who read for fun at least a few times a week by age and sex.

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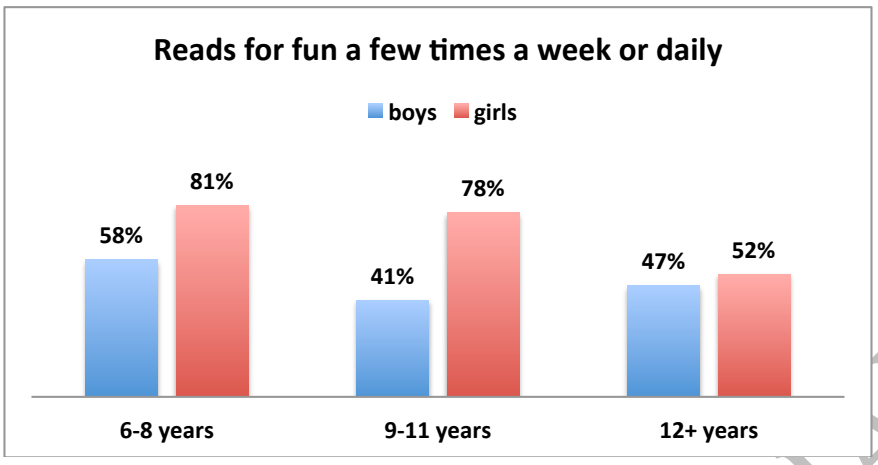

For children in elementary school, reading for fun is associated with practicing at least one physical activity, working at a computer, not playing video games for over one hour a day, and rated very good or excellent in school.

Compared to other First Nation communities in Canada, in Grassy Narrows, among children (6- 11 years):

- Fewer watch television for more than 1.5 hours/day;
- Four times more work on a computer for more than 1.5 hours/day;
- Twice as many play video games more than 1.5 hours/day.

Community activities

Approximately one third of the children and youth participate in art or music groups or lessons or take part in traditional singing, drumming or dancing groups or lessons.

Regardless of age range, more than two-thirds of children (70%) participate in the community organized cultural events. In the 12 to 17 years of age range, there is a tendency for more girls to participate compared to boys.

For events related to First Nation identity and recognition of rights, one third of children and youth usually participate and there is no difference between age ranges. In the 12 to 17 years of age range, more girls participate compared to boys; 58% of teenage girls participate in activities related to their identity and the recognition of their rights.

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Food consumption

The ANA-CHA was not designed to evaluate the nutritional status of the children and youth but provides a portrait of the consumption of non-traditional and traditional foods.

Over 75% of children and youth eat milk/milk products, carbohydrates, protein and fruit juice at least once a day. Over 60% of children and youth eat fruit in summer and winter. Less than 60% eat vegetables every day. **Compared to other First Nation communities, fewer 6 – 11 year olds in Grassy Narrows eat vegetables every day** (68% vs. 50%).

The survey questions on traditional food asked about consumption over the previous year. Bannock and walleye, the most eaten traditional foods, is consumed by 2/3 of the children and youth. **Walleye** was eaten at least a few times over the past year by 49% of children and youth, and was eaten often by 14%. Proportionally more children and youth who fish eat walleye; 23% of those who fish ate walleye often over the past year.

There was an inverse relation between eating vegetables every day and body mass: proportionally more **overweight** children **do not** eat **vegetables** at least once a day. Eating **vegetables is positively associated with fewer difficulties in school**, notably in mathematics and too many distractions.

A higher proportion of high school students who eat **walleye often** have short **attention spans** compared to the others (45% vs. 11%).

The details of food consumption patterns are described in Chapter 4 and the comparisons for all foods with other First Nation communities in Chapter 11.

Maternal context

Children's health and behaviour are influenced not only by prenatal conditions, but also by the context in which they live. The ANA-CHA adult survey provided information on parents' socio-economic status, nutrition, community participation and physical and mental health. The child questionnaire provided information on the child's eating habits, success in school, having spent time in the care of Child and Family Services, physical activity, health as well as on possible mercury exposure through current fish consumption.

To explore how home context may affect children's development, we merged the ANA-CHA adult and the ANA-CHA child databases, selecting only those whose mother answered the child questionnaire and those who were 4 years of age or more. In these analyses, we only included Band members. A total of 186 mother/child pairs filled these criteria.

When comparing the maternal and household context of younger (4 – 11 years old) and older children, most indicators (demographics, maternal physical and mental health) are similar, although more mothers of older children understand or speak the Anishinaabe

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language, indicating that younger children are less exposed to the language. More mothers of older children likewise had a parent who attended a residential school, but there is no difference in the mothers' father being a fishing guide (60%) or living in a smoke-free home (approximately 85%)

However, major differences are observed for indicators of poverty and maternal education indicating that the mothers of younger children are poorer off compared to the mothers of older children. The table below is taken from Table 8 (Chapter 9).

Mothers' situation	**4-11 years old**	**12-17 years old**
Indicators of poverty		
Lowest income adequacy category	30%	20%
Income less than $20,000	50%	39%
Struggle to meet basic needs for food	65%	54%
Severe food insecurity	27%	19%
Maternal Education		
High school diploma	19%	31%
Very good/excellent success in school	33%	46%
Furthered education	53%	66%

Analyses indicate that in addition the associations with fish consumption described above, maternal health, well-being and socio-economic status can likewise contribute to the children's health and wellbeing.

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Children in care of the Child and Family Services

In a report to the Royal Commission on Aboriginal Peoples Child and Family Wellness in 1994, Joyce Timpson wrote[9] *"The social problems of Grassy Narrows have been immense. Child welfare statistics reflect great suffering. In 1977, 56 children from the community were admitted to the care of the Kenora Children's Aid Society, the highest rate in the Kenora District, an area with the highest rate of children in care in Ontario. The single point rate in January 1977 for children in care from Grassy Narrows was 16.8 percent of the child population."* The author indicates that this high rate has been attributed to the impact of residential schools, relocation and mercury poisoning.

The Grassy Narrows' CHA findings show that there has been little change. In these analyses, which were limited to mother-child pairs, with the mother currently living in Grassy Narrows, 23 children (16%), were in the care of Child and Family Services outside of Grassy Narrows

[9] Timpson J. Aboriginal Families and Child Welfare prepared for the Royal Commission on Aboriginal Peoples Child and Family Wellness, 1994. (http://data2.archives.ca/rcap/pdf/rcap-170.pdf accessed October 18, 2018)

at the time of the survey. The mothers, whose child or children were in care outside of Grassy Narrows, represent 18% of mothers living in Grassy Narrows at the time of the survey.

- All of the **maternal grandfathers were fishing guides**.
- All mothers had an **income of less than $25,000/year.**
- Most (82%) had a **maternal grandmother who attended a residential school**.

Among the Grassy Narrows mothers who are currently living in Grassy Narrows, 34% report that at least one of their children has been in the care of Child and Family Services outside of Grassy Narrows, representing 32% of all children whose mother is a Band member living on reserve. Like for other First Nation communities, the likelihood of ever having been in care is associated with maternal heavy drinking, but it also increased:

- Fivefold if the maternal **grandfather was a fishing guide;**
- Fourfold if the maternal **grandmother had attended a residential school;**
- **Maternal low mastery score**, which represents how much one considers that they have control over their lives.

While the intergenerational negative impact of residential schools on children being in care has been previously studied, the findings of the present survey in Grassy Narrows indicate that the intergenerational impact of the social and economic trauma and illness among fishing guides, and their families, likewise had deleterious effects on raising the next generation of children. The legacy of mercury compounds and exacerbates the legacies of colonialism and residential schools on the health and wellbeing of the next generation.

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Recommendations

The ANA-CHA child survey provides an overview of the health and welfare of the children of Grassy Narrows Band members and non-Band members living on reserve or spouses of Band members living off reserve.

For these children, born since 1999, the findings that relate to maternal fish consumption during pregnancy and the children's development, health and behaviour, are consistent with the scientific literature on mercury exposure from fish consumption[10].

Although we did not ask what specific fish was eaten during pregnancy, and just asked about fish consumption, our findings are similar to the 2005 report "Our Waters, Our Fish"[11]. Over 90% of fish consumed in Grassy Narrows is walleye and very few other fish species. Walleye is traditional to the culture and wellbeing of the Asubpeeschoseewagong Netum Anishinabek.

The on-going efforts led by the community to remediate the river contamination will take years. There is a need to act immediately to improve the conditions of this and future generations of children.

The following recommendations stem from the results of the Grassy Narrows Child and Youth Health Assessment (CHA) survey:

Mothers of child-bearing age

- Since, early in their pregnancies, women usually do not know whether they are pregnant, a stable **Learning Centre** should be established for women of child-bearing age with secure funding in order to **provide information** to this and future generations about the history of mercury contamination and its effects on the developing foetus and child. Prenatal classes should be offered.

- This **Learning Centre** could also regularly **supply nutritious food** and information for women of child bearing age and special meals for women throughout their pregnancy.

- There should be a **financial incentive** to attend the **Learning Centre**. Generations of people of Grassy Narrows have been directly and indirectly financially impoverished by this major Canadian disaster, for which they have no responsibility. There is a responsibility on the part of governments who allowed this situation to continue for

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[10] Karagas M et al. Evidence on the human health effects of low-level methylmercury exposure. Environ Health Perspect 120: 799–806 ; 2012

[11] Chan L et al. "Our waters, our fish, our people" Mercury contamination in fish resources of two Treaty #3 communities. Report to Grassy Narrows First Nation. 2005.

several generations to assure that harm to present and future generations is minimized.

- Pregnant women should have access to traditional and professional counseling, access to midwifery and doula services. Access to financial stipends could serve to counter the harmful effects of poverty.

- Training in the **Learning Centre** should be offered to all parents and grandparents so that they better understand how mercury has impacted their community. In the Adult Survey, we showed that there are fewer elders in Grassy Narrows compared to other First Nation communities to pass on traditional and historic information. This could take the form of a living museum.

Children and youth

The health and well-being of children and youth have been affected directly by prenatal exposure to mercury and indirectly by the intergenerational consequences of mercury contamination of the fish resources in their community. To counteract the harmful effects on physical and mental health, behaviour and school performance, the following actions should be taken:

- The findings of this survey strongly support the demands of the Grassy Narrows community for an **emergency and long-term programs for child and youth suicide prevention.** This program should be part of a stable institution (with permanent funding) for children, youth and adults (see Adult ANA-CHA Report and recommendations) that would address suicidal ideation in a way that is relevant to the specific situation and needs of the community[12,13]. Such a program should focus not only on emergency counselling and crisis intervention, but also on the underlying root causes of mental distress. A full-time child psychologist, adequately trained in the impact of colonialism on First Nations and the impact of mercury on mental health and behaviour, is needed for such a program, which likewise requires a traditional counselor/health and elders.

- The type of chronic conditions that were identified in the present study as being associated with fish consumption practices are higher among Grassy Narrows children and youth compared to other First Nation communities. The findings on neurological and neuropsychological disorders, as well as the number of claims that have been made to the Mercury Disability Board for children underline the need for **adequate medical and neuropsychological assessment and therapy** for these children.

[12] Nasir et al. The need for a culturally-tailored gatekeeper training intervention program in preventing suicide among Indigenous peoples: a systematic review. BMC Psychiatry 16(1), 357; 2016.
[13] Toombs et al. First Nations parenting and child reunification: Identifying strengths, barriers, and community needs within the child welfare system. Child & Family Social Work. 23:408–416; 2018.

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- Primary care physicians need to be cognisant of the potential effects of mercury exposure and be able to refer patients to specialists, particularly in neurology and neuropsychology. Since there are no specialist facilities in Grassy Narrows, financial coverage is needed for travel and expenses not covered by existing programs.

- School principals, teachers, health professionals, counsellors and social workers should be made aware of the long-term consequences of mercury exposure on children. This **awareness program** needs to be repeated every time a person is hired because turn-over is high on reserve and history can rapidly be forgotten.

- There needs to be **resources in the school** that address the children's and youth's specific difficulties, the prevalence of which are higher in Grassy Narrows compared to other First Nation communities and associated with maternal fish consumption during pregnancy. Programs of speech therapy, exercises that can increase attention span and emotion management are just some examples. Children, who require specific help, should be provided with one-on-one support through the Ontario Individual Education Plan (IEP).

- The survey showed that children and youth who do not eat vegetables every day do more poorly in school. Since this may constitute an indicator or nutritional status, it points to the need to set up **community kitchens** with healthful food that is available, in or outside of the school. The adult survey likewise revealed the need for a community kitchen and the finding of the child and youth survey support this recommendation. The community kitchens could use healthy local and traditional foods, such as berries, wild rice, more and deer and fish with low concentrations of mercury harvested from safe locations by local harvesters.

- The percentage of children and youth currently or previously in care of **Child and Family Services** is very high. Many studies have shown the deleterious effects of the child welfare system removing First Nation children and youth from their communities[14]. Although the present survey was not designed to specifically examine this issue, the findings indicate that the multifactorial underlying factors are not addressed. These findings echo the concept in an article by Toombs and co-authors[16]: ***"Heal the community to help the child"***. As in other communities, the mothers of children who are or have been in care live in poverty, have little control over their lives and have parents who were in residential schools. A unique factor in Grassy Narrows is having had a father who was a fishing guide. Further examination of the interventions of the child welfare system with a view to addressing the underlying issues and reducing the number of children in the care of Child and Family Services is severely needed.

[14] Toombs et al. First Nations parenting and child reunification: Identifying strengths, barriers, and community needs within the child welfare system. Child & Family Social Work. 23:408–416; 2018.

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- The importance of elders passing on traditional knowledge as a deterrent to a high prevalence of children and youth being placed in care of Child and Family Services was identified in the report to the Royal Commission on Aboriginal Peoples Child and Family Wellness[15], In the ANA-CHA Adults report, we, like others have shown that there is a dearth of elders in Grassy Narrows. There is a need for a program that will provide opportunities for children and youth to actively learn traditional knowledge, which contributes to a sense of identity, belonging and pride.

A comprehensive study of the children in Grassy Narrows with intervention components

The situation and needs of the children and youth in Grassy Narrows have never been addressed in a comprehensive study. To improve the situation of the Grassy Narrows community, such a study requires three components: evaluation, intervention and a re-evaluation. It should include a dietary survey, measurement of nutrients and mercury biomarkers, neuropsychological and health assessment, which would drive the intervention (e.g. cognitive stimulation, behavioural therapy, diet, etc.), followed by an evaluation to determine whether there is improvement and the factors that contributed (or did not contribute) to the improvement.

It is noteworthy that fish consumption advisories are unclear and if the information provided in the Chan report of 183 grams of fish/week or two average size portions of walleye every month,[16] is applied to the results from the Grassy Narrows CHA survey, pregnant women who ate fish once a month are within the recommended limits. The present survey shows that even a lower consumption of fish (e.g. once a month during pregnancy) is associated with deleterious effects on children's development.

The findings of this survey suggest that the current guidelines need to be revisited. They are clearly inadequate in this community. The guidelines, which were established on studies of marine fish eaters, and maybe inadequate for freshwater fish eaters. It is also possible that they may be too high for communities, like Grassy Narrows, with known mercury contamination over a long period of time. The guidelines should be applicable to all fish-eating communities.

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[15] Timpson J. Aboriginal Families and Child Welfare prepared for the Royal Commission on Aboriginal Peoples Child and Family Wellness, 1994. (http://data2.archives.ca/rcap/pdf/rcap-170.pdf accessed October 18, 2018)

[16] Chan, L. Our Waters Our Fish. Report to Grassy Narrows First Nation. 2005; p. 77.

Conclusion

Despite the strong scientific evidence of the harmful effects of prenatal mercury exposure on children's development, this is the first comprehensive survey of the health and wellness of the children and youth of Grassy Narrows. The findings clearly indicate that mercury exposure, particularly *in utero*, compounds the physical and mental health problems that are consistently reported for First Nation communities in Canada.

For decades, the Grassy Narrows community has decried the situation. There have been numerous reports, articles, book chapters and books written about Grassy Narrows. But, little has been done to specifically address the hardships created by this environmental disaster. The recommendations that stem from this survey are based on the co-construction of knowledge of the situation of the children and youth. The community's voice needs to be heard and solutions should be developed, refined and implemented under their leadership, with support from relevant professionals, and provincial and federal governments.

The children youth of Grassy Narrows deserve to be "more than mercury".

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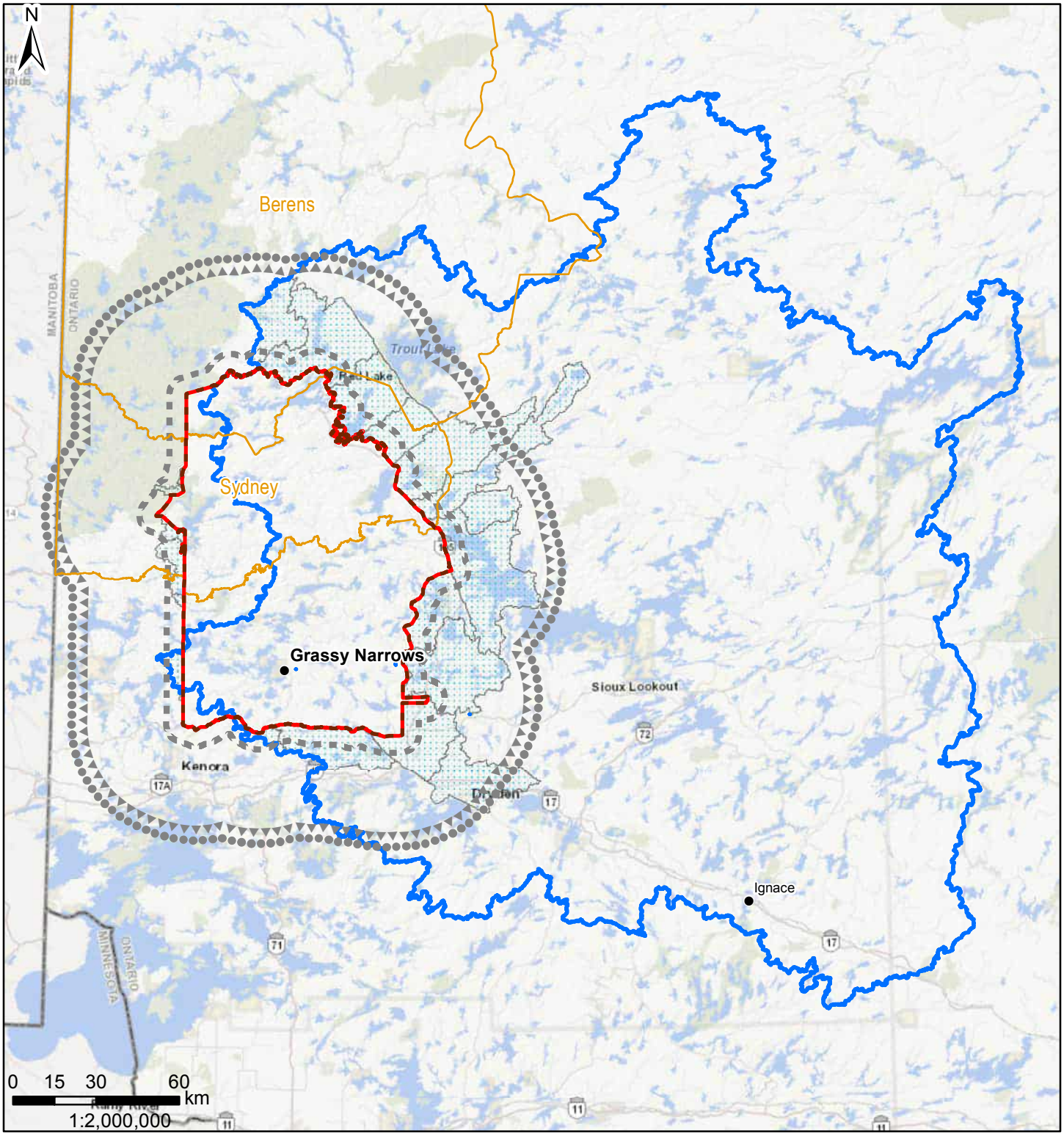
Asubpeeschoseewagong (Grassy Narrows) Interim Core Area of Interest for Mining



- Interim Core Area of Interest for Mining
- Moose Home Range (6km)
- Wolverine Home Range Area (36km)
- Walleye Migration Area (40km)
- Caribou Range Boundaries
- Nearby Quaternary Watersheds That Flow Into The Core
- English River Watershed at Separation Narrows

N.B. This is an interim product created under duress arising from the escalation of imposed mining activity by the Crown and industry and for the sole purpose of identifying an interim area for negotiations on mining related activity. It is not a complete representation of Grassy Narrows' area of interest. Due to unique circumstances and capacity constraints Grassy Narrows has not completed comprehensive studies required to fully determine its area of interest including, but not limited to, land use and occupancy, ethnohistory, archeaology, biology, and hydrology. For example, rights and interests associated with air quality, migratory birds, travel routes, marten, lake sturgeon, wolves, eastern cougar, landscape intactness, climate resilience, biodiversity, genetic diversity, and many other factors are not reflected here. Also, linear boundaries are an imposed non-Indigenous concept that does not accord with the nature of Grassy Narrows' relationship with the land which includes extensive interconnectedness, reciprocity, travel, sharing, and trade. This map does not limit any claims by Grassy Narrows people to assert their rights and interests throughout their territory and to protect themselves from harm to their health, rights, way of life, livelihood, society, and environment. Grassy Narrows people have Treaty rights, and practice them, throughout the Treaty 3 area. Grassy Narrows people also have inalienable inherent rights given by the Creator, some of which are affirmed in international law and instruments. The Grassy Narrows people are the true experts about their land, rights, and interests.

Environmental Health

RESEARCH

Open Access

Past mercury exposure and current symptoms of nervous system dysfunction in adults of a First Nation community (Canada)

Aline Philibert[1], Myriam Fillion[2,1], Judy Da Silva[3], Tanya Suvendrini Lena[4] and Donna Mergler[1*]

Abstract

Background: The watershed in Asubpeeschoseewagong Netum Anishinabek (Grassy Narrows First Nation) territory has been contaminated by mercury (Hg) since 1962, resulting in very high Hg concentrations in fish, central to the community's culture, traditions, economy and diet. Biomarkers of Hg exposure (umbilical cord blood and hair/blood samples), monitored between 1970 and 1997, decreased over time. A recent Grassy Narrows Community Health Assessment (GN-CHA) survey included current symptoms of nervous system dysfunction. The present study aimed to cluster self-reported symptoms and examine their associations with past Hg exposure.

Methods: The GN-CHA included 391 adults. Symptom clustering used a two-step segmentation approach. Umbilical cord Hg and/or yearly measurements of equivalent hair Hg were available for 242 participants. Structural Equation Models (SEM) displayed the associations between Hg exposure and clusters, with Hg exposure modelled as a latent variable or in separate variables (prenatal, childhood and having had hair Hg $\geq$ 5 µg/g at least once over the sampling period). Longitudinal Mixed Effects Models (LMEM) served to examine past hair Hg with respect to clusters.

Results: A total of 37 symptoms bonded into 6 clusters, representing Extrapyramidal impairment, Sensory impairment, Cranial nerve disturbances, Gross motor impairment, Neuro-cognitive deficits and Affect/Mood disorders. Median Hg concentrations were 5 µg/L (1–78.5) and 1.1 µg/g (0.2–16) for umbilical cord and childhood hair, respectively. More than one-third (36.6%) had hair Hg $\geq$ 5 µg/g at least once. In SEM, latent Hg was directly associated with Extrapyramidal and Sensory impairment, Cranial nerve disturbances and Affect/Mood disorders. Direct associations were observed for prenatal exposure with Affect/Mood disorders, for childhood exposure with Extrapyramidal impairment and Cranial nerve disturbances, and for hair Hg $\geq$ 5 µg/g with Extrapyramidal and Sensory impairment. For all clusters, a further association between past Hg exposure and symptom clusters was mediated by diagnosed nervous system disorders. LMEM showed higher past hair Hg among those with higher scores for all clusters, except Affect/Mood disorders.

Conclusion: Our findings provide evidence that in this First Nation community, past Hg exposure from fish consumption was associated with later-life clusters of coexisting symptoms of nervous system dysfunction.

Keywords: Mercury, Past exposure, First nation, Nervous system dysfunction, Symptom clusters, Clustering, Structural equation modelling, Mixed effects model

Background

In the 1960's, a chloralkali plant discharged approximately 10,000 kg of mercury (Hg) into the Wabigoon-English River system in Northwestern Ontario, contaminating

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fish resources as far as 250 km downstream [1]. Asubpeeschoseewagong Netum Anishinabek (Grassy Narrows First Nation) and Wabaseemoong Independent Nation (previously known as Whitedog and Islington Bands), for whom walleye *(Sander vitreus)* is central to their traditions, culture, economy and health, were seriously affected by this disaster [2]. Between 1970 and 1997, governmental agencies carried out biomonitoring programs in these communities to assess Hg concentrations in blood and hair [3]. Another program (1970–1992) assessed Hg concentrations in umbilical cord blood collected at the local hospital [3, 4]. Biomarker Hg concentrations from Grassy Narrows First Nation followed a similar pattern to Hg levels in local fish from the contaminated river system, with extremely high concentrations in the early 1970's, a sharp decline until 1977 and a less pronounced decline until 1987, after which, mean concentrations remained relatively stable [5, 6].

In 1975, neurological examinations of 89 residents from the two communities, carried out by Dr. Masazumi Harada and colleagues [7], showed a high prevalence of signs and symptoms, similar to those reported by patients with Minamata Disease. The team revisited the communities in 2002 and 2004 and examined 175 individuals. Sixty (n=60) persons were diagnosed with Minamata Disease, 54 with Minamata Disease with complications due to other diseases, and 25 with "suspicion of Minamata Disease" [7]. Self-reported symptoms included numbness, pain in limbs, joints and back, decreased vision, impaired hearing, cramps in limbs, dizziness, tendency to fall, forgetfulness, impaired finger movement, tremor and speech impairment. For 27 persons who had been examined in 1975, symptoms had worsened [7]. Takaoka and co-authors [8] compared self-reported symptoms of volunteers from the Grassy Narrows First Nation community from examinations performed in 2010, with residents from the Minamata area and a reference group from other areas of Japan. The authors observed that the prevalence of specific and non-specific complaints of older persons from Grassy Narrows was similar to those from the Minamata area, while the prevalence among younger persons from Grassy Narrows was lower, but higher than the Japanese reference group [8]. While signs and symptoms reported in this study are consistent with methylmercury poisoning [9], the findings are limited by the recruitment strategy and the absence of measurements of mercury exposure.

In 2015, Grassy Narrows First Nation undertook a Community Health Assessment survey (GN-CHA), which included a list of 59 symptoms, as well as questions on current and past fish consumption. Although understanding one single symptom is worthwhile per se, people rarely present with one symptom, but rather with an array of multiple coexisting symptoms [10]. Clustering bonds concurrently occurring symptoms [10], whose pattern reflects the nature of the underlying dysfunction [11]. Multidimensional approaches and statistical techniques have been proposed to facilitate the integrated analysis of multiple symptoms [10, 12–15]. Also, a growing body of research has used advanced statistical techniques to examine the contributions of Hg exposure [16–26]. The objective of the present study was to bond GN-CHA reported symptoms of nervous system dysfunction into clusters and to examine their association to long-term and past Hg exposure.

Methods

For the present study, carried out in collaboration with the Grassy Narrows First Nation community, we merged information from the GN-CHA survey and two government biomarker monitoring programs (umbilical cord Hg and blood and/or hair Hg) to examine the associations between current reported symptoms from the GN-CHA survey and past Hg exposure, using cluster analyses, structural equation models (SEM) and longitudinal mixed effects models (LMEM) (Fig. 1).

GN-CHA survey

The GN-CHA survey for adults (18 years old and over), initiated in 2015, included 266 questions that covered many aspects of their life and health: demographics, education, generational attendance of residential school, work and income, food consumption, health status, diabetes care, wellness and mental health, injuries, disability, health care access, physical activity, smoking, drinking and drug use, community wellness and traditional culture. Most questions were taken from the First Nation Regional Health Survey 2008/2010 (FNRHS 2008/2010) [27], which provided a basis for comparison with other First Nation communities in Canada. Specific questions were added about fish consumption at different periods of one's life, as well as illnesses and symptoms consistent with Hg poisoning. The questionnaire was pre-tested with 10 community members in July 2016. A house-to-house survey design was used, with the questionnaire on a web-based platform.

Survey administration was supervised by two field coordinators from Grassy Narrows; nine local interviewers went from house-to-house between December 2016 and March 2017. A total of 213 houses were identified on the reserve; 83.6% of houses were surveyed. Persons living off-reserve were recruited using convenience sampling. The results of the survey were presented to and discussed with community members during several small group and community meetings. The final report was

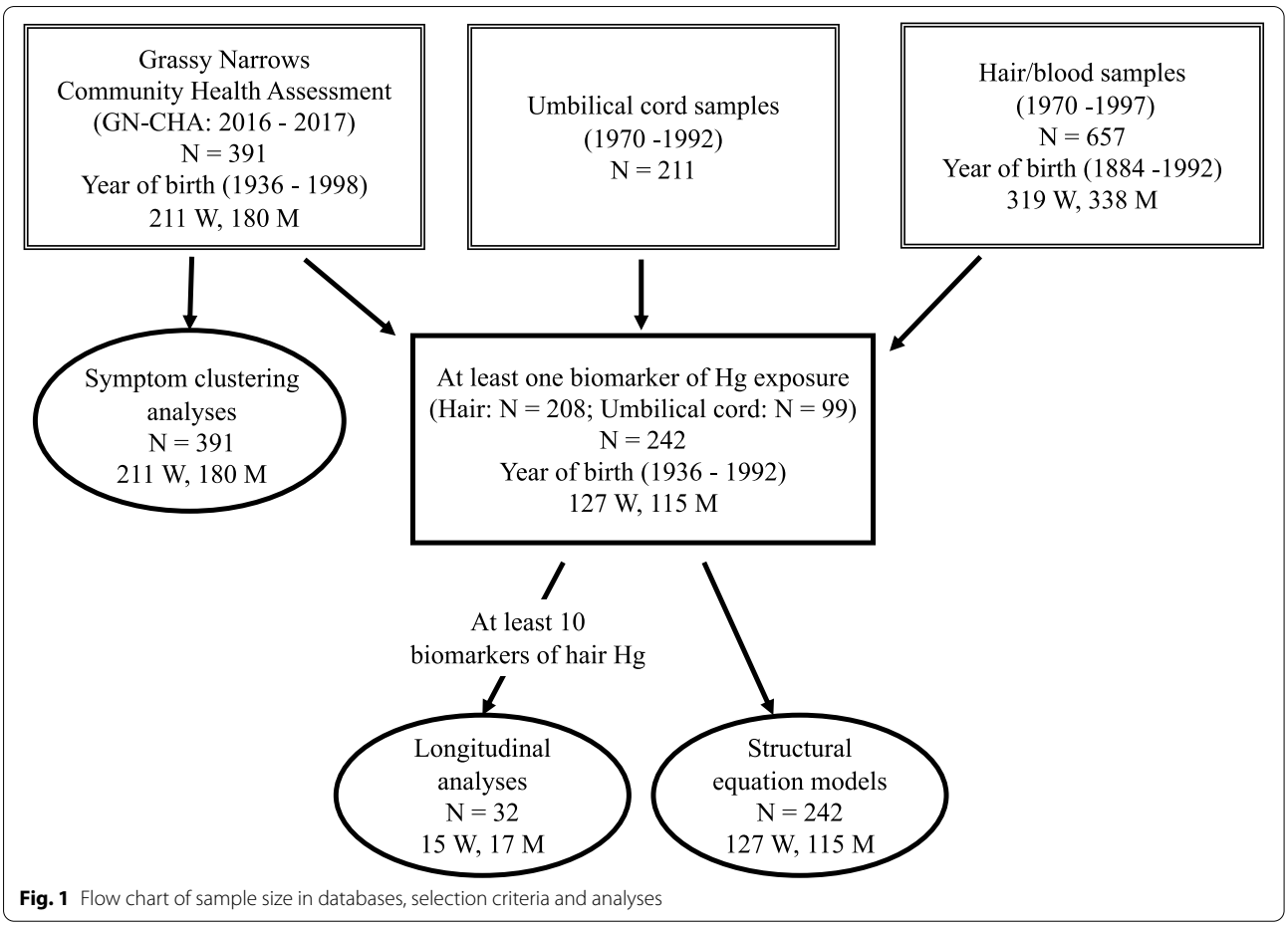


Fig. 1 Flow chart of sample size in databases, selection criteria and analyses

approved by Chief and Council and a summary was made public on May 24, 2018.

A total of 391 Registered Grassy Narrows First Nation members (Band members) participated in the GN-CHA survey. At the time of the survey, 303 were living on-reserve and 88 off-reserve.

For the present study, we used the following variables from the GN-CHA: Demographics: age, sex, living on/off reserve, schooling, generational attendance of residential school in the family. Work: currently working (yes/no), currently looking for work (yes/no), reasons for not working (disability or illness/other). Food security: struggle to pay for food once a month or more in the last 6 months. Fish consumption: childhood fish consumption at 10 years of age (5 categories grouped into once a month or less/at least several times a month); walleye consumption over the past year (not at all/a few times/often). Lifestyle: current smoking (yes/no) and current alcohol consumption (heavy drinking (yes/no), defined in the FNRHS 2008/2010 [27] as 5 drinks in one drinking occasion at least once/month in the past 12 months). Health status: obesity (yes/no) was categorized using Body Mass Index $\geq 30\,kg/m^2$ and at least one reported diagnosed chronic health conditions (yes/no), as listed in the FNRHS 2008/2010 (allergies, arthritis, asthma, cancer, chronic back pain, chronic bronchitis, diabetes, emphysema, heart disease, hepatitis, high blood pressure, liver disease, osteoporosis, rheumatism, stomach or intestinal problems, thyroid problems, and tuberculosis) and at least one diagnosed nervous system disorder (blindness, epilepsy, Bell's palsy, cerebral palsy, muscular dystrophy, Kennedy's disease, Parkinson's diseases, Alzheimer' disease, senile dementia, psychological/nervous disorders, cognitive/mental disorders, Attention deficit hyperactivity disorders (ADHD), learning disability).

The GN-CHA included 59 self-reported symptoms, rated on a 5-point Likert rating scale (*"Never"*, *"Rarely"*, *"From time to time"*, *"Very often"*, *"All the time"*). Higher scores on the Likert rating scale indicate greater frequency of symptoms.

Historic Hg biomarker data

At the request of Chief and Council of Grassy Narrows First Nation, the authors obtained from the First Nations

and Inuit Health Branch (FNIHB) of the Ministry of Indigenous Services Canada and the Ontario Ministry of Health and Long-term Care, archived Band members' historic biomarker data (hair and/or blood Hg concentrations), gathered between 1970 and 1997 and umbilical cord Hg data, collected between 1970 and 1992 at the hospital where Grassy Narrows women gave birth (Fig. 1).

Blood and hair samples were taken as part of a monitoring program of the Medical Research Branch of Health Canada [4]. The objective of the program was to identify persons whose Hg biomarker concentrations surpassed the guidelines of the time. There was no sampling strategy. The program primarily targeted fishing guides and their families, but anyone could volunteer and provide a sample [4]. Some years. The sampling period was longer than others and there was no consistency in the month that sampling was carried out.

Samples were analysed for total Hg at Health Canada laboratories [4, 28, 29]. According to Farant et al. 1981 [28], in the initial years, sample analyses were performed according to the Magos method [29] and later, a more efficient and less time-consuming method used an improved cold-vapor atomic absorption technique. The two methods were highly correlated for blood ($r=0.98$) and hair ($r=0.97$) [28].

Past Hg exposure databases

We created a past Hg exposure database, which included umbilical cord Hg concentrations for 211 newborns from Grassy Narrows, born between 1970 and 1992 (Fig. 2a) and blood/hair monitoring data, collected between 1970 and 1997, from persons born between 1884 and 1992. For the latter, we used the highest measure of equivalent hair Hg concentration for each year sampled; the details are described elsewhere [6]. A total of 3603 year-based equivalent hair measurements were available over the sampling period for 657 persons (Fig. 2b),

For the present study, we selected GN-CHA participants with at least one biomarker measurement: either an umbilical cord Hg measurement ($n=99$) and/or at least 1 year-based hair Hg concentration ($n=208$; 1018 measurements) for a total of 242 persons. The number of year-based hair Hg measurements for each person varied between 1 and 23; 75 persons (36.1%) had 5 or more measurements, while 32 (15.4%) had 10 or more. For childhood Hg exposure, we used the mean hair Hg concentration between 5 and 15 years of age ($n=137$ (56.6%)). Childhood Hg concentrations were significantly higher for persons who reported childhood fish consumption frequency at least several times a month compared to those who ate less (Additional file 1, Fig. 1). Moreover, those who ate fish at least several times a month and had attended a residential school (outside of the community) had lower Hair Hg at 10 years of age (3.8 µg/g [1.7–5.9] ($n=16$) vs. 5.8 µg/g [4.2–7.3] ($n=30$)).

Estimated past Hg exposures

For participants who did not have an umbilical cord Hg measurement, estimated Hg values were predicted from linear regression models using the 211 umbilical cord data (Fig. 2a) on the year of birth for the three periods of Hg exposure (1970–1976, 1977–1987 and 1988–1992). These estimates were then adjusted on where the person's mother had spent her pregnancy and/or gave birth. For those who were born or whose mother spent

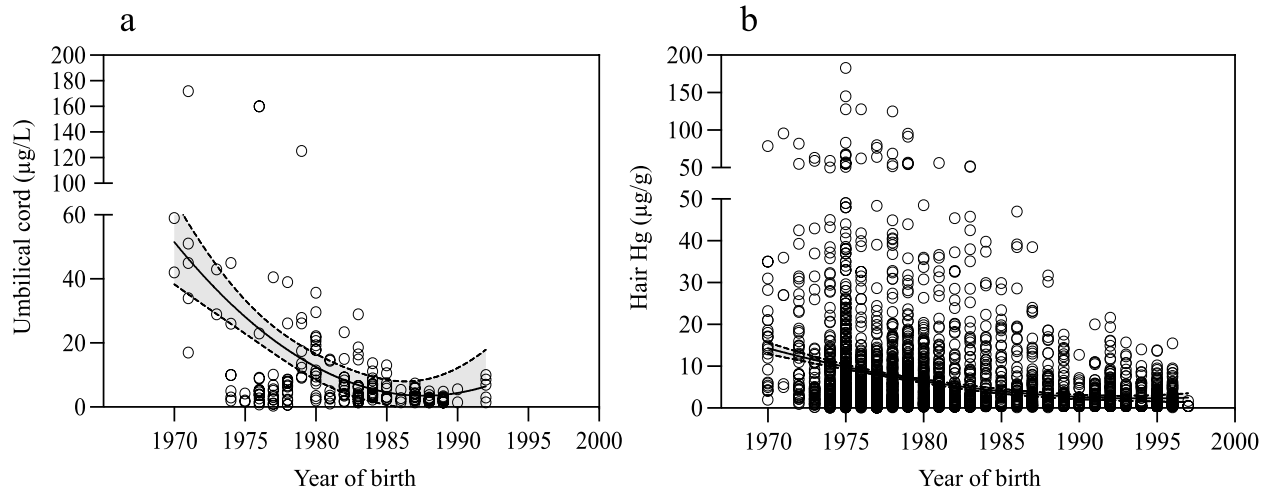


Fig. 2 Distribution of Hg biomarker concentrations over time. **a** Umbilical cord blood Hg (µg/L) collected between 1970 and 1992 ($n=211$). **b** Equivalent hair Hg (µg/g) from samples collected between 1970 and 1997 ($n=657$)

her pregnancy in the Wabigoon-English River region between 1970 and 1992, the mean measured umbilical cord blood Hg for their year of birth was used. For those born prior to the Hg discharge in 1962, we attributed 1.0 µg/L for cord blood Hg, while for those born between 1962 and 1970, mean cord blood Hg in 1970 was used (65.7 µg/L), and for those born after 1992, mean cord blood Hg from 1992 was applied (4.48 µg/L). Finally, for individuals, whose mother spent her pregnancy and delivered elsewhere, cord blood Hg was set at 1.0 µg/L.

For study participants, who did not have childhood hair Hg values, we derived estimates from the yearly-hair Hg database ($n=657$), using the overall mean hair Hg for the year in which they turned 10 years of age. For participants, who were ≥ 10 years old in 1962 (beginning of the discharge) childhood hair Hg was set at 0.1 µg/g. For those who were 10 years of age between 1963 and 1970, the mean measured hair Hg in children in 1970 was used. Since there were few Hg data after 1990 and there appears to be a plateau over this last period (Additional file 1, Fig. 1), we attributed 0.81 µg/g for those who were 10 years of age after 1990. For all those who were 10 years of age after 1962, estimates were then adjusted on reported childhood fish consumption and having attended a residential school. We were unable to estimate childhood hair Hg exposure for 13 persons (5.4%) of the 242 study participants, who were missing hair Hg data between 5 and 15 years old and who did not answer the question about childhood fish consumption in the GN-CHA survey.

To validate the estimated Hg measures, we tested the correlations between measured and estimated values for both umbilical cord and childhood hair Hg, using non-parametric tests (Spearman).

Symptom clustering

Self-reported symptoms from the GN-CHA survey ($n=391$) were clustered based on their Likert scale, using a simultaneous two-step multivariate segmentation approach [30–32]. One is agglomerative and aims at maximising a homogeneity criterion by successively aggregating the variables into clusters using a hierarchical ascendant clustering algorithm. The other is representative and creates a composite variable from a weighted linear combination of symptoms (synthetic variable that can be read as a gradient) for each cluster using a mixed factorial approach (PCAMIX method) [30, 32, 33]. For each composite variable (cluster), all participants received a score based on his/her symptom frequency.

A bootstrap approach was used for maximizing the homogeneity criterion within clusters and determining the suitable number of clusters. The desired number of clusters (K) was determined from the analysis of aggregation levels, stability of the partitions via bootstrapped mean-adjusted Rand Index and boxplots. The mean-adjusted Rand index was based on the generation of 60 bootstrap samples. Each cluster was carefully inspected based on its proportion of variation explained (a minimum of 50% was mandatory) and on degree of "closeness" among the symptoms being clustered (a minimum of 0.6 squared correlation of the variable with its composite variable was required). Some symptoms add noise while providing little or no information in identifying the underlying pattern inherent to the cluster [34]. Finally, we tested for the "driving" symptoms that best reflect the cluster. We validated the cluster results, using the VARCLUS function of the SAS computer application (JMP Professional 15.0 software).

A confirmatory factor analysis (CFA) was conducted to evaluate the construct validity of symptom clustering using a series of fit parameters [35–39], using the following indices: Chi-square divided by the degrees of freedom ($\chi 2/df$), Standardized Root Mean Square Residual (SRMR), Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI) and Tucker Lewis Index (TLI). Internal consistency (scale reliability) for each cluster was tested using the Cronbach alpha [35, 40–42]. Construct validity for each cluster was also confirmed by the neurologist (T. S. Lena).

Structural equation models

SEM is a comprehensive methodology for representing and simultaneously testing a network of complex relationships. This technique can incorporate observed (measured) and unobserved variables (latent), while traditional techniques only allow for measured variables. The latent variable is an unobservable multidimensional construct that cannot be directly measured [43, 44]. SEM allows for data from multiple exposures and multiple outcomes to be considered simultaneously [45]. It is based on an interrelated system of linear regression equations that extend the possibility of relations between observed and latent variables, as well as direct and indirect (mediation) relations and allows for flexibility in modeling covariance structures [19, 39, 46, 47]. Finally, SEM provides path diagrams that are useful to understand and interpret the contribution of the various variables. The standardized factor loadings allow for pathway comparison.

In the SEM, we used the latent variable for symptom clusters rather than the composite variable because it better reflects the structural concept of co-occurring symptoms. A latent variable was likewise used for Hg exposure at different times (prenatal, childhood and having had ≥5 µg/g hair Hg at least once over the monitoring period). Each cluster was analysed using two SEM,

the first with the latent Hg exposure variable and the second with the Hg exposure variables at the three different times. We tested possible direct and indirect (mediation) associations between Hg exposure variables and the symptom clusters. Age, sex, year of sampling, residence, as well a series of variables representing socioeconomic status (income, struggle to pay for food), drinking, smoking, obesity and medical history (diabetes, hypertension, heart disease, stroke, hypercholesteremia, separately and/or grouped into the variable "at least one diagnosed chronic health condition"), were tested a priori as covariates. We further tested whether sex modified the relation between past Hg exposures and symptom clusters (moderation). Moderated mediation was also tested with age and sex.

Variables with a skewed distribution were log (base 10) transformed. Because latent variables, Hg exposures and covariates, are all on different scales, we used standardized path coefficients to test the magnitude of relations. Standardized coefficients indicate the expected amount of change in standard deviation (SD) in the dependent latent symptoms cluster for an increase of one SD in the predictor, while other predictors (covariates) are kept constant. The adequacy of model fit to the data was determined using multiple indices: χ2/df, CFI, TLI, RMSEA, SRMR and Akaike's Information Criterion (AIC) and Schwarz's Bayesian information criterion (BIC) [35–39]. Diagonally weighted least squares (DWLS) adjustments in SEM were used to take into account the ordinal nature of symptom frequency outcomes. To improve the reliability of the latent construct's scale or the models, we examined residual variances between indicators. Modification indices (MI) were used to assess the addition or deletion of variables and/or associations to improve the goodness of fit of the SEM. The sequence of initial fit, MI and refitting were repeated until the best fit SEM was attained.

To ensure that the database of 242 participants was sufficient to run SEM, two types of power analyses were performed: i) to detect model misspecification and ii) to detect target effect (influence of Hg exposure on the symptom cluster) [48]. A-priori, post-hoc, and compromise power-analyses were run simultaneously to detect model misspecification based on Chi-square likelihood-ratio and RMSEA tests of close and not-close fit, [49–52]. The power for detecting specific target effect was determined with simulated data in SEM [48].

For the SEM, validated prenatal and childhood Hg exposure estimates, described above, were used when there was no measurement, while for GN-CHA variables, missing data were imputed using Multivariate Imputation by Chained Equations (MICE).

To support the SEM, we ran a series of Directed Acyclic Graphs (DAG) for sensitivity analyses. DAG is a visual representation of causal assumptions that makes underlying relations explicit. It is used to detect overt bias, notably through backdoor paths that identify the presence of confounding [53, 54]. Modifications to DAG-implied adjustment sets include conditioning confounding and variables with ambiguous causing roles [55, 56].

Longitudinal mixed effects models

LMEMs were performed using direct measurements of longitudinal hair Hg with respect to the composite variable for each cluster. We chose mixed effects modeling (MEM) as it is robust to missing data and irregularly spaced sampling; it also handles both time-invariant and time-varying covariates [57]. MEM enables multilevel modeling and partitioning of the covariance structure (random effects). We tested a priori the following covariates (age, sex, variables of lifestyle and medical history, age at sampling and sampling season). The normality of residuals was tested using a q-q plot. The most appropriate model was selected using the Akaike Information Criterion (AIC), the Baysian Information Criteria (BIC) and the likelihood ratio (LR) test at $p <= 0.05$.

For the longitudinal approach, LMEM requires repeated measures. Because of the absence of a biomarker sampling strategy, over half (56%) of the 208 persons with hair Hg measurements had 3 repeated measurements or less. Despite the flexibility of MEM with missing data, we preferred not to impute Hg levels for people whose diet and environmental context varied over time, particularly when living off-reserve. For LMEM, we only included persons with at least 10 hair Hg measurements ($n = 32$ (17 men and 15 women)), with a total of 447 hair Hg measurements, covering a period from 10 to 23 years (median 21 years).

To ensure that there were sufficient observations for the analyses, we estimated the minimal required sample size, based on formulas from Hedeker and co-authors [58] and direct calculations using the G*power software [59–61]. Since one centimeter of a hair sample represents an accumulation of Hg during approximately 1 month [62], we used a low correlation of repeated measures between yearly-based samples (rho 0.1 and 0.2). Because the effect size was unknown, 0.25 was chosen. Power analyses were set at 80%, with a two-tailed 5% hypothesis test, 10 time points and up to four fixed factors; the minimum number of participants required was between 29 and 42.

Threshold of statistical significance in all analyses was set at $p \leq 0.05$.

Database management and descriptive statistical analyses were performed using JMP Professional 15.0 (Statistical Analysis Hardware (SAS Institute). LMEM were conducted with Stata 16 software (StataCorp. 2019. Stata Statistical Software: Release 16.0. College

Station, TX: Stata Corporation). All other analyses were computed using the R statistical software version 3.6.1. (R Core Team, 2016). We used the R package ClustOfVar [31] for clustering analyses and the MICE (Multiple Imputation by Chained Equations) package for multiple imputation of missing data in CFA and SEM. PairedData and dplyr packages were used for paired-t tests. CFA and SEM models were computed with the R package Lavaan [39]. The dagitty and ggdag R packages were used for analysing SEM and DAG. A-priori, post-hoc, and compromise power-analyses were computed using the semPower package. To assess power for detecting a target effect in SEM we used an online tool: yilinandrewang.shinyapps.io/pwrSEM/ [63].

Results

Relevant characteristics of the 391 participants in the GN-CHA survey, whose data were used for symptom clustering, are presented by age category in Tables 1 and 2. In this community, age also reflects changes in Hg exposure over time. Almost half of the participants were between 30 and 49 years of age, with no difference in age distribution between women and men. There were important age differences in schooling. Proportionally fewer older persons had attended high school, however, over half of those 30 years and older had furthered their education through post-secondary training programs (data not shown). In Canada, First Nation children were placed, often forcibly, in residential schools, with harmful

Table 1 The relative frequency of the characteristics of the population within each age category

	N[a]	18–29 y n (%)	30–49 y n (%)	50+ y n (%)	Total n (%)	Chi-square (LR)[b] *p*-value
Sex	391					
Women		66 (53.3%)	97 (51.6%)	48 (60.8%)	211 (54%)	1.94 0.380
Men		58 (46.7%)	72 (48.4%)	31 (39.2%)	180(46%)	
Living on reserve	390	95 (76.6%)	144 (77.0%)	62 (78.5%)	301 (77.2%)	0.10 0.949
Schooling						
Attended school	382	122 (100%)	180 (98.4%)	75 (97.4%)	377 (98.7%)	4.13 0.257
Attended high school	366	115 (98.3%)	166 (94.9%)	48 (64.9%)	329 (89.9%)	52.6 < 0.0001
Other education	386	33 (27.1%)	108 (58.4%)	43 (54.4%)	184 (47.7%)	31.69 < 0.0001
Residential school						
Attended residential school	376	0	6 (3.4%)	52 (66.7%)	58 (15.4%)	171 < 0.0001
Parents in residential school	326	36 (40.5%)	148 (89.7%)	68 (94.4%)	252 (77.3%)	89 < 0.0001
Work activities						
Currently working[c]	349	39 (37.5%)	94 (52.2%)	32 (48.5%)	165 (49.2%)	5.90 0.052
Currently looking for work[c]	165	45 (81.8%)	58 (75.3%)	7 (21.2%)	110 (66.7%)	38.2 < 0.0001
Struggle to pay for food monthly or more in the last year	332	28 (26.9%)	38 (24.2%)	17 (23.9%)	83 (25.0%)	3.65 0.392
Current smoker	376	54 (46.2%)	90 (49.7%)	24 (30.8%)	168 (44.7%)	0.28 0.016
Heavy drinker	360	79 (71.2%)	100 (56.8%)	20 (27.4%)	199 (55.3%)	35.3 < 0.0001
Obese	375	47 (39.8%)	93 (51.7%)	36 (46.8%)	176 (46.9%)	4.03 0.133
At least one diagnosed chronic health condition	385	46 (38.3%)	117 (62.9%)	67 (84.8%)	230 (59.7%)	46.6 < 0.0001
At least one diagnosed nervous system disorder	381	20 (17.1%)	37 (19.9%)	35 (44.9%)	92 (24.2%)	32.6 < 0.0001

[a] Number (N) of valid responses (does not include don't know or don't remember and refused)

[b] Likelihood Ratio Chi-square compares the relative frequency between age categories

[c] Excludes students, stay at home parents and retirees

Table 2 The relative frequency of fish consumption by age category

	N	18-29 y n (%)	30-49 y n (%)	50+ y n (%)	Total n (%)	Chi-square (LR) *p*-value
Fish consumption at 10 y of age	333					
None		9 (9.4%)	10 (6.1%)	4 (5.5%)	23 (6.9%)	101 <0.0001
Hardly ever/occasionally		32 (33.3%)	26 (15.9%)	3 (4.1%)	61 (18.3%)	
Once a month		24 (25.0%)	38 (23.2%)	2 (2.7%)	64 (19.2%)	
Several times a month		28 (29.2%)	96 (42.1%)	24 (32.9%)	121 (36.4%)	
Every day		3 (3.1%)	21 (12.8%)	40 (54.8%)	64 (19.2%)	
Walleye consumption over past year	382					
Not at all		23 (19.5%)	29 (15.7%)	9 (11.4%)	61 (16.0%)	3.44 0.486
A few times		60 (50.9%)	96 (51.9%)	48 (60.8%)	204 (53.4%)	
Often		35 (29.7%)	60 (32.4%)	22 (27.9%)	117 (30.6%)	

Likelihood Ratio Chi-square compares the relative frequency between age categories

effects on themselves and their families [64, 65]. In the present study, no one born after 1978 had attended residential school; for those born prior to this date, 58 persons (50.0%) had been in a residential school, while for their mothers and/or fathers, it was 95.4%. At the time of the survey, 51.1% of women and 43.1% of men were working, excluding persons studying, retired or at home with children ($n=32$). Among participants who reported not working, 78% of those between 18 and 49 years of age were looking for work, while 31 persons (68.9%) of those over 30 years of age, who were not looking for work, reported that it was due to illness or disability.

There was no age difference for difficulty paying for food, which was reported by almost 25% of participants. The prevalence of current smokers and heavy drinkers significantly decreased with age. Obesity was most prevalent among those 30–49 years old, of whom two-thirds were women. Sixty percent of participants reported that a health professional had told them that they had at least one chronic health condition; the prevalence increased significantly with age.

There were no differences between men and women for age distribution, schooling, having attended or having parents who attended residential school, difficulty paying for food, and current smoking. Proportionally more men reported heavy drinking compared to women (62.7% vs 48.7%; Chi-square LR 7.17; $p=0.007$), while women had a significantly higher prevalence of obesity (54.0% vs 38.9%; Chi-square LR: 14.01, $p=0.003$) and at least one chronic health condition diagnosed by a health professional (68.5% vs 49.7%; Chi-square LR: 14.01, $p=0.0001$).

In this community, fish, especially walleye, is the source of Hg exposure [4, 5]. Table 2 contains the responses to the GN-CHA questions on past and current fish consumption frequency. Over half of those 50 years and older (born before 1968) reported that, as a child, they ate fish daily. Childhood fish consumption frequency significantly decreased over time. Fish consumption questions were species specific. Walleye is still the fish the most consumed; 30.6% of persons surveyed in the GN-CHA reported often eating walleye compared to 4.7% for whitefish and 3.2% for northern pike. No differences were observed between women and men for the frequency of childhood or current fish consumption.

For symptom clustering of the GN-CHA, aggregation levels and construct stability are presented in Additional file 1, Fig. 2. Aggregation distances supported a cutting threshold between 5 and 8 clusters (Additional file 1, Fig. 2a), while the bootstrapped mean-adjusted R and criterion suggest 6, 7, 11, or 12 (Additional file 1, Fig. 2b). The boxplots (Additional file 1, Fig. 2c) showed that the highest stability of the partition solution varies between K5 and K9, with K7 showing a slightly higher median value, but a lower dispersion around the mean. After verification of all the above criteria, we kept a total of six clusters. Goodness of fit for CFA was acceptable for the six clusters (CFI = 0.85, TLI = 0.84, RMSEA = 0.08, SRMR = 0.05), with a narrow 90% CI, representing a high degree of precision. The Cronbach alpha (> 0.8) for each cluster confirmed internal consistency (Additional file 1, Supplementary Table 1).

The six clusters included a total of 37 symptoms. Additional file 1, Supplementary Table 1 presents the list of symptoms retained in each cluster with its correlation. Cluster 1 (Extrapyramidal impairment), which

aggregated the highest number of symptoms ($n=9$), included tremors, balance impairment, functional limb weakness and pain in arms and legs, reflecting an extension of extrapyramidal neurological symptoms. Cluster 2 (Sensory impairment) included peripheral neuropathic deficits, notably upper and lower limb sensory impairments including numbness, dullness and tingling. Cluster 3 (Cranial nerve disturbances) included anosmia, ageusia, dysphagia and tingling around the mouth. Cluster 4 (Gross motor impairment) aggregated symptoms that affect carrying, lifting and walking. Cluster 5 (Neuro-cognitive deficits) groups cognitive dysfunction associated with memory loss, hearing impairment and speech disorders. Finally, Cluster 6 (Affect/Mood disorders) included anxiety, irritability, depression and sleeping issues. For each cluster, there was no particular driving symptom. Most symptoms were highly related to their own cluster (Additional file 1, Supplementary Table 1).

For the large majority of symptoms, no significant difference was observed in the proportion of men and women who reported its frequency as very often/all the time (Additional file 1, Supplementary Table 1). Symptom frequency increased significantly with age (data not shown), with the exception of difficulty pronouncing words, forgetting to do things, doing nothing, irritability, anxiety, difficulty falling asleep, waking up at night, depressed, tiredness and difficulty concentrating (Fisher's Exact Test; $p \geq 0.08$).

The descriptive characteristics of the composite variable for each cluster for women and men are presented in Additional file 1, Table 2. A higher score in the composite variable reflects a higher frequency of coexisting symptoms. Scores were significantly higher in women than in men, with the exception of Neuro-cognitive deficits. Scores increased significantly with age (Rho: 0.138–0.409; $p < 0.01$), with the exception of Affect/Mood disorders (Rho: 0.108; $p=0.095$).

Of the original GN-CHA participants ($n=391$) who were used to create the clusters, 242 were selected on the basis of having at least one Hg biomarker measurement (Fig. 1). Umbilical cord, childhood hair Hg concentrations and the percentage of persons with at least one hair mercury concentration ≥ 5 µg/g with respect to age category are presented in Table 3. There was a positive association between childhood fish consumption and measured hair Hg, adjusted for sex and year of sampling (MEM: Wald Chi-square = 96.9; $p=0.003$). Paired t-tests, comparing mean hair Hg at 10 years of age, for each year, between those who reported eating fish during childhood at least several times a month and those who reported eating less, supported the MEM result (Wilcoxon Signed-Rank prob.>|S|, S: 37.5; $p=0.020$).

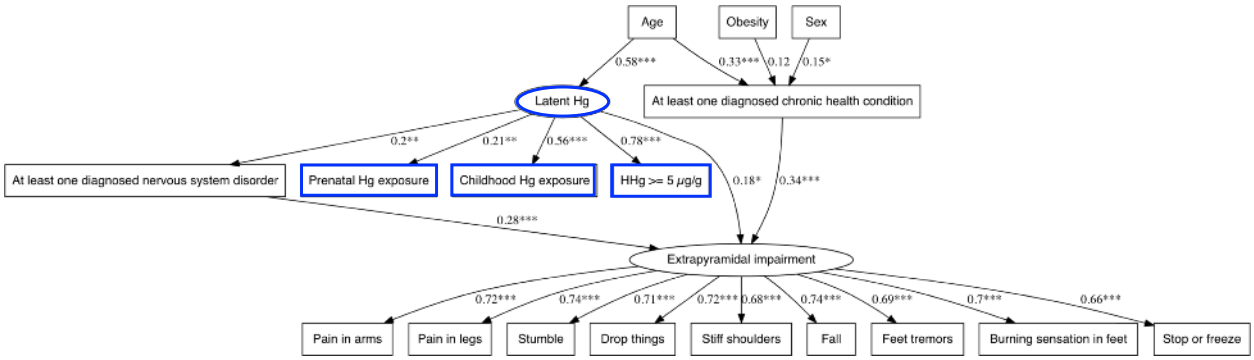
Persons retained for the SEM analyses ($n=242$) had similar characteristics to the original participants (Tables 1 and 2), although they were slightly older (median: 39 years old; interquartile range: 32–50), with proportionally fewer persons in the 18–29 y old category (13.6%). Compared to the entire cohort (Table 2), more young persons reported eating fish frequently during their childhood (41.6%), and often consuming walleye during the past 12 months (41.9%).

In the SEMs, measured and estimated Hg values were used when measures were missing. Validation of estimated Hg values showed significant associations with direct measurements for both prenatal and childhood Hg exposure ($n=99$; Rho = 0.22; $p=0.023$ and $n=137$; Rho = 0.73; $p<0.0001$, respectively). Most participants ($n=197$ (81.4%)) were born after 1962 (when exposure began) and had both pre- and post-natal exposures. Only 8 of the 242 persons (3.3%) were over 15 years of age in 1962.

For each symptom cluster, SEMs were performed (i) with latent Hg and (ii) with prenatal, childhood and hair Hg ≥ 5 µg/g. Path diagrams, showing the configuration of the different pathways and the one-to-one relation between variables, are illustrated in Figs. 3 and 4 and in Supplementary Figs. 3–12 in Additional file 1. SEM standardized path coefficients, representing the total quantified contribution of significant direct and indirect associations, are presented in Figs. 5 and 6.

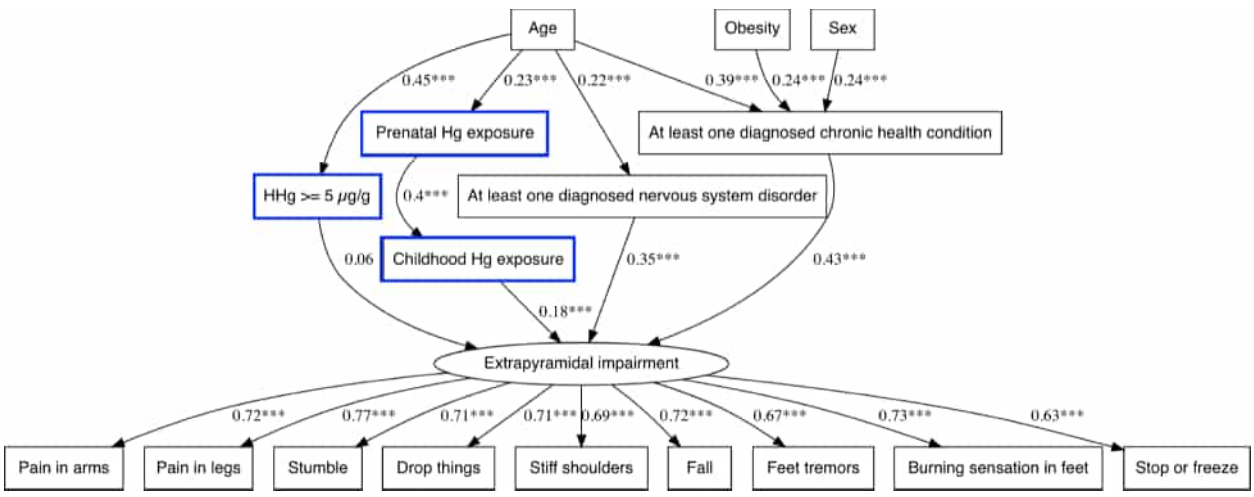
Table 3 Measured mercury concentrations by age category

	N	18–29 y Median (min-max)	30–49 y Median (min-max)	50^{+} y Median (min-max)	Total Median (min-max)	Wilcoxon test *p*-value
Umbilical cord (ppb)	99	3.5 (1.5–10)	5.6 (1–78.5)	–	5 (1–78.5)	0.023
Childhood Hair Hg (µg/g)	137	0.9 (0.5–2)	0.7 (0.2–16)	2.9 (0.6–15)	1.1 (0.2–16)	< 0.0001
			n (%)	n (%)	n (%)	
Hair ≥ Hg 5 µg/g at least once	208	0	27 (22.9%)	49 (74.2%)	76 (36.6%)	< 0.0001



Goodness of fit: χ2/df=2.02, CFI=0.92, TLI=0.91, RMSEA=0.06 (0.05-0.08), SRMR=0.06

Fig. 3 SEM path diagram linking retrospective latent Hg exposure and covariates to the latent symptoms cluster variable for Extrapyramidal impairment. Abbreviations: χ2/df: Chi-square divided by the degrees of freedom (χ2/df), CFI: Comparative Fit Index, TLI: Tucker Lewis Index, RMSEA: Root Mean Square Error of Approximation, SRMR: Standardized Root Mean Square Residual



Goodness of fit: χ2/df=1.30, CFI=0.99, TLI=0.98, RMSEA=0.03 (0.01-0.05), SRMR=0.06

Fig. 4 SEM path diagram linking retrospective Hg exposure parameters (prenatal and childhood Hg exposure) and having had ≥5 µg/g hair Hg at least once between 1970 and 1997) and covariates to the latent symptoms cluster variable for Extrapyramidal impairment. Abbreviations: χ2/df: Chi-square divided by the degrees of freedom (χ2/df), CFI: Comparative Fit Index, TLI: Tucker Lewis Index, RMSEA: Root Mean Square Error of Approximation, SRMR: Standardized Root Mean Square Residual

For all latent Hg-based SEMs, childhood Hg exposure and hair Hg 5 µg/g were the main drivers in the construct of latent Hg (Figs. 3 and 5). Latent Hg showed a direct contribution to most symptom clusters, but not Neuro-cognitive deficits and Gross motor impairment. For all clusters, there was also a pathway mediated through having at least one diagnosed nervous system disorder.

In every SEM with Hg exposure variables for prenatal, childhood and hair Hg ≥ 5 µg/g, there was a significant relation between prenatal and childhood exposure (Figs. 4 and 6 and Supplementary Figs. 8–12, Additional file 1). For Extrapyramidal impairment (Fig. 4) and Cranial nerve disturbances (Supplementary Fig. 9, Additional file 1), standardized path coefficients showed that the contribution of prenatal exposure to the cluster was mediated by childhood exposure.

For Sensory Impairment (Supplementary Fig. 8, Additional file 1), Gross motor impairment (Supplementary Fig. 10, Additional file 1) and Neuro-cognitive deficits (Supplementary Fig. 11, Additional file 1), there was a chain of mediation from prenatal exposure to childhood exposure and from childhood exposure to being

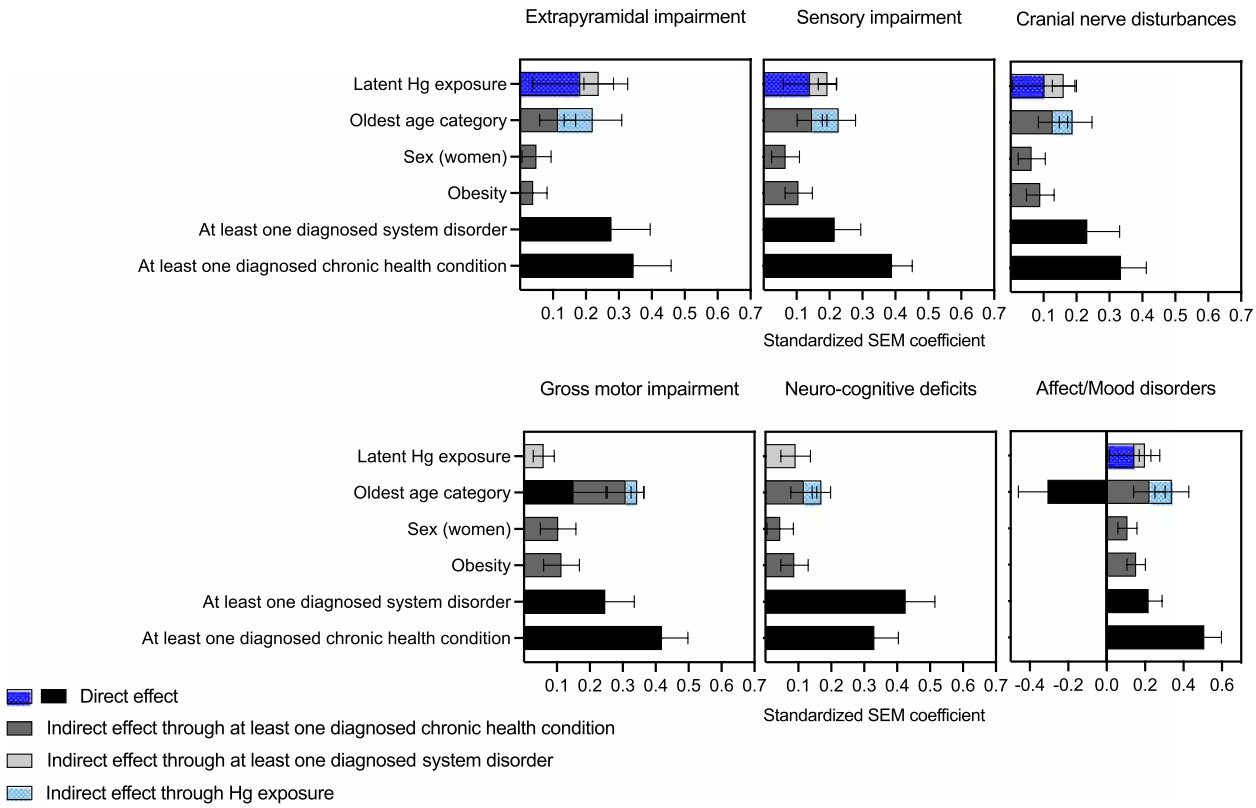


Fig. 5 SEM standardized path coefficients for direct and indirect contributions of latent Hg and covariates on the symptom latent variable for each cluster

diagnosed with at least one nervous system disorder. When the same chain of mediation was modelled for Extrapyramidal impairment and for Cranial nerve disturbances, the models' fit parameters were weaker. In these cases, the direct association of childhood Hg with the symptom cluster was stronger than its indirect association through diagnosed nervous disorder.

Prenatal Hg exposure was directly associated with Affect/Mood disorders (Supplementary Fig. 12, Additional file 1). Hg ≥ 5 µg/g directly influenced Extrapyramidal and Sensory impairment (Fig. 4 and Supplementary Fig. 8 in Additional file 1, respectively).

The best fit models were those that included childhood exposure as mediator for prenatal exposure. Childhood exposure was not a confounding variable in the relation between prenatal exposure, diagnosed nervous system disorder or any symptom cluster. Moreover, there was no moderated mediation with age category or Hg exposure in the SEM.

Although of different magnitudes, age category, sex and obesity, at least one diagnosed chronic health condition and at least one diagnosed nervous system disorder, were directly and/or indirectly associated with symptom clusters in all SEMs. Positive associations were observed with age category with respect to diagnosed nervous system and chronic health conditions, with the exception of Affect/Mood disorders, for which age was both negatively (direct) and positively (indirect) associated with symptom frequency reporting (Supplementary Fig. 12, Additional file 1). Older persons tended to report fewer symptoms of Affect/Mood disorders (direct), unless they suffered from chronic health conditions and/or nervous system disorders (indirect). Past Hg exposure mediated the contribution of age for all clusters, except for Gross motor impairment (Supplementary Fig. 10, Additional file 1) and Neuro-cognitive deficits (Supplementary Fig. 11, Additional file 1).

Longitudinal MEM analyses were performed with all persons who had at least 10 year-based hair measurements ($n = 32$; 17 men and 15 women). Their median age was 54 years (interquartile range: 48–64). The associations between longitudinal hair Hg and the median of the composite variable for each cluster are shown in Table 4. Age, sex and year of sampling were included as fixed factors, and age at time of sampling as a random factor. In these analyses, 5 of the 6 clusters were significantly associated ($p \leq 0.05$) or show a tendency (< 0.10) with longitudinal hair Hg. No association was

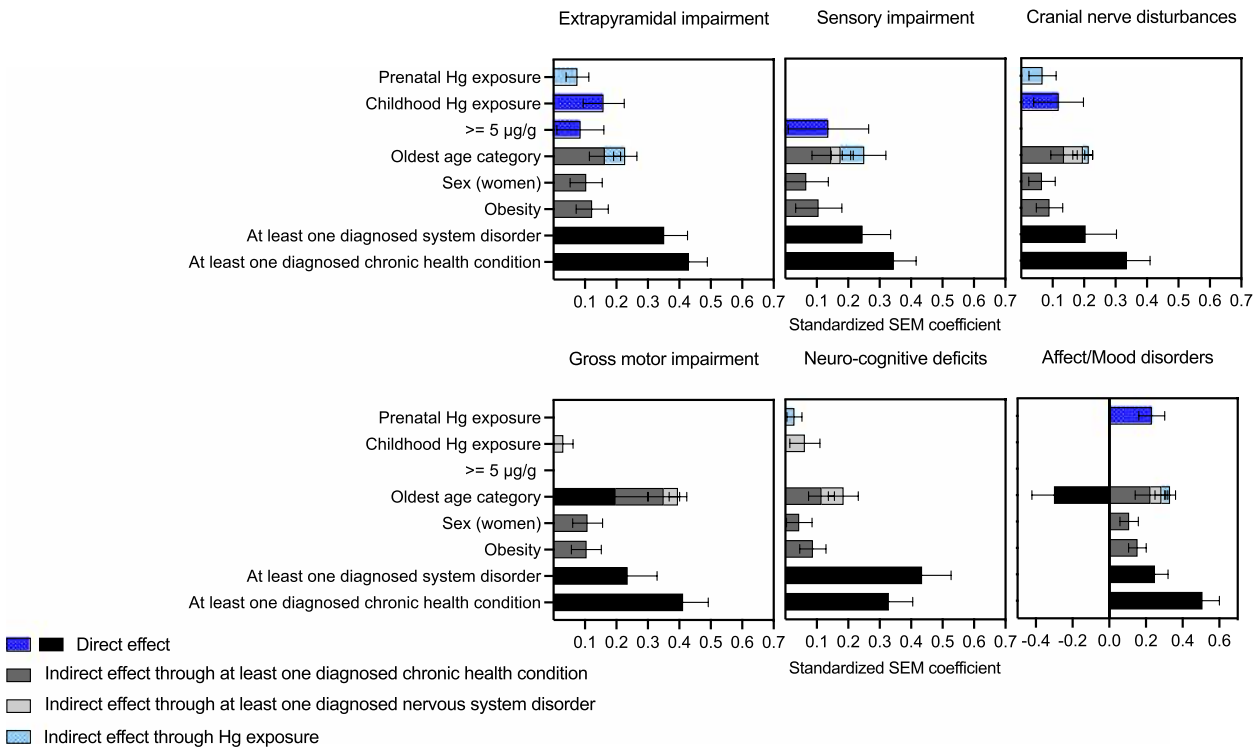


Fig. 6 SEM standardized path coefficients for direct and indirect contributions of prenatal, childhood and ≥ 5 µg/g hair Hg (1970–1997) and covariates on the symptom latent variable for each cluster

observed between longitudinal hair Hg and Affect/Mood disorders.

Discussion

To our knowledge, this is the first study to link past Hg exposure from freshwater fish consumption with clusters of current multiple coexisting symptoms. Clustering analysis enabled us to characterize the various symptom profiles, which constitute the physical and/or mental translation of structural phenomena. The non-random distribution of symptoms and their strong correlation in each cluster suggests a common mechanism or etiology [10, 12, 66]. Here, the six clusters, derived from statistical empirical validation, reflect the involvement of different aspects of nervous system dysfunction, which we classified as representing primarily Extrapyramidal impairment, Sensory impairment, Cranial nerve disturbances, Gross motor impairment, Neuro-cognitive deficits, and Affect/Mood disorders. The symptoms that make up

Table 4 Longitudinal Mixed Effects Model results for estimates of hair Hg concentrations from 1970 to 1997 with respect to the median of the cluster score

Composite cluster variable [a, b]	Hair Hg Estimate[c]	% Confidence Interval	*p* -value
Cluster1 (Extrapyramidal impairment)	1.76	0.0–3.6	0.061
Cluster2 (Sensory impairment)	1.57	−2.7 - 3.4	0.096
Cluster3 (Cranial nerve disturbances)	2.60	1.0–4.2	0.001
Cluster4 (Gross motor impairment)	2.70	0.4–5.1	0.023
Cluster5 (Neuro-cognitive deficits)	2.41	0.6–4.2	0.009
Cluster6 (Affect/Mood disorders)	−0.33	−0.3 - 1.0	0.758

[a] Only participants with 10 measurements and more of hair Hg are included in the analyses (32 persons; 447 Hair Hg measurements)

[b] Significant covariates include age, sex, year of sampling (random effect: age of sampling nested in year of sampling)

[c] Hair Hg estimates represent the difference in hair Hg with respect to cluster scores above and below the median over the sampling period

these clusters were similar to those reported by persons from Grassy Narrows in 2010 [8, 67] and consistent with the many descriptions of methyl Hg poisoning through fish consumption [68–75].

SEM provided the opportunity to simultaneously examine covariance, mediation and moderation between variables through a domino effect of successive pathways from past exposure to current symptoms. The Hg exposure latent variable, which grouped different periods of exposure (prenatal Hg, childhood Hg and hair Hg $\geq 5\,\mu g/g$ at least once), enabled us to examine their combined contributions. Latent Hg exposure variables have been used in other studies. Choi et al. [23] showed that a grouped Hg exposure variable, including current Hg nail and blood concentrations and hair Hg concentration 7 years previously, was associated with adverse cardiovascular outcomes in Faroese whaling men. In a study by Grandjean and co-authors [76], the combined prenatal and childhood Hg exposures were negatively related to children's neurobehavioral outcomes. In the present study, the combined past Hg exposures were, directly and indirectly, associated with all clusters.

Hg biomarker data, collected in Grassy Narrows First Nation between 1970 and 1997 provided a unique opportunity to examine symptom clusters with respect to past exposure over a long-term period and at various time points. The findings of longitudinal analyses, based on participants with at least 10 year-based hair Hg measurements over the sampling period, showed that long-term Hg exposure was associated with higher symptom frequency for all the clusters of nervous system dysfunction, with the exception of Affect/Mood disorders. This is consistent with SEM findings where Affect/Mood disorders showed a significant relation only with prenatal exposure.

Independent Hg exposures may provide insight into the relative importance of exposure at different time periods. While prenatal exposure was directly associated with Affect/Mood disorders, for other clusters, its contribution was mediated by childhood exposure. Fetal Minamata patients present with psychiatric disorders (Harada, 1964 cited in Yorifuji et al. [77]). A re-analysis of 1971 data from Minamata patients showed that psychiatric symptoms peaked at 20 years of age [77]. This may be similar to the present study where young adults ($\leq$ 29 years of age) reported a higher frequency of altered mood symptoms. The importance of prenatal and childhood Hg exposure has been raised by many authors [25, 78]. Children are more vulnerable to toxic exposure than adults because their brains are in a state of rapid growth, with relatively higher absorption rates to body weight; their body systems are not prepared to properly metabolize, detoxify, and excrete toxic substances [79–81].

Although the GN-CHA did not include the age of onset of symptoms, the association between past exposure and later-life symptoms raises the issue of delayed and/or progressive neurotoxicity. Delayed neurotoxicity was reported in 13-year-old monkeys, treated with methyl Hg from birth to 7 years of age [82]. A silent latency period for methyl Hg toxicity has been proposed using examples from the Minamata and Iraq disasters [83]. Newland and co-authors [84] discuss mechanisms by which neuronal development may have long-lasting behavioral consequences that appear in adulthood and, in some cases, may not appear until aging.

The FNRHS 2008/2010 included few nervous system disorders in their list of diagnosed health conditions [27]. The GN-CHA added a series of neurologic disorders which share some of the signs and symptoms of Hg poisoning. These disorders mediated the relation between latent Hg exposure and all symptom clusters and between childhood exposure and Sensory impairment, Gross motor impairment and Neuro-cognitive deficits.

In Canada, chronic health conditions are disproportionately higher among Indigenous communities compared to the non-Indigenous population [85]. The most commonly reported chronic health conditions in the GN-CHA are similar to other First Nation communities across Canada: high blood pressure, allergies, arthritis, diabetes, and chronic back pain [27]. Results of the SEM showed the expected associations of having at least one chronic health condition with age and obesity, with women presenting a higher prevalence compared to men. It is noteworthy that the highest direct contribution to all symptom clusters was having at least one diagnosed chronic health condition and/or nervous system disorder.

SEM remains one of the best approaches to assess simultaneously direct and indirect associations by investigating all relevant regression pathways. Our findings are consistent with follow-up studies of persons that had been affected by Hg pollution from the Chisso Company in Minamata, decades after the company had halted the dumping of methyl Hg into the bay [74, 86–88]. The Japanese studies compared persons who had lived in polluted and non-polluted regions since they did not have actual measures of Hg exposure for the individuals who were evaluated.

Some limitations need to be considered in interpreting the present results. The study reposes on self-reported questionnaire data from the GN-CHA, raising the question of recall bias, and under- or over-reporting. To offset these limitations, the Cronbach alpha and CFA confirmed the construct reliability of the clustered symptoms. Reported diagnosed health conditions and nervous system disorders reflected whether a person had

consulted a health professional who had diagnosed this condition, as well as the accuracy of the diagnosis. Further studies would benefit from clinical assessments in relation to past Hg exposure.

A further limitation is with respect to Hg biomarkers obtained from a government monitoring program [3]. Sampling was not carried out regularly and samples were not collected yearly from everyone, resulting in many missing values. Moreover, there were seasonal and yearly differences in fish consumption frequency [3, 6]. Hg exposure imprecision could also be associated with blood and hair measurements over the sampling years, notably laboratory measurement imprecision and biological variation [89]. Ideally, one would like to have had continuous Hg biomarker measurements over all participants' lifetime, but this was not possible. To address the challenges posed by the biomarker database, for the SEMs, the estimated umbilical cord and childhood Hg values were validated, and we used latent variables of Hg exposure to manage residual error terms between variables. For the longitudinal MEMs, we limited the analyses to persons with a minimum of 10 hair Hg measurements, representing exposure for 10 years or more.

Studies on Minamata Disease have shown differences in fetal, non-fetal infantile and adult Hg damage to the brain [90]. In the present study, the large majority of persons experienced both prenatal and postnatal exposure. The mediated contribution of prenatal exposure on symptom clusters through childhood exposure, observed in most SEMs, suggests that their independent contributions are difficult to assess. While both prenatal and childhood Hg exposures decreased over time, reflecting diminishing fish Hg concentration and changing family dietary patterns, they also represent different stages of neurodevelopment and have potentially different effects. Our data showed that childhood Hg exposure may be a mediator/cumulative effect of prenatal exposure, except for Affect/Mood disorders. We tested childhood exposure alone, but the associations were stronger when prenatal exposure was included in the model.

The Grassy Narrows Hg disaster began in 1962 and after 1970, fish Hg concentration and fish consumption decreased over time, paralleled by a decrease in biomarker Hg concentrations. Associations with Hg exposure, observed in the models, may be partially masked by age. The inverse relation between year of birth and Hg exposure made age an ambiguous variable. Age was a risk factor for the symptom clusters, covaried with Hg exposure, but was not a consequence of Hg exposure.

Conclusions

Since the disaster, Grassy Narrows First Nation has expressed concern about the high rate of symptoms of nervous system dysfunction in their community. This is the first study to demonstrate links between long-term and past Hg exposure and current coexisting symptoms. Given the complexity of the interrelations between the various determinants of chronic health problems in this and other First Nation communities, SEM and LMEM methods were useful to link past Hg exposure with present-day symptoms. Further studies should examine the mechanisms that underlie these manifestations.

Abbreviations

Hg: mercury; GN-CHA: Grassy Narrows Community Health Assessment; FNRHS: First Nations Regional Health Survey; FNIHB: First Nations and Inuit Health Branch; SEM: Structural Equation Model; LMEM: Longitudinal Mixed Effects Model; CFA: Confirmatory factor analysis (CFA); χ2/df: Chi-square divided by the degrees of freedom; SRMR: Standardized Root Mean Square Residual; RMSEA: Root Mean Square Error of Approximation; CFI: Comparative Fit Index; TLI: Tucker Lewis Index; AIC: Akaike's Information Criterion; BIC: Schwarz Bayesian Information Criterion; DWLS: Diagonally weighted least squares; MI: Modification Indices; MICE: Multivariate Imputation by Chained Equations; DAG: Directed Acyclic Graphs; MEM: Mixed Effects Model.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12940-022-00838-y.

Additional file 1: Supplementary Table 1. Characteristics of symptom clusters.

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Authors' contributions

AP created the database, determined the statistical approaches and performed the analyses. She co-wrote the manuscript with DM. JDS is the initiator and organizer of the GN-CHA survey. She provided input for data interpretation. MF participated in the analyses and dissemination of the GN-CHA. She participated in the writing and editing of the manuscript. TSL provided the neurological interpretation of the symptom clusters and verified the manuscript. DM was invited by Grassy Narrows First Nation as scientific advisor for the GN-CHA. She was responsible for over-seeing the fieldwork, analyzing the data and preparing the reports. She is principal investigator on the present research. All authors read and approved the final manuscript.

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Availability of data and materials
Archived mercury biomarker data were obtained from the First Nations and Inuit Health Branch (FNIHB) of the Ministry of Indigenous Services Canada, at the request of Grassy Narrows First Nation. The datasets generated and analysed in the present study are the property of Grassy Narrows First Nation. Permission for use of the data lies with Grassy Narrows Chief and Council.

Declarations

Ethics approval and consent to participate
Ethics approval for the GN-CHA was obtained from the Manitoulin Anishinaabek Research Review Committee (MARRC), who issued an Ethics Certificate on September 1, 2016. Informed consent forms were signed by all participants. Consent included survey participation and the linking of the information from the GN-CHA to data obtained from previous surveillance programs and/or studies of Hg exposure. Ethics approval for the present study was obtained from the ***Université du Québec à Montréal*** (2016_e_1350) and Health Canada Research Ethics Board (REB 2017–0006).

Consent for publication
All participants provided consent for publication. The present study was presented to Grassy Narrows' Chief and Council of, who approved the manuscript for publication on May 12, 2021.

Competing interests
The authors declare that they have no competing interests.

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ROLES OF PARTICIPANTS IN CONSULTATION AND ENGAGEMENT DURING THE IMPACT ASSESSMENT PROCESS LED BY THE AGENCY

IMPACT ASSESSMENT PROCESS

Phase 0 – Pre-Planning

Proponent:

- Engages Indigenous groups to present the project
- Learns the views of the groups, including potential effects and how they wish to be engaged, to incorporate them into the **Initial Project Description**

Agency:

- Informs Indigenous groups about the impact assessment process to support them in understanding how they can participate in the process
- Learns the views and contexts of the Indigenous groups, including potential effects and how they wish to be engaged

Indigenous groups:

- Learn about the proponent, proposed project, Agency and impact assessment process
- Share views and values with the proponent and Agency, including potential effects and how they wish to be engaged

Phase 1 – Planning (180 days)

Proponent:

- Engages Indigenous groups to inform the **Detailed Project Description** and responds to issues and concerns identified in the **Summary of Issues**

Agency:

- Seeks input from Indigenous groups on the project, the proponent's **Initial Project Description**, key draft documents for an impact assessment (**Tailored Impact Statement Guidelines**, **Indigenous Engagement and Partnership Plan**), and how they would like to be meaningfully consulted in an impact assessment

Indigenous groups:

- Participate in engagement and consultation activities
- Identify key issues, including potential impacts on rights
- Advise on how they would like to be engaged and provide input and feedback on the **draft Tailored Impact Statement Guidelines** and **draft Indigenous Engagement and Partnership Plan**, if an impact assessment is required

Phase 2 – Impact Statement (up to 3 years)

Proponent:

- Engages Indigenous groups to gather information, identify potential effects and appropriate mitigation, and address concerns
- Prepares the **Impact Statement** based on the **Tailored Impact Statement Guidelines**, considering and including Indigenous knowledge where provided

Agency:

- Supports Indigenous groups and the proponent in understanding the impact assessment process and expectations
- Facilitates engagement with the proponent, Indigenous groups and others, as required
- Leads consultation with Indigenous groups on the proponent's **Impact Statement**

Indigenous groups:

- Undertake community activities to learn about the project and provide input to the proponent and Agency
- Contribute Indigenous knowledge
- Engage with the proponent to co-develop or collect any relevant information and identify potential effects, mitigation and follow-up measures, to inform the **Impact Statement**
- Participate in consultation activities led by the Agency

Phase 3 – Impact Assessment (300 days)

Proponent:

- Participates in Agency-led consultations with Indigenous groups, as appropriate
- Provides comments on potential conditions

Agency:

- Leads ongoing consultation with Indigenous groups on the proponent's impact assessment information, if needed
- Prepares the **draft Impact Assessment Report** and potential conditions
- Leads consultation with Indigenous groups on the **draft Impact Assessment Report** and potential conditions

Indigenous groups:

- Participate in consultation activities, including verifying impacts, mitigation and follow-up measures described in the proponent's impact assessment information and the **draft Impact Assessment Report**
- Contribute Indigenous knowledge
- Provide comment on the **draft Impact Assessment Report** and potential conditions

Phase 4 – Decision-making (30 days)

Proponent:

- Awaits the Minister's **Decision Statement**, which includes enforceable conditions

Agency:

- Posts the **Decision Statement** and **final Impact Assessment Report** on the Canadian Impact Assessment Registry Internet site

Indigenous groups:

- Await the Minister's **Decision Statement**, which includes enforceable conditions

Phase 5 – Post-Decision (ongoing)

Proponent:

- Implements mitigation measures, follow-up programs and, as appropriate, adaptive management plans
- Complies with the **Decision Statement** and corrects any non-compliance

Agency:

- Verifies compliance with the **Decision Statement**
- Provides information on compliance and enforcement

Indigenous groups:

- Work with the proponent on how they wish to be engaged, should the project proceed
- Participate in follow-up and monitoring activities, as may be provided by the **Decision Statement**
- Inform the Agency of potential non-compliance through voluntary reporting

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DECEMBER 10, 2021

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ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO),
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

APPLICATION UNDER Section 2(1)
of the *Judicial Review Procedure Act*
R.S.O. 1990, c. J.1

APPLICATION RECORD
VOLUME 1 OF 5

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Court File No.

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

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J	Exhibit "J" -	Exchange of MNR communications on MNR Staff Internal Review of the Draft Stand and Site Guide	1,699 - 1,701
K	Exhibit "K" -	Article by Raveena Aulakh, "Ontario's biologists called clear-cut plan 'big step backwards', The Toronto Star, January 17, 2015	1,702 - 1,703

TAB			PAGE NO.
L	Exhibit "L" -	Letters to David Sone, Earthroots from MNRF, with attachments, dated March 2 and 3, 2015	1,704 - 1,710
M	Exhibit "M" -	Letter to Agatha Garcia-Wright, MOE from Deb Weedon, MNRF, with attachment, dated July 8, 2014	1,711 - 1,715
N	Exhibit "N" -	Exchange of electronic communications between Anne Cameron, MOECC to David Sone, Earthroots, dated December 30, 2014 and David Sone, Earthroots to Devon Wills, MOECC, dated December 28, 2014	1,716 - 1,717
O	Exhibit "O" -	Letter to Mary Ledwell, MOECC from David Sone, Earthroots, dated January 7, 2015	1,718 - 1,719
P	Exhibit "P" -	Letter to Mary Ledwell, MOECC from David Sone, Earthroots, dated January 8, 2015	1,720 - 1,721

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

BETWEEN:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

- and -

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

NOTICE OF APPLICATION TO DIVISIONAL COURT FOR JUDICIAL REVIEW

TO THE RESPONDENTS:

A LEGAL PROCEEDING HAS BEEN COMMENCED by the Applicants. The claim made by the Applicants appears on the following pages.

THIS APPLICATION for Judicial Review will come on for a hearing before the Divisional Court on a date to be fixed by the Registrar at the place of hearing requested by the Applicants. The Applicants request that this application be heard at Osgoode Hall, 130 Queen Street West, Toronto, Ontario, M5H 2N5.

IF YOU WISH TO OPPOSE THIS APPLICATION, to receive notice of any step in the application or to be served with any documents in the application, you or an Ontario lawyer acting for you must forthwith prepare a notice of appearance in Form 38A prescribed by the Rules of Civil Procedure, serve it on the Applicants' lawyer or, where

the Applicants do not have a lawyer, serve it on the Applicants, and file it, with proof of service, in the office of the Divisional Court, and you or your lawyer must appear at the hearing.

IF YOU WISH TO PRESENT AFFIDAVIT OR OTHER DOCUMENTARY EVIDENCE TO THE COURT OR TO EXAMINE OR CROSS-EXAMINE WITNESSES ON THE APPLICATION, YOU OR YOUR LAWYER MUST, IN ADDITION TO SERVING YOUR NOTICE OF APPEARANCE, SERVE A COPY OF THE EVIDENCE ON THE Applicants' lawyer or, where the Applicants do not have a lawyer, serve it on the Applicants, and file it, with proof of service, in the office of the Divisional Court within thirty days after service on you of the Applicants' application record, or not later than 2 p.m. on the day before the hearing, whichever is earlier.

IF YOU FAIL TO APPEAR AT THE HEARING, JUDGMENT MAY BE GIVEN IN YOUR ABSENCE AND WITHOUT FURTHER NOTICE TO YOU. IF YOU WISH TO DEFEND THIS PROCEEDING BUT ARE UNABLE TO PAY LEGAL FEES, LEGAL AID MAY BE AVAILABLE TO YOU BY CONTACTING A LOCAL LEGAL AID OFFICE.

Date: September 1, 2015

Issued by _____

Samantha Bacchus,
A Commissioner, etc., Province of Ontario
For the Government of Ontario,
Ministry of the Attorney General.

Registrar
Divisional Court
Superior Court of Justice
Osgoode Hall
130 Queen Street West
Toronto, Ontario M5H 2N5

TO: The Honourable Bill Mauro
Minister of Natural Resources and Forestry
c/o Legal Services Branch
Ministry of Natural Resources and Forestry
Whitney Block, Room 3420
99 Wellesley Street West
Toronto, Ontario M7A 1W3
Attention: Mr. Leith Hunter, Director

AND TO: The Honourable Glen Murray
Minister of the Environment and Climate Change
c/o Legal Services Branch
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 10th Floor
Toronto, Ontario M4V 1P5
Attention: Ms Halyna Perun, Director

AND TO: Attorney General of Ontario
Crown Law Office – Civil
8th Floor, 720 Bay Street
Toronto, Ontario
M7A 2S9
Attention: Mr. Troy Harrison, Director

Constitutional Law Branch
4th Floor, 720 Bay Street
Toronto, Ontario
M7A 2S9
Attention: Mr. Michel Helie, Director

APPLICATION

This is an Application for judicial review of a provincial decision approving clearcut logging activities and refusing to order an individual environmental assessment ("IEA") regarding potential mercury contamination and adverse human health effects, arising from the approved activities.

The decision consists of two inter-related stages:

(1) a December 2013 decision by the Minister of Natural Resources and Forestry, or the Minister's designate (the "Natural Resources Minister"), approving a forest management plan ("Plan"), which allows clearcut logging of the Whiskey Jack Forest in northwestern Ontario under section 9 of the *Crown Forest Sustainability Act,* S.O. 1994, c. 25 ("*CFSA*"), and

(2) a December 2014 decision by the Minister of the Environment and Climate Change, or the Minister's designate (the "Environment Minister") refusing, under section 16 of the *Environmental Assessment Act,* R.S.O. 1990, c. E.18 ("*EAA*"), to grant a Part II order (or "bump-up") requested by the Applicants that would have allowed an IEA to be conducted on whether clearcut logging authorized under the Plan could:

(a) release mercury to the watersheds of and adjacent to the English-Wabigoon river system, which system runs through the

Whiskey Jack Forest most of which is part of the traditional territory of the Grassy Narrows First Nation ("Grassy Narrows"),

(b) contaminate fish therein, and

(c) increase the risk of harm to humans consuming the fish.

The Applicants challenge the approval of the Plan and the refusal of their request for a bump-up with respect thereto (collectively the "Decision") on the basis that the exercise of these statutory powers of decision infringe on the rights of their members (1) to life, liberty and security of the person as guaranteed by section 7 of the *Canadian Charter of Rights and Freedoms*, Part 1 of the *Constitution Act, 1982* being Schedule B to the *Canada Act 1982* (U.K.), c. 11 (the "*Charter*"), and (2) to equality under section 15(1) of the *Charter*.

The Applicants also challenge the Decision on other constitutional and administrative law grounds set out below.

1. The Applicants make application for:

***Charter* Remedies**

(a) an order under section 24(1) of the *Charter* declaring that the Decision,

(i) infringes section 7 of the *Charter*, by depriving them of their life, liberty and security of the person in a manner not in accordance with the principles of fundamental justice;

(ii) infringes section 15(1) of the *Charter* by depriving them of their right to equality;

(b) an order under section 24(1) of the *Charter* setting aside the Decision;

(c) an order under section 24(1) of the *Charter* in the nature of mandamus directing the Environment Minister to authorize an IEA as requested by the Applicants;

(d) an interim and permanent order under section 24(1) of the *Charter* prohibiting the Natural Resources Minister from authorizing third parties, by licence or otherwise, from conducting clearcut logging in the Whiskey Jack Forest under authority of the Plan;

(e) an interim and permanent order under section 24(1) of the *Charter* enjoining third parties with a licence or other instrument from the Natural Resources Minister from conducting clearcut logging in the Whiskey Jack Forest under authority of the Plan;

Administrative Law Remedies

(f) an order declaring that:

(i) in failing to ensure that mercury releases would be prevented or mitigated, approval of the Plan by the Natural Resources Minister was without legal authority under the *CFSA* or, in the alternative, unreasonable; and

(ii) the refusal by the Environment Minister to grant a bump-up request so as to assess under an IEA potential environmental and

health impacts from mercury releases was without legal authority under the *EAA* or, in the alternative, unreasonable;

(g) an order quashing or setting aside:

(i) the Decision; and

(ii) any authorizations, licences, permits, or approvals by the Ministers, or their respective ministries, enabling implementation of the Plan to proceed, in whole or in part, before this Application has been heard and determined by this Honourable Court;

Remedies Based on the Federal Paramountcy Doctrine

(h) an order declaring that the Plan, by permitting release of mercury, a deleterious substance, into water frequented by fish, is contrary to, conflicts or is inconsistent with, section 36(3) of the federal *Fisheries Act*, R.S.C. 1985, c. F-14, and is thereby rendered inoperative to the extent of the conflict or inconsistency;

Costs

(i) an order requiring the Respondents to pay the Applicants costs of this Application if requested or, in the alternative, an order that all parties shall bear their own costs;

Other Relief

(j) such further or other relief as counsel may advise and this Honourable Court may permit.

Grounds for the Application

2. The Grounds for the application are:

The Parties

(a) The Applicants are:

(i) Chief Roger Fobister, Senior, the elected chief and a member of Grassy Narrows, and having the status of an "Indian" within the meaning of the *Indian Act*, R.S.C. 1985, c. I-5 ("*Indian Act*"), who is bringing this application on his own behalf and on behalf of all other members of Grassy Narrows;

(ii) Sherry Fobister, William Fobister, Senior, and Simon Fobister, each of whom is a member of Grassy Narrows, having the status of an "Indian" within the meaning of the *Indian Act*, who also bring this application on their own behalf and on behalf of all other members of Grassy Narrows; and

(iii) Grassy Narrows, a First Nation being among the Aboriginal peoples of Canada recognized under s. 35 of the *Constitution Act, 1982*, and having the status of a "band" within the meaning of the *Indian Act*. Members of Grassy Narrows live on and off the English River 21 Reserve (hereinafter the "Grassy Narrows Reserve"), a "reserve" within the meaning of the *Indian Act*. The members of Grassy Narrows, whose ancestors signed Treaty No. 3, are Anishinabe

(Ojibway) men, women, and children many of whom engage in the practice of traditional Anishinabe activities in their traditional territory, which are central to their identity, diet, culture, and economy, including by:

(A) fishing in the English-Wabigoon river system watershed, or adjacent watersheds, in the area that includes the Whiskey Jack Forest; and

(B) consuming fish caught from those waters.

(b) The Respondent Natural Resources Minister is responsible for the *CFSA*, Ontario's primary statute permitting logging of, and development and approval of forest management plans for, the Crown forests of Ontario.

(c) The Respondent Environment Minister is responsible for the *EAA*, Ontario's primary statute for examining the effects of undertakings, such as logging and related forest management activities on Crown lands in Ontario, on the natural environment, human life, and social, economic, and cultural conditions.

Overview

(d) The Applicants rely on fishing in the watershed of the English-Wabigoon river system as a significant part of their way of life, and on the consumption of area fish as a significant part of their diet. Existing

mercury pollution dating from the discharge of mercury by a Dryden, Ontario chlor-alkali plant into the same river system in the 1960s has had, and continues to have, a significant adverse impact, due to the consumption of mercury-contaminated fish, on the health and well-being of members of Grassy Narrows, including some of the individual Applicants who have been diagnosed with, or whose children have been diagnosed with, symptoms consistent with mercury poisoning. The Applicants fear that clearcut logging authorized under the Plan poses a serious risk of additional harm to the health and well-being of community members because it will trigger new releases of mercury to the watershed, increase the accumulation of mercury in the food chain, and prolong and exacerbate the existing mercury problem.

Historical Background: Industrial Discharges of Mercury in the English-Wabigoon River System

(e) Beginning in the 1960s, a chlor-alkali plant at Dryden, Ontario began discharging mercury into the English-Wabigoon river system, eventually discharging approximately 9,000 kilograms of mercury into the river system, which flows into and through the traditional lands and territory of the Applicants;

(f) Once in the water, the mercury was transformed by chemical-biological processes into methyl mercury, a nerve poison capable of bio-accumulating up the food chain, being ingested by fish, and adversely

impacting humans consuming methyl mercury-contaminated fish caught from waters in the aforementioned area;

(g) The consumption of methyl mercury-contaminated fish by members of Grassy Narrows resulted over the decades in serious, and well-documented, neurological harm and other adverse health impacts, many of which continue to afflict many members of Grassy Narrows to this day;

(h) Litigation by Grassy Narrows against the federal and Ontario governments, and the successor company to the original industrial discharger, resulted in a settlement in the 1980s and the payment of some compensation as well as the establishment of a mercury disability board to evaluate and compensate members of Grassy Narrows suffering on-going neurological harm and other adverse health impacts consistent with mercury poisoning arising from the industrial discharges of mercury into local bodies of water;

(i) The watershed of the English-Wabigoon river system where the industrial discharges of mercury took place encompasses most of the Whiskey Jack Forest;

(j) Fish within this watershed continue to have levels of mercury above, or near, the limit for safe human consumption;

(k) Grassy Narrows Reserve is located within the Whiskey Jack Forest itself.

The Whiskey Jack Forest Management Plan

(l) Starting in or about 2010 and continuing to late 2013, the Ministry of Natural Resources and Forestry ("MNRF") gave periodic public notice of its intention to develop a forest management plan that would authorize logging for the Whiskey Jack Forest, and sought from time to time public comment on various stages of what eventually became the approved Plan.

(m) Over this same 2010 to 2013 period, Grassy Narrows and other groups raised publicly through the media, and directly with the provincial government, their concern that the sole method of harvesting trees under the Plan, clearcut logging, would interfere with the rights of the members of Grassy Narrows and risked the release of new, or additional, sources of mercury into the region's watershed system, the potential for increased methyl mercury contamination of fish, and consequential harm, or further harm, to the health and well-being of members of Grassy Narrows consuming the fish.

(n) During the 2010 to 2013 period, and earlier, MNRF also was independently aware, through its own research and investigations, of the mercury problem arising from clearcut logging and the challenge of

preventing or mitigating it. Notwithstanding these concerns, the Natural Resources Minister approved the Plan in December 2013.

The Bump-up Request

(o) The notice of decision approving the Plan indicated that persons objecting to the decision could apply to the Ministry of the Environment and Climate Change ("MOECC") requesting a bump-up under the *EAA* that would, if approved, authorize an IEA to be performed before the Plan would be allowed to go into effect.

(p) Grassy Narrows, in conjunction with an environmental non-governmental organization not party to this application, filed such a request in January 2014 as well as supplementary submissions with supporting material in May, July, September, and November 2014.

(q) The initial request, the supplementary submissions of Grassy Narrows, and the response of MNRF demonstrated the need for an IEA, including:

(i) since the industrial discharges of mercury in the 1960s, clinical evaluations of members of Grassy Narrows show that many have suffered from, and continue to suffer from, a variety of neurological health problems attributable to eating methyl mercury contaminated fish caught in area waters;

(ii) peer-reviewed scientific studies show clearcut logging in boreal forests at latitudes similar to the Whiskey Jack Forest, leads to the presence, or increased presence, of methyl mercury in fish in watersheds where the logging takes place;

(iii) members of Grassy Narrows fear the health risks posed by eating mercury-contaminated fish but continue to do so for a variety of complex reasons, including because fishing and consumption of fish caught has always been part of their traditional way of life, diet, and culture, which they do not wish to lose, and because it is an affordable source of food in an impoverished community;

(iv) MNRF admitted that it makes no claims for the effectiveness of the only measures it proposes for the mitigation of mercury impacts to water from clearcut logging authorized under the Plan;

(v) MNRF personnel involved in preparation of, or comment with respect to, guidance materials for the Plan raised concerns that key measures proposed for use with the Plan would not be enforceable and would not adequately mitigate mercury releases to water and could, in fact, exacerbate them.

(r) Despite the above and related submissions and material filed by Grassy Narrows and admissions by MNRF, the Environment Minister, or his designate, refused the bump-up request of Grassy Narrows in December 2014, allowing implementation of the Plan to proceed. In doing so, the refusal decision specifically relied on the mitigation measures that MNRF disclaimed the effectiveness of in controlling mercury impacts, and simply imposed requirements for monitoring such measures during clearcut logging activity authorized under the Plan.

The Decision Violates the Section 7 *Charter* Rights of the Applicants

(s) Section 7 of the *Charter* declares that everyone has the right to life, liberty and security of the person and the right not to be deprived thereof except in accordance with the principles of fundamental justice.

Depriving Applicants of Right to Life, Liberty and Security of the Person

(t) The Decision violates the section 7 *Charter* rights of the Applicants by:

(i) Depriving them of their right to life guaranteed under section 7 by increasing their risk of death, illness or disease as a result of the approval and anticipated implementation of the Plan and corresponding refusal to examine beforehand, through an IEA, the potential impacts to them posed by consumption of mercury-contaminated fish arising from, or exacerbated by, clearcut logging authorized by the Plan in the Whiskey Jack Forest;

(ii) Depriving them of their right to liberty guaranteed under section 7 by undermining, or seriously compromising, their freedom to choose an environment in which to reside and in which to practice their traditional way of life, including fishing in their traditional territory, due to the serious risks they face, if they stay in the area, of neurological or other harm, or such further harm, as a result of eating fish caught in local waterways contaminated by methyl mercury caused by clearcut logging authorized by the Plan, and not studied beforehand, through an IEA;

(iii) Depriving them of their right to security of the person guaranteed under section 7 by:

(A) increasing the risk to their physical security by exposing them to health damage, or further health damage, including death or disability, due to approval and implementation of the Plan that will permit clearcut logging with known potential to release mercury into the watershed, contaminating fish, and leading to neurological and other harm to those consuming the fish, and not studying the issue beforehand through an IEA; and

(B) increasing the risk to their psychological security because the Decision constitutes serious state-imposed psychological stress arising from their fear that clearcut logging authorized by the Decision, which has been strongly linked in the scientific literature to runoff and bioaccumulation of mercury, will exacerbate the contamination of fish, as well as neurological and other health problems experienced by members of Grassy Narrows consuming the fish.

The Deprivations are not in Accordance with Principles of Fundamental Justice

(u) The Decision also constitutes a deprivation of the section 7 rights of the Applicants by not being in accordance with principles of fundamental justice.

Failure to Respect Sanctity of Human Life

(i) Given the history of mercury impacts on the members of Grassy Narrows, the Decision fails to respect the sanctity of human life, a substantive principle of fundamental justice, by risking further harm to human health and well-being, if not loss of human life, in the community from mercury exposure arising from approval and implementation of the Plan, which authorizes clearcut logging, and failing to examine the risks before hand through an IEA.

Denial of Procedural Protections

(ii) The Decision denies the Applicants procedural protections as it was made without their being able to appear before an independent body that could have considered these matters under three different statutes because:

(A) MNRF failed to promulgate a regulation setting out an appeal process for forest management plans as authorized under section 12 of the *CFSA*;

(B) MNRF and/or MOECC failed to classify by regulation forest management plans as instruments that are eligible for third party appeals under sections 38-48 of the *Environmental Bill of Rights, 1993*, S.O. 1993, c. 28 and O. Reg. 681/94 promulgated thereunder, which could have led to an independent public hearing with respect to the Plan;

(C) as a result of the Environment Minister refusing to grant the bump-up request, the Applicants were denied an opportunity:

(1) to obtain an IEA that could have provided in-depth study and consideration of the issue of mercury release to area waters and resulting health implications thereof, from the Plan's authorization of clearcut logging, matters of vital concern to their life, health, and well-being as consumers of fish from these waters; and

(2) to request an independent public hearing under sections 9.1-9.3 of the *EAA* with respect to the resulting IEA; and

(D) the substitution of a notice, comment, and consultation opportunity offered by MNRF/MOECC to Grassy Narrows was not adequate in the context of this case in comparison to a hearing before an independent body, particularly given the health threats posed by mercury to members of Grassy Narrows arising from clearcut logging authorized under the Plan, and the information known only to MNRF at the time respecting the limitations of its mercury mitigation measures.

Effects Grossly Disproportionate to Objectives

(iii) The effects of the Decision on the life, liberty, and security of the person of members of Grassy Narrows due to potential additional

exposure to mercury and the failure to study same through an IEA before proceeding, are grossly disproportionate to the Decision's objectives of allowing the harvesting of trees in the Crown forest by clearcut logging.

Offends Basic Tenet of Legal System

(iv) The Decision also is not in accordance with principles of fundamental justice because it offends a basic tenet of the legal system by violating the equality rights of the Applicants under section 15(1) of the *Charter*, as set out below.

The Decision Violates the Section 15(1) *Charter* Rights of the Applicants

(v) Section 15(1) of the *Charter* declares that every individual is equal before and under the law and has the right to the equal protection and equal benefit of the law without discrimination and, in particular, without discrimination based on race, national or ethnic origin, colour, religion, sex, age or mental or physical disability.

(w) The Decision violates the section 15(1) *Charter* rights of the Applicants by: (1) creating a distinction based on grounds enumerated in, or analogous to, section 15(1); and (2) creating a disadvantage based on the distinction.

Creating a Distinction

(x) The Decision violates section 15(1) of the *Charter* by creating a distinction that:

(i) disproportionately burdens:

(A) members of Grassy Narrows who live within the watershed and who are identifiable by their Aboriginality, their place of residence, their historical and ongoing practice of traditional Aboriginal activities in their traditional territory, including fishing, all characteristics that are actually or constructively immutable, and which the government has no legitimate interest in expecting the people of Grassy Narrows to change in order to receive substantive equality under the law; and

(B) women of childbearing age in the community who must avoid consumption of methyl mercury-contaminated fish or risk exposing their unborn children to serious adverse health effects; and

(ii) ignores their pre-existing health disadvantage as a result of past consumption of methyl mercury-contaminated fish from local waters.

Creating a Disadvantage

(y) The Decision further violates section 15(1) of the *Charter* by creating a disadvantage on the basis of the above distinction that perpetuates the history of prejudice experienced by Aboriginal peoples in Canada in

general, and the exposure to mercury suffered by members of Grassy Narrows in particular by authorizing, and refusing to examine beforehand through an IEA potential impacts to them posed by, clearcut logging that will trigger new releases of mercury into the local water system, thus effectively putting the members of Grassy Narrows in the position of either:

(i) giving up the fishing and other traditional activities in their traditonal territory that are of significant importance to a band member's personal identity; or

(ii) further exposing themselves and their unborn children to harm due to consumption of fish contaminated by new releases of mercury to area waters.

The Decision is not justified by Section 1 of the *Charter*, or Disproportionately and Unreasonably Interferes with *Charter* Guarantees

(z) The violations of sections 7 and 15(1) of the *Charter* set out above do not constitute a reasonable limit demonstrably justified in a free and democratic society pursuant to section 1 of the *Charter*. The impugned Decision impairs the rights of the Applicants, does not advance a sufficiently important governmental objective and, in any event, fails to meet the proportionality requirements of section 1 of the *Charter*. Alternatively, the Decision, in seeking to meet statutory objectives,

disproportionately and unreasonably interferes with protections guaranteed to the Applicants under sections 7 and 15(1) of the *Charter*.

The Decision Violates Administrative Law Principles

(aa) In making the Decision, the Ministers, or their designates, erred in law and/or acted beyond or without jurisdiction in that:

(i) there was no evidence that the mercury mitigation measures proposed pursuant to, or in conjunction with, the Plan would mitigate mercury impacts to the river system, avoid contamination of fish, or prevent serious risk of harm to members of Grassy Narrows consuming contaminated fish, and there was substantial evidence to the contrary;

(ii) the Natural Resources Minister failed to meet the purposes, duties, and conditions precedent imposed upon the Minister pursuant to sections 1, 2, 9, and 68 of the *CFSA* and various manuals and guides promulgated thereunder, requiring the Minister to only approve a Plan that provides for the sustainability of the Crown forest ecosystem by meeting the social, economic, and environmental needs of present and future generations, as well as minimizing adverse effects to animal life and water;

(iii) the Environment Minister, in refusing to grant the bump-up request and order that an IEA be conducted, failed to meet the purposes and duties imposed by sections 1, 2 and 16 of the *EAA* and declaration orders promulgated thereunder related specifically to forest management on Crown lands, to protect the environment, including human life;

(iv) relevant factors were not taken into account or, in the alternative, irrelevant factors were taken into account.

The Plan Conflicts, or is Inconsistent, with the Federal *Fisheries Act*

(bb) In authorizing the Plan under section 9 of the *CFSA*, which will allow clearcut logging operations causing or permitting the deposit of mercury, a deleterious substance, into water frequented by fish, including the watersheds of and adjacent to, the English-Wabigoon river system, the Natural Resources Minister's decision conflicts or is inconsistent with the prohibition in section 36(3) of the *Fisheries Act* prohibiting such deposits and is thereby, pursuant to the federal paramountcy doctrine, inoperative to the extent of the conflict or inconsistency.

Constitutional and Statutory Provisions

(cc) *Canadian Charter of Rights and Freedoms*, Part 1 of the *Constitution Act, 1982* being Schedule B to the *Canada Act 1982* (U.K.), 1982, c. 11 (the "*Charter*"), sections 1, 7, 15(1), 24(1), 28;

(dd) *Constitution Act, 1982*, being Schedule B to the *Canada Act 1982* (U.K.), 1982, c. 11, section 35;

(ee) *Indian Act*, R.S.C. 1985, c. I-5;

(ff) *Crown Forest Sustainability Act*, S.O. 1994, c. 25;

(gg) *Environmental Assessment Act*, R.S.O. 1990, c. E.18;

(hh) *Environmental Bill of Rights, 1993*, S.O. 1993, c. 28 and O. Reg. 681/94;

(ii) *Fisheries Act*, R.S.C. 1985, c. F-14, section 36(3);

(jj) *Judicial Review Procedure Act*, R.S.O. 1990, c. J.1;

(kk) *Courts of Justice Act*, R.S.O. 1990, c. C.43;

(ll) *Rules of Civil Procedure*, R.R.O. 1990, Regulation 194.

(mm) Such further or other grounds as counsel may advise and this Honourable Court may permit.

Documentary Evidence

3. The following documentary evidence will be used at the hearing of the application:

(a) the record to be filed by the Respondent Ministers pursuant to section 10 of the *Judicial Review Procedure Act*, R.S.O. 1990, c. J.1;

(b) Affidavit of Simon Fobister, affirmed July 30, 2015;

(c) Affidavit of Amber Ellis and David Sone, sworn August 21, 2015;

(d) Affidavit of Chief Roger Fobister, Senior, affirmed August 26, 2015;

(e) Affidavit of Joseph Fobister, affirmed August 26, 2015;

(f) Affidavit of William Fobister, Senior, affirmed July 30, 2015;

(g) Affidavit of Sherry Fobister, affirmed August 26, 2015;

(h) Affidavit of David Sone, sworn August 21, 2015;

(i) Affidavit of Dr. Richard Carignan, to be sworn, _____2015;

(j) Supplementary Affidavit of Dr. Richard Carignan, to be sworn, _____2015;

(k) Affidavit of Dr. Donna Mergler, to be sworn, _____ 2015;

(l) Affidavit of Dr. Anna Willow, to be sworn, _____, 2015;

(m) Affidavit of Dr. Justin Podur, to be sworn, _____, 2015;

(n) Such further or other material as counsel may advise and this Honourable Court may permit.

Date: September 1, 2015

CANADIAN ENVIRONMENTAL LAW ASSOCIATION
130 Spadina Avenue, Suite 301
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Counsel for the Applicants

Court File No. 446/18 15

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

NOTICE OF APPLICATION TO DIVISIONAL COURT FOR JUDICIAL REVIEW

CANADIAN ENVIRONMENTAL LAW ASSOCIATION
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Solicitors for the Applicants

SUPERIOR COURT OF JUSTICE
COUR SUPÉRIEURE DE JUSTICE
FILED / DÉPOSÉ
SEP 0 1 2015
REGISTRAR / GREFFIER
DIVISIONAL COURT TORONTO
COUR DIVISIONNAIRE

Title, Certification and Approval Page

Forest Management Plan
for the
Whiskey Jack Forest
(Management Unit #490)

Ontario Ministry of Natural Resources (MNR)
Kenora District, Northwest Region

for the 10-year period from April 1, 2012 to March 31, 2022.

I hereby certify that I have prepared this forest management plan, including Silvicultural Ground Rules, to the best of my professional skill and judgement with the assistance of an interdisciplinary planning team in accordance with the requirements of the *Forest Management Planning Manual* and *the Forest Information Manual*.

_____ _____ Date: _____
R.P.F. seal Kurt Pochailo, R.P.F.
Plan Author, Ontario Ministry of Natural Resources

I recommend that this forest management plan be approved for implementation and certify that it has been prepared in accordance with the requirements of the *Forest Management Planning Manual,* the *Forest Information Manual* and relevant policies and obligations (including any relevant MNR agreements with Aboriginal peoples). I also certify that the forest management plan has been prepared using the applicable forest management guides. In this forest management plan, prescriptions that differ from specific direction or recommendations in the applicable forest management guides are identified in the attached List of Exceptions.

Certified and Recommended for Approval By:

_____ Date: _____
Deb Weedon
District Manager, Kenora District
Ontario Ministry of Natural Resources

Approved by: _____ Date: _____
Allan Willcocks
Regional Director, Northwest Region
Ontario Ministry of Natural Resources

Forest Information Portal Submission Identifier: _____

The original signed and stamped version of this page is retained at the MNR Kenora district office in Kenora.

Ministry of the Environment and Climate Change

Environmental Approvals Branch

2 St. Clair Avenue West
Floor 12A
Toronto ON M4V 1L5
Tel.: 416 314-8001
Fax: 416 314-8452

Ministère de l'Environnement et de l'Action en matière de changement climatique

Direction des autorisations environnementales

2, avenue St. Clair Ouest
Étage 12A
Toronto ON M4V 1L5
Tél : 416 314-8001
Téléc. : 416 314-8452

Ontario

DEC 2 2 2014

Mr. Simon Fobister
Grassy Narrows Chief
Grassy Narrows Ontario
P0X 1B0

Dear Mr. Fobister:

Thank you for your interest in the Ministry of Natural Resources and Forestry's (MNRF) proposed Whiskey Jack 2012-2022 Forest Management Plan (Whiskey Jack FMP).

On January 22, 2014, I received your request that MNRF be required to prepare an individual environmental assessment (IEA) for the Whiskey Jack FMP. I am taking this opportunity to inform you that I have decided that an IEA is not required.

Despite my not requiring an IEA be prepared, I understand that concerns were raised in the IEA request with respect to mercury. Therefore, I am imposing conditions on the Whiskey Jack FMP. These conditions will ensure that further monitoring is undertaken and compliance with the most current requirements of the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (Stand and Site Guide) are assumed by the MNRF.

In making my decision, I have given careful consideration to Whiskey Jack FMP documentation, the provisions of Declaration Order MNR-71, referred to as MNRF's Class Environmental Assessment Approval for Forest Management on Crown Lands in Ontario (Class EA), and the issues/concerns raised in your IEA request. Your concerns together with the reasons for my decision are set out in the attached table.

The Class EA is a process by which MNRF prepares Forest Management Plans (FMPs), including evaluating alternatives, assessing environmental effects, developing mitigation measures, and consulting with the public, without having to obtain approval from me and Cabinet for each individual FMP.

The Class EA has itself been subject to review and approval under the *Environmental Assessment Act* (EAA), which determined, in part, that the application of the Class EA

process would enable proponents to meet the intent and purpose of the EAA. MNRF has demonstrated that it has planned and developed the Whiskey Jack FMP in accordance with the provisions of the Class EA. I am satisfied, therefore, that the purpose of the EAA, "the betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management in Ontario of the environment", has been met for the Whiskey Jack FMP.

The issues/concerns you raised were extensively reviewed. I am satisfied that the issues/concerns have been addressed by the work done to date by MNRF, or will be addressed in future work that is required to be carried out.

With this decision having been made, MNRF can now proceed with the FMP activities set out in the Whiskey Jack FMP, subject to any other permits or approvals required. MNRF must implement the activities in the manner in which they are set out in the Whiskey Jack FMP, and inclusive of all commitments made during the review of the IEA request, mitigation measures, and environmental and other provisions therein.

Again, I would like to thank you for participating in the Class EA process and for bringing your concerns to my attention.

Sincerely,

Agatha Garcia-Wright
Director
Environmental Approvals Branch

c: Mr. Allan Willcocks, Regional Director, Northwest Region, MNR
Mr. Kurt Pochailo, Management Forester, MNR
Mr. Paul Glassford, MNR Senior Advisor, Forest Class EA – Sault Ste. Marie
Mr. John Sullivan, MNR Forest EA Implementation Coordinator
EA File No. 02-07 Whiskey Jack FMP 2012-2022

Whiskey Jack Forest 2012-2022 Forest Management Plan

Ministry's Review of Issues Raised by Grassy Narrows First Nation:

Issues	Response
Clearcut logging and the construction of access roads will disturb the soil causing mercury to travel through the water system, amplifying existing contamination.	The MNRF uses the Stand and Site Guide to develop forest management plans. The Stand and Site Guide provides direction to minimize site disturbance, sediment transport and hydrologic disruption in forest management plans. These reduce the potential for existing mercury mobilization as a result of forest disturbances. The MNRF has informed the Ministry of the Environment and Climate Change (MOECC) that mobilization of mercury following forest disturbance may not be any different than that experienced during natural disturbances. The Whiskey Jack FMP will also mitigate potential adverse effects on the environment including the application of Area of Concern prescriptions, silvicultural ground rules, and best management practices for road construction activities. The MNRF is currently undertaking research to gain further understanding of the potential connection between forestry operations and mercury. This will help inform the development of guidance material used for forest management planning. The MOECC is placing a condition requiring the MNRF to implement forest management planning activities in accordance with the Whiskey Jack FMP and the Stand and Site Guide to ensure that monitoring of the environment, which includes mercury, is undertaken. In addition, a condition requiring the MNRF to follow the most current version of the Stand and Site Guide will be imposed by the MOECC to ensure that the best available guidance is being used for the development of forest management planning. A final condition will be imposed requiring the MNRF to report to the Director, Environmental Approvals Branch, what changes have been made to the Whiskey Jack FMP as a result of any updates to the Stand and Site Guide. I am satisfied that the Stand and Site Guide, used to prepare the Whiskey Jack FMP, provides a methodology to minimize potential mercury contamination in waterways following disturbances such as road construction and clearcut logging.
An increase in mercury will harm fish and terrestrial animals that eat fish, including humans, for a long time period.	The MNRF has followed scientific studies which show that increases in methylmercury concentrations in fish following clearcut operations are generally limited to cases when soils are disturbed. As mentioned above, the Stand and Site Guide provides a methodology for minimizing soil disturbance, such as operating on frozen ground. As the Whiskey Jack FMP has been developed under the provisions of the Stand and Site Guide, the MNRF will minimize soil disturbance, thus minimizing potential mercury movement and contamination in fish and

Issues	Response
	terrestrial animals. The implementation of mitigation measures that the MNRF will be using for the WJFMU, such as emulating natural disturbance patterns, harvesting only in winter on shallow soil sites and reinforcing slopes and bank, will reduce the risk of mercury contamination in animals. I am satisfied that mercury movement and potential mercury contamination in animals will be mitigated using methodologies from the Stand and Site Guide which were incorporated into the Whiskey Jack FMP.
Clearcut logging leads to an increase in mercury, whereas forest fires remove mercury.	The MNRF informed the MOECC that fire intensity is an important factor that influences mercury response. High intensity fires volatilize mercury in the organic soil layer whereas low intensity fires leave this layer undisturbed, with mercury subsequently being mobilized as water tables rise and surface runoff increases. The MNRF has stated that studies conducted by various research groups have found that the highest mercury levels in fish are from watersheds impacted by low intensity fires and lower mercury levels are in fish from watersheds with high intensity fires. The MNRF has indicated that for the 10-year planned renewal and tending operations in the WJFMU, which consists of 745,548 ha of productive forest, prescribed burns will occur during site preparation over an area of 1,069 ha. The MNRF is also planning to undertake natural regeneration which will include clearcut silvicultural system over an area of 25,631 ha. Artificial regeneration will be applied over an area of 27,839 ha and will include planting and seeding. The MNRF claims that harvesting in the WJFMU should emulate natural disturbances (i.e. forest fires). The MNRF also claims that increases in mercury due to clearcut operations would be no different than those experienced for natural occurrences. The requester is suggesting that the production of methylmercury is greater with clearcut operations versus natural forest fires. The Stand and Site Guide acknowledges that mercury dynamics will likely change within the watershed as a result of any type of forest disturbance. MNRF has concluded that the mechanism and magnitude of mercury response differs between burned and harvested watersheds but that some level of mercury response is also found following disturbance by fire. As noted previously, potential mercury movement and contamination is associated with the disruption of soils. To reduce the disruption of soils and the level of mercury movement, the MNRF will implement mitigation measures, such as emulating natural disturbance patterns, harvesting only in winter on shallow soil sites and reinforcing slopes and bank, in the WJFMU.

Issues	Response
	I am satisfied that a combination of forest disturbances will be used during the management of the Whiskey Jack FMP and will include prescribed burns.
The MNRF does not have the science and information to develop prescriptions to mitigate the effect of mercury on terrestrial or aquatic ecosystems.	The Declaration Order stipulates that MNRF shall maintain a program of scientific studies to assess the effectiveness of forest management guides. Results from these studies are used to assist MNRF in the review and revision of forest management guides. The MNRF is currently supporting research projects that are examining patterns in fish mercury bioaccumulation, evaluating the levels of mercury runoff from forest and wetland soils to aquatic systems, and examining the synthesis of land use effects (e.g., mining, hydroelectric, and forest management activities) on watershed mercury cycling and export. The MNRF states that results from its ongoing research will be used during the required periodic reviews of the Stand and Site Guide. Periodic reviews of the Stand and Site Guide are required as part of the adaptive management approach in order to evaluate and improve direction in the guide with respect to minimizing the potential adverse effects of mercury mobilization and subsequent bioaccumulation. The Stand and Site Guide includes a series of predictions or hypotheses. Those with a high degree of uncertainty have been identified as a high priority for testing through an effectiveness monitoring program. The results of the monitoring program, along with other sources of information, are used during periodic reviews of the Stand and Site Guide to ensure the most up to date information is being used when developing forest management plans. The MNRF Stand and Site Guide Background and Rationale for Direction document outlines a mercury response to forest management activities but also identifies mercury export as a priority for effectiveness monitoring. The MOECC is imposing a condition requiring MNRF to conduct monitoring in the Whiskey Jack FMP in accordance with the most current version of the Stand and Site Guide. This will help to ensure that the best available guidance is being used and current research methods to minimize the adverse effects of mercury mobilization and subsequent bioaccumulation are implemented. I am satisfied that the MNRF has prepared the Whiskey Jack FMP in accordance with its Stand and Site Guide and will be subject to any updates based on new research.

Issues	Response
The Whiskey Jack FMP does not contain requirements for ongoing monitoring of mercury levels to determine if approved forest operations will elevate mercury levels.	The MNRF's Declaration Order and the Forest Management Planning Manual contain planning requirements for the monitoring of forest management activities in a forest management plan. The requirements include providing a description of the monitoring of forest operations, with specific provisions for Areas of Concern, to ensure operations are in compliance with the forest management plan. The prevention, minimization and mitigation of the effects of forest management on the environment are addressed through the application of the appropriate guides required by Condition 38 of Declaration Order MNR-71. The development, review and revision of these guides is also mandated by this same condition of the Declaration Order, and directs the MNRF to assess the effectiveness of guides through appropriate scientific research projects and does not implicate ongoing monitoring in the context of individual forest management plans. Concerns such as those identified by the requesters are addressed during the periodic review, and potential revision, of the guides. The Stand and Site Guide acknowledges that mercury dynamics will likely change within the watershed as a result of any type of forest disturbance and that further research and monitoring is required to refine direction in the guide. The MNRF is currently considering the issue of the effects of mercury in the review of the Stand and Site Guide which is scheduled for review in the fall of 2014, with a completion date of December 31, 2015. The MOECC has also established in the Declaration Order a requirement for the formulation and implementation of a Provincial Forest Technical Committee, whose role will be to ensure that Guides are kept current with respect to scientific knowledge and management practices. The committee acts as a review board for proposed changes to existing guides and recommending priorities for new or existing guides. The MOECC is imposing a condition requiring MNRF to conduct monitoring in the Whiskey Jack FMP in accordance with the most current version of the Stand and Site Guide. This will help to ensure that the best available guidance is being used and current research methods to minimize the adverse effects of mercury mobilization are implemented. I am satisfied that the MNRF is considering the effects of mercury in the review of the Stand and Site Guide.
The MNRF did not respond to comments	The MNRF did not receive correspondence during the planning process from the Grassy Narrows First Nation regarding mercury concerns. Concerns regarding honouring the Process Agreement made between

Issues	Response
submitted by you on the mercury issue during the preparation of the Forest Management Plan.	Grassy Narrows First Nation and MNRF, amalgamating the Whiskey Jack and Kenora forests, and being kept informed during the Whiskey Jack FMP planning process were raised by Grassy Narrows First Nation in 2010. The issue of methylmercury was raised by Grassy Narrows First Nation for the first time, prior to the IEA request, in an October 24th, 2013 letter to the Premier, coinciding with Stage 4 of the forest management planning process (review of the Draft Whiskey Jack FMP). The Premier's office responded to Grassy Narrows First Nation on February 11, 2014 and stated that Ontario wanted to continue to work together. The MNRF also received a letter from Grassy Narrows First Nation on October 28, 2013; however, there was no mention of mercury. On April 17, 2014 the MNRF responded to the concerns raised in Grassy Narrows First Nation's October 28, 2013 letter. Earthroots submitted correspondence to the MNRF on October 31, 2013 stating that it was concerned with the impact of clearcutting on mercury levels in fish in local lakes and rivers. The MNRF responded to the concerns identified by Earthroots in a letter dated April 7, 2014, indicating that MNRF applied the direction in the approved Stand and Site Guide to mitigate potential adverse effects of forest management activities on the environment. A more detailed account of the consultation conducted between Grassy Narrows First Nation and the MNRF can be found in the section below. I am satisfied that the MNRF responded to comments submitted by the requesters during the preparation of the Whiskey Jack FMP.
Concerns about the failure to discharge the duty to consult in the development of the Whiskey Jack FMP.	The MNRF informed the MOECC that it followed the public and Aboriginal consultation requirements outlined in the Declaration Order and the 2009 Forest Management Planning Manual for the Whiskey Jack FMP (Phase I). At each stage in the development of the Contingency Plan and Forest Management Plan notification letters were sent to Grassy Narrows First Nation to invite participation in the Forest Management Plan process. Prior to the commencement of the formal public consultation process for the preparation of the Whiskey Jack FMP the MNRF consulted with the Grassy Narrows First Nation. In a letter dated April 20, 2009 the MNRF invited six Aboriginal communities, including Grassy Narrows First Nation, to discuss the development of a customized consultation approach for forest management planning in advance of the formal public consultation. Also in this correspondence, the MNRF offered the Aboriginal communities an opportunity to have a community

Issues	Response
	representative sit on the Forest Management Plan Planning Team and Local Citizens Committee. All of the Aboriginal communities declined the opportunity to develop a customized consultation approach and did not provide representation to the Local Citizens Committee. All of the Aboriginal communities, except for Grassy Narrows First Nation, did provide representatives for the Planning Team. The Invitation to Participate, dated February 3, 2010, was sent by MNRF to the six Aboriginal communities. Grassy Narrows First Nation responded to the invitation on March 17, 2010 in which they outlined their concerns with moving forward with the planning of the Whiskey Jack FMP without a Process Agreement in place. The MNRF responded to Grassy Narrows First Nation's letter on June 22, 2010 and stated that MNRF wanted to work together with Grassy Narrows First Nation. No other formal response was provided by the other five Aboriginal communities; however, representatives from all five communities began attending the Planning Team meetings. A letter was sent on December 14, 2011 inviting the six Aboriginal communities to review and comment on the Long Term Management Direction for the Whiskey Jack FMP. Grassy Narrows First Nation submitted a letter to the MNRF on June 13, 2012 requesting information and providing an overview of their concerns. The MNRF responded on July 6, 2012. The other five Aboriginal communities participated in meetings with the MNRF and continued to participate on the Planning Team. On January 14, 2013 the MNRF sent letters to each of the six Aboriginal communities asking if they would like an information session provided to their communities. On January 31, 2013 the MNRF sent a follow-up letter to the six Aboriginal communities announcing the MNRF's intention to hold public information centres. On April 3, 2013 the MNRF sent another letter to Grassy Narrows First Nation asking if the community would like an information session to be held. The MNRF did not receive a response from Grassy Narrows First Nation.Specific Aboriginal communities, Whitefish Bay First Nation, Wabauskang First Nation and Dalles First Nation, accepted the MNRF's offer of information sessions. An invitation to review the Draft Plan for the Whiskey Jack FMP was sent to the six Aboriginal Communities on July 30, 2013. Grassy Narrows First Nation sent a letter to the Premier of Ontario dated October 24, 2013 outlining their concerns with the undertaking and highlighting mercury concerns. The Premier's office responded on February 11, 2014 and stated that Ontario wanted to continue to work together. A letter was also submitted by Grassy Narrows First Nation

Issues	Response
	to the MNRF on October 28, 2013 and was responded to by the MNRF on April 17, 2014. Whitefish Bay First Nation was the only other Aboriginal community to respond to the MNRF's invitation to review the Draft Plan; however, due to circumstances within the community a meeting was never held. On December 23, 2013 the MNRF invited the six Aboriginal communities to inspect the final Whiskey Jack FMP. Grassy Narrows First Nation submitted an IEA request and no response was received by the MNRF from the other communities. I am satisfied that the duty to consult has been met.

Court File No.

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other
members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

AFFIDAVIT OF SIMON FOBISTER

I, SIMON FOBISTER, of Grassy Narrows, in the District of Kenora, AFFIRM AND SAY AS FOLLOWS:

1. I am one of the applicants in the within application for judicial review, and as such have knowledge of the matters hereinafter deposed to.

2. I am currently the Executive Director for Band Administration of Grassy Narrows First Nation (hereinafter "Grassy Narrows"), an applicant in the within application for judicial review, and I have been working in that capacity since 2014.

3. I am a member of Grassy Narrows and I was its elected Chief during the periods 2002-2014 and 1976-1980.

4. I reside upon property located in Grassy Narrows.

5. I fish in various lakes, streams, and waters that form part of the watershed of the English-Wabigoon river system that runs through the Whiskey Jack Forest, our traditional territory, and I eat fish that I catch from these waterways.

OVERVIEW: GRASSY NARROWS HISTORY, STATUS, AND RELATION TO WATERSHED OF ENGLISH-WABIGOON RIVER SYSTEM AND WHISKEY JACK FOREST

6. The members of Grassy Narrows are Anishinaabe (also referred to as Ojibway). Our ancestors are signatories to Treaty No. 3. I learned from elders in my community that since time immemorial our ancestors and we, their descendents, have hunted, trapped, harvested, and fished in the area that includes the watershed of the English-Wabigoon River System, in northwestern Ontario. I have attached as Exhibit "A" to my affidavit an excerpt from the trial judgment in *Keewatin v. Ontario*. The trial judgment, decided during my tenure as Chief of Grassy Narrows, recognizes our history of engaging in these traditional activities in our traditional territory and their centrality to our identity.

7. Members of Grassy Narrows live both on and off-reserve in the watershed of the English-Wabigoon river system, which flows west past Dryden, Ontario to the Manitoba border. This river system, and its watershed, which I have been taught by elders in my community have always been used and occupied by our people for traditional activities of hunting, trapping, fishing, and harvesting plants for food and medicinal purposes, as well as activities ancillary to these traditional activities, runs through the area where clearcut logging recently was authorized by the Respondents as part of a Forest Management Plan for the Whiskey Jack Forest (the "Plan") for the period 2012 to 2022.

8. I fear that clearcut logging authorized under the Plan will release mercury into the watershed, contaminate the fish we, as a people, consume from those waters, and harm our health and well-being in violation of our legal rights under section 7 and our equality rights under section 15(1) of the *Canadian Charter of Rights and Freedoms*. The history of past industrial discharges of mercury to this river system and the resulting, and on-going, health impacts to our people heighten my concern that clearcut logging will trigger new, and exacerbate existing, mercury-related health problems in the Grassy Narrows community. This is not reasonable. I am concerned that the impact will be especially severe because our community has already suffered greatly, and our capacity to endure has been stretched to its limits.

HISTORICAL BACKGROUND: INDUSTRIAL DISCHARGES OF MERCURY IN THE ENGLISH-WABIGOON RIVER SYSTEM

9. Beginning in the 1960s, a chlor-alkali plant at Dryden, Ontario began discharging mercury into the English-Wabigoon River System, eventually discharging approximately 9,000 kilograms of mercury into the river system. Once in the water, the mercury was transformed by chemical-biological processes into methyl mercury, a neurological poison capable of bio-accumulating in the food chain, being ingested by fish, and adversely impacting humans consuming methyl-mercury contaminated fish caught from area waters. The consumption of methyl mercury-contaminated fish by our people resulted over the decades in serious, and well-documented, neurological harm and other adverse health impacts, many of which continue to afflict members of my community to this day. These observations, based on government documents or peer-reviewed scientific studies, are contained in submissions Grassy Narrows and Earthroots, the latter an environmental non-governmental organization not party to this judicial review application, made to the Respondent Minister of the Environment in January 2014 in support of a request for an Individual Environmental Assessment ("IEA") of the decision of the Respondent Minister of Natural Resources in December 2013 to approve the Plan. A copy of our January 2014 letter that accompanied our submissions is attached as Exhibit "B" to my affidavit. A copy of the full submissions is attached as Exhibit "C" to the affidavit of Amber Ellis and David Sone of Earthroots.

10. Litigation, initiated by Grassy Narrows along with other First Nations during my tenure as Chief in the late 1970s, against the federal and Ontario governments and the responsible companies resulted in the mid-1980s in an out-of-court settlement and the

payment of some compensation as well as the establishment of a mercury disability board to evaluate and compensate the people of Grassy Narrows suffering from neurological and other ill-effects arising from the industrial discharges of mercury. The settlement was confirmed by federal and Ontario legislation that acknowledges that the industrial discharges of mercury to the English-Wabigoon River System, and related river systems, led to the presence of methyl mercury in these ecosystems and that it may have had and may continue to have effects in respect of the social and economic circumstances and the health of present and future members of Grassy Narrows and the other Bands that were parties to the litigation. A copy of the Ontario legislation is attached as Exhibit “C” to my affidavit. A copy of the federal legislation is attached as Exhibit “D” to my affidavit.

THE WHISKEY JACK FOREST MANAGEMENT PLAN

11. In or about February 2010 and continuing to late 2013 the Ministry of Natural Resources and Forestry (“MNRF”) gave periodic public notice of its intention to develop a forest management plan under the authority of the provincial *Crown Forest Sustainability Act* that would allow logging in the Whiskey Jack Forest over the period 2012 to 2022 and inviting participation in the process of developing the plan. The notice indicated that there are over 1.1 million hectares in the Whiskey Jack Forest, with almost 750,000 hectares considered by MNRF to be productive forest lands. Subsequent public notices inviting public participation regarding later stages in the development of what eventually became the approved Plan were issued in December 2011, January 2013, July 2013, and December 2013. A copy of the composite public notices is attached as Exhibit “E” to my affidavit.

12. Due to concerns in our community about earlier government plans to log the Whiskey Jack Forest going back to at least the late 1990s, which concerns were further heightened by the February 2010 notice, members of the Grassy Narrows community and I, as Chief at the time, communicated our concerns to the government directly and through other channels, such as the media, at least twenty times from the late 1990s to late 2013 that the sole method of harvesting trees, clearcut logging, under what eventually became the Plan, would interfere with the rights of members of our community. In particular, as we increasingly became aware of the link between clearcut logging and mercury, our fear grew with respect to the release of new sources of mercury into the region's waterways, the potential for increased methyl mercury contamination of fish, and consequent harm, or further harm, to the health and well-being of community members. These various expressions of concern over the late 1990s to 2013 were listed at pages 10-13 in Exhibit "C" to the affidavit of Amber Ellis and David Sone, referred to above.

13. I know that from an early stage of the development of the Plan, the Premier of Ontario, the Honourable Kathleen Wynne, when she was Aboriginal Affairs Minister, was aware of our concerns about clearcuts deepening the impact of mercury on our community, because she responded to these concerns in a CBC interview in June 2012. The interview is listed at page 11 of Exhibit "C", and summarized at page 11 of Exhibit "H", of the affidavit of Amber Ellis and David Sone.

14. Furthermore, in October 2013, in my capacity as Chief of Grassy Narrows at the time, I sent a letter to Premier Wynne, expressing my concern and that of the Grassy Narrows Band Council respecting the proposed Plan. In this regard, I stated in part that: “You are fully aware that our community continues to struggle with the devastating health impacts from 9,000 kg of mercury that was dumped into our river system in the 1960s with the permission of the government of Ontario. Three generations of our people bear the burden of this degenerative neurological poison. New clearcut logging will bring even more mercury into our river and our food chain, further prolonging and exacerbating this avoidable tragedy. We condemn such processes and plans”. A copy of this letter is attached as Exhibit “F” to my affidavit. The letter is also listed at page 14 of Exhibit “C” of the affidavit of Amber Ellis and David Sone.

APPROVAL OF THE PLAN

15. Despite our expressions of concern, notice of approval of the Plan under the authority of the Respondent Minister of Natural Resources was released in December 2013 as set out in Exhibit “E” of my affidavit, referred to above. The Plan, as approved, indicates that 100 per cent of the 53,471 hectares of the area to be cut over the 10-year (2012-2022) planned harvest in the Whiskey Jack Forest will be cut using clearcut logging as the tree harvesting method. A copy of a summary of the Plan indicating this at page 4 of that document is attached as Exhibit “G” to my affidavit. A copy of the full Plan is attached as Exhibit “B” to the affidavit of Amber Ellis and David Sone.

THE BUMP-UP REQUEST

16. The notice of approval of the Plan, now Exhibit "E" to my affidavit, indicated that persons objecting to the decision could apply to the Ministry of the Environment, now known as the Ministry of the Environment and Climate Change ("MOECC"), requesting a bump-up under the *Environmental Assessment Act* that would, if approved, authorize an IEA to be performed before the Plan would be allowed to go into effect.

17. Grassy Narrows and Earthroots took this opportunity and filed with MOECC a bump-up request in January 2014 seeking an IEA that would examine potential mercury impacts arising from clearcut logging authorized under the Plan. The transmittal letter respecting this request is contained in Exhibit "B" to my affidavit, and the full bump-up request is contained in Exhibit "C" to the affidavit of Amber Ellis and David Sone, mentioned and referred to above.

18. I affirm this affidavit in support of the within application for judicial review, and for no other or improper purpose.

AFFIRMED before me in the City of Toronto, in the Province of Ontario, this 30th day of July, 2015.

Joseph Castrilli
A Commissioner, etc.

JOSEPH CASTRILLI

Simon Fobister

This is Exhibit "A" referred to in the affidavit of SIMON FOBISTER sworn before me, this 30th day of JULY 20 15

affirmed

Joseph Castrilli
A COMMISSIONER FOR TAKING AFFIDAVITS

JOSEPH CASTRILLI

Excerpts from trial judgment in *Keewatin v. Ontario (Minister of Natural Resources)*, [2011] O.J. No. 3907 (Ontario Superior Court of Justice)

[475] Lovisek gave evidence that in 1873, the Ojibway were primarily concerned about preserving their way of life, including their right to continue hunting, fishing and trapping as in the past. They valued their seasonal round, the pursuit of their livelihood through traditional harvesting. Their culture and identities were intimately connected with hunting, trapping, fishing and harvesting wild rice as their ancestors had done since time immemorial.

....

[772] The Treaty 3 Ojibway loved their lives and their country (Lovisek, November 16, 2009 at p. 39). They relished their way of life, including their seasonal round of trapping, hunting, fishing and harvesting over the breadth of their territories. They valued their customs and were not prepared to give them up....

...

[773] I accept the evidence of Lovisek...that they were prepared to embrace a Euro-Canadian presence **only** if it would be compatible with their cherished way of life, and would not cause serious interference with their hunting, fishing and trapping – central aspects of their distinctive culture central to their identity.

Asubpeeschoseewagong
Netum Anishinabek
GRASSY NARROWS, ONTARIO P0X 1B0 • PHONE (807) 925-2301 • FAX (807) 925-2649

EARTHROOTS

This is Exhibit "B" referred to in the affidavit of SIMON FOBISTER sworn before me, this 30th day of JULY 20 15

affirmed

Joseph Castrilli
A COMMISSIONER FOR TAKING AFFIDAVITS
JOSEPH CASTRILLI

January 22, 2014

Ian Parrott
Director of Environmental Assessment and Approvals Branch
Ontario Ministry of Environment
2 St Clair Ave W, Floor 12A
Toronto ON M4V1L5

Dear Mr. Parrott,

Re: Request for Individual Environmental Assessment of Whiskey Jack Forest Management Plan (EBR Registry No. 010-9240)

We are writing on behalf of Grassy Narrows First Nation (Grassy Narrows) and Earthroots to request an Individual Environmental Assessment of the Whiskey Jack Forest Management Plan 2012-2022 (the logging plan) that was approved on December 23, 2013 by the Ministry of Natural Resources.

Earthroots is a grassroots environmental organization dedicated to protecting Ontario's wilderness, wildlife and watersheds through research, education and action.

Asubpeeschoseewagong Netum Anishinabek (ANA) or Grassy Narrows First Nation is an indigenous Anishinabe community located within the Treaty 3 area.

The logging plan fails to adequately deal with the impacts of logging on mercury levels in boreal water and fish. As a result the logging plan fails to protect the environment and to ensure sustainability. In particular the logging plan will harm water quality, fish habitat, wildlife, and the health of people who eat the fish. The logging plan will also impact the inherent Aboriginal and Treaty rights to fish to an extent that precludes the meaningful exercise of those rights.

These shortcomings of the logging plan are in spite of the fact that peer reviewed scientific literature has demonstrated a clear link between clearcut logging and unsafe mercury levels in fish in boreal forest watersheds. While the research in support of this literature generally was not carried out in the Whiskey Jack Forest, the boreal forest conditions examined and logging activities considered in these studies are similar, if not identical, to the conditions and activities expected in Whiskey Jack if the logging plan proceeds as approved.

This failure of the logging plan is particularly grave because of the well-known existing mercury contamination problem in the English and Wabigoon River watersheds, and the well-documented prevalence of methylmercury poisoning arising from the consumption of contaminated fish (Minamata Disease) in Asubpeeschoseewagong (Grassy Narrows) and Wabaseemoong (White Dog).

The history of local mercury contamination, and its ongoing impacts, dictates that the highest level of caution and duty of care must be applied in any action that may deepen and prolong this problem by increasing the levels of mercury in the local food chain. Failure to do so would be a failure to protect the health of the environment and the sustainability of our forests, as well as a failure to uphold the honour of the Crown.

Grassy Narrows has a number of concerns with respect to the Ministry of Natural Resources' decision to approve the Forest Management Plan. These concerns include the failure to discharge the duty to consult, the failure to properly account for treaty rights and traditional use of the land, the failure to ensure that a proper forest inventory has been used to inform the Crown's decision making process, and a concern that the level of logging is unsustainable and unjustifiably infringes our aboriginal and treaty rights. The fact that we do not raise these issues below in relation to our bump-up request should not be taken as in any way suggesting that these concerns are unimportant or will not be raised in other fora.

Grassy Narrows and Earthroots submit that the logging plan warrants a review under an Individual Environmental Assessment because:

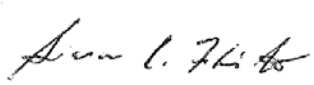
- the outstanding mercury issues (i.e., impacts upon human and ecosystem health) have not been addressed adequately, or at all, under the *Crown Forest Sustainability Act*, or in the forest management planning process, to date;
- similarly, they will not be adequately addressed in any other current or future regulatory or approvals process regarding the logging activities in Whiskey Jack Forest (e.g., in the *Lakes and Rivers Improvement Act* regarding water-crossings);
- these public interest issues raise matters of profound importance both to Grassy Narrows First Nation, and to other stakeholders and the public at large;
- to effectively and thoroughly address these issues it is necessary, as a preliminary step, for the proponent of the logging plan to prepare an Individual Environmental Assessment that fully examines (with public input) all matters listed in section 6.1(2) of the *Environmental Assessment Act*, especially in relation to:
    - the alleged purpose of, or rationale for, allowing clearcutting/logging activities to occur in Grassy Narrows Territory;
    - the alleged purpose of, or rationale for, allowing clearcutting/logging activities in close proximity to fish-bearing waterbodies within the Whiskey Jack Forest despite the risk of additional mercury contamination;
    - alternative sources of wood for the real wood supply needs of local mills;
    - alternatives to the proposed forestry activities and alternative methods of carrying out such activities;
    - the environment affected, and the environmental effects (direct, indirect, and cumulative) of the logging activities;
    - proven mitigation actions to prevent the risk of mercury contamination from logging activities; and
    - systematic evaluation of the advantages and disadvantages of the proposed activities and the alternatives.

The precise nature and scope of the foregoing factors can be developed (with public input) in the Terms of Reference which precede the preparation of the Individual Environmental Assessment. In summary, the potential mercury impacts are significant, adverse, long-lasting, and are

unresolved to date in the forest management planning process. These impacts are best addressed through a process that includes, but is not necessarily limited to, a robust Individual Environmental Assessment.

We go into more detail about the concerns of Grassy Narrows and Earthroots in the appended text. Where possible, we quote directly from peer-reviewed scientific journal articles to avoid misinterpretation of the available facts.

Sincerely,



Simon Fobister,
Grassy Narrows Chief

Amber Ellis,
Earthroots Executive Director

Enclosure: Bump-up Request for an Individual Environmental Assessment (IEA) submitted to the Ontario Ministry of the Environment regarding the Forest Management Plan for the Whiskey Jack Forest for the 10-year period April 1, 2012 to March 31, 2022 - Final Plan Inspection Approved by the Ministry of Natural Resources, December 23, 2013 - EBR Registry No. 010-9240

cc: Premier of Ontario
Ontario Minister of the Environment
Ontario Minister of Natural Resources
Ontario Minister of Aboriginal Affairs
Ontario Minister of Health and Long Term Care
Minister of the Environment - Canada
Minister of Health – Canada
Minister of Aboriginal Affairs and Northern Development - Canada
Grand Chief, Grand Council of Treaty Three
Regional Chief, Chiefs of Ontario
National Chief, Assembly of First Nations

Bill 76

2ND SESSION, 33RD LEGISLATURE, ONTARIO 35 ELIZABETH II, 1986

This is Exhibit "C" referred to in the affidavit of SIMON FOBISTER sworn before me, this 30th day of JULY 20 15

affirmed

Joseph Castrilli
A COMMISSIONER FOR TAKING AFFIDAVITS
JOSEPH CASTRILLI

Bill 76

(Chapter 23
Statutes of Ontario, 1986)

An Act to implement the Terms of a Settlement of all Claims arising out of the Contamination by Mercury and other Pollutants of the English and Wabigoon and Related River Systems

The Hon. I. Scott
Attorney General

1st Reading	June 11th, 1986
2nd Reading	June 26th, 1986
3rd Reading	June 26th, 1986
Royal Assent	July 7th, 1986

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Bill 76

1986

An Act to implement the Terms of a Settlement of all Claims arising out of the Contamination by Mercury and other Pollutants of the English and Wabigoon and Related River Systems

Preamble

WHEREAS the Government of Canada, the Government of Ontario, Reed Inc., Great Lakes Forest Products Ltd., The Islington Indian Band and The Grassy Narrows Indian Band have entered into a settlement of all claims and causes of action, past, present and future, arising out of the discharge by Reed Inc. and its predecessors of mercury and other pollutants into the English and Wabigoon and related river systems and the continuing presence of any such pollutants, including the continuing but now diminishing presence of methylmercury, in the related ecosystems since its initial identification in 1969;

AND WHEREAS the discharge of such pollutants and governmental actions taken in consequence thereof may have had and may continue to have effects in respect of the social and economic circumstances and the health of the present and future members of the Bands;

AND WHEREAS the Government of Canada and the Government of Ontario have assumed certain obligations under the settlement in favour of the Bands;

AND WHEREAS the settlement provides, among other things, for the payment of certain sums to each Band, for the establishment of The Grassy Narrows and Islington Bands Mercury Disability Board, the establishment of the Grassy Narrows and Islington Bands Mercury Disability Fund, the payment of benefits to Band members and, subject to certain exceptions contained in the settlement, the abolition of all existing and future rights of action of the Bands and of every past, present or future member of the Bands, and the estates thereof, in respect of any claims and causes of action that are the subject of the settlement, in consideration of the rights and benefits set out in the settlement;

AND WHEREAS it is expedient that the Legislature give effect to and implement the terms of the settlement:

Therefore, Her Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:

Definitions

1. In this Act,

"administrator" means a person authorized under this Act to administer the Fund in accordance with a plan document;

"applicant" means any member or past member of a Band who makes an application or on whose behalf an application is made and lodged with the administrator, and shall be deemed to include, as if a member of a Band, a registered Indian customarily resident on a reserve before the 1st day of October, 1985;

"application" means a written application, in prescribed form, of an applicant and includes a medical report in prescribed form from an authorized physician;

"authorized physician" means a physician entitled to practice medicine in any jurisdiction in Canada or the United States of America and designated as an authorized physician by the Board;

"award" means a decision of the Board to make available a benefit to an applicant in respect of an application and includes a determination by the administrator which has not been reviewed by the Board;

"Band" means The Islington Band of Indians or The Grassy Narrows Band of Indians and "the Bands" means both of them and includes, for the purposes of sections 36 and 39, a registered Indian customarily resident on a reserve before the 1st day of October, 1985;

"Band Council" means the Council of a Band;

"benefit" means the monetary amounts paid or payable by the administrator pursuant to an award and "maximum benefit" means the maximum monetary amounts payable in accordance with the terms of the settlement;

"Board" means The Grassy Narrows and Islington Bands Mercury Disability Board established by this Act;

"certificate" means a resolution of the Council of the Band of which an applicant is a member, setting forth such matters as the Board may prescribe;

"condition" means an observable medical symptom, sign or condition, or combination of related medical symptoms, signs or conditions which,

(a) is a known condition, or

(b) has been determined by the Board to constitute a condition, on the basis that it is reasonably consistent with mercury poisoning and capable of significantly impairing the quality of life or limiting the activities of an applicant, and "known condition" means any of the conditions specified as known conditions in the settlement;

"costs of the Board" means,

(a) fees and disbursements payable to or incurred by or on behalf of the members of the Board in connection with their duties as members,

(b) the personal expenses of an applicant awarded by the Board under section 29, and

(c) the expenses incurred by the Board in consulting with professionally qualified persons under clause 6 (1) (b),

but does not include the fees and disbursements of a member who is a Band representative or of a member who is an employee of any other party to the settlement;

"depletion" means the total amount of reserves maintained by the administrator;

"disability" means a condition or combination of conditions observed by an authorized physician upon examination of an applicant;

"disbursements" means the costs of travel, accommodation, meals and communications reasonably incurred by or on behalf of members of the Board in connection with their duties as members;

"fiscal year" means the period from the 1st day of April in one year to the 31st day of March in the next year;

"Fund" means the Grassy Narrows and Islington Bands Mercury Disability Fund established by this Act;

"plan document" means the document or documents which define the responsibilities of the administrator and includes an agreement between the Board, or members of the Board, and the administrator, the schedules prescribing criteria for persons who may obtain assistance for disability and the levels of benefits, Neurological Grading Guidelines, Clinical Neurological Examination Protocol and the form of application prescribed by the Board;

"prescribed" means prescribed by the Board;

"reserve" means, as the context requires, the land set aside for the use and benefit of a Band or an amount designated by the administrator according to actuarial principles for the satisfaction of an award;

"settlement" means a settlement made in the public interest with the Bands, as set out in a Memorandum of Agreement signed by the parties thereto in the month of November, 1985, of disputes arising out of the discharge, by Reed Inc. and its predecessors, of mercury and any other pollutants into the English and Wabigoon and related river systems, and the effects which the discharge of such mercury and other pollutants and the continuing but now diminished presence of methylmercury in the related ecosystems may have had and may continue to have upon, and the concerns raised in respect of, the social and economic circumstances and the health of the present and future members of the Bands;

"undepleted balance" means the actual balance of the Fund including accrued income, less depletion.

Purpose of Act

2. The purpose of this Act is to implement, to the extent that the legislative authority of the Legislature extends thereto, the terms of a settlement, subject to certain exceptions contained therein, of all claims, whether past, present or future, arising out of the contamination by mercury and other pollutants of the English and Wabigoon and related river systems, the terms of which settlement are embodied in a Memorandum of Agreement signed by the parties thereto in the month of November, 1985, made between Her Majesty the Queen in Right of Canada as represented by the Minister of Indian Affairs and Northern Development, Her Majesty the Queen in Right of the Province of Ontario, Reed Inc., Great Lakes Forest Products Ltd., The Islington Indian Band and The Grassy Narrows Indian Band.

Board established

3.—(1) A board to be known as "The Grassy Narrows and Islington Bands Mercury Disability Board" is hereby established.

Composition of Board

(2) The Board shall consist of seven members, composed of a chairman and,

(a) two members, one of whom is a representative of one Band and one of whom is a representative of the other Band;

(b) two members, each of whom is a duly qualified physician; and

(c) two members who are not representatives or members of either Band or duly qualified physicians.

Appointment of Board members

4.—(1) The chairman and other members of the Board shall be appointed by a search committee, constituted in accordance with the terms of the settlement, on such terms and conditions as the search committee agrees upon with each Board member.

Appointments or replacements to be unanimous

(2) The chairman and other members of the Board may be replaced from time to time by the search committee, and every appointment or replacement must be the unanimous decision of the search committee and shall be certified in writing by each member of the committee.

Costs of the Board

(3) Pursuant to the settlement, Canada, Ontario, The Islington Indian Band and The Grassy Narrows Indian Band shall each pay 25 per cent of the costs of the Board.

Level of disbursements

(4) Disbursements of the Board or of members of the Board, as the case may be, shall generally be in accordance with the levels from time to time in effect in respect of employees of Ontario.

Collection of costs of Board by administrator

(5) The administrator shall, in accordance with the procedures prescribed by the regulations made under this Act,

(a) collect the costs of the Board from time to time from the parties liable therefor; and

(b) pay the moneys when received to the persons entitled thereto.

Liability of Board

(6) Neither the Board nor any member thereof is liable for any act done or decision made in good faith in relation to any aspect of its proceedings.

Panel for decision of Board

5. The chairman, the two Band representatives and two other members, designated for the purpose by the chairman, constitute a panel of the Board and are sufficient for the exercise of all the jurisdiction and powers of the Board in connection with the making of a decision by the Board.

Powers of Board

6.—(1) The Board may,

(a) consult with and obtain the assistance of any official of the Government of Canada or of Ontario who is able to provide information, advice or assistance to the Board in respect of public health, public health education or any government programs that the Board considers may touch upon the matter of mercury poisoning;

(b) consult with such professionally qualified persons as the Board considers necessary;

(c) make such recommendations as the Board considers appropriate to the Bands or to any minister of the Government of Canada or Ontario;

(d) amend the plan document in accordance with subsection 22 (1);

(e) amend, or with the consent of the Attorney General of Ontario, terminate an agreement with an administrator and enter into an agreement with another administrator;

(f) have regard to the terms of the settlement for the purpose of interpreting and giving effect to this Act,

and shall,

(g) supervise the administration of the Fund and make awards or supervise the making of awards by the administrator in accordance with this Act; and

(h) designate from time to time as authorized physicians two or more physicians that the Board considers,

(i) have expert knowledge in respect of conditions consistent with methylmercury poisoning, and

(ii) will be available and may be required for the purpose of providing medical reports in respect of applicants.

(2) The Board may, Idem

(a) prescribe the form of an application;

(b) prescribe the contents of an affidavit that is to accompany an application;

(c) prescribe the matters that are to be included in a certificate;

(d) prescribe the form of medical report to be submitted with an application;

(e) prescribe any other matter or thing that by this Act is to be or may be prescribed.

(3) The Board may, in its discretion, make an award that takes effect on a day not earlier than the day the application relating to the award was made. Retroactive application of award

7. Where the Board considers that, after the date of the settlement, Where conduct of applicant to be considered by Board

(a) the conduct of an applicant has contributed and is contributing to the continuation or exacerbation of a disability;

(b) the applicant at the time of the conduct had an understanding of its possible effects; and

(c) the conduct occurred under circumstances where the applicant knew or ought to have known that a practical alternative form of conduct without significant disadvantage was available,

the Board,

(d) shall consider the conduct in making or reviewing an award and may establish or vary conditions in the award; and

(e) may, where there are clear clinical grounds for concluding that the conduct has contributed to the continuation or exacerbation of the disability or where the Board finds that any condition attached to an award under clause (d) has been disregarded, make

or vary an award to provide a benefit in such lesser amount than would otherwise be provided as the Board considers appropriate.

Fund to be established

8.—(1) There shall be established and maintained a fund to be known as the Grassy Narrows and Islington Bands Mercury Disability Fund into which shall be deposited by each Band the sum of money set out in the settlement.

Agreement between Board and administrator

(2) The Board shall make use of the services of an administrator in the investment, management and administration of the Fund and shall, subject to the approval of the Attorney General of Ontario, enter into such agreement or agreements with any person as the Board considers necessary for that purpose.

Gifts or bequests

(3) The administrator may,

(a) accept and administer as part of the Fund any unconditional gift or bequest from any person; and

(b) with the approval of the Board, accept and administer in accordance with the conditions attached thereto, any conditional gift or bequest from any person.

When Board not to approve acceptance of gift or bequest

(4) The Board shall not approve the acceptance of any conditional gift or bequest if the Board considers that the conditions attached thereto are not consistent with the objects of this Act or the administration of the Fund.

Income forms part of Fund

(5) The income of the Fund shall form part of the Fund.

Benefits paid out of Fund

(6) Every benefit paid by the administrator under the authority of this Act shall be paid out of the Fund.

Fees and expenses of administrator

(7) The fees and approved expenses of the administrator as provided for in the plan document shall be paid out of the Fund.

Reserves

(8) The administrator shall, in respect of each award, set aside and maintain a reserve, determined and revised from time to time in accordance with actuarial principles, in the amount estimated to be required, together with the income thereon, to provide for the payment of benefits under the award.

When undepleted balance is less than $100,000

(9) In the event that the undepleted balance is less than $100,000 at any time, the administrator shall thereupon give notice thereof in writing to the Bands, the Treasurer of

Ontario and the Board and thereupon the Treasurer shall from time to time as required deposit to the Fund out of the Consolidated Revenue Fund such amount of money as is required to raise the undepleted balance to not less than $100,000.

Audit of Fund

(10) The administrator shall provide for an audit of the Fund annually and at the end of each fiscal year shall provide a copy of the auditor's report to the Bands, the Attorney General of Ontario, the Treasurer of Ontario and the Board.

Application for assistance

9. An applicant may, at any time before the Fund is closed, submit an application in the prescribed form for assistance from the Fund in respect of disability which the applicant believes is caused by mercury poisoning.

Material to accompany application

10. An application shall be accompanied by,

(a) an affidavit of the applicant setting out the matters prescribed;

(b) in respect of the conditions manifested in the disability, a medical report from an authorized physician;

(c) a certificate of the Council of the Band of which the applicant is a member setting out such matters as the Board prescribes; and

(d) such other material as the Board prescribes.

Submission of application to administrator

11. Every application shall be submitted to the administrator and, in the event that an application is submitted by an applicant to the Board or to a member of the Board, the Board or the member shall forthwith transmit the application to the administrator.

Application to be in prescribed form

12. The administrator shall determine whether each application is in the prescribed form and, if it is not, shall provide written notice to the applicant setting out the deficiencies.

Corrections

13. Any deficiencies may be corrected without resubmission of the entire application.

Duties of administrator on receipt of application

14. Upon receipt of an application in the prescribed form, the administrator shall, within twenty-one days,

(a) if the application qualifies in accordance with the plan document and is accompanied by the material set out in section 10, subject to clause (c), advise

the applicant and the Board in writing that the application is accepted and specify the benefit payable in accordance with the plan document;

(b) if the application does not appear to the administrator to qualify in accordance with the plan document or is not accompanied by the material set out in section 10, advise the applicant and the Board in writing of the reason it does not appear to qualify; or

(c) if unable to determine whether the application qualifies, or what is the benefit payable, in accordance with the plan document, or if the administrator believes that there is any reason for the application to be considered by the Board, transmit the application to the Board together with such questions for the Board's decision as the administrator considers appropriate, and advise the applicant in writing that the application has been transmitted to the Board.

Provision of interim benefits to applicant

15. When an application is transmitted to the Board under clause 14 (c), the administrator may, with the consent of the chairman, provide such benefit to the applicant as the administrator considers appropriate pending a decision from the Board and, in the event that the Board subsequently decides that an award should not be made or that a lower benefit should be provided, the amounts or the excess amounts which have been provided shall not be recovered from the applicant.

Where Board required to review decision

16. An applicant or the Board or any member of the Board may, at any time after a determination by the administrator under clause 14 (a) or (b), by notice in writing to the Board or to the applicant or to the Board and the applicant respectively, require that the decision of the administrator be reviewed.

Powers of Board

17. The Board shall, at its next meeting, or in any event within four months or, if more than two years after the coming into force of this Act, eight months after receipt of an application under clause 14 (c) or of notice under section 16, review the application and,

(a) approve the application and make or confirm or vary an award; or

(b) reject the application.

Provision of benefits

18. When an application is subject to review under section 16, the administrator shall, pending receipt of the Board's decision, provide a benefit, or not, in accordance with the

determination made under section 14 and, if the determination is varied by the award of the Board, the administrator shall not give retroactive effect to the award unless expressly so directed by the Board's decision.

Chairman to certify decision of Board

19. The chairman shall set forth and certify in writing every decision of the Board and shall incorporate in the decision the answer of the Board to any question submitted by the administrator under clause 14 (c), and shall provide a copy of the decision to the applicant and to the administrator.

Review by Board

20. The Board may in its sole discretion, at any time after giving notice to the applicant, on its own motion or upon request from an applicant or any member of the Board or the Attorney General of Ontario, review and vary any award.

Decision final

21.—(1) The Board has exclusive jurisdiction to exercise the powers conferred upon it by this Act and to determine all questions of fact and law that arise in any matter before it and, subject to sections 20 and 23, every decision of the Board is final and binding and is not subject to review and, subject to this Act, shall be given effect by the administrator.

Non-application of R.S.O. 1980, c. 484

(2) The *Statutory Powers Procedure Act* does not apply to the Board in its exercise of a statutory power of decision under this Act.

Consent required to amend plan document

22.—(1) The Board shall not amend the plan document, except as provided for in subsection (2), without the consent of the Attorney General of Ontario, the Minister of Indian and Northern Affairs, Canada and the Band Councils.

Addition of further conditions to plan document

(2) The Board may add any further condition to the plan document and assign points in respect of such condition in conformity with the distribution of points then in effect for other conditions.

Award to be based on nature and extent of disability

(3) Notwithstanding anything in this Act, the Board shall make or confirm or vary each award in such amount as it considers appropriate, having regard to the nature and extent of an applicant's disability, but shall not make any award in an amount greater than the maximum benefit.

Procedure

23. The Board shall establish its own procedure including, without limitation, the location of its meetings, and any applicant aggrieved by the procedure, even where the procedure prescribed by this Act has been followed, may request the Board to review an award under section 20.

Evidence

24.—(1) The Board may make any decision without hearing any evidence but may, in its sole discretion, hear evidence under oath and every member of the Board may examine or cross-examine any person.

Applicant may be heard

(2) Any applicant may appear and be heard at any meeting of the Board at which his or her application or award is to be considered or reviewed, and the Board shall provide notice to each applicant accordingly.

Examination of persons

25. No person other than a member of the Board may, except to the extent permitted by the Board in its sole discretion, examine or cross-examine any person at any meeting of the Board.

Report to be considered

26. The Board shall consider, in respect of each condition manifested in the disability, the medical report of an authorized physician before making an award.

What Board may consider

27. The Board shall consider any information, advice, report, evidence or other material or matter which, in its sole discretion, it deems useful for the purpose of deciding any matter including whether it may be appropriate to make or vary any award or awards, and may hear or, subject to subsection 24 (2), not hear any person.

No costs

28. The Board shall not award costs of any application.

Personal expenses

29. The Board may, in its sole discretion, direct payment of all or part of the personal expenses of an applicant in connection with an application, whether or not the Board makes an award.

Quorum

30.—(1) The quorum of the Board shall be four of the panel established under section 5 and the decision of three or more members of the panel is the decision of the Board, and where a decision is not concurred in by three or more members of the Board,

(a) in the case of a review brought under section 16, the decision of the administrator shall be deemed to be confirmed; and

(b) in the case of an application transmitted under clause 14 (c), the application shall be deemed to be rejected.

Use of telecommunications

(2) The Board may, with the consent of the members of the panel established under section 5 and, where applicable, of an applicant, conduct any meeting or make any decision by tele-

communications without the members being physically present in the same place.

Five members only to participate in decision

(3) Other than for the purposes of section 32 and subject to subsection (4) of this section, not more than five members shall participate in any decision of the Board.

Exception

(4) Notwithstanding section 5, the chairman may, if the nature of any decision appears to justify the consequent cost, establish a panel of all members of the Board, in which event the quorum shall be six and the decision of four or more members is the decision of the Board, and where a decision is not concurred in by four or more members of the Board,

(a) in the case of a review brought under section 16, the decision of the administrator shall be deemed to be confirmed; and

(b) in the case of an application transmitted under clause 14 (c), the application shall be deemed to be rejected.

Assistance to applicant by Board member

31. Any member of the Board may assist an applicant in the preparation or submission of an application to the administrator or before the Board and shall not, by reason thereof, be disqualified from participating in the decision of the Board.

Termination of Fund

32.—(1) The Fund may be terminated and closed by the Board after the expiry of three consecutive years from the date of the last award or variation of an award, but in any event not sooner than the 1st day of January, 2001, and with the consent of at least six members of the Board.

Report of Board

(2) The Board shall, before consenting to the Fund being closed, provide to the Minister of Indian and Northern Affairs, Canada, the Attorney General of Ontario and each of the Bands a report in respect of the efficacy of the Fund in achieving the objects of this Act.

Duty of administrator

(3) Upon the Board consenting to the Fund being closed,

(a) the administrator shall, if then possible, purchase from the balance of the Fund for every applicant then in receipt of a benefit a life annuity in the amount of the annual benefit or, if not then possible, do so as soon as it becomes possible, and thereupon advise the Board that the Fund is closed; and

(b) the administrator shall thereupon pay, to the extent of any balance of the Fund remaining, first to the

Treasurer of Ontario the total of any amounts paid by the Treasurer under subsection 8 (9), and then to each Band one-half of any balance remaining.

Board dissolved

(4) Upon the acceptance by the Attorney General of Ontario of the report provided for in subsection (2) and completion of the payments by the administrator provided for in subsection (3), the Board shall be dissolved.

Indemnification of Treasurer of Ontario

33. The Treasurer of Ontario shall be deemed to be and hereafter continue to be indemnified by each of the Bands, to the extent of any amounts paid to each Band under clause 32 (3) (b) together with interest calculated on such payments at a rate equal to the Consumer Price Index for Canada published by Statistics Canada, against liability for any claim by a person who would have been eligible to be an applicant but for the termination of the Fund brought against any party to the settlement in respect of the matters contemplated by the settlement.

Reciprocal legislation by Canada

34. This Act is enacted in contemplation of a reciprocal enactment by the Parliament of Canada for the purpose of giving effect in part to the settlement, and shall be construed accordingly.

Effect of Act

35. This Act shall have force and effect only to the extent that it is within the legislative jurisdiction of the Legislature.

Benefits not treated as income for purposes of other Acts

36.—(1) Notwithstanding any other Act of the Legislature, the benefits paid or payable to a member of a Band under the terms of the settlement shall not be considered or treated as income for the purposes of any other Act of the Legislature and no payment to which that member is entitled under any other Act of the Legislature shall be reduced by reason of the payment or availability of benefits to that member under the terms of the settlement.

Availability of programs or services not diminished

(2) The moneys paid to the Bands in accordance with the settlement and the benefits paid from the Fund to members of the Bands shall be considered as additional to any applicable program or service offered by the Government of Ontario, and the availability to the Bands and the members thereof of such program or service shall not be diminished by reason of the moneys paid under the settlement or the benefits paid from the Fund.

Insured services under R.S.O. 1980, c. 197

37. Every examination, service, test or report provided by, or at the direction of, an authorized physician in respect of an applicant in accordance with a requirement of the plan

document, the administrator or the Board shall be deemed to be an insured service under the *Health Insurance Act*.

Representative action

38. For greater certainty, Ontario Supreme Court Action Number 14716/77 (Judicial District of York) shall be deemed to be a representative action, and its disposition in accordance with the settlement shall not be called into question in any court.

Existing and future rights of action abolished

39. All existing and future rights of action of the Bands and of every past, existing or future member of the Bands, and the estates thereof, in respect of claims and causes of action which are the subject of the settlement are, in consideration of and pursuant to the settlement, abolished.

Limitation on liability in respect of claims

40.—(1) The total liability in respect of any claim by a past, present or future member of a Band or a registered Indian customarily resident on a reserve before the 1st day of October, 1985, brought against any party to the settlement in respect of matters contemplated by the settlement, whether brought before or after the Fund is closed, shall be not more than the cost, at the time of the claim, of a life annuity in the amount of the annual maximum benefit payable from the Fund at the time the claim was brought or immediately prior to the Fund being closed, as the case may be.

Does not contemplate claims may be brought

(2) Section 33 and this section shall not be deemed to contemplate that any claim described in section 33, notwithstanding the other provisions of this Act, may be brought or maintained.

Settlement entire

41. The settlement is entire and the consideration flowing to the Bands and their present and future members therefrom shall be deemed to flow to every such member, and the settlement shall not be deemed to be divided between the Bands and their present and future members by this Act or anything done under the authority of this Act.

Regulations

42. The Lieutenant Governor in Council may make regulations prescribing, for the purposes of subsection 4 (5), the procedures to be followed in the collection of the costs of the Board and in the payment of the moneys received to the persons entitled thereto.

Moneys

43. The moneys required to be paid by Ontario in accordance with the terms of the settlement, including the payment of interest thereon where provided for in the settlement at the rate of 8.52 per cent per annum compounded annually from the 15th day of October, 1985, shall be paid out of the Consolidated Revenue Fund.

Commencement

44. This Act comes into force on a day to be named by proclamation of the Lieutenant Governor.

Short title

45. The short title of this Act is the *English and Wabigoon River Systems Mercury Contamination Settlement Agreement Act, 1986*.

[redacted]

000067

This is Exhibit "D" referred to in the affidavit of SIMON FOBISTER sworn before me, this 30th day of JULY 20 15

affirmed

Joseph Castrilli
A COMMISSIONER FOR TAKING AFFIDAVITS

JOSEPH CASTRILLI

33-34-35 ELIZABETH II

33-34-35 ELIZABETH II

CHAPTER 23

CHAPITRE 23

An Act to approve, give effect to and declare valid certain agreements between the Government of Canada, the Government of Ontario, Reed Inc., Great Lakes Forest Products Ltd., the Islington Indian Band and the Grassy Narrows Indian Band

Loi approuvant, mettant en oeuvre et déclarant valides certaines conventions entre le gouvernement du Canada, le gouvernement de l'Ontario, Reed Inc., Great Lakes Forest Products Ltd., la bande indienne d'Islington et la bande indienne de Grassy Narrows

[*Assented to 17th June, 1986*]

[*Sanctionnée le 17 juin 1986*]

Preamble

WHEREAS the Government of Canada, the Government of Ontario, Reed Inc., Great Lakes Forest Products Ltd., the Islington Indian Band and the Grassy Narrows Indian Band have entered into an Agreement for the settlement of all claims and causes of action, past, present and future, arising out of the discharge by Reed Inc. and its predecessors of mercury and other pollutants into the English and Wabigoon and related river systems and the continuing presence of any such pollutants, including the continuing but now diminishing presence of methylmercury in the related ecosystems since its initial identification in 1969;

AND WHEREAS the discharge of such pollutants and governmental actions taken in consequence thereof may have had and may continue to have effects in respect of the social and economic circumstances and the health of the present and future members of the Bands;

AND WHEREAS the Government of Canada and the Government of Ontario have assumed certain obligations under the Agreement in favour of the Bands;

AND WHEREAS the Agreement provides, among other things, for the payment of certain sums to each Band, the establish-

Préambule

ATTENDU QUE le gouvernement du Canada, le gouvernement de l'Ontario, Reed Inc., Great Lakes Forest Products Ltd., la bande indienne d'Islington et la bande indienne de Grassy Narrows sont convenus de régler toute revendication et tout droit d'action, passés, présents et futurs, découlant du déversement, par Reed Inc. et ses prédécesseurs, de mercure et de tout autre polluant dans le réseau hydrographique English-Wabigoon, y compris tant la présence continue de ces polluants que la présence continue mais en voie de diminution de mercure méthylé dans les écosystèmes connexes depuis qu'on a constaté sa présence en 1969;

ATTENDU QUE le déversement de ces polluants et les mesures gouvernementales prises à cet égard peuvent avoir eu et continuer d'avoir des incidences en ce qui touche la conjoncture économique et sociale, ainsi que la santé, des membres actuels et futurs des bandes en question;

ATTENDU QUE le gouvernement du Canada et le gouvernement de l'Ontario ont, aux termes de la Convention, contracté certaines obligations à l'égard des bandes en question;

ATTENDU QUE la Convention prévoit, notamment, le paiement de certaines sommes à chacune des bandes en question, la consti-

ment of the Grassy Narrows and Islington Bands Mercury Disability Board, the establishment of the Grassy Narrows and Islington Bands Mercury Disability Fund, the payment of benefits to Band members and, subject to certain exceptions contained in the Agreement, the abolition of all existing and future rights of action of the Bands and of every past, present or future member of the Bands, and the estates thereof, in respect of any claims and causes of action that are the subject of the Agreement, in consideration of the rights, privileges and benefits set out in the Agreement;

AND WHEREAS the Government of Canada and the Government of Ontario are obligated, pursuant to section 2.1 of the Agreement, to recommend to Parliament and the Legislature of Ontario, respectively, special legislation to give effect to the Agreement;

NOW, THEREFORE, Her Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:

SHORT TITLE

Short title

1. This Act may be cited as the *Grassy Narrows and Islington Indian Bands Mercury Pollution Claims Settlement Act*.

INTERPRETATION

Definitions

2. (1) In this Act,

"Agreement" «*Convention*"

"Agreement" means the Memorandum of Agreement between Her Majesty the Queen in Right of Canada as represented by the Minister of Indian Affairs and Northern Development, Her Majesty the Queen in Right of the Province of Ontario, Reed Inc., Great Lakes Forest Products Ltd., the Islington Indian Band and the Grassy Narrows Indian Band, signed by each party thereto in the month of Novem-

tution du Conseil chargé d'apporter de l'aide aux membres des bandes indiennes de Grassy Narrows et d'Islington souffrant d'incapacité due à la pollution au mercure, la création du fonds d'aide aux membres des bandes de Grassy Narrows et d'Islington souffrant d'incapacité due à la pollution au mercure, le paiement d'indemnités aux membres de ces bandes et, sous réserve de certaines exceptions que stipule la Convention, l'annulation de tous les droits d'action présents et futurs de ces bandes, de leurs membres, anciens, actuels ou futurs, ainsi que de leur succession, à l'égard des revendications et des droits d'action qui font l'objet de la Convention et en contrepartie des droits, privilèges et avantages qu'elle prévoit;

ATTENDU QUE le gouvernement du Canada et le gouvernement de l'Ontario se sont, en application de l'article 2.1 de la Convention, engagés à recommander au Parlement et à la Législature de l'Ontario, selon le cas, l'adoption de lois spéciales visant à mettre en oeuvre la Convention en vigueur,

SA MAJESTÉ, sur l'avis et avec le consentement du Sénat et de la Chambre des communes du Canada, décrète :

TITRE ABRÉGÉ

Titre abrégé

1. *Loi sur le règlement des revendications des bandes indiennes de Grassy Narrows et d'Islington (pollution par le mercure).*

DÉFINITIONS

Définitions

2. (1) Les définitions qui suivent s'appliquent à la présente loi.

«bande» La bande indienne d'Islington ou la bande indienne de Grassy Narrows.

«bande» "*Band*"

«biens mobiliers» S'entend des biens personnels visés à la *Loi sur les Indiens*.

«biens mobiliers» *French version only*

«contrat de mise en main tierce» Le contrat de mise en main tierce daté du 16 décembre 1985, conclu entre Great Lakes Forest

«contrat de mise en main tierce» "*Escrow Agreement*"

"Band" «*bande*»

"Escrow Agreen «*contra mise en tierce*»

Regist Indian memb Band

Agre appr

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ber, 1985, tabled in the House of Commons by the Minister of Indian Affairs and Northern Development on May 21, 1986 and recorded as document number 331-7/43, as amended by the Escrow Agreement;

"Band" «*bande*»

"Band" means the Islington Indian Band or the Grassy Narrows Indian Band;

"Escrow Agreement" «*contrat de mise en main tierce*»

"Escrow Agreement" means the Escrow Agreement between Great Lakes Forest Products Limited, Her Majesty the Queen in Right of the Province of Ontario, Reed Inc. and National Trust Company, the terms of which were approved of and consented to by the Grassy Narrows Indian Band and Islington Indian Band and by Her Majesty the Queen in Right of Canada as represented by the Minister of Indian Affairs and Northern Development, dated as of the 16th day of December, 1985, tabled in the House of Commons by the Minister of Indian Affairs and Northern Development on May 21, 1986 and recorded as document number 331-7/43.

Products Limited, Sa Majesté la Reine du chef de la province d'Ontario, Reed Inc. et National Trust Company, lequel a fait l'objet de l'approbation et de l'assentiment de la bande indienne de Grassy Narrows, de la bande indienne d'Islington et de Sa Majesté la Reine du chef du Canada représentée par le ministre des Affaires indiennes et du Nord canadien, et déposé devant la Chambre des communes par le ministre des Affaires indiennes et du Nord canadien le 21 mai 1986 sous le numéro d'enregistrement 331-7/43.

«Convention» "*Agreement*"

«Convention» Le protocole d'entente conclu entre Sa Majesté la Reine du chef du Canada représentée par le ministre des Affaires indiennes et du Nord canadien, Sa Majesté la Reine du chef de la province d'Ontario, Reed Inc., Great Lakes Forest Products Ltd., la bande indienne d'Islington et la bande indienne de Grassy Narrows, signé par chacune des parties au cours du mois de novembre 1985 et déposé devant la Chambre des communes par le ministre des Affaires indiennes et du Nord canadien le 21 mai 1986 sous le numéro d'enregistrement 331-7/43, compte tenu des modifications apportées par le contrat de mise en main tierce.

Registered Indian deemed member of Band

(2) Any person registered as an Indian pursuant to the *Indian Act* who was customarily resident on a reserve of a Band before October 1, 1985 and who, pursuant to paragraph 1(*b*) of Schedule A to the Agreement, is deemed to be an applicant within the meaning of that paragraph shall, for the purposes of this Act, be deemed to be a member of the Band.

Présomption d'appartenance à la bande

(2) La personne qui, résidant habituellement dans une réserve de la bande avant le 1er octobre 1985, est un Indien inscrit au sens de la *Loi sur les Indiens* et qui, conformément à l'alinéa 1*b*) de l'annexe A de la Convention, est réputée être un requérant au sens de cet alinéa est, pour l'application de la présente loi, réputée être un membre de la bande.

AGREEMENT

CONVENTION

Agreement approved

3. (1) The Agreement is hereby approved, given effect and declared valid.

Approbation

3. (1) La Convention est approuvée, mise en oeuvre et déclarée valide.

Conferral of rights, privileges and benefits

(2) On the abolition of all rights of action referred to in subsection (3), the beneficiaries under the Agreement shall have the rights, privileges and benefits set out in the Agreement.

Octroi de droits, privilèges et avantages

(2) Les bénéficiaires visés par la Convention ont, à compter de l'annulation des droits d'action visés au paragraphe (3), les droits, privilèges et avantages qu'elle prévoit.

Abolition of rights of action

(3) Except as provided in sections 1.16 and 2.3 of the Agreement, all existing and future rights of action of a Band and of every past,

Annulation des droits d'action

(3) Sauf disposition contraire des articles 1.16 et 2.3 de la Convention, est annulé tout droit d'action présent et futur de la bande, de

present and future member of a Band, and of the estates thereof, in respect of any of the claims or causes of action that are the subject of the Agreement are hereby abolished.

ses membres, anciens, actuels ou futurs, ainsi que de leur succession, à l'égard des revendications et des droits d'action qui font l'objet de la Convention.

Exception to *Indian Act*

4. (1) Subject to subsection (2), for the purposes of subsection 90(1) of the *Indian Act*,

(*a*) all moneys paid or payable to a Band pursuant to the Agreement, and any personal property purchased by the Band therewith,

(*b*) all moneys paid at the discretion of a Band in accordance with the Agreement to a trust or corporation, and any personal property purchased by the trust or corporation therewith, and

(*c*) any real or personal property purchased by a Band or by a trust or corporation for the purpose of giving effect to section 2.5 of the Agreement,

shall be deemed to be personal property that was given to the Band under an agreement between the Band and Her Majesty but subsections 90(2) and (3) of the *Indian Act* shall not apply with respect thereto.

Loi sur les Indiens : exception

4. (1) Sous réserve du paragraphe (2) et pour l'application du paragraphe 90(1) de la *Loi sur les Indiens*, sont réputés être des biens mobiliers donnés à la bande aux termes d'une convention conclue entre la bande et Sa Majesté :

a) les sommes payées ou payables à la bande conformément à la Convention, de même que les biens mobiliers que la bande a achetés avec ces sommes;

b) les sommes que la bande, à sa discrétion, verse à une fiducie ou à une personne morale conformément à la Convention, de même que les biens mobiliers que la fiducie ou la personne morale a achetés avec ces sommes;

c) les biens immobiliers ou les biens mobiliers achetés par la bande, une fiducie ou une personne morale afin de mettre en oeuvre l'article 2.5 de la Convention.

Toutefois, les paragraphes 90(2) et (3) de la *Loi sur les Indiens* ne s'y appliquent pas.

Idem

(2) Subsection 89(1) of the *Indian Act* or any enactment of Parliament to the like effect shall not apply

(*a*) in respect of any real or personal property referred to in paragraph (1)(*c*); or

(*b*) for the purposes of paragraph 41(a) of Schedule A to the Agreement, in respect of any amount paid pursuant to subparagraph 40(*c*)(ii) of Schedule A to the Agreement or pursuant to any enactment of the Legislature of Ontario that implements that subparagraph or in respect of any personal property purchased by a Band therewith.

Idem

(2) Ni le paragraphe 89(1) de la *Loi sur les Indiens*, ni les autres dispositions législatives du Parlement ayant un effet semblable ne s'appliquent :

a) aux biens immobiliers ou aux biens mobiliers visés à l'alinéa (1)*c*);

b) en ce qui concerne l'alinéa 41*a*) de l'annexe A de la Convention, aux sommes payées conformément au sous-alinéa 40*c*)(ii) de l'annexe A de la Convention ou conformément aux dispositions législatives de la Législature de l'Ontario destinées à mettre ce sous-alinéa en oeuvre, ainsi qu'aux biens mobiliers que la bande a achetés avec ces sommes.

Exception to *Canada Health Act*

5. Every examination, service, test or report made or provided by a medical practitioner in respect of a member of a Band pursuant to the Agreement shall be deemed for the purposes of the *Canada Health Act* to be an insured health service provided under the health care insurance plan of the Province of Ontario.

Loi canadienne sur la santé : exception

5. Les examens, services, tests et rapports faits ou fournis, selon le cas, par un médecin à l'égard des membres de la bande conformément à la Convention sont réputés, pour l'application de la *Loi canadienne sur la santé*, être des services de santé assurés fournis en application du régime d'assurance-santé de la province d'Ontario.

Benefits not to be treated as income

6. (1) The benefits paid or payable to a member of a Band pursuant to the Agreement shall not be treated as income of that member for the purposes of any other Act of Parliament.

Government programs to continue

(2) No payment or service to which a Band or any member of a Band is entitled under any other Act of Parliament or under any program of the Government of Canada shall be reduced or diminished by reason of the payment or availability of benefits to the Band or any member of the Band pursuant to the Agreement.

REGULATIONS

Regulations

7. The Governor in Council may make such regulations as are necessary for the purpose of carrying out the Agreement or for giving effect to any of the provisions thereof.

APPROPRIATION

Payments out of C.R.F.

8. There shall be paid out of the Consolidated Revenue Fund such sums as may be required to meet the monetary obligations of Canada under the Agreement.

COMING INTO FORCE

Coming into force

9. This Act shall come into force on a day to be fixed by proclamation.

Indemnités et revenus des bénéficiaires

6. (1) Les indemnités payées ou payables aux membres de la bande conformément à la Convention ne constituent pas des revenus de ces membres pour l'application de toute autre loi fédérale.

Maintien des programmes gouvernementaux

(2) Le paiement ou la possibilité de paiement d'indemnités à la bande ou à ses membres conformément à la Convention n'a pas pour effet de réduire ou de diminuer les paiements ou services auxquels la bande ou ses membres ont droit en application d'une autre loi fédérale ou d'un programme du gouvernement canadien.

RÈGLEMENTS

Règlements

7. Le gouverneur en conseil peut prendre les règlements nécessaires à l'application de la Convention ou de telle de ses dispositions.

Paiements sur le F.R.C.

8. Les sommes nécessaires au gouvernement du Canada pour s'acquitter des obligations financières que lui impose la Convention sont prélevées sur le Fonds du revenu consolidé.

ENTRÉE EN VIGUEUR

Entrée en vigueur

9. La présente loi entre en vigueur à la date fixée par proclamation.

QUEEN'S PRINTER FOR CANADA © IMPRIMEUR DE LA REINE POUR LE CANADA
OTTAWA, 1986

This is Exhibit "E" referred to in the affidavit of SIMON FOBISTER sworn before me, this 30th day of JULY 20 15

Joseph Castrilli
A COMMISSIONER FOR TAKING AFFIDAVITS

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Information Notice: JOSEPH CASTRILLI

EBR Registry Number: 010-9240

Title:
Forest Management Plan for the Whiskey Jack Forest for the 10-year period April 1, 2012 to March 31, 2022 – Final Plan Inspection

Ministry:
Ministry of Natural Resources

Date Information Notice loaded to the Registry:
December 23, 2013

This notice was first published to the Environmental Registry on February 19, 2010, at the Invitation to Participate stage. It was republished on December 14, 2011 at the Review of Long Term Management Direction stage. It was re-published on January 31, 2013 at the Review of Proposed Operations stage.

It was republished on July 30, 2013 at the Review of Draft Plan stage.

It was republished August 28, 2013 to extend the review period. The remainder of the notice has not been altered.

It was republished on December 23, 2013 at the Final Plan Inspection stage.

Keyword(s): Land | Timber Management | Land use planning | Forests

This notice is for your information. The Environmental Bill of Rights does not require this notice to be placed on the Environmental Registry, however, section 6 of the Act does allow the Environmental Registry to be used to share information about the environment with the public.

Rationale for Exemption to Public Comment:

This proposal is considered to be a proposal for an instrument under the EBR; however, it is not prescribed by Ontario Regulation 681/94 as a classified proposal for purposes of the EBR. Therefore, MNR is not required to post this proposal on the Environmental Registry.

MNR is voluntarily posting this Notice on the Environmental Registry for information purposes to advise interested parties of the formal public consultation opportunities for this proposal in accordance with the requirements of the Forest Management Planning Manual (FMPM). To participate in that consultation process, the public is invited to submit comments to the contact person identified in this notice.

No formal comment period is established under the EBR through this notice.

Description:

The Whiskey Jack Forest is located Northwestern Ontario, with area in both the Ministry of Natural Resources Administrative Districts of Kenora and Red Lake. The Kenora District office takes the lead role coordinating the administrative and planning activities associated with this forest, including the review of the forest management plan.

Of the over 1.1 million hectares in this forest, almost 750,000 are considered productive forestlands. These productive forestlands can be found in both of the Hill's site regions represented in the Whiskey Jack forest. These include Site Region 5-S which corresponds to the northern limit of the Great Lakes- St. Lawrence Forest and Site Region 4-S which is dominated by Boreal Forest conditions.

Contact:

Kurt Pochailo
Management Forester
Ministry of Natural Resources
Regional Operations Division
Northwest Region
Kenora District
808 Robertson Street
PO Box 5080
Kenora Ontario
P9N 3X9
Phone: (807) 468-2597
Fax: (807) 468-2736

Additional Information:

The following government offices have additional information regarding this Notice. To arrange a viewing of these documents please call the Ministry Contact or the Office listed below.

Kenora District
808 Robertson Street
PO Box 5080
Kenora Ontario

Predominant tree species found in this area include jack pine, black spruce, poplar, white spruce, birch and balsam fir. Cedar, larch, ash, red pine and white pine are found intermittently throughout the forest but with a stronger affinity to the southern portions of the area.

The Whiskey Jack forest is a Crown Management Unit with the responsibility of forest management planning held by the MNR, in consultation with the public. Weyerhaeuser iLevel (Kenora) and Kenora Forest Products (Kenora) have wood supply commitments from the forest, as do some smaller mills. Wood fibre from the Whiskey Jack Forest may also go to other mills in Ontario via trades, sales, and other business-to-business negotiations.

Communities within or in close proximity to this forest include Kenora, Sioux Narrows, Redditt, Vermillion Bay, Ear Falls, Grassy Narrows, Wabaseemoong, Wabauskang, and Whitefish Bay.

Decision:

This notice will be updated as new information becomes available.

Purpose of the Notice:

To advise the public that the forest management plan covering forest management activities for the Whiskey Jack Forest for the period 2012-2022 is being prepared. The plan is being prepared in accordance with the Crown Forest Sustainability Act (1994) (CFSA), the Forest Management Planning Manual for Ontario's Crown Forests (2009) (FMPM), and the terms and conditions of the Class Environmental Assessment for Timber Management on Crown Land in Ontario, as extended and amended by MNR's Class Environmental Assessment Approval for Forest Management on Crown Lands in Ontario (MNR-71).

The forest management plan is required to comply with the provisions of the FMPM. The forest management plan will provide for the sustainability of the Crown forest on the management unit, and will outline the long-term strategic direction and objectives for the management related to:

- sustainability of the forest resource;
- biodiversity;
- social and economic matters (including timber harvest levels);
- the provision of forest cover for those values which are dependent on forest cover; and,
- silviculture.

Other Information:

Information about the forest management planning process, information which will be used in the preparation of the plan, and background information about the management unit can be reviewed during normal office hours at the Ministry of Natural Resources Kenora District office. It is recommended that persons make an appointment for viewing. This background information may also be viewed during non-business hours by making an appointment with the government contact person listed in this notice.

Kurt Pochailo, R.P.F.
Plan Author
Ministry of Natural Resources
Kenora District
808 Robertson St., P.O. Box 5080
Kenora, ON P9N 3X9
Phone: (807) 468-2597
Fax: (807) 468-2736
kurt.pochailo@ontario.ca

During the Review of the Draft Forest Management Plan, comments are being sought on the background information to be used in the development of the plan. The Ministry of Natural Resources is collecting comments and information regarding this forest management plan under the authority of the Crown Forest Sustainability Act to

P9N 3X9
Phone: (807) 468-2501

assist in making decisions and determining future public consultation needs. Comments and opinions will be kept on file for use during the operating term of the forest management plan and may be included in study documentation which is made available for public review.

Under the Freedom of Information and Protection of Privacy Act, personal information will remain confidential unless prior consent is obtained. However, this information may be used by the Ministry of Natural Resources as public input on other resource management surveys and projects. For further information regarding this Act, please contact Hassan Mohamed, MNR, Kenora, at 807-468-2580.

Other Public Consultation Opportunities:

In accordance with the provisions of the Forest Management Planning Manual (FMPM), formal public consultation is planned to occur at five stages during the preparation, review and approval of this plan. The FMPM sets out that direct written notice is required to be given to certain individuals and organizations, on the mailing list, at each stage of the planning process; individuals and organizations may request to be added to this list, which is updated at each stage. Public notice is also given through advertisements in local newspapers.

The following is a summary of public and Aboriginal consultation:

Stage One – Invitation to Participate: February 3, 2010

Stage Two – Review of the Long Term Management Direction: December 14, 2011 to January 31, 2012

Stage Three – Information Centre - Review of Proposed Operations: March 4, 2013 to May 6, 2013

Stage Four – Information Centre - Review of the Draft Forest Management Plan: August 29, 2013 to October 31, 2013

Stage Five – Public Inspection of approved Forest Management Plan: December 23, 2013 to January 22, 2014

An approved forest management plan is scheduled for implementation commencing April 1, 2014.

All comments and submissions received for Stages One through Four will be considered as part of the decision-making by the ministry. Under the public consultation provisions of the FMPM, a written response will be provided to all written comments and submissions, and upon request, to all verbal comments. All comments and submissions will become part of the public record. Stage Five is an inspection period only. No comments are being sought at that stage.

There is an opportunity during the forest management planning process to seek resolution of issues with the MNR District Manager or the MNR Regional Director in accordance with the process described in Part A, Section 3.4.1 of the Forest Management Planning Manual (2009).

During the 30-day inspection period, commencing December 23, 2013 and ending January 22, 2014 any person may make a written request to the Director of Environmental Assessment and Approvals Branch, Ministry of the Environment, for an individual environmental assessment of specific proposed forest management activities in the forest management plan. A response to a request for an individual environmental assessment will normally be provided after the completion of the 30-day inspection period.

Add Notice into My Watch List

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Ontario

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Asubpeeschoseewagong Netum Anishinabek

GRASSY NARROWS, ONTARIO P0X 1B0 • PHONE: (807) 925-2201 • FAX: (807) 925-2649

This is Exhibit "F" referred to in the affidavit of SIMON FOBISTER sworn before me, this 30th day of JULY 20 15

Joseph Castrilli
A COMMISSIONER FOR TAKING AFFIDAVITS

JOSEPH CASTRILLI

JC affirmed

Hon. Kathleen Wynne
Premier
Legislative Bldg
Rm 281
Queen's Park
Toronto ON M7A1A1

October 24, 2013

Dear Premier Wynne,

RE: Forest Management Plan for the Whiskey Jack Forest for the 10-year period April 1, 2012 to March 31, 2022

The Grassy Narrows First Nation Chief and Council reject the Forest Management Plan for the Whiskey Jack 2012-2022 on the basis of failure to consult and infringes on our Aboriginal and Treaty Rights

This document attempts to make plans to clearcut log the lands that we use for our physical, spiritual, and cultural survival. We cannot allow this.

For centuries we have raised our voices to protect our rights and our land. But Ontario and Canada continue to ignore us with devastating consequences for our people and our land. This plan is a violation of our inherent human rights given to us by the Creator, as well as our rights as recognized by Treaty 3, the Constitution of Canada, and the UN Declaration on the Rights of Indigenous Peoples.

Ontario has a long and terrible legacy of imposing decisions on our people and our lands against our will and without consent. The theft of our children to residential schools, the damming of our river, the relocation of our community, mercury poisoning, and clearcut logging have all taken a deep toll on our health, our culture, and our way of life.

Premier Wynne, you came to our community in the summer of 2012 and said that you wanted to rebuild Ontario's relationship with Grassy Narrows. You said that this time you wanted to "get it right." Instead MNR officials have continued to unilaterally pursue clearcut logging plans. These planning processes were and continue to be developed without our participation, knowledge and consent. We are frustrated that these processes are conducted entirely outside of the five year long process we have undertaken in good faith with Ontario to reach a mutually agreeable resolution to these issues.

MNR plan sets out a schedule to clearcut much of what little mature forest remains on our Territory after decades of large scale industrial logging will further erode our ability to sustain our families and to practice our culture through fishing, hunting, trapping, medicine harvesting, ceremony and healing.

Asubpeeschoseewagong Netum Anishinabek

GRASSY NARROWS, ONTARIO P0X 1B0 • PHONE: (807) 925-2201 • FAX: (807) 925-2649

We do not accept any application of this plan to our traditional lands. The Chief & Council along with community Elders stand united on this issue and are determined to protect the community's way of life.

You are fully aware that our community continues to struggle with the devastating health impacts from 9,000 kg of mercury that was dumped into our river system in the 1960's with the permission of the government of Ontario. Three generations of our people bear the burden of this degenerative neurological poison.

New clearcut logging will bring even more mercury into our river and our food chain, further prolonging and exacerbating this avoidable tragedy. We condemn such processes and plans.

We have been repeatedly told that Ontaro cannot undue what was done over forty years ago, but we are deeply concerned that Ontario wishes to repeat further degradation to Grassy Narrows. It is now within your power to ensure that the mistakes of the past are not repeated at the expense of another generation of Grassy Narrows children.

We call on you to ensure that never again will Ontario attempt to force decisions on our people and our lands.

What will your legacy be?

Chief Simon Fobister

Summary of the 2012 to 2022 Whiskey Jack Forest Management Plan

Location

The Whiskey Jack Forest Management Unit (MU) is located within the Kenora District and the Northwest Region of the Ministry of Natural Resources (MNR).

This is Exhibit "5" referred to in the affidavit of SIMON FOBISTER sworn before me, this 30th day of JULY 20 15
Joseph Castrilli
A COMMISSIONER FOR TAKING AFFIDAVITS
JOSEPH CASTRILLI

Public Contacts

The public contacts for the plan are:

Kurt Pochailo, R.P.F.	Plan Author	(807) 468-2597
Deb Weedon	MNR District Manager	(807) 468-2501
Wayne Bruce	LCC representative	

Management Responsibility

The Whiskey Jack Forest (Management Unit #490) has been a Crown Management Unit since Abitibi Company of Canada surrendered the Sustainable Forest Licence in August 2009. The Kenora District MNR administers its forest management planning activities and operations from the MNR District office located in Kenora, Ontario. More details about the administration of the forest can be found in section 1 of the plan. The management unit description is included in section 2 of the plan.

Local Citizen's Committee Participation

A member of the local citizen's committee (LCC) has participated in the preparation of the forest management plan as a planning team member and attended all information sessions. The proposed management strategy, long-term management direction and draft forest management plan were presented to the committee and input was requested on these products as well as the background information.

The LCC has prepared a brief statement of agreement or disagreement with the draft plan. This statement and the full LCC report can be found in the plan electronic submission.

Long-term Management Direction Summary

The Long-term Management Direction (LTMD) for the forest provides guidance for the levels of access, harvest, renewal and tending activities required to achieve the desired future forest and benefits. In the development of the LTMD, management objectives and indicators are identified and analytical methodologies, models and tools regarding forest regulation, social and economic assessment, wildlife habitat supply and landscape management are used. This is discussed in section 3 of the FMP which references supporting details found in the supplementary documentation to the plan.

The long-term management direction provides a means of assessing the sustainability of the management strategy through the measurement and monitoring of indicators that have been developed for each management objective. It is expected that a balanced achievement of the

quantitative and qualitative biological, social and economic objectives, will result in the desired long-term future forest condition and benefits.

Plan Objectives and Indicators

As required by the *Crown Forest Sustainability Act*, management objectives for the Whiskey Jack Forest must be compatible with the sustainability of the Crown forest, and indicators of objective achievement must be identified. In addition, the *Crown Forest Sustainability Act* requires that each FMP contain management objectives relating to:

(a) Crown forest diversity, including consideration for the conservation of natural landscape patterns, forest structure and composition, habitat for animal life and the abundance and distribution of forest ecosystems;

(b) Social and economic factors, including harvest levels and a recognition that healthy forest ecosystems are vital to the well-being of Ontario communities;

(c) The provision of forest cover for those values that are dependent on the Crown forest; and

(d) Silviculture for the harvest, renewal and maintenance of the Crown forest.

Table FMP-9 (located in Section 9.0) summarizes management objectives, indicators, desirable levels and associated targets and presents an assessment of achievement of desirable levels for each objective, for those which can be assessed at this time. The management objectives, indicators, desirable levels and targets were developed with input from the Kenora Local Citizens Committee (through the Desired Forest and Benefits meetings), the planning team, and MNR advisors. Sources of information considered in their development included, but were not limited to: the current FMP; background information; forest management guides and policies; Reports of Past Forest Operations; MNR forest management planning direction and training, and scoping investigations for the 2012 to 2022 FMP.

For each management objective, at least one indicator of objective achievement was developed, along with an associated desirable level(s) and target(s). Some objectives have multiple indicators to measure achievement. A desirable level is a specific number, a range or a trend for an indicator, to be achieved and maintained over time. As with desirable levels, targets are specific numbers, ranges, or trends, with a timeframe for achievement. The establishment of targets for each objective reflected a balancing of objective achievement and considered:

(a) Social, economic and environmental considerations;
(b) The associated indicator and its desirable level;
(c) The current forest condition; and,
(d) The short-term (10 years), medium-term (20 years) and long-term (80-100 years).

The rationale used in setting desirable levels and targets is summarized in section 3.5 of the plan. Modelling with the Strategic Forest Management Model (SFMM) assisted in quantitative scoping investigations and the development of the long-term management strategy (see section 3.6) that balances the achievement of management objectives over time. There are a total of 11 objectives and 30 indicators in this FMP.

The Long-term Management Direction

The Long-term Management Direction (LTMD) is represented by the types and levels of access, harvest, renewal and tending activities required to manage forest cover in a manner that balances the achievement of management objectives over time. The MNR approved Strategic Forest Management Model (SFMM) is used to develop the Long-term Management Direction.

The development of the Long-term Management Direction is an iterative process whereby results are examined and SFMM inputs adjusted as required to improve the model's ability to meet management objectives. This process commonly involves adjusting volume targets, harvest flow policies and targets for the forest diversity indicators – forest unit area, old forest area, mature forest and wildlife habitat. As each investigation is run, the resulting harvest volume, forest diversity indicators, silvicultural expenditures and the silvicultural treatment program are examined. The process continues until the planning team is satisfied that no further significant improvements can be made, that on balance objectives have been achieved, and that the solution is practical and can be implemented. The modelling process that led to the Long-term Management Direction is described in section 3.6 of the plan and the Analysis Package in Supplementary Documentation A.

The outputs of forest modelling for the Long-term Management Direction provide the source for the long-term (100-year) projections of quantifiable objectives and are documented within the plan in the following tables:

(a) Projected Forest Condition for the Crown Productive Forest (Table FMP-5);
(b) Projected Habitat for Selected Wildlife Species (Table FMP-6);
(c) Projected Available Harvest Area by Forest Unit (Table FMP-7); and
(d) Projected Available Harvest Volume by Species Group (Table FMP-8);

These tables can be found in section 9.0 of the FMP.

Planned Forest Operations for the 10-year Plan Period

Silvicultural Systems, Forest Units and Silvicultural Ground Rules

In order to describe the planned forest operations, it is necessary to first explain some forestry terminology:

Clearcutting has long been recognized as a form of management wherein the mature trees are removed in one operation. Clearcutting still involves the removal of the majority of the mature trees, however, the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* (MNR, 2010) require the retention of residual trees to be left after the harvest and often residual patches of uncut areas are to be left as well. Clearcutting is an appropriate management system in the Boreal Forest for many mixedwood stands and stands to be managed for tree species that are intolerant of shade (e.g. poplar, white birch, jack pine).

Each stand is assigned to a forest unit based on species composition, stocking and history. All stands within a forest unit are managed under the same silvicultural system but may be managed with different treatments (e.g. planting, site preparation, tending) and may have different objectives in terms of different future forest conditions. The management strategy is indicated through the Silvicultural Ground Rule.

Each stand to be harvested is assigned a Silvicultural Ground Rule. Each Silvicultural Ground Rule (SGR) describes the components that make up an individual SGR, including a description

of the current and future stand conditions, renewal treatment options and the regeneration standards that are to be met. Each SGR is intended to describe the harvest, renewal and tending activities that will be carried out on a given stand to allow the current Forest Unit, following harvest, to succeed to the Future Forest Unit, whether it is similar to the pre-harvest stand or a different Forest Unit.

Planned Harvest Operations

Results of the long-term strategic planning were used to plan operations for the ten-year period of this plan. The following table summarizes the harvest operations that are planned (i.e. in detail) for the first five-year term (2012-2017), and those which are proposed (i.e. less detail) for the second five-year term (2017-2022) of the FMP. The planned harvest area and percentage of the total 10-year planned harvest area for each of the three major silvicultural systems is listed below, however as reported, only the clearcut silvicultural system is being implemented on the Whiskey Jack Forest during this plan period (See section 4.3 of the FMP for more details):

Silvicultural System (i.e. Harvest System)	10-year Planned Harvest Area (ha)	% of 10-year Planned Harvest Area
Clearcut	53,471	100 %
Shelterwood	0	0 %
Selection	0	0 %
Total	**53,471**	**100%**

Harvest Area and Volume by Forest Unit and Species Group

The estimated available harvest areas for the 10-year plan period summarized by principal forest units and the harvest volumes (m3) associated with the harvest areas by the principal species groups are listed below:

Forest Unit	Planned Harvest Area (ha)
BFM	1,401
CMX	8,814
HMX	11,360
OCL	-
OTH	-
PJD	3,130
PJM	5,368
POD	11,887
PRW	208
SBL	297
SPD	6,821
SPM	4,186
Total	**53,471**

Species Group	Planned Harvest Volume (m3)
White Pine - Red Pine	20,106
Spruce-Pine-Fir	3,074,828
*** Other Conifer (Cedar, Larch)**	61,959
Poplar	1,756,375
White Birch	401,587
*** Tolerant Hardwood (Black Ash)**	19,862
Total	**5,334,717**

(Net merchantable volumes)

* Volumes for Other Conifer (Larch, Cedar) and Tolerant Hardwood (Black Ash) are reported but are not considered major species groups on the Whiskey Jack Forest.

Planned Road Access

The planned (10 year) road construction summarized for two road classes (primary and branch roads) that are needed to access all harvest and renewal operations over the 10-year period are listed below. Operational (i.e. tertiary) roads are not listed. (See section 4.5 of the FMP for more details).

Road Classification	Planned Road Construction (km)
Primary	30
Branch	19
Total	**49**

The Road Use Management Strategies for each Primary Road are located within FMP Supplementary Documentation G. The proposed Primary Road corridors associated with the 2011 FMP are illustrated on the FMP Summary Map and Composite Map (electronic version of FMP).

The management strategies for each road are consistent with those indicated in the Crown Land Use Policy Atlas.

Planned Forest Renewal and Tending Operations

The planned (10 year) renewal and maintenance activities that are required to meet the plan objectives are listed below by renewal activity type. These renewal activities will be carried out on the current planned harvest areas as well as areas harvested during past plan terms.

Artificial regeneration refers to tree planting and seeding. Supplemental treatment usually refers to an area that is regenerating naturally that needs some supplemental (usually tree planting) treatment to meet the regeneration standards. (See section 4.4. of the FMP for more details).

Renewal Activities	Planned Treatment Area (ha)
Natural Regeneration	25,631
Artificial Regeneration	27,839
Total Regeneration	53,470
Retreatment	0
Supplemental	0
Total Tending	8,065

Area of Concern Prescriptions

The forest provides for many forest values. Some values have the potential to be negatively impacted by forest management. The areas around these values are termed *Areas of Concern*.

An area of concern may be a social value such as an authorized hiking trail or an archaeological site or it may be an ecological or environmental value such as a stream or significant wildlife habitat feature (e.g. a great blue heronry, a hawk nest, deer wintering area, mineral licks or a provincially significant wetland).

The FMP includes Area of Concern prescriptions for many different values. These prescriptions may include a no-cut buffer zone, an area with access restrictions and/or a modified

management area wherein there may be restrictions on timing of harvest or silvicultural activity, method of harvest or types of trees that can be harvested. Some prescriptions are developed from the direction in a forest management guide and others are developed at the planning team level. A few examples of the many Area of Concern prescriptions follow to give the reader a sense of Area of Concern prescriptions:

> ***Example 1 (N01)**. A primary bald eagle nest receives a 200 m radius no cut reserve with no new access roads allowed. Outside this 200 m radius is a further 200 m wide zone in which harvesting may occur (subject to conditions on whether or not nest is occupied and relative potential impact of operations) and it must occur outside the critical breeding period to avoid disturbing the young birds.*
>
> ***Example 2 (M01)**. Mineral licks will receive a 120 m no cut reserve measured from the edge of woody vegetation averaging at least 2 m tall and with ≥25% canopy cover. This reserve is in excess of what is required for water quality and protection of fish habitat, but will provide additional protection and habitat cover for animals using the mineral lick.*
>
> ***Example 3 (TV01)**. Large tourism lakes will receive a 90 m no cut reserve. This prescription may be in excess to what is required to protect the water quality and fish habitat but it will provide a visual buffer from users of the lake.*

Operational prescriptions for areas of concern and silvicultural ground rules for regular operations have been prepared in accordance with the applicable forest management guides. There are no area of concern prescriptions and one silvicultural prescription that are exceptions to the guides. Full tree logging on NWO Ecosites 11 and 12, where total organic matter plus soil depth is less than 20 cm, is designated as a 'not recommended' practice in the *Silvicultural Guide to Managing for Black Spruce, Jack Pine, and Aspen on Boreal Forest Ecosites in Ontario* (MNR, 1997). The shallow soil sites on the Whiskey Jack Forest are, for the most part, productive and, it is felt, that using full tree logging in a careful manner will preserve the sites nutrient capacity. The forest industry is contributing to a comprehensive, region wide initiative to monitor the impacts of this treatment on these site conditions. Operational prescriptions for areas of concern have been prepared consistent with the Endangered Species Act to protect habitat related to species at risk known to exist on the forest.(See section 4.2.1 of the FMP for more detail).

Issues

There are two issues affecting the 2012-2022 Whiskey Jack Forest Management Plan that have the potential to become contentious:

1. The August 2011 Court decision regarding the "Keewatin Lands" (north of the English River system) – Note that as per the stay ordered on consent of the parties, there will be no harvesting of trees for subsequent sale or other commercial purposes other than for firewood within the area of the Whiskey Jack Forest north of the English River, without the consent of Grassy Narrows First Nation.
2. More generally, Grassy Narrows has concerns with the Whiskey Jack Forest that are currently being addressed through the Process Agreement that was signed between ANA and MNR.

Ontario will continue to consult with Grassy Narrows First Nation, Naotkamegwanning First Nation (Whitefish Bay), Ochiichagwe'babigo'inning First Nation (Dalles), Wabaseemoong Independent First Nations (Whitedog), Wabauskang First Nation and Kenora Métis Council and respect any existing obligations in relation to their rights. The Planning Team and LCC will receive public and Aboriginal input via the consultation phases of the forest management plan.

Public Consultation

There are two remaining formal consultation opportunities for the Whiskey Jack Forest Management Plan. There is a 60-day public comment period (Aug. 29, to Oct. 28, 2013) including information centres for Review of the Draft Forest Management Plan. There is an opportunity during this 60-day review period of the draft forest management plan to seek resolution of issues with the MNR District Manager or during the 30 days following the completion of the 60-day review period with the MNR Regional Director (in accordance with the issue resolution process described in Part A, Section 3.4.1 of the Forest Management Planning Manual). Public inspection of the MNR approved Forest Management Plan is tentatively scheduled from December 2013 to January 2014. There is an opportunity during the 30-day period for public inspection of the MNR approved forest management plan for any person to make a written request to the Director, Environmental Assessment and Approvals Branch, Ministry of the Environment for an individual environmental assessment of specific proposed forest management activities in the forest management plan (in accordance with the process described in Part A, Section 3.4.2).

A comment form is attached as Appendix 1.

Summary Map

Proposed harvest, renewal and tending operations, locations of existing and new primary and branch road construction corridors for the 10-year term are shown on the summary map labelled MU490_2012_FMPDP_P1_MAP_Sum. The map also contains an index/grid for identifying specific operational maps.

Appendix 1: Comment Form

WHISKEY JACK FOREST
2012-2022 FOREST MANAGEMENT PLAN

NAME DATE

ADDRESS (Please include full mailing address)

COMMENTS

The Ministry of Natural Resources is collecting comments and information regarding the forest management plan under the authority of the Crown Forest Sustainability Act to assist in making decisions and determining further public consultation needs. Your comments will be forwarded to the Plan Author and shared with the Kenora Local Citizens Committee (LCC) so that they may consider your concerns. Comments and opinions will be kept on file for use during the forest management plan period and may be included in study documentation which is made available for public review.

Under the Freedom of Information and Protection of Privacy Act (1987) personal information will remain confidential unless prior consent is obtained. However, this information may be used by the Ministry of Natural Resources to seek public input on other resource management surveys and projects. For further information regarding this Act, please contact Stephen Duda, MNR at (807) 468-2543.

There are two remaining formal consultation opportunities for the Whiskey Jack Forest Management Plan. There is a 60-day public comment period (Aug. 29 – Oct. 28, 2013) including information centres for Review of the Draft Forest Management Plan. There is an opportunity during this 60-day review period of the draft forest management plan to seek resolution of issues with the MNR District Manager or during the 30 days following the completion of the 60-day review period with the MNR Regional Director (in accordance with the issue resolution process described in Part A, Section 3.4.1 of the Forest Management Planning Manual). Public inspection of the MNR approved Forest Management Plan is tentatively scheduled from December 2013 to January 2014. There is an opportunity during the 30-day period for public inspection of the MNR approved forest management plan for any person to make a written request to the Director, Environmental Assessment and Approvals Branch, Ministry of the Environment for an individual environmental assessment of specific proposed forest management activities in the forest management plan (in accordance with the process described in Part A, Section 3.4.2).

Comments may be forwarded to the Kenora District Office, Ministry of Natural Resources, 808 Robertson Street, Box 5080, Kenora, ON, P9N 3X9.

Court File No.

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

AFFIDAVIT OF SIMON FOBISTER

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Joseph F. Castrilli (LSUC No. 26123A)
Richard D. Lindgren (LSUC No. 28529E)

Solicitors for the Applicants

Court File No.

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other
members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

AFFIDAVIT OF AMBER ELLIS AND DAVID SONE

WE, AMBER ELLIS AND DAVID SONE, of the City of Toronto, in the Province of Ontario, EACH MAKE OATH AND SAY AS FOLLOWS:

1. I, Amber Ellis, am the Executive Director of Earthroots Coalition ("Earthroots") and, as such, have knowledge of the matters hereinafter deposed to.

2. I have been the Executive Director of Earthroots since 2006. From 1997 to 2006, I was co-director of the organization. Earthroots is a non-profit organization dedicated to the conservation of wilderness, wildlife, and watersheds in Canada, with a focus on Ontario. In this capacity, we work with groups who seek similar goals.

3. I, David Sone, am the Director, Northern Ontario Campaigns at Earthroots and, as such, have knowledge of the matters hereinafter deposed to.

4. I have been with Earthroots since 2010.

FOREST MANAGEMENT PLAN

5. We have worked with the Grassy Narrows First Nation ("Grassy Narrows") concerning the proposal by the Ministry of Natural Resources and Forestry ("MNRF") to develop a forest management plan ("Plan") under the authority of the *Crown Forest Sustainability Act*. The Plan would allow clearcut logging in the Whiskey Jack Forest in northwestern Ontario over the period 2012 to 2022. In this regard I, Amber Ellis, approved on behalf of Earthroots submissions prepared by Mr. Sone that were submitted to the MNRF in late October 2013, during the notice and comment process concerning the Plan. The submissions raised concerns that clearcut logging proposed under the Plan would exacerbate the mercury problem at Grassy Narrows. A copy of the October 2013 submissions is attached as Exhibit "A" to our affidavit.

6. The MNRF approved this Plan in December 2013. A copy of the Plan, consisting of the Plan text, tables, supplementary documentation, analysis package, summary text, summary map, and further map respecting fisheries and wetlands, is attached as Exhibit "B" to our affidavit.

JANUARY 2014 BUMP-UP REQUEST

7. Following the MNRF approval of the Plan, in January 2014 I, Amber Ellis, approved on behalf of Earthroots submissions prepared by Mr. Sone that Earthroots co-filed with Grassy Narrows as a request of the Ministry of the Environment, now the Ministry of the Environment and Climate Change ("MOECC"), for a bump-up under section 16 of the *Environmental Assessment Act*. The request, if granted, would result in an Individual Environmental Assessment ("IEA") being conducted into the potential mercury impacts to the environment and human health arising from clearcut logging authorized under the Plan before the Plan could be implemented. This initial request is mentioned and referred to in the affidavit of Simon Fobister, current Executive Director and former Chief of Grassy Narrows, in respect of the within application for judicial review. A copy of the January 2014 request we filed with Grassy Narrows is attached as Exhibit "C" to our affidavit. A map outlining the geographic location of the specific area of concern of the bump-up request with respect to the Whiskey Jack Forest appears as the last page in Exhibit "C".

8. Exhibit “C” identifies and documents a wide variety of concerns with the Plan, based on government documents and peer-reviewed scientific studies, in support of the bump-up request. These concerns, based on these documents and studies, include:

(a) clearcut logging impacts water quality through mercury contamination; in particular, such logging has been found to raise mercury levels in boreal lakes and rivers, like those found in Grassy Narrows territory, and to raise the levels of methyl mercury, the form of mercury that bio-accumulates in the food chain and acts as a neurotoxin in humans who eat fish;

(b) clearcut logging elevates mercury levels in fish; in particular, such logging has been found to increase the level of mercury in fish often above the safe level for human consumption and that this effect is most pronounced in fish at the top of the food chain like walleye and pike, the primary fish eaten by the people of Grassy Narrows;

(c) fish in Grassy Narrows have critical levels of mercury above, or near, the limit for safe human consumption;

(d) the main effects of mercury exposure to humans are understood to be neurological, renal (kidney), cardiovascular and immunological impacts. Exposure to mercury while in the womb can lead to neurodevelopmental problems in children;

(e) mercury impacts human health in Grassy Narrows; in particular, 35 years of studies by doctors from Japan who have undertaken clinical examinations of members of the community, and published the results, in the years since industrial discharges of mercury ended, confirm that people in Grassy Narrows are suffering neurological harm and other adverse health impacts due to eating fish contaminated with methyl mercury;

(f) the Plan, a document over 400 pages in length, covering the area through which the historically industrially mercury-contaminated English-Wabigoon river system runs, does not mention the word “mercury”, let alone measures for controlling mercury impacts, nor does the primary MNRF manual on forest management planning refer to mercury;

(g) the only guidance document MNRF uses for dealing with mercury impacts arising from clearcut logging, the Stand and Site Guide (“SSG”): (1) mistakenly equates the effects of such logging with natural events, like forest fires, contrary to the scientific literature which concludes that, unlike large fires, clearcut logging will increase mercury levels in fish, (2) relies on measures neither designed for, nor proven to be effective in, mitigating mercury impacts, (3) takes a log now, monitor the results later, approach to determining the effectiveness of mercury mitigation measures, and (4) may make the mercury problem worse than previous government guidelines because it (i) allows logging to the shoreline, and (ii) removes threshold

constraints contained in predecessor guidance documents designed to limit catchment disturbance and, as a result, will increase the release of mercury to water.

APRIL 2014 MNRF RESPONSES TO EARTHROOTS OCTOBER 2013 SUBMISSIONS AND GRASSY NARROWS-EARTHROOTS JANUARY 2014 BUMP-UP REQUEST

9. In April 2014, MNRF responded to our October 2013 submissions on the Plan. MNRF stated that it had "determined that there is sufficient legal, regulatory and policy framework, including guidelines, to ensure that current information and knowledge about mercury dynamics in the Boreal Forest is considered in land-use and resource management decisions". The response also noted that MNRF was reviewing its policies and monitoring protocols, as well as undertaking research to improve the understanding of mercury dynamics in the Boreal Forest. A copy of the MNRF response is attached as Exhibit "D".

10. Also in April 2014, MNRF filed a response to the January 2014 bump-up request with MOECC. In its response, MNRF raised a number of issues that are specific to Grassy Narrows and that are addressed in the affidavit of Chief Roger Fobister, Senior in support of the within application for judicial review. MNRF also stated in its response that (1) work conducted by Quebec researchers Garcia and Carignan is likely the most comprehensive study on the association between watershed disturbances and fish mercury levels and that fish in disturbed watersheds had higher mercury levels than fish in undisturbed watersheds, and (2) in developing the Plan, it complied with the mitigation

measures set out in the SSG and forest management planning manual as required by the *Crown Forest Sustainability Act*. A copy of the MNRF response is attached as Exhibit "E" to our affidavit.

MAY 2014 REPLY TO MNRF RESPONSE

11. In May 2014, I, Amber Ellis, again approved on behalf of Earthroots submissions prepared by Mr. Sone that Earthroots and Grassy Narrows filed with MOECC as a reply to the MNRF response of April 2014 to the January 2014 bump-up request. In our reply to the MNRF response that in developing the Plan MNRF complied with the mitigation measures set out in the SSG and forest management planning manual as required by the *Crown Forest Sustainability Act*, we noted that the MNRF response explicitly conceded that (1) the potential for forest management activities to result in mobilization of terrestrial mercury into aquatic systems is well documented and a serious concern, (2) MNRF was making no claims that the direction in the SSG, or its application, would mitigate or eliminate mercury mobilization into such systems, (3) there are no proven measures to mitigate the harm arising from mercury impacts of clearcut logging, and (4) MNRF was making no further commitments in the Plan to address the concerns raised by Grassy Narrows or Earthroots on this issue beyond following the SSG. A copy of the May 2014 reply is attached as Exhibit "F" to our affidavit.

JULY 2014 SUPPLEMENTARY SUBMISSION IN SUPPORT OF BUMP-UP REQUEST

12. In late May 2014, Earthroots received documentation respecting certain issues pertinent to development of the Plan arising from a request for information we made to MNRF in

or about January 2014 under the *Freedom of Information and Protection of Privacy Act*. Because the documentation from MNRF was relevant to the bump-up request made to MOECC that we had co-filed with Grassy Narrows, we filed this new information with MOECC as a supplementary submission on the joint behalf of Grassy Narrows and Earthroots in late July 2014. A copy of the submission to MOECC, and the documentation, is attached as Exhibit "G" to our affidavit.

13. What we indicated in the submission portion of Exhibit "G" is that the documentation consists of excerpts from comments MNRF received on the SSG, which appear to have been written by two northwestern Ontario MNRF fisheries biologists, at least one of whom was credited by MNRF with having made significant contributions to the writing of individual sections of the SSG itself.

14. The SSG, released by MNRF in 2010, is the guidance document that MNRF relied on for identifying measures for mitigating impacts from clearcut logging arising from the Plan and it was also referenced as such in MNRF's April 2014 response, filed with MOECC, to the Grassy Narrows-Earthroots bump-up request of January 2014.

15. The comments of the MNRF biologists, attached in their entirety in Exhibit "G", stated that the reduction in protection for river, stream, pond and lake shorelines in the SSG needed to be reconsidered for a number of reasons, including (1) mercury is finding its way into water courses from cutovers even with current reserves/AOCs (Areas of

Concern) in place, and (2) this is likely to be exacerbated if complete removal of shoreline vegetation is permitted.

16. The comments of the MNRF biologists went on to state that: “The public and especially First Nations are very sensitive of mercury entering our water systems and they are not going to like the idea that it might be increased”. The MNRF biologists stated further that: “[T]he task team that developed the latest recommendations for protecting aquatic habitat didn’t propose clear cutting entire shorelines so why are we. This task team included some very knowledgeable folks including some of our research scientists”.

17. What we inferred from the observations of the MNRF biologists, and so stated in the submission portion of Exhibit “G”, was that the (1) reserves/AOCs that had been in place prior to the new SSG taking effect were not sufficient to prevent mercury from being released into local water bodies after clearcutting, (2) the new (2010) SSG weakened existing riparian protections (i.e. reserves and AOCs), (3) the amount of mercury entering water bodies is likely to increase as a result of the changes contained in the new SSG, (4) the SSG is not consistent with the limited current science on preventing mercury releases from clearcuts, and (5) the documentation in Exhibit “G” reveals that the MNRF may not have followed the advice of its own fisheries and aquatic habitat experts in developing the SSG as it relates to key concerns respecting the mercury issue.

SEPTEMBER 2014 SUPPLEMENTARY SUBMISSION IN SUPPORT OF BUMP-UP REQUEST

18. In September 2014, I, Amber Ellis approved on behalf of Earthroots further supplementary submissions prepared by Mr. Sone that Grassy Narrows and Earthroots filed with MOECC in support of the bump-up request. These supplementary submissions are attached as Exhibit "H" to our affidavit. The supplementary submissions attached and summarized a 2010 report, publicly released in 2014, prepared for the Mercury Disability Board. The Board was established under Ontario legislation as part of the settlement in the 1980s of the mercury litigation referred to at paragraph 10 of the affidavit of Simon Fobister filed in support of the within application for judicial review. The report, prepared by toxicologists retained by the Board, summarized observations made over the years regarding human health impacts on members of Grassy Narrows, and a neighbouring first nation community, from past industrial discharges of mercury in the English-Wabigoon river system. In particular, the observations of the report included that:

(a) as a result of high mercury exposure in Grassy Narrows in the 1960s and 1970s, there is no doubt that many persons in the community were suffering from mercury-related neurologic disorders; and

(b) follow-up studies by doctors from Japan indicate there is probably still a problem in the Grassy Narrows community due to previous mercury exposure; and

(c) some individuals still exhibit high levels of exposure.

19. The report of the Board, summarized in the Exhibit "H" submissions, also made general observations about the effects of mercury exposure on human health based on a review of studies world-wide. These observations included:

(a) there is a wide consensus that even at low levels, mercury can impact the intellectual and motor development of children, based on observations made in population studies; and

(b) at the sub-clinical and population level, studies in different parts of the world report slower development in newborns, infants, and children exposed to methyl mercury in utero, or during early childhood.

NOVEMBER 2014 SUPPLEMENTARY SUBMISSION IN SUPPORT OF BUMP-UP REQUEST

20. In November 2014, I, Amber Ellis approved on behalf of Earthroots further supplementary submissions prepared by Mr. Sone that Grassy Narrows and Earthroots filed with MOECC in support of our bump-up request. A copy of these submissions is attached as Exhibit "I". These submissions, again largely based on government documents and peer-reviewed scientific studies, noted the following:

(a) an MNRF report on the program designed to monitor the effectiveness of the SSG in mitigating impacts of forest management activities, indicated that it was not sufficient to address aquatic system process uncertainties with respect to mercury, and information on the effectiveness of direction

contained in the SSG should not be expected for several years after the SSG is implemented;

(b) in the late 1970s, 93 percent of the 105 individuals in Ontario with blood mercury levels greater than 100 parts per billion were from Grassy Narrows (56%) and from a neighbouring first nation community (37%); high blood mercury levels contribute to anxiety; physical and mental health effects such as anxiety due to mercury contamination in the English-Wabigoon River System have been borne almost entirely by the native people of Grassy Narrows and another nearby first nation community; the fear and anxiety from knowing that fish were contaminated was debilitating to many people in these communities; the threat of mercury poisoning clearly affected their mental health; a reduction in fish mercury levels could help to reduce anxiety and mental trauma experienced by these people;

(c) MNRF research has documented an increased flux of both mercury and methyl mercury in streams following tree harvesting by clear-cut logging; and

(d) MOECC recognizes that fish consumption patterns in first nation communities are different from those published in the government's guide to eating sports fish; a reduction in mercury contamination in fish could lead to reduced health risk at Grassy Narrows because, according to MOECC, the

people of Grassy Narrows have the most opportunity and inclination to eat fish from contaminated water bodies; the federal government recommends that mercury concentrations in fish should be 0.2 parts per million or lower before the people at Grassy Narrows can safely eat them; the MOECC sport fish guide does not list a fish as "do not eat" for the general population until mercury levels are more than nine times that level.

21. We each swear this affidavit in support of the within application for judicial review, and for no other or improper purpose.

SWORN before me in the City of Toronto, in the Province of Ontario, this 21st day of August, 2015.

Joseph Castrilli

A Commissioner, etc.

JOSEPH CASTRILLI

Amber Ellis

SWORN before me in the City of Toronto, in the Province of Ontario, this 21st day of August, 2015.

Joseph Castrilli

A Commissioner, etc.

JOSEPH CASTRILLI

David Sone

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Protecting Ontario's wilderness, wildlife and watersheds through research, education and action since 1986.

This is Exhibit "A" referred to in the affidavit of AMBER ELLIS AND DAVID SONE sworn before me, this 21st day of AUGUST 20 15

Joseph Castrilli
A COMMISSIONER FOR TAKING AFFIDAVITS
JOSEPH CASTRILLI

October 31st, 2013

Kurt Pochailo, R.P.F.
Plan Author
Ministry of Natural Resources
Kenora District
808 Robertson St., P.O. Box 5080
Kenora, ON P9N 3X9

Re: **EBR Registry Number 010-9240** – Forest Management Plan for the Whiskey Jack Forest for the 10-year period April 1, 2012 to March 31, 2022 – Review of Draft Forest Management Plan

Dear Mr. Pochailo,

Please consider this letter an official submission to the public input process for the Draft Forest Management Plan for the Whiskey Jack Forest 2012-2022.

Earthroots is a grassroots environmental organization dedicated to the protection of Ontario's wilderness, wildlife and watersheds – we represent 12,000 supporters across Ontario.

We strongly oppose the draft plan on the grounds that it does not meet the obligation to meaningfully consult, accommodate, and obtain the free, prior and informed consent of the Grassy Narrows First Nation.

Grassy Narrows has rejected the plan, and we join with them. We cannot support any plan for the Whiskey Jack Forest until the conflict with Grassy Narrows has been resolved in a just way.

Earthroots is also deeply concerned about the ecological degradation to the Whiskey Jack Forest that will result if the plan is implemented. We will briefly summarize our concerns re: the potential threats to the area's ecology, however we will reserve a more thorough analysis for a plan that has the support of the Grassy Narrows First Nation.

Past mismanagement of the Whiskey Jack Forest has left a forest that is severely degraded. This has been partially documented in the independent Whiskey Jack Forest Audit 2004-2009.

In particular the audit documented the following impacts:

1) Productive land degraded through soil compaction, rutting, and excessive roads, landings, and slash piles;
2) Conversion of forest away from natural conditions including the replacement of conifer stands with broadleaf and mixed stands;
3) Degradation of wildlife habitat, especially moose, caribou, and martin;
4) Regeneration failure due to cost cutting;
5) Eradication of some tree species;
6) Failure to account for the effects of a major spruce budworm infestation.

These points are elaborated on in our summary and release about the Independent Audit.

The report states that, "[f]orest sustainability… will not be achieved unless corrective measures are immediately taken." [p.iii]

Earthroots believes that the draft FMP does not address the above issues aggressively enough. In many cases the draft FMP exacerbates existing issues while the LTMD plans to improve them only over the course of the following 60 or 80 years. It is unacceptable to delay the remediation of this forest to a theoretical point in the future three generations from now.

The draft FMP proposes to continue a number of disturbing trends:

a) Loss of the few remaining roadless areas in the forest through new road building;
b) Logging targets what little mature forest that remains after decades of intensive logging, insect infestation, blow down, and fire;
c) Near extirpation of caribou, and now moose from the forest. The complete loss of winter caribou habitat and the long term failure to meet martin core targets;
d) Extremely low levels of protected areas (approximately 4%);
e) Return to extensive use of aerial spraying of herbicides in spite of scientific evidence on impacts to amphibians and biodiversity;
f) High volumes of wood for low job intensity products;
g) Failure to account in any way for the scientifically established impact of clearcutting on mercury levels in piscivorous fish in local lakes and rivers already known to contain dangerous levels of mercury;
h) Prioritizing logging over all other landuses and values.

On the longstanding dispute between Grassy Narrows First Nation (GNFN) and the Ministry of Natural Resources (MNR) the auditors reported that fundamental differences "cannot be resolved without… relinquishing significant authority to the First Nation to manage portions of the Whiskey Jack Forest according to the desires of the GNFN community. The audit team further believes that the forest management planning process did not anticipate, nor was it designed to resolve the type of dispute currently being experienced on the Whiskey Jack Forest." [p.5] Earthroots echoes this sentiment.

The cumulative effect of over a century of landuse decisions imposed on the people of Grassy Narrows has had a devastating impact on their health, culture, and livelihood. Ontario should meet Grassy Narrows' demand to restore their control over their territory.

We refer you also to our joint letter to Premier Wynne on this matter with organizations representing over 1 million people in Ontario (attached). Please consider this letter as part of our submission.

It is counterproductive to produce forest management plans against the will of the Grassy Narrows First Nation, especially since the Supreme Court is preparing to hear Grassy Narrows' case which calls into question Ontario's authority to make such plans.

We call on Ontario to finally respect the voice of Grassy Narrows.

Kind regards,

Amber Ellis
Executive Director

amber@earthroots.org
416-599-0152 x11

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This is Exhibit "B" referred to in the affidavit of AMBER ELLIS AND DAVID SOME sworn before me, this 21st day of AUGUST 20 15

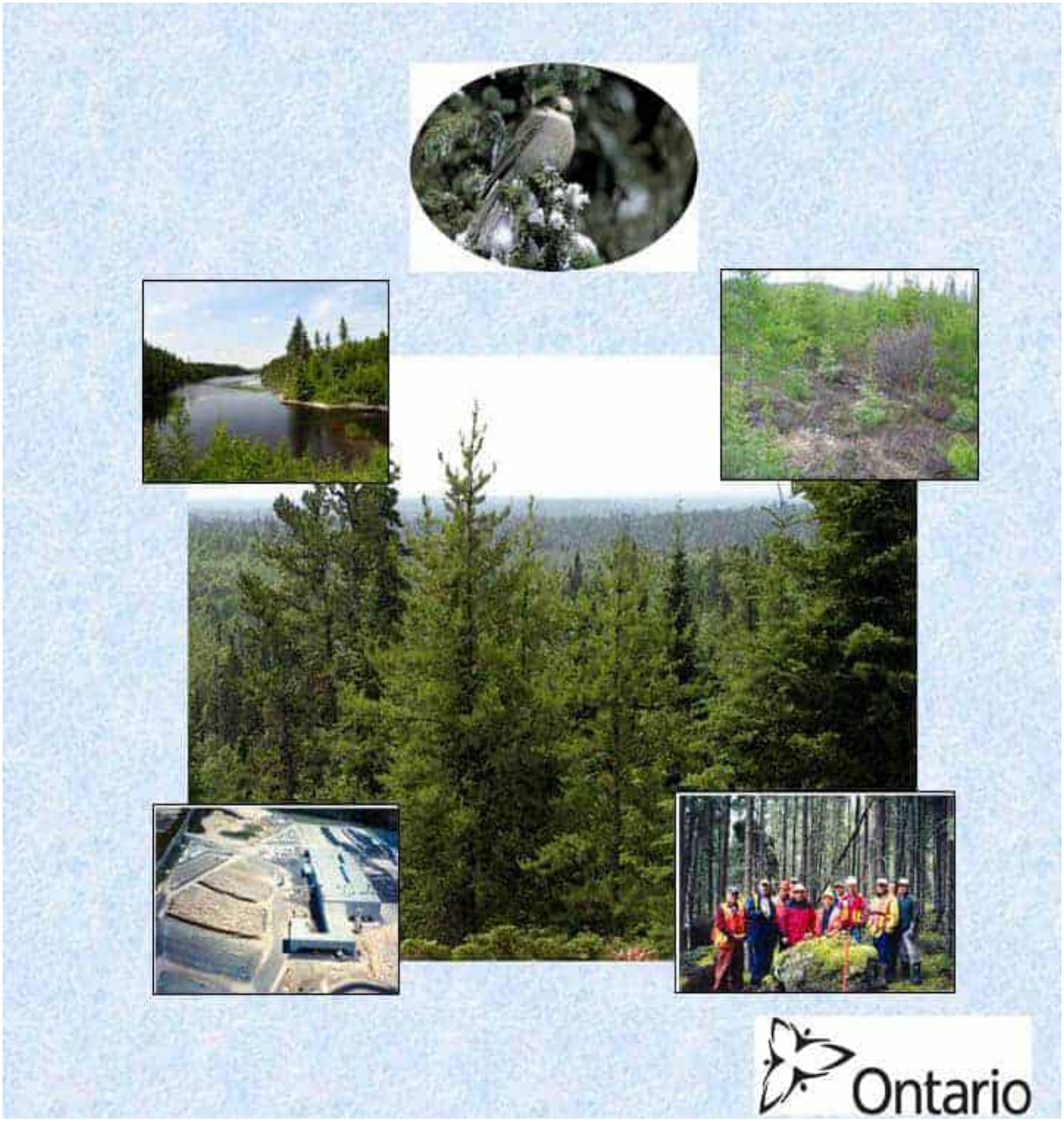
Joseph Castrilli
A COMMISSIONER FOR TAKING AFFIDAVITS

JOSEPH CASTRILLI

2012 - 2022
Forest Management Plan
for the
Whiskey Jack Forest

Plan Text

2012 - 2022
Forest Management Plan
for the
Whiskey Jack Forest



Title, Certification and Approval Page

Forest Management Plan
for the
Whiskey Jack Forest
(Management Unit #490)

Ontario Ministry of Natural Resources (MNR)
Kenora District, Northwest Region

for the 10-year period from April 1, 2012 to March 31, 2022.

I hereby certify that I have prepared this forest management plan, including Silvicultural Ground Rules, to the best of my professional skill and judgement with the assistance of an interdisciplinary planning team in accordance with the requirements of the *Forest Management Planning Manual* and *the Forest Information Manual*.

_____ _____ Date: _____
R.P.F. seal Kurt Pochailo, R.P.F.
Plan Author, Ontario Ministry of Natural Resources

I recommend that this forest management plan be approved for implementation and certify that it has been prepared in accordance with the requirements of the *Forest Management Planning Manual,* the *Forest Information Manual* and relevant policies and obligations (including any relevant MNR agreements with Aboriginal peoples). I also certify that the forest management plan has been prepared using the applicable forest management guides. In this forest management plan, prescriptions that differ from specific direction or recommendations in the applicable forest management guides are identified in the attached List of Exceptions.

Certified and Recommended for Approval By:

_____ Date: _____
Deb Weedon
District Manager, Kenora District
Ontario Ministry of Natural Resources

Approved by: _____ Date: _____
Allan Willcocks
Regional Director, Northwest Region
Ontario Ministry of Natural Resources

Forest Information Portal Submission Identifier: _____

The original signed and stamped version of this page is retained at the MNR Kenora district office in Kenora.

List of Exceptions

Forest Management Plan
for the

Whiskey Jack Forest

Ontario Ministry of Natural Resources (MNR)
Kenora District, Northwest Region

for the 10-year period from April 1, 2012 to March 31, 2022.

All silvicultural treatments in the silvicultural ground rules (Table FMP-4) which are exceptions to the recommendations in the silvicultural guides, and all operational prescriptions for areas of concern which are exceptions to the specific direction or recommendations (standards and guidelines) in the applicable forest management guides, are provided in this list of exceptions. The specific section of the forest management plan that provides documentation of the exception is also referenced in this list.

Description of Exception	Specific Section of Plan
The following are exceptions to the *Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (3 volumes, MNR, 1997)*:	Table FMP-4, Section 4.2.2.1: Silvicultural Ground Rules, and Monitoring Section 4.7.2: Exceptions
- Full tree logging on ES 11 and 12 where total soil depth (mineral and surface organic) is less than 20 cm. - Artificial seeding on ES 14. - Natural regeneration of jack pine or spruce on ES 21.	

List of Management Plan Contributors

Forest Management Plan
for the
Whiskey Jack Forest

Ontario Ministry of Natural Resources (MNR)
Kenora District, Northwest Region

for the 10-year period from April 1, 2012 to March 31, 2022.

Planning Team Members

Planning Team Member Name	Representing	Role
Kurt Pochailo, R.P.F.	MNR	Plan Author/Area Forester
Hassan Mohamed, R.P.F.	MNR	Acting Planning & Information Management Supervisor/ Planning Team Chair / Project Manager/Resource Analyst
Shawn Stevenson	MNR	Area Supervisor
Susan Jarvis, R.P.F.	Forest Concepts	Planning Contractor
Shannon Rawn, R.P.F.	Miisun Integrated Resource Management Inc.	Planning Contractor
Sarah McKenzie	MNR	Management Biologist
Abby Anderson, R.P.F.	MNR	District Planner
Wayne Bruce	Kenora LCC	LCC Representative
Dutchie Loman	Red Lake LCC	LCC Representative
Dale Munro, R.P.F.	Kenora Forest Products	Industry Representative – Receiving Facility
Matt Wilkie, R.P.F.	Weyerhaeuser	Industry Representative – Receiving Facility
Scott Lockhart	MNR	Aboriginal Community Liaison
Gregg Lloyd, R.P.F.	MNR	MNR Forester (Red Lake District)
Joel Henley	Kenora Métis Council	Aboriginal Representative
Doug Riffel	Wabauskang First Nation	Aboriginal Community Representative
TBA	Wabaseemoong Independent Nations	Aboriginal Community Representative
Alex Tom	Naotkamegwanning (Whitefish Bay) First Nation	Aboriginal Community Representative
TBA	Ochiichagwe'babigo'inning (Dalles) First Nation	Aboriginal Community Representative

Planning Team Advisors

Key Advisors/Support Staff	Representing	Role
Lil Anderson	MNR	Communications Support
Donna Puls	Miisun Integrated Resource Management Inc.	Planning Contractor
Darryl Pajunen	MNR	GIS Support
Todd Skene	MNR	Operational Support
Matt Yeo	Ontario Parks - Parks Superintendent	Operational Support

Other Advisors and Support Staff:

MNR Regional/Provincial	Position:
Kevin Ride, R.P.F.	Regional Forest Resources Supervisor
Chris Schaefer, R.P.F.	Forest Management Planning Specialist
Rob Bowen, R.P.F.	Regional Analyst
Scott Hole, R.P.F.	Regional Analyst
Glen Hooper	Regional Planning Biologist
Angus Carr, R.P.F.	Regional Planning Analyst
Cathy Cavalier, R.P.F.	Forest Program Specialist
Hilary Gignac, Lori Skitt	Species at Risk Biologists
Renee Carriere	Cultural Heritage Specialist
Bill Taylor	Native Liaison Officer
Jenn Hughes	District Fire Management
Brian Campbell, R.P.F.,	Forest Industry Liaison
Mike Davis, R.P.F.	Forest Industry Liaison

Parks Advisors:	Position:
Julie Sullivan	Senior Park Planner
Ron Lee Kam	Natural Heritage Specialist

Science Advisors:	Position:
Colin Bowling	Science Advisor
Bob White	Science Advisor

Plan Reviewers

Plan Reviewer Name	Position
Ian Pyke, R.P.F.	MNR Area Forester (Kenora) and Coordinator for Lists of Required Alterations
Hassan Mohamed, R.P.F.	Acting Planning and Information Management Supervisor, Planning Team Chair, Project Manager, Resource Analyst
Shawn Stevenson	Area Supervisor
Gregg Lloyd, R.P.F.	MNR Area Forester (Red Lake)
Sarah McKenzie	Management Biologist

Plan Reviewer Name	Position
Abby Anderson, R.P.F.	District Planner
Scott Lockhart	Aboriginal Community Liaison
Todd Skene	IRM Technical Specialist
Fred Zroback	Area Technician
John Myshrall	Area Technician
Jennifer Hughes	Fire Operations Supervisor
Chris Schaefer, R.P.F.	Forest Mgmt. Planning Specialist
Cathy Cavalier, R.P.F.	Forest Program Specialist
Rob Bowen, R.P.F.	Regional Analyst
Angus Carr R.P.F.	Regional Planning Analyst
Julie Sullivan	Senior Park Planner
Ron Leekam	Natural Heritage Specialist
Hilary Gignac, Lori Skitt	Species at Risk Biologists
Glen Hooper	Regional Planning Biologist
Christine Hague	Species at Risk Biologist
John VanDenBroeck	Biodiversity Species at Risk Biologist
Lil Anderson	Communications Support
Brian Campbell, R.P.F.	Forest Industry Liaison
Deb Weedon	District Manager

Any **Plan Advisor** who provided direction during the production of this Forest Management Plan was required to ensure that sections of the plan pertaining to their advice were reviewed.

Kenora Local Citizens Committee Members

Clarke Anderson – Chair	Kenora Trapper's Council
Wayne Bruce	Lake of the Woods District Property Owners Association (Planning Team Member)
Dave Canfield	City of Kenora
Karen Cederwall	Independent
Henry Dribnenky	Lake of the Woods District Property Owners Association (Alternate)
Rod McKay	Forest Industry
Alasdair Mowat	Mineral Exploration
David Anderson	Independent
Dale Munro	Forest Industry (Alternate)
Alex Rheault	Tourism
Pat Rheault	Tourism (Alternate)
Mark Scott	Independent Loggers
Sandra Triskle	Kenora Métis Council
Floyd Triskle	Kenora Métis Council (Alternate)

The Local Citizens Committee (LCC) was involved in the development of this Whiskey Jack Forest 10-year forest management plan. The LCC committee's report on its involvement in the planning process is included in Supplementary Documentation J of the forest management plan.

<u>The committee's general agreement or disagreement with the Forest Management Plan:</u>
The Kenora LCC is in general agreement with the Whiskey Jack Forest FMP. However, all KLCC members have expressed some level of reservation with one or more specific aspects of the plan.

Red Lake District Resource Advisory Committee (LCC) Members

Dutchie Loman	Ear Falls Hunters & Anglers Club and Northwoods Fish and Game Club (Planning Team Member)
John Whitton	Ontario Prospector's Association
Floyd Drager	Public Representative
Lori Lamond	Ear Falls Trapper's Council
Paul Parsons	Municipality of Red Lake
Sandy Middleton	Municipality of Red Lake (alternate)
Hugh Carlson	Northern Ontario Tourist Operators
John Fahghren	Northern Ontario Tourist Operations (alternate)
Gary Beardsley	Road-based Tourist Outfitters and Ear Falls Chamber of Commerce
Russ Power	Ear Falls Hunters & Anglers Club and Northwoods Fish and Game Club (alternate)
Dave Cobb	Forest Industry/SFL's
Jody Reid	Forest Industry/SFL's (alternate)

The Local Citizens Committee (LCC) was involved in the development of this Whiskey Jack Forest 10-year forest management plan. The LCC committee's report on its involvement in the planning process is included in Supplementary Documentation J (page 14) of the forest management plan.

<u>The committee's general agreement or disagreement with the Forest Management Plan:</u>

"There were no problems or issues identified that were specific to the Whiskey Jack Forest 2012-2022 FMP."

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B Aboriginal Background Information Reports (retained at Kenora MNR District Office)

C Summary of Aboriginal Involvement (retained at Kenora MNR District Office)

D Social and Economic Description, including community demographic profiles.

E Monitoring Programs for Exceptions

F Monitoring Program for Regeneration Success

G Roads Planning Documentation

H Area of Concern (AOC) Planning Documentation

I Summary of Public Consultation, including:
(i) a summary of all comments received and the consideration of those comments;
(ii) a summary of issue resolution; and
(iii) a summary of each stage of consultation.

J Local Citizens Committee Report

K Final List of Required Alterations,
and a List of Major Changes from the Draft to Final Plans

L Planning Team Terms of Reference

M Statement of Environmental Values (SEV)

N Spatial Analysis Reports, including:
i) Caribou Habitat Analysis
ii) Marten Habitat Analysis
iii) Landscape Pattern (OLT and NDPE indicators)

FMP Maps:
Composite Maps (scale 1:200,000)
- Index Map - Harvest, renewal and tending, roads
- Spatial analysis maps (marten habitat, NDPE landscape pattern)
- Moose emphasis areas and deer emphasis areas (scale 1 :200,000)

Operations Maps by OBM (scale 1:20,000)
Values Maps (scale 1:100,000)

NOTE: Information products for harvest, renewal and tending operations will serve as the stand list.

List of Digital FMP File Names

Electronic FMP packaged into a single compressed file **MU490_2012_FMP_P1.zip**

File Name:	Plan Component:

Note: For the draft plan submission, file names contain "FMPDP" instead of "FMP".

MU490_2012_FMP_P1_TXT_PlanText.PDF	Plan Text
MU490_2012_FMP_P1_TBL_Tables.PDF	Plan Text Tables
MU490_2012_FMP_P1_TXT_AnPack.PDF	Supp. Doc. A – Analysis Package
MU490_2012_FMP_P1_TXT_SuppDoc.PDF	Supp. Doc. B-N, compiled into a single file containing:

Supp. Doc. B - Aboriginal Background Information Report(s)
Supp. Doc. C - Summary of Aboriginal Involvement
Supp. Doc. D – Social and Economic Information, including demographic profiles.
Supp. Doc. E - Monitoring Programs for Exceptions
Supp. Doc. F - Monitoring Program for Regeneration Success
Supp. Doc. G - Roads Planning Documentation
Supp. Doc. H - Area of Concern (AOC) Planning Documentation
Supp. Doc. I - Summary of Public Consultation (including a summary of each stage)
Supp. Doc. J - Local Citizens Committee Report
Supp. Doc. K - Final List of Required Alterations, and a List of Major Changes from the Draft to Final Plans
Supp. Doc. L - Planning Team Terms of Reference
Supp. Doc. M - Statement of Environmental Values (SEV)
Supp. Doc. N – Spatial Analyses – Caribou, Marten, Landscape Pattern

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FMP Maps:

MU490_2012_FMP_P1_MAP_Index_00.PDF	FMP Index Map (Composite scale 1:100,000) • Harvest, renewal and tending, roads.
MU490_2012_FMP_P1_MAP_Herb_Comp_00.PDF	Potential areas for Aerial Herbicide treatment
MU490_2012_FMP_P1_MAP_Ops00000_00.PDF (series)	Operations Maps by OBM # (scale 1:20,000)

Values Maps (scale 1:100,000):

MU490_2012_FMP_P1_MAP_ValWild_00.PDF	Natural Resource Features – Flora & Fauna
MU490_2012_FMP_P1_MAP_ValFish_00.PDF	Natural Resource Features - Fisheries & Wetlands
MU490_2012_FMP_P1_MAP_ValRec_00.PDF	Resources Uses
MU490_2012_FMP_P1_MAP_ValLand_00.PDF	Land Values (excluding existing roads responsibility)
MU490_2012_FMP_P1_MAP_ValBMA_00.PDF	Bear Management Areas
MU490_2012_FMP_P1_MAP_ValTrap_00.PDF	Trapline Areas
MU490_2012_FMP_P1_MAP_ValRBT_00.PDF	Resource-based Tourism Values

Cultural Heritage Values, Aboriginal Values:
These maps are not available in the FMP - Information is retained at MNR District Office.

Spatial Analysis Maps:

Landscape Pattern:

MU490_2012_FMP_P1_MAP_LandPat_04.PDF	Disturbance Pattern – 2022 Sliding Scale
MU490_2012_FMP_P1_MAP_LandPat_05.PDF	Landscape Pattern – 2012-2017 Planned Clearcuts

Marten Habitat Analysis:

MU490_2012_FMP_P1_MAP_MartenBmark__00.PDF	Marten – Benchmark Cores

Moose or Deer Emphasis Areas Map:

MU490_2012_FMP_P1_MAP_MEA_DEA_00.PDF	Moose and Deer Emphasis Areas

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MU490_2012_FMP_P1_LAYER	Inventory and Operational Planning Geospatial Data Layers
MU490_12PCM00.E00	Planning Composite Inventory
MU490_12FDP00.E00	Forecast Depletions
MU490_12BMI00.E00	Base Model Inventory
MU490_12PHR00.E00	Planned Harvest
MU490_12AOC00.E00	Areas of Concern
MU490_12PRC00.E00	Planned Road Corridor
MU490_12ORB00.E00	Operational Road Boundaries
MU490_12ERU00.E00	Existing Road Use Management Strategy
MU490_12PAG00.E00	Planned Aggregate Extraction Area
MU490_12PRT00.E00	Planned Renewal and Tending
MU490_12PCC00.E00	Planned Clearcuts
MU490_2012_FMP_P1_MODEL	Analysis Models
SFMM Modelling Files:	
WJF_2012_SFMM_Cases.dat	Executable SFMM case files
WJF_2012_SFMM_inputs.zip	Executable SFMM input files
WJF_2012_Final_Test_Results.pdf	Summary of Final Test Results
NDPE Analysis Files:	
MU490_2012_FMP_NDPE_PlanEndwCuts	Folder with NDPE Analysis shape files for Plan End with Cuts

File Name:	Plan Component:

Note: For the draft plan submission, file names contained “FMPDP” instead of “FMP”.

FMP Summary Submission packaged into a single compressed file MU490_2012_FMPSUM_P1.zip

MU490_2012_FMP_P1_TXT_Sum.PDF	FMP Summary Text (English)
MU490_2012_FMP_P1_MAP_Sum_00.PDF	FMP Summary Map (English)
MU490_2012_FMP_P1_TXT_SumFR.PDF	FMP Summary Text (French)
MU490_2012_FMP_P1_MAP_SumFR_00.PDF	FMP Summary Map (French)

Additional files associated with Draft FMP Summary Submission only:

MU490_2012_FMPDP_P1_TXT_LCCReport.PDF	LCC Report
MU490_2012_FMPDP_P1_TXT_PrelimAlt.PDF	Preliminary List of Required Alterations

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	- 2.1.3 Information on Other Forest Resources	Text, Page 52
		Supp. Doc. G, H
	- Forest Resource Inventory update sources	Supp. Doc. A, Sections 4.0 and 6.0
	- 2.3 Aboriginal Background Information Report	Text, Page 102
Description of the Environment Affected	2.0 Management Unit Description	Text, Page 19
	- Values map	FMP Maps
	- 2.1.3 Information on Other Forest Resources	Text, Page 52
		Supp. Doc. G, H
	- Forest Resource Inventory update sources	Supp. Doc. A, Sections 4.0 and 6.0
	4.3 Harvest Operations	Text, Page 242
	- Digital stand list	Geospatial Planned Harvest Layer
	4.4 Renewal and Tending Operations	Text, Page 257
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	- 2.3 Aboriginal Background Information Report	Text, Page 102
Description of the Selection of Operations and the Alternatives which were Considered	3.0 Long-Term Management Direction	Text, Page 103
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	Supplementary Documentation:	
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	- Road planning	Supp. Doc. G
	- Area of concern planning	Supp. Doc. H
Description of the Proposed Activities	4.3 Harvest Operations	Text, Page 242
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	4.4 Renewal and Tending Operations	Text, Page 257
	4.2 Prescriptions for Operations	Text, Page 219
	4.5 Roads	Text, Page 260
	Supplementary Documentation:	
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	- Area of concern planning	Supp. Doc. H
Description of the Expected Effects on the Environment and Proposed Mitigation Measures	3.0 Long-Term Management Direction	Text, Page 103
	4.2.1 Operational Prescriptions for Areas of Concern	Text, Page 219
	4.5 Roads	Text, Page 260
	Supplementary Documentation:	
	- Road planning	Supp. Doc. G
	- Area of concern planning	Supp. Doc. H
Description of Proposed Monitoring	4.2.2 Prescriptions for Harvest, Renewal and Tending Areas	Text, Page 224
	4.2.1 Operational Prescriptions for Areas of Concern	Text, Page 219
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	Supplementary Documentation:	
	- Monitoring programs	Supp. Doc. E, F
	- Road planning	Supp. Doc. G
	- Area of concern planning	Supp. Doc. H
Description of Public Consultation and A Summary of the Results	Supplementary Documentation:	
	- Public consultation summary	Supp. Doc. I
	- Report of the local citizens committee	Supp. Doc. J
	- Issues addressed	Supp. Doc. I, K
	- Required alterations from draft plan review	Supp. Doc. K
Any Other Environmental Assessment Matters	Statement of Environmental Values (SEV)	Supp. Doc. M

1.0 INTRODUCTION

The *Crown Forest Sustainability Act* and the *Environmental Assessment Act* provide the legislative framework for forest management on Crown lands in Ontario. The *Crown Forest Sustainability Act* requires that each forest management plan provides for the long-term health of the Crown forest and have regard for plant life, animal life, water, soil, air and social and economic values, including recreational values and heritage values. The forest management plan meets these requirements by developing and incorporating a management strategy that balances objectives related to forest diversity, socio-economics, forest cover and silviculture. The Ministry of Natural Resources (MNR) has the ultimate responsibility of sustainable management of the province's Crown forests in order to meet social, economic and environmental objectives of present and future generations.

A Forest Management Plan Summary has been prepared for this forest management plan and is available in English and French.

1.1 Planning Context

The Crown forest of Ontario is subdivided into forests or management units (MUs) for the purpose of forest management. The Whiskey Jack Forest is managed by the Ontario Ministry of Natural Resources as a Crown Management Unit. It is one of two management units administered from the Kenora MNR District Office, one of 21 management units in the MNR Northwest Region, and one of the 45 management units in the Province of Ontario.

The forest management planning requirements and the provisions of the environmental assessment approval are incorporated into the *Forest Management Planning Manual for Ontario's Crown Forests* (MNR, 2009). This manual is referenced in this plan as the "FMPM", "FMP Manual" or the "Forest Management Planning Manual". Forest management plans must also be prepared in accordance with the *Forest Information Manual* (MNR, 2009, FIM).

This Whiskey Jack Forest FMP has been prepared by the Plan Author, a professional forester registered under *Bill 110, the Ontario Professional Foresters Act, 2000* in an open and consultative fashion with the assistance of an interdisciplinary planning team. This team includes professional and technical staff from the MNR and Miisun Integrated Resource Management Inc. as well as members representing First Nation communities, Local Citizens Committees (LCC) from Kenora and Red Lake, and representatives of wood receiving mills. Opportunities for participation by interested and affected stakeholders, organizations, and the general public have been provided during the planning process. The Terms of Reference for the Whiskey Jack Forest Planning Team is included in Supplementary Documentation L.

This forest management plan (FMP) is prepared for the 10-year period from April 1, 2012 to March 31, 2022. The management plan describes forest management activities, such as timber harvesting, road construction and silviculture that will take place during the plan period. The preparation of the plan occurs in two phases. The strategic, long-term planning and the planning of the first five-years of operation are conducted during Phase I. This management plan includes the results of the Phase I planning which covers strategic planning for a ten-year period from April 1, 2012 to March 31, 2022, and details specific operations during the first five-year term from April 1, 2012 to March 31, 2017. Phase II operational planning will commence approximately a year in advance of the second five-year term, subject to Regional Director

endorsement of the Year 3 Annual Report. Detailed operations for the second five-year phase of this plan will be prepared and submitted for approval to guide future operations. This forest management plan supersedes the 2012-2014 Contingency Plan for the Whiskey Jack Forest.

1.2 Statement of Environmental Values

The *Ontario Ministry of Natural Resource's Statement of Environmental Values (SEV), 2008* under the *Environmental Bill of Rights (EBR)* is a document which describes how the purposes of the EBR are to be considered whenever decisions that might significantly affect the environment are made in the Ministry. In the development of this forest management plan, MNR's Statement of Environmental Values has been considered along with direction from Ontario's Crown Land Use Policy Atlas. The plan is intended to reflect the direction set out in the SEV, and to further the objective of managing Ontario's natural resources on a sustainable basis. An SEV consideration document has been prepared by MNR for the plan, and is provided in Supplementary Documentation M. A listing of the environmental assessment components of the forest management plan is located in the plan text immediately following the Table of Contents.

1.3 Management Unit Location and Administration

The Whiskey Jack Forest is located approximately 450 kilometres west of Thunder Bay in the Northwest Region of the Ontario Ministry of Natural Resources (MNR), primarily within the Kenora District, but partially in the Red Lake District to the north. The forest is administered as a Crown Unit by the Kenora District MNR Office (English River Area).

The location of the Whiskey Jack Forest and its proximity to MNR districts and areas within the MNR Northwest Region is illustrated in Figure 1. Figure 2 illustrates the Whiskey Jack Forest at a larger scale, showing boundaries, wood receiving mill locations, administrative boundaries and references the location of the MNR administrative office.

Communities within or adjacent to the Whiskey Jack Forest include the City of Kenora (including the former Keewatin and Jaffray Melick), Sioux Narrows, Redditt, Vermilion Bay, Ear Falls and Red Lake. First Nations communities that are within or adjacent to the Whiskey Jack Forest include Asubpeeschoseewagong Netum Anishinabek (Grassy Narrows First Nation), Wabaseemoong Independent Nations and Ochiichagwe'babigo'inning (Dalles First Nation), Wabauskang First Nation, and Naotkamegwanning (Whitefish Bay First Nation).

The Whiskey Jack Forest was licensed under Sustainable Forest Licence (S.F.L.#542253) effective April 1st, 1997. The Whiskey Jack Forest is the result of the amalgamation of the previous Pakwash Forest (FMA 502100) and Patricia Forest (FMA 502000) Forest Management Agreement areas. The Pakwash Forest was formerly that section of Parcel 1, License 326700 lying north of the English River system. A Forest Management Agreement was signed in 1984 between the Province of Ontario and Boise Cascade Canada Ltd. (now Abitibi-Consolidated) to establish the Pakwash Forest. At that same time forest management agreements were also signed to establish the Patricia Forest and the Lake of the Woods Forest. The Patricia Forest was an amalgamation, as of April 1989, of the East Patricia Forest (FMA 501900) and the Lake of the Woods Forest (FMA 502000). There have not been any changes to the management unit boundary since the signing of the S.F.L.

Figure 1 Regional Setting of the Whiskey Jack Forest

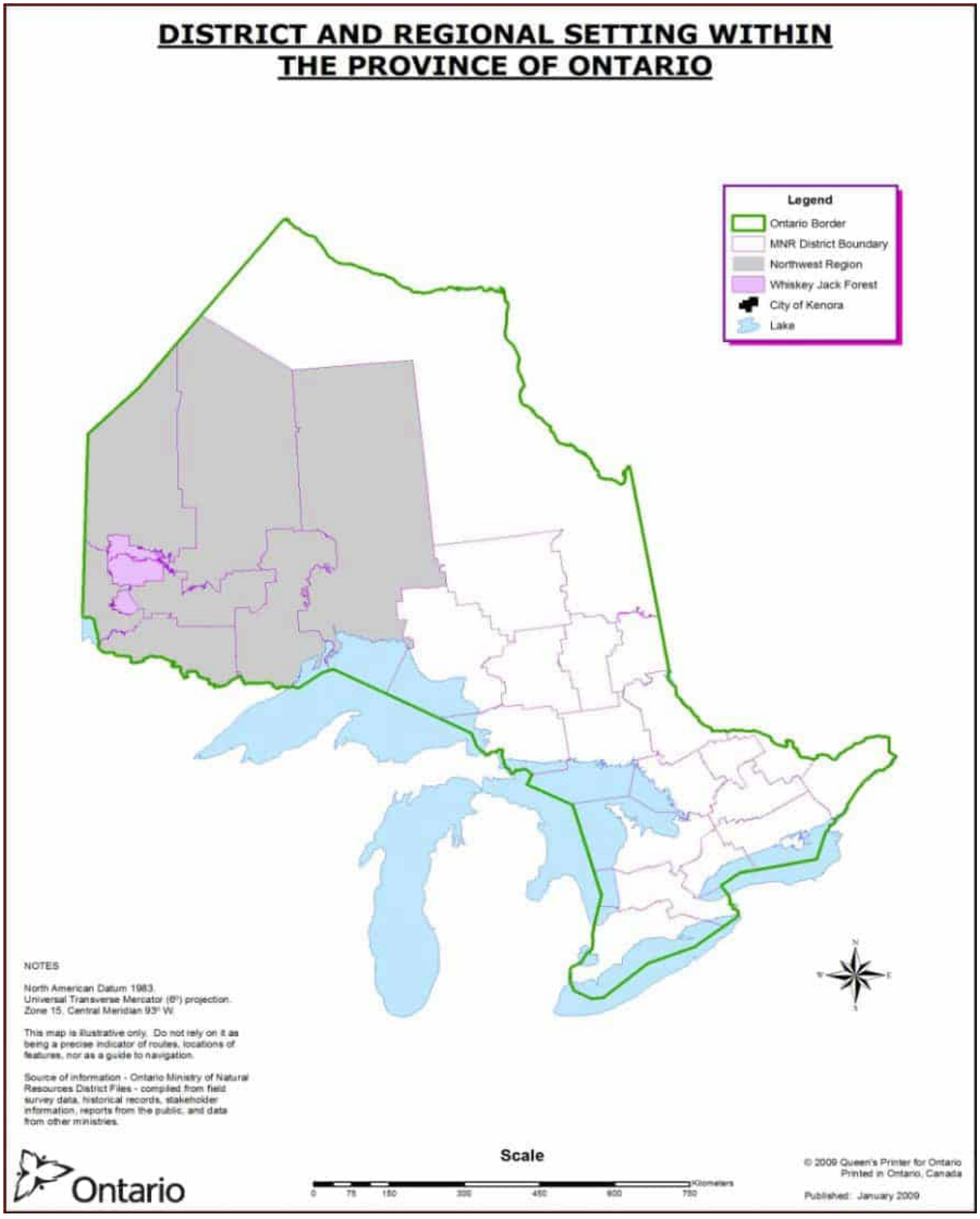
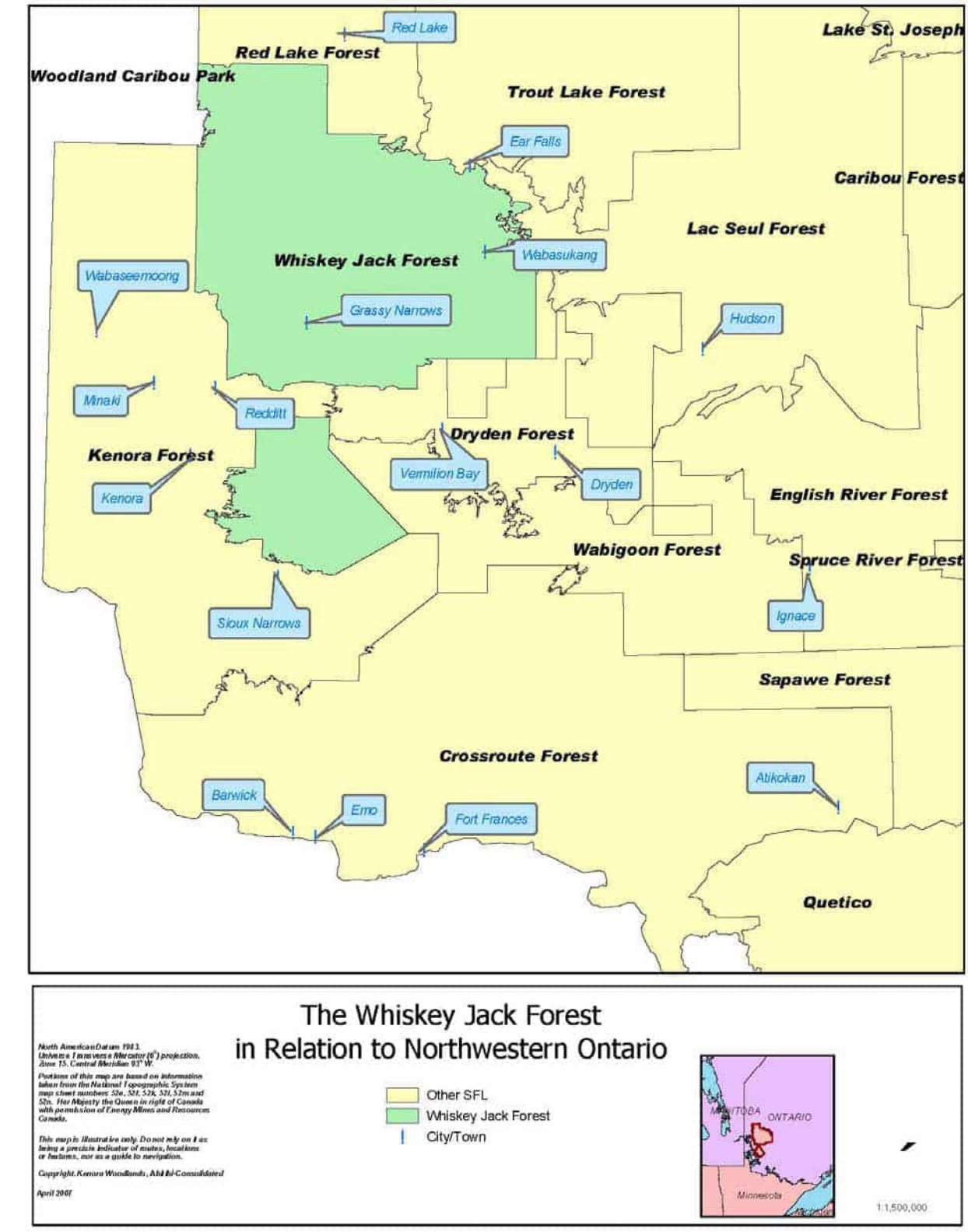


Figure 2 Management Unit Map for the Whiskey Jack Forest



Note: MNR Kenora District Office located at 808 Robertson Street, Kenora, Ontario.

2.0 MANAGEMENT UNIT DESCRIPTION

2.1 Forest Description

2.1.1 Current Forest Condition

This section of the plan text describes the Crown forest and patent land Crown timber, as described in the forest inventory, and discusses the implications of land type (e.g., large areas of non-productive forest within the management unit) on the development of the forest management plan. The plan text discusses the implications of patent land within the management unit on the development of the forest management plan.

2.1.1.1 Forest Inventory

The planning inventory for the management unit provides information required for forest management planning, including forest modelling, habitat modelling and forest biodiversity analyses. The Forest Resource Inventory (FRI) information is updated annually as a result of forest management activities and natural disturbances. The planning inventory also contains expected or forecasted changes, based on planned operations from the current approved forest management plan (e.g. forest operations which have not yet been implemented during the 2004-2012 terms). The details with respect to updates made to the planning inventory are presented in Supplementary Documentation A - Analysis Package.

The planning composite was developed based on the 2004 Whiskey Jack FMP planning collection inventory (PCOL). The Inventory Task Team considered the 2004 PCOL inventory as the most up to date inventory information available and would require the least amount of update information in order to be usable for planning purposes for the 2012 FMP.

Abitibi surrendered the Whiskey Jack Forest SFL to MNR in 2009. As a surrender condition, Abitibi Bowater Inc. updated the forest polygon coverage to include actual harvest depletion, silviculture and Free-To-Grow information from April 1, 2004 to March 31, 2009. MNR was responsible for all other inventory updates including the creation of a seamless coverage from this inventory. The overall Crown land base decreased by 103 ha as a result of boundary adjustment to match the management unit metes and bounds. As a result of the major inventory update undertaken in 2005, the production land base increased by 7,012 ha. This resulted from some area that was shifted to protection forest (3,352 ha) and a decrease in unclassified land (reduced road right-of-way buffering, 3,660 ha).

For updates to the planning inventory, MNR provided values and ownership information. This information is stored in the Natural Resources Values Information System (NRVIS) and the Land Information Ontario (LIO) Warehouse. Information regarding Free-To-Grow (FTG) was provided from regeneration surveys and depletions records that were created from aerial photography and high resolution satellite imagery.

The composite planning inventory was assembled using the following methodology:

- Updated historical information related to natural and harvest depletions updated to 2009, ownership and roads base coverages;
- Updated values, hydro corridors, and railway beds; and
- Updated stand information based on Free-To-Grow surveys.

Then the planning inventory was used to create the Base Model Inventory using the following methodology:

- Updated inventory format as per the revised *Forest Information Manual* (FIM) and associated technical specifications;
- Updated forest units, development stages and silvicultural intensities;
- Created a Forecast Depletion layer from the approved 2009-2012 Contingency Plan. Estimated depletions were given a year of depletion (YRDEP) of 2012;
- Revised (grew) young forest stand heights through application of an approved algorithm.
- Merged inventory with the MU wide AOC reserves to create the Base Model Inventory (BMI).

The BMI layer was utilized for Table FMP-3 and the Strategic Forest Management Model (SFMM) modelling initial land base. Area summaries in all tables reflect the base model inventory (after the union on the planning inventory and the forecast depletions). This usually results in an over estimation of "recent disturbance" and "below regeneration standards" area due to the full depletion of all forecast clearcut forest unit stands.

As result of a recommendation of the Minister's Council on Forest Sector Competitiveness (June 2005), the Ministry of Natural Resources is assuming the responsibilities for Forest Resource Inventories. Based on recommendations from the Provincial Forest Inventory Advisory Committee, acquisition of new aerial photography was completed in 2009. Follow up calibration plot establishment and photo interpretation work is tentatively scheduled for June 2015 to January 2017, at which time the inventory is tentatively scheduled for delivery in March 2017. These dates are subject to change.

2.1.1.2 Land Ownership and Productivity

The planning inventory can be broadly described in terms of land ownership. Table FMP-1 is a Crown Land Summary, presenting the area (in hectares) of different land types (forested & non-forested), by Crown ownership type for the Whiskey Jack Forest (Managed and Park). Forest management activities are only planned on managed, Crown land; however Crown - Parks (parks, conservation reserves, etc.), may contribute to wildlife habitat and other non-timber objectives. Where appropriate, these ownership and land type classifications are illustrated on maps within this FMP.

A summary of the land types by ownership for the management unit at the beginning of the plan period is provided in Table FMP-1 Management Unit Crown Land Summary. The total Whiskey Jack Forest is 1,063,446 hectares in size, comparable to the land base reported in the previous 2004 FMP. The 2009 Forest Management Planning Manual, used for this FMP, revised the format of Table FMP-1 and now it does not include Patent or Federal lands, only Crown land. Of the total Whiskey Jack Forest land base, 1,053,515 hectares are Crown land (Managed or Park/Conservation reserves, reported in Table FMP-1) and the remainder is Patent Land or Federal Land (not reported in Table FMP-1 and not managed in this FMP).

Provincial Parks and Protected Areas (Ownerships 5 and 7) include several different classifications (all Crown land). Each class and individual area has different objectives and permit different activities within the defined areas. There are six classifications of provincial parks; 1)Wilderness Class Parks, 2) Nature Reserve Class Parks, 3) Cultural Heritage Class Parks, 4) Natural Environment Class Parks, 5) Waterway Class Parks, and 6) Recreational

Class Parks. In addition to parks, there are conservation reserves (considered in combination with Crown park land in the forest inventory and planning).

The Whiskey Jack Forest has seven Provincial Parks surrounded by, or immediately adjacent to the SFL boundaries. Parks within the management unit include the West English River, Eagle-Dogtooth, Tide Lake and the Maynard Lake Parks. Pakwash Provincial Park is located adjacent to the northeast corner of the unit, Rushing River Provincial Park is located in the southern portion of the forest, and Woodland Caribou Provincial Park (and Park Addition) is located in the northwest portion of the unit. All of these parks have either an Interim Management Statement or a park management plan that provides direction. More detail on the parks and protected areas is included in text Section 2.1.3.3.5.

The park and protected areas within the Whiskey Jack Forest encompasses 89,295 hectares (8% of forest) and is 85 hectares greater than the parks land base reported in the 2004 FMP. The provincial parks in and adjacent to the Whiskey Jack Forest are managed by Ontario Parks, while the conservation reserves are managed by Kenora, Sioux Lookout and Red Lake Districts of the Ministry of Natural Resources.

Managed, Crown land (Ownership 1) covers 964,220 hectares (84%) of the Whiskey Jack Forest, a decrease of 188 hectares since the 2004 FMP. This difference is the net difference from revisions for a decrease in reported water, an increase in the non-productive area and protection forest, and an increase in forested area.

The Crown, managed and park areas are used for the strategic planning for this forest management plan.

Patent land – (Ownerships 2, 3, or 4) Approximately 3,066 hectares of patent land (<1% of the production forest) are included within the boundaries of the Whiskey Jack Forest. Provincially, there are three classifications of patent land (other than Crown owned patent land, see note below):

Ownership 2 – Patent land with timber rights reserved to the Crown;
Ownership 3 - Patent land - Fee Simple (private land), no timber reserved;
Ownership 4 – Patent land – Company Freehold.
Note: Patent land owned by MNR, Lands & Forests or other Crown ministries is treated as if it were Ownership 1 – Crown, Managed Land.

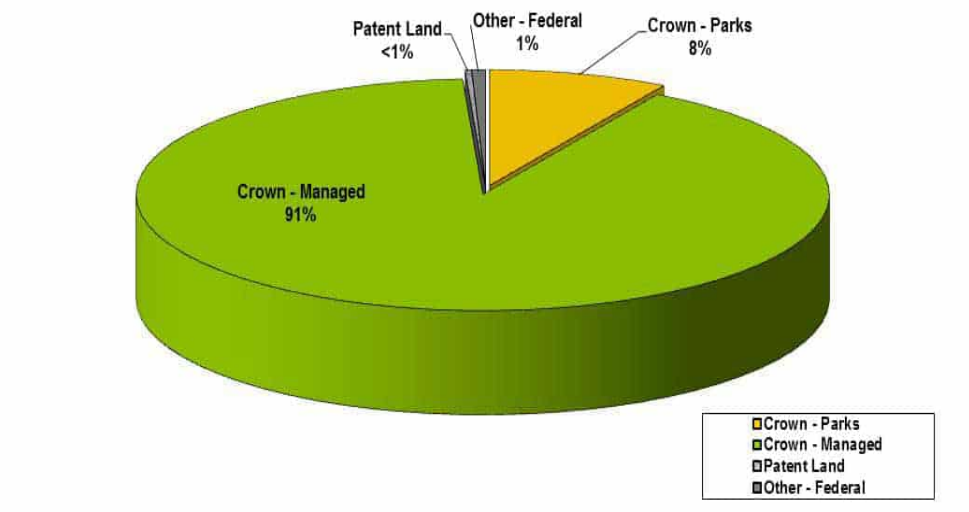
All patent land on the Whiskey Jack Forest is classified as Ownership 3 in the forest resources inventory, though some tracts of patent land do have trees reserved to the Crown. Landowners wishing to harvest trees on patent land should contact the Land Registry Office to confirm if trees are reserved to the Crown.

In accordance with the *Crown Forest Sustainability Act,* all patent land (Ownerships 2, 3, and 4) is excluded from the Whiskey Jack Forest SFL area and is therefore not included in this forest management plan or its associated strategic planning. Patent land is not reported in Table FMP-1. Patent land must be considered as values during forest management planning for the managed, Crown area of the Whiskey Jack Forest. Negotiations with landowners must occur to gain permission if access through patent land is required for harvest or renewal activities. Renewal activities, especially aerial chemical tending, are impacted based on the proximity to patent land where treatment is limited to ground spraying as aerial spraying is considered too great of a liability.

Federal land (Ownerships 6 and 9) accounts for 6,866 hectares (1%) of the Whiskey Jack Forest and is also not included in the management plan strategic planning or operations. Other (federal) land is not reported in Table FMP-1.

The proportion of Crown land (park and managed), patent and other (federal) land are illustrated in Figure 3. Excluding patent and other (federal) land, Managed Crown land accounts for 92% of the Whiskey Jack Forest Crown land, with Crown Park land contributing the remaining 8%.

Figure 3 Land Ownership Summary of the Whiskey Jack Forest



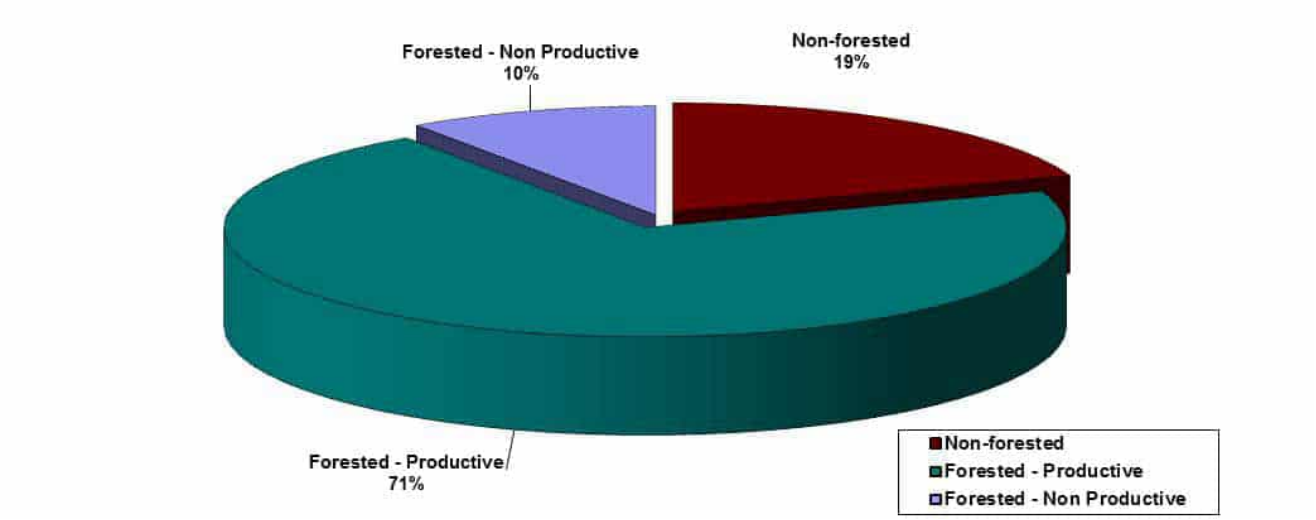
The Whiskey Jack Forest inventory was used as an input to calculate and measure the achievement of Management Objectives (Section 3.5) and Determination of Sustainability (Section 5.0). The forested stands were totalled and categorized into forest units (Section 2.1.2.1). The total land base (Crown managed and park including non-productive) for the Whiskey Jack Forest was calculated to be 1,053,501 hectares in SFMM, which is comparable to the total Crown, Managed and Park land base in Table FMP-1 (14 hectares less, acceptable rounding difference). Patent land (3,066 hectares) and Other (federal) land (6,866 hectares) are not included in the strategic modelling. The reconciliation of the land base of the Whiskey Jack Forest (Table FMP-1) and the SFMM land base used for strategic planning purposes is documented in an optional table located in the table file immediately following Table FMP-3 (also in Supplementary Documentation A – Analysis Package, Section 6.2.1 Land Base Assumptions).

The FMPM (2009) defines the following:

- **Productive Forest** is “all forest areas which are capable of growing commercial trees, irrespective of planning decisions, and which is further sub-divided into “protection forest and production forest”.
- **Protection Forest** is “productive forest land on which forest management activities cannot normally be practiced without incurring deleterious environmental effects because of obvious physical limitations such as steep slopes and shallow soils over bedrock”.
- **Production Forest** is “productive forest land, at various stages of growth, with no obvious physical limitations on the ability to practice forest management”.

For Crown land, the productive forest area is 745,548 hectares (Crown Managed and Parks) or 71 percent of the total Crown area according to the updated Planning Inventory. Water and non-forested land account for 206,541 hectares (19%) of the Crown land base. Non-productive land makes up the balance of the Whiskey Jack Forest with 101,426 hectares (10% of Crown land). The total area of the productive forest is tabulated in Table FMP-1, and depicted graphically in Figure 4.

Figure 4 Crown Land Productivity Summary



Planned harvest depletions for the 2004-2024 forest management plan and 2009-2012 Contingency Plan and actual recent depletions prior to 2012 are classified as "Below Regeneration Standards" forested stands (age class 1-10) in the appropriate forested stand classification for this plan (Forest Unit, Section 3.2.1). Older "Below Regeneration Standards" area, formerly referred to as "true Barren and Scattered" area, is identified in Table FMP-1. More detail on the classification of the forest in the planning inventory is included in Supplementary Documentation A – Analysis Package, Section 4.

It is worth clarifying that area currently classified as being "below regeneration standards" is being reported differently than was done for the 2004 FMP. The older stands (DEVSTAGE equal to LOWNAT, LOWPLANT, LOWSEED, LOWMGMT) are equivalent to the previous "true" Barren and Scattered (B&S) that were reported in the previous FMP. These areas are considered as not being productive in the strategic modelling even though they still provide some benefit for wildlife habitat and forest diversity. The more recently depleted areas, through both harvesting and natural depletions, are now reported on a separate line in Table FMP-1 (NEWNAT, NEWPLANT, NEWSEED and NEWMGMT areas). These "NEW…" areas are not currently meeting regeneration standards but are expected to achieve standards within this plan period either through renewal treatments or natural regeneration. The "NEW…" classified areas are considered as productive forest in the strategic modelling and continue to provide the benefits afforded by forest stands. This "NEW…" area was not reported separately in the 2004 FMP, but was classified as "B&S" in Table FMP-1 and reclassified as young, growing forested stands in the strategic modelling land base.

2.1.2 Forest Classification

This section of the plan text describes the current forest condition and the various means of classifying the land base for forest management planning.

2.1.2.1 Forest Units

Forest stands are aggregated into forest units (FUs) to facilitate management planning. For this plan, the planning team considered the variability of ecosites, management implications and resulting timber yields when determining the forest units for the plan. The forest units represent ecologically based areas of the productive forest land base:

- Have similar species composition;
- Develop in a similar manner (naturally and in response to silvicultural treatments); and
- Are managed under the same silvicultural system.

Forest units provide a foundation for silvicultural ground rules (Table FMP-4), strategic modelling forest dynamics (yield curves, forest succession), analysis of management objective achievement (prediction of forest conditions, available harvest area, biodiversity, managed forest available for timber production, timber volume projections, wildlife habitat potential) and the selection of areas of operations. The development of forest units is an iterative process that must be based on science and are ecologically defensible. Forest unit development occurs within the context provided by management objectives with a link to the desired future forest condition. The development of ecologically based forest units may be constrained by the current forest condition, knowledge or current land base classification.

The first step in the development of plan forest units for this 2012 FMP was agreement that it was a cooperative process with the Kenora Forest 2012-2022 Planning Team and that both forest management plans would be prepared using the same forest unit definitions. Preparing 2012 plans for these adjacent forests utilizing the same forest units was considered a key objective as identical forest units would streamline future planning if there was a potential land base amalgamation and identical forest units would streamline future reporting of forest management activities. Another consideration was that by utilizing the same suite of forest units, there were some efficiencies to be realized in plan development for the 2012 plans (e.g. strategic modelling inputs, plan documentation, etc.). While development of forest units was a joint process between two planning teams, both teams separately demonstrated the appropriateness of the final PLANFUs to each of the two individual management units.

The Forest Resource Inventory parameters used for the development of these forest units were species composition, stocking, site class, age and ecosite (for shallow and wet soils). A number of adjustments were made to the Whiskey Jack Forest 2004 FMP forest units to be more consistent with the Northwest Region Standard Forest Units (SFU). With only very minor exceptions, each standard forest unit fit into a single PLANFU. This strong correlation between PLANFUs and SFUs was important since many forest diversity and forest condition desirable levels and targets were based on science developed for the Ontario Landscape Tool, which utilized inputs documented primarily by standard forest units. Better correlation in forest units to SFUs allowed better analysis of projections to Ontario Landscape Tool Simulated Ranges of Natural Variation (SRNV).

A number of Regional Standard Forest Units were amalgamated to create the 2012-2022 Whiskey Jack Plan Forest Unit. Major ones are the Upland Cedar (**UplCe)** was lumped into Conifer Mixedwood (**CMX)** since Upland Cedar (**UplCe)** is on a much more productive site than Other Conifer Lowland (**OCLow)**, and only makes up 3,545 ha , Hardwood Dominated (**HrDom),** Hardwood Mixedwood **(HrdMw),** White Birch Dominated **(BwDom)** and White Birch Shallow **(BwSha)** was lumped to create Hardwood Mixedwood **(HMX),** Balsam Fir Pure **(BfPur)** was lumped with Balsam Fir Mixedwood **(BfMx1)** to create Balsam Fir Mixedwood **(BFM),** Red Pine Dominant **(PrDom),** White Pine Dominant **(PwDom**) and Red Pine – White Pine Mixedwood **(PrPrMx)** was lumped to create Red Pine – White Pine Mixedwood **(PRW).** These areas were lumped because they represent small area.

Forest units for both the Whiskey Jack Forest 2004-2024 Forest Management Plan (WJ 2004 FMP) and the Whiskey Jack Forest 2012-22 Forest Management Plan (WJ 2012 FMP) were based on the Northwest Regional Standard Forest Units; however the forest units were revised to better amalgamate regional standard forest units and improved to reflect better representation of ecosite classification according to *The Terrestrial and Wetland Ecosites of Northwestern Ontario (MNR, 1996)*. An ecosite is primarily a mapping unit integrating a consistent set of environmental factors and vegetative conditions. They are composed of eco-elements that describe common assemblages of both abiotic (soil depth, texture, moisture regime, hydrology and nutrient regime) and biotic (plant community structure and composition) components.

The relationship between plan forest units from the 2004 and 2012 FMPs and regional standard forest units are summarized in
Figure 5. Table FMP-2 presents summary of the description of forest units including a description of each forest unit, forest types, main ecosites, associated regional forest unit, silvicultural system, and the FRI sort parameters. The development of these forest units is detailed in the Analysis Package Supplementary Documentation A (Section 5.1) including the analysis of the productive Crown, managed land base by Northwest Region standard forest units, ecosites, average species compositions, average stocking and site class. This FMP is prepared based on available information and updates made to the Forest Resource Inventory (FRI) and this information forms the basis for the development of forest units. These forest units have been reviewed and approved as appropriate for the Whiskey Jack Forest by the MNR.

A total of 12 forest units were developed and approved to represent unique stand and site conditions on the Whiskey Jack Forest for the 2012 FMP. The forest units for this plan are outlined below:

Pure Forest Units

The following list represents forest units that are comprised of one dominant tree species:

- PJD - jack pine dominated stands with minimal poplar component;
- POD - poplar dominated stands;
- SPD - upland black (or white) spruce dominated stands with minimal hardwood;
- OCL - larch and cedar dominated lowland stands; and
- SBL - lowland black spruce stands.

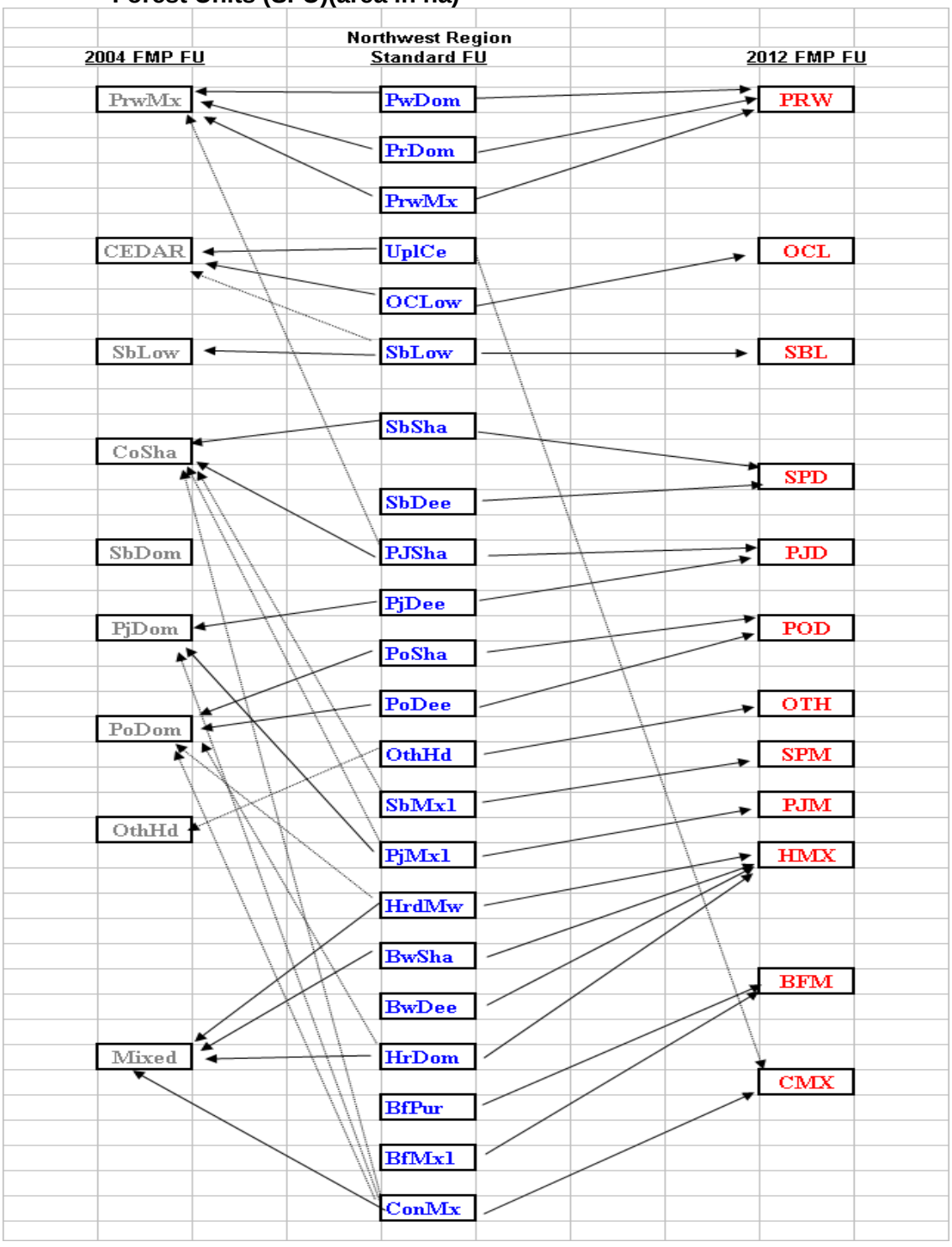
Mixedwood Forest Units

These forest units represent mixed conifer or mixed hardwood stand conditions:

- BFM - balsam fir mixedwood stands;
- CMX - conifer mixedwood stands;
- HMX - mixed hardwood dominated stands;

OTH - other hardwood mixedwood stands;
PJM - jack pine dominated mixedwood stands with minimal hardwood;
SPM - spruce dominated mixedwood stands with minimal hardwood; and
PRW - red pine and white pine mixedwood stands.

Figure 5 Correlation of Plan Forest Units (PLANFU) 2004 and 2012 to Standard Forest Units (SFU)(area in ha)



A summary of the managed Crown productive forest area for the Whiskey Jack Forest is provided in Table FMP-3 by forest unit area, age class and availability for timber production. The productive forest area is also reported by classifications as being production forest or protection forest (classification definitions referenced in Section 2.1.1.2). There are a total of 673,090 hectares of production forest and a total of 32,515 hectares of protection forest on the Crown, managed portion of the Whiskey Jack Forest.

The managed, Crown land within the Whiskey Jack Forest was further classified as available or unavailable according to the *Forest Resources Inventory Technical Specifications (2009)*. The availability indicator identifies which portions of the managed Crown production forest are available for timber production or not. The availability of forest is based on several pieces of information such as access, land use designation, physical operability limitation and managed decisions. Those managed, Crown land stands that are deemed unavailable are considered as reserves for the strategic modelling purposes.

Of the production forest reported in Table FMP-3 (673,090 ha), there are 131,335 hectares estimated to be unavailable for timber production in the inventory, leaving 538,618 hectares estimated to be available for timber production (see Table FMP-3 footnotes). Estimated unavailable area includes forested islands, older LOWNAT area unsuitable for harvest operations, estimated (new) slope-based riparian reserves, nest reserves and tourism reserves.

It should be noted that areas designated as unavailable during this plan, may in fact become available for forest management activities in the future due to advances in timber harvesting technologies, or changes in land use guidelines or their application.

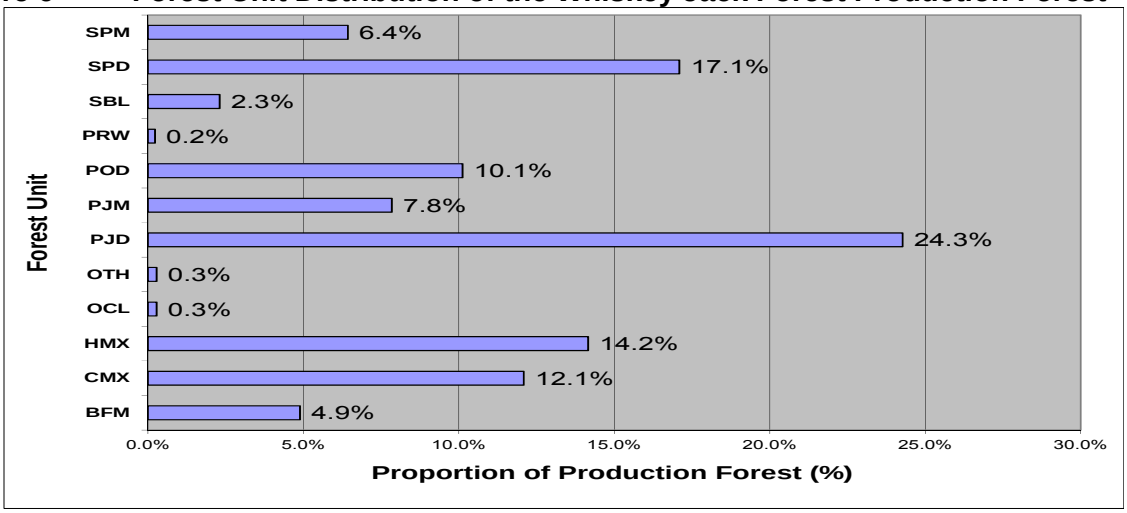
Unavailable area was initially classified in the forest resources planning composite inventory. A further refinement of unavailable area was completed with the Base Model Inventory to identify additional areas projected to be unavailable for operations due to spatial considerations. This total estimate of unavailable area was included in the strategic SFMM modelling data (strategic planning land base reconciled in the table following Table FMP-3, also located in Supplementary Documentation A – Analysis Package, Section 6.2.1 Table 9).

The Whiskey Jack Forest is mostly a conifer dominated forest (64% in PJD, SPD, PJM, SPM, PRW, OCL, BFM and SBL) with 26% mixedwood forest (CMX and HMX) and a slightly lesser proportion of purer poplar dominated forest (10% in POD)(Figure 6).

There is a silvicultural strategy to increase to more pure conifer and hardwood species stands on the Whiskey Jack Forest as would have been created by wildfire (see rationale Section 3.5.2.2 Objective 2: Forest Composition, indicators 2a, 2b, 2e). There is also a provincial and management unit strategy to maintain or increase the area of the red pine and white pine mixedwood (PRW) forest unit area. Red pine and white pine renewal will be encouraged on the Whiskey Jack Forest, but most likely will result in increased red pine and white pine species composition within forest units, with a minimal increase in the PRW forest unit area.

The following is a description of each forest unit and the amount of production forest area available for timber production, as presented in Table FMP-2 and Table FMP-3. Production area by forest unit is described below (listed in order of occurrence on the forest – most common to least common forest units).

Figure 6 Forest Unit Distribution of the Whiskey Jack Forest Production Forest



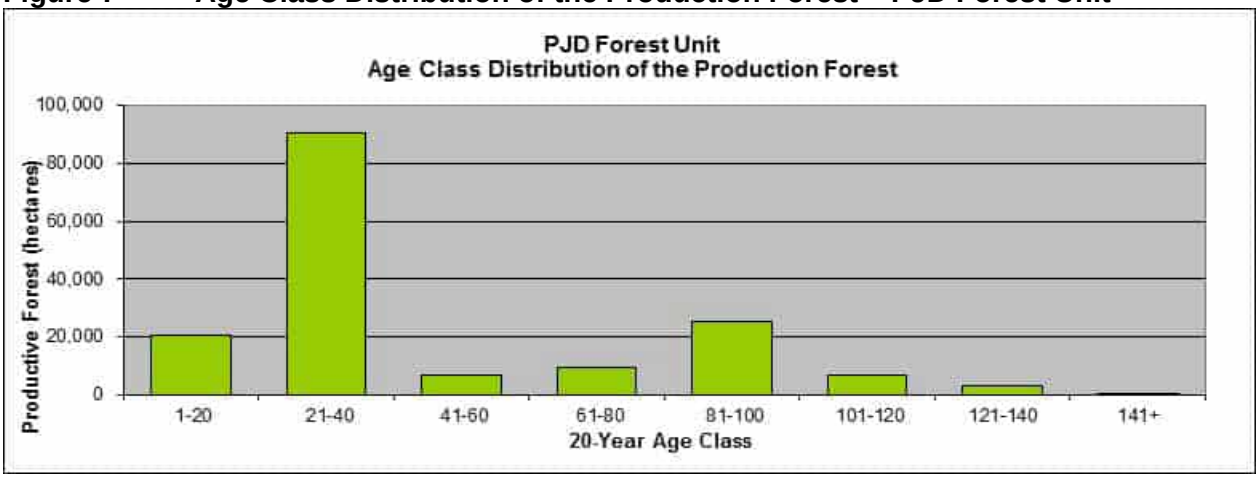
Jack Pine Dominated (PJD) Forest Unit

The PJD forest unit is largest forest unit on the Whiskey Jack Forest and is comprised of jack pine dominated stands (jack pine greater than or equal to 70%) with minimal poplar component. The PJD forest unit includes the Jack Pine Shallow (PjSha) and Jack Pine Deep (PjDee) regional standard forest unit areas.

The PJD forest unit occupies 24% of the production forest land base (163,384 hectares, Figure 7). PJD forest unit stands are located most frequently on Ecosite 12 areas with some occurrences on Ecosite 20. Typical sites are dominated by jack pine, with minor occurrences of black spruce, poplar, white birch and balsam fir. Soils are often very shallow and dry to fresh with fine to coarse sand or coarse loam.

The relatively high level of PJD forest in the 21-40 year age class can be primarily attributed to wildfires that occurred in the 1980s. The relatively low level of conifer in the 41-60 year age class is typical of the northwest region and results from a period when there was minimal investment in conifer regeneration after harvesting (this situation changed in the early 1980s with the signing of the first Forest Management Agreements). The current forest condition does not reflect any significant management implications to be considered in the development of this

Figure 7 Age Class Distribution of the Production Forest – PJD Forest Unit



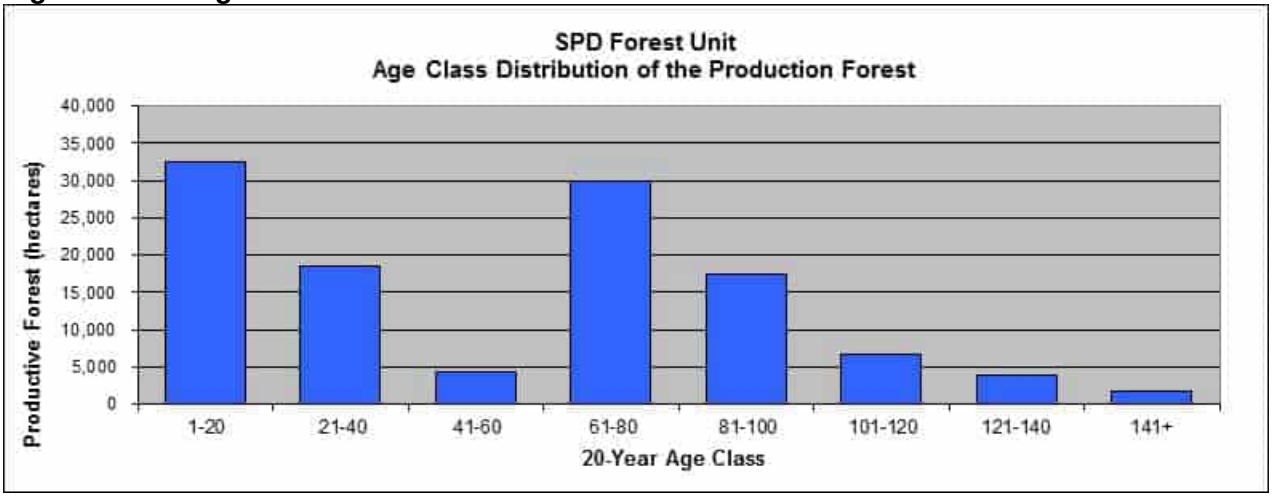
FMP however silvicultural strategies will be implemented to encourage the maintenance of the PJD forest unit area through time while limiting the conversion of area to mixedwoods such as CMX and HMX.

Spruce Dominated Upland (SPD) Forest Unit

The SPD forest unit is the second largest with 17% of the production forest land base (115,053 ha, Figure 8). The SPD forest unit is primarily upland black (or occasionally white) spruce dominated stands with minimal hardwood present. SPD stands are usually associated with Ecosites 12, 20 and 22. Typical sites are dominated by black spruce, with occurrences of jack pine, poplar, white birch and balsam fir. Soils are often shallow and dry to fresh with fine to coarse sand to fine loamy-clayey soils. The SPD forest unit includes area classified as SbSha, SbDee, SbMx1 regional standard forest unit areas.

The relatively high level of SPD forest in the 1-20 year age class can be attributed to significant area not yet free to grow and how forest inventories are interpreted. It is common to classify a stand as SB 100% if the stand is too young to be interpreted on aerial photography. Many of these stands may be in actuality SPM mixed stands containing a component of jack pine. Under current management practices, pure black spruce conditions have a higher level of difficulty to regenerate due to slow growth rate in comparison to other tree competitors. The success of producing SPD forest is much lower and must be considered a priority in increasing area above the current forest level. Many wildlife species prefer mature, conifer (including spruce) dominated forests for habitat which will be a consideration during development of the long-term management direction and setting of desirable levels for indicators of management objective achievement.

Figure 8 Age Class Distribution of the Production Forest – SPD Forest Unit



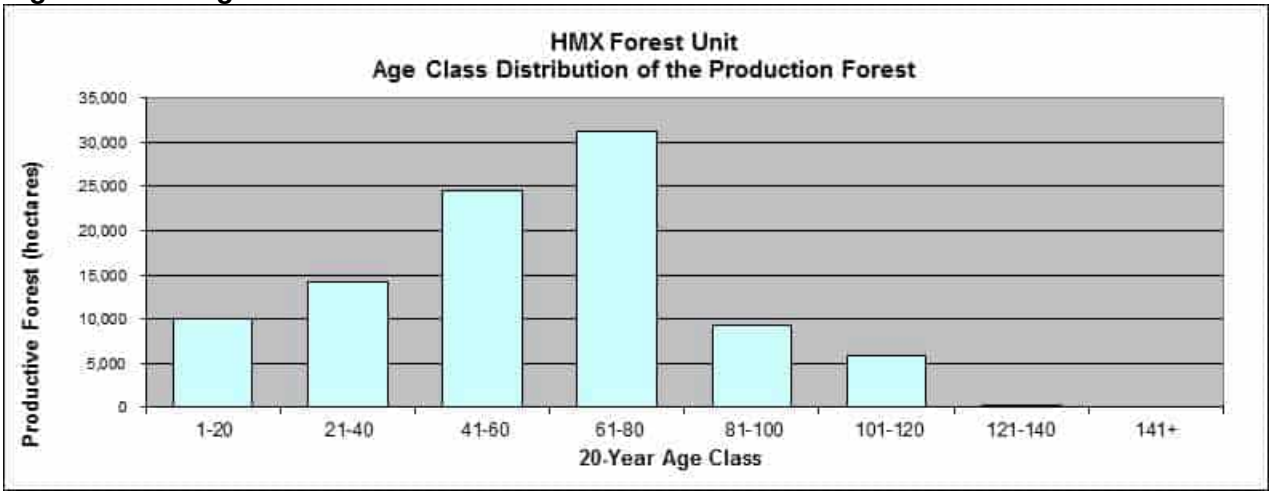
Hardwood Mixedwood (HMX) Forest Unit

The HMX forest unit is the third largest forest unit on the Whiskey Jack Forest comprising 14% of the production forest land base (95,322 hectares, Figure 9). The HMX forest unit is made up of mixed hardwood conifer stands, with 50% or more of the stand composed of hardwoods. The HMX forest unit includes area primarily classified as HrdMx, HrDom regional standards forest units, with some additional area classified as the BwDee and BwSha regional standard forest units.

HMX is most often found on Ecosites 12, 19, 29 and 11 which are frequently very shallow soils over bedrock or fresh, well drained, with coarse loamy to fine sandy soils but this forest unit can also be found on the fine loamy-clayey soils. This forest unit has a predominance of area in the 61-80 year old age class, primarily a result from wildfires 60-80 years ago.

As with the mixed conifer forest unit (CMX), the increase of this forest unit area through time can be attributed to past forest practices and not the historic forest condition. The long-term management strategy for this plan needs to consider the impacts of increasing hardwood and mixed forest type on pure and conifer dominated forest units, and on the provision of wildlife habitat. Silvicultural strategies will be implemented in this plan that will gradually reduce the area of the HMX forest unit area over the next 50 years (approximate timeframe). Most HMX conversion will be to the purer POD forest unit area, and some of the drier sites will be considered for conversion to conifer dominated forest units (Section 4.2.2.1 Silvicultural Ground Rules, Section 3.6.3. Assessment of Management Objectives).

Figure 9 Age Class Distribution of the Production Forest – HMX Forest Unit

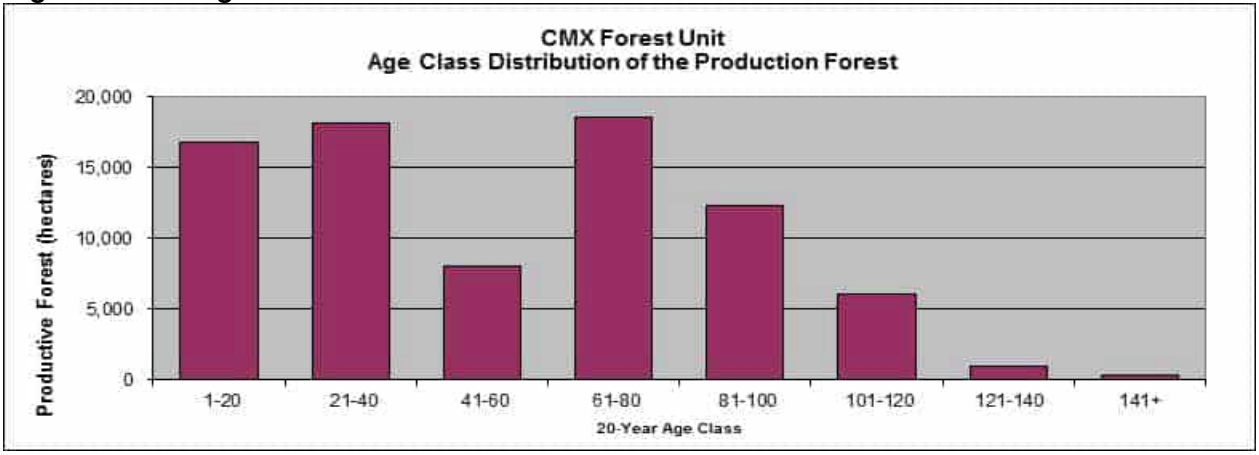


Conifer Mixedwood (CMX) Forest Unit

The CMX forest unit makes up 12% of the production forest, 81,361 hectares. Age class distribution of the CMX forest unit is included in Figure 10. CMX areas are mixed conifer hardwood stands. The CMX forest unit has relatively good representation of area by age class in all but the 41-60 year old class that has proportionately less area. This change is a result of past harvesting techniques that did not encourage hardwood regrowth, followed by renewal strategies in past three decades that limited the amount of herbicide spray that was conducted on the forest. Although this forest unit reflects both pioneer and successional characteristics, its increase must be controlled through silvicultural treatments to mitigate declines in more pure forest unit types.

CMX is predominantly found on Ecosite 12, 21 and 11 areas. Typical sites are dominated by jack pine, white spruce, black spruce and balsam fir with mixtures of trembling aspen and white birch. Coniferous component exceeds 50% of the canopy. Very shallow soils are often dry to fresh with fine to coarse sand or coarse loam but this forest unit can also be found on the fine loamy-clayey soils. These stands are classified in the ConMx and UplCe regional standard forest units.

Figure 10 Age Class Distribution of the Production Forest – CMX Forest Unit



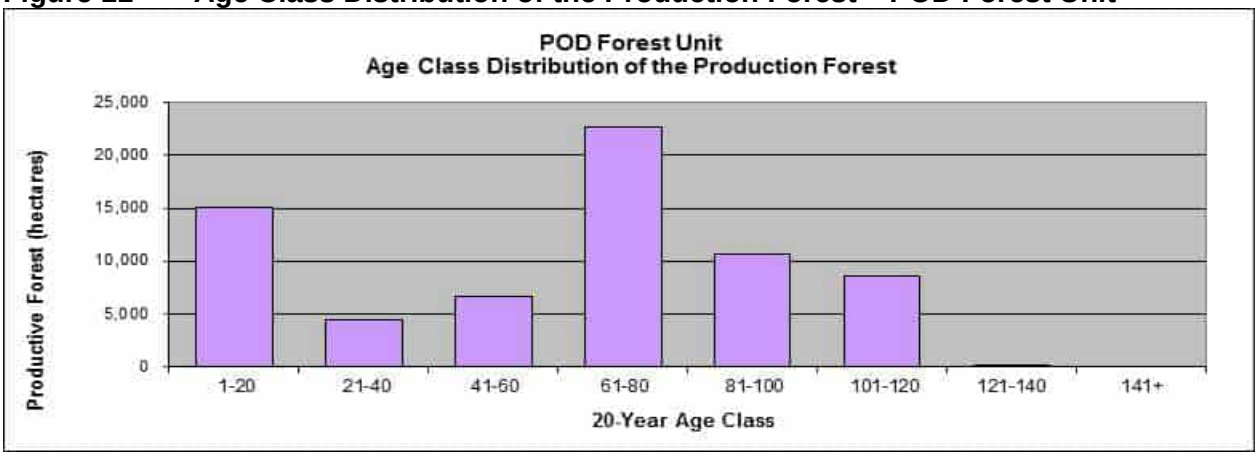
Poplar Dominated (POD) Forest Unit

The POD forest unit is made up of poplar dominated stands with greater than or equal to 70% poplar, including balsam poplar. The POD forest unit areas are also classified as PoSha and PoDee regional standard forest unit areas. The POD forest unit is only 10% of the production forest land base supporting poplar dominated stands (68,089 hectares, Figure 11). The POD stands are often located on fresh, well drained, with sandy-coarse loamy to fine loamy clayey soils, classified as Ecosite 29, 19 and 12 (shallow soils).

The age class distribution is relatively even with larger areas in the 1-20 and 61-80 year old age classes. While there is a natural component of poplar forest on the Whiskey Jack Forest, the occurrence of wildfires 61-80 years ago also contributes to the amount of poplar dominated forest being reported. Natural regeneration of these hardwood dominated stands often resulted in increased poplar composition which increased the area of the POD forest unit.

Poplar regeneration is prolific after harvest and the increase of this forest unit through time can be contributed to recent forest renewal practices including limited herbicide use and an increase in the poplar harvest due to increased local utilization of hardwood volumes. Renewal strategies applied to appropriate sites will allow an increase in the poplar component on many poplar dominated HMX mixedwood areas which will result in an overall increase in the POD forest unit area through time (4.2.2.1 Silvicultural Ground Rules).

Figure 11 Age Class Distribution of the Production Forest – POD Forest Unit

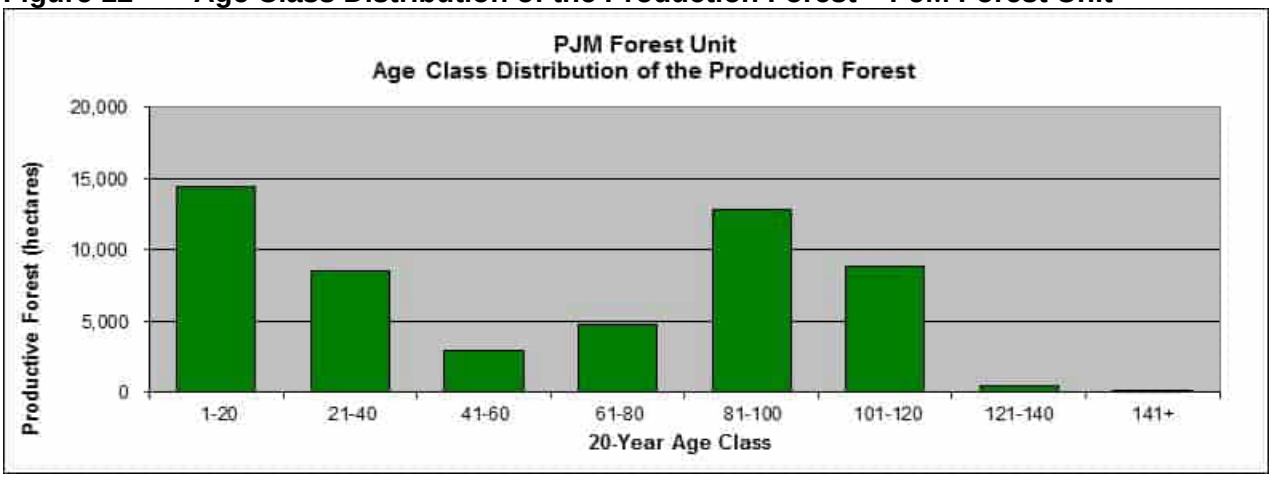


Jack Pine Mixedwood (PJM) Forest Unit

The PJM forest unit occupies 8% of the production forest land base (52,819 hectares, Figure 12). PJM occurs on Ecosites 12 and 21 most often. These shallow sites are characterized by an overstory dominated by jack pine with occurrences of black spruce, poplar, white birch and balsam fir. Poplar and birch make up 20% or less of the stand composition. PJM areas often have dry to dry-fresh moisture regimes, and have frequent occurrence of bedrock. The shallow soils of Ecosite 12 must be considered during harvest operations (SGR Table FMP-4).

PJM forest unit area is classified as the PjMx1 regional standard forest unit. The PJM forest unit has a relatively even age class distribution, with the exception of a lower occurrence in the 41-60 year old age class. This gap in maturing PJM area will be managed through the normal practice of balancing the allocation of eligible harvest stands with other conifer dominated forest unit areas to meet management objectives. No specific management implications are warranted for the PJM forest unit as the silvicultural strategies are similar to those applied to the PJD and SPM forest units.

Figure 12 Age Class Distribution of the Production Forest – PJM Forest Unit



Spruce Dominated Mixedwood (SPM) Forest Unit

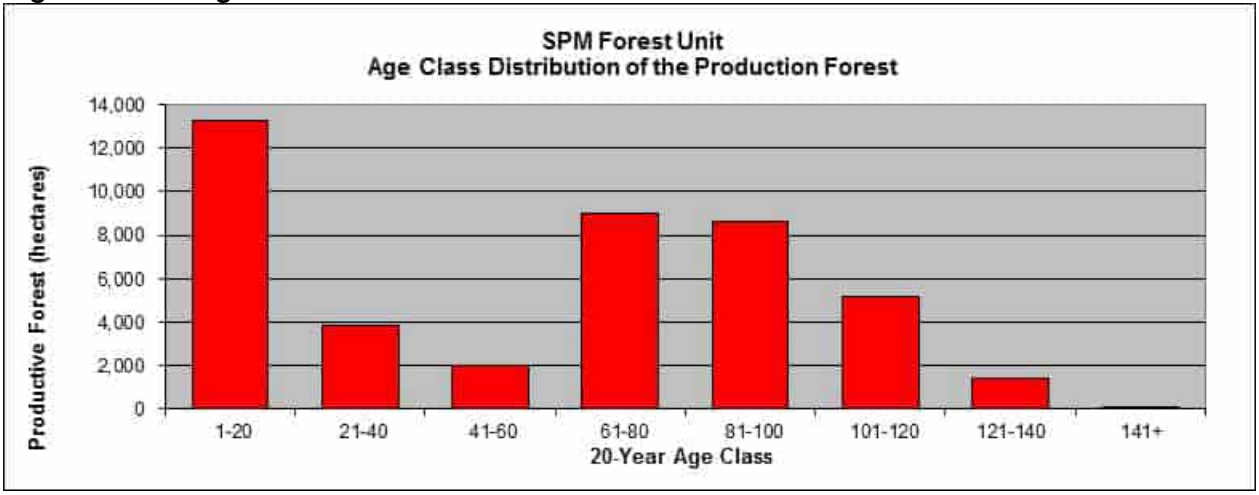
The black spruce mix (SPM) forest unit occurs on 43,285 hectares of the production forest on the Whiskey Jack Forest (6%, Figure 13). SPM occurs most often on Ecosites 12, 21 and 20. These sites are characterized by black spruce, with occurrences of jack pine, poplar, white birch and balsam fir. Poplar and birch are 20% or less of the stand composition. Soils are often dry to fresh with fine to coarse sand or coarse loam, with the very shallow soils occurring on Ecosite 12 areas.

The SPM forest unit includes areas classified as the SbMx1 regional standard forest unit area. The age class distribution reflects lower areas in the 21-40 and 41-60 year age classes. SPM is in many cases a transitional (successional) forest unit and changes in abundance though time as the jack pine component decreases due to natural succession and the spruce becomes more dominant. Silvicultural strategies have more recently favoured SPM renewal to encourage conifer dominated forest with minimal hardwood.

The current forest condition does not reflect any significant management implications to be considered in the development of this FMP. Since SPM forest unit areas tend to naturally

succeed to the SPD forest unit through aging, which causes a decline of the shorter-lived non-spruce tree species, there is a risk of a gradual reduction in the SPM forest unit area through time. Silvicultural strategies will be considered during this plan to maintain area in this forest unit and not allow a continual decrease in SPM forest unit area.

Figure 13 Age Class Distribution of the Production Forest – SPM Forest Unit

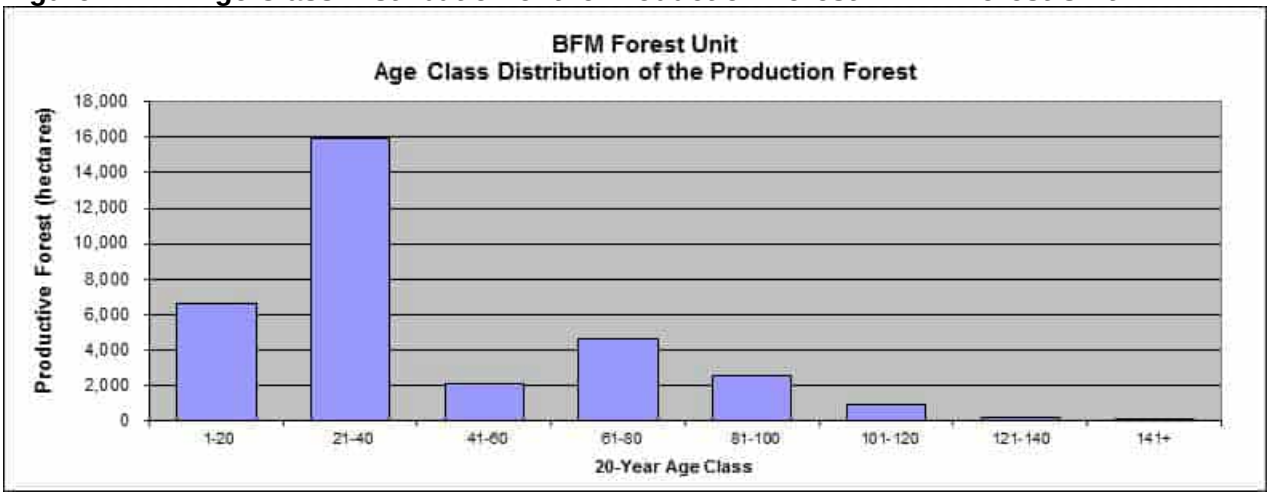


Balsam Fir Mixedwood (BFM) Forest Unit

The Balsam Fir (BF1) forest unit constitutes only 5% of the Whiskey Jack Forest production forest area (32,936 ha, Figure 14). The BFM forest unit is comprised of area classified in the BfMx1, and BfPur regional standard forest units. The majority of BFM area is in the 21-40 year old age class. BFM is typically found on Ecosites 12, 21 and 11 areas.

The area in the BFM forest unit is naturally variable. Small amounts of area transition into the forest unit through old age natural succession and natural disturbances. The natural cycle of spruce budworm infestations and high flammability of balsam fir serve to reduce the area in the forest unit when these events occur. The Whiskey Jack Forest is currently on the lower end of the cycle of occurrence of balsam fir area.

Figure 14 Age Class Distribution of the Production Forest – BFM Forest Unit

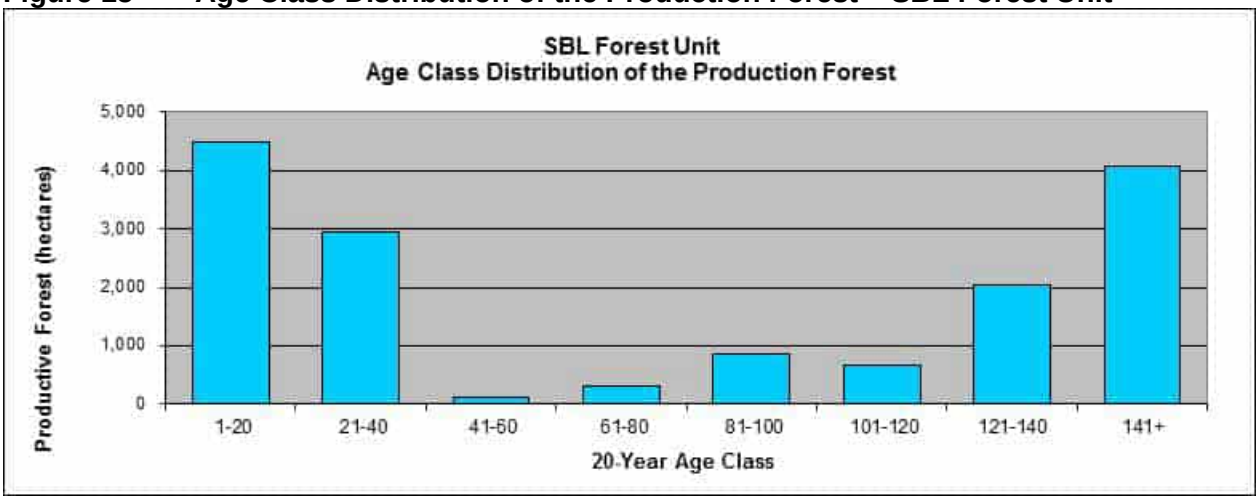


The following four forest units are minor components of the Whiskey Jack Forest and all totaled, comprise the remaining 3% of the production forest.

Black Spruce Lowland (SBL) Forest Unit

The SBL forest unit is made up of lowland black spruce stands, generally on Ecosites 35 and 36. Soils are very wet, nutrient poor organic material. This forest unit has site specific requirements. The SBL forest unit stands fall into the SbLow regional standard forest units. The SBL forest unit found on 2% of the production forest land base, often in smaller stands scattered throughout the forest (15,538 hectares, Figure 15). The site characteristics are limited on the land base as any increase of this forest unit is limited to lowland areas. Management strategies usually target more productive lowland site which are also easier to regenerate to spruce. Consideration must be given to maximum area that can be harvested and treated per year as well as slower growth characteristics on these lowland sites. This forest unit generally occurs as small, scattered stands on the forest and has been under-harvested in the past as is indicated by the age class structure favouring older stands.

Figure 15 Age Class Distribution of the Production Forest – SBL Forest Unit

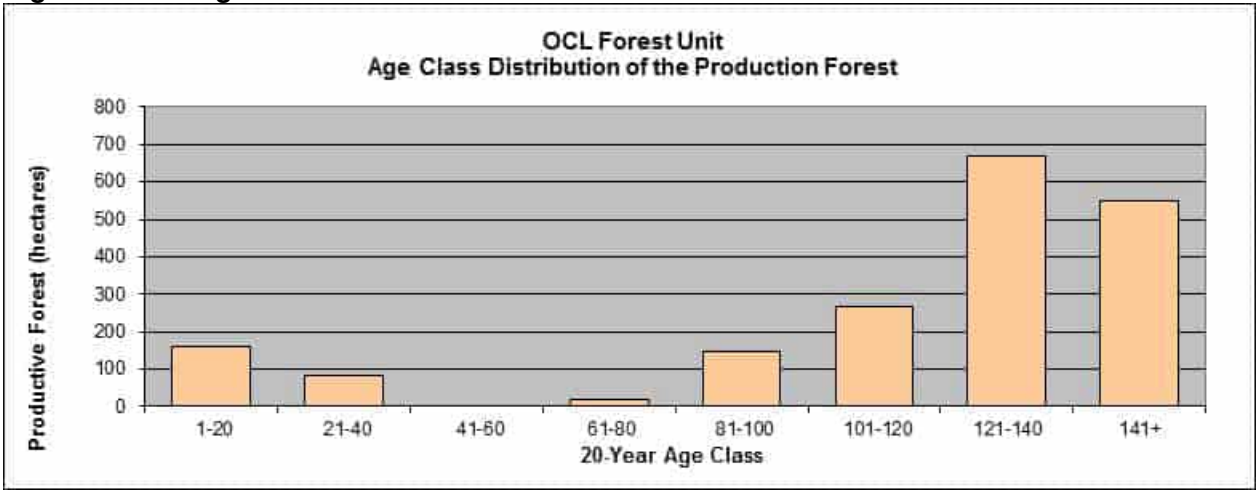


Other Conifer Lowland (OCL) Forest Unit

The OCL forest unit covers only 0.3% of the production forest on the Whiskey Jack Forest (1,895 hectares, Figure 16). OCL occurs primarily on Ecosites 37 and 36 characterized as intermediate swamp with wet, organic soils. Cedar and black spruce are the dominant tree species with occurrences of larch and balsam fir. The black spruce is limited to less than 50% of the stand composition. The OCL forest unit includes area classified as OcLow regional standard forest unit area.

The age class distribution shows an abundance of older (>80 years old) stands. This forest unit occurs in specific site characteristics and is very limited on the land base. Any increase of this forest unit is limited to lowland areas. Decreases in OCL may be contributed to increases in spruce lowlands (by increased black spruce species composition) which can be more productive and economically desirable. Management strategies will have to be considered in maintaining these forest types. However, these areas are usually not harvested which will help maintain current forest levels.

Figure 16 Age Class Distribution of the Production Forest – OCL Forest Unit

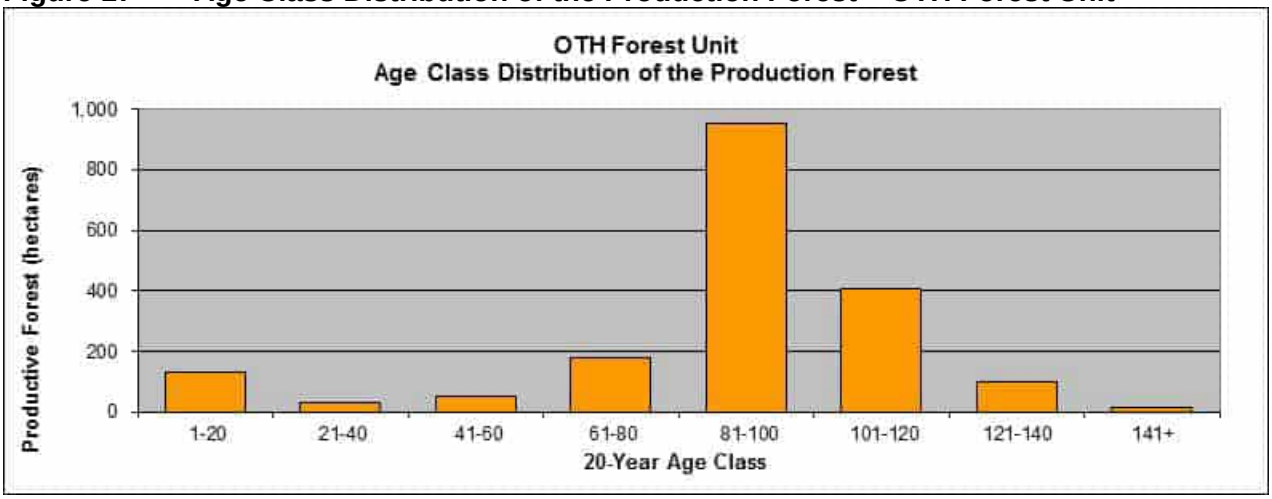


Other Hardwood (OTH) Forest Unit

The Other Hardwood (OTH) forest unit occurs on 0.3% of the production forest (1,880 hectares, Figure 17). OTH stands most commonly occur on Ecosites 38, 33 and 30 areas characterized by forested wetland usually dominated by black ash. OTH stands are classified in the OthHd regional standard forest unit.

There is a greater occurrence of OTH in the 81-100 year old age class. This forest unit occurs in specific site characteristics that are limited on the land base. Management strategies will have to be considered in maintaining these forest types. However, only small areas of OTH are harvested which will help maintain the current OTH forest area.

Figure 17 Age Class Distribution of the Production Forest – OTH Forest Unit

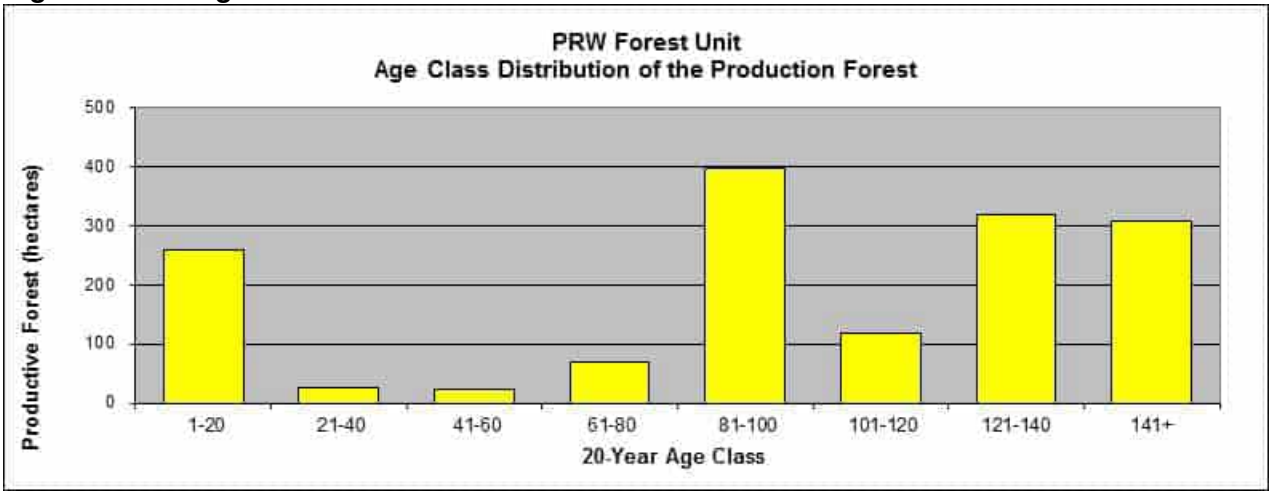


Red Pine and White Pine Mixedwood (PRW) Forest Unit

The PRW forest unit occurs on 1,528 hectares of the production forest (0.2%, Figure 18). The PRW forest unit is found predominantly on Ecosite 11 and 18 sites which are either very shallow soils (11) or fresh, well drained, coarse loam (18). The conifer overstory contains red pine with occurrences of white pine, poplar, white birch and balsam fir. PwDom, PrwMx and PrDom regional standard forest unit areas make up the PRW forest unit area.

The age class distribution reflects the majority of PRW stands being over 80 years of age. The occurrence of the PRW forest unit area is currently lower than was suggested by historical management unit forest inventories. The restoration of red pine and white pine will be encouraged on the sites through the protection of white pine and red pine advanced growth where possible. Red pine is not difficult to regenerate, however, white pine is more difficult to regenerate with survival to maturity due to the white pine weevil and white pine blister rust infection and mortality. Renewal strategies will primarily focus efforts on regenerating red pine mixed with other species in order to increase the occurrence of red pine and to promote a minor increase in the PRW forest unit area in the future. Minimal white pine is expected to be planted in harvest areas due to the challenges in survival to maturity. Management strategies and conservation of existing forest must be considered.

Figure 18 Age Class Distribution of the Production Forest – PRW Forest Unit



2.1.2.2 Forest Landscape Classes

This section of the plan text describes the forest landscape classes and the plan start forest composition, structure and pattern at the landscape level. The plan text also describes any management implications of the plan start forest landscape pattern on the development of the forest management plan.

Provincial Forest Landscape Classes

The *Forest Management Guide for Landscapes* (Landscape Guide) was still being drafted and was not required to be applied to forest management plans in the Boreal Forest at the time of preparation of this 2012 Whiskey Jack Forest FMP. However, the information on biodiversity indicators and the simulated ranges of natural variation for these biodiversity indicators was considered the best available science by the Planning Team and regional advisors. Therefore a management objective indicator related to landscape class area was included in this 2012 FMP in Table FMP-9. This approach was endorsed by the Planning Team and LCC and was consistent with regional and provincial FMP training provided to 2012 FMP Planning Teams.

The amount of area by landscape class is a non-spatial measure of the area, in hectares, of the landscape classified into landscape classes. Seven landscape classes have been developed for assessment in the Northwest Region. These landscape classes incorporate forest type attributes, age and to a limited degree site (e.g. upland / lowland designation for conifer forests).

The assessment of area by landscape class is new for 2012 FMP Planning Teams and has not been included in forest management plans for the Whiskey Jack Forest previously. Landscape classes are measured during strategic modelling analysis and areas are not tagged within the Base Model Inventory. Areas by landscape class have been incorporated into the Ontario Landscape Tool (OLT) to approximate the best estimate of the simulated range of natural variation for the Whiskey Jack Forest. The planning team compared the Plan Start 2012 landscape class areas to the OLT suggested natural range in area and determined an appropriate landscape class objective indicator and desirable levels during development of the Long-term Management Direction. See Section 3.5.2.2 Forest Composition Indicator 2a for Plan Start areas for managed landscape classes and the desired level based on the simulated range of natural variation.

The seven NWR landscape classes are described in Table 1 with reference added for which plan forest units are included in each landscape class (subject to age criteria included in Table 2). The Plan Start 2012 area by landscape class for the Crown forest is presented below in Figure 19. Approximately, 57% of the Whiskey Jack Forest is in the immature development stages, with only 43% being in the mature and late successional landscape classes.

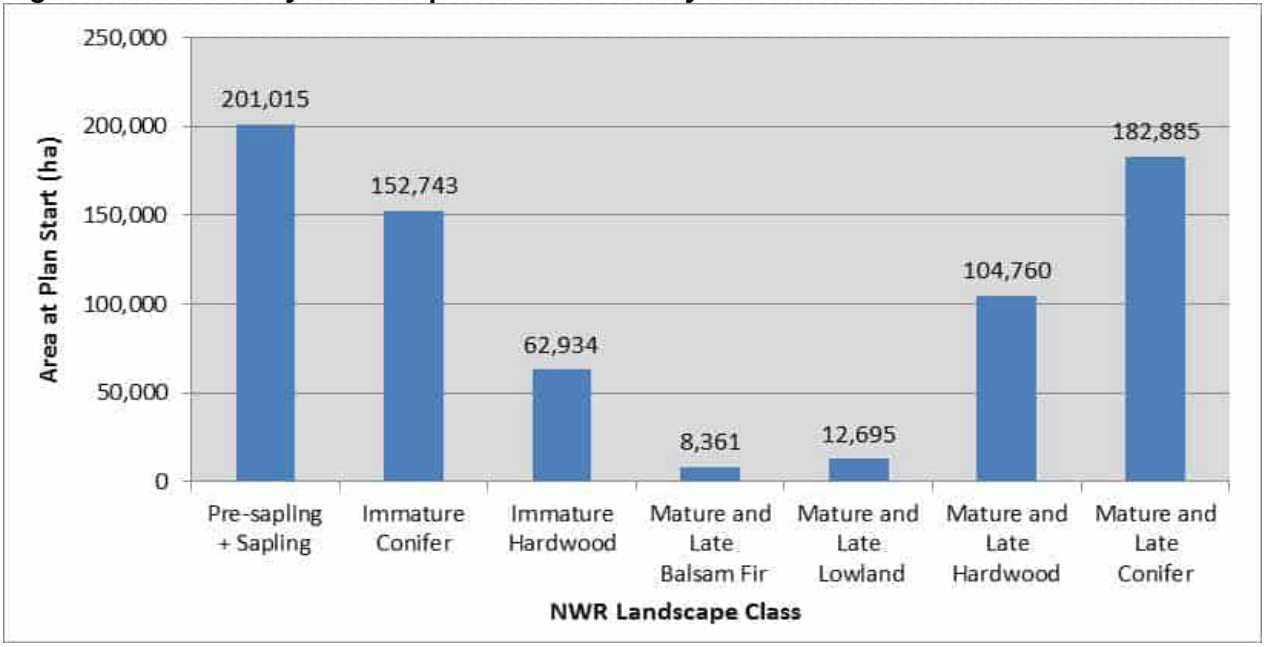
Table 1 Northwest Region Landscape Classes
(excerpt from Ontario Landscape Tool Science and Information Package A with PLANFU column added)

Landscape Class	Northwest Region 3W, 4S, 4W, 3S Landscape Guide Forest Unit	Development Stages	Corresponding Plan Forest Units (PLANFUs)
1 - Presapling & Sapling	All	Pre-sapling, Sapling	All
2 - Immature Conifer	BfDom, ConMX, PjDee, PjMx1, PrwMx, SbDee &SbMx1	Immature	BFM, CMX, OCL, PJD, PJM, PRW, SBL, SPD, SPM.
3 - Immature Hardwood	BwDom, HrdMw, HrDom, OthHd, PoDee,	Immature	HMX, POD, OTH
4 – Mature & Late Balsam Fir	BfDOM	Mature, Late	BFM
5 – Mature & Late Lowland Conifer	OcLow, SbLow	Mature, Late	OCL, SBL.
6 – Mature & Late Hardwood & Mixed	BwDom, HrdMw, HrDom, PoDee	Mature, Late	HMX, POD, OTH
7 – Mature & Late Upland Conifer & Mixed	ConMx, PjDee, PjMx1, PrwMx, SbDee & SbMx1	Mature, Late	CMX, PJD, PJM, PRW, SPD, SPM.

Table 2 Northwest Region Landscape Development Stage Onset Ages by Forest Unit

Onset Age (years) by Stage:	Forest Unit:											
	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
Presapling	0	0	0	0	0	0	0	0	0	0	0	0
Sapling	5	10	5	10	5	10	10	5	10	10	10	10
Immature	10	30	10	30	10	30	30	10	20	30	30	30
Mature	60	70	60	70	60	70	70	60	80	70	70	70
Late Successional	80	100	100	100	90	100	100	100	140	160	120	110

Figure 19 Area by Landscape Class – Whiskey Jack Forest 2012



Forest Type by Age Grouping

In addition to the landscape classes described above, the planning team also used total productive Crown forest area by forest unit groupings as a landscape indicator of forest type. Plan start area by forest unit was discussed in text Section 2.1.2.1.

The final landscape indicator used by the planning team for the purpose of measuring milestones related to forest composition and structure was the old forest indicator by FMP forest unit. The provincial definition was used to establish the age-of-onset. Plan start proportions of old forest by forest unit are reported in Table 3. Old forest red pine and white pine area is also measured and is calculated to be 457 hectares in 2012.

Table 3 Area of Old Forest by Forest Unit Grouping at Plan Start

Old Forest Grouping and Onset Age	Code	2012 (ha)
Balsam Fir > 80 years	BFo	3,707
Lowland Conifer > 100 years	CLo	1,851
Conifer Mixedwood >100 years	CMo	8,730
Hardwood > 100 years	HWo	16,931
Other Hardwood > 90 years	OHo	1,252
Jack Pine > 100 years	PJo	23,267
Spruce Lowland > 160 years	SLo	2,007
Spruce Upland > 110-120 years	SPo	10,155
Red Pine and White Pine > 140 years	PRWo	457
	TOTAL	68,357

Forest Landscape Pattern

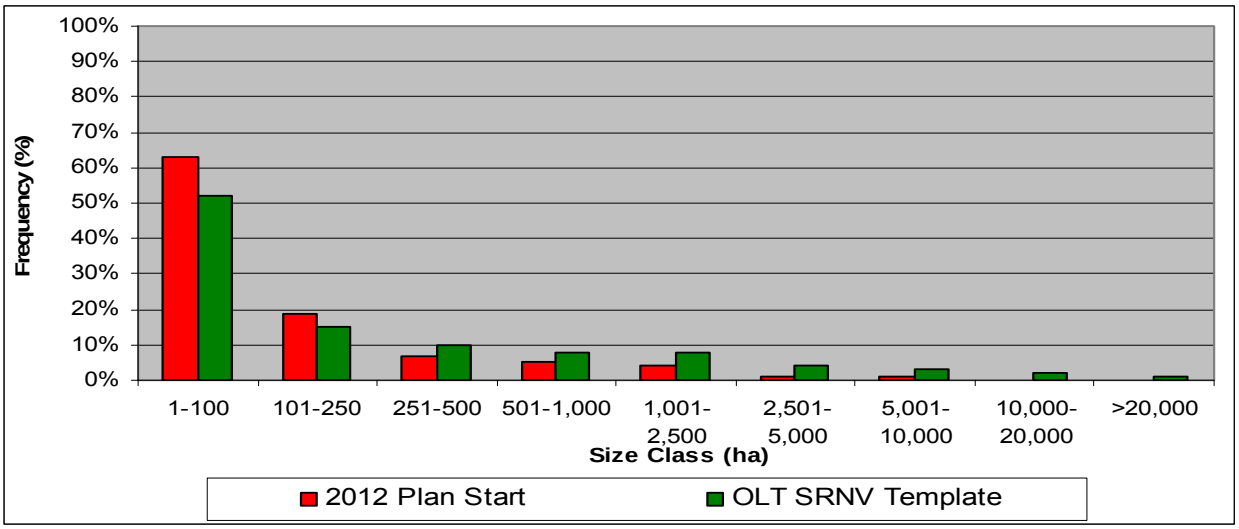
The Forest Management Planning Manual (FMPM), and Natural Disturbance Pattern Emulation Guide (NDPEG) both require the FMP to examine landscape pattern based on the frequency distribution of young forest patches by size class. Landscape level direction from the NDPEG was followed since the *Forest Management Guide for Boreal Landscapes* (Landscape Guide) was still in draft form and did not replace the requirement to follow landscape level NDPEG direction. However, since Science and Information in support of Ontario's Forest Management Guide for Boreal Landscapes contained the most current science and direction for management at the landscape level in the Boreal Forest, this Science and Information in support of Ontario's Forest Management Guides for Landscapes was also incorporated into this 2012 Whiskey Jack Forest FMP.

Patches deal with the *extent* of the homogeneous forest types that make up the landscape mosaic. Patch size can influence the availability of habitat conditions. From the Simulated Range of Natural Variation (SRNV) work done for the Whiskey Jack Forest, young forest patch is classified into stands less than 36 years old. The resulting SRNV estimated natural landscape pattern for young forest is used as the "Template" of the natural forest landscape pattern for the Whiskey Jack Forest.

The young forest frequency by size class of the land base at Plan Start 2012 was compared to the SRNV template for the management unit to determine a baseline distribution of young forest patch size at the start of this planning period. Figure 20 shows the relationship of the current young forest patch size frequency compared to the SRNV. In general, the distribution of young forest patches is similar to the template distribution. Differences are observed in the smaller young forest size patch frequencies where the SRNV developed for the Whiskey Jack Forest

suggests there would naturally be less small disturbances (1-100 and 101-250 ha), and more larger disturbances (> 250 ha) than is evident at Plan Start. This larger proportion of smaller young forest patch at Plan Start 2012 is a result of past forest management, natural disturbance and harvesting practices on the Whiskey Jack Forest, and is typical of the management units in the Northwest Region.

Figure 20 Frequency Distribution of Young Forest by Size Class - 2012 vs SRNV



Management direction in the last 10 years has been to move to larger harvest blocks to emulate natural disturbance patterns more closely. It will take the implementation of several forest management plans with larger harvest area patches to reverse the legacy of small disturbance patches on the Whiskey Jack Forest.

This forest landscape pattern analysis is documented in Supplementary Documentation N – Spatial Analyses: Landscape Pattern (OLT and NDPE). Maps generated during this landscape pattern disturbance analysis are included in the FMP as (MU490_2012_FMP_P1_MAP_LandPat_04.pdf and map 05).

2.1.2.3 Management Zones

In the development of the long-term management direction, the planning team chose to partition the management unit into management zones. A management zone is a geographical area within a management unit that provides spatial context to the long-term management direction, and may influence strategic analysis, and operational planning. Two types of management zones, strategic and operational, were used to represent spatial considerations. Strategic management zones represent areas with distinct ecological characteristics, landscape biodiversity requirements or forest-level harvest and retention considerations.

Management zones may be assigned to differentiate areas such as ecological zones, watershed zones, wilderness zones, industrial working circles etc. For strategic purposes in this 2012 FMP, it was agreed to use wildlife management zones as the primary strategic landscape pattern zones. Strategic management zones are identified in the SMZ field of the spatial planning composite inventory (PCM) information, and operational management zones are identified in the OMZ field. Landscape pattern zones were also classified in the planning composite inventory (identified in the SUBMU field for areas in the caribou habitat management zone) and also serve as a strategic management zone.

Sub-management units were used in the 2004 FMP to split out the areas where caribou habitat management was conducted and general areas outside the caribou management zone where different management objectives were considered and modelled. The 2004 subunits in the caribou zone were included in the inventories for this FMP and were identified in the BMI and PCM spatial forest information layers in the SUBMU field.

The Caribou Conservation Plan (CCP) provides direction to manage the quality, quantity and location of caribou habitat in the area of continuous extent of caribou occurrence. MNR's *Cervid Ecological Framework* also provided direction for which cervid species are managed for on the landscape.

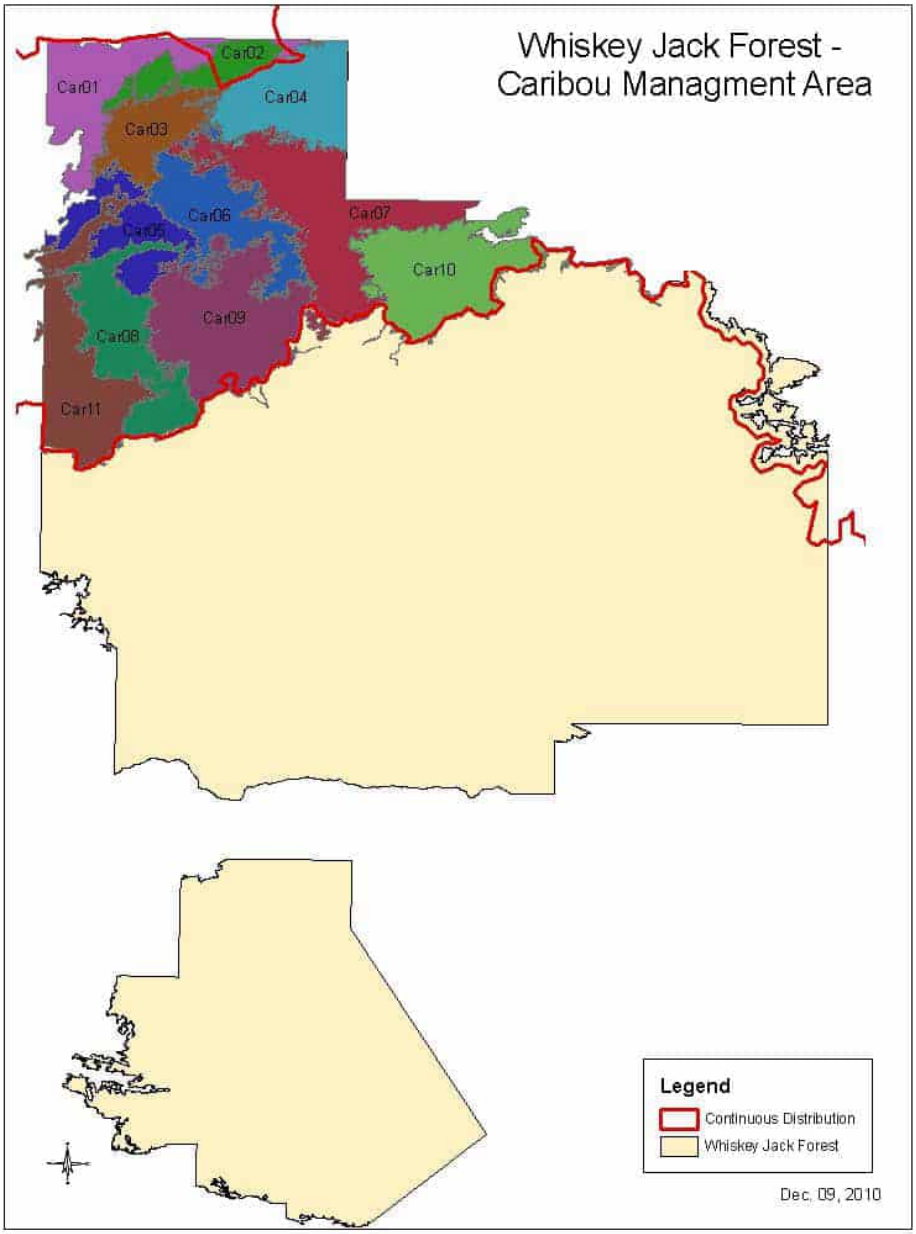
Currently, MNR's delineation of the area of continuous range occupancy for woodland caribou is the primary division of the management zone for caribou (strategic zone) and the rest of the management unit being managed primarily for marten (strategic), moose (operational) and deer (operational).

These wildlife management zones are described in more detail below:

Strategic Management Zone – Caribou Habitat Management Zone

For strategic purposes in this 2012 FMP, it was agreed to continue to implement the existing 2004 FMP sub-management units which represented the caribou habitat mosaic blocks where caribou habitat management was the primary consideration. The caribou zone and the caribou mosaic blocks within the caribou zone are shown in Figure 21. Caribou dynamic habitat schedule blocks (caribou blocks Car01 through to Car11) are strategic management zones and are identified in the SMZ field of the spatial PCM inventory information. Detailed spatial habitat analysis is documented in Supplementary Documentation N – Spatial Analyses: Caribou Habitat.

Figure 21 Caribou Habitat Management Zone on the Whiskey Jack Forest

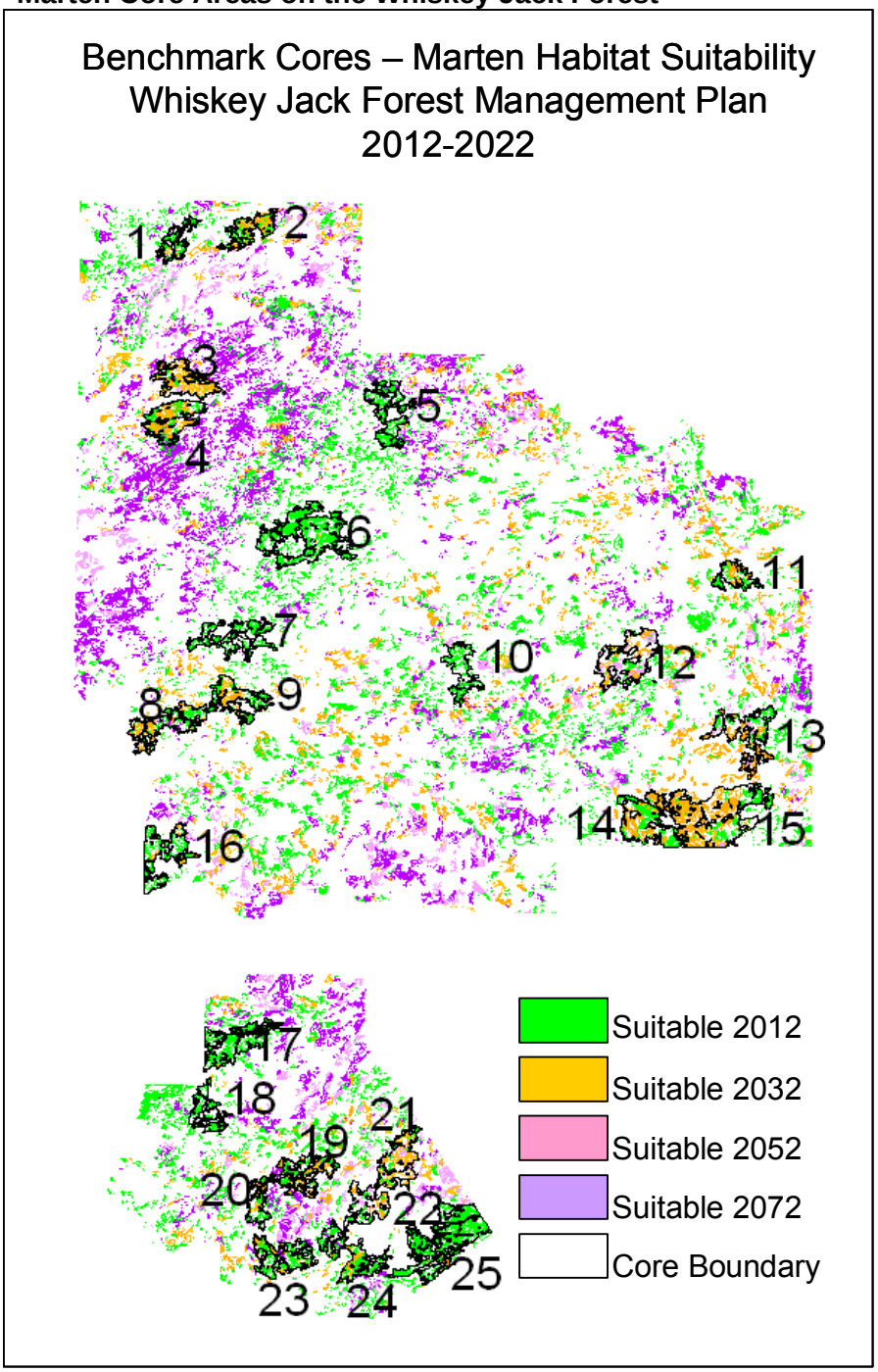


Strategic Management Zone - Marten Core Habitat

The *Forest Management Guidelines for the Provision of Marten Habitat (MNR, 1996)* was applied to the Whiskey Jack Forest for this plan. Spatial analysis was conducted for marten with additional habitat definitions of capable and suitable included. The intent of the marten guideline is to provide large contiguous areas of mature conifer-dominated forest as habitat. The strategic landscape level application of the guidelines directed planning teams to develop core areas of suitable marten habitat in 3,000 to 5,000 hectare blocks to be deferred from harvesting. The planning team applied the strategic landscape level section of the marten guidelines on 25 relatively large contiguous areas (marten core habitat areas or large,

landscape patches) of Crown land on Whiskey Jack Forest (Figure 22). Marten core areas outside of the caribou management zone are strategic management zones and are identified in the SMZ field of the spatial planning composite inventory information. The caribou blocks are the primary SMZ in the caribou management zone, therefore marten cores in the caribou zones Car01 to Car11 are not identified in the SMZ field of the PCM inventory. Detailed spatial habitat analysis is documented in Supplementary Documentation N – Spatial Analyses: Marten Habitat.

Figure 22 Marten Core Areas on the Whiskey Jack Forest



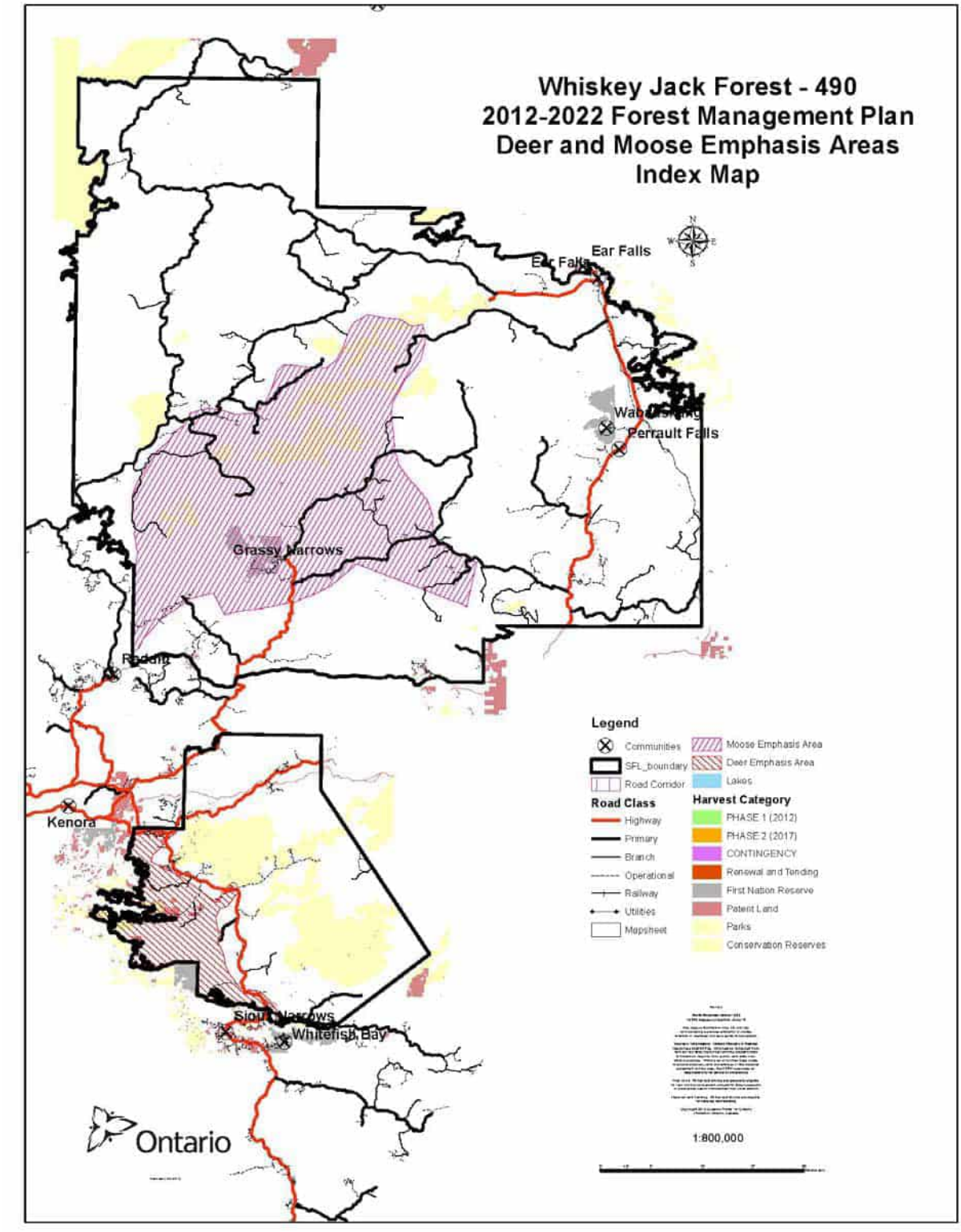
Operational Management Zones – Moose Emphasis Areas and Deer Emphasis Areas

Moose are a habitat generalist and can use a broad range of forest conditions to meet their needs. Although they are habitat generalists, some habitats are preferred over others and habitat preferences change during the year. To achieve forest conditions in a managed forest that are similar to the conditions moose prefer and would encounter in a natural forest ecosystem, areas can be selected for moose emphasis areas (MEAs). Moose emphasis areas are locations where moose habitat will be enhanced through operational forest management practices. Specific MEAs are not managed strategically over the long-term (160 years) but rather considered at the operational planning level for each plan period. The intent of operational management efforts for moose habitat management is to maintain or create through timber management activities the diversity of age classes and species of vegetation that provide habitat for moose. Habitat management efforts focus on seasonal high use areas such as early and late wintering areas and on special areas such as calving sites, aquatic feeding areas and mineral licks, if present. Spatial consideration for moose habitat occurred during the area of concern planning process, before forest management activities were finalized for this plan.

White-tailed Deer - Areas of the management unit with an objective(s) to emphasize white-tailed deer habitat were identified as large landscape patches through application of the Science and Information in support of Ontario's Forest Management Guides for Landscapes. These areas are deer winter concentration areas (or yards) and encompass a single yard or a number of yards. Areas which are not yards and have strategic importance to local deer populations (e.g., large stands or concentrations of mast trees; high-quality summer habitat) are also identified as having an objective for deer habitat.

The forest composition and age structure was analyzed for the Whiskey Jack Forest resulting in Moose Emphasis Areas and Deer Emphasis Areas (Figure 23). MEAs and DEAs are operational management zones and are identified in the OMZ field of the spatial planning composite inventory information.

Figure 23 Moose Emphasis Areas and Deer Emphasis Areas on the Whiskey Jack Forest



2.1.2.4 Other Forest Classifications

This section of the plan text describes the other forest classifications (e.g. forest inventory classifications and habitat for wildlife species) used in the forest management plan. Any management implications concerning the other forest classifications on the development of the forest management plan are also discussed.

2.1.2.4.1 Other Forest Inventory Classifications

There are additional classifications of forest composition, age and function that have been identified in the PCM and BMI forest resource inventories. These classifications are summarized in Table 4**.**

Table 4 Other Forest Inventory Classifications

Inventory Field	Forest Inventory Classification	Code	Description	Analysis Package Reference
SFU	**Standard Forest Units:**	PwDom	White Pine Dominant	AP - Section 5.1.1
	(NW Region)	PrDom	Red Pine Dominant	
		PrwMx	Red and White Pine Mixedwood	
		UplCe	Cedar Dominant Uplands	
		OCLow	Other Conifer Lowlands (Ce/La)	
		SbLow	Black Spruce Lowlands	
		SbSha	Shallow Spruce Dominated Uplands	
		SbDee	Productive Spruce Dominant Uplands	
		PjSha	Shallow Jack Pine Dominated Uplands	
		PjDee	Productive Jack Pine Dominated Uplands	
		PoSha	Shallow Aspen Dominated Uplands	
		PoDee	Productive Aspen Dominated Uplands	
		BwSha	Birch Dominated Shallow Soils	
		BwDom	Productive White Birch Dominated	
		OthHd	Tolerant Hardwoods	
		SbMx1	Spruce Dominant Conifer Mixedwoods	
		PjMx1	Jack Pine Dominant Conifer Mixedwoods	
		BfPur	Balsam Fir Dominated	
		BfMx1	Balsam Fir Dominated Conifer Mixedwood	
		ConMx	Conifer Dominant Mixedwood	
		HrDom	Hardwood Dominant	
		HrdMw	Hardwood Dominant Mixedwood	
		The SFUs are developed regionally to reflect the different forest conditions found across the province and the different forest types. SFUs are sorted along with age to determine landscape classes and were also considered during development of plan forest units.		
SI	**Silvicultural Intensity:**	PRSNT	Present - average natural forest dynamics	AP - Section 5.2.3
		EXTEN	Extensive - managed, natural regeneration	
		BASC1	Basic - managed, prompt renewal after harvest	
		INTN1	Intensive - managed, prompt density regulated renewal (CMX, PJD, PJM, SPD, SPM and PRW only).	
		Silviculture Intensity (SI) indicates forest productivity and the expected growth and development pattern. SI applies only to even-aged forest stands that are managed under the clear-cut silvicultural system.		

2.1.2.4.2 Habitat for Selected Wildlife Species

The Crown Forest Sustainability Act requires the conservation of biological diversity during forest management planning. However, there are hundreds of species of vertebrates and many thousands of species of invertebrates in the boreal forest and it would be impossible to provide for them all using species-specific approaches. Therefore, in the Whiskey Jack Forest, habitat for wildlife is provided using a variety of strategies, including:

i) emulating natural disturbance patterns and residual structure in harvested stands following the *Natural Disturbance Pattern Emulation Guide (MNR, 2001)*;
ii) renewing harvested areas promptly following approved silviculture guides;
iii) utilizing the available information contained in the science package embedded in the Ontario Landscape Tool;
iv) applying area of concern (AOC) prescriptions to protect sensitive sites (e.g., riparian zones, den sites, nest sites);
v) applying habitat guidelines for species at risk and selected species,
vi) applying Conditions on Regular Operations (CROs) around specific wildlife values when they are encountered during operations if not already protected through implementation of AOC prescriptions, and
vii) modelling the supply of preferred habitat over time for species at risk whose habitat can be projected through time (e.g. woodland caribou).

It is thought that by emulating natural disturbance patterns and residual structures in harvested stands and renewing the sites appropriately, the needs of most wildlife will be addressed over the long term (this is “coarse filter management”; see MNR 2001). Additional area-based and species-specific measures (“fine filter management”; MNR 2001) are undertaken for wildlife that are sensitive (e.g., great blue heron and species at risk - caribou, bald eagle), or species of particular public interest (e.g., moose, deer, marten). Finally, the overall effect of the management direction proposed in the FMP on habitat and the sustainability of the forest is assessed by modelling the supply of a broad array of habitat types and seral stages.

The intent of measuring the habitat supply of selected species is to aid in the assessment of the impact of forest management practices on forest sustainability. In consultation with the MNR Regional and District MNR wildlife biologists, the local citizens committee and with reference to forest management planning manuals and guides, the planning team has selected specific wildlife species habitat as indicators of wildlife habitat in northwestern Ontario and the Whiskey Jack Forest. The habitats for the selected wildlife species are used as indicators of objective achievement, and are considered in the overall determination of forest sustainability for the Whiskey Jack Forest. The provision of sustainable wildlife habitat through time must be achieved while balancing the socio-economic benefits from the forest. The selected wildlife species whose preferred habitats are considered during development of the plan and reported in this FMP in Table FMP-6 are listed with their abbreviated code in Table 5.

Table 5 Selected Wildlife Species

Selected Wildlife Species	Species Code Abbreviation
Caribou - refuge	Cr
Caribou - winter used	Cwu
Caribou - winter preferred	Cwp

(Photo Credit: MNR)

Woodland Caribou – Forest Dwelling Population *(Rangifer tarandus caribou*) occur within Northwest Region including the north-northwestern portion of the Whiskey Jack Forest. The forest-dwelling population of woodland caribou in Ontario have been classified as Species At Risk, and their habitat is actively managed in this forest management plan.

The Science and Information in support of Ontario's Forest Management Guides for Boreal Landscapes includes management indicators for caribou habitat (i.e. refuge, winter used and winter preferred) therefore these caribou habitat classifications are included as selected species habitat whose habitat is reported in Table FMP-6. Habitat for the woodland caribou is described in Section 2.1.3.1 Inventories and Information for Species at Risk.

Ontario's Woodland Caribou Conservation Plan provides policy direction for the management and recovery of Woodland Caribou (forest-dwelling boreal population), and will apply to the areas of continuous and discontinuous distribution. Woodland Caribou (forest-dwelling boreal population) are designated as "Threatened" in Ontario under the *Endangered Species Act, 2007*. *Ontario's Woodland Caribou Conservation Plan* was a principle document used by the Planning Team to develop management strategies for current and projected habitat for caribou on the Whiskey Jack Forest.

Currently, MNR's delineation of the area of continuous range occurrence, including area identified for caribou habitat recovery, is the primary consideration for the division of the management zone for caribou habitat management. Caribou habitat management is documented in Supplementary Documentation N – Caribou Habitat Analysis which includes a map of the dynamic caribou habitat schedule (DCHS) areas.

Implication of plan start habitat levels – The caribou zone has been delineated into a dynamic caribou habitat schedule (DCHS) consistent with the Caribou Conservation Plan and with habitat management strategies included in the 2004 FMP for the Whiskey Jack Forest. Strategic planning, including renewal strategies in accordance with Silvicultural Ground Rules, will be considered in this FMP to increase the amount of caribou refuge and winter habitats in accordance to more closely approximate the Simulated Bounds of Natural Variation for caribou habitat on the forest. The Plan Start and desired levels (based on Simulated Ranges of Natural Variation) for the caribou habitat indicators are discussed in Section 3.5.2.3 Wildlife Habitat, Indicators 3a, 3b and 3c.

Additional Wildlife Species with Spatial Habitat Management

Marten *(Martes americana*). The marten is a valuable furbearer which was determined by the Environmental Assessment (EA) Board (April 1994) to be a provincially featured species for timber management in the Boreal Forest of Ontario. MNR's former featured species policy highlighted caribou, moose, deer and pileated woodpeckers, and was thought to provide for the habitat requirements of approximately 70% of the vertebrate species in Ontario. Marten habitat

was selected to represent (a) large tracts of mature and older forest, (b) large, coarse woody material on the forest floor, and (c) wildlife habitat trees to be retained on harvested areas. The stand level requirements for coarse woody material and wildlife trees are now guided by direction from the approved Stand and Site Guide.

(Photo Credit: Larry Colwell, www.bss.sfsu.edu)

The spatial habitat management requirements of the *Forest Management Guidelines for the Provision of Marten Habitat* (i.e. large tracts of mature and older forest) are still in effect for this 2012 FMP, and will continue to be implemented until the draft Boreal Landscape Guide is approved. The featured species approach is being replaced by the landscape level direction in the draft Boreal Landscape Guide (when approved) and requirement for large landscape patches in the approved *Stand and Site Guide*.

The *Forest Management Guidelines for the Provision of Marten Habitat (MNR, 1996)* was applied to the Whiskey Jack Forest for this plan. The marten habitat guidelines influence the supply and spatial configuration of marten habitat on the landscape. Spatial planning of harvest allocations attempts to provide large tracts of contiguous future marten habitat by (a) harvesting blocks in larger disturbance size classes, and (b) harvesting the remaining, smaller areas within previously harvested areas in order to defragment the area and create a larger disturbance pattern for marten future habitat.

Spatial analysis was conducted for marten with additional habitat definitions of capable and suitable included. Core areas are to be spread across the forest and connected by riparian reserves and other unharvested forest. The marten habitat guide suggests that such cores will be large enough to provide high quality habitat for approximately 25 breeding females.

The previous 2004-2024 Forest Management Plan for the Whiskey Jack Forest identified marten cores and in doing so ensured that harvest allocations and road development was restricted from those areas. These areas were deferred from the available land base in the strategic modelling of the selected management alternative. The development of the marten core areas for this 2012 FMP also included deferrals of these areas for 60 years. The Ontario Marten Analyst Model (OMA2) was used for spatial analysis and core area analysis at plan start (Year 2012). The OMA2 model is a spatial analysis program used for the long-term projection of marten habitat levels. Using FRI stand species composition, stocking, age and height, OMA2 classifies the land base into capable and suitable habitat. Capable habitat is defined as those forest types that have the potential to develop into marten habitat. Suitable habitat is defined as those forest stands that have developed certain compositional and structural components (forest stands with greater than 40% spruce, pine, fir, cedar composition, greater than 40% stocking, tree height greater than 15 metres, and age greater than 79 years). OMA2 also estimates the future forest condition based on age and height from the normal yield tables. This "growing of the forest" allows for the spatial projection of suitable marten habitat for 20, 40 and 60 years into the future to aid in the identification of core habitat areas. Ideally, core habitat areas are 3,000 to 5,000 hectares in size and are comprised of 75% suitable forest condition, however lesser quality or smaller sized areas are considered as core habitat areas if locally valuable. The landscape level target is to maintain 10-20% of the capable habitat forest in suitable condition within core areas. Analysis shows that at Plan Start 2012, there is 4.9% of total capable marten habitat in suitable condition in core areas on the Whiskey Jack Forest.

Implications of plan start habitat levels – The marten core area analysis indicated core habitat below the range suggested by the marten guide. While the marten core area deferrals do not allow the Whiskey Jack Forest to meet the minimum 10% suitable marten core habitat objective, the deferrals do provide for the maximum amount of marten core habitat possible on the management unit for the next sixty years. Therefore the Planning Team agreed to continue application of the marten core area deferrals that were included in the 2004 FMP and 2012 Contingency Plan.

A detailed description of how the *Forest Management Guidelines for the Provision of Marten Habitat* were applied in the Whiskey Jack Forest. A description of the classification system and results from the spatial analysis, are provided in Supplementary Documentation N – Marten Habitat Analysis. A map of the marten core areas on the Whiskey Jack Forest is provided in the electronic FMP as MU490_2012_FMP_P1_MAP_MartenBMark_00.

Moose *(Alces alces)* The moose is a highly valued game species in Ontario and is very important to the culture of the local people and to the economic viability of the tourist industry and associated businesses in the Whiskey Jack Forest area. The *Stand and Site Guide* includes current science on moose habitat use and *Stand and Site Guide* direction was applied for this FMP. Because moose have diverse habitat requirements, providing habitat for moose also provides habitat for many other wildlife species. Moose range in Ontario encompasses a wide variety of physiographic site conditions. Moose tend to prefer forests with much edge, with older, more mature stands in close proximity to young deciduous stands. Such areas provide food and shelter from weather and predators. Moose also show a preference for areas where aquatic plants can be fed upon in spring and summer. Mineral licks are also used, although they may not occur at all in any given forest. The best moose habitat are forests with an abundance of these elements intermixed over large areas (e.g., > 10,000 ha).

(Photo Credit: MNR)

Forest management, that produces irregularly shaped and sized cuts with scattered shelter patches and a high diversity of age classes and species of vegetation, can and has been beneficial to moose numbers in the Kenora area. Timber cutting has been one of the major producers of moose habitat in the Province of Ontario, and without this disturbance, moose populations would be lower.

The intent of management efforts for moose habitat management is to maintain or create through timber management activities the diversity of age classes and species of vegetation that provide habitat for moose. Habitat management efforts focus on seasonal high use areas such as early and late wintering areas and on special areas such as aquatic feeding areas and

mineral licks, if present. Spatial consideration for moose habitat has occurred during the area of concern planning process before forest management activities were finalized for this plan.

As mentioned in Section 2.1.2.3 Management Zones, to achieve forest conditions in a managed forest that are similar to the conditions moose prefer and would encounter in a natural forest ecosystem, areas can be selected for moose emphasis areas (MEAs). Moose emphasis areas are locations where moose habitat will be enhanced through forest management practices. Moose habitat will exist across the forest, while the moose emphasis areas will just enhance the habitat quality in the designated areas. There are also many other factors that impact moose populations aside from habitat, and moose emphasis areas are only relevant to habitat planning. With that being said, habitat planning improves the habitat for moose populations.

Implications of plan start habitat levels – The Planning Team considered the quality and abundance of moose habitat at Plan Start and decided to identify and manage Moose Emphasis Areas for target species composition at the operational level. The analysis was done for the Whiskey Jack Forest resulting in the identification of one large Moose Emphasis Area in the northern portion of the forest, south of the area of the dynamic caribou habitat schedule.

It should be noted that even with an abundance of good to excellent moose habitat, moose populations may become depressed. Over the past decade, moose numbers in the Whiskey Jack Forest have declined substantially, and although a decline in habitat quality is likely a contributing factor, evidence suggests that disease and parasites, weather, predation and other factors are also implicated. Over time, though, moose populations should recover if habitat conditions are suitable.

White-tailed Deer *(Odocoileus virginianus)*

The white-tailed deer prefer foraging habitat which includes the pre-sapling and sapling stages of mixedwood balsam fir-spruce stands and lowland hardwood stands. The presence of suitable grasses and forbes (any herb that is not grass or grass-like) can enhance summer range by prolonging the longevity of openings and providing early spring and late fall browse for deer. Winter deer habitat must provide cover from snow and be located in association with browse species. Cedar is usually the best interceptor of snow and often grows in association with preferred browse. Arboreal lichens, where available, may provide a portion of the required food supply. In the absence of cedar, a mixture of spruce, pine and/or balsam fir may be used for deer yarding purposes, also referred to as winter concentration areas. Deer winter concentration areas tend to be a part of learned behaviour, so areas that are preferred can be of lasting significance. Winter concentration areas have been identified in the Whiskey Jack Forest through approved aerial survey techniques. This information was used to determine where deer habitat would be emphasized in deer emphasis areas (DEA). One DEA is located in the southern portion of the forest. (Photo Credit: www.duke.edu)

The Whiskey Jack Forest supports many areas that provide both deer and moose habitat. Winter severity is a major factor in controlling deer populations on the Whiskey Jack Forest.

Spatial consideration for deer habitat has occurred during the area of concern planning process before forest management activities were finalized for this plan. As mentioned in Section 2.1.2.3 Management Zones, to achieve forest conditions in a managed forest that are similar to the conditions deer prefer and would encounter in a natural forest ecosystem, suitable area was selected as a deer emphasis areas (DEA).

Implications of plan start habitat levels – The Planning Team considered the quality and abundance of deer habitat at Plan Start and decided to identify and manage Deer Emphasis Areas for target species composition at the operational level. The analysis was done for the Whiskey Jack Forest resulting in the identification of one Deer Emphasis Area in the southern Lake of the Woods portion of the Whiskey Jack Forest.

2.1.3 Forest Resources

2.1.3.1 Inventories and Information for Species at Risk

Ontario's *Endangered Species Act, 2007* (*ESA*) (Government of Ontario 2007) came into effect on June 30, 2008 to protect and recover the province's species at risk. MNR is the lead provincial government agency responsible for the management of species at risk in Ontario.

A "*species at risk*" is any naturally-occurring plant or animal in danger of extinction or of disappearing from the province. Therefore, recognition of potential significant negative conditions to species at risk or the known locations of their habitat have been considered by the Planning Team and where necessary, forest management operations were planned to mitigate any such potential adverse conditions.

Species at Risk are defined as *species that are at risk of extinction, extirpation or becoming endangered globally or within a jurisdiction or region*. Managing forested landscapes on a sustainable basis will help to contribute to the stability of special concern, threatened or endangered species that are either resident or transient in this area. In addition site conservation planning is also required for species at risk as they are often limited in numbers and/or location, necessitating in some cases Area of Concern prescriptions.

Forest management and the resulting harvesting operations alter forest conditions (tree species, age class, and structure) and the available habitat, reducing habitat supplies temporarily for some species and creating new opportunities for other species. It is important to have a sense of the potential for impact on the other forest resources that are dependent upon the range of forest cover and conditions.

The *Forest Management Planning Manual* (FMPM) requires that each FMP must identify and discuss any forest dependent Species at Risk (special concern, threatened or endangered) that inhabit the Whiskey Jack Forest and the contribution and importance of habitat for those species.

There are two separate Species at Risk lists: the provincial Species at Risk in Ontario (SARO) list which is developed by the Committee on the Status of Species At Risk in Ontario (COSSARO) and the federal Species at Risk Act (SARA) list which is developed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The provincial list of species must be considered during development of forest management plans however it should be noted that all species federally listed as endangered or threatened are also recognized as provincially featured species in Ontario's forest management planning process.

MNR's Natural Heritage Information Centre is the source of information on species of flora, fish and wildlife listed as endangered or threatened, and species of special concern.

The known locations of occurrences of flora and fauna Species at Risk were reviewed in the Whiskey Jack Forest in order to determine if operations would impact these values. The provincially listed species (SARO) were identified by MNR as having the potential to occur in the Whiskey Jack Forest and are identified in Table 6.

The following Species At Risk are also found within the Whiskey Jack Forest, but are not considered forest-dependent and/or forestry-related and therefore are not specifically managed in the FMP: American White Pelican, Golden Eagle, Bobolink, Horned Grebe, Shortjaw Cisco.

The history and habitat requirements of the forest-dependent species at risk with the potential to occur on the Whiskey Jack Forest are discussed in more detail following the table (in same order as listed in Table 6.

All known forest dependent Species at Risk (SAR) have their habitat managed in the plan using species specific guidelines and/or by recognizing specific habitats as values and developing appropriate area of concern (AOC) prescriptions. If in the future, any SAR is thought to exist near areas proposed for forest operations, the area will be surveyed and mapped by a qualified individual, and an appropriate area of concern prescription will be developed and applied.

The Species At Risk whose preferred habitat was strategically considered during development of the plan and reported in this FMP in Table FMP-6 is the woodland caribou (three habitat types: refuge, winter preferred and winter used). Caribou habitat management is documented in Supplementary Documentation N – Caribou Habitat Analysis which includes a map of the dynamic caribou habitat schedule (DCHS) areas.

Table 6 Forest Dependent Species At Risk (SARs) on the Whiskey Jack Forest

PROVINCIAL STATUS (SARO list)	SPECIES (Common Name)	SPECIES (Latin Name)	FOREST CONTEXT
Endangered	Eastern Cougar	*Puma concolor*	Public reports of observations of transient animals. No known den locations. Protection: see AOC D03 in FMP-10/FMP-19.
Endangered	Western Silvery Aster	*Symphyotrichum sericeum*	Highly restricted range. Known sites within a conservation reserve, not subject to forest management activities.
Endangered	Northern Bat	*Myotis septentrionalis*	Forest dependent. No known hibernacula on the Whiskey Jack Forest. Protection: see AOC NO08 in FMP-10/FMP-19.
Endangered	Little Brown Bat	*Myotis lucifugus*	Forest dependent. No known hibernacula on the Whiskey Jack Forest. Protection: see AOC NO08 in FMP-10/FMP-19.
Threatened	Woodland Caribou	*Rangifer tarandus caribou*	Dynamic Caribou Habitat Schedule planning in the northern part of the forest. No operations near calving/nursery values, though if a new value was identified near an area of operations, an AOC prescription would be develeoped and applied.
Threatened	Wolverine	*Gulo gulo*	No known denning sites. Large tracks of mature forest planned for through the caribou DCHS and marten core areas. Protection: see AOC D05 in FMP-10/FMP-19.
Threatened[2009]	Whip-poor-will	*Caprimlugus vociferus*	Forest dependent, particularly lands with a combination of open areas and woodlands. Though not on the Whiskey Jack Forest, the Dixie Lake Road area seems to be a regionally important 'hot-spot' in Red Lake District. Protection: see AOC NO04 in FMP-10/FMP-19.
Threatened	Least Bittern	*Ixobrychus exilis*	Wetland species - currently no known locations within forest. Protection: see AOC WW01 in FMP-10/FMP-19.
Threatened	Lake Sturgeon	*Acipenser fulvescens*	Lake of the Woods,Winnipeg River, English River System - Water crossings are considered as part of ESA. No crossings included in the FMP that affect known Lake Sturgeon areas.
Threatened	Showy Goldenrod	*Solidago speciosa*	Highly restricted in range – confined to one Crown parcel not subject to forest management activities.
Threatened	Barn Swallow	*Hirundo rustica*	Forest dependent (cleared and young forest stages). Protection: see AOC BS02 in FMP-10/FMP-19.
Threatened	Flooded Jellyskin	*Leptogium rivulare*	Seasonally flooded wetlands, particularly those including black ash. Flooded jellyskin grows below the high-water mark, usually on tree bark – but has been found growing on rock (Sandy Lake area). Protection: see AOC WW02 in FMP-10/FMP-19.
Special Concern	Eastern Wolf	*Canis lupus lycaon*	Hybrids occur throughout area. Protection: see AOC D04 in FMP-10/FMP-19.
Special Concern	Bald Eagle	*Halieetus leucocephalus*	Breeds throughout area. Protection: see AOC N01, N02, N03, N04 in FMP-10/FMP-19.
Special Concern	Black Tern	*Chlidonias niger*	Wetland bird, restricted range. Not forest dependent.
Special Concern	Olive-sided Flycatcher	*Contopus cooperi*	Breeds throughout area. Protection: see AOC NO06 in FMP-10/FMP-19.
Special Concern	Short-eared Owl	*Asio Flammeus*	No known breeding locations. Habitat is large open fields associated with agriculture. Protection: see AOC NO03 in FMP-10/FMP-19
Special Concern	Canada Warbler	*Euphagus carolinus*	Breeds throughout area. Protection: see AOC NO07 in FMP-10/FMP-19.
Special Concern	Common Nighthawk	*Chordeiles minor*	Breeds throughout area. Protection: see AOC NO05 in FMP-10/FMP-19.
Special Concern	Rusty Blackbird	*Euphagus carolinus*	No known locations. Typically observed near wet areas in conifer-dominated forests. Protection: In the event a nest is discovered and confirmed on the forest, an AOC prescription will be developed in consultation with MNR staff.
Special Concern	Snapping Turtle	*Chelydra serpentina*	Southern portion of unit. Breeds throughout area. Usually found in shallow water. Protection: see AOC NE10 in FMP-10/FMP-19.

STATUS: ENDANGERED

Cougar (*Puma concolor*) - The cougar is considered to be "endangered" in Ontario. It has been confirmed to occur in southern Manitoba but there have been no confirmed observations in the Northwestern Ontario. The cougar is a habitat generalist and deer are its preferred prey.

MNR tracks cougar reports and may respond with follow-up investigation of public reports depending on the circumstances. These reports to date have been of a transitory nature. MNR and partners also attempt to gather information using remote cameras and through the collection of DNA samples.

Should a cougar den be discovered, Table FMP-10 AOC prescription D03 will be applied, and if possible the area will be avoided during the denning period. This prescription is accordance with the *Stand and Site Guide*. . (Photo Credit: MNR)

STATUS: ENDANGERED

The **Western Silvery Aster** (*Symphyotrichum sericeum*) has daisy-like flowers that come in various shades of bright pink to deep purple. Leaves of this plant are covered with silky hairs, giving it a silvery appearance. They are found in well-drained soil. The Western Silvery Aster inhabits open habitats that are susceptible to succession from other vegetation. In Ontario, it is known to grow in two areas in the Rainy River district on the south shore of Lake of the Woods, and on an island in the lake. These areas are not subject to forest management activities, and continue to be monitored by MNR.

Western Silvery Aster is protected by Ontario's Endangered Species Act and the federal Species at Risk Act. The habitat of Western Silver Aster is regulated under the ESA, 2007. Cottage development is a potential threat to the Western Silvery Aster. The risk of impact through forest management activities is low given the locations of the known sites. Should Western Silvery Aster be discovered at a new location on the unit, the site conditions, as defined in the regulation, would be avoided or a permit sought through the ESA, 2007. . (Photo Credit: Bill Crins_www.rom.on.ca)

STATUS: ENDANGERED

Northern Bat (*Myotis septentrionalis*), better known simply as the Northern Long-eared Bat, is a small to medium sized bat, best recognized by its long rounded ears, which extend beyond the tip of the nose when laid forward. It has a comparatively longer tail and larger wing area than other Myotis species of similar size (7-8 cm in length). This bat has dull to light brown fur on the back, and yellowish fur on the underside.

Northern Bat
(Photo Credit: http://en.wikipedia.org)

STATUS: ENDANGERED

The **Little Brown Bat** (*Myotis lucifugus*) has uniformly glossy, dark brown fur on the back and upper parts with slightly paler, greyish fur underneath. Mature Little Brown Bats reaches a body length of 7-10 cm.

Little Brown Bat
(Photo Credit: mens-news.com)

General Bat Information:

Ontario bats have small eyes and poor vision and use 'echolocation', a series of high pitched sounds through its nose or slightly opened mouth, to navigate and identify prey. These sounds are very high pitched, too high for humans to hear.

All of Ontario's bat species are insectivores. Most foraging occurs over lakes, ponds, streams, wetlands, associated riparian habitats, other open habitats, or along roads, trails, and other forest edges; some foraging also occurs below, within, or above forest canopies, especially in older forest with irregular canopy structure. All species use forested habitats for roosting and/or reproduction. Some species simply roost in tree foliage but most species roost under the loose bark of dead or declining trees or in tree hollows or cavities. Most nursery colonies are reported from human dwellings, but trees with large hollows or cavities are likely used in natural situations.

The Northern Bat and the Little Brown Bat hibernate in Ontario, typically using caves or abandoned mines that provide above freezing air temperature and high relative humidity. Suitable hibernacula may be a limited resource; individual sites may be used by large numbers of bats drawn from an area of several thousand km2 around the hibernaculum. Disturbance of hibernating bats is a major mortality factor. COSSARO (May 2012) reported that Canadian bats that hibernate underground are dying from White Nose Syndrome (WNS), caused by a fungus, Geomyces destructans, that was inadvertently imported from Europe to North America. WNS has not been documented west of Wawa yet but appears to be spreading rapidly.

General direction that maintains a diversity of forest types and ages (including old forest), a range of potential roost and nursery sites within stands (cavity trees), and the integrity of aquatic and shoreline habitats largely addresses the basic habitat requirements of bats.

There are no known bat hibernacula on the Whiskey Jack Forest, however if one is identified the AOC NO08 prescriptions in Tables FMP-10 and FMP-19 will be implemented. It is unlikely that forest management operations would disturb a hibernaculum located underground, but if avoidance is not possible and disturbance is likely, an ESA permit may be sought in consultation with the MNR Species at Risk Biologist.

STATUS: THREATENED

Woodland Caribou – forest-dwelling population (*Rangifer tarandus caribou*) are native to Ontario's northern forests. They are an important indicator of the healthy boreal forest ecosystem on which they rely. As one of several jurisdictions responsible for managing the northern boreal forest, Ontario has an important role in Woodland Caribou stewardship.

(Photo Credit: MNR)

All caribou in Canada, including the barren-ground caribou, are of the same species and reported to be the most abundant ungulate in Canada (Canadian Cooperative Wildlife Health Centre 2005). A review by Sleep (2007) concluded there are perhaps 2 million or more caribou of all types in Canada. Ontario's caribou are all members of the woodland caribou subspecies, but two "ecotypes" have been identified: forest-dwelling and forest-tundra ecotypes. These ecotypes differ mainly in their behaviour (the tendency to migrate from the forest to the tundra or to remain within the forest). Only the forest-dwelling ecotype is considered to be "threatened". A status report produced by Thomas and Gray (2002) for COSEWIC estimated about 1.28 million of Canada's caribou belong to the woodland caribou subspecies, and about 184,000 of those belong to the forest-dwelling ecotype or sub-population.

In a status report on the woodland caribou prepared for MNR, Harris (1999) provided population estimates. The status report stated that in 1996 there were about 21,000 caribou in Ontario (all of the "woodland caribou" subspecies). This population included about 5,000 of the threatened "forest-dwelling ecotype" (listed as "at risk" federally in 2002 and provincially in 2004), with the remainder (about 16,000) being the forest-tundra ecotype (Harris 1999), which has not been listed by COSSARO or COSEWIC as "at risk".

The geographic range of caribou in Ontario has receded northward since the late 1800s. Several factors have been hypothesized to have had a role including hunting, forest fires, land clearing, logging, and increased predation by wolves due to increased populations of moose and deer. Hunting of caribou by non-Aboriginal people has been banned in Ontario since 1929. Another influence on caribou is a parasitic nematode (*Parelaphostrongylus tenuis*) commonly

called the "brain worm" that is carried by deer. Although deer are not seriously affected, the parasite can cause death to infected caribou and moose. When deer invade moose and caribou habitat, the frequency of transmission of this parasite is increased.

Specific management actions have been undertaken for caribou in this forest since a draft version of the "*Forest Management Guidelines for the Conservation of Woodland Caribou – a Landscape Approach*" (Racey et al.1999) was first applied. The 2012-2022 FMP will be the third plan for this forest to address caribou habitat explicitly. Since the forest-dwelling woodland caribou has been classified as a "species at risk" in Ontario, it is more important than ever for the FMP to consider caribou habitat management.

In winter, caribou use open coniferous forest with abundant terrestrial or arboreal lichens (Racey et al. 1999). Refuge habitat, consisting of a variety of ages of conifer-dominated stands, is also important for caribou (Racey et al. 1999). Refuge habitat is habitat unlikely to support large numbers of alternate prey species suitable for large predators. It consists of immature and older ConSh, CuPjk, SbMix (spruce-dominated mixedwood), and all ages of SbLow.

(Photo Credit: MNR)

The objective of the spatial components of the guide was to provide a sustainable supply of connected, suitable year round caribou habitat and to protect sensitive sites, such as calving sites. To apply the caribou habitat guide spatially, MNR identified calving sites and ecologically-based caribou habitat tracts across the northern portion of the Whiskey Jack Forest and across the entire portion of the Area of the Undertaking in northwestern Ontario in which caribou occur. Habitat mosaic blocks that complement the habitat tracts have also been identified to assist in scheduling forest harvesting, and to maintain a continuous supply of connected habitat in suitably large patches.

Ontario's Woodland Caribou Conservation Plan provides policy direction for the management and recovery of Woodland Caribou (forest-dwelling boreal population), and will apply to the areas of continuous and discontinuous distribution. In this FMP, the caribou habitat guidelines are used to assess caribou habitat spatially through application of the dynamic caribou habitat schedule (DCHS, previous referred to as the caribou mosaic), and habitat relationships defined in the guidelines are also used in non-spatial habitat supply modelling performed within the Strategic Forest Management Model (SFMM). The supply of caribou habitat was measured non-spatially in SFMM, treating habitat as an ecological constraint and a test of the sustainability of the overall Long-term Management Direction. Both preferred winter habitat and refuge habitat were modelled over a 150-year period for the Long-term Management Direction (see Table FMP-6 and Section 3.6.0.3 Habitat for Species At Risk and Selected Wildlife Species).

One of the key directions in the 2009 *Forest Management Planning Manual* (FMPM) is to develop an FMP with the best available science and information, new legislation, regulation and policy, and changes to forest conditions and land base (FMPM A-29). The expectation was to

utilize the *Forest Management Guides for Boreal Landscapes* (hereafter called the draft Boreal *Landscape Guide*) in development of the 2012 Whiskey Jack FMP. Since the landscape guide was not approved for implementation during the development of this FMP, regional advice has been to utilize the draft *Boreal Landscape Guide* science package as a reference for the estimated natural forest condition. The science packages used in the development and prepared for the support of the *Landscape Guide* were prepared by science teams.

There are several new management objective indicators included in Science and Information in support of Ontario's Forest Management Guides for Landscapes that have been incorporated into this 2012 FMP related to caribou habitat management: young forest patch size by size class, mature and old forest area (amount and pattern), old forest area, caribou refuge and winter habitat (amount and pattern) and the simulated ranges of natural variation used to set desirable levels for these indicators was considered the best available science by the Planning Team and regional advisors. The direction identifies and helps to set landscape mosaic goals and targets for forest composition (forest tree species groups and age classes) and structure (pattern) in forest management plans. Spatial and non-spatial indicators of caribou habitat amount and pattern/texture (refuge and winter habitats) were analyzed through use of the Ontario Landscape Tool (OLT) with the forest inventory for the Whiskey Jack Forest. This methodology was used to set desirable levels and analyze spatial and non-spatial results. This analysis was a significant step forward in forest management as compared to previous FMPs.

Finally, a General Habitat Description under the *Endangered Species Act, 2007* was approved June 2013. MNR has developed a draft Range Management Policy that is currently on the Environmental Registry for public comment. Any required additions or changes to caribou habitat management in Ontario dictated by the Range Management Policy will be included or amended into the forest management plan.

Caribou habitat is spatially managed in the northern part of the Whiskey Jack Forest through the Dynamic Caribou Habitat Schedule, in accordance with the Caribou Conservation Plan. Consideration for other values (ie. calving and migration) occurs through AOC and operational planning (i.e. timing restrictions). Prescriptions that consider Section 9 of the ESA (harm and harass) have been developed. Several survey flights have occurred in the last three years to determine and/or confirm winter habitat use. A summer survey was conducted on Sydney Lake in 2009 (partnership with Wabaseemoong through the SAR Stewardship Fund). Best Management practices for forestry operations in caribou country are currently being developed in accordance with the General Habitat Description.

Details of the spatial analysis of habitat supply are provided in Supplementary Documentation N – Caribou Habitat Analysis, and in Supplementary Documentation N – Landscape Pattern OLT.

STATUS: THREATENED

The **Wolverine** (*Gulo gulo*) has been described as resembling a compact, strongly built, small bear in general appearance except for its bushy tail and shorter legs (Hash, 1999). The wolverine is a "scavenging predator" that depends to a large extent on carrion, but will also eat berries, fish, small to medium-sized mammals, birds, and any other prey it can catch. Individual wolverines occupy very large home ranges (generally much larger than 10,000 hectares), which they cover in search of carrion and live prey. Denning habitat is critical for the persistence of the wolverine in disturbed landscapes.

Recently, wolverines have been studied extensively in the Red Lake District, north and northeast of the Whiskey Jack Forest. Ontario has the most easterly viable wolverine population in Canada, believed to be concentrated in northwestern Ontario, roughly from Red Lake-Sioux Lookout to Fort Severn-Peawanuck. There have been wolverine observations within the northern parts of the Kenora District. Incidental harvest of wolverine by trappers has been documented and addressed through the ESA, 2007.

Because of their very large home ranges, opportunistic nature, and affinity for a wide variety of habitat types (Hash 1999), management strategies that emulate natural disturbances, maintain a supply of forest types in approximately natural amounts, and protect denning sites should provide for wolverines over the long term. Therefore, at this time, the management approach for the Whiskey Jack Forest is: (i) to provide large patches of suitable habitat in the caribou zone through application of the *Forest Management Guidelines for the Conservation of Woodland Caribou – a Landscape Approach* (Racey et al.1999), (ii) to protect wolverine denning sites if identified in accordance with direction in the *Stand and Site Guide*, and (iii) to ensure the supply of all forest types present in the Whiskey Jack Forest reflects natural levels under the Long-term Management Direction (see Section 3.0 of the FMP).

As a species listed as threatened on the Species at Risk in Ontario List, and with the implementation of the new Endangered Species Act (2007), wolverine will be provided habitat protection under the General Definition (SAR Policy 4.1) of habitat in 2013 (within the timeframe of this plan). This general habitat protection will be applied until such a time when a habitat regulation will be developed specifically for the protection of wolverine habitat. The wolverine recovery plan is currently in draft phase and is expected to be completed in the near future. Once these recommendations are made to the Ontario government, they will have the opportunity to produce a government response statement which will further detail the management approach to be taken with respect to the protection of wolverine and their habitat. If wolverine habitat values (den sites) are identified in the Whiskey Jack Forest, area of concern D05 will be implemented as stated in Table FMP-10.

(Photo Credit: BioInfo Images, www.rom.on.ca)

STATUS: THREATENED

The **Whip-poor-will** (*Caprimlugus vociferus*) is a medium-sized bird (22-26 centimetres long) with mottled brown and grey feathers that help it blend in with its surroundings. Since the whip-poor-will becomes active at dusk and rests during the day, it is more commonly heard than seen. Whip-poor-wills are most vocal during bright, moonlit nights when they can be heard singing their name "Whip-poor-will". (Photo Credit: Mark J M Wilson)

The Whip-poor-will is usually found in areas with a mix of open and forested areas, such as savannahs, open woodlands or openings in more mature, deciduous, coniferous and mixed forests. It forages in these open areas and uses forested areas for roosting (resting and sleeping) and nesting. It lays its eggs directly on the forest floor, where its colouring means it will easily remain undetected by visual predators.

Whip-poor-will have been reported many times in the Lake of the Woods area according to the Atlas of the Breeding Birds of Ontario, but no known nesting sites have yet been confirmed. The Whip-poor-will was announced as Threatened in the fall of 2009. In 2010 Aboriginal Traditional Knowledge (ATK) was collected for sites around Lake of the Woods.

There are no known nesting sites at this time, however should a nesting site be identified during the course of implementation of this FMP, protection of the area will be achieved through application of Area of Concern prescription NO04. (Facts: http://www.mnr.gov.on.ca/276687.pdf)

STATUS: THREATENED

Least Bittern (*Ixobrychus exilis*) is more likely heard than seen, as it "coo"s softly from deep in a cattail marsh. This species is the smallest of the North American herons. Least Bitterns generally require medium to large, quiet marshes and as marshes decrease in size and human recreation increases, the population declines in an area. (Photo Credit: Mark Peck, www.rom.on.ca)

Because of its secretive nature breeding locations are likely underrepresented. The Atlas of the Breeding Birds of Ontario (ABBO) has a possible Least Bittern breeding site listed for the Lake of the Woods area. Though there are no identified breeding locations in the Kenora District, it mostly likely that Least Bitterns breed within the southern portion of the Whiskey Jack Forest. Surveys for this species have not yet been undertaken in the Kenora District but rather have been focused on areas with reports and areas that appear to have high habitat suitability (areas in southern Lake of the Woods).

The main threat to Least Bitterns is draining of wetlands for conversion to farmland and urban development. This species is not forest-dependent. If a nesting site is found, Table FMP-10, AOC prescription WWO1 will be applied, and if avoidance is not possible an ESA permit will be sought in consultation with the Species at Risk Biologist.

STATUS: THREATENED

Lake Sturgeon *(Acipenser fulvescens)* is unlike any other fish found in Ontario. This unusual fish has five rows of bony plates arranged along the back and sides; the skin is covered with tiny toothlike projections that give it the feel of fine sandpaper; and the dorsal fin is fairly large and located just forward of the tail, which is unequally lobed like that of a shark. Like catfish, the Lake Sturgeon is a specialized bottom feeder. The Lake Sturgeon is Canada's largest freshwater fish species: past records exist of specimens exceeding 2 metres in length and 136 kg in weight, although most mature specimens seen today are much smaller. It usually inhabits the bottoms of shallow areas of large freshwater lakes and rivers, but migrates each year from early May to late June to swift-flowing water to spawn. Individuals usually return to the same spawning rivers year after year. The decline in numbers witnessed today partially reflects human over-exploitation in the latter half of the nineteenth century. At present, it is likely that over-harvesting for meat and caviar forms a significant threat to the Lake Sturgeon. Additional threats include the construction of dams, which may disrupt habitat and interrupt spawning movements and timing; habitat degradation resulting from human activities; habitat contamination caused by chemicals, toxins, and fertilizers; and the introduction of non-native species that include competing and predatory fish, and plants that may modify habitat. (Photo Credit: MNR)

Lake Sturgeon are found throughout Lake of the Woods, the Winnipeg River and the English River systems. Lake sturgeon values are considered when planning for water crossings. Most recently there have been discussions with Weyerhaeuser surrounding a bridge crossing that has the potential to impact lake sturgeon spawning habitat (e.g. Caribou Falls crossing of the English River on the adjacent Kenora Forest). As more information becomes available regarding the Lake Sturgeon recovery strategy, it will be incorporated into FMP planning. Lake sturgeon monitoring and assessment has been ongoing since 2007 with partnerships with Ontario Power Generation, Wabaseemoong First Nation, Dalles First Nation and the Department of Fisheries and Oceans).

Forestry operations on the Whiskey Jack Forest are not expected to impact Lake Sturgeon habitat directly, however road construction in the vicinity of any known Lake Sturgeon spawning areas is considered during road planning. MNR District and regional wildlife biologists and Species At Risk Biologists are consulted for direction on the acceptable construction design to ensure there is no negative impact on spawning habitat. If negative impacts cannot be avoided, an ESA permit may be required for activities at these sites.

STATUS: THREATENED

Showy Goldenrod *(Solidago speciosa)* belongs to the distinctive group of wildflowers which produce showy, yellow flowers in late summer and early fall. In Canada, it grows in prairies, particularly under oaks in a habitat called the oak savannah. It prefers sandy soils and does not tolerate disturbance.

(Photo Credit: MNR)

Showy Goldenrod is protected by the federal Species at Risk Act and Ontario's Endangered Species Act. It receives general habitat protection under the ESA, 2007. This species is restricted to one location and is not subject to forest management. The site is monitored by MNR staff. Should new populations be discovered an AOC will be developed or an ESA permit sought.

STATUS: THREATENED

Barn Swallow *(Hirundo rustica)* is the most widespread species of swallow in the world. It is a distinctive passerine bird with blue upperparts, a long, deeply forked tail and curved, pointed wings. It is found in Europe, Asia, Africa and the Americas.

The preferred habitat of the Barn Swallow is open country with low vegetation, such as pasture, meadows and farmland, preferably with nearby water. This swallow avoids heavily wooded or precipitous areas and densely built-up locations. The presence of accessible open structures such as barns, stables, bridges or culverts to provide nesting sites, and exposed locations such as wires, roof ridges, abandoned buildings or bare branches for perching, are also important in the bird's selection of its breeding range. This is a species which has greatly benefited historically from forest clearance, which has created the open habitats it prefers, and from human habitation, which have given it an abundance of safe man-made nest sites. It builds a cup nest from mud pellets in barns or similar structures and feeds on insects caught in flight.

At this time this there are no known sites within the management unit and the likelihood of its occurrence is low. Barn Swallow nests should be considered when planning maintenance or replacement of bridges. Should Barn Swallow nests be discovered within the Whiskey Jack Forest during the course of implementation of this FMP, protection of the area will be achieved through application of Area of Concern prescription BS02 in Table FMP-10.

(Facts and Photo Credit: en.wikipedia.org)

STATUS: THREATENED

Flooded Jellyskin *(Leptogium rivulare)* is a leaf-like lichen that grows at the base of trees growing around vernal ponds that fill with meltwater in spring, then dry up in summer. The lichens, which are bluish-grey when dry, swell up and become translucent when they are submerged (hence the name "jellyskin"). Lichens are compound organisms consisting of a fungus co-existing with an algae or bacteria. Lichens grow slowly – perhaps one millimetre per year. Individual lichens grow to about 6 cm, but lichens cluster and can form larger encrustations half a metre across trees. Flooded Jellyskin has always been rare throughout its range. While it has an extremely restricted range, there are likely thousands of individuals present at ponds in Ontario. Ponds are being threatened by recreational use and housing development. One of the main tree species around the vernal pools that the lichens live on is Black Ash, which is threatened by a recent invader, the Emerald Ash Borer. Forestry operations on the Whiskey Jack Forest are not expected to impact Flooded Jellyskin habitat. There are no known woodland pools supporting Flooded Jellyskin at this time, however should a site be identified, protection of the area will be achieved through application of AOC prescription WW02.

STATUS: SPECIAL CONCERN

(Photo Credit: MNR)

The **Eastern Wolf** *(Canis lupus lycaon)* a distinct form of the Grey Wolf, lives in southern Ontario and Quebec. The Eastern Wolf differs from other subspecies of Grey Wolf in Canada: it is smaller, fawn-coloured with long black guard hairs on the back and sides, and the back of the ears are reddish. It is estimated that there are about 2,000 Eastern Wolves in Ontario and Quebec. Eastern Wolves live in groups called "packs," which typically number from 3-6 adults. Each pack has a home range that is loosely defended from neighbouring packs and may be as big as 500 km2. Eastern Wolves prey primarily on White-tailed Deer and Moose.

The Eastern Wolf has disappeared from all of southern Ontario largely as a result of forest clearance and farmland development, and the subsequent loss of habitat. The wolf is classed as a furbearer under the Fish and Wildlife Conservation Act (1997) and there is a regulated hunting season in Ontario. A grey wolf-eastern wolf hybrid occurs across the northwest and is included in the Species At Risk designation. All known denning locations are recognized as values in the FMP planning process. Appropriate area of concern (AOC D04) prescriptions are applied in accordance with the approved forest management plan (Table FMP-10) and direction from the *Stand and Site Guide.*

STATUS: SPECIAL CONCERN

Bald Eagle (*Halieetus leucocephalus*) - COSSARO down listed the bald eagle from "endangered" to "special concern" in northern Ontario in 2006 due to improvements in densities observed in this region of Ontario. The Kenora District MNR has a good database of the locations of past and presently used Bald Eagle nesting sites, containing over 450 recorded nest locations for the Whiskey Jack Forest. Nest locations are collected through a variety of means, including aerial surveys targeting stick nests, compliance flights for other values, as well as other flights that occur for forest management. Values are also provided by the public and forest industry staff. (Photo Credit: Mark Peck, www.rom.on.ca)

Habitat of Bald Eagles (nesting sites) could potentially be affected by forestry operations, but this is mitigated through Area of Concern planning. A combination of reserves and timing restrictions on operations is applied around all nests. The preferred nest trees are large, supercanopy poplar, white pine and red pine on or near the shorelines of productive lakes. Prescriptions for identified nests were developed with information gathered from flights, carry-over from previous FMP, and assessment of potential impact.

The recovery of Bald Eagle in northern Ontario is a combination of population increases in all areas, including the Whiskey Jack Forest. Bald Eagle nesting habitat is protected through implementation of prescriptions and conditions outlined in this FMP that were developed using the *Stand and Site Guide* (AOC prescriptions N01, N02, N03 and N04 in Table FMP-10).

STATUS: SPECIAL CONCERN

The **Black Tern** (*Chlidonias niger*) is a small tern that has a black head and underparts during the breeding season. They are mainly insect predators, hovering just above the water as they pick their prey off the surface. They build floating nests in loose colonies in shallow marshes, especially in cattails. In winter they migrate to the coast of northern South America.

Black Terns are largely associated with wetland complexes and nest in colonies in wetland marshes associated with lakes, ponds, and rivers. Hemi-marsh, an interspersion of emergent vegetation (i.e. cattails, bulrushes, burreed, and reeds) and open water appear to be a critical factor in nest habitat selection. (Photo Credit: Mark Peck, www.rom.on.ca)

Traditional nesting areas of Black Tern have been largely provided by the public and are tracked through the Natural Heritage Information Centre. Specific Black Tern Surveys are not conducted by MNR for the purpose of Forest Management Planning. There are 13 reports of Black Terns in the Lake of the Woods area, though none are on the Whiskey Jack Forest.

Sensitive breeding habitat for the Black Tern is not forest-dependent. Black Terns are Special Concern and are not afforded protection under the ESA 2007. However, a prescription is applied through the application of the *Stand and Site Guide* (AOC WW01 in this FMP). Roads can impact black tern nesting habitat if water crossings cause changes in water flow to an area. This factor will be considered when roads are planned on the Whiskey Jack Forest.

STATUS: SPECIAL CONCERN

Olive-sided Flycatcher *(Contopus cooperi)* are often found perched on top of a large tree or snag in the boreal forest and are often heard in large wetlands, riparian zones and burns. It will use early successional forests that have been logged or burned, if there are ample tall snags and trees to use for foraging perches and nearby wetland complexes. Olive-sided Flycatchers' breeding habitat usually consists of coniferous or mixed forest adjacent to rivers or wetlands. The Olive-sided Flycatchers commonly nest in conifers such as white and black spruce, jack pine and balsam fir. This species captures all of its meals in flight, specializing in bees, wasps, large flies, beetles and dragonflies.

(Photo Credit: Brian Small, www.mnr.gov.on.ca)

They perform one of the longest migrations of the Nearctic migrants, and are typically known as late arrivals in the spring and early migrants in the fall. Although their breeding range is quite expansive, their low density and significant declines over the past 30 years have caused them to be listed by COSSARO.

There have been many confirmed and probable sightings of Olive-sided Flycatchers in the Lake of the Woods area according to the Atlas of the Breeding Birds of Ontario. Minimal other information is available for the Kenora District. There are no known nesting sites at this time, however should a nest be identified during the course of implementation of this FMP, protection of the area will be achieved through application of Area of Concern prescription NO06.

STATUS: SPECIAL CONCERN

The **Short-eared Owl** (*Asio flammeus*) is a medium-sized owl that lives in open areas such as grasslands, marshes and tundra where it hunts for small mammals, especially voles. Short-eared Owls nest on the ground. These owls have been observed to the east in the Dryden Forest but there are no known nesting sites in the Kenora District. Records from the recent Atlas of Breeding Bird in Ontario (ABBO, 2001-2005) suggest the Short-eared Owl is a possible or probable nester in the Lake of the Woods area and vicinity. The Short-eared Owl was probably more common and widespread in southern Ontario when there were larger areas of prairie and savannah, their preferred habitat. The creation of new grasslands with the clearing of forests for farmland may have initially benefited the species, but as agricultural methods became more intensive, these areas became unsuitable for the species. Current threats include loss of marshes.

There are no known nest locations in the Whiskey Jack Forest. If a nest is discovered during the course of forest management operations, MNR will be consulted and AOC prescription NO03 will be implemented which is consistent with *Stand and Site Guide* direction for Short-eared Owl nests.

(Photo Credit: Mark Peck, www.rom.on.ca)

STATUS: SPECIAL CONCERN

The **Canada Warbler** *(Euphagus carolinus)* is a small, brightly coloured songbird. Males are more brightly coloured than females, with bluish-grey upperparts and tail and bright yellow underparts. The head is bluish with a black forehead and "sideburns," which join to form a distinctive necklace of black stripes across its chest. In the spring, males can be heard singing a distinctive song of clear, liquid notes ending emphatically.

The Canada Warbler breeds in a range of deciduous and coniferous, usually wet forest types, all with a well developed, dense shrub layer. Dense shrub and understory vegetation helps conceal Canada warbler nests that are usually located on or near the ground on mossy logs or roots, along stream banks or on hummocks. It winters in South America. The Canada warbler is one of the last migratory songbird species to arrive on Canadian nesting grounds in the spring and is also one of the first species to leave at the end of summer. A reduction in forests with a well-developed shrub-layer has likely impacted Canada Warblers throughout their breeding range. The Atlas of the Breeding Birds of Ontario (ABBO) reports many possible sightings of Canada warblers in the Lake of the Woods area, but no confirmed nesting sites.

There are no known nesting sites at this time, however should a nesting site be identified during the course of implementation of this FMP, protection of the area will be achieved through application of Area of Concern prescription NO07. (Photo Credit: Brenda Carroll)

STATUS: SPECIAL CONCERN

The **Common Nighthawk** (*Chordelies minor*) is a medium-sized bird, active at night or at twilight. It has cryptic plumage, long wings, short legs, and a very short bill. Its wide mouth scoops up large insects on the wing, and its flight is very agile, silent and erratic. Common Nighthawks build no nest, laying their eggs instead on the bare ground. Traditional Common Nighthawk habitat consists of open areas with little to no ground vegetation, such as logged or burned-over areas, forest clearings, rock barrens, peat bogs, lakeshores, mine tailings.

This species is found throughout the Whiskey Jack Forest and is frequently associated with cutover areas. No specific surveys are undertaken, however public reports are recorded. The ABBO lists possible and probable nesting sites for the common nighthawk in the Lake of the Woods area. There are no known nesting sites at this time, however should a nest be identified during the course of implementation of this FMP, protection of the area will be achieved through application of Area of Concern prescription NO05. (Photo Credit: Mark Peck, www.rom.on.ca)

STATUS: SPECIAL CONCERN

The **Rusty Blackbird** (Euphagus carolinus) was listed by COSEWIC as a bird of "special concern" in Canada. The OBBA suggests it has declined by about 30% in northern Ontario since the first atlas 20 years ago. This bird nests in immature coniferous trees in open shoreline forests and scrubby habitat adjacent to wetlands such as beaver meadows, marshes, ponds, swamps, and bogs (COSEWIC 2006). The rusty blackbird forages by walking along shorelines searching for invertebrates. Forest management that results in some harvesting and coniferous regeneration along shorelines would benefit this species. The recent OBBA does contain records of possible and probable nesting for the rusty blackbird in the region, though no confirmed nesting sites are identified for the Whiskey Jack Forest. If a rusty blackbird nesting site is found, appropriate AOC prescriptions will be developed and applied. (Photo Credit: Mark Peck, www.rom.on.ca)

STATUS: SPECIAL CONCERN

The **Snapping Turtle** (*Chelydra serpentina*) is Canada's largest freshwater turtle, reaching an average length of 20-36 cm and a weight of 4.5-16.0 kg. Snapping turtles have large black, olive or brown shells typically covered in algae. Their tails, which can be longer than their body, "dinosaur-like" triangular crests along their length. Hatchlings are about the size of a loonie and are smaller and darker than adults, with pronounced ridges along the length of their shell.

Snapping Turtles spend most of their lives in water. They prefer shallow waters so they can hide under the soft mud and leaf litter, with only their noses exposed to the surface to breathe. During the nesting season, from early to mid-summer, females travel overland in search of a suitable nesting site, usually gravely or sandy areas along streams. Snapping turtles often take advantage of man-made structures for nest sites, including roads (especially gravel shoulders), dams and aggregate pits.

(Facts: http://www.mnr.gov.on.ca/276686.pdf, Photo Credit: Wasyl Bakowsky, NHIC)

Snapping turtles are known to nest on the Whiskey Jack Forest. Information on nest sites has been collected through Aboriginal Traditional Knowledge as well as public reports. Information on occurrences is tracked through NHIC. Snapping Turtle is a Special Concern species and is not afforded protection under the ESA, 2007. If a snapping turtle nesting site is found during implementation of this FMP, AOC NE10 in Table FMP-10 will be applied.

2.1.3.2 Fish and Wildlife Inventories

This section of the plan text describes fish and wildlife resources on the Whiskey Jack Forest, excluding those species already discussed as selected species (Section 2.1.2.4.2) or species at risk (Section 2.1.3.1). A summary of available information on the occurrence of fish and wildlife species follows and is based on fish and wildlife inventory and habitat information. The quantity and quality of habitat for these species are not likely to be affected by forest operations. Information is presented for fisheries resources in the following subsection.

There are a variety of wildlife species that occur on the unit, and limited information is gathered on the abundance and distribution of these species using inventory techniques. Inventory techniques primarily include aerial surveys for bird nesting sites, which provides some information on species with nests that can be viewed from the air (e.g. bald eagles, osprey, great blue heron). There are over 600 known nest locations in the Whiskey Jack Forest.

In 2000 and 2001, 104 elk were released in the Lake of the Woods restoration area; specifically near Cameron Lake in the Kenora Forest. Following their release, research and monitoring efforts suggest elk numbers declined, but have recently stabilized and may be increasing. Presently, the population in the core area (approximately a 40 km radius from the release site) is estimated to be about 40 animals, with a similar or smaller number of animals in small groups scattered over a much wider area extending into the Whiskey Jack Forest.

There are two Black Bear Population Index Network (BBPIN) lines that pass through the Whiskey Jack Forest. The lines were designed to provide a broad-scale view of the bear population trends in Ontario. Although informative for managing black bear population, this information is not used for forest management planning; there is however an AOC for bear dens if one is identified within a harvest block.

Moose aerial inventories are conducted to estimate abundances of moose however; they are not on the same scale as a forest management unit. Although these surveys are not always developed for the intention of inventory for a FMP, the information may be useful to some degree when choosing Moose Emphasis Areas.

Deer winter concentration areas are regularly mapped using approved and standardized inventory techniques. This information is used to aid in the delineation of deer emphasis areas. The management of moose and deer emphasis areas will follow guidance provided by the *Stand and Site Guide*.

2.1.3.2.1 Fisheries Resource

The fisheries resource on this unit is diverse as many lakes, rivers and streams are found throughout the Whiskey Jack Forest. Stream and pond values are divided into High, Medium or Low Potential Sensitivity (HPS, MPS and LPS) to forest management activities. Lakes and rivers are High Sensitivity to forest management activities. Sites inventoried as HPS sites have one or more of the following characteristics;

- Known to contain fish species that are highly sensitive to perturbations (e.g. lake trout),

- Known to provide components of fish habitat for which there is a high degree of species dependence,
- Known to contain a rare habitants or fish that are species at risk
- Low habitat resiliency
- Identified as significant habitat by specific fisheries management plans.

MPS sites have one or more of the following characteristics;

- Known to contain fish species that are moderately resilient to perturbations (e.g. walleye, northern pike)
- Known to provide components of fish habitat for which there is a moderate degree of species' dependence
- Known to contain habitats or fish that have a limited distribution
- Moderate habitat resiliency

LPS streams or ponds are those sites that do not meet the criteria for an HPS or MPS stream or pond.

There are over 1,700 lakes with a total surface area of approximately 500,000 hectares within the boundaries of Kenora District. There are over 200,000 hectares of water in the Whiskey Jack Forest. Lake of the Woods and three major river systems, the English River, Wabigoon River and Winnipeg River systems, which encompass 50% of the total water area of Kenora District.

The major sport and commercial species sought by anglers, tourist industry, commercial and subsistence fishers are: yellow pickerel (walleye), sauger, northern pike, muskellunge, black crappie, smallmouth bass, largemouth bass, yellow perch, lake trout, lake whitefish, and lake sturgeon. In addition to the major commercial and sport species, other species include ling (burbot), bullheads, cisco (lake herring), white sucker, and redhorse suckers.

Unregulated forest management activities can have detrimental effects on fisheries resources by degrading, harmfully altering, disrupting or destroying fish habitat. The most common negative impacts occur with improper road water crossings which can remove or alter physical cover critical to fish habitat (spawning, rearing habitats) and/or block the migration of fish. To ensure this does not occur on the Whiskey Jack Forest, harvest block design and water crossings will follow the prescriptions and conditions outlined in this FMP that were developed using the *Stand and Site Guide*. For example, water bodies will be assigned AOC prescriptions based on type of water body (i.e. lake, river or stream), potential sensitivity to forest management activities (i.e. high, moderate or low) and slope of surrounding land. Water crossings will be located away from critical fish habitats and appropriate crossings structures (bridge, culvert etc.) will be used to ensure fish migration.

Kenora District also possesses a number of water bodies inhabited by two locally and provincially significant fish species: muskellunge (57 lakes) and lake trout (119 lakes). Kenora District possesses approximately 15% of the province's muskellunge waters. This species is managed for trophy opportunities and is afforded water quality protection similar to lake trout. Due to the increasing concern with the survival of lake trout, both within the MNR and internationally, and the fact that MNR is the trustee of 20% of the world's lake trout resource, every lake trout lake is important and needs protecting in Ontario (*Kenora District Land Use Guidelines 1983*).

The *Kenora District Fisheries Management Plan* is a background document used in the preparation of this forest management plan, and should be referenced for additional detail on the fisheries resource.

Implications of Fisheries Resources - Fisheries Resources will be considered during area of concern planning for operations adjacent to riparian zones as well as during roads planning. The initial land base available for timber production used for the Strategic SFMM modelling was reduced to not include estimated riparian zones in the calculation of the available harvest area for this 10-year period. The quantity and quality of these fisheries resources are not likely to be affected by forest operations.

2.1.3.2.2 Rare Species

The Natural Heritage Information Centre (NHIC) database was searched to identify rare species, that are known occur on the Whiskey Jack Forest. Rare species are classified as those with rankings of S1, S2 and S3. These classifications are defined as:

S1 (Extremely rare) in Ontario; usually 5 or fewer occurrences in the province or very few remaining individuals;

S2 (Very rare) in Ontario; usually between 5 and 20 occurrences in the province or with many individuals in fewer occurrences; and

S3 (Rare to uncommon) in Ontario; usually between 20 and 100 occurrences in the province; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances.

Rare species confirmed to exist on the Whiskey Jack Forest at one time, according to NHIC are listed in Table 7. A note on whether they are forest dependent and if so, what protection is afforded them in the FMP is listed. A record in NHIC means that species was observed in a particular area at one time, and many records are more than 20 years old. Additional rare species may be present but are currently unknown in the area.

Implications of Rare Species – When a rare species (on the S1 to S3 species list) is identified in an area of operations, encountered during forest operations, or confirmed during the duration of the plan, the occurrence will be addressed using an appropriate area of concern prescription, or through the creation of a Condition on Regular Operations, developed from the appropriate MNR guide or a prescription will be developed by the planning team where the species is not covered by an MNR guide.

Table 7 List of Rare Species on the Whiskey Jack Forest

Scientific Name	English Name	S-Rank	Plan Protection
Spermophilus franklinii	Franklin's Ground Squirrel	S3	Not forest dependent
Podiceps grisegena	Red-necked Grebe	S3B	Water quality AOC's apply
Limosa fedoa	Marbled Godwit	S3B	Water quality AOC's apply
Xanthocephalus xanthocephalus	Yellow-headed Blackbird	S2B	Not forest dependent
Coenagrion angulatum	Prairie Bluet	SH	Water quality AOC's apply
Aeshna interrupta lineata	Variable (Lineate) Darner	S2	Water quality AOC's apply
Arigomphus comutus	Horned Clubtail	S3	Water quality AOC's apply
Gomphus graslinellus	Pronghorn Clubtail	S3	Water quality AOC's apply
Stylurus notatus	Elusive Clubtail	S2	Water quality AOC's apply
Somatochlora focipata	Forcipate Emerald	S3	Water quality AOC's apply
Sympetrum corruptum	Variegated Meadowhawk	S3	Water quality AOC's apply
Allium cernuum	Nodding Onion	S2	Not forest dependent
Amorpha canescens	Downy Indigobush	S1	Not forest dependent
Anemone patens	Prairie Crocus	S1	Not forest dependent
Artemisia dracunculus	Dragon Wormwood	S1	Not forest dependent
Artemisia frigida	Prairie Sagebush	S3	Not forest dependent
Asclepias ovalifolia	Dwarf Milkweed	S2	When a specific location is identified that may be impacted by forest operations, an AOC prescription will be deveopled with MNR staff.
Bouteloua curtipendula	Side-oats Grama	S2	Not forest dependent
Calamovilfa longifolia var. longifolia	Prairie Sand Reed	SX	Not forest dependent
Caltha natans	Floating Marsh Marigold	S2	Water quality AOC's apply
Carex assiniboinensis	Assiniboia Sedge	S2	When a specific location is identified that may be impacted by forest operations, an AOC prescription will be deveopled with MNR staff.
Carex conoidea	Field Sedge	S3	Water quality AOC's apply
Carex obtusata	Blunt Sedge	S2	Water quality AOC's apply
Carex saximontana	Rocky Mountain Sedge	S2	Not forest dependent
Carex torreyi	Torrey's Sedge	S2	When a specific location is identified that may be impacted by forest operations, an AOC prescription will be deveopled with MNR staff.
Chenopodium leptophyllum	Slim-leaved Goosefoot	S1	Not forest dependent
Corispermum americanum	American Bugseed	S1S3	Not forest dependent
Corispermum villosum	Hairy Bugseed	S1S3	Not forest dependent
Cuscuta cephalanthi	Bottonbush Dodder	S2	Water quality AOC's apply
Cyperus schweinitzii	Schweinitz's Flatsedge	S3	Not forest dependent
Cypripedium arietinum	Ram's-head Lady's-slipper	S3	Water quality and woodland pool AOC's apply
Cystopteris laurentiana	Laurentian Bladder Fern	S3	When a specific location is identified that may be impacted by forest operations, an AOC prescription will be deveopled with MNR staff.
Dalea candida	White Prairie Clover	SX	Not forest dependent
Dalea purpurea	Purple Prairie Clover	S1	Not forest dependent
Dichanthelium leibergii	Leiberg's Panic Grass	S2	When a specific location is identified that may be impacted by forest operations, an AOC prescription will be deveopled with MNR staff.
Dichanthelium perlongum	Long-stalked Panic Grass	S2	Not forest dependent
Elatine rubella	Long-stemmed Waterwort	SH	Water quality AOC's apply
Eurybia schreberi	Schreber's Wood Aster	S2S3	Not forest dependent
Festuca hallii	Plains Rough Fescue	S1	Not forest dependent
Galium brevipes	Limestone Swamp Bedstraw	S2S3	Not forest dependent
Glycyrrhiza lepidota	Wild Licorice	S3	When a specific location is identified that may be impacted by forest operations, an AOC prescription will be deveopled with MNR staff.
Hesperostipa comata	Needle and Thread Grass	S1	Not forest dependent
Heuchera americana	American Alumroot	S2	When a specific location is identified that may be impacted by forest operations, an AOC prescription will be deveopled with MNR staff.
Hudsonia tomentosa	Woolly Beach-heath	S3	When a specific location is identified that may be impacted by forest operations, an AOC prescription will be deveopled with MNR staff.
Juncus vaseyi	Vasey's Rush	S3	Not forest dependent
Lechea stricta	Strict Pinweed	S1	Not forest dependent
Lithospermum canescens	Hoary Puccoon	S3	Not forest dependent
Micranthes pensylvanica	Eastern Swamp Saxifrage	S1	When a specific location is identified that may be impacted by forest operations, an AOC prescription will be deveopled with MNR staff.
hispidissimum	Soft-hairy False Gromwell	S2	When a specific location is identified that may be impacted by forest operations, an AOC prescription will be deveopled with MNR staff.
Opuntia fragilis	Brittle Prickly Pear	S3	When a specific location is identified that may be impacted by forest operations, an AOC prescription will be deveopled with MNR staff.
Pascopyrum smithii	Western Wheat Grass	S2	Not forest dependent
Quercus ellipsoidalis	Northern Pin Oak	S3	When a specific location is identified that may be impacted by forest operations, an AOC prescription will be deveopled with MNR staff.
Schoenoplectus heterochaetus	Slender Bulrush	S3	Not forest dependent - Water quality AOC's apply
missouriensis	Leonard's Small Skullcap	S3	When a specific location is identified that may be impacted by forest operations, an AOC prescription will be deveopled with MNR staff.
Senecio eremophilus	Desert Ragwort	S2	When a specific location is identified that may be impacted by forest operations, an AOC prescription will be deveopled with MNR staff.
Solidago missouriensis	Missouri Goldenrod	S2	Not forest dependent
longipetiolata	Gray-stemmed Goldenrod	S1S2	Not forest dependent
Sporobolus heterolepsis	Prairie Dropseed	S3	Not forest dependent
pansum	Prairie White Heath Aster	S2	When a specific location is identified that may be impacted by forest operations, an AOC prescription will be deveopled with MNR staff.
Viola novae-angliae	New England Violet	S3	When a specific location is identified that may be impacted by forest operations, an AOC prescription will be deveopled with MNR staff.
Woodsia scopulina	Mountain Woodsia	S3	When a specific location is identified that may be impacted by forest operations, an AOC prescription will be deveopled with MNR staff.
Rhizomnium gracile	A Moss	S1	When a specific location is identified that may be impacted by forest operations, an AOC prescription will be deveopled with MNR staff.

2.1.3.3 Natural Resource Features, Land Uses and Values

This section of the plan text identifies the information portrayed on the values maps (Section 2.1.3.3.1), and how it was used in the preparation of the forest management plan. The text also includes a list of sources of the information on the values map(s) or otherwise available in the values database and identification of those subjects for which data is recognized as being incomplete or missing.

The management implications of natural resource features, land uses and values, on the development of the forest management plan is included in Sections 2.1.3.3.2 through 2.1.3.3.9.

Land use policy areas that are documented in the Crown Land Use Policy Atlas (CLUPA) are referenced in Section 2.1.3.3.5 Parks and Protected Areas. The CLUPA also contains fifteen general use areas in addition to the parks and protected areas. While there are no provincial-level policy restrictions to forest management in the general use areas, it should be recognized that there are some general use areas with local-level policy restrictions. Of the 15 general use areas in the Whiskey Jack Forest, 10 (67%) contain qualifying land use direction that denotes that forest operations will recognize the importance of tourism and recreational use in the area, and will be conducted so as to have minimal impact on such. Four of the other general use areas identify the importance of recreation and tourism in the Land Use Intent for the area, but do not contain specific direction related to commercial timber harvest.

Other uncommon or notable natural resource features (e.g., significant old growth stands, large wetland complexes) which occur on the management unit are also to be discussed in this section however there are no other uncommon or notable natural resource features on the Whiskey Jack Forest.

2.1.3.3.1 Values Information and Maps

Values are features, benefits, or conditions of the forest that are linked to a geographic area, that are of interest from various points of view, and that must be considered in forest management planning. The values maps are intended to be used primarily as background information for planning, and will also be used for display purposes and to solicit additional information about natural resource features, land uses and values. Any person or party can provide values information at any time. Information about values normally comes from the MNR or other government staff; SFL holders, other forest resource licence holders and their operators; non-government organizations, third parties, other resource users, or the public; and Aboriginal communities. Values Maps are included in the supplementary documentation of the plan (see FMP Maps – Values Maps).

The public consultation process described in the *Forest Management Planning Manual* (FMPM, MNR, 2009) supports the collection and provision of information about values at any time during the development and implementation of a forest management plan.

Values can be classified into two groups based on the requirements to provide information for forest management planning: timber values and non-timber values. Timber values include such features as growth and yield plots, research plots, and seed orchards. The FRI is not considered as a timber value for purposes of prescribing requirements for values information.

Non-timber values include such features as cultural heritage sites, Aboriginal values, and critical wildlife and fisheries habitat areas, such as mineral licks, raptor nests, or spawning areas. Non-timber values also include various uses such as wild rice production areas, recreational areas, trails, Aboriginal use areas, and traditional use areas.

Values maps provide a summary of the geographic location(s) of *known* natural resource features, land uses and values which must be considered in forest management planning and about which further inventory information is available. A value is considered to be a *known* value when there is sufficient information to describe its geographic location and its basic features. Known values must be considered in forest management planning. The MNR shall determine if a value can be treated as a known value based on the available information and in consideration of standards described in the *Forest Information Manual* (FIM, MNR, 2009).

MNR values information is stored in the *Natural Resources Values Information System* (NRVIS). The *Natural Resources and Values Information System* is a Geographic information System (GIS) based system for managing the storage of the Ontario Ministry of Natural Resources' (MNR) digital land related information in a standardized manner. It provides the ability to store, maintain and access over 600 different geographic feature types.

Information about certain values such as, the location and description of Aboriginal values, cultural heritage sites, sites of Species at Risk, rare vascular plants, fish spawning areas, etc. may be considered as “sensitive information” that, if released or portrayed on maps may pose a threat to the existence, integrity, or health of those values. Sensitive information about values shall not be made available or accessible to the public. Where the availability of information could be considered as potentially detrimental to the existence of a value, the MNR shall determine whether or how the value can be depicted on a values map.

Values Maps - For each forest management plan, MNR produces a series of values maps. The *Forest Information Manual* (FIM, MNR, 2009) and the FMPM require the production of a series of maps depicting specific values on the Whiskey Jack Forest that are used for forest management planning purposes. This series of maps is identified as follows;

- 4.1a Natural Resources Features Values Map – Wildlife, Areas of Natural and Scientific Interest (ANSI) and Forestry Values;
- 4.1b Natural Resources Features Values Map – Fisheries and Wetlands;
- 4.2 Resource Uses Values Map;
- 4.3 Land Values Map;
- 4.4 Bear Management Areas Values Map;
- 4.5 Trapline Areas Values Map;
- 4.6 Resource-Based Tourism Values Map; and
- 4.7 Cultural Heritage Values Map.

(Note: the Cultural Heritage map identifies Archaeological Potential Areas (APAs) which have already been portrayed on Areas of Operations maps in the FMP supplementary documentation. Therefore a separate Cultural Heritage Values map was not prepared for this FMP.)

Known values and land uses on the Whiskey Jack Forest are documented on the Values Maps. Technical requirements and information to be portrayed on values maps are detailed in the *Forest Information Base and Values Technical Specifications*. More detailed information on

certain land uses is included in the Social and Economic Description in Supplementary Documentation D.

Sources of Values Information - The principle source of values information for display was the Natural Resources Values Information System (NRVIS) compiled and maintained by MNR – Kenora District. NRVIS values data was originally obtained from a number of sources, including:

- fisheries habitat and population surveys
- protected area regulation plans
- protected areas inventories
- protected area management direction documents
- wildlife habitat inventories
- MNR staff, forest industry and public reporting
- Aboriginal reports and/or cultural heritage values studies
- forest compliance reports
- water crossing and road corridor inspections
- Ministry of Northern Development, Mines and Forestry (MNDMF)
- Ministry of Tourism and Recreation (MTR)
- Ontario Base Map (OBM) features
- Land Use Permit System (LUPS), control maps and survey plans
- Boat cache inventory
- Natural Heritage Information Centre
- Forest Resource Inventory (FRI)

A number of methodologies were used to collect the various data for compilation in NRVIS. Wildlife habitat values were generally provided from public/MNR/industry reports and from standardized inventories conducted by MNR according to the *Selected Wildlife and Habitat Features: Inventory Manual (MNR, 1998)*. Specific survey designs included the identification and/or ranking of:

- Moose aquatic feeding areas and mineral licks,
- Identification of early and late winter moose habitat,
- Bald eagle, or other stick nests, and
- Locating other provincially and locally featured species habitats.

Most of these surveys are conducted using rotary-wing aircraft, and occasionally fixed-wing aircraft.

Fisheries habitat values (spawning, nursery and migration areas) were often obtained in conjunction with aerial surveys of wildlife habitat; field inspections or aerial observations of proposed road corridors and water crossings; Aquatic Habitat Inventories (AHI) or lake surveys; and public reports. Fish species occurrence and thermal regime were largely determined from the AHI database or from more detailed fish population surveys on specific water bodies.

There are no identified provincially significant wetlands on the Whiskey Jack Forest.

Locations of significant communities of flora and fauna, in particular rare vascular plants, were obtained through field inspections by the Natural Heritage Information Centre (NHIC) and District MNR staff and from site specific investigations by contractors or consultants.

The locations of recreational, commercial and resource user boat caches were derived from formal MNR boat cache authorization agreements and control maps. Additional infrastructure, such as commercial outpost camps, land use permits (LUPs) and resource user (trapper, baitfish) cabins were identified in LUPs, lands control maps and actual survey plans on file at the MNR District office.

Missing or Incomplete Data - In general, the lands and waters within the Whiskey Jack Forest have been surveyed over the past several years and during previous FMP planning processes. Values information is updated continuously as new values are identified, or it is confirmed that previously identified values no longer exist (e.g. stick nests). Values information must be considered the "best available" at the time of plan preparation however values information is continually being updated. Timing of the area surveyed to update local values is often affected by the available MNR funding for surveys.

MNR data collection efforts have followed standard methodologies as outlined in the *Selected Wildlife and Habitat Features: Inventory Manual (MNR, 1998)*. District staff, Natural Heritage Information Centre (NHIC), environmental consultants and the general public have also obtained data on Species at Risk and rare species.

FMP Management Implications - Where a known value may be affected by forest management activities, the *Forest Management Planning Manual (2009)* requires that a defined geographic area adjacent to the feature be established. The defined geographic area is called an "area of concern" (AOC). An operational prescription is developed for each AOC or group of AOCs to prevent, minimize or mitigate adverse effects of forest management operations on the value. Operational prescriptions for AOCs may be reserves (e.g. prohibition of operations), modified operations (e.g. specific conditions or restrictions on operations) or regular operations (i.e., in accordance with the silvicultural ground rules), individually or in combination. Modified operations may be regular operations with conditions (e.g. timing, equipment), or unique prescriptions that are developed to protect or manage specific values or land uses. Areas estimated to be impacted by reserves were incorporated in the strategic modelling for the Long-term Management Direction (LTMD) in order to calculate the most realistic available harvest area for this plan and to assess long-term objective achievement.

Operational prescriptions were developed for an individual AOC or groups of AOCs using the forest management guides identified by MNR as applicable to the forest (e.g. the *Stand and Site Guide*). An operational prescription may also be proposed from another planning exercise for inclusion in the FMP (e.g., Resource Stewardship Agreements (RSAs)). In some situations, the planning team will develop an operational prescription (e.g., prescription for operations adjacent to private land). Additional information regarding the development of operational prescriptions for AOCs associated with known values on the Whiskey Jack Forest is provided in Section 4.2 Prescriptions for Operations.

Where a new value is identified during implementation of the plan, the AOC prescription associated with the geographic area of the value (Table FMP-10) will be implemented or conditions on regular operations (Section 4.2.2.2) for the value will be implemented. Conditions on regular operations (CROs)(prescriptions for harvest, renewal, and tending) have been developed through application of MNR's forest management guides relating to conserving biodiversity at the stand and site scales (*Stand and Site Guide*).

2.1.3.3.2 Old Forest Red Pine and White Pine

The Whiskey Jack Forest includes the transition forest zones between the Boreal Forest to the north and the Great Lakes-St. Lawrence Forest in the south. Conditions are favourable in this transition zone for red pine and white pine. The red pine and white pine forest unit area (PRW) represents less than 1% of the productive forest area. While this area is not large, it does present opportunities for the management of these tree species for sawlogs as well as for the old forest characteristics required by certain cavity nesting species such as the pileated woodpecker. Mature pines are also the favoured nesting habitat of the bald eagle.

The *Old Growth Policy for Ontario's Crown Forests (MNR, 2003)* guides the maintenance or restoration of old forests on the Whiskey Jack Forest. Old forest red pine and white pine forest communities are portrayed on Map 4.1b Natural Resource Features Values – Wildlife and Forestry. There are 309 hectares of old forest red pine and white pine at the start of this plan (all PRW forest unit area greater than 140 years old).

Old forest in all forest units were incorporated into the Management Objectives, associated indicators, desirable levels, and the strategic modelling based on definitions and criteria outlined in the *Old Growth Policy for Ontario's Crown Forests* (MNR 2003), *Old Growth Forest Definitions for Ontario* (MNR 2003), and the *Old Growth FMP Interpretation Note No. 1* (MNR, 2003). Based on results from the strategic modelling, old forest communities on the Whiskey Jack Forest will continue to be represented across the landscape at levels within or exceeding the desirable levels endorsed in the Long-Term Management Direction.

Not all old forest red pine and white pine forest communities will be managed for old forest condition values. Old forest red pine and white pine stands may be planned for harvest if their harvest is in accordance with the Long-term Management Direction (Section 3.0), achievement of management objectives and harvest eligibility criteria (Section 3.6.2).

2.1.3.3.3 Resource-based Tourism Areas

The Resource-Based Tourism Values Map (Map 4.6) was produced locally during the forest management planning process. The map only displays the properties, facilities, or the land-based amenities of tourism operators who are Resource-based Tourism Establishments. The information displayed on the values map includes:

- Recognized RBT Main Base Lodges (remote, semi-remote, drive-in);
- Recognized RBT Outpost Camps (remote, semi-remote, drive-in);
- Recreation Access Points; and
- Boat Caches (commercial)
- Recreation Trails

Depending on the resource-based tourism values, the maps may include camping sites, hunting stations, swimming beaches, fish and wildlife viewing sites, scenic lookouts, identification of navigable waterways, picnic sites and RBT access routes. The information portrayed on the Resource-based Tourism Map was taken into consideration during Resource Stewardship Agreement negotiations during plan development.

There are approximately 362 tourist operators in Kenora District, of which 219 are associated with the Whiskey Jack Forest (identified on Values Map 4.6 Resource-Based Tourism Values Map). The tourism industry has been an important component in the Kenora area for a long time. Lodges and cottages were in operation by 1905. At that time the activities were based on hunting, fishing and canoeing opportunities. The Whiskey Jack Forest has attracted recreation-based tourism since the late 19th Century due to its variety of natural values. The area continues to be a desired recreational destination for canoeing, boating, fishing, hunting, hiking, snowmobiling, camping and cottaging.

MNR was committed to maintaining the viability of the tourism industry by protecting tourism values in the forest management planning process through the application of the *Management Guidelines for Forestry and Resource-Based Tourism* .

The *Tourism and Forest Industry Memorandum of Understanding (MOU)* is an agreement between the government, the tourism industry and the forest industry on the development of Resource Stewardship Agreements (RSAs) and related matters. A Resource Stewardship Agreement is an agreement negotiated between two legal entities: a Resource-Based Tourism Establishment (RBTE) operator; and the Sustainable Forest Licensee. Essentially, the parties agree, through negotiations of an RSA, to apply forest management operational prescriptions to protect specific tourism values and roads planning and/or related conditions on new and existing roads that affect forest management that will be approved by the MNR and included in the FMP under the Crown Forest Sustainability Act. The RSA may also include other provisions the parties agree to that are not part of the FMP.

Since the Whiskey Jack Forest is managed by the Ministry of Natural Resources, not an SFL company, there are no Resource Stewardship Agreements for this forest. However tourism values and natural resource features are considered during forest management planning through the application of the Area of Concern process. Any forest management prescriptions developed by MNR with resource-based tourist operators are carried forward in this FMP and applied to any relevant planned operations in this forest management plan. These prescriptions are included in Table FMP-10 Operational Prescriptions for Areas of Concern or Table FMP-19 Road Crossings, Landings and Aggregate Pits in Areas of Concern. Tourist operators are contacted several times throughout development of the forest management plan to ensure any known concerns are discussed and if warranted, operations planned in the FMP are adjusted to mitigate the concern and adequately protect identified values.

2.1.3.3.4 Mineral, Aggregate and Quarry Pits

Historically, mining and mineral exploration have been an important activity in this management unit and historically gold, silver and copper were the predominant commodities mined. Currently there are four granite producers in operation which have been and continue to be a significant contributor to the economy of the area. The value of total granite production was not available at the time of writing. Historical metal production occurred within the management unit between 1893 and 1951 and totaled 68,513 ounces gold, 14,762 ounces silver and 1.89 million pounds of copper valued at $49.73 million CDN at current metal prices.

In addition to historical and current mineral production there are significant concentrations of gold, nickel, copper, silver and uranium contained within documented mineral deposits throughout the management unit. The total estimated value of metals contained within these deposits at current commodity prices is in excess of $158 million CDN.

There are an estimated 1,605 active mining claim units recorded throughout this management unit, as indicated on MNDM's CLAIMaps website (MNDM, 2006). These claims represent an investment in the management unit of approximately $400,000 CDN for claim staking, which directly relates to its mineral potential. In addition there is an estimated dollar expenditure of nearly $650,000 CDN per year related to mineral exploration work required to keep the claims in good standing. Current claim staking targets areas with potential for uranium, rare-metals, zinc and gold. Historically, several areas within the management unit have seen extensive staking and mineral exploration.

There are 12 aggregate sites located in the Whiskey Jack Forest, all of which are operated by MNR.

The FMP Values Maps provide detail for active aggregate permit areas, unrehabilitated aggregate sites, land use permit locations and Crown lease locations.

There are few implications of mineral, aggregate and quarry pits on forest management activities. Annually, mining claim holders must be notified of forest management activities scheduled on their respective mining claims. Harvest and silviculture activities must not damage or destroy claim posts. Obtaining good sources of aggregate on Crown land is a consideration during roads planning and identification of operational road boundaries. Lack of suitable aggregate sources for forest access roads can result in long aggregate haul distances for road building, or the increase use of winter access for timber extraction.

2.1.3.3.5 Parks and Protected Areas

The purpose of Ontario's Provincial Parks and protected areas is to permanently protect a system of provincial parks and conservation reserves that includes ecosystems that are representative of all of Ontario's natural regions, protects provincially significant elements of Ontario's natural and cultural heritage, maintains biodiversity and provides opportunities for compatible, ecologically sustainable recreation. Ontario's provincial parks and conservation reserves are dedicated to the people of Ontario and visitors for their inspiration, education, health, recreational enjoyment and other benefits with the intention that these areas shall be managed to maintain their ecological integrity and to leave them unimpaired for future generations.

The following are important benefits and help to demonstrate how provincial parks support our quality of life:

- Protection and contribution to ecological functions (air quality, water quality, flood control, soil stabilization),
- Biodiversity contributions (genetic material, protection of species at risk),
- Protection of resource integrity (some of the last green spaces left in the province),
- Health effects from use of parks (mental, physical, spiritual benefits),
- Worker productivity (healthy and happy workers tend to be more productive - a visit to a provincial park can contribute),
- Educational benefits (young and old learning about our environment),
- Scientific benefits (research in provincial parks),
- International responsibilities to protect natural settings, features and wildlife,
- Business location decisions (quality of life/business) and community cohesion.

There are several different classifications of parks and protected areas. Each class and individual area has different objectives and permit different activities within the defined areas. There are six classifications of provincial parks; 1)Wilderness Class Parks, 2) Nature Reserve Class Parks, 3) Cultural Heritage Class Parks, 4) Natural Environment Class Parks, 5) Waterway Class Parks, and 6) Recreational Class Parks. In addition to parks, there are conservation reserves that not only provide protection to representative ecosystems, biodiversity and provincially significant elements of Ontario's natural and cultural heritage, but also allow opportunities for ecologically sustainable land uses, including traditional outdoor heritage activities and associated economic benefits.

There are seven provincial parks or protected areas adjacent to or surrounded by the Whiskey Jack Forest. Parks in the management unit include the West English River, Eagle-Dogtooth, Tide Lake and the Maynard Lake Parks. The Pakwash Provincial Park is located adjacent to the northeast corner of the unit, Rushing River Provincial Park is located in the southern portion of the forest, and Woodland Caribou Provincial Park (and addition) is located in the northwest portion of the unit. All of these parks have either an Interim Management Statement or a park management plan that provides direction.

Scattered throughout or adjacent to the Whiskey Jack Forest there are nine Conservation Reserves including Campfire River, Clay Lake, Dryberry Lake, Lac Seul Islands, Lake of the Woods CR, Scenic Lake, Scotty Lake, Solitary Lake and Twilight Lake Conservation Reserves. Additional social and economic information on parks and protected areas is included Section 2.2.3.2 and in Supplementary Documentation D - Social and Economic Information.

PROVINCIAL PARKS

A description of each provincial park follows. The number associated with each area corresponds to the Crown Land Use Policy Atlas (CLUPA) area number

West English River (P2345), a non-operating waterway class park of 22,923 hectares, was regulated in 2003. The area includes that portion of the English River from Barnston Lake to Tide Lake. The waterway contains old growth red and white pine at the northern extent of its range, wilderness environments and tourism attributes, and is an historic travel corridor. Two provincial nature reserves, Maynard Lake and Tide Lake, abut the park. Motor boating, canoeing, sport fishing, hunting and camping are popular activities, although the actual use is unknown.

Eagle-Dogtooth (P2363), a non-operating waterway class park of 41,128 hectares, was regulated in 2003. It provides a waterway linkage between Eagle Lake and nearby protected areas (e.g., Rushing River, Winnange). It is an important recreational waterway. The site contains regionally significant moraines, wetlands, pine forest ecosystems, eagles, waterfowl and is an important recreation and tourism area. Motor boating, canoeing, sport fishing, hunting and camping are popular activities, although the actual use is unknown.

Tide Lake (P2614), a non-operating nature reserve class park of 51 hectares, was regulated in 1997. It consists of the peninsula between Ball and Tide lakes. The park provides representation/protection of an atypical old growth white pine stand (age class + 160 years) at the northern limit of the species' range. It is surrounded by West English River Provincial Park on three sides. Camping, day-use, hunting and most other recreational activities are prohibited because of the classification of the park. The actual amount of use is unknown.

Maynard Lake (P2698), a non-operating nature reserve class park of 25 hectares, was regulated in 1997. It consists of a peninsula with deep soils on the east shore of Maynard Lake. It provides representation/protection of an atypical old growth white pine stand (age class + 160 years) at the northern limit of the species range. It is surrounded by West English River Provincial Park on three sides. Camping, day-use, hunting and most other recreational activities are prohibited because of the classification of the park. The actual amount of use is unknown.

Pakwash (P2528) is a staffed natural environment class provincial park of 3,993 hectares. The park was established in 1967 and was regulated in 1989 as a natural environment class Provincial Park. The park provides representation/protection of Site District 4S-2, specifically the Hartman Moraine. Pakwash provides opportunities for car-camping and day-use. The park is operated by Friends of Pakwash.

Rushing River (P2615), a staffed recreation class provincial park of 340 hectares was established in September 1958. Natural features include jack pine uplands, wetlands and a lush river valley. The park has a popular campground, day-use area and interpretive facilities/trails.

Woodland Caribou (P2370e), an operating wilderness class park of 450,000 hectares, was regulated in 1983. It protects representative earth and life science features of Site District 4S-1, such as the Eagle-Finlayson Moraine, prairie-boreal vegetation and habitat for Woodland Caribou, a threatened species.

Woodland Caribou recommended park additions (P2370) were established during Ontario's Living Legacy – Land Use Strategy. There are four additions to the existing park (Douglas Lake, Peisk Lake, Anchor Lake and Sydney Lake areas) although only Sydney Lake is within the FMU. The Sydney Lake addition includes a significant white elm site. A primary forest access road crossing between Rowdy and Sydney Lakes will be permitted as determined through previous forest management planning processes. This addition is in the most popular backcountry canoeing area of the park.

CONSERVATION RESERVES

A description of each conservation reserve follows. The number associated with each area corresponds to the Crown Land Use Policy Atlas (CLUPA) area number.

Campfire River Conservation Reserve (C2368), a protected area of 4,180 hectares is located approximately 73 kilometers north of the City of Kenora, immediately west of South Pakwash Road. The reserve contains extensive representation of wetland vegetation, including deep and shallow marshes, graminoid marshes, wet meadows, low shrub fens, and thicket swamps. Coniferous, deciduous and mixed forests are all represented within the reserve. The reserve is used for fishing, hunting and trapping. The traditional harvesting of wild rice is practiced in Paintpot Lake. Winter activities include ice fishing and snowmobiling.

Clay Lake Conservation Reserve (C2594), a protected area of 89 hectares. The CR contains an old growth red and white pine community at northern fringe of its range; a core area of 27 hectares of 70% red pine and white pine aged at 121+ years; known to contain very large trees; other stands contain up to 40% white pine as well as some scattered red pine. The reserve is made up of lacustrine deposits.

Dryberry Lake Conservation Reserve (C2357), a protected area of 21,850 hectares of land and water, with Dryberry Lake itself forming half of this total. It is located approximately 25 kilometres southeast of the City of Kenora and 20 kilometres north of Sioux Narrows. This reserve incorporates Dryberry Lake, Point Lake and several smaller unnamed lakes located east of Northwest Bay and west of Point Lake. This site contains representative landform and vegetation types including mixed conifer, sparse forest and burn on weakly and moderately broken bedrock, and vegetated bedrock. There are also several red and white pine stands in excess of 75 years old. Dryberry Lake provides a world class lake trout, smallmouth bass, northern pike, and muskellunge fishery. There are a number of identified bald eagle nests within the boundary. There are also several identified archeological values within the area.

Lac Seul Islands Conservation Reserve (C2317), a protected area of 14,723 hectares. The vast waterway system of Lac Seul extends from Sioux Lookout westward to Ear Falls and abuts the communities of Whitefish Bay, Keesic Bay and Frenchman's Head of the Lac Seul First Nation Reserve. The conservation reserve includes over 1000 islands found within the Lac Seul waterway system. There are several established access points found within the Sioux Lookout area that provides easy access to Lac Seul. This conservation reserve contains sand dune complexes, historical, cultural and archaeological sites and offers excellent tourism, recreational and educational experiences. The forest cover of the islands primarily consists of balsam fir, black spruce, white birch and white spruce. The area includes a significant old growth red and white pine stand located on Eagle Island.

Lake of the Woods Waters Conservation Reserve (C2501) is a protected area of 1,984 hectares. The conservation reserve is water-based, consisting of open waters and wetlands. It is located 15 kilometers northwest of the Town of Rainy River. The area provides continuity of protection for the water between the mainland and the offshore barrier-islands of the Sable Islands Provincial Nature Reserve. The reserve contains significant wetland communities and shallow open water lagoon areas that provide productive habitat for an array of fish and wildlife species. The conservation reserve represents part of a very large sand barrier island – lagoon complex, a unique feature to the Canadian Shield.

Scenic Lake Conservation Reserve (C2365), a protected area of 1,890 hectares is located approximately 53 kilometres north of the City of Kenora. This reserve incorporates Scenic Lake, all islands within the lake, Moose Lake, and a 200 metre buffer zone around the lake shores. The reserve contains representation of several forest types, including aspen, white birch, balsam fir, white and black spruce, and jack pine. Fishing opportunities exist for northern pike and smallmouth bass. There are also boating opportunities, as well as snowmobiling, and hunting opportunities for moose, deer, black bear, small game, and waterfowl.

Scotty Lake Conservation Reserve (C2361) is a protected area of 775 hectares. The original Scotty Lake Conservation Reserve (encompassing 53 hectares) had been identified as an area containing old growth White Pine on moderately broken ground moraine and was regulated on January 7, 1995. Resulting from *Ontario's Living Legacy* (*OLL*) natural heritage program, an additional 722 hectares adjacent to the original reserve was selected for protection due to the representative landform and vegetation types (primarily mixed and sparse forests on weakly broken ground moraine and burn) existing within the area. The Scotty Lake Conservation Reserve Addition (C2361) is the first expansion to a previously established conservation reserve in the Province of Ontario. Scotty Lake Conservation Reserve is located approximately 69 kilometres north of the City of Kenora and includes two unnamed headwater lakes located

southeast of Little Mountain Lake. Aboriginal interests in the area are primarily those of Grassy Narrows First Nation.

Solitary Lake Conservation Reserve (C2362), a protected area of 257 hectares is located approximately 85 kilometres north of the City of Kenora. The reserve incorporates the area adjacent to the northeastern shoreline of Solitary Lake and the peninsula on the west shore of the lake. It also includes the small island between these two areas, as well as the large island found in the southern basin of Solitary Lake. Mixed stands of aspen, birch, spruce, fir and some jack pine dominate the reserve. The majority of wetland vegetation is comprised of graminoid meadows and fens, low shrub bogs, shrub-rich treed bogs, and red alder thicket swamps.

Twilight Lake Conservation Reserve (C2430), a protected area of 396 hectares and is located approximately 85 kilometres northeast of the City of Kenora. The reserve primarily incorporates: Twilight Lake; a 200 metre buffer along the north and west shores of the lake; an area extending from 200 metres southeast of the creek intersecting the south end of Twilight Lake, to Evening Lake in the northeast; and a portion of Evening Lake's west shoreline, which borders the reserve in the northeast. Aboriginal interests in the area are primarily those of Grassy Narrows and Wabauskang First Nations. The reserve contains representation of several forest types: Aspen hardwoods, mixed stands of White Birch, Aspen/Spruce mixedwoods, and Jack Pine/Spruce stands on shallow soils on bedrock. Also existing here are Red Pine (along the western extremity of the reserve), a small stand of Black Ash (in the southeast portion), and wetland communities

Implications of Parks and Protected Areas –
During forest management planning, the area within provincial parks and conservation reserves, within the boundaries of the Whiskey Jack Forest are used in the contribution to wildlife habitat and for the establishment of core habitat areas for marten habitat or large landscape patches. Similarly, these areas contribute to meeting "old forest" targets and preferred wildlife habitat levels, but are not included in the area of the forest available for harvest operations.

Conducting forest management operations adjacent to parks and protected areas requires consideration of the values and potential access, tourism and recreation concerns. Parks staff (parks) and district staff (conservation reserves) will be consulted regarding boundary layout prior to commencement of adjacent harvest operations. During plan development, parks managers are consulted and can influence FMP development as it relates to access, noise and aesthetics in proximity to parks and protected areas.

2.1.3.3.6 Crown Land Recreation and Cottaging

In addition to the commercial activity described above, there is significant social and economic benefit derived from Crown land recreation and cottaging on the Whiskey Jack Forest. The various values or activities are described below with discussion of the implications of the activities or value on the development of the FMP.

The Whiskey Jack Forest has attracted recreation-based tourism since the late 19th Century due to its variety of natural values. The area continues to be a desired recreational destination for canoeing, boating, fishing, hunting, hiking, snowmobiling, camping and cottaging for the following reasons:

- There is a high concentration of interconnected lakes, rivers and portages.
- The rugged topography including cliffs, low wetlands, viewpoints and island-dotted lakes provide excellent scenery for summer and winter travelers.

- The area is traversed by numerous trails providing winter recreation opportunities by snowmobile, cross-country ski, or dog sled. In the summer, canoeist and hikers can access remote locations.
- There are numerous cultural heritage values including very old native heritage sites and more recent logging and mining heritage sites.

The large variety of lakes and rivers, some of which are remote while others are easily road accessible, provide a wide range of angling opportunities. Whiskey Jack Forest has excellent natural lake trout lakes and walleye fishing is also popular in hundreds of small lakes along with larger lakes such as Lake of the Woods.

The Whiskey Jack Forest has portions of Fisheries Management Zones (FMZs) 4 and 5. FMZs reflect certain ecological factors and angler use patterns, such as climate zones, watersheds, fishing pressure and road access. In general FMZ 4 has less access with less fishing pressure and being more northerly, its waters are somewhat less productive with fisheries that are not as diverse as those of FMZ 5.

In addition to the FMZ's, Whiskey Jack Forest includes the Specially Designated Waters (SDWs) Lake of the Woods and Winnipeg River. SDWs are managed and monitored separately to reflect their unique and important fisheries.

The Whiskey Jack Forest is comprised of five Wildlife Management Units (WMU); zones 2, 3, 5, 6, 7B and 8. This represents a significant portion of these wildlife units that are utilized extensively for hunting and fishing. Hunting continues to be an important recreational activity in the Whiskey Jack Forest area. Big game is the primary activity although ruffed grouse, black bear, migratory waterfowl and snowshoe hare are also hunted. Hunting is either carried out adjacent to access roads created by the forest industry, by use of water based transportation to remote roadless areas, or by fly-in outfitters to backcountry locations. A large proportion of big game hunters are non-resident hunters who contribute to the local economy depending on how many local services they utilize. More than 90% of the bear hunters are nonresidents. There are a wide variety of trails in the Whiskey Jack Forest that are used (depending on the nature of the activity and the Land Use designation) by hikers, cross country skiers, dog sledders, snowmobilers, and ATV operators. In addition to prepared trails, there are opportunities to travel on ungroomed areas such as snowshoeing along lakes and portages or snowmobiling along ungroomed lakes or unploughed roads.

Rushing River Provincial Park, and a few other private campgrounds along Highway 17 and Highway 71 corridor, provides camping opportunities. Approximately 65,000 people visit or use the many canoe routes around the park. Canoe trippers and anglers that are flown into backcountry sites use most of the remote sites. Many cottages were established after the railroad arrived in 1888 and made access to the Whiskey Jack Forest area easier. There are abundant cottages on Lake of the Woods are primarily located on the many islands on the lake, since shoreline development is limited. The building of what is now known as Hwy 17 made it easier to access additional lakes in the area.

Implications - Forest management within the Whiskey Jack Forest is planned with consideration for the effects of forest operations on various natural and man-made values associated with Crown land recreation and cottaging. Examples of this consideration include:

- Natural features, such as water bodies, canoe routes and portages, bird nests or colonies, and furbearer dens, are considered through the Area of Concern planning process (Table FMP-10 Prescriptions for Areas of Concern).
- Certain man-made features are also specifically considered through the Area of Concern planning process (e.g. growth and yield plots, railways, cultural heritage values, highway corridors, natural gas transmission pipelines).
- Trails - Where possible, trails are left clear of debris from harvesting operations and in many cases, previous forest access roads are used as snowmobile trails. Access to snowmobile trails is typically addressed during FMP development through communication and agreements between the snowmobile club and the SFL to address club use of SFL roads.
- Access points are specifically designed for public access to lakes or to support camping and other activities. There are also numerous access points, camp sites, and recreational areas that have been informally developed and not all of these are known and therefore are not identified as values. On the Whiskey Jack Forest, there are 73 designated MNR public access points, 147 designated camping sites, and 23 identified picnic area. These areas are considered during operational planning for harvest areas and road development. Roads to access points are retained to allow continued public access. Harvest operations near camp sites and recreational areas may be modified to limit operations to the off season. Camp sites generally are located in areas of concern adjacent to water bodies.
- On the Whiskey Jack Forest, there are an extensive number of MNR issued boat caches, which allow the holder the right to freely cache a boat on Crown Land adjacent to a designated water body. On the Whiskey Jack Forest, there are 418 commercial boat caches, 223 private boat caches and 99 resource harvest boat caches. All boat caches are identified as values and normally fall within Area of Concerns of a shoreline reserve therefore additional modifications on planned operations are not usually required.

2.1.3.3.7 Commercial Fur Trapping

Trapping provides seasonal employment for 89 registered traplines in the Whiskey Jack Forest. Additionally, there are approximately 17 First Nation Community traplines located with the Whiskey Jack Forest. The major fur bearing animals that are of economic importance are beaver, fox, muskrat, lynx, otter, mink, fisher, and marten. Registered trap lines cover the entire Whiskey Jack Forest.

All primary trappers are on the FMP mailing list and have had the opportunity to review and provide comments on proposed forest operations in the Whiskey Jack Forest. Individual trap line boundaries, as well as known trapline cabins and trails are considered values and mapped. Where identified values are adjacent to or within areas proposed for forest operations, Area of Concern planning may be initiated to mitigate any negative impacts on the value. Typically, AOC prescriptions that may include strategies such as timing restrictions, notification requests and/or road decommissioning may be applied to protect trails and trapline cabins and address additional concerns brought forth by trappers.

All primary trappers on the FMP mailing list are kept informed of changes to the planned operations on an annual basis through the notification associated with the Annual Work Schedule.

Implications - Wildlife habitat was considered during development of the Long-Term Management Direction for the FMP. Spatial and non-spatial habitat analysis was analyzed for marten to ensure the provision of adequate habitat now and into the future. Harvest eligibility criteria include the consideration for harvest deferrals in marten core habitat areas for up to 60 years.

2.1.3.3.8 Private Land

Patent land comprises a very small portion (less than 1%) of the Whiskey Jack Forest as described in Section 2.1.1.2 Land Ownership and Productivity. In accordance with the *Crown Forest Sustainability Act,* Patent Land is not included in this forest management plan. Patent Land was not included in the strategic modelling for this plan, nor is any forest operations proposed in this FMP on any Patent Land.

Implications - Where patent land is adjacent to areas proposed for forest operations, Area of Concern PL01 was applied, unless a prior agreement with the land owner was been reached. Road building, road-use and forest operations adjacent to patent land are also planned to ensure no negative impact on these areas.

2.1.3.3.9 Strategic Forest Access

Early logging of the Whiskey Jack Forest began over 100 years ago with the harvest of red and white pine trees on the shores of Lake of the Woods. Pulp wood operations started in the 1920s with the construction of the Kenora paper mill. Within the next four decades, pulpwood and saw log harvest continued, moving north towards the Jones Road area. The northern area of the Whiskey Jack Forest was accessed only in the early 1970s and the majority of harvesting operations were centred in this area in the 1980s and 1990s. The advent of salvage operations in the 1990s added an extensive number of roads to an already existing strong road network created during the 1980s. The Whiskey Jack Forest road network was expanded slightly over the past twenty years and has resulted in a well-accessed forest as we enter the 2012 planning period.

There are no areas on the Whiskey Jack Forest designated as roadless. Unless access controls or road decommissioning is identified in this forest management plan (Table FMP-18 Road Construction and Use Management), it is expected that existing roads will remain open for public use during the 10-year period of this plan. Strategic road access is considered in this 2012 FMP through an objective indicator for road density of primary and branch roads with desirable levels set for the caribou zone (decrease road density) and the non-caribou zone which is used extensively for public recreation. Road construction and decommissioning has minimal impacts on the amount of productive forest area (negatively and positively respectively); however it has a greater impact on the accessibility of the future wood supply and the provision of recreational opportunities. Decommissioning will occur when roads are no longer required for future forest access and the MNR or a third party are not interested in maintaining the road infrastructure. (Note: Roads may be decommissioned to enhance caribou habitat regardless of whether a third party is interested in maintaining the road.)

2.2 Social and Economic Description

2.2.1 Overview of Social and Economic Context

Communities that have been impacted by forest management activities on the Whiskey Jack Forest over the last five years include Dryden, Fort Frances, Kenora and Sioux Lookout.

The communities of Kenora, Dryden and Fort Frances have the majority of wood volume from the Whiskey Jack Forest over the past years. Wood deliveries over the last several years have been redirected due to indefinite closures of certain sawmills and the closure of the Abitibi-Bowater paper mill in Kenora. The planned wood supplies from the Whiskey Jack Forest are directed towards: Weyerhaeuser – Kenora LSL mill and Kenora Forest Products (Kenora) (Table FMP-15). Other volumes will be sold on the open market. The volumes delivered over the last several years can be viewed in tabular format in Section 2.2.3.

Aboriginal Communities within or adjacent to the Whiskey Jack Forest whose interests of traditional uses may be affected by forest management activities include:

1. Asubpeeschoseewagong Netum Anishnabek First Nation (Grassy Narrows)
2. Naotkamegwanning First Nation No. 32A (Whitefish Bay)
3. Wabaseemoong Independent Nations (Whitedog)
4. Wabauskang First Nation No.21
5. Ochiichagwe'babigo'inning First Nation (Dalles)
6. Kenora Métis Council

2.2.2 Summary of Demographic Profiles

This section contains a summary of community profiles that receive significant social and economic benefit from the Whiskey Jack Forest. The profiles contain information on populations, labour force, community characteristics and household prosperity indicators. Population information includes gender, age, ethnicity, languages and education levels. Prosperity information reflects household characteristics and income. Community employment and dependency (on the forest industry sector) ratios are included to reflect the state of the labour force.

The main source of information for these profiles is derived from 2006 Statistics Canada census data. First Nations information from census data is often limited due to low return information. Additional information related to First Nation community profiles is derived from Department of Indian Affairs and Northern Development and Grand Council of Treaty 3. The individual community profile datasheets are located in Supplementary Documentation D, PART B.

It should be noted that the available information presented relating to the community dependency on forestry was based on 2006 Statistics Canada information and does not reflect the fact that forest products processing facilities in some of these communities have been closed permanently or shut down indefinitely resulting in spin off effects from the loss of employment.

The following communities are affected by forestry activity occurring on the Whiskey Jack

Forest within the Kenora MNR District. The list includes communities that host forestry facilities; supply labour to the forest industry; and Aboriginal communities. Details for each community are summarized in the following subsections:

2.2.2.1 Dryden
2.2.2.2 Fort Frances
2.2.2.3 Kenora
2.2.2.4 Sioux Lookout
2.2.2.5 Asubpeeschoseewagong Netum Anishnabek First Nation (Grassy Narrows)
2.2.2.6 Naotkamegwanning First Nation (Whitefish Bay First Nation)
2.2.2.7 Wabaseemoong Independent Nations (Whitedog)
2.2.2.8 Wabauskang First Nation No.21
2.2.2.9 Ochiichagwe'babigo'inning First Nation (Dalles)

2.2.2.1 Dryden

The town of Dryden is located on Highway 17, centrally located in the Dryden Forest. With a population of 8,195, Dryden is made up of 3,285 dwellings. The population in Dryden is stable and has increased slightly in the past 10 years. It is predicted that the population will decrease if the forest industry continues to struggle. The 2006 Census may not totally capture the full effect of the closure of the Weyerhaeuser sawmill and definitely does not reflect the impact of the closure of the paper production at the Domtar Pulp Mill. The average annual income in Dryden is $37,246, with a total labour force of 4,290 people. Average household size is 2.4, with an average household income of $72,443. The average value of a home in Dryden is approximately $171,993. Rent in Dryden on average $653 per month which is approximately 22% lower than the provincial average.

Dryden has a 94% employment rate. A significant 35% of the population has moved within the last five years. Only 5% of the population of Dryden was born outside of Canada, having immigrated from Europe and the United States.

Dryden's population is represented by 95% being Canadian born and 10% of the population being Aboriginal. Migration is referred to as how many people have moved into or locally in the community over the last five years. Migration over five years was 36%. The official language is English spoken by 93% of the population (English only) and the remaining 7% speak both English and French. 39% of the population continued post-secondary studies in college, university or trades while 34% did not continue studies after graduating from high school.

The Aboriginal population in Dryden includes 792 people with a labour force 415 of whom 390 are employed as part of the local workforce. The average income for Aboriginal men is $42,528 and $18,574 for women. Approximately 2% of the Aboriginal population in Dryden has limited knowledge of an Aboriginal language while 15% primarily speak an Aboriginal language and use the language at home.

Approximately 17% of the labour force is employed by the forestry sector (705 people), making an average annual income of $69,645, far above the local average. Dryden's employment dependence ratio (EDR) for forestry is approximately 1:16, which is very high. The majority of those working in the forestry sector are employed at forest nurseries, the local pulp and paper mill, support activities and logging.

2.2.2.2 Fort Frances

Fort Frances is located west of Rainy Lake at the International Falls, Minnesota, United States of America border. One Resolute Forest Products mill (formerly AbitibiBowater Inc.) is located in Fort Frances, which may receive wood from the Whiskey Jack Forest. Fort Frances district historically has not received large amount of wood volume from the Whiskey Jack Forest. The current forecast of wood flow suggests Fort Frances District to be the third highest dependency on Whiskey Jack Forest wood.

Fort Frances has a population of 8,103 people with a work force of 4,165. The population was stable for the past 20 years, but has been decreasing since 1996.

Employment in Fort Frances is at a rate of 93% with individuals earning an average of $35,087 annually. Men tend to make 32.2% more than women annually on average with incomes of $42,167 and $28,613 respectively. Dependency on the forest industry in Fort Frances is 14.6 times higher than the provincial average with the forest industry employing approximately 610 people (17% of the total labour force). Forestry in Fort Frances provides an average income that is 38% higher than the average community income as a whole ($56,379 as to $35,087).

Fort Frances contains approximately 3,445 households, with an average of 2.3 persons per household. The average value of a household is $138,127 and has an income of $63,556. Rent in Fort Frances is an average of $618 per month which is 30% below the provincial average.

A large portion of Fort Frances residents graduated from a secondary institute, approximately 32%. Post-secondary education was pursued by 44% of the graduating population. The remaining percent of the population completed their education at a primary school level. English is the official language used in Fort Frances (94%) while an additional 6% can speak both English and French. Only 7% of the Fort Frances population was born outside of Canada, and 87% of these people immigrated to Canada prior to 1991.

Fort Frances has an Aboriginal population of 1,362 people; including a workforce of 625 people who earn an average of $28,980 per year. An Aboriginal male earns an average annual income of $26,491, while the average annual income of an Aboriginal female is $31,361. Less than 6% of Fort Frances' Aboriginal population speaks their traditional language. Almost half of the Aboriginal population in Fort Frances is Métis.

2.2.2.3 Kenora

The City of Kenora is located on the north shore of the Lake of the Woods, on the Trans-Canada Highway. Kenora has a population of 15,177 people, of which 2,400 are Aboriginal. The Kenora labour force is 8,225 workers. Of the total labour force 485 people are employed in the forest industry. Population levels in Kenora have been relatively consistent since 1981 until the present census in 2006.

Kenora has a relatively diverse economy, relying upon a number of sectors, including forestry, tourism, mining and metals, equipment manufacturing, high technology and agriculture.

The closure of both the Devlin Timber Company sawmill and the AbitibiBowater pulp and paper mill in 2005 negatively affected the Kenora population and forestry related employee figures that

may not be reflected in the 2006 Census. Likewise the indefinite closure of the Kenora Forest Products sawmill would not be reflected in the census figures.

The AbitibiBowater pulp and paper mill in Kenora closure resulted in the layoff of approximately 300 people. Prior to the mill closure, approximately 7% of the labour force was employed by the forestry sector (560 people; dependency ratio of ~1:6) (based on 2001 census data); these workers were earning considerably more than the local average and were employed as loggers or at the pulp and paper mill. The mill closure leaves Kenora with approximately 485 people employed in forestry. A person currently employed in the forest industry in Kenora tends to make an annual income of $53,756 which is about 35% higher than the community average as a whole.

The Weyerhaeuser laminated strand lumber mill in Kenora receives the majority of hardwood fibre from the Whiskey Jack Forest.

Kenora has an employment rate of 93% and individuals make an average annual income of $35,252. On average men make $42,474 annually and women on average make $14,000 less. Of the non-aboriginal communities who receive wood from the Whiskey Jack Forest, Kenora has the lowest dependency ratio of only 5.8 times higher than the provincial average. Since Kenora is located on Lake of the Woods, the second largest inland lake in Ontario, and is relatively close to Winnipeg there is a much higher dependency on hunting and fishing recreation.

Kenora has 6,250 dwellings with the average value of each dwelling being approximately $172,060. Households on average in Kenora have an income of $67,773 and individually house 2.4 people. Rent in Kenora is an average of $633 per month and is still lower than the provincial average.

Ninety-five percent of the population of Kenora was born in Canada, most of whom are third generation or greater. The official language in Kenora is English. Approximately 29.6% of the population ended their schooling following high school, 13% attending college, 16% attended university, and 12.9% were trained in trades.

The Aboriginal population in Kenora has a knowledge of their traditional language with approximately 9% identifying an Aboriginal language as their first language, and approximately 9% speaking their Aboriginal language at home. Slightly less than half of the Aboriginal population in Kenora is Métis. The Aboriginal community has a labour force of 1,115 with an average income of $28,885. Aboriginal women make slightly less ($26,698) than Aboriginal men ($30,798).

2.2.2.4 Sioux Lookout

Sioux Lookout is located north of Minnitaki Lake and south of Lac Seul, at the junction of the Canadian National (CN) railway line and Highways 72, 516, 642 and 664. Hudson is west of Sioux Lookout along Highway 664, south of Lost Lake, and is included in the demographic profile for Sioux Lookout. The Mackenzie Forest Products Inc. mill is located in Hudson.

Sioux Lookout is home to 5,183 people, living in 1,925 dwellings, with a labour force of 3,190 earning an average of $38,971 per year. The incomes earned by men are approximately $10,000 per year higher than those earned by women ($33,942) per year. Aboriginal men earn approximately $9,000 more per year than Aboriginal women, although both are lower than the

local average (an average of $27,401 per year). The population of Sioux Lookout is generally stable, having increased slightly over the past 20 years. The average dwelling in Sioux Lookout costs approximately $184,898. Average monthly rent is $743 in Sioux Lookout. Household income, based on an annual income, is in the order of $79,374. Approximately 49% of the households have combined incomes of over $100,000 per year.

Approximately 18% of Sioux Lookout's population attended university, 11% attended college and 11% studied a trade. Also, 27% of the population graduated from secondary school while 32% completed primary school.

Approximately 11% of the workforce in Sioux Lookout is employed in the forestry sector (335 people), earning an average of $47,889 per year. The majority of these workers are employed in logging operations and at the Hudson sawmill. Forestry is the main employment sector for Sioux Lookout, with a economic dependency ratio (EDR) of 1:10, followed by health with an ERD of approximately 1:2. These figures do not reflect fact that the Hudson sawmill was shutdown indefinitely in 2008. Newspaper articles in April 2010 suggest there is a possibility that the mill may start up on a scaled back level.

The Aboriginal population in Sioux Lookout includes 1,457 people, 765 of whom are part of the local workforce. Approximately 35% of the Aboriginal population in Sioux Lookout has knowledge of an Aboriginal language, with 35% speaking an Aboriginal language at home.
Over 91% of the people living in Sioux Lookout were born in Canada. Of those born outside of Canada, over 91% have been in Canada for more than 15 years, and 57% of those born outside of Canada are originally from the United States, with the remainder arriving from Europe.

2.2.2.5 Asubpeeschoseewagong Netum Anishnabek First Nation (Grassy Narrows)

The Grassy Narrows First Nation (Asubpeeschoseewagong Netum Anishinabek) occupies the English River No. 21 reserve. The reserve is located 80 kilometres north of Kenora (Jones Road, also known as Highway 671). The Grassy Narrows First Nation is affiliated with the Bimose Tribal Council and Grand Council Treaty #3.

The community of Grassy Narrows has an approximate population of 633 people, 52% of which is male and 48% female. The age demographic reflects a younger population the majority of the population under 30 years of age. No information is available of population trends. The majority of the population speaks Ojibway with 51% of the population describing Aboriginal Language as first learned and 60% speak it in the home. 100% of the population is reported to speak English.

Grassy Narrows had approximately 185 private dwellings. The median income in 2006 for all private households was $25,580 per year. Average individual income is $11,599 per year.

The education level within the community appears to be increasing. The census suggests 60% of people over 15 have only primary educations, 9% of people completed secondary school, and 31% completed post-secondary education (university, college or trades).

The overall labour force for the community is 235 with and employment level of 66%. Occupations vary with sales leading at 52%, followed by trades with 19% of the workforce, management at 11%, finance at 11% and primary industries with 7% of the workforce.

Grassy Narrows is not dependent on the forest industry, but is more dependent on government employment (5 times more), education (4 times more) and health care (3 times more) than the provincial average.

2.2.2.6 Naotkamegwanning First Nation (Whitefish Bay)

The Naotkamegwanning First Nation has three reserves:

1. The community settlement is at the Whitefish Bay No. 32A site, located approximately 8 kilometres east of Sioux Narrows accessible via Gaudry Road off Highway # 71.
2. Sabaskong Bay No. 32C, located 65 kilometres southeast of Kenora on Lake of the Woods.
3. Yellow Girl Bay No. 32B located 32 kilometres southeast of Kenora on Lake of the Woods.

Whitefish Bay No. 32A can be accessed via Highway 71. This First Nation is affiliated with the Bimose Tribal Council and Grand Council Treaty #3.

The Naotkamegwanning First Nation has approximately 622 people with 51% male population and 49% female. The age profile for the community is mostly a younger demographic with a median age of 23 years. The primary language of the community is English with 100% of the population speaking English, and 48% of the population also speaking Aboriginal languages. Thirty-nine percent of the community describes Ojibway as first learned language. The average education level within the community is low with only 27% of people with post secondary education and 51% with only primary education. No information is available on population trends.

The average individual income is $14,061 per year with little difference between males and females average income. The labour force is 235 people and an employment rate of 83%. The main occupations are in sales (53%), trades (20%), management (10%), finance (10%) and primary industries (7%).

2.2.2.7 Wabaseemoong Independent Nations (Whitedog)

The Wabaseemoong Independent Nations (sometimes referred to as Whitedog) has three Reserves:

1. Islington No. 29, which is located 13 kms east of the Manitoba border and 77 kms northwest of Kenora.
2. One Man Lake No. 28, which is located on the north shore of One Man Lake, 100 kms northwest of Kenora.
3. Swan Lake No. 29, which is located on the east shore of Swan Lake, 36 kms northwest of Kenora.

Most of Wabaseemoong's on-reserve population lives at the main community of Whitedog located on Islington No. 29 Reserve and accessible via Highway 596. Swan Lake is road accessible and has a few families that live there on an infrequent basis. One Man Lake has no road access. Kenora is the nearest service centre.

The Wabaseemoong Independent Nations has approximately 785 people with 50% male population and 50% female. The age profile for the community is mostly a younger demographic with a median age of 24 years. The primary language of the community is English with 100% of the population speaking English, and 52% of the population also speaking Aboriginal languages. Forty-four percent of the community describes Ojibway as first learned

language. The average education level within the community is low with only 3% of people with post-secondary education and 10% with only primary education. No information is available on population trends.

The average individual income is $14,516 per year with little difference between males and females average income. The labour force is 505 people and an employment rate of 41%. The main occupations are in government services (18%), sales (15%), trades (9%), and primary industries (4%).

2.2.2.8 Wabauskang First Nation No.21

The Wabauskang First Nation occupies the Wabauskang No. 21 reserve. The reserve is located 67 kilometres northwest of Dryden off of Highway #105. Ear Falls is the closest urban centre which is approximately 27 km north of the community. The Wabauskang First Nation is affiliated with the Bimose Tribal Council and Grand Council Treaty #3.

The Wabauskang First Nation has a total registered population of 85. This is an increase of 40% from the 2001 census. The population on-reserve is approximately 53% male, 47% female. Based on the 2006 census, the majority of the population is under 50 years of age. The median age of population is 25 with 77% of the population over the age of 15 years. There are 30 private households housing approximately 2.8 people each. The majority of the population use English as their mother tongue. No income related values are available through Statistics Canada.

The educations background of the community reflects approximately 27% of the people over 15 years of age have post-secondary education, 13% graduated from secondary school and 60% completed primary education.

Forestry employs 10 people in Wabauskang which is enough to push the dependency ratio to 37 times greater than the provincial average. Actual income for residents of Wabauskang is unknown.

2.2.2.9 Ochiichagwe'babigo'inning First Nation (Dalles)

The Ochiichagwe'babigo'ining First Nation (sometimes referred to as The Dalles) is located within 50 Km north of Kenora to which it has year-round road access on Highway 658. Most of the Ochiichagwe'babigo'ining on-reserve population lives at the main community.

The Ochiichagwe'babigo'ining First Nation has approximately 156 people with 54% male population and 45% female. The age profile for the community is mostly a younger demographic with a median age of 26 years. The primary language of the community is English with 100% of the population speaking English, and 45% of the population also speaking Aboriginal languages. Thirty-three percent of the community describes Ojibway as first learned language. The average education level within the community is low with only 0% of people with post-secondary education and 13% with only primary education. There was a 34% reduction in population since 2001.

There is no information on the individual income of the community. The labour force is 110 people and an employment rate of 38%. The main occupations are in sales (18%), management (18%), government services and trades (9%).

2.2.3 Industrial and Non-industrial Uses of the Forest

This section of the forest management plan includes a summary of the industrial and non-industrial uses of the forest organized by sector. The sectors include:

Section 2.2.3.1	Timber;
Section 2.2.3.2	Recreation and Tourism;
Section 2.2.3.3	Mining, Aggregate and Hydro Generation; and
Section 2.2.3.4	Other Uses.

The complete description of industrial and non-industrial uses of the forest is included in Supplementary Documentation D – Social and Economic Information, Part A.

2.2.3.1 Timber

Communities that have received significant volumes of wood from the Whiskey Jack Forest over the last nine years prior to plan production include Kenora, Dryden and Fort Frances. The amount delivered changes from year to year as impacted by mill closures and market conditions. The following table (Table 8) is a summary of the wood deliveries that is also presented in more detail in Supplementary Documentation D.

Table 8 Summary of Mill Deliveries from the Whiskey Jack Forest 2004-2013

Whiskey Jack Forest
Timber Use
2004/05 to 2012/13

Company Name	Mill Destination	Product	Species Sector	2004/2005	2005/2006	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	Total	Share
Abitibi Consolidated	Kenora	Paper	Conifer	194,257	71,138								265,395	11%
Kenora Forest Products	Kenora	Sawmill	Conifer	154,721	155,265	131,192	80,766						521,944	22%
Weyerhaeuser	Kenora	Composite	Poplar / White Birch	152,768	204,695	120,908	100,110	19,071		5,334	4,060	18,175	625,120	26%
Abitibi Consolidated	Fort Frances	Pulp	Conifer	49,358	34,835	26,132	99,227	2,195					211,746	9%
Abitibi Consolidated	Fort Frances	Paper	Conifer	33,250	48,209	71,565	44,519	702					198,245	8%
Abitibi Consolidated	Thunder Bay	Paper	Conifer	0	60	0	0	0					60	0%
Ainsworth	Barwick	Composite	Poplar / White Birch	682		0	0	0	477				1,159	0%
McKenzie Forest Products	Hudson	Sawmill	Conifer	1,663	9,383	0	0	0					11,046	0%
Domtar	Dryden	Paper	Conifer	21	0	0	0	0					21	0%
Domtar	Dryden	Pulp	Conifer	32	0	0	0	0	116,201	95,887	130,942	167,375	510,437	21%
Devlin Timber	Kenora	Sawmill	Conifer	5,751	0	0	0	0					5,751	0%
Domtar	Ear Falls	Sawmill	Conifer	6,152	0	0	0	8,744					14,896	1%
Multiply	Nipigon	Composite	Poplar / White Birch	2,580	6,522	7,967	0	0					17,069	1%
Longlac Wood Industries	Longlac	Composite	Poplar / White Birch	-	-	-	1,748	0					1,748	0%
E&G Custom Sawing	Kenora	Sawmill	Conifer	0	0	0	0	288	252				540	0%
Wincrief Forestry Products	White Dog	Sawmill	Red Pine / White Pine									170	170	0%
1423 1358807 Ontario Ltd.	Perrault Falls	Sawmill	Conifer						1,959	335			2,294	0%
Misc.	Kenora	Building	Conifer	5	0	0	0	0					5	0%
Misc.	Kenora	Building	Poplar / White Birch	125	0	0	0	0					125	0%
Misc.	Kenora	Fuelwood	Poplar / White Birch	0	38			52					90	0%
Misc.	Kenora	Sawmill	Red Pine / White Pine Category 1	0	1,433	0	0	0					1,433	0%
Misc.	Kenora	Fuelwood	Conifer	0	26	454	634	78	1,000				2,192	0%
			Total	601,365	531,602	358,219	327,003	31,130	119,889	101,556	135,002	185,720	2,391,486	

The community of Kenora receives the greatest amount of timber, chips or other forest resources from the Whiskey Jack Forest due to the proximity of the Whiskey Jack Forest in relation to the Weyerhaeuser laminated strand lumber mill situated in Kenora. Over the nine year period reported, the Weyerhaeuser - Kenora mill received 26% of the delivered fibre from the Whiskey Jack Forest, the vast majority being poplar and birch. The Abitibi-Consolidated mill in Kenora received 11% of wood deliveries, and the Kenora Forest Products sawmill in Kenora received 22%, however Abitibi-Consolidated mill closed permanently in November 2005 and the Kenora Forest Products sawmill is indefinitely shut down.

Deliveries to Fort Frances have been fairly consistent at around 17% of Whiskey Jack Forest fibre being delivered the Resolute Forest Products (formerly AbitibiBowater Inc.) Pulp and Paper mill (all conifer pulp and paper fibre).

While the number of employees varies from the large laminated strand lumber or pulp and paper mills to the smaller numbers required to operate sawmills, the economic importance of the wood processing facilities on the community is still high as the sawmills are often in smaller communities, where the pulp mills are located in larger population based communities.

The Aboriginal communities who both benefit from the forest management activities on the Whiskey Jack Forest are the same ones whose interests or traditional uses may be affected by forest management activities. The identification and protection of Aboriginal values has been addressed in this plan.

2.2.3.2 Recreation and Tourism

Tourism Industry

There are numerous tourist operators in the Whiskey Jack Forest. The recreational activities provided by these outfitters include options for fishing, hunting, camping and other eco-tourism opportunities. The number of individuals, residents and non-residents, procuring services from these tourist establishments are numerous, and they contribute a significant amount of economic resources to local communities.

It is estimated that 500,000 people visited Kenora district in 2001 which was made up of travellers from Ontario (20%), other Canadian provinces (25%), United States (55%) and Others (1%). The Sunset Country Economic Study reports that in 2001, 443 operators provided employment to 3,785 persons of which 1,221 were located in the Whiskey Jack Forest. The operator survey also indicated that there were 758 First Nations employed in Sunset Country of which 80% were seasonal or part time employees.

Although a variety of outdoor recreation activities are provided by these tourism businesses, the primary activities offered at the Resource-Based Tourism (RBT) lodges and outposts in the Whiskey Jack Forest are fishing and hunting opportunities. In addition to the RBT outfitters, there are a significant number of fishing and hunting opportunities offered by operators on the forest that are not classified as RBT.

Crown Land Recreation

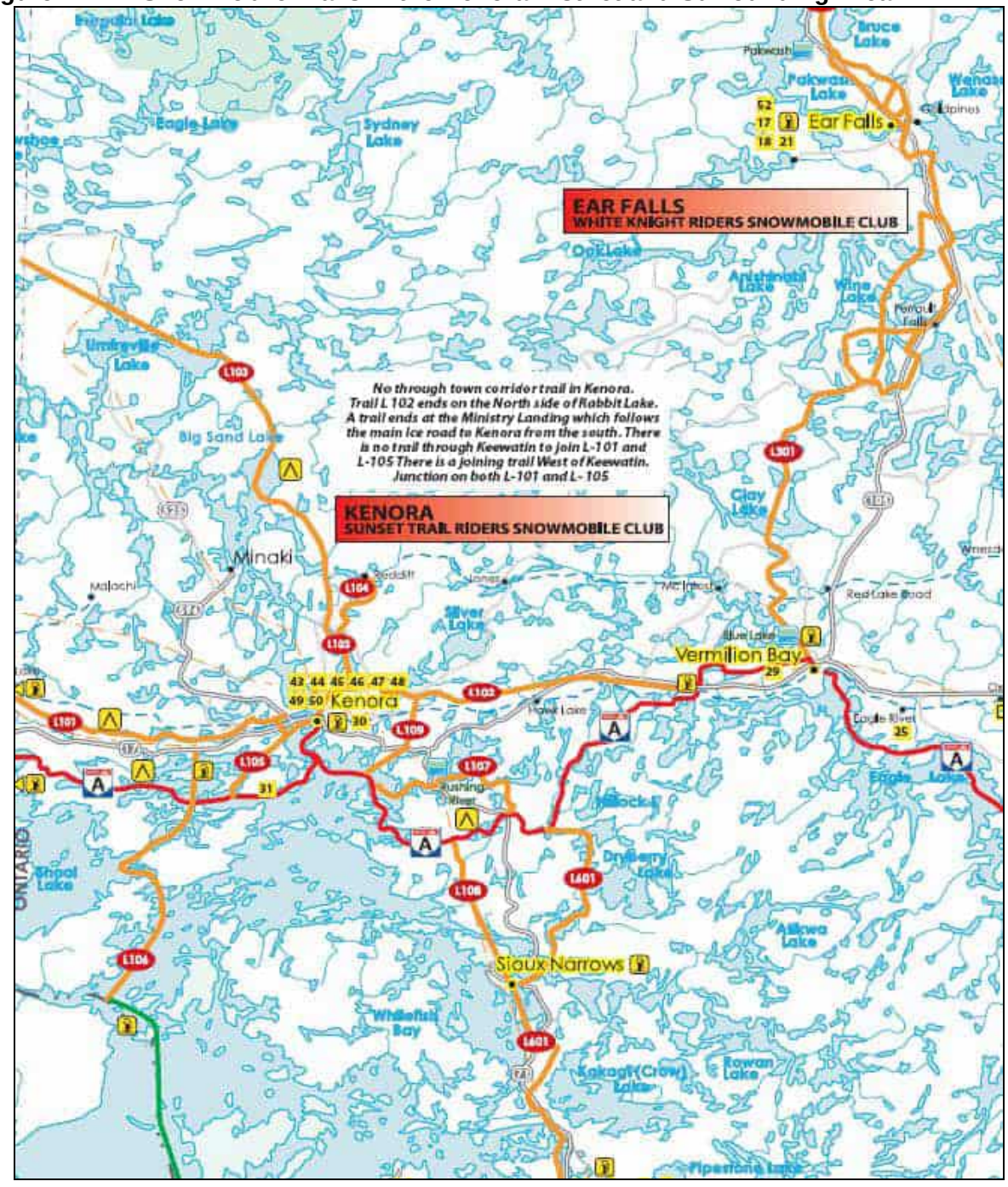
In addition to the commercial activity described above, recreationalists derive great benefit from the Whiskey Jack Forest. There are approximately 960 kilometres of active primary and branch forest access roads and additional 10,000 km of inactive and operational roads, providing opportunities such as hunting, camping, berry picking, fuelwood collection, bird watching, trails and access to small lakes for angling. Additional recreational opportunities are provided through canoe routes, snowmobile trails and various public access points. There are numerous private homes and recreational camps on the Whiskey Jack Forest.

Cottages - Area values associated with patent cottage lots are not presently available. However, there are abundant cottages on Lake of the Woods, which are primarily located on the many islands on the lake, since shoreline development is limited. The building of what is now known as Hwy 17 made it easier to access additional lakes in the area. Local and out of the area cottage owners spend thousands of dollars a year in the local communities. The economic influence of cottages in the area varies from basic food and building supplies to recreational purchases.

Trails – The Whiskey Jack Forest contains a large network of trails and canoe routes associated with the Crown land and waterways. There are also thousands of kilometres of mapped and unmapped trails of various types on Crown land within the Whiskey Jack Forest. In the summer months many of these trails are used as ATV, cycling, horseback riding and hiking trails.

Snowmobiling is a popular sport on the Whiskey Jack Forest and surrounding area. The trail guide produced by the Ontario Federation of Snowmobile Clubs and the Kenora Sunset Trail Riders Snowmobile Club shows an established network of main and feeder trails throughout the Kenora District (Figure 24). The thousands of snowmobilers that use the vast trail systems in the areas contribute economically to a variety of businesses in the local area. Forest management within the area considers the effects of forest operations of trail systems and access issues. Where possible, trails are left clear of debris from harvesting operations and in many cases, harvest roads are used as snowmobile trails.

Figure 24 Snowmobile Trails in the Kenora District and Surrounding Area



There are access points specifically designed for public access to lakes and some that support camping and other activities. There are also numerous access points, camp site, and recreating areas that have been informally developed and not all of these are known and therefore are not identified as values.

On the Whiskey Jack Forest, there are an extensive number of MNR issued boat caches, which allow the holder the right to freely cache a boat on Crown Land adjacent to a designated water body.

The total amount of camping, snowmobiling, ATVing, hiking, mountain biking and cross-country skiing trails and activity that takes place within the forest boundaries cannot be fully identified at this time. Similarly, no information on the revenue generated by recreation (i.e. tourism not associated with a tourism lodge or outfitter) is available at this time.

Angling and Hunting Opportunities - The Forest contains a variety of sport fishing lakes, as well as overlapping with several wildlife management units. Thousands of hunting and fishing licenses are sold across the province to both resident and non-resident hunters and anglers. Local hunters and fisherman contribute significant amount of economic spin off in the form of purchasing of fuel, equipment and general needs to support their activities. Other residents of the province, that are not local and non-residents contribute even larger economic input to the areas by sustaining lodges and purchasing supplies for their activities.

People travel long distances to hunt and fish in the remote and semi-remote forested areas in the region, either through tourism operators or on their own. The sale of food, lodging, outdoor equipment and supplies related to hunting and fishing contributes millions of dollars annually to the provincial economy, much of which is potentially generated in the north. As noted earlier, the Whiskey Jack Forest is the base for over 140 tourism operations, suggesting that the economic impact of recreational tourism in this area is significant.

Hunting continues to be an important recreational activity in the Whiskey Jack Forest area. Hunting is either carried out adjacent to access roads created by the forest industry, by use of water based transportation to remote roadless areas, or by fly-in outfitters to backcountry locations. A large proportion of big game hunters are non-resident hunters who contribute to the local economy depending on how many local services they utilize. More than 90% of the bear hunters are non-residents. There are a wide variety of trails in the Whiskey Jack Forest that are used (depending on the nature of the activity and the Land Use designation) by hikers, cross country skiers, dog sledders, snowmobilers, and ATV operators. In addition to prepared trails, there are opportunities to travel on ungroomed areas such as snowshoeing along lakes and portages or snowmobiling along ungroomed lakes or unploughed roads.

Sport Fishing - The area contains numerous lakes, wetland areas, rivers and streams that provide fishing opportunities for both resident and non-residents. The major sport fishing species sought by anglers are: yellow pickerel (walleye), sauger, northern pike, muskellunge, black crappie, smallmouth bass, largemouth bass, yellow perch, lake trout, lake whitefish and lake sturgeon.

Parks and Protected Areas - The purpose of Ontario's Provincial Parks and protected areas is to permanently protect a system of provincial parks and conservation reserves that includes ecosystems that are representative of all of Ontario's natural regions, protects provincially significant elements of Ontario's natural and cultural heritage, maintains biodiversity and provides opportunities for compatible, ecologically sustainable recreation. Ontario's provincial

parks and conservation reserves are dedicated to the people of Ontario and visitors for their inspiration, education, health, recreational enjoyment and other benefits with the intention that these areas shall be managed to maintain their ecological integrity and to leave them unimpaired for future generations.

There are several different classifications of parks and protected areas. Each class and individual area has different objectives and permit different activities within the defined areas. There are six classifications of provincial parks; 1) Wilderness Class Parks, 2) Nature Reserve Class Parks, 3) Cultural Heritage Class Parks, 4) Natural Environment Class Parks, 5) Waterway Class Parks, and 6) Recreational Class Parks. In addition to parks, there are conservation reserves.

There are seven provincial parks or protected areas adjacent to or surrounded by the Whiskey Jack Forest. Parks in the management unit include the West English River, Eagle-Dogtooth, Tide Lake and the Maynard Lake Parks. The Pakwash Provincial Park is located adjacent to the northeast corner of the unit, Rushing River Provincial Park is located in the southern portion of the forest, and Woodland Caribou Provincial Park (and addition) is located in the northwest portion of the unit. All of these parks have either an Interim Management Statement or a park management plan that provides direction.

Scattered throughout or adjacent to the Whiskey Jack Forest there are nine Conservation Reserves including Campfire River, Clay Lake, Dryberry lake, Lac Seul Islands, Lake of the Woods CR, Scenic Lake, Scotty Lake, Solitary Lake and Twilight Lake Conservation Reserves. Some of the social contributions of parks and protected areas are previously described in Section 2.1.3.3.5.

Ontario Parks reports on the following indicators of economic impact:

- Value Added
- Provincial Gross Sales (or Provincial Gross Output)
- Wages & Salaries
- Provincial Person Years of Employment

Economic impacts are based on expenditures such as those made by the park on operations and capital improvements, as well as average visitor trip expenditures (camper and day visitor).

As well, the public and municipal officials should be aware that provincial parks help to make their communities attractive for business as well as for tourists and retirees. The retirement community brings in pension income, which is often indexed to inflation and is recession proof. Communities with attractive waterfronts, low crime, recreational activities and healthy environments are sought out by the retirement community. The park budget (operating and capital) represents a grant or transfer payment from the government to their community. Not all communities have this transfer. The community may also receive grants in lieu of taxes.

The provincial parks in and adjacent to the Whiskey Jack Forest are described in section 2.1.3.3 (Natural Resource Features, Land Uses and Values).

Woodland Caribou (P2370e), an operating wilderness class park of 450,000 hectares, was regulated in 1983. It protects representative earth and life science features of Site District 4S-1, such as the Eagle-Finlayson Moraine, prairie-boreal vegetation and habitat for Woodland Caribou, a threatened species. The park provides opportunities for backcountry canoeing,

camping and outpost camp and main base lodge fishing. The park had 4799 camper-nights and 4799 days-use visitors in 2007. For 2005/06, the economic impact of Woodland Caribou Provincial Park was: Initial expenditure: $503,938; Value Added: $709,902; Wages and Salaries: $505,559; Person-years employment: 28. Only a portion of the Whiskey Jack Forest abuts Woodland Caribou, so the entire economic impact of the park does not affect the Forest.

Woodland Caribou recommended park additions (P2370) were established during Ontario's Living Legacy – Land Use Strategy. There are four additions to the existing park (Douglas Lake, Peisk Lake, Anchor Lake and Sydney Lake areas) although only Sydney Lake is within the FMU. The Sydney Lake addition includes a significant white elm site. A primary forest access road crossing between Rowdy and Sydney Lakes will be permitted as determined through previous forest management planning processes. This addition is in the most popular backcountry canoeing area of the park. It is unknown how much of the economic impact of Woodland Caribou Provincial Park (see above) can be assigned to the Sydney Lake recommended park addition.

Maynard Lake (P2698), a non-operating nature reserve class park of 25 hectares, was regulated in 1997. It consists of a peninsula with deep soils on the east shore of Maynard Lake. It provides representation/protection of an atypical old growth white pine stand (age class + 160 years) at the northern limit of the species range. It is surrounded by West English River Provincial Park on three sides. Camping, day-use, hunting and most other recreational activities are prohibited because of the classification of the park. The actual amount of use is unknown.

Tide Lake (P2614), a non-operating nature reserve class park of 51 hectares, was regulated in 1997. It consists of the peninsula between Ball and Tide lakes. The park provides representation/protection of an atypical old growth white pine stand (age class + 160 years) at the northern limit of the species' range. It is surrounded by West English River Provincial Park on three sides. Camping, day-use, hunting and most other recreational activities are prohibited because of the classification of the park. The actual amount of use is unknown.

West English River (P2345), a non-operating waterway class park of 22,923 hectares, was regulated in 2003. The area includes that portion of the English River from Barnston Lake to Tide Lake. The waterway contains old growth red and white pine at the northern extent of its range, wilderness environments and tourism attributes, and is an historic travel corridor. Two provincial nature reserves, Maynard Lake and Tide Lake abut the park. Motor boating, canoeing, sport fishing, hunting and camping are popular activities, although the actual use is unknown.

Eagle-Dogtooth (P2363), a non-operating waterway class park of 41,128 hectares, was regulated in 2003. It provides a waterway linkage between Eagle Lake and nearby protected areas (e.g., Rushing River, Winnange). It is an important recreational waterway. The site contains regionally significant moraines, wetlands, pine forest ecosystems, eagles, waterfowl and is an important recreation and tourism area. Motor boating, canoeing, sport fishing, hunting and camping are popular activities, although the actual use is unknown.

Pakwash (P2528) is a staffed natural environment class provincial park of 3,993 hectares. The park was established in 1967 and was regulated in 1989 as a natural environment class Provincial Park. The park provides representation/protection of Site District 4S-2, specifically the Hartman Moraine. Pakwash provides opportunities for car-camping and day-use. The park is operated through a partnership with Ear Falls 2000 Inc. The park had 8,523 camper-nights

and 476 days-use visitors in 2007. For 2005/06, the economic impact of Pakwash Provincial Park was: Initial expenditure: $178,746; Value Added: $205,386; Wages and Salaries: $124,866; Person-years employment: 3.2. Only a portion of the Whiskey Jack Forest abuts Pakwash, so the entire economic impact of the park does not affect the Forest.

Rushing River (P2615), a staffed recreation class provincial park of 340 hectares was established in September 1958. Natural features include jack pine uplands, wetlands and a lush river valley. The park has a popular campground, day-use area and interpretive facilities/trails. The park had 47,804 camper-nights and 14,960 days-use visitors in 2007. For 2005/06, the economic impact of Rushing River Provincial Park was: Initial expenditure: $3,896,802; Value Added: $4,815,843; Wages and Salaries: $3,771,395; Person-years employment: 118.3. Only a portion of the Whiskey Jack Forest abuts Rushing River, so the entire economic impact of the park does not affect the Forest.

2.2.3.3 Mining, Aggregate and Hydro Generation

Mining, Mineral Exploration and Aggregates

Historically, mining and mineral exploration have been an important activity in this management unit and historically gold, silver and copper were the predominant commodities mined. Currently there are four granite producers in operation which have been and continue to be a significant contributor to the economy of the area. The value of total granite production was not available at the time of writing. Historical metal production occurred within the management unit between 1893 and 1951 and totaled 68,513 ounces gold, 14,762 ounces silver and 1.89 million pounds of copper valued at $49.73 million CDN at current metal prices.

In addition to historical and current mineral production there are significant concentrations of gold, nickel, copper, silver and uranium contained within documented mineral deposits throughout the management unit. The total estimated value of metals contained within these deposits at current commodity prices is in excess of $158 million CDN.

There are an estimated 1,605 active mining claim units recorded throughout this management unit, as indicated on MNDM's CLAIMaps website (MNDM, 2006). These claims represent an investment in the management unit of approximately $400,000 CDN for claim staking, which directly relates to its mineral potential. In addition there is an estimated dollar expenditure of nearly $650,000 CDN per year related to mineral exploration work required to keep the claims in good standing. Current claim staking targets areas with potential for uranium, rare-metals, zinc and gold. Historically, several areas within the management unit have seen extensive staking and mineral exploration.

There are 12 aggregate sites located in the Whiskey Jack Forest, all operated by MNR.

Hydro Generation

A number of hydro-electric facilities are located within or adjacent to the forest. These facilities are on the English River between Lac Seul and the Manitoba border and on the Winnipeg River between Lake of the Woods and the English River.

Four facilities are located within Kenora district and supply power to the area. Two of these are owned by Ontario Power Generation and the other two (both in Kenora) are owned by Resolute Forest Products (formerly AbitibiBowater Inc.).

1. Caribou Falls - Caribou Falls consist of three power generating units built in 1958 on the English River at the outlet of Umfreville Lake. The Caribou station was the third plant built along the English River which represented just a fraction of the widespread program undertaken to meet the challenge of expansion in mining and also pulp and paper industries.
2. Whitedog Falls - This facility consists of three power generating units built in 1958 on the Winnipeg River at Whitedog Falls.
3. Kenora Power House and Norman Dam - These generating stations are owned by Resolute Forest Products (formerly AbitibiBowater Inc.). The Kenora Power House is located on the

Winnipeg River in Kenora at the outlet of Lake of the Woods. The Norman Dam generating station is located on the Winnipeg River in Kenora.

Two additional sites owned by Ontario Power Generation are located within the district:

4. Ear Falls - There are four power generating units at Ear Falls located on the English River at the outlet of Lac Seul. The first unit began operating in 1930. Additional generating capacity is being developed at the Ear Falls GS by adding a new 12.5 MW generating unit capable of generating approximately 52 million kilowatt hours of hydroelectricity per year.
5. Manitou Falls - This facility is located on the English River where it enters Barnston Lake downstream of Ear Falls. There are five operating units located at this facility. Construction on this facility began in 1953.

2.2.3.4 Other Uses

Summary of First Nation Use of Other Resources - First Nation community members actively use portions of the Whiskey Jack Forest for many resource-based activities, many providing social and/or economic benefits.

Fishing - Several First Nation communities hold commercial fishing licences on Lake of the Woods and inland lakes. Lake of the Woods and surrounding lakes are used for subsistence fishing by community members. Surrounding tourist lodges provide some employment opportunities for First Nation residents as guides in the sport fishery.

Trapping - First Nation community individuals hold registered trap lines located all or partially within Kenora District.

Wild Rice - Wild rice is harvested annually by community members for personal use and re-sale from various lakes throughout the area.

Cultural and Social, other Wildlife - Special sites within the forest are used for traditional cultural purposes such as fasting, vision quests and offerings. The specific location of these sites are known to community members, and the community is encouraged to participate in the forest management planning process to ensure these values are considered in proposed forest management activities. Certain wildlife species, such as the bald eagle, have a cultural and social significance to First Nation people. The protection and management of these species and their habitats is important.

While the subsistence hunting, fishing, and gathering of resources from within the forest are an integral part of community existence, there are no accurate records of the level of such harvest. The harvest of deer, moose, waterfowl, rabbits and grouse provides an important source of food to community members.

Trapping and Traplines - Trapping provides seasonal employment for 89 registered traplines in the Whiskey Jack Forest. Additionally, there are approximately 17 First Nation Community traplines located with the Whiskey Jack Forest. The expected average resources value per trapline is estimated at $2,440. Since all the trappers work out of their home it would not be appropriate to identify their names in this document The

major fur bearing animals that are of economic importance are beaver, fox, muskrat, lynx, otter, mink, fisher, and marten. Registered trap lines cover the entire Whiskey Jack Forest (Values Map 4.4).

Baitfish - In 2009-2010, the Whiskey Jack Forest had licensed baitfish individuals of which all are camp operators operating in 95 harvest areas. Baitfish is consumed locally by the angling industry. Since the majority of baitfish operators' work as individuals out of their home, it would not be appropriate to identify their name in this document. The baitfish industry provides supplemental income to these people and complements the local angling industry.

Commercial Bear Management - There are approximately 124 commercial bear management areas on the forest operated by 76 tourist operators. All of these areas are accessible from the existing road network on the unit. The bear management areas are distributed throughout the unit except for the areas close to populated centres. Registered bear management areas cover all of the Whiskey Jack Forest as seen on the 2012 Values Map 4.4.

Other - Local residents use the forest for fuelwood cutting; primarily white birch and poplar.

2.3 Aboriginal Background Information Report

The Aboriginal Background Information Report summarizes, for each Aboriginal community, past and current resource use and recent forest management-related concerns, and includes an Aboriginal values map. Specifically, the report will contain:

(a) a summary of the use of natural resources on the management unit by Aboriginal communities, in particular hunting, fishing, trapping and gathering;

(b) forest management-related problems and issues for those Aboriginal communities;

(c) an Aboriginal values map which identifies the locations* of natural resource features, land uses and values which are used by, or of importance to, those Aboriginal communities. In particular, the following features, land uses and values will be mapped:

(i) areas of significance to local Aboriginal communities, such as areas used for traditional or recreational activities;
(ii) boundaries of trapline management areas of those Aboriginal communities (i.e., all registered trapline areas associated with individual Aboriginal communities);
(iii) Reserves and Aboriginal communities;
(iv) areas that have been identified as being required as Reserve lands or for economic or capital development projects of those Aboriginal communities;
(v) areas used by those Aboriginal communities for fuelwood or building materials;
(vi) sites of local archaeological, historical, religious, and cultural, significance to those Aboriginal communities, including Aboriginal cemeteries, spirit sites and burial sites; and
(vii) areas identified by Aboriginal communities during the archaeological predictive modelling process as having archaeological potential; and

(d) a summary of the involvement of Aboriginal communities in the preparation of the Aboriginal Background Information Report.

** Publicizing the location of certain values may be detrimental to conservation, in which case information would not normally be shown on the Aboriginal values map(s).*

The *Forest Management Planning Manual (2009)* requires agreement from each Aboriginal community for the inclusion of their Aboriginal Background Information Report in the forest management plan. No Aboriginal communities affected by this Whiskey Jack Forest FMP provided such agreement. Therefore the Aboriginal Background Information Reports prepared during plan development are retained at the Kenora District Office of the Ministry of Natural Resources and do not form part of this forest management plan.

3.0 DEVELOPMENT OF THE LONG-TERM MANAGEMENT DIRECTION

3.1 Introduction

The long-term management direction (LTMD) for the forest provides guidance on levels of access, harvest, renewal and tending activities required to achieve a balance of objectives over time and meet the desired future forest and benefits. In the development of the LTMD, management objectives and indicators were developed/established and target levels identified through various analytical methodologies (models and tools) with regard to forest guidelines, social and economic assessment, wildlife habitat, and landscape management over time. The overall goals are to provide for biological diversity, sustainable forest management, social and economic benefits/development, and protection of natural resources and the forest ecosystem condition on the Whiskey Jack Forest.

The long-term management direction provides a means of assessing the sustainability of the management strategy through the measurement and monitoring of indicators that have been developed for each management objective. These management objectives, both quantitative and qualitative are based on the desired future forest and benefits.

The Long-term Management Direction was prepared for the Whiskey Jack Forest 2012-2022 Forest Management Plan and received preliminary endorsement by the Kenora District Manager and Regional Director (Northwest Region) on March 22nd, 2012. The Summary of the Long-term Management Direction is included in Supplementary Documentation O.

Development of the Long-term Management Direction is discussed in detail in Sections 3.2 through 3.6:

Section 3.2	Management Considerations during LTMD development;
Section 3.3	Development of the Base Model for strategic planning;
Section 3.4	Determining Desired Forest and Benefits
Section 3.5	Management Objectives and Indicators (including determination of appropriate desirable levels for indicators); and
Section 3.6	Long-term Management Direction.

The Available Harvest Area (AHA) for the 10-year period of this forest management plan is presented by forest unit in Section 3.6.1, as well as the criteria used for the selection of areas for harvest operations (Section 3.6.2). Management objective achievement is determined by the overall achievement of the established desirable levels and targets (Section 3.6.3). The socio-economic impacts associated with implementation of the long-term management direction are summarized in Sections 3.6.4.

Primary road corridors proposed for the next twenty-year period are discussed in Section 4.5.1 of this plan text.

3.2 Management Considerations

Management considerations are changes to the forest condition (e.g. large natural disturbance) or social, economic or environmental concerns that will be considered in the development of the long-term management direction. Management considerations are also considered in the planning and implementation of operations.

Some management considerations were identified from Section 1.2.3 of the *Forest Management Planning Manual*, and other management considerations were identified during development of the Long-term Management Direction by the Planning Team. Sources of information on the management considerations included previous direction from the 2004 FMP, new MNR policies and guides, results of consultation efforts, previous forest inventories and the process to update the 2012 forest resources inventory, the Independent Forest Audit, planning team discussions on primary road access, and Aboriginal negotiations with the provincial government that resulted in the Keewatin Decision.

The Planning Team discussed the following management considerations that may influence the development of the long-term management direction:

Section 3.2.1 Revisions to the Forest Resources Inventory;
Section 3.2.2 New Forest Management Guides;
Section 3.2.3 Caribou Habitat Management;
Section 3.2.4 Species at Risk;
Section 3.2.5 Aboriginal Interests;
Section 3.2.6 Climate Change;
Section 3.2.7 Issues Raised During the Independent Forest Audit; and
Section 3.2.8 Shifts in Markets or Utilization.

Many management considerations may affect the development of the long-term management direction. The following subsections summarize the management considerations and how information was used to confirm or change past management direction.

3.2.1 Revisions to the Forest Resources Inventory

There have not been any significant revisions to the land base since the preparation of the 2004 FMP. The forest resources inventory was updated to reflect actual attribute changes since 2004 (planning inventory) and additional estimated attribute changes to April 1, 2012 (base model inventory). The inventory attribute changes were a result of actual harvest areas, surveyed free-to-grow renewal areas, actual silvicultural treatments applied to specific sites, road construction and mapped natural disturbances. There have not been any major natural disturbances on the Whiskey Jack Forest since the 2004 FMP was approved.

Considerations in FMP: The revised planning inventory (including ownership and forest stand attributes) is included in the initial strategic modelling land base and reported in forest management plan land base Tables FMP-1 and FMP-3. Details of the updates to the inventory are included in Supplementary Documentation A – Analysis Package, Section 4: Development of the Planning Inventory, and Section 6: Base Model Inventory and Base Model.

3.2.2 New Forest Management Guides

The *Forest Management Guide for Boreal Landscapes* (Landscape Guide) was in production and was not approved for implementation for forest management plans in the Boreal Forest at the time of preparation of this 2012 Whiskey Jack Forest FMP. The Ontario Landscape Tool (OLT) developed to support the Landscape Guide (when approved) was available for use by planning teams. The science package embedded into OLT included the most current science and analysis on the simulated natural forest condition and the range of natural variation for a multitude of forest attributes. The OLT information on landscape class areas, young forest patch size by size class, mature and old forest area (amount and pattern), old forest area, caribou refuge and winter habitat (amount and pattern) and the simulated ranges of natural variation (SRNV) was used to set desirable levels for these indicators and was considered the most current available science by the Planning Team and regional advisors. Therefore the Science and Information in support of Ontario's Forest Management Guides for Landscapes management objective indicators (Table FMP-9) related to landscape composition and pattern were included in this 2012 FMP. This approach was endorsed by the Planning Team and LCC and was consistent with regional and provincial FMP training provided to 2012 FMP Planning Teams. The use of the OLT model represented an improvement in the estimation of the natural forest condition and natural ranges of variation of indicators as compared to previous forest management plans.

The *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* (Stand and Site Guide) was new for this 2012 FMP and was also followed for the 2012-2014 Contingency Plan. Overall, the application of the Stand and Site Guide was challenging as the description of forest values has changed from previous management guides (i.e. cool and cold water lakes are now classified as High Potential Sensitivity (HPS) or Moderate Potential Sensitivity (MPS) to forest management activities). The Planning Team feels the Stand and Site Guide direction was incorporated successfully into the area of concern planning, conditions on regular operations, conditions on roads, landings and aggregate pits, and planned operations.

3.2.3 Caribou Habitat Management

Woodland Caribou are native to Ontario's northern forests. They are an important indicator of the healthy boreal forest ecosystem on which they rely. As one of several jurisdictions responsible for managing the northern boreal forest, Ontario has an important role in Woodland Caribou stewardship.

Ontario's Woodland Caribou Conservation Plan provides policy direction for the management and recovery of Woodland Caribou (forest-dwelling boreal population), and will apply to the areas of continuous and discontinuous distribution. Woodland Caribou (forest-dwelling boreal population) are designated as "Threatened" in Ontario under the *Endangered Species Act, 2007*.

Ontario's Woodland Caribou Conservation Plan was a principle document used by the Planning Team to develop management strategies for current and projected habitat for caribou on the Whiskey Jack Forest.

The purpose of *Ontario's Woodland Caribou Conservation Plan* (CCP) is to:

- Provide broad policy direction regarding Woodland Caribou conservation and recovery;
- Summarize the actions the Government of Ontario intends to take in response to recommendations in the Ontario Woodland Caribou Recovery Strategy and the government's priorities in taking those actions (Government Response Statement)1; and
- Outline initiatives to support Woodland Caribou recovery.

The CCP requires that forest management plans provide for caribou habitat, including silviculture, scheduling of harvesting and deferrals, science-based modeling, precautionary planning in the face of natural uncertainty such as wildfire, and a requirement for caribou habitat provision objectives and a dynamic caribou habitat schedule. Forest management plans will demonstrate how planning decisions provide for an uninterrupted supply of year-round caribou habitat within the limits of natural forest variability, recognizing the influence of both forest harvesting and wildfire.

Currently, MNR's delineation of the area of continuous range occurrence, including area identified for caribou habitat recovery, is the primary consideration for the division of the management zone for caribou habitat management. A review of the caribou habitat analyses from the previous 2004 and draft 2009 FMPs did not identify any significant changes in habitat or assumptions therefore the application of caribou habitat management was agreed to be continued for this plan. For strategic purposes in this 2012 FMP, it was agreed by the Planning Team and Plan Advisors to continue to implement the existing 2004 FMP sub-management units which represented the caribou habitat mosaic blocks where caribou habitat management was the primary consideration. Dynamic caribou habitat schedule blocks (DCHS blocks Car01 through Car11) were accepted as strategic management zones for this FMP. Analysis of caribou habitat management for this FMP is included in Supplementary Documentation N.

As previously identified in Section 3.2.2 New Forest Management Guides, there are several new management objective indicators included in this 2012 FMP related to caribou habitat management: young forest patch size by size class, mature and old forest area (amount and pattern), old forest area, caribou refuge and winter habitat (amount and pattern) and the simulated ranges of natural variation used to set desirable levels for these indicators was considered the best available science by the Planning Team and regional advisors.

The CCP requirement for consideration of silviculture for the provision of future caribou habitat is included as management indicators for conifer forest unit dominance within the caribou zone, and also occurrence of jack pine and spruce species composition (conifer purity) within conifer forest units in the caribou zone. Through effective implementation of Silvicultural Ground Rules (Table FMP-4, text Section 4.2.2.1), the maintenance of or increase in conifer dominated forest in the caribou zone should provide for future caribou habitat should any harvest occur within the area. There are limited operations planned in the DCHS blocks (only Car06-Car10) during the term of this FMP.

The road density management indicator required by the FMPM has been divided into two to report road densities within and outside of the caribou management zone. This split in the indicator allowed for the setting of a desirable level for the caribou zone that specifically addressed the intent to minimize linear features that negatively impact functional habitat for woodland caribou.

Finally, a General Habitat Description under the *Endangered Species Act, 2007* was approved June 2013. MNR has developed a draft Range Management Policy that is currently on the Environmental Registry for public comment. Any required additions or changes to caribou habitat management in Ontario dictated by the Range Management Policy will be included or amended into the forest management plan.

3.2.4 Species At Risk

The Forest Management Plan must discuss any forest dependent Species at Risk (SAR) that may inhabit the Whiskey Jack Forest and the contribution and importance of habitat for those species. Since the 2004 FMP was approved, the Endangered Species Act was passed in 2007 with several habitat protection regulations for Endangered Species being draft for future implementation. The known locations of occurrences of flora and fauna Species at Risk were reviewed on the Whiskey Jack Forest in order to determine if operations would impact these values. Forest dependent Species At Risk that have been known to occur or have the potential to occur in the Whiskey Jack Forest were identified in Section 2.1.3.1.

> **Considerations in FMP:** Habitats for Species at Risk are documented in text Section 2.1.3.1. All known Species at Risk have their habitat managed in the plan using species specific guidelines and/or by recognizing specific habitats as values and developing appropriate area of concern (AOC) prescriptions (Table FMP-10). The woodland caribou is the only forest-dependent Species At Risk present on the Whiskey Jack Forest that has their habitat modelled strategically through time. Other forest dependent Species At, Common Nighthawk nests, Risk may be present on the Whiskey Jack Forest, but their habitat is not suitable for long-term strategic modelling. AOC prescriptions are included in Table FMP-10 for cougar dens, wolf dens, wolverine dens, bald eagle nests, short-eared owl nests, whip-poor-will nesting areas, Canada Warbler nests, Olive-sided Flycatcher nests, bat hibernacula and wetlands occupied by breeding black terns, and least bitterns. If in the future, any species at risk are thought to exist near areas proposed for forest management operations, the area will be surveyed by a qualified individual, mapped, and an appropriate area of concern prescription will be developed and applied.

3.2.5 Aboriginal Interests

Aboriginal interests may be expressed both as the interests of Aboriginal communities and the interests of aboriginal individuals and organizations. There are five First Nation communities and one Aboriginal community within or adjacent to the forest that may be directly affected by forest operations within the Whiskey Jack Forest:

Asubpeeschoseewagong Netum Anishinabek (Grassy Narrows First Nation),
Wabaseemoong Independent Nations,
Ochiichagwe'babigo'inning (Dalles) First Nation,
Wabauskang First Nation,
Naotkamegwanning First Nation No. 32A (Whitefish Bay), and
Kenora Métis Council.

Wabaseemoong Independent Nations recently signed a Stewardship Protocol Agreement with the Ministry of Natural Resources which establishes a process for engagement with the First Nation on resource development within an area defined as the Wabaseemoong Stewardship Area.

Aboriginal individuals (outside of their community), who trap, hunt, fish, collect wild rice, collect forest products and work in the forest may also be influenced by forest operations on the Whiskey Jack Forest.

Considerations in FMP:

Direction from past Whiskey Jack FMPs was confirmed and was enhanced for this plan. The forest management planning process directs specific involvement for Aboriginal Communities and Representatives of those communities are invited to participate as members of the Planning Team.

- MNR contacted the Kenora Metis Council and all five Aboriginal First Nations located on or adjacent to the Whiskey Jack Forest and offered them the opportunity to decide if they wished to participate in the Whiskey Jack Forest planning process. This approach allowed the communities to decide on 'adjacency' and desired level of involvement. This participation was intended to assist MNR in its understanding and consideration of Aboriginal Community interests and traditional uses on the Whiskey Jack Forest.
- The Aboriginal Communities were also invited to select a Representative to sit as part of the FMP Planning Team. Each Aboriginal Planning Team member was also designated as a member of the Aboriginal Task team to ensure opportunity for discussion of FMP topics and to share ideas on topics outside the scope of Forest Management Planning.

The forest management planning process directs specific involvement for Aboriginal Communities in the identification of Aboriginal values and input and review into the Aboriginal Background Information Reports.

- The communities were invited to participate in the identification of Aboriginal Values. The Planning Team encouraged the identification of values important to the community, regardless of whether the values are shared with MNR. This was promoted through the provision of tailored maps with a Community focus and the opprotunity for ad-hoc community meetings. It was up to each Community to determine how much information about values would be shared with the Planning Team and MNR.
- The Communities were also invited to participate in the development of their Aboriginal Background Information Report. Communities were encouraged to write all or portions of the report. If that was not successful, they were encouraged to review the MNR-prepared reports. If the MNR-prepared reports were used, the Aboriginal Background Information Reports used from the 2004 Whiskey Jack Forest FMP, 2006 Kenora Forest FMP and the 2011 Dryden Forest FMP served as the starting points for these reports. Red Lake, Sioux Lookout and Dryden Districts were asked to provide background information for those Communities located outside of the Kenora District.

The forest management planning process directs specific involvement for Aboriginal Consultation.

- The Communities were invited to determine an appropriate consultation approach for their community. Timing of the approach was left to each community. MNR repeatedly re-iterated their offers to participate in tailored consultation throughout all stages of FMP development.

- When requested by specific Aboriginal Communities, the Planning Team presented plan information at community meetings at various times during plan development. Each presentation was tailored to the topics and level of detail that was requested by each community.

The forest management planning process provides direction with regard to notification about the planning process.

- All five Aboriginal Communities and the Kenora Metis Council received notification at each stage of Public Consultation.
- Aboriginal Community Representatives (from communities identifying such) received all Planning Team agendas and minutes, as well as notification at each stage of Public Consultation.
- Direct mailout at each stage of Public Consultation was sent to all known values-holders and those requesting to be on the mailing list. Aboriginal values-holders typically include individuals or organizations that are licensed trappers, commercial and/or bait fishermen, camp operators, as well as collectors of wild rice and collectors of forest products.
- Newspaper notices at each stage of Public Consultation were placed in Wawatay News, the local Aboriginal newspaper.

3.2.6 Climate Change

The Kenora Local Citizens Committee expressed its concern with how climate change will affect the local forest and also suggested that a climate change adaptation option should be included in this plan.

The planning team discussed the issue of potential impacts of climate change and whether there were changes in management strategies that needed to be included in the forest management plan to mitigate negative impacts. Scientists continue to monitor and analyze the occurrence and impacts of climate change. Research work on seed zones and climate change has been inconclusive for this area about how climate change may affect suitability of tree growth in different seed zones.

To date, no specific direction has been provided by MNR to FMP planning teams on specific strategies to be implemented to mitigate potential impacts of climate change. In future forest management plans, if supported by specific policies and scientific data, applicable management strategies may be incorporated into development of the LTMD.

3.2.7 Issues Raised During the Independent Forest Audit

Independent Forest Audits (IFA) are required to occur on the Whiskey Jack Forest at least every five years. The last IFA was conducted in 2009 resulting in recommendations, some of which were relevant during preparation of this forest management plan. A general summary of issues and how they were considered during development of this plan follows:

i) Update the forest resources inventory with free-to-grow information and barren and scattered survey information.

Considerations in FMP: The planning composite inventory was updated by MNR with all recent free-to-grow information and barren and scattered survey results. This update was approved in Progress Checkpoint #1 of the planning process.

ii) Use silvicultural survey information to develop the silvicultural program.

Considerations in FMP: The planning composite inventory was updated by MNR with recent free-to-grow and silvicultural effectiveness monitoring information. Silvicultural effectiveness monitoring results were also used in the development of post-renewal forest succession assumptions for the strategic modelling component of LTMD development (what forest units are expected to result from various regeneration treatments). A discussion of silvicultural treatments that are successful on the Whiskey Jack Forest is included in FMP Section 4.2.2.1 Silvicultural Ground Rules and documented in Table FMP-4.

iii) Silvicultural strategies are reflected in the operational renewal program.

Considerations in FMP: For each forest unit, the Silvicultural Ground Rules (Table FMP-4) identify broad silvicultural strategies and specific acceptable operational treatments in accordance with approved provincial silvicultural guides. The strategic renewal assumptions are included in the strategic SFMM modelling during development of the Long-term Management Direction. The linkage between strategic and operational silviculture and the application of the LTMD projected renewal program is discussed in FMP Section 4.4 Renewal and Tending Operations and Table FMP-17. Projections from the LTMD are considered during operational planning of the renewal program. Confirmation that the implementation of the operational silvicultural program will support the LTMD is included in FMP Section 4.9 Comparison of Proposed Operations to the LTMD, the SFMM modelling Final Test of Sustainability (plan supplementary documentation), and Section 5.0 Determination of Sustainability.

iv) The natural condition be considered in development of indicator desirable levels.

Considerations in FMP:

The support tool for the draft Boreal Landscape Guide, the Ontario Landscape Tool (OLT), provides Simulated Ranges Natural of Variation (SRNV) for the indicators included in the model. These SRNV s are based on the best available science and reflect the estimated natural forest condition. These SRNV s will be incorporated into desirable levels for many FMP indicators, and assessed during development of the Long-term Management Direction.

v) Moose habitat shelter patches.

Considerations in FMP:

Moose management strategies are discussed in text Section 2.1.2.3 Management Zones. The Stand and Site Guide directs the consideration of forest cover for moose habitat. Planned and mapped residual forest patches are identified on the geospatial

information layer (MU490_12PRP00.E00) submitted in the FMP. During harvest operations, some patches of mapped residual may be moved as long as the patches are designated as being acceptable to move (e.g. not required in a certain specific location for habitat) and the same amount of residual forest area is retained as was approved in the FMP.

vi) Operations on fine-textured soils.

Considerations in FMP:

This is an operational consideration related to implementation of planned operations. Conditions on Regular Operations (Section 4.2.2.2) are included in the FMP to direct operations on sensitive sites, and conditions to minimize erosion, rutting and compaction.

vii) Quality of site preparation results.

Considerations in FMP:

This is an operational consideration related to implementation of the silvicultural program, including site preparation, as forecast in Table FMP-17. Site preparation quality standards are included in work contracts issued for site preparation to ensure payment for a good quality result, suitable for subsequent planting or seeding treatments. Monitoring and assessment of regeneration (Section 4.7.3) to confirm that Silvicultural Ground Rule (Table FMP-4, Section 4.2.2.1) regeneration standards are met that will contribute to the achievement of management objectives (Section 3.6).

viii) Less common species planted on appropriate sites.

Considerations in FMP:

This is an operational consideration related to implementation of the silvicultural program. Silvicultural Ground Rules (Table FMP-4 and Section 4.2.2.1) identifies acceptable species and regeneration standards for each ground rule on specific ecosites. Forest Operations Prescriptions are prepare annually and confirm specifically what SGR and what acceptable treatments will be carried out on what area during that operating year. Planned silvicultural treatments must conform to approved SGRs.

ix) Slash management in harvest areas.

Considerations in FMP:

Slash pile management and limited loss of productive land to landings and slash piles is included in Conditions on Regular Operations (Section 4.2.2.2).

x) Survey silviculturally treated areas and identify any areas requiring retreatment or tending.

Considerations in FMP:

The monitoring procedures for the assessment of regeneration success are documented in Section 4.7.3 of the forest management plan. Survey methodology will include the timing of assessments and survey for the identification of areas requiring additional treatments. The Silvicultural Ground Rules (Table FMP-4) include reference to regeneration standards used to determine regeneration success.

xi) Adequate tree seed for implementation of the regeneration program.

Considerations in FMP:

Renewal support including tree seed and planting stock required for the five-year term of the plan is discussed in Section 4.4.2.2 Cone Collections and Planting Stock Procurement. Implementation of the identified renewal support activities will ensure

adequate tree seed and planting stock to carry out the forecast renewal program (Table FMP-17).

xii) Road decommissioning strategy.

Considerations in FMP:

Table FMP-18 Road Construction and Use Management identifies all roads to be decommissioned during the plan period. Road use management strategies (Section 4.5.8 and Supplementary Documentation 14) outline use management strategies, including decommissioning and rehabilitation options, when the roads are no longer required for forest management purposes. Road decommissioning is included as a silvicultural strategy in the caribou zone.

xiii) Water crossing monitoring strategy.

Considerations in FMP:

Water crossing monitoring and assessment is discussed in the FMP in Section 4.74 Roads and Water Crossings and in Table FMP-18 (component of road use management strategies) and the associated road Supplementary Documentation. Conditions on water crossings in areas of concern are detailed in Table FMP-19 and supplementary Documentation 13.

xiv) Forestry aggregate pit rehabilitation.

Considerations in FMP:

Forestry Aggregate Pits are discussed in FMP Section 4.5.6 and include operational standards accordance with the FMPM (2009) Appendix VII.

3.2.8 Shifts In Markets or Utilization

The forest management plan is developed to regulate the supply of forest products through time, in addition to strategically planning for the achievement of non-timber objectives over time. The quantity of wood harvested from the Whiskey Jack Forest and where the wood is processed is variable from one year to the next in the 10-year forest management plan period. The uncertain economic times that are being experienced by the forest industry in general were considered by the Planning Team. While shifts in markets or wood utilization may be on-going, it was considered important to provide a supply of timber from the Whiskey Jack Forest in order to provide continued local and regional socio-economic benefits.

Considerations in FMP: Harvest volumes are estimated in the strategic modelling through forest unit yield curves. The planning team analyzed regional and business plan wood supply targets during strategic planning scoping analyses to determine potential and sustainable timber production levels from the Whiskey Jack Forest. The Long-term Management Direction includes specific timber volume targets balanced with other management objectives for the Whiskey Jack Forest. Operational planning resulted in allocated harvest areas with associated volumes related to the projected mill utilization.

3.3 Base Model for Strategic Analysis

The Strategic Forest Management Model (SFMM) was used as the primary analysis tool for the strategic analysis. This tool is used to track the entire Whiskey Jack Forest land base through time, and produce projections of changes to the forest structure and composition for 160 years into the future. SFMM also allows for the evaluation of forested areas and their contribution to forest diversity, timber production, old forest area and wildlife habitat through time. The Base Model serves as the common starting point for all scenarios investigated during development of the long-term management direction.

The first step in development of the Base Model for the management plan LTMD was development of a Base Model Inventory (BMI) used to classify the initial forest land base within the Strategic Forest Management Model. For the BMI, the planning forest resources inventory for the Whiskey Jack Forest was updated to March 31st, 2012.

Secondly, a suite of SFMM modelling inputs for natural forest dynamics, silvicultural options and management options were developed that would provide structure to the projected natural and human-influenced changes projected within the SFMM model.

During development of the Base Model, it was important to correlate the SFMM natural forest dynamics (without fire suppression) to the Simulated Ranges of Natural Variation (SRNV) incorporated into the Ontario Landscape Tool (OLT), so that both models projected similar future natural forest conditions. If this correlation was not completed, there could be a situation where planning teams could not achieve desirable target results, no matter what was projected for harvest and renewal in the Long-term Management Direction. This correlation ensured that OLT SRNVs are achievable, or in fact may identify where certain OLT projections are not reasonable for the FMP considering the planning inventory used. In this latter situation, differences would be identified and desirable levels for management objective indicators would need to be developed from sources other than the OLT model. The first step in this correlation was the development of a SFMM run to simulate the natural forces of change in the forest, which are disturbance (principally fire disturbance with no fire suppression) and old age succession (stands convert to different species composition through time, or stands break up to form younger stands from understory trees). The Natural Scenario (Nature12) is this simulation using the Strategic Forest Management Model (SFMM) of how the forest might develop in the absence of human intervention. The result of the correlation of SFMM natural forest projections (no fire suppression or harvesting) was that natural (old age) succession and fire disturbance (cycles and transitions) were reviewed and refined in SFMM as necessary to align with the OLT SRNV projections using Boreal Forest Landscape Dynamics Simulator (BFOLDs) inputs. This was an iterative process and resulted in the two models generally being comparable for the forest composition classes being reviewed: landscape classes, caribou habitat, old forest area, forest unit area.

Strategic silviculture options were developed to represent the broad renewal treatments appropriate for the forest. Various renewal treatment options (e.g. extensive, basic and intensive silvicultural treatments) were incorporated into the Strategic Forest Management Model for each forest unit (as appropriate), and included assumptions about how the forest will develop after these general treatments are applied, their associated costs, success rates and future forest conditions. Strategic silvicultural options are reflected in the Silvicultural Ground Rules Table FMP-4 and correspond to current or future forest units as described in Section 2.1.2.1 Forest Units. The broad silvicultural assumptions are in accordance with the Silvicultural

Ground Rules (Section 4.2.2.1).

An analysis package was developed, documenting assumptions pertaining to the strategic modelling inputs and the Base Model. The analysis package is included as Supplementary Documentation A to the forest management plan, with Section 6.0 detailing the development of the Base Model Inventory, the Base Model and associated modelling assumptions.

3.3.1 Analysis Package

The outputs of the forest modelling for the Long-term Management Direction are summarized in the Analysis Package for the plan (Supplementary Documentation A, in Appendices 2 and 3). Digital files are included in electronic FMP plan folder (**MU490_2012_FMP_P1_MODEL**) in MU490_2012_FMP_SFMM_inputs.zip and electronic case files are included in MU490_2012_FMP_SFMM_cases.DAT). The decisions made in the development of the LTMD are documented in the Analysis Package.

The strategic silviculture inputs assumptions used to develop the Base Model Inventory and Base Model related to the land base, forest dynamics (forest succession, growth and yield), available silvicultural options, biological limits, and other model assumptions identified by the planning team are included in Supplementary Documentation A – Analysis Package, Section 6.2.3. Also included in the Analysis Package are the results of the key investigations and the details leading to the development of the Long-term Management Direction.

A summary of how the management objectives were represented in the analysis is included in Supplementary Documentation A - Analysis Package (Section 9.1 Management Objective Representation and Interpretation of Results in the Analysis). The Analysis Package also includes a summary of changes made to the base model, and how the achievement of objectives was interpreted from the model results. The modelling results, conclusions of the analysis, and a digital copy of the key model runs evaluated in the scoping analysis (including the LTMD) are also included in file MU490_2012_FMP_SFMM_cases.DAT.

3.4 Desired Forest and Benefits

As part of the forest management plan objective setting process, it is necessary to have an understanding of the forest structure and composition, and the goods and services, which are desired from the forest to achieve a balance of social, economic and environmental needs. The desired forest and benefits are developed considering the background information available, and include the benefits identified locally by the planning team and the Local Citizens Committees, with input from the public. Some desired forest and benefits are inherently suggested by the *Crown Forest Sustainability Act (CFSA)*, the *Forest Management Planning Manual*, MNR guides (e.g. Draft *Forest Management Guide for Boreal Landscapes*); provincial policy (e.g. *Old Growth Policy for Ontario's Crown Forests*) or other direction.

The Planning Team, the Kenora Local Citizens Committee (LCC) and the Red lake District Resource Management Advisory Committee (LCC) were involved in the development of the desired forest and benefits for the 2012-2022 Whiskey Jack Forest FMP. The desired forest and benefits are the forest structure and composition and goods and services, which are desired from the forest to achieve a balance of social, economic, and environmental needs from the forest over time.

Multiple meetings were held from March to October 2010 with representatives from the Local Citizens Committee and the Planning Team. These meetings were held to provide participants with background information on the forest, an overview of landscape level guidelines, and to develop a list of desired forest and benefits and associated desirable and target achievement levels.

The following subsections document the process used to refine the objectives for this 2012 FMP:

- Section 3.4.1 Review and Confirmation of Objectives from the 2004 FMP;
- Section 3.4.2 Indicators Resulting from New MNR Direction;
  - Aboriginal Involvement
  - Local Citizens Committee Effectiveness
  - Habitat for Species At Risk (SARs)
  - Landscape Biodiversity Indicators
  - Various planning and compliance monitoring indicators to be assessed during plan implementation.
- Section 3.4.3 Comments Raised During Desired Forest and Benefits Meetings.

The participation in the Desired Forest and Benefits Meetings by Local Citizens Committee and Planning Team members is documented in the Supplementary Documentation – Summary of Public Consultation.

The final plan objectives and indicators are detailed in Section 3.5 with rationale for desirable levels. The best balance of achievement of plan objectives is discussed in the development of the Long-term Management Direction (Section 3.6). The LTMD was developed to achieve the desired forest conditions and goods and services from the Whiskey Jack Forest as identified by the Local Citizens Committees, Planning Team and the public.

3.4.1 Review Confirmation of Objectives from the 2004 FMP

The Planning Team and Local Citizens Committees (Kenora and Red Lake) reviewed and discussed objectives from the 2004-2024 forest management plan to confirm which objectives were still desired forest and benefits applicable to the 2012 FMP. The following desired forest and benefits from the 2004 FMP were confirmed as being important to include in this forest management plan.

Each 2004 FMP management objective is noted below with reference to the decision to include or not include the objective in this 2012 FMP. Several 2004 FMP objectives are not carried forward as management objectives in this FMP, but will continue to be considered through operational planning or plan implementation strategies.

1. Forest Structure Objective:

The objective is to maintain or move toward a natural age class structure that is within the estimated bounds of natural variation for the Whiskey Jack Forest through management planning and silviculture.

Targets: - Maintain old forest area;
- Forest age class distribution.

Consideration in 2012 FMP:

- Area of old forest assessment required by FMPM and included in the Science and Information in support of Ontario's Forest Management Guides for Landscapes. Old forest indicator carried forward and included in Objective 2 Forest Composition by area of old forest and area of mature and late successional landscape classes.

2. Forest Composition Objective:

The objective is to maintain or move toward a range of forest units and age classes within the bounds of natural variation as developed for the Whiskey Jack Forest.

Targets: - Area of each forest unit by age class;
- Maintain or increase the amount of PRWMX forest unit.

Consideration in 2012 FMP:

- Forest type (forest unit) and age grouping indicators carried forward and included as indicators in Objective 2. Forest Composition as required by the FMPM.
- Red pine and white pine forest (PRW) area indicator carried forward as required by FMPM(2009) and in Science and Information in support of Ontario's Forest Management Guides for Boreal Landscapes.

3. Natural Disturbance Pattern Emulation Objective:

The objective is to emulate natural disturbance patterns, characteristic of the Whiskey Jack Forest.

Targets: - Maintain or move toward a pattern of natural forest disturbance;
- Disturbance size class and frequency distribution;
- Percentage of planned clearcuts >260 ha;
- Amount of peninsular and insular residual forest retained; and
- Retention of wildlife trees.

Consideration in 2012 FMP:

- Natural disturbance pattern (originally required by the *Natural Disturbance Pattern Emulation Guideline)* was initially replaced by mandatory biodiversity indicators as the Science and Information in support of Ontario's Forest Management Guides for Boreal Landscapes (see Section 3.4.2: Indicators Resulting from New MNR Direction). Incorporated into Objective 1: Landscape Pattern. During LTMD development, the Planning Team was informed that the Landscape Guide would not be approved in time for full implementation for 2012 FMPs, therefore the landscape disturbance frequency by size class indicator from the NDPE guide and 2004 FMP was added back into the suite of indicators for the 2012 FMP.
- The stand level residual component from the NDPE guide is now required as per the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales.* Residual and wildlife tree requirements are related to operational practices and are included in the forest management plan as Conditions on Regular Operations (Section 4.2.2.2) and are not included as objectives or indicators.

4. Sustained Wood Supply Objective:

The objective is to provide a predictable and continuous supply of wood to the forest products industry from the Whiskey Jack Forest.

Targets: - Maintain specific minimum annual harvest volume by species group (spruce-pine-fir, poplar and white birch)

Consideration in 2012 FMP:

- Long-term annual harvest volume carried forward as a mandatory FMPM (2009) indicator in Objective 4: Wood Supply.
- Variance of projected harvest volumes between 10-year terms will be assessed during development of the Long-term Management Direction for acceptability to the Planning Team of projected harvest volumes in the short-term and long-term in relation to the balanced achievement of all management objectives.

5. Working with Aboriginal Peoples Objective:

The objective is to work with local Aboriginal peoples, whose communities are situated in or adjacent to the Whiskey Jack Forest, to identify and implement forest operations (harvest, access, renewal, maintenance and protection) that will maintain or enhance social and economic benefits to Aboriginal peoples.

Targets: - Provide opportunity to harvest 10,000 cubic metres, on an annual basis, to members of Grassy Narrows First Nation (Asubpeeschoseewagong Netum Anishinabek).

Consideration in 2012 FMP:

- Harvest area allocations and assignment of licensees will occur during development of the forest management plan. All licensee commitments will be incorporated into the planned operations and reported in Table FMP-14 Planned Harvest Volume and Wood Utilization.

6. Forest Resources for Personal and Commercial Use Objective:

The objective is to make available incidental volumes of timber for other uses such as fuelwood, building logs, furniture and other materials. (These incidental volumes will come from areas

allocated within this FMP).

Targets: - Provide opportunities for the public to obtain fuelwood; and
- Provide opportunities for the public to obtain incidental quantities of timber for a variety of uses including building logs.

Consideration in 2012 FMP:

- Delete as a management objective. Harvest area allocations, including the identification of public fuelwood collection areas, will occur during operational planning for the forest management plan. Provision of fuelwood areas is carried forward and included in harvest area and volume included in Objective 4: Wood Supply. Fuelwood areas are specifically discussed in the FMP text Section 4.2.2.3 Silvicultural Treatments of Special Public Interest.
- Harvest of specific incidental quantities of timber will be considered either during planned harvest allocation development by the SFL (if known) or by MNR after plan implementation through regular incidental harvest volume permits.

7. Tourism, Commercial and Non-Commercial Forest Users Objective:

The objective is to select and prescribe forest operations (harvest, renewal, maintenance, protection and access) that consider the requirements of other forest users, allowing continued use of the forest while minimizing conflict between forest operations and other forest users.

Targets: - Maintain a system of active forest access roads available for public travel;
- Contact licensed tourism operators for RSA negotiations; and
- Minimize conflict between forest industry and all other users.

Consideration in 2012 FMP:

- Delete as a separate forest users management objective. Communication with tourism and other forest users and consideration for values is a requirement of forest management planning in Ontario and does not require a separate objective in order to be implemented. Maintenance of an active road network is a component of Objective 8: Road Access and includes an indicator for road density (See Section 3.5.2.8).
- It is required that all resource-based tourism operators must be contacted early in the planning process and offered the opportunity to negotiate Resource Stewardship Agreements.
- The planning process requires that known stakeholders and identified values be considered during operational planning for harvest, renewal and tending activities and for road access planning. Conflict between the forest industry and other users will be minimized through implementation of this requirement.
- Mandatory consideration for stakeholders and known values are documented in the Table FMP-10 Prescriptions for Areas of Concern, Table FMP-19 Road Crossings, Landings, and Forestry Aggregate Pits in Areas of Concern, text Section 4.2.2.2 Conditions on Regular Operations, text Section 4.5.3 to 4.5.4 Area of Concern Crossings – Roads, and associated supplementary documentation for areas of concern and road planning.
- The success in implementation of area of concern prescriptions for the protection of values is included in the FMP in Objective 10: Forest Values (see new mandatory indicators Section 3.4.2, FMPM (2009)).
- Maintenance of road access is a component of the mandatory road density indicator required by the FMPM(2009)(Objective 8: Road Density). See new mandatory

indicators Section 3.4.2, FMPM (2009).

8. Other Land Uses Objective:

The objective is to conduct forest management activities in a manner that considers private land, parks and other land designations or values.

Targets: - Protect known values through implementation of the area of concern prescriptions approved in the forest management plan.

Consideration in 2012 FMP:

- Delete as a separate Other Land Uses management objective.
- The planning process requires that known stakeholders and identified values, including land ownership and management status, be considered during operational planning for harvest, renewal and tending activities and for road access planning.
- Consideration for stakeholders and known values are documented in the Table FMP-10 Prescriptions for Areas of Concern, Table FMP-19 Road Crossings, Landings, and Forestry Aggregate Pits in Areas of Concern, and associated supplementary documentation for areas of concern and road planning.
- The success in implementation of area of concern prescriptions for the protection of values is included in the FMP in Objective 10: Forest Values (see new mandatory indicators Section 3.4.2, FMPM (2009)).

9. Cultural Heritage Values Objective:

The objective is to protect identified, registered, or high potential archaeological and cultural heritage sites from conditions that could potentially damage or cause an increase in rates of deterioration.

Targets: - No negative impacts on identified archaeological or cultural heritage values resulting from forest management activities;
- Minimal fibre loss and archaeological mitigation costs through value protection

Consideration in 2012 FMP:

- Delete as a separate Cultural Heritage Values objective.
- The planning process requires that cultural heritage values, including archaeological potential areas, be considered during operational planning for harvest, renewal and tending activities and for road access planning.
- Mandatory consideration for known values, including cultural heritage values, are documented in the Table FMP-10 Prescriptions for Areas of Concern, Table FMP-19 Road Crossings, Landings, and Forestry Aggregate Pits in Areas of Concern and associated supplementary documentation for areas of concern and road planning.
- The success in implementation of area of concern prescriptions for the protection of values is included in the FMP in Objective 10: Forest Values (see new mandatory indicators Section 3.4.2, FMPM (2009)).

10. Wildlife Habitat Objectives

10(a) Selected Wildlife Species Objective:

The objective is to provide suitable/preferred habitat within the bounds of natural variability for the selected wildlife species within the Whiskey Jack Forest.

Targets: - Maintain habitat for selected species within a specified range; and
- Avoid any significant reductions in habitat available for selected species.

Consideration in 2012 FMP:

- Modelled wildlife non-spatial preferred habitat is not required for species other than the Species At Risk (carried forward in Objective 3). Habitat for selected species are accounted for in the multiple forest biodiversity, forest composition and structure indicators that are indicators of various habitats (Objectives 1-3).

10(b) Caribou Objective:

The objective is to maintain or improve contribution of the Whiskey Jack Forest to continued range occupancy and healthy populations of woodland caribou in Northwestern Ontario.

Target: - NWEST portion of the forest to contribute to the habitat range for woodland caribou.

Consideration in 2012 FMP:

- Consideration for woodland caribou habitat (a Species At Risk) is carried forward in the 2012 plan in Objective 3: Wildlife Habitat. This consideration is required by the Endangered Species Act 2007 and is in accordance with the Caribou Recovery Plan 2009.
- Management zones were identified, one of which is the area of the forest to be management primarily for woodland caribou habitat. These management zones are discussed in text Section 2.1.2.3.
- The draft *Forest Management Guide for Boreal Landscapes (Landscape Guide)* suggested two new indicators that relate to caribou habitat in the caribou zone.
  - Amount of woodland caribou habitat (refuge, winter)(Objective 3); and
  - Texture (arrangement) of woodland caribou habitat (refuge, winter)(Obj. 3).
- The FMPM(2009) requires an indicator for habitat for forest-dependent Species At Risk. Therefore the Landscape Guide indicator for amount of woodland caribou habitat (first bullet above) also satisfies the FMPM requirement.

10(c) Marten Objective:

The objective is to maintain or move toward having 10-20% of capable marten habitat area in suitable conditions arranged in core areas of 3,000 to 5,000 hectares.

Target: - Maintain specific portion of suitable forest land base in marten core habitat areas.

Consideration in 2012 FMP:

- Marten core areas were required by the *Forest Management Guidelines for the Provision of Marten Habitat* for the 2004 FMP. This habitat management guide is still in effect as the Landscape Guide has not been approved in time for full application for 2012 FMPs. The Science and Information in support of Ontario's Forest Management Guide for Boreal Landscapes also suggests direction and indicators for forest diversity, including landscape forest composition, pattern and texture. The Stand and Site Guide requires the provision of large landscape patches. Therefore, marten core areas are carried forward in the 2012 FMP in Objective 3: Wildlife Habitat, as well as consideration in the new landscape indicators in Objective 1: Landscape Pattern.

10(d) Moose Objective:

The objective is to retain a year round supply of suitable habitat (including foraging and winter habitat) for moose on the Whiskey Jack Forest.

Target: - Amount of preferred habitat for moose foraging and moose winter habitat.

Consideration in 2012 FMP:

- Consideration for moose habitat is carried forward in the 2012 plan.
- Management zones were identified, one of which is the area of the forest to be management primarily for moose habitat. These management zones are discussed in text Section 2.1.2.3.
- Habitat for selected species, including moose, are accounted for in the multiple forest biodiversity, forest composition and structure indicators that are indicators of various habitats.
- The Science and Information in support of Ontario's Forest Management Guide for Boreal Landscapes includes suggested biodiversity indicators for mature and late successional forest and for young forest distribution (see Section 3.4.2: Indicators Resulting from New MNR Direction). These indicators are incorporated into Objective 2: Forest Composition and in Objective 1: Landscape Pattern and will measure some components of moose habitat.
- The *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* provides direction for the consideration of Moose Emphasis Areas (MEAs). If MEAs are warranted for the management unit, discussion is included in text Section 2.1.2.3 Management Zones, with detailed analysis of the MEAs included in plan supplementary documentation. Operational planning of harvest areas must consider proportion of area in specific forest composition classes with MEAs if MEAs are identified for a FMP.

10(e) Stick Nest Objective:

The objective is to provide for the protection of nest sites and associated habitat of bald eagle, osprey, great blue heron and other locally significant forest dwelling raptors.

Target: - Minimize negative impacts on stick nests (i.e. bald eagle, great blue heron, osprey, and forest dwelling raptors).

Consideration in 2012 FMP:

- Delete as a separate stick nest management objective.
- The *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* provides mandatory direction for prescriptions for the protection of nests for many bird species, including stick nests.
- Mandatory consideration and appropriate prescriptions for the protection of stick nests are documented in the Table FMP-10 Prescriptions for Areas of Concern, Table FMP-19 Road Crossings, Landings, and Forestry Aggregate Pits in Areas of Concern, text Section 4.2 Prescriptions for Operations, text Section 4.2.2.2 Conditions on Regular Operations, text Section 4.5.3 to 4.5.4 Area of Concern Crossings – Roads, and associated supplementary documentation for areas of concern and road planning.
- The success in implementation of area of concern prescriptions for the protection of values, including stick nests, is included in the FMP in Objective 10: Forest Values (see new mandatory indicators Section 3.4.2, FMPM (2009)).

11. Soil Objective:

The objective is to minimize any possible adverse effects of forest practices on soil quality.

Targets: - No forest operations in areas where forest practices threaten the long-term site productivity;
- No Forest Operations Compliance Information System (FOCIS) reports with non-compliances related to site damage; and
- Limit area of roads and landings to 1% of area proposed for forest operations.

Consideration in 2012 FMP:

- Delete as a separate forest users management objective.
- The *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* provides direction for management practices that prevent, minimize or mitigate site damage, and practices to mitigate erosion, hydrological impacts, loss of productive land, and nutrient retention on shallow soil sites.
- Consideration for sensitive sites is documented in text Section 4.2.2.1 Silvicultural Ground Rules, Section 4.2.2.2 Conditions on Regular Operations, and Section 4.7.2 Monitoring and Assessment for Exceptions.
- The success in implementation of management practices that prevent, minimize or mitigate site damage is included in the FMP in Objective 10: Forest Values (see new mandatory indicators Section 3.4.2, FMPM (2009)).
- Maintenance of sustainable amounts of Crown managed forest available for timber production is carried forward as it is a mandatory indicator required by the FMPM (2009) in Objective 5: Managed, Crown Forest. This indicator is directly affected by the quantity of productive land converted to roads and landings.

12. Fisheries and Water Quality Function Objective:

The objective is to maintain riparian habitat, water quality and to prevent the harmful alteration, disruption or destruction of fisheries habitat where forest management activities occur.

Targets: - Minimize impact to riparian areas from harvest through the application of no-cut reserves; and
- To implement forest practices that do not create the harmful alteration, disruption or destruction of fisheries habitat without Department of Fisheries and Oceans consent.

Consideration in 2012 FMP:

- Delete as a separate fisheries and water quality management objective.
- The *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* provides mandatory direction for the protection of fisheries and water quality values.
- The planning process requires that identified values be considered during operational planning for harvest, renewal and tending activities and for road access planning.
- Mandatory consideration and appropriate prescriptions for the protection of known values are documented in the Table FMP-10 Prescriptions for Areas of Concern, Table FMP-19 Road Crossings, Landings, and Forestry Aggregate Pits in Areas of Concern, text Section 4.2 Prescriptions for Operations, text Section 4.2.2.2 Conditions on Regular Operations, text Section 4.5.3 to 4.5.4 Area of Concern Crossings – Roads, and associated supplementary documentation for areas of concern and road planning.
- The success in implementation of area of concern prescriptions for the protection of values, including aquatic values, is included in the FMP in Objective 10: Forest Values (see new mandatory indicators Section 3.4.2, FMPM (2009)).

13. Silviculture Objective:

The objective is to apply the most appropriate level of silviculture that will ensure the long-term forest sustainability while consistent with all other objectives of this plan.

Target: - Assess and silviculturally treat depleted areas to achieve the level of forest cover and wood supply required to sustain the forest resources of the Whiskey

Jack Forest.
- Lowest achievable silviculture costs per cubic metre.
- Maximize yield and product quality.

Consideration in 2012 FMP:

- Maintenance of sustainable amounts of Crown managed forest available for timber production is carried forward as it is a mandatory indicator required by the FMPM (2009) in Objective 5: Managed, Crown Forest.
- Consideration for silvicultural treatment costs is included in the development of silvicultural option assumptions in the strategic modelling during development of the Long-term Management Direction, therefore the target for lowest silvicultural costs was not specifically carried into this FMP. Projected LTMD silvicultural treatments are determined after consideration for the achievement of management objectives, treatment costs and estimated available funding from the Forest Renewal Trust Fund.
- The FMPM(2009) requires three new indicators of regeneration success (achieve free-growing status), silvicultural success (free-growing to projected forest unit) and strategic silvicultural planning (area treated by planned silvicultural treatment intensity) (see Section 3.4.2: Indicators Resulting from New MNR Direction). These three indicators are incorporated into Objective 9: Forest Renewal.

Successful regeneration (three indicators above) will contribute to the maximization of timber yields through time (Objective 4: Wood Supply).

3.4.2 Indicators Resulting from New MNR Direction

Since the approval of the 2004 FMP, several major MNR guidance documents have been revised or prepared that are being implemented on the Whiskey Jack Forest for the first time for this 2012 forest management plan. These documents contain new (and some previously measured) indicators of forest sustainability to be included in forest management plan development. Where new indicators are prescribed by new MNR direction, the indicators may be assessed in association with existing, confirmed management objectives from the 2004 FMP (if appropriate), or be included with new objectives for the 2012 FMP. The documents containing new MNR direction include:

1. Forest Management Planning Manual for Ontario's Crown Forests (Dec. 2009)

The Forest Management Planning Manual prescribes the requirements for Ontario's forest management planning system including a detailed description of the planning process and the products. The forest management planning cycle, established by the manual, consists of planning, implementation, monitoring and reporting. Since preparation of the 2004 FMP, the FMP manual was revised twice: once in 2004 for implementation by 2007-2011 FMP planning teams, and again in late 2009 for implementation by 2011+ FMP planning teams.

The FMPM(2009) requires certain new indicators of forest sustainability be included in each forest management plan. Indicators that were previously included in the 2004 FMP and are being carried forward into this plan (Section 3.4.1) are not duplicated in the following bullets:

New Indicators Assessed During Plan Preparation:

- Indicator for Aboriginal community involvement in plan development (Obj. 6);

  The Aboriginal communities and MNR recognized that information in previous FMPs on Aboriginal values and background community information have not been as complete or accurate as they could have been with information reviewed or supplied by the communities themselves. Additional indicators have been added to the 2012 FMP (Objective 6) to ensure better communication with Aboriginal communities and input throughout the forest management planning process. These indicators reflect opportunities for involvement provided to, and involvement of Aboriginal Communities in the plan development process. The indicators include:
  (a) Number of Aboriginal communities in or adjacent to the Whiskey Jack Forest with representation on the planning team;
  (b) Number of Aboriginal communities (that are in or adjacent to the Whiskey Jack Forest) that contribute information to the planning process.

- Indicator for Local Citizens Committee self-evaluation of its effectiveness in plan development (Objective 7);

  This is a new objective for this plan included for the associated mandatory indicator from the *Forest Management Planning Manual (2009)* required for this

FMP. This indicator will relate to both the Kenora LCC and the Red Lake LCCs. While involvement of the LCCs has been encouraged and well received during preparation of past plans, the quality and effectiveness of the LCCs involvement will now form one of the indicators by which forest sustainability is measured.

(a) Local citizens committee's self-evaluation of its effectiveness in plan development.

Specific desired forest conditions and goods and services discussed with the Local Citizens Committees are included in Sections 3.4.1 to 3.4.3. The management objectives and indicators are detailed in Section 3.5 with rationale for desirable levels.

- Indicator for habitat for species at risk (Objective 3):

The importance of considering the forest dependent species at risk has been discussed in Section 2.1.3.1. In recognition of this importance, the FMPM (2009) requires the inclusion of an objective indicator related specifically to the non-spatial habitat estimated for Species at Risk (Objective 3).

(a) Area of habitat for forest-associated species at risk.

The only Species at Risk on the Whiskey Jack Forest that have habitat that can be effectively modelled non-spatially through time in the strategic modelling is the woodland caribou. Reporting will occur at the time of Long-term Management Direction and in Year Seven and Year Ten Annual Reports.

New Indicators assessed after plan implementation:

- Actual conifer caribou habitat - % of Conifer Dominated Forest Units in the Caribou Zone (Objective 3);
- Actual conifer purity of caribou habitat - % of Jack Pine and Spruce Species Composition by Forest Unit in the Caribou Zone (Objective 3);
- Actual harvest area by forest unit (% of planned)(Objective 4);
- Actual harvest volume by species group (% of planned)(Objective 4);
- Kilometres of SFL roads per square kilometre of Crown forest (Objective 8);
- Regeneration Success: Percent of harvested forest assessed as free-growing by forest unit (Objective 9);
- Silvicultural Intensity: Planned and actual percent of harvest area treated by silvicultural intensity (Objective 9);
- Silvicultural Success: Planned and actual percent of area successfully regenerated to the projected forest unit by forest unit (Objective 9);
- Percent of forest operation inspections in non-compliance by activity and remedy type (Objective 10);
- Compliance with management practices that prevent, minimize or mitigate site damage (% of inspections in non-compliance, by remedy type)(Objective 11); and
- Compliance with management practices that protect water quality and fish habitat (% of inspections in non-compliance, by remedy type)(Objective 11).

2. Ontario's Woodland Caribou Conservation Plan (Oct. 2009)

The Caribou Conservation Plan provides broad policy direction regarding woodland caribou conservation and recovery. This plan states that in areas licensed for forest management within the continuous extent of caribou occurrence, Ontario will ensure that forest management practices fully consider both current and future Woodland Caribou habitat needs, reflecting natural forest conditions and dynamics. The plan requires that all management plans include:

(a) Provision for caribou habitat during forest management planning by requiring the development of a "dynamic caribou habitat schedule" for each forest management plan.
(b) A caribou-based objective for silviculture to be included in all forest management plans within the geographic distribution of caribou.
(c) Use of the Silvicultural Effectiveness Monitoring to assess the effectiveness of forest renewal for caribou, provide recommendations for improvements, and monitor how successfully logged areas are tracking toward a suitable future habitat condition.
(d) Determination of densities (thresholds) of roads to support caribou persistence.

The Planning Team has considered these requirements and included a dynamic caribou habitat schedule (formerly referred to the "caribou mosaic" in the previous FMPs) in the management zones and strategic planning for the management plan. The following objective indicators are included in the plan and address points (b) to (d) above.

New Indicators:

- Indicator for % of upland conifer dominated forest units in caribou zone. (Objective 3);
- Indicator for % of conifer species composition in caribou zone. (Objective 3);
- Indicator for density of SFL road per square kilometre of Crown forest, specifically in the caribou zone of the forest (Objective 8).

3. (DRAFT) Forest Management Guide for Boreal Landscapes

This draft guide may be considered by 2012 Planning Teams as a guide for maintaining or enhancing natural landscape structure, composition and patterns that provide for the long term health of forest ecosystems in an efficient and effective manner. When approved, the Landscape Guide will replace existing landscape, stand and site scale direction previously found in several other documents. In the meantime, the science package developed to support the Landscape Guide is the most current science and information for many of the landscape related indicators.

The Landscape Guide suggests several new indicators of forest biodiversity be included in each forest management plan. The Planning Team reviewed these suggested indicators and decided to include them in the 2012 FMP:

New Indicators Assessed After Plan Implementation:

- Landscape class area for mature and older age classes (Obj. 2);
- Old forest by appropriate grouping (plan forest unit or landscape guide forest unit)(Obj. 2);
- Red pine and white pine forest unit areas (grouped)(Obj. 2);

- Upland spruce and jack pine dominated forest areas (grouped)(Obj. 2);
- Texture (arrangement) of the mature and old forest (all forest units combined)(Obj. 1);
- Young forest patch size (Obj. 1);
- Amount of woodland caribou habitat (refuge, winter)(Obj. 3); and
- Texture (arrangement) of woodland caribou habitat (refuge, winter)(Obj. 3).

4. Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (March 2010)

The Stand and Site Guide provides direction on various aspects of conserving biodiversity, including aquatic and wetland habitats and shoreline forests, special habitat features (e.g. bird nests, dens, bat hibernacula), and habitat for species at risk. It also addresses topics like road and water crossing construction and maintenance, forestry aggregate pits, and soil and water conservation (e.g. rutting, erosion, nutrient loss), and salvage and biofibre harvest operations. The Stand and Site Guide replaces existing stand and site scale direction previously found in numerous forest management guides.

While most direction in the Stand and Site Guide is "operational direction" at the stand and site level, the guide contains some landscape level direction that may be applicable in the Long-term Management Direction of a forest management plan. Each planning team will determine if any direction from this guide warrants an indicator in the strategic planning of the FMP. No indicators have been included in the Whiskey Jack Forest FMP that relate to Stand and Site Guide direction.

5. Landscape Direction from Existing MNR Guides

Landscape direction from the following guides was included in the 2012 FMP. (Note: These guides would have been replaced by the Landscape Guide, but it was not approved in time for development of this FMP.)

Forest Management Guide for Natural Disturbance Pattern Emulation (2001)

- Landscape pattern (Objective 1), disturbance frequency and planned clearcuts.
- Note: the approved *Stand and Site Guide* replaces stand level direction from the NDPE guide.

Forest Management Guidelines for the Provision of Marten Habitat (1996)

- Marten core habitat (Objective 3).
- During development of the LTMD, it was thought that the marten guide was going to be replaced by the Landscape Guide for use in the FMP. The Planning Team decided to include one additional indicator to approximate the landscape pattern of concentrated (>60%) mature and old conifer (Objective 1) in addition to the other indicators suggested by the Science and Information in support of Ontario's Forest Management Guide for Boreal Landscapes. There was concern that the combination of indicators for mature/old landscape pattern (spatial), mature/late conifer landscape class (non-spatial), and upland pine and spruce (non-spatial) may not cover all the area currently assessed according to the marten habitat guide. This concentrated conifer indicator area is similar to marten core habitat but allows a greater range in sizes and distribution of this older conifer area. This

- indicator is measured through use of the OLT Model. This concentrated conifer landscape pattern indicator was retained in the Whiskey Jack plan after the provincial decision was made to continue use of the marten habitat guide.

3.4.3 Comments Raised during Desired Forest and Benefits Meetings

This section summarizes the main comments or issues raised by the LCC or Planning Team during Desired Forest and Benefits meetings as recorded and synthesized by the Kenora District MNR. The Planning Team response to how this issue was addressed (if possible) within development of the forest management plan is also noted in this table.

Input from Desired Forest and Benefits meeting, Kenora LCC, and Red Lake District Resource Management Advi
Notes synthesized by MNR Kenora District.

FMPM - Forest Management Planning Manual;
LG - Landscape Guide;
SSG - Stand and Site Guide.

Theme		Input	Synthesis	Tracked to Where Used	Phase of Planning Addressed
Forest Management	General	Sustainable forest management/harvest Sustainable, predictable, consistent wood supply	- Sustainable forest management with predictable wood supply	Included in **Objective 4** Wood Supply with mandatory (FMPM) long-term harvest volume indicator.	LTMD-FMP-9-Obj. 4
		No net loss in productive forest land	- No net loss in productive forest land (to roads, chipper piles)	Included in **Objective 5**: Managed Crown Forest with mandatory (FMPM) available land base indicator (desirable level to be determined) Plan text (Section 4.2.2.2) includes **Condition on Regular Operations (Section 4.2.2.2)** to mitigate loss of productive land.	LTMD-FMP-9-Obj. 5
		Less fire supression where silviculturally beneficial	- Less fire prevention	MNR fire suppression policy for designated areas incl KF and WJF. Identify priority areas for surpression during times of escalated fire activity and/or limited resources.	
		Use Boreal Mixedwood Guide	- Use Boreal Mixedwood Guide	May consider for Silvicultural Ground Rules (SGRs) **FMP-4** on limited areas. Manage for mixedwood anyway, but generally want less mixedwood on forest as per OLT. Mandatory (LG) indicator (**Objective 2**) for landscape class area.	LTMD-FMP-9-Obj. 2
		Forest composition and structure similar to pre-mill/natural condition*	- Forest should consist of variable age classes - Produce a healthy, more natural, mixed forest	Mandatory FMPM/LG indicators for forest composition and age included in Objective 2: Forest Composition. Desirable levels based on simulated natural condition from Ontario Landscape Tool (OLT). - pre-harvest, natural condition related to OLT Simulated Natural Range of Variation (SRNV) projections.	LTMD-FMP-9-Obj. 2
		Variable age classes			LTMD-FMP-9-Obj. 1& 2
		Forest should consist of various age harvested areas, older growth			LTMD-FMP-9-Obj. 1& 2
		Increased conifer component/regeneration	- Increase conifer component in forest, esp. Pr/Pw		LTMD-FMP-9-Obj. 2
		Increase Pr/Pw component of forest			LTMD-FMP-9-Obj. 2
		Healthy forest			
		More natural/mixed forest			
		Historic disturbance sizes		Mandatory indicators (LG) for young forest frequency by size class and also for mature/old forest landscape pattern (texture) included in **Objective 1**: Landscape Pattern.	LTMD-FMP-9-Obj. 1
	Harvesting	Pre-harvest inspections for values confirmation, cultural consideration and cost verification	- Conduct pre-harvest planning and site inspections	Operational planning strategy to conduct pre-harvest inspections and mandatory AOC planning to consider identified values (**FMP Section 4.2 Prescriptions for Operations**).	
		Increase red pine harvest	- Increase red pine harvest	Specific harvest area/volume targets could be considered in Long-term Management Directon (LTMD) development while balancing all objectives. Included in text **Section 3.5 Objectives and Indicators and strategic modelling**.	LTMD-FMP-9-Obj 4
		Accessible fuelwood areas	- Fuelwood areas	Areas available for fuelwood collection identified on **planned harvest area maps**. Discussed in text **Section 4.3.1.4 Fuelwood Collection Areas**.	
		Increased old growth	- Increase old forest area	Mandatory (FMPM/LG) indicator for amount old forest included in Objective 2: Forest Composition. Desirable level expected to be related to natural forest SRNV range.	LTMD-FMP-9-Obj. 2
		Cut old growth - selective cut	- Cut old growth - selective cut	Old forest will not be excluded in harvest eligibility criteria (**text Section 3.6.5 Selection of Areas for Harvest**), however harvest of old forest could only occur to the extent that the retention of old forest indicator is still achieved.	

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Theme	Input	Synthesis	Tracked to Where Used	Phase of Planning Addressed
Clearcut	No clearcutting	- No clearcutting	Clearcutting is an appropriate silvicultural system for the Boreal Forest (**SGRs FMP-4**). All harvest areas will include retention of residual forest patches and individual wildlife trees, so clearcuts are not "cut clear"(**Section 4.2.2.2 Conditions on Regular Operations**). Also operational prescriptions for retention of forest area for protection of other values (e.g. tourism values, aquatic values, wildlife incuding Species At Risk values, etc.) will occur adjacent to harvest areas. Areas suitable for a Boreal mixedwood trial will be identified during plan implementation.	
	Mix of clearcut and other harvest practices	- Use other harvest practices as well as clearcutting		
	Examination of other harvesting techniques (besides clearcutting)			
	Protect advanced growth when clearcutting	- Protect advanced growth during harvest	Silviculturally appropriate for some areas (SGRs FMP-4). Age and species of advanced growth for protection is dependent on the site being harvested. All harvest areas will have residual forest retained and wildlife trees (**Section 4.2.2.2 Conditions on Regular Operations**).	
Buffers	Harvesting to shorelines (where appropriate)	- Harvest to shorelines (where appropriate)	Stand and Site Guide allows harvest to shorelines in certain circumstances (**Table FMP-10 Operational Prescriptions for Areas of Concern**). Application of harvesting of shorelines will be limited to appropriate areas with consideration for other values. **FMP Section 4.2 Prescriptions for Operatrions**	
	No shoreline harvest	- Do not harvest to shorelines		
	Less use of buffers*	- Leave fewer buffers (esp. roadside to reduce accidents)	The SSG dictates some reserve distances (aquatic values/wildlife habitat), other reserves are planning team decisions (road buffers).**FMP Section 4.2 Prescriptions for Operatrions**	
	Buffers between Reserve and Crown Land	- Leave more buffers (FN's, waterbodies, moose corridors)		
	Buffers around larger lakes and streams			
	Cut blocks should be connected via uncut corridors		Wildlife travel corridors planned where needed for caribou zone. SSG mandatory retention of residual forest in and around harvest areas (**Section 4.2.2.2 Conditions on Regular Operations - Residual**).	

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Theme		Input	Synthesis	Tracked to Where Used	Phase of Planning Addressed
	Silviculture	Utilize prescribed burn	- Use prescribed burns for regeneration and forest health	Available silvicultural tool if (a) is recommended in provincial silvicultural guides for the specific site/species, (b) is warranted on specific sites (SGRs FMP-4) and c) is in accordance with district fire management policy. If appropriate, prescribed burns will be identified in the plan text and forecast renewal **Table FMP-17**. *(will require further Planning Team discussion)*	
		Use of fire in harvested/insect damaged areas for forest health			
		Chemical-free forest	- Do not use any pesticides in the forest	Chemical tending will be considered if the treatment is recommended in provincial silvicultural guides, and is warranted on specific sites. Chemical tending is an important tool for the manipulation of forest cover and will assist in moving toward simulated natural forest condition (OLT conifer targets). *(mayrequire further discussion)*	
		Use of herbicide spray to meet objectives	- Use herbicides to promote conifer regeneration		
		Increase in extensive (intensive?) silviculture	- Increase intensive silviculture	Acceptable treatments in **SGRs FMP-4.** Balance of intensive/extensive treatments relates to the achievement of indicators for forest composition (type) for the LTMD.	LTMD-FMP-4
		Limited treatments	- Increase extensive silviculture		
		Plant areas that were left unplanted		Assessment of Regeneration Success (discussed in text **Section 4.7.3** and related to regeneration standards in **SGRs FMP-4**) will determine if areas require retreatment.	
Access/Roads		Mixture of roaded and remote areas	- Keep some areas of forest remote	Mandatory (FMPM) indicator for road density (**Objective 8**). Consideration during road planning, caribou mosaic, retention of Large Landscape Patches, Resource Stewardship Agreements, **FMP-18 Road Constructon and Use Management**, primary road planning for LTMD, road use management strategies.	LTMD-FMP-9-Obj. 8
		Decreased roads/no excessive road networks			
		Retain Remote Tourism Area			
		Roads closed after harvest in remote areas to protect wildlife	- Close some roads to protect wildlife & remote tourism		
		Rehabilitate/abandon all unused water crossings	- Make forest more accessible (for hunting, firewood, etc.)		
		Increased/maintained road accessibility (for hunters/trappers)			
		Accessible lakes and hunting areas		Roads planning is completed with consideration for road use and other values. Road density will determine quantity of accessible roads, however the location of the roads may change through time as roads are built and others decommissioned. Planning will have consideration for road density by large landscape area (e.g. caribou zone)	
		Fewer restrictions-maximized residential use (hunt, fish, ATV, cottage)			

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Theme		Input	Synthesis	Tracked to Where Used	Phase of Planning Addressed
Wildlife		Managed for optimal wildlife habitat for benefit of users	- Manage wildlife habitat to benefit users (hunters, outfitters)	FMP will identify Management Zones (**Section 2.1.2.3**) to guide strategies for wildlife habitat management. - Landscape Guide and Stand and Site Guide both provide direction on manipulation of forest cover for the provision of wildlife habitat.	
		Create a variety of habitats	- Manage for multiple species		
		Increased/maintained presence of wildlife			
		Some specific areas managed for moose/deer			
		Increased moose habitat			
		Manage for moose vs. caribou	- Manage for moose vs. caribou		
		Sustainable caribou habitat	- Manage for caribou (specific locations)		LTMD-FMP-9-Obj. 3
		Caribou reoccupation to area near English River			
		Caribou areas should be north of AOU, highways and people			
		Wildlife habitat consistent with guideline recommendations	- Wildlife habitat consistent with guideline recommendations		
		Define wildlife species with forest type		Plan text (**Section 2.1.3 Forest Resources**) will describe main species and habitat (Species At Risk, other reported species and rare species).	
		Less marten core	- Less marten core areas	Large, landscape patches required by LG. No marten guide implementation of core habitat areas with new LG. (note: in the absense of an approved Landscape Guide default will be to the existing approved marten guide - indications are that the large landscape patches (LG) will correspond closely to the marten cores.	
		Identify appropriate wildlife trees	- Identify wildlife trees	SSG requires retention of wildlife trees based on species and flamability (**text Section 4.2.2.2**).	
		Less chemical tending - increased browse	- Increase browse by reducing chemical tending	SGRs in **FMP-4** will identify if tending acceptable. Implement based on wildlife management strategies (**FMP-17 forecast renewal**).	
		Indication of number of wolverine and caribou in forest		FMP manages and discusses wildlife habitat not populations. District does surveys on wildlife populations. *(note out of scope)*	
		Proper assessment of wildlife population and wildlife habitat	- Better idea of wildlife populations (i.e. caribou, wolverine)		
Economics		Maximize industrial benefit	- Maximize industrial use & provide employment - locally	Plan operations in accordance with LTMD to provide sustainable economic opportunities. Intent is to identify long term predictable and sustainable wood supply. - Implement Area of Concern prescriptions in planned operations to protect other identified values. - Social and Economic Description has non-timber users as well as timber users identified as well, support for other forest users are considered in other non-timber objectives. - Social and economic indicators included in FMP for Long-term harvest area and volume **(Obj. 4 Wood Supply)**. - Ecological sustainability indicators included for **Forest Values (Obj. 10) and Soil and Water Resources (Obj. 11).**	LTMD-FMP-9-Obj. 4
		Healthy forest industry			
		Adapt to changes in Forest Industry			
		Employment			
		Keep economic benefits locally (i.e. do not sell to US, other Districts)			
		Maximize forest resources			
		Sustainable, predictable, economic wood supply	- Sustainable, predictable, economic wood supply		LTMD-FMP-9-Obj. 4
		Support all users of forest			
		Managed for other traditional users			

Theme	Input	Synthesis	Tracked to Where Used	Phase of Planning Addressed
Stakeholders	Equal opportunity for all user groups (not forestry first)	- Equal opportunity for all stakeholders	Opportunity for consultation throughout plan production through contact with the planning team, task teams, individual stakeholder communication, several formal public consultation opportunities, comments through LCCs, issue resolution process.	
	Consideration given to active traplines	- Consider active traplines and impacts over lifetime of trapper	Values, including traplines, considered during the AOC planning process and trappers notified as part of the public consultation process.	
	Consider trapline/habitat impacts over lifetime of trapper			
	Stakeholder acceptance of FMP	- Stakeholder acceptance of FMP	Planned operations, Area of Concern planning and Roads planning presented twice to public for comment. RSA contact made with all RBTOs. All known stakeholders notified for comment during public consultation opportunities. (Note: when Whiskey Jack Forest reverted to a Crown unit, RSAs were not applicable, therefore none signed.) All known comments will be recorded for the public consultation summary and must be considered during development of the FMP. Kenora and Red Lake local citizens' committees actively involved in FMP production and informed on a regular basis of progress towards completion and opportunities for involvement.	
	Plan for fire resistant areas around communities	- Plan for fire resistant areas around communities	not specifically an FMP issue - focus is on community (FireSmart) and fire breaks / specific regeneration adjacent to communities. Refer communities to OMNR Fire and Aviation.	
	Roads closed after harvest in remote areas to protect remote tourism		RSA process is implemented (if applicable) and any negotiated prescriptions affecting the forest are included in the FMP. Road use strategies (**FMP-18**) will address road decommissioning after forest management activities completed.	
	Resource Stewardship Agreements	- Maintain RSAs		
	Value of Tourism industry considered in planning		RSA contact made with all RBTOs (if applicable), offer to include formula provided by LCC Tourism Contact to identify tourism value, MNR available for participation in RSA discussions (upon request of RBT operator and/or forest industry. Target of industry interests appropriately addressed as demonstrated by no issue resolution or bump up requests.	

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Theme		Input	Synthesis	Tracked to Where Used	Phase of Planning Addressed
First Nations		Increased Aboriginal involvement	- Increased Aboriginal participation/involvement	FMP process requires opportunities for Aboriginal consultation and representation on the planning team. - Planning Team has also organized an Aboriginal task team to aid communication and discussion and the Terms of Reference include opportunities for Aboriginal Input to be developed by the Aboriginal Team members and communities and have this included as part of the plan. - Input into Aboriginal reports on values and community background information is also requested by the Planning Team and forms an indicator in **Objective 6**. - Mandatory FMPM indicator for Aboriginal Involvement in Planning included in **Objective 6**.	LTMD-FMP-9-Obj. 6
		Increased Aboriginal participation in forest management planning			
		Increased cooperation between industry and First Nations	- Increased cooperation between industry and First Nations		
		First Nation employment			
		Aboriginal leading studies of traditional use and values	- Aboriginal-led studies of traditional use and values	Terms of Reference include opportunities for Aboriginal Input to be developed by the Aboriginal Team members and communities and have this included as part of the plan.	
		Protect medicinal herbs, natural medicines	- Protect medicinal herbs, sacred/historic sites		
		Protect sacred/historic sites			
Other		Adaptable to climate change (genetic modifications)	- Adaptable to climate change	Provincial acknowedgement, but no clear direction on operational strategies to be included in FMPs.	
		Clear running rivers/streams	- Clean lands and waters	SSG direction for protection of aquatic values incorparated in **Table FMP-10,** Conditions on Regular Operaitons (**Section 4.2.2.2**) and operational planning.	
		No garbage on site after logging/mining		Standard Operating Practice to remove garbage from forest operation's work sites when finished. Compliance and Enforcement item (not planning)	

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3.5 Objectives and Indicators

The desired forest conditions and goods and services from the Whiskey Jack Forest as discussed by the Planning Team and Local Citizens Committees were reviewed and resulted in the management objectives to be strategically planned for and assessed for achievement in this 2012-2022 FMP. The process of finalizing management objectives and assigning appropriate desirable and target levels for objective indicators are described in the following subsections:

1. Finalize plan management objectives and assign relevant indicators of objective achievement (included in Section 3.5.2 documentation);
2. General approach to determine desirable levels for indicators (Section 3.5.1); and
3. Document desirable and target levels for objective indicators and provide rationale for choice of these levels (Section 3.5.2).

A summary of the specific management objectives for this plan is included in Section 3.5.2. For each objective, an indicator or multiple indicators are identified including the actual "measure" for each indicator, timing of assessment, the general rationale for desirable levels for each indicator, and references where scoping investigation results influenced the setting of desirable and target levels for indicators.

The Analysis Package documents strategic modelling inputs (Parts 1, 2, 3), results and conclusions for the development of management objectives and scoping investigations (Parts 4, 5). The Analysis Package is Supplementary Documentation A and is included as FMP file: MU490_2012_FMP_P1_TXT_AnPack.PDF.

3.5.1 General Approach to Determining Desirable Levels for Indicators

The Forest Management Planning Manual (2009) (FMPM) requires objectives for natural landscape patterns, forest structure and composition, and distribution and abundance of forest ecosystems. For these objectives, the FMPM requires indicators of landscape pattern, area by forest unit and development stage, and amount and distribution of old growth forest to be included in a forest management plan (FMP). The FMPM refers to forest management guides for the specific indicators and desirable levels for which a target will be established. In addition to the forest management guides, when developing objectives for the amount and distribution of old growth forest, planning teams are to follow direction in the Old Growth Policy for Ontario's Crown Forest (2003).

For this Whiskey Jack Forest FMP, the desirable levels for certain indicators of objective achievement were determined after analysis of a simulated natural forest scenario, which estimated how the forest might develop in the absence of human intervention. The Regional Science and Information Packages and Ontario Landscape Tool include the most current science-based estimates of the natural forest condition. The Simulated Range of Natural Variation (SRNV) estimates in the OLT are forest management unit specific and are both area and landscape pattern based. For each of the indicators required by the FMPM, the planning team used the Regional Specific Science and Information Packages and/or Ontario's Landscape Tool to identify specific indicators for their plan, and used the associated SRNV to identify desired levels. The current levels on the management unit for each indicator were also considered when developing targets. The planning for a future forest condition that is

comparable to OLT natural forest condition projections was the primary consideration for development of the LTMD.

The OLT SRNV replaces the Strategic Forest Management Model (SFMM) based natural benchmark approach. The estimates of landscape pattern, area by forest unit and development stage, and amount and distribution of mature and old forest found in the Science and Information Packages are based on current science. The SRNV estimates are robust but it is not appropriate to compare them to SFMM natural benchmarks and wildlife habitat models that were used to develop desired levels and targets in previous forest management plans.

Indicators of forest composition and structure, proportion of old forest and wildlife habitat are examples of indicators with desirable levels determined in relation to the simulated ranges of natural variation. During development of the LTMD, SFMM results were compared to the SRNV for relevant indicators and reviewed to see if the estimated SRNVs were reasonable desirable levels for these indicators for the FMP.

Some of the indicators are not based on strategic modelling; e.g., road density, compliance, Aboriginal involvement. Desirable levels for other indicators were determined after analysis of the quantity that was currently or historically available from the forest, or the amount that can be sustainably produced while considering the achievement of all objectives (e.g. harvest area, harvest volumes) or the quantity that was expected to be achieved through implementation of the plan (e.g. compliance with area of concern prescriptions, actual harvest area, harvest volume and deliveries to mill, areas renewed to free-growing status, road density).

Spatial analyses were used to assess the potential of the Whiskey Jack Forest to produce marten core habitat and landscape pattern by specific planned clearcut size classes. Scoping investigations for various indicators of forest composition, structure and pattern were conducted early in the development of the LTMD and were considered in the determination of desirable and target levels for the desired forest and benefits from the Whiskey Jack Forest (documented in Section 3.5.2).

3.5.2 Management Objectives, Indicators and Desirable Levels

The list of desired forest and benefits, past management plans for the Whiskey Jack Forest, and MNR sources of direction (including Figure A-3 from the *Forest Management Planning Manual for Ontario's Crown Forest, 2009*) and forest management guides were used to develop plan objectives, indicators of objective achievement, desirable levels, and targets for the 2012 Whiskey Jack FMP.

As per direction in the 2009 FMPM, objective categories, criteria and indicators from the Crown Forest Sustainability Act (CFSA) objective categories were developed. A total of 30 indicators of objective achievement were developed by the Planning Team for the long-term management direction for this plan.

A management objective was developed for each desired forest and benefit indicator (or group of related indicators) identified for the plan. A desirable level and the timeframe for achievement were also developed for each indicator of objective achievement. Only indicators that could be quantified were selected for the management plan.

The Strategic Forest Management Model (SFMM) was used to develop a Long-term Management Direction that balances the achievement of certain management objectives over time (those that can be modelled non-spatially through time). The objectives considered in the Long-term Management Direction include forest composition and age class structure, proportion of old forest areas, areas of red pine and white pine, available forest area, habitat for woodland caribou (Species At Risk), harvest areas, and harvest volumes.

A process of repetitive analyses was conducted to balance the achievement of management objectives while developing a Long-term Management Direction for the Whiskey Jack Forest. Results or findings of the strategic scoping analyses were used to guide the balancing of management objectives. During LTMD development, the Planning Team was forced to make trade-offs for conflicting management objectives or where the land base of the Whiskey Jack Forest did not allow achievement of desirable levels in the short or medium-term between multiple indicators. Trade-offs were also required when the achievement of certain desired forest conditions conflicted with the provision of desired goods and services, or vice versa. If desirable levels could not be reached in this 10-year plan period, short-term compromises were reached, and targets for this plan period were established to allow movement towards the desirable levels for the indicator.

A summary of the plan objectives, indicators of objective achievement, desirable levels, targets and timing of assessment follows in this text section and is included in Table FMP-9. The following text also described the rationale for desirable and target levels for each indicator and references where scoping investigation results influenced the setting of desirable and target levels for indicators.

3.5.2.1 Objective 1: Landscape Pattern

Objective 1: Landscape Pattern:
"To emulate natural disturbance and landscape patterns characteristic of the management unit."

This objective is carried forward from the 2004 FMP in accordance with the *Forest Management Guide for Natural Disturbance Pattern Emulation (2001*) and also addresses a landscape pattern indicator from the *Forest Management Planning Manual (2009)* required for this FMP.

Indicator: (1a) % of polygons with >60% mature and old forest

Timing of Assessment: Completion of proposed LTMD,
Completion of Phase I Ops Planning, and
Year 10 Annual Report.

How Measured: Spatial measurement in OLT model at 500 ha and 5,000 ha scales.

Desirable Level: The desirable level is to have the landscape pattern consistent with OLT percentage projections for mature/old forest established for the forest (Table 9).

Table 9 Desirable Level for Percent of Polygons with >60% Mature or Old Forest

Analysis Scale	Plan Start 2012 Percentage	Minimum Desirable Percentage
Scale: 500 ha hexagon	27%	35%
Scale: 5,000 ha hexagon	18%	28%

Target Level: Movement towards desirable level during this plan period.

Rationale for Desirable and Target Levels:
This landscape pattern indicator is assessed to determine whether the proposed plan activities will create a landscape pattern consistent with historic natural disturbances. The minimum desirable level for proportions of mature and old forest were calculated by the Ontario Landscape Tool and accepted by the Planning Team as the best estimation of the natural forest condition. The target level (movement towards desirable level) recognizes that it is almost impossible to change a current landscape pattern to match desirable levels in one 10-year plan period given the starting point or pattern of the forest at Plan Start.

Indicator: (1b) Young Forest Patch Size by Size Class

Timing of Assessment: Completion of proposed LTMD,
Completion of Phase I Ops Planning, and
Year 10 Annual Report.

How Measured: Spatial measurement in OLT model.

Desirable Level: The desirable level is to have young forest landscape pattern consistent with OLT projections by size class calculated for the forest (Table 10).

Table 10 Young Forest Frequency Percentage by Size Class

Young Forest Patch Size Class	Plan Start Percentage	Desirable Percentage
1 - 100 ha	63%	52%
101 - 250 ha	19%	15%
251 - 500 ha	7%	10%
501 - 1,000 ha	5%	8%
1,001 - 2,500 ha	4%	8%
2,501 - 5,000 ha	1%	4%
5,001 - 10,000 ha	1%	3%
10,000 - 20, 000 ha	0%	2%
> 20,000 ha	0%	1%

Target Level: Movement towards desirable level during this plan period.

Rationale for Desirable and Target Levels: This indicator for natural disturbance pattern of the forest is measured by the young forest landscape pattern. The Plan Start and Plan End young forest frequency distribution is measured using the OLT model with the updated forest inventories and is compared to the natural disturbance frequency template supplied by MNR. This natural template was derived using the best current available information which comes from the science information built into the OLT model. Achievement of the template frequency distribution of young forest by size class is the desirable level. The target level (movement towards desirable level) recognizes that it is almost impossible to change a current landscape pattern to match desirable levels in one 10-year plan period given the starting point or pattern of the forest at Plan Start. The timeframe in which the desirable level can be achieved is also limited by the layout of the planned harvest allocations that must adhere to the standard that 80% of planned clearcuts are to be <=260 hectares in size (NDPE Guide), the same size classes that should be reduced to reach the desirable level for this indicator.

Indicator: (1c) % of polygons with >60% mature and old conifer forest

The Planning Team decided to include one indicator to approximate the landscape pattern of concentrated (>60%) mature and old conifer in addition to the other indicators suggested by the Science and Information in support of Ontario's Forest Management Guide for Boreal Landscapes. There was concern that the combination of indicators for mature/old landscape pattern (spatial), mature/late conifer landscape class (non-spatial), and upland pine and spruce (non-spatial) may not cover all the area currently assessed according to the marten habitat guide. This concentrated conifer indicator area is similar to marten core habitat but allows a

greater range in sizes and distribution of this older conifer area. This indicator was retained in the Whiskey Jack plan after the provincial decision was made to continue use of the marten habitat guide.

Timing of Assessment: Completion of proposed LTMD,
Completion of Phase I Ops Planning, and
Year 10 Annual Report.

How Measured: Spatial measurement in OLT model at 500 ha and 5,000 ha scales.

Desirable Level: The desirable level is to have the landscape pattern consistent with OLT percentage projections for mature/old conifer forest established for the forest (Table 11).

Table 11 Desirable Level for Percent of Polygons with >60% Mature or Old Conifer Forest

Analysis Scale	Plan Start 2012 Percentage	Minimum Desirable Percentage
Scale: 500 ha hexagon	4%	19%
Scale: 5,000 ha hexagon	1%	9%

Target Level: Movement towards desirable level during this plan period.

Rationale for Desirable and Target Levels:
This landscape pattern indicator is assessed to determine whether the proposed plan activities will create a landscape pattern consistent with historic natural disturbances. The minimum desirable level for proportions of mature and old conifer forest were calculated by the Ontario Landscape Tool and accepted by the Planning Team as the best estimation of the natural forest condition. The target level (movement towards desirable level) recognizes that it is almost impossible to change a current landscape pattern to match desirable levels in one 10-year plan period given the starting point or pattern of the forest at Plan Start.

3.5.2.2 Objective 2: Forest Composition

Objective 2: Forest Composition:
"To maintain or move towards a natural range of forest composition and age distribution."

This objective combines several objectives carried forward from the 2004 FMP and includes indicators to address two indicators from the *Forest Management Planning Manual (2009)* required for this FMP (area by forest unit and age grouping, amount and distribution of old forest).

Indicator: (2a) Crown Productive Forest by Landscape Class

This indicator contributes to the assessment of forest composition and development stage as required by the FMPM as previously noted, but more specifically this indicator was included to address the indicator for assessment of landscape class that is included in the draft *Forest Management Guide for Landscapes* (Landscape Guide). While this guide is not approved for implementation in the Boreal Forest, the Planning Team decided that the inclusion of an indicator for landscape class area was pro-active and would provide valuable information for reference and determination of trends for the next forest management plan. Mature and late successional landscape classes were considered for this indicator in accordance with regional FMP training direction and the milestones table prepared and considered according to Science and Information in support of Ontario's Forest Management Guide for Boreal Landscapes during preparation of Table FMP-9.

Timing of Assessment: Completion of proposed LTMD, and
Year 7 and Year 10 Annual Reports.

How Measured: SFMM Crown productive area by mature/late successional provincial Landscape Class projected through time.

Desirable Level: The desirable level is to maintain the mature and late successional landscape class areas at or above the minimum of the lower interquartile hectare range (Simulated Range of Natural Variation)(SRNV) for each mature and late successional landscape as projected by the Ontario Landscape Tool for the Whiskey Jack Forest (Table 12).

Table 12 Minimum Desirable Area by Landscape Class

Landscape Class	Plan Start Ha.	Minimum Desirable Ha.
Mature/Late Balsam	8,361	8,706
Mature/Late Lowland	12,695	12,845
Mature/Late Hardwood	104,760	43,021
Mature/Late Conifer	182,885	178,461

Target Level: Same as desirable level measured in the medium term (Terms 4-8).

Rationale for Desirable and Target Levels: The Ontario Landscape Tool (OLT) provides an analytical projection of the range of forest types/age class structure for the Whiskey Jack Forest. The minimum SRNV for mature/late successional landscape classes was adopted as the

desirable level and was considered to be the best available science on the natural forest structure. Target levels were kept the same as desirable levels for each of the landscape classes in this indicator and are measured in the medium term (Terms 3-8). While two of the landscape classes achieved desirable levels with Plan Start conditions, the two smallest landscape classes (ML Balsam, ML Lowland) decreased slightly in area in Term 2, contrary to desirable levels, therefore a short-term target timeframe corresponding to this 10-year plan period was not feasible for this indicator's target timeframe. All desirable and target levels can be achieved in the medium term.

Indicator: (2b) Crown Productive Forest by Forest Unit and Age Grouping

Timing of Assessment: Completion of proposed LTMD, and Year 7 and Year 10 Annual Reports.

How Measured: SFMM Crown productive forest unit area grouped by (a) young/immature and (b) mature and late successional age groupings projected through time.

Desirable Level: The desirable level is to achieve and maintain productive forest area by forest unit and age grouping at or above the minimum SRNV area projected by OLT (Table 13**Table 25**).

Table 13 Minimum Desirable Area by Forest Unit and Age Grouping

Forest Unit / Age Grouping	Plan Start Ha.	Min. Desirable Ha.
BFM - Young/Immature	18,788	1,948
- Mature/Late	8,361	8,361
CMX - Young/Immature	57,387	11,696
- Mature/Late	31,106	24,197
HMX - Young/Immature	51,632	21,591
- Mature/Late	55,608	19,993
OCL - Young/Immature	187	465
- Mature/Late	2,029	1,499
OTH - Young/Immature	162	448
- Mature/Late	1,833	1,240
PJD - Young/Immature	133,098	106,124
- Mature/Late	49,734	52,493
PJM - Young/Immature	29,870	36,541
- Mature/Late	31,975	27,435
POD - Young/Immature	26,658	12,670
- Mature/Late	47,319	12,933
PRW - Young/Immature	635	635
- Mature/Late	2,677	1,367
SBL - Young/Immature	6,945	3,667
- Mature/Late	10,666	10,078
SPD - Young/Immature	67,038	6,479
- Mature/Late	45,748	34,643
SPM - Young/Immature	24,292	17,441
- Mature/Late	21,645	21,733

Target Level: The target level is the same as the desirable level to be measured in the medium term (30-80 years).

Rationale for Desirable and Target Levels: The minimum Simulated Range of Natural Variation area by forest unit and age grouping summarized from the OLT model was adopted as the desirable level for this indicator. The target level was the same as the desirable level but measured in the medium term.

Many forest unit/age grouping areas achieve desirable levels with Plan Start conditions, however some forest unit/age grouping areas are projected to need more time to achieve desirable levels. The medium-term timeframe for target achievement is needed to stabilize the majority of forest unit – age grouping classes. With 12 forest units each having two age groupings, there is considerable variation in movement towards or away from the desirable levels in any given 10-year term. Therefore, a medium-term target was selected since shorter term assessment for overall forest condition achievement would be problematic (how to assess if several of the 24 forest unit – age combinations were not at desirable levels at various times) and this indicator was considered less critical to achieve in the short or medium term as compared to landscape classes (Indicator 2a), old forest area (Indicator 2c) or upland pine and spruce forest area (Indicator 2e).

Indicator: (2c) Amount and Distribution of Old Forest

This indicator is required by the FMPM and the *Old Growth Policy for Ontario's Crown Forests.*

Timing of Assessment: Completion of proposed LTMD, and
Year 7 and Year 10 Annual Reports.

How Measured: SFMM old forest grouping area projected through time. Old forest groups and definitions are based on late successional (old) forest classification from the OLT model summarized into forest unit old forest groupings.

Desirable Level: The desirable level is to achieve and maintain old forest area by forest unit group at or above the minimum desirable hectares (Table 14).

Table 14 Minimum Desirable Percentage by Old Forest Group

Forest Unit Group / Onset Age (years)	Plan Start Level (ha)	Minimum Desirable Level (ha)
OLD - BFo >80 years	3,707	5,315
OLD - CLo >100 years	1,851	1,328
OLD - CMo >100 years	8,730	20,665
OLD - HWo >100 years	16,931	7,050
OLD - OHo >90 years	1,252	992
OLD - PJo >100 years	23,267	20,800
OLD - SLo >160 years	2,007	3,319
OLD - SPo >110-120 years	10,155	25,840
OLD - PRW >140 years	457	457

Target Level: Overall movement towards desirable level as projected for the end of the plan period.

Rationale for Desirable and Target Levels: The Ontario Landscape Tool (OLT) provides an analytical projection of the range of forest types/age class structure for the Whiskey Jack Forest. The desirable level was set be a minimum of the SRNV by old forest grouping. Red pine and white pine forest area is not well represented in the OLT model. Therefore the desirable level for PRW Old Forest was set to maintain a minimum of area as existed at Plan Start. The target level allows overall movement towards the desirable level within this 10-year plan period, with allowance for minor deviations by individual old forest groupings.

Indicator: (2d) Amount of Red Pine and White Pine Forests

This indicator addresses the *Old Growth Policy for Ontario's Crown Forests*.

Timing of Assessment: Completion of proposed LTMD, and
Year 7 and Year 10 Annual Reports.

How Measured: SFMM PRW productive forest unit area (all ages) projected through time.

Desirable Level: The desirable level is to maintain a minimum of the Plan Start area of the PRW forest unit (3,312 ha).

Target Level: Same as desirable level.

Rationale for Desirable and Target Levels: The Planning Team investigated the estimated amount of red pine and white pine forest that would occur in the natural forest through use of the Ontario Landscape Tool natural simulation. The PRW Plan Start value from the OLT Tool was reported to be 856 hectares, significantly lower than our inventory data. The current forest inventory has 3,312 hectares of PRW forest unit area at Plan Start, an amount thought by the Planning Team to be less than historically occurred. The discrepancy between PRW estimates in the inventory and OLT model were discussed and the conclusion was that the OLT model did not accurately define the PRW land base. Therefore, unlike other forest condition indicators, the OLT SRNV was not used as the desirable level for this indicator and the Planning Team developed a different approach.

The Planning Team recognized the need to maintain the current area of red pine and white pine forest and preferably increase the PRW forest area through time. Strategic modelling over the next 100+ years suggested the desirable level was achievable and therefore the target level was the same as the desirable level. Since strategic modelling is less reliable the farther into the future that is projected, achievement of this indicator beyond 100 years was not forced in the LTMD through modelling constraints.

Indicator: (2e) Amount of Upland Pine and Spruce Forest

While not required, this indicator is suggested by the Science and Information in support of Ontario's Forest Management Guide for Boreal Landscapes and was endorsed by the Planning Team for inclusion in the plan.

Timing of Assessment: Completion of proposed LTMD, and
Year 7 and Year 10 Annual Reports.

How Measured: SFMM productive forest unit area projected through time for the PJD, PJM, SPD and SPM forest units.

Desirable Level: The desirable level is to maintain a minimum of 457,260 ha upland pine and spruce as per OLT minimum SRNV projections for upland conifer.

Target Level: Movement towards the desirable level in this 10-year plan period.

Rationale for Desirable and Target Levels: The Ontario Landscape Tool (OLT) provides an analytical projection of the range of forest types for the Whiskey Jack Forest including the estimated range upland conifer in the natural forest. OLT projected a minimum of 457,260 hectares of upland conifer (jack pine and spruce) which was adopted as the desirable level. Strategic modelling confirmed that this desirable level was achievable, though the Planning Team was very aware that this magnitude of increase in upland conifer as compared to the Plan Start level (403,400 ha) would be a significant consideration during development of Silvicultural Ground Rules (Section 4.2.2.1, Table FMP-4) and Operational Planning (harvest Section 4.3 and Renewal and Tending Section 4.4). Therefore, movement towards the desirable level in this plan period was adopted as the target level.

3.5.2.3 Objective 3: Wildlife Habitat

Objective 3: Wildlife Habitat:
"To maintain forest function for wildlife habitat in the management unit."

This objective is carried forward from the 2004 FMP and also addresses an indicator of non-spatial wildlife habitat from the *Forest Management Planning Manual (2009)* required for this FMP. The indicator for marten core habitat area management is carried forward from the 2004 FMP in accordance with the *Forest Management Guidelines for the Provision of Marten Habitat (MNR, 1996)* and also is a landscape pattern indicator for this plan.

Indicator: (3a) Area of Habitat for Forest-dependent Species At Risk

This indicator is required by the FMPM (2009) and recognizes the special consideration for Species At Risk and their habitat as mandated by the Endangered Species Act (provincial) and Species At Risk Act (federal). Woodland caribou habitat is the only Species at Risk habitat measured for this indicator. The successful implementation of prescriptions for the protection of Species At Risk habitat values will be assessed in Indicator 10a.

Timing of Assessment: Completion of proposed LTMD, and
Year 10 Annual Report.

How Measured: SFMM model includes extra "species" in yield curves to track area by caribou habitat type (3 types: refuge, winter used and winter preferred). Non-spatial caribou habitat is measured for the caribou zone only (not the entire forest).

Desirable Level: The desirable level is to achieve and then maintain preferred habitat for Species At Risk (woodland caribou) at or above minimum SRNV level (Table 15).

Table 15 Minimum Desirable Habitat for Species At Risk

Wildlife Habitat in caribou zone	Plan Start Level (ha)	Minimum Desirable Level (ha)
Caribou - refuge	103,969	147,605
Caribou - winter used	45,055	26,809
Caribou - winter preferred	20,581	36,912

Target Level: Movement towards desirable level over next 30 years.

Rationale for Desirable and Target Levels: The Ontario Landscape Tool (OLT) provides an analytical projection of the range of forest types and age structure for the Whiskey Jack Forest including the estimated range caribou habitat within the caribou zone. OLT projections were reviewed and SFMM investigations confirmed these minimum SRNV levels were achievable and sustainable. Therefore the desirable level was accepted by the Planning Team. The target level was adjusted to allow a 30 year timeframe for achievement of the desirable level since caribou refuge and winter preferred habitats are projected to not move towards the desirable level in Term 2 (both) or Term 3 (winter preferred only), but do achieve and maintain the target levels from Term 4 onwards.

Indicator: (3b) % of Polygons with >60% Caribou Refuge Habitat in Caribou Zone

Timing of Assessment: Completion of proposed LTMD, and Year 10 Annual Report.

How Measured: Spatial measurement in OLT model at 6,000 ha and 30,000 ha scales.

Desirable Level: The desirable level is to have the landscape pattern consistent with OLT percentage projections for caribou refuge habitat in the caribou zone established for the forest (Table 16).

Table 16 Desirable Level for Percent of Polygons with >60% Caribou Refuge Habitat

Caribou refuge habitat in caribou zone	Plan Start (%)	Minimum Desirable Level (%)
Scale: 6,000 ha hexagon	36%	87%
Scale: 30,000 ha hexagon	25%	92%

Target Level: Movement towards desirable level during this plan period.

Rationale for Desirable and Target Levels: This indicator is assessed to determine whether the proposed plan activities will create a landscape pattern consistent with the natural forest condition. The minimum desirable level for proportions of caribou habitat in the caribou zone were calculated by the Ontario Landscape Tool and accepted by the Planning Team as the best estimation of the natural forest condition. The target level (movement towards desirable level) recognizes that it is difficult to change a current landscape pattern to match desirable levels in one 10-year plan period given the starting point or pattern of the forest at Plan Start.

Indicator: (3c) % of Polygons with >60% Caribou Winter Habitat in Caribou Zone

Timing of Assessment: Completion of proposed LTMD, and Year 10 Annual Report.

How Measured: Spatial measurement in OLT model at 6,000 ha and 30,000 ha scales.

Desirable Level: The desirable level is to have the landscape pattern consistent with OLT percentage projections for caribou winter habitat in the caribou zone established for the forest (Table 17).

Table 17 Desirable Level for Percent of Polygons with >60% Caribou Winter Habitat

Caribou winter habitat in caribou zone	Plan Start (%)	Minimum Desirable Level (%)
Scale: 6,000 ha hexagon	0%	45%
Scale: 30,000 ha hexagon	0%	40%

Target Level: Movement towards desirable level during this plan period.

Rationale for Desirable and Target Levels: This indicator is assessed to determine whether the proposed plan activities will create a landscape pattern consistent with the natural forest condition. The minimum desirable level for proportions of caribou habitat in the caribou zone were calculated by the Ontario Landscape Tool and accepted by the Planning Team as the best estimation of the natural forest condition. The target level (movement towards desirable level)

recognizes that it is difficult to change a current landscape pattern to match desirable levels in one 10-year plan period given the starting point (0%) or pattern of the forest at Plan Start.

Indicator: (3d) Landscape Pattern - Interior, Marten Core Habitat

This indicator is required by the *Forest Management Guidelines for the Provision of Marten Habitat (1996).*

Timing of Assessment: Completion of proposed LTMD, and Year 7 and Year 10 Annual Reports.

How Measured: % suitable of capable marten habitat in core areas as measured in Marten Analyst2 according to marten suitable and capable habitat definitions applied to the updated planning inventory.

Desirable Level: The desirable level is to retain 10-20% of capable marten habitat area in suitable conditions in core areas of 3,000 to 5,000 ha.

Target Level: The target level acceptable in this plan is 10-20% of capable marten habitat area in suitable conditions in core areas of greater than 1,000 ha moving towards the desirable level measured in 2072.

Rationale for Desirable and Target Levels: Investigations for wildlife habitat, including marten core areas, was conducted both spatially and non-spatially. Initially, the spatial distribution of marten core habitat areas were compared to the 2004-2024 FMP marten core areas and suitable marten habitat was assessed for this plan period through to the next 60 years. Marten cores were also compared to the dynamic caribou habitat subunits and schedule to ensure consistency. This scoping confirmed continuation of the marten cores from the 2004 FMP which set the marten habitat deferrals for the strategic modelling. The proposed spatial layout of the marten core areas was recommended by the Planning Team and reviewed by regional Plan Advisors and the Local Citizens Committees. All parties were in favour of the recommended spatial distribution of the marten core habitat areas.

Percentage suitable in cores of total capable habitat measured spatially using OMA2. Desired level reflects marten habitat guideline. Initial analysis was completed to determine a favourable core deferral scenario with respect to marten habitat and spatial distribution. Marten cores were developed to meet guideline levels and to incorporate the best concentrations of suitable habitat, spatially distributed across the forest for the next 60 years.

The target level was varied by Planning Team decision and review of core achievement analysis. The target level was reduced to allow consideration of suitable habitat in core areas of greater than 1,000 ha suitable habitat where additional core areas were spatially important on the forest. Target % levels include some smaller, higher quality cores that will provide functional marten habitat for the next 60 years. Since marten core area analyses use 20 year increments for the projected suitable habitat percentages, the timeframe for the target was extended to 60 years to coincide with the analysis time periods and projected increase in suitable core habitat through time.

Indicator: (3e) % of Conifer Dominated Upland Forest Units in Caribou Zone

This indicator contributes to the silvicultural objective requirement of *Ontario's Woodland Caribou Conservation Plan (2009)*.

Timing of Assessment: Year 7 and Year 10 Annual Reports.

How Measured: This indicator is calculated from an updated Base Model Inventory. In the caribou zone, total productive forest area of targeted conifer forest units (only PJD, PJM, SBL, SPD and SPM forest units) divided by the total productive area, expressed as a percentage. Information is reported by forest unit, but indicator is for combined total percentage of the targeted forest units in the caribou zone (not individually).

Desirable Level: The desirable level is to maintain or increase percentage of upland conifer dominated forest units in the caribou zone.

Target Level: Same as desirable level.

Rationale for Desirable and Target Levels: The specific targeted forest units are the purer conifer forest units which have the capability of producing better caribou habitat than mixedwoods do. Conifer forest composition is critical to woodland caribou habitat (Species At Risk) therefore a reduction in hardwood and mixedwood forests in the caribou zone is desirable and will result in an increase in preferred caribou habitat. The desirable and target levels are to maintain or increase the percentage of specific conifer dominated forest unit area in the caribou zone at or above the Plan Start level of 75%.

Indicator: (3f) % of Conifer Species Composition in Caribou Zone

This indicator contributes to the silvicultural objective requirement of *Ontario's Woodland Caribou Conservation Plan (2009)*.

Timing of Assessment: Year 7 and Year 10 Annual Reports.
Note: This assessment is short-term but reporting will continue over future planning periods. The assessment of conifer purity at Year 7 and 10 provide trends through time.

How Measured: Forest composition to be derived using the Base Model Inventory with the species composition string parsed out. Indicator calculated for only PJD, PJM, SBL, SPD and SPM forest units within the caribou zone: the combined species composition percentage for jack pine, black spruce and white spruce (only) is calculated, based on the area weighted average tree species composition by forest unit.

Desirable Level: The desirable level is to maintain or increase percentage of conifer species composition in the caribou zone.

Target Level: Same as desirable level.

Rationale for Desirable and Target Levels: Conifer forest composition is critical to woodland caribou habitat (Species At Risk) therefore a reduction in hardwood and mixedwood species composition in the caribou zone is desirable and will result in an increase in preferred caribou habitat. It is important to maintain the purity of conifer species composition within the targeted

forest units in order to maintain high quality caribou habitat. The desirable and target levels are to maintain or increase the percentage of jack pine, black spruce and white spruce species composition in the caribou zone at or above the Plan Start levels of:

PJD Forest Unit – 97%
PJM Forest Unit – 92%
SBL Forest Unit – 95%
SPD Forest Unit – 92%
SPM Forest Unit - 89%.

3.5.2.4 Objective 4: Wood Supply

Objective 4: Wood Supply:
"To provide a predictable and continuous supply of wood products to the forest products industry from the management unit."

This objective was included in the 2004 FMP and with similar wording in many previous forest management plans. A predictable future wood supply from the Whiskey Jack Forest was discussed by MNR, the Planning Team and LCCs as a desired forest and benefit. In recognition of the need to address short-term as well as long-term projected wood supply, an additional indicator was added to specifically measure and report achievement of wood supply for this 10-year plan period (short-term). The long-term harvest area and volume indicators are required by the *Forest Management Planning Manual (2009).*

Indicator: (4a) Long-term projected available harvest area

Timing of Assessment: Completion of proposed LTMD.

How Measured: SFMM projected available harvest area.

Desirable Level: The desirable level is to maintain an average total available harvest area above 4,100 ha/year.

Target Level: Same as desirable level measured over the long-term (100 years).

Rationale for Desirable and Target Levels: This desirable level was determined through scoping and development of the Proposed Long-term Management Direction. The target level was left the same as the desirable level as results from scoping and the LTMD supported achievement while balancing other plan objectives. The FMPM dictated that this indicator have a long-term time frame (100 years).

Indicator: (4b) Long-term projected available harvest volume by species group

Timing of Assessment: Completion of proposed LTMD.

How Measured: SFMM projected annual harvest volumes by species group.

Desirable Level: The desirable level is to achieve the highest possible long-term annual harvest volumes by species group while maintaining a balance of objective achievement.

Target Level: Same as desirable level measured over the long-term (100 years). The FMPM dictated that this indicator have a long-term time frame (100 years).

Rationale for Desirable and Target Levels: The desired benefit is to maximize a sustainable harvest from the forest while balancing the achievement of other non-timber objectives. Therefore the desirable and target levels are to maximize volumes through time.

Scoping investigations and development of the LTMD provided indication that the forest would be able to increase Spruce-Pine-Fir harvest volume from the current 279,000 cubic metres per year to sustainable levels of approximately 340,000 cubic metres per year (with a few terms higher, up to as much as 400,000 cubic metres per year). Projected poplar harvest volume decreased from the short-term (200,000 cubic metres per year) to the medium-term (90,000 – 100,000 cubic metres per year). The rate of decrease in poplar volume was managed in the LTMD while balancing achievement other management objectives.

Indicator: (4c) Short-term Projected Harvest Volume Per Year

Timing of Assessment: Completion of proposed LTMD.

How Measured: SFMM projected total annual harvest volume for Term 1.

Desirable Level: The desirable level is to maintain harvest volume (all species combined) at or above 510,000 cubic metres per year for this plan (2012-2022).

Target Level: Same as the desirable level measured for this plan period.

Rationale for Desirable and Target Levels: A minimum annual volume of 510,000 cubic metres (net merchantable cubic metres, all species combined) is desirable for the short-term to ensure positive socio-economic benefits and non-timber objective achievement through this plan period. Through scoping investigations and development of the LTMD, it was confirmed by the planning team that current harvest levels could be sustained through the long-term at 450,000-500,000 cubic metres per year (therefore the target level is the same as the desirable level).

Indicator: (4d) Actual Harvest Area, by Forest Unit (% of planned harvest area)

Timing of Assessment: Year 7 and Year 10 Annual Reports.

How Measured: Actual harvest area by forest unit reported in annual reports divided by the forecast harvest areas by forest unit in the FMP, expressed as a percentage.

Desirable Level: The desirable level is to achieve the 80-100% or 90-100% of the planned harvest area by forest unit actually harvested the 10-year plan period (2012-2022) based on Table FMP-11.

Target Level: Same as desirable level measured at Plan End.

Rationale for Desirable and Target Levels: The desirable level of a minimum of 80% or 90% harvest (after reductions for inoperable, residual, etc.) is a goal, however uncertain economic times may limit markets for some harvest volumes and inoperable areas may limit some harvest areas. It was expected that the forest units with larger available harvest areas (HMX, CMX and POD) would achieve a minimum 90-100% harvested area. However forest units with smaller available harvest areas would have more variable harvest area term to term dependent on demand to harvest or markets for specific volumes and the scheduling of allocated stands in one five-year term or another. Since there is no available harvest area projected for the OCL or OTH forest units, the desirable and target levels for OCL and OTH are “not applicable”.

NOTE: Planned harvest area includes internal areas to be left unharvested during operations (inoperable, residual, etc.) therefore the desirable and target levels for actual harvest area reflect the anticipated reductions for unharvested areas (will never achieve 100% harvest).

Indicator: (4e) Actual Harvest Volume, by Species Group (% of planned harvest volume)

Timing of Assessment: Year 7 and Year 10 Annual Reports.

How Measured: Actual harvest volume reported in annual reports summarized by species group divided by the forecast harvest volumes by species group in the FMP, expressed as a percentage.

Desirable Level: The desirable level is to have 80-100% or 90-100% of the planned harvest volume by species group actually harvested during the 10-year plan period (2012-2022) based on FMP-13.

Target Level: Same as desirable level measured at Plan End.

Rationale for Desirable and Target Levels: The desirable level allowed a range of achievement to acknowledge the variability in the forest industry today. As discussed with the indicator for harvest area, the uncertain economic times we are experiencing may make it impossible to plan markets for all timber, therefore a desirable and target level range of a minimum of 80-100% by species group for the smaller species groups (White Birch and Red Pine-White Pine) with the expectation that the larger species groups (Spruce-Pine-Fir, Poplar) would achieve 90-100% harvest.

3.5.2.5 Objective 5: Managed Crown Forest

Objective 5: Managed Crown Forest:
"To provide continuous social benefits resulting from the managed, Crown forest available for timber production on the management unit."

This objective is associated with a mandatory indicator from the *Forest Management Planning Manual (2009)* required for this FMP.

Indicator: (5a) Managed Crown Forest Available for Timber Production

Timing of Assessment: Year 7 and Year 10 Annual Reports.

How Measured: Plan Start available area measured from SFMM initial land base at LTMD. Annual Report (Table AR-14 Assessment of Objective Achievement) measurements based on updated the area of productive, managed Crown forest available for timber production, in hectares, at the end of the plan period recorded and compared to the area of managed Crown forest available for timber production as projected in the forest management plan. Available area does not include parks, conservation reserves (e.g. land use decisions, non-managed ownership classifications) or unavailable production forest (e.g. actual and estimated shoreline, tourism or nest reserves). Available forest area is measured from the Base Model Inventory.

The BMI is constructed from the Planning Inventory updated for actual depletions, FTG survey results, long-term losses to non-productive land, etc. with additional forecasts for depletion and estimated reserve (unavailable) areas. The updated BMI measured for the indicator assessment includes the same classification of available area as incorporated into the SFMM model for strategic modelling for the forest management plan.

Desirable Level: The desirable level is to maintain a minimum of 570,000 hectares of Managed, Crown forest available for timber production through time.

Target Level: Same as desirable level.

Rationale for Desirable and Target Levels: Used SFMM scoping analysis to determine desirable and target levels. Desirable level is achievable as the forest is reasonably well accessed now which will minimizes further losses of available forest to roads and landings (classified as non-forest).

3.5.2.6 Objective 6: Aboriginal Involvement in Planning

Objective 6: Aboriginal Involvement:
"To work with local Aboriginal peoples, whose communities are situated in or adjacent to the management unit, to identify and implement forest operations (harvest, access, renewal, maintenance and protection) that will maintain or enhance social and economic benefits to Aboriginal peoples."

For this plan, the *Forest Management Planning Manual (2009)* required a new mandatory indicator to be assessed concerning Aboriginal involvement in plan development. The Planning Team translated this requirement into two indicators associated with Aboriginal representation on the Planning Team and Aboriginal input in the planning process. These new indicators were added to address identified issues with the effectiveness of Aboriginal consultation and the quality of Aboriginal community background information prepared for the FMP.

Indicator: (6a) Representation on the Planning Team

Timing of Assessment: Draft plan (Table FMP-9).

How Measured: Review of planning team minutes and the final FMP Terms of Reference for Planning Team membership.

Desirable Level: The desirable level is to have five Aboriginal Communities located in or adjacent to the Whiskey Jack Forest with representation on the planning team, measured during plan development.

Target Level: Same as desirable level.

Rationale for Desirable and Target Levels: Aboriginal involvement on the planning team is greater than was experienced for the 2004 FMP. This is considered a significant step in engaging Aboriginal communities. There are currently five Aboriginal communities located in or adjacent to the Whiskey Jack Forest with representation on the planning team.

Indicator: (6b) Aboriginal Communities that Contribute Information to the Planning Process

Timing of Assessment: Draft plan (Table FMP-9).

How Measured: Review of planning team minutes, Community Representative meetings, the final FMP Terms of Reference for Planning Team membership and consultation records.

Desirable Level: The desirable level is to have a minimum of five Aboriginal Communities located in or adjacent to the Whiskey Jack Forest that contribute information to the planning process, measured during plan development.

Target Level: Same as desirable level.

Rationale for Desirable and Target Levels: It is desired for all affected Aboriginal communities participate in the planning process and provide input into Aboriginal reports, it is recognized that the communities that are in or adjacent to the Whiskey Jack Forest will be more engaged and should provide more input. The desirable and target levels reflect that there may be a few communities not directly impacted by operations on the Whiskey Jack Forest that do not choose to provide input. MNR efforts were directed at all affected communities to get the best response possible.

3.5.2.7 Objective 7: Local Citizens Committee Involvement

Objective 7: Local Citizens Committee Involvement:
"To have the Local Citizens Committee effectively participate in the development of the management plan."

This is a new objective for this plan included for the associated mandatory indicator from the *Forest Management Planning Manual (2009)* required for this FMP. While LCC involvement has been encouraged and well received during preparation of past plans, the quality and effectiveness of the LCC involvement will now form one of the indicators by which forest sustainability is measured.

Indicator: (7a) Local Citizens Committee's Self-evaluation of its Effectiveness in Plan Development

Timing of Assessment: Draft plan (Table FMP-9).
How Measured: Analysis of LCC completed effectiveness survey.

Desirable Level: The desirable level is to have both the LCC Effectiveness Survey results indicate at least 60% effectiveness in the development of the management plan.

Target Level: Same as desirable level.

Rationale for Desirable and Target Levels: A 50% effectiveness ranking implies neither effectiveness nor ineffectiveness. Therefore a 60% effective ranking was determined to be the minimum desirable and target level, however more favourable results (80%+) are expected.

3.5.2.8 Objective 8: Road Access

Objective 8: Road Access:
"To provide road-based access, land use and recreational opportunities through road maintenance and development of access to areas planned for harvest and renewal within the plan period."

This indicator is a new mandatory indicator of road density from the *Forest Management Planning Manual (2009)* required for this FMP. The separation of desirable levels for road density in the caribou zone and non-caribou zone are in accordance with *Ontario's Woodland Caribou Conservation Plan (2009)*.

Indicator: (8a) Kilometres of SFL Road per Square Kilometre of Crown Forest.

Timing of Assessment: Year 7 and Year 10 Annual Reports.

How Measured: The length (km) of primary and branch SFL responsibility road on the forest is measured and divided by the area of Crown productive forest (in km2).

Desirable Level: The desirable level is maintain SFL primary and branch forest access road density in the non-caribou zone at a minimum of 0.11 km/km2 productive Crown area (Plan Start density) and to maintain SFL primary and branch forest access road density in the caribou zone at a maximum of 0.13 km/km2 productive Crown area.

Target Level: Same as desirable level.

Rationale for Desirable and Target Levels: Forecasted road density at plan start for this 2012 FMP is 0.11 km/km2 in the non-caribou zone and 0.12 km/km2 in the caribou zone. Habitat management strategies suggest limited roads and trails where caribou and marten core habitat management is in effect therefore a maximum level of 0.13 km/km2 was set for the caribou zone. More road access can be created elsewhere on the management unit so as to maintain or enhance the overall access for other forest users. While different areas of the non-caribou zone will have decreased or increased road densities, the Planning Team decided to include a minimum road density for the non-caribou zone at no less than the Plan Start road density of 0.11 km/km2.

3.5.2.9 Objective 9: Forest Renewal

Objective 9: Forest Renewal:
"To successfully regenerate harvest areas to Free-Growing status in a manner that is consistent with the regeneration standards outlined in the Silvicultural Ground Rules."

This objective is related to objectives carried forward from the 2004 FMP. This objective is associated with new mandatory indicators from the *Forest Management Planning Manual (2009)* required for this FMP.

The achievement of these forest renewal indicators will demonstrate that the silvicultural strategies implemented in the FMP (Section 4.2.2.2 Silvicultural Ground Rules) are on track to achieve the desired future forest condition as projected in the LTMD. These silvicultural strategies include treatments that attempt to increase conifer dominated stands and minimize the hardwood mixedwood component as suggested by caribou habitat management (caribou zone) and suggested by the indicators for forest composition by landscape class and upland conifer (Objective 2).

Indicator: (9a) Regeneration Success: Percent of Harvested Forest Area Assessed as Free-Growing by Forest Unit

Timing of Assessment: Year 7 and Year 10 Annual Reports.

How Measured: Identify hectares harvested by term from previous Annual Reports and Year 7 and 10 Annual Reports. Identify declared successfully regenerated area by term and determine % success by forest unit. Compare to target % by forest unit.

Desirable Level: The desirable level is to achieve 95-100% of harvest area successfully regenerated to free-growing status within 10 years of harvest.

Target Level: Same as desirable level.

Rationale for Desirable and Target Levels: On the Whiskey Jack Forest, nearly 100% of harvest area assessed reaches free to grow (regeneration success) within 10 years of treatment. The range in desirable and target levels (95-100%) recognizes that spruce plantations may require a little longer than 10 years to reach FTG height therefore desired level is 95-100% success in 10 years.

Indicator: (9b) Silviculture Intensity: Planned and Actual Percent of Harvested Area Treated by Silvicultural Intensity

Timing of Assessment: Year 7 and Year 10 Annual Reports.

How Measured: Planned (target): Identify silvicultural intensity for planned harvest areas by term from the composite planning inventory, express as a percent of total harvest area. Actual: Identify hectares treated by silvicultural intensity from Annual Reports and express as percent of total harvest area.

Desirable Level: The desirable level is to achieve a minimum of 80-90% of area treated by planned silvicultural treatment intensity for each 5-year plan term (2012-2017, 2017-2022).

Target Level: Same as desirable level.

Rationale for Desirable and Target Levels: It is important that renewal treatment efforts match the level of intensity projected by the LTMD and these levels were determined to be necessary to achieve the long-term management objectives for the forest. However, variation may be acceptable if similar results can be achieved through less intensive or less costly methods, or if in fact an area requires more intensive treatment to achieve desirable results. Where one intensity level is overachieved, another is underachieved compounding the variance from planned when this indicator is reported. Therefore it was considered that a desirable level of a minimum of 80-90% treatment to planned intensities was reasonable.

Indicator: (9c) Silvicultural Success: Planned and Actual Percent of Harvested Forest Area Assessed as Free-Growing and Successfully Regenerated to the Projected Forest Unit

While regeneration success of free-growing stands is expected, there may be some areas that regenerate to forest units other than those originally planned. This indicator is a measure of silvicultural success and planning.

Timing of Assessment: Year 7 and Year 10 Annual Reports.

How Measured: Planned (target): Percentages used in strategic modelling by forest unit. Actual: Identify hectares harvested by term by forest unit from previous Annual Reports and Year 7 and 10 Annual Reports. Identify hectares declared successfully regenerated by term and forest unit and determine % of harvested area by forest unit. Compare to planned rates by forest unit.

Desirable Level: The desirable level is 70-100% of harvest area successfully regenerated to free-growing status and to the projected forest units within 10 years of harvest.

Target Level: Same as desirable level.

Rationale for Desirable and Target Levels: The desirable and target levels recognize that regeneration to forest units other than originally planned is not silvicultural success but may still result in acceptable future forest conditions that are consistent with the strategic post-renewal forest succession transitions in the LTMD. With 12 forest units on the Whiskey Jack Forest, it is usual that a 10% variance in a stand's species composition may cause an area to be classified as one forest unit rather than another. This forest unit definition variance is reflected in a minimum desirable achievement of 70% silvicultural success. It was acknowledged that there would be no strategic impact in failure to successfully regenerate area if the area was PJD versus PJM, or was SPD versus SPM therefore the choice of 70% minimum success was considered reasonable. Lower silvicultural success does not mean that the forest is not being regenerated effectively, but it does reflect the change in forest units on certain sites through time.

3.5.2.10 Objective 10: Forest Values

Objective 10: Forest Values:
"To implement forestry operations in a manner that minimizes negative impacts on all identified resource users, and protects all identified values."

This objective is associated with a new mandatory compliance indicator from the *Forest Management Planning Manual (2009)* required for this FMP.

Indicator: (10a) % of Forest Operation Inspections in Non-Compliance, By Activity and Remedy Type (i.e. severity)

Timing of Assessment: Year 7 and Year 10 Annual Reports.

How Measured: Analysis of compliance reports.

Desirable Level: The desirable level is to have a maximum 5% of forest inspections reported in non-compliance reported for each 5-year plan term (2012-2017, 2017-2022).

Target Level: Same as desirable level.

Rationale for Desirable and Target Levels: A desirable and target level of a maximum of 5% of forest operations inspections in non-compliance is an important level to achieve as this level of non-compliance is caused by activities that were not documented in the Forest Management Plan and which negatively impact upon the objectives and strategies on the Forest Management Plan. Although operations will strive for 0% non-compliance, a desirable and target level of a maximum of 5% is acceptable as generally most occurrences of non-compliances are less severe and have no long-term effect on the forest ecosystem or environment.

3.5.2.11 Objective 11: Soil and Water Resources

Objective 11: Soil and Water Resources: "To maintain productivity of soil function, and to protect water quality and fisheries habitat where forest management activities occur in the forest."

Targets for soils, fisheries and water quality objectives from the 2004 FMP are carried forward in this objective. This objective addresses required compliance indicators from the *Forest Management Planning Manual (2009).*

Indicator: (11a) % of Forest Operations Inspections in Non-Compliance with Management Practices that Prevent, Minimize or Mitigate Site Damage (by remedy type)

Timing of Assessment: Year 7 and Year 10 Annual Reports.

How Measured: Analysis of compliance reports.

Desirable Level: The desirable level is to have a maximum 5% of inspections related to prescriptions in the FMP that were developed using the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* reported as not in compliance.

Target Level: Same as desirable level.

Rationale for Desirable and Target Levels: The desirable and target levels recognize that while not desirable, an incidence of non-compliance may occur. The desirable level of no more than 5% of inspections not in compliance is a reasonable level given the importance of preventing, minimizing or mitigating site damage.

Indicator: (11b) % of Forest Operations Inspections in Non-Compliance with Prescriptions Developed for the Protection of Water Quality and Fish Habitat (by remedy type)

Timing of Assessment: Year 7 and Year 10 Annual Reports.

How Measured: Analysis of compliance reports.

Desirable Level: The desirable level is to have a maximum of 5% of inspections related to water quality and fish habitat protection prescriptions not in compliance.

Target Level: Same as desirable level.

Rationale for Desirable and Target Levels: The desirable level of no more than 5% non-compliance annually with AOC prescriptions recognizes that while not desirable, an incidence of non-compliance may occur. The maximum desirable level of 5% non-compliance is a reasonable level given the importance of protecting water quality and fish habitat.

3.6 Long-term Management Direction

A long-term management direction (LTMD) is represented by the types and levels of access, harvest, renewal and tending activities required to manage forest cover and balance the achievement of management objectives.

The Strategic Forest Management Model (SFMM) was used to develop a management strategy that balanced the achievement of all the management objectives and desirable levels as presented in Table FMP-9.

A process of repetitive analyses was conducted to balance the achievement of management objectives while developing a LTMD for the Whiskey Jack Forest. Results or findings of the scoping analyses were used to guide the balancing of management objectives. The LTMD represents a balance in the achievement of management objectives. The final digital LTMD model run (27d-OLTMS.cas) was provided for review to MNR district and region. Development of the LTMD and modelling outputs, showing how the forest is expected to develop over time in terms of forest composition and structure, and the projected types and levels of activities required to achieve management objectives are summarized in Supplementary Documentation A - Analysis Package in Section 9.0 and Appendix 3. The projected results of the LTMD are documented in FMP text sections and tables as follows:

Section 3.6.0 Development of the LTMD and Projected Forest Condition
- Section 3.6.0.1 Scoping Investigations and Development of the LTMD
- Section 3.6.0.2 Forest condition for the Crown productive forest (FMP-5)
- Section 3.6.0.3 Habitat for species at risk and selected wildlife species (FMP-6)

Section 3.6.1 Available Harvest Area by Forest Unit (FMP-7)
- Section 3.6.1.1 Available Harvest Volume by Species Group (FMP-8).

Section 3.6.2 Selection of Areas for Harvest
- Section 3.6.2.1 Harvest Area Eligibility Criteria
- Section 3.6.2.2 Harvest Area Selection Criteria
- Section 3.6.2.3 Rationale for Planned Harvest Areas by Forest Unit and Age Class

Section 3.6.3 Assessment of Objective Achievement (FMP-9)

Section 3.6.4 Social and Economic Assessment

Summaries of the desired forest and benefits, plan objectives, indicators of objective achievement, desirable levels, and targets were included in Table FMP-9 and discussed in Section 3.5. Table FMP-9 was not finalized until scoping investigations were conducted and potential desirable levels for indicators were discussed with the Local Citizens Committees (LCC)(Kenora and Red Lake).

The Long-term Management Direction was presented to and endorsed by the Planning Team, Local Citizens Committees and the Regional Director, MNR Northwest Region. Public review of the LTMD during FMP production included opportunities at Stage Two - Review of Proposed Long-Term Management Direction, and Stage Three – First Information Centre Review of Proposed Operations.

3.6.0 Development of the LTMD and Projected Forest Condition

3.6.0.1 Scoping Investigations and Development of the LTMD

Strategic analysis is an iterative process used to determine the types and levels of access, harvest, renewal, and tending activities required to balance the achievement of management objectives associated with the management of forest cover, and to develop achievable targets in the proposed long-term management direction.

Desirable levels that were not provided directly by guides or other sources of direction were refined through scoping analysis. Scoping analysis is an iterative process that involves a series of investigations to provide insight to what the forest is capable of producing in order to develop realistic and feasible desirable levels for objective indicators. Scoping investigations consider implications on wood supply, forest composition and age structure, wildlife habitat, and other non-timber resources for the short- term, medium-term, and long-term. These values were also considered throughout the 160-year planning horizon. All strategic modelling was conducted and reviewed co-operatively between the Strategic Task Team and MNR district staff, with valued input and advice from the plan advisors including regional MNR staff.

The FMP Manual requires that the establishment of targets for each indicator will consider:

(a) the current forest condition;
(b) a balance of social, economic and environmental considerations;
(c) the associated indicator and the desirable level;
(d) the potential achievement for the short term (10 years), medium term and long-term; and
(e) projections from past forest management plans and historical levels of objective achievement.

In addition, for harvest level indicators, the targets will also consider:

(a) historic wood utilization;
(b) Ontario Forest Accord Advisory Board benchmark harvest levels, as identified in the *Regional Wood Supply Strategies*; and
(c) maximum even-flow harvest volume by major species group.

The above listed forest condition, desired forest and benefits, projected achievement and harvest related investigations were all considered during scoping investigations during development of the LTMD.

The base model was used as the starting point for the development of the proposed long-term management direction. For all scoping investigations, unless specifically noted otherwise, the following management decisions were consistently included in each investigation as per the Base Model:

- management decisions for caribou management (SUBMUs and operational timing);
- large landscape patch deferrals (includes marten core habitat management);
- estimated reserve areas as per the Stand and Site Guide (riparian, nests) and estimates of known tourism reserves;
- crude control of projected TOTAL harvest volumes of +/- 20% variance allowed between 10-year terms; and

- execution of SFMM for the greatest volume of timber harvested over the entire planning period.
  Note: Volume groups are referenced as TOTAL – all species, SPF – Spruce-Pine-Fir, PO – poplar, and BIRCH – White Birch. "Terms" in the SFMM modelling are 10-year terms. All volumes are reported in net merchantable cubic metres.

Specific SFMM model inputs varied for each investigation and projected results are documented in a standardized 3-Page Summary for all documented investigations in Supplementary Documentation A – Analysis Package, Appendix 2. The Analysis Package includes additional detail on the summary and conclusions of scoping investigations (Section 8.3) and development of the LTMD (Section 9.2).

Summary of Scoping Investigation Conclusions

The following summary of scoping investigations and significant conclusions were considered in the development and rationalization of desirable levels for management indicators.

(a) An investigation into the ability of the forest to meet forest diversity and forest cover desirable levels (based on current forest condition and forest dynamics);

Based on results, it was investigated when the Simulated Range of Natural Variation (SRNV) achievement for OLT investigations could occur (e.g. in 70 years, or in 50 years).

CONCLUSION: There was no reason to not meet OLT suggested minimum levels within 50-60 years (e.g. versus not meeting levels until 70-100 years in the future) for all OLT landscape classes, old forest, upland conifer area and non-spatial caribou habitat except MLI (mature and late successional intolerant hardwood). Desirable levels for mature/late landscape class area (Indicator 2a), old forest class area (Indicator 2d), upland conifer (Indicator 2e) and caribou habitat (Indicator 3a) were agreed to be the minimum OLT SRNV levels.

CONCLUSION: It was concluded that constraints to force the general achievement of projected forest unit area by age grouping (young versus mature/late) to OLT minimum SRNV levels could not be utilized in the absence of OLT desirable level constraints. In isolation, forest unit age groupings had reasonable projections but the achievement of landscape class areas and old forest areas were negatively impacted.

CONCLUSION: Constraints for the mature age groupings by forest unit from Term 8 (70 years) were considered acceptable for forest unit / age grouping desirable levels for Indicator 2b. Control of forest unit area for the young age grouping was not considered as significant to manage as was the need to ensure sufficient area in the mature and older age grouping. The LTMD Task Team and Planning Team also agreed that the achievement of desirable levels for landscape class area was a higher priority as compared to total forest unit area through time, or forest unit by age grouping (young versus mature/late).

CONCLUSION: The total area of the PRW forest unit was consistently above the range projected by OLT (SFMM 2012 = 3,312 ha versus OLT 2012 = 856 ha at Plan Start). It was recognized that OLT does not adequately simulate the forest dynamics for red pine and white pine regeneration and natural succession. Therefore a desirable level of

maintaining a minimum of the Plan Start PRW value (no decrease) was adopted rather than a lower level prescribed by the OLT model.

CONCLUSION: The LTMD Task Team and Planning Team agreed that spatial indicators for landscape pattern/texture and caribou habitat would have desirable levels as projected by the OLT model. This represented the best science and information on natural landscape pattern. This related to Indicators 1a, 1b, 1c, 3b and 3c.

The management objectives, indicators, desirable levels and the timing of assessment for each indicator are documented in Table FMP-9.

(b) An investigation and assessment of the ability of the forest to continue to supply forest benefit levels associated with the current forest management plan;

Several items related to wood supply, forest condition and age, and wildlife habitat were reviewed to complete this assessment.

Wood Supply - First, a SFMM investigation was completed that incorporated wood supply by species group from the 2004 FMP, with the objective of sustaining 2004 wood supply levels for as many terms as possible. Targets were included for PWR (1.6 Mm3/year), SPF (400 Mm3/year), PO (265 Mm3/year) and BW (25 Mm3/year) species groups. **CONCLUSION**: The Spruce-Pine-Fir and the Red Pine-White Pine wood supplies were projected to be met for 40 years (Terms 1-4). Hardwood volumes (Poplar, Birch) were limited after Term 2 or 3 respectively. Wood supply can be comparable to the 2004 FMP for this plan period, but without added constraints to force the projected increase in hardwood volumes in Terms 3-7, future hardwood will be less than were projected in the 2004 FMP.

Productive Area by Forest Unit – This comparison is a reflection of the forest condition that contributes to other desired forest and benefits such as wildlife habitat, forest diversity and harvest area. Habitat for selected wildlife species are no longer measured in the strategic modelling, rather the combination of landscape class area, old forest groupings and landscape pattern/texture indicators are considered as better measure of forest condition. Forest units from the 2004 FMP are aligned to roughly correspond to the 2012 FMP PLANFUs, though it must be noted that this is a rough comparison only. The differences were partially due to refined forest unit definitions and should not compromise the Whiskey Jack Forest's ability to continue to provide forest benefits associated with the productive forest.

Old Forest Area – Next, the quantity of old forest was compared for Plan Start 2004 and 2012. The comparison utilizes the PLANFUs and old forest definitions used in each of the plans with 2004 PLANFUs organized and grouped to roughly align with the 2012 FMP old forest groupings. It is evident that through aging of the forest over the past eight years, significantly more area has now aged enough to be classified as old forest (2004: 19,649 ha versus 2012: 68,801 ha). Therefore, while this increase in area of old forest may be detrimental to future wood supply and provide a greater fire hazard in some portions of the forest, it does provide more of the inherent benefits associated with older forest structure (e.g. wildlife habitat for those species preferring old forest, forest diversity).

Caribou Habitat – A similar dynamic caribou habitat schedule was spatially applied for both the 2004 and 2012 forest management plan land bases. Therefore it is expected that the projected benefits to caribou are comparable for both plans.

Marten Habitat – a similar spatial distribution of marten core areas was incorporated into both the 2004 and 2012 FMPs. Plan Start achievement of % suitable of total capable % was 3.7% for the 2004 FMP (13 cores) and 4.9% for the 2012 FMP (17 cores or Large Landscape Patches). These results support the forest's ability to continue to supply spatial marten core area.

CONCLUSION: Based on the comparison of projected wood supply, productive forest area, old forest area, caribou habitat and marten habitat, it is expected that the 2012 Whiskey Jack Forest will continue to be able to supply forest benefit levels associated with the 2004 forest management plan.

Summary of LTMD Development Investigations and Conclusions

Upon completion of the investigation of the types and levels of activities and setting of desirable levels (Section 3.5.1 and 3.5.2) and conducting broad and specific scoping investigations, the Planning Team began developing a Long-term Management Direction (LTMD). This task was iterative in that various objectives were included in the strategic model and refined in multiple steps to results in a strategic option that provides a balance of achievement of all modelled management objectives. Through all iterations, the impacts of constraints/changes were reviewed with respect to forest condition (forest unit areas, caribou habitat, old forest), projected harvest areas and volume, and the projected renewal program. The results for forest condition were repeatedly compared to those projected by OLT Simulated Ranges of Natural Variation (SRNV) for the Whiskey Jack Forest, with adjustments to constraints through time added to improve consistency of results to the SRNV.

The following summary of investigations and significant conclusions were considered in the development of the Long-term Management Direction and indicator target levels.

(a) Ontario Forest Accord Advisory Board (OFAAB) benchmark harvest levels, as identified in the Regional Wood Supply Strategies.

CONCLUSION: OLT landscape indicator targets achievement was good due to the constraints added to all LTMD development scenarios. OFAAB Benchmark volume targets for PWR (0.6 Mm3/year), SPF (354 Mm3/year), PO (149 Mm3/year) and BW (4 Mm3/year) were able to be met in all terms. The PO (poplar) species group benchmark level was projected to be met in all terms except Terms 4-6.

The OFAAB historic harvest area and volume investigations are documented in text Section 3.6.1 Available Harvest Area and Section 3.6.1.1 Available Harvest Volume by Species Group.

(b) Maximum even-flow harvest volume by major species group.

The even flow (flat line) harvest volume investigations gave ballpark estimates of how much volume by species group (PWR, SPF, PO and BW) could be sustained through time if there was the same volume projected in every term. Additional information was derived

from the even-flow runs to see what volumes were projected if volumes could increase, but not decrease, between terms. This information was recorded as the non-declining volumes by species group but are not saved investigations. The non-declining information gave an indication of what terms limited the projected harvest volumes for each species group.

Results	Even Flow Volumes (m3 /year)	Non-declining volumes: (Information point only, not saved cases.)
06-Flat-PWR	1,290 m3	1,290 increases to 1,431 in T9 and then 2,178 in T13 and 2,200 in T15.
07-Flat-SPF	392,370 m3	389,174 then increases to 474,804 T7 to end.
08-Flat-PO	110,507 m3	110,051 limited to T6, then incr to 117,878 in T7. Incr to 134,591 in T15.
09-Flat-BW	17,467 m3	Same as even flow, so limited by last term.
09-Flat-TOTAL	551,399 m3	546,319 m3 to T6, then incr to 616,460 m3 in T7-T14, then incr to 705,091 m3 for T15.

CONCLUSION: Increased volumes can be realized by allowing increases in volumes between terms or by adjusting the OLT achievement targets or timeframe for achievement. Poplar volumes were confirmed to be a challenge that needed to be addressed in the LTMD, particularly for the short-term. Spruce-Pine-Fir projected volumes were generally at an acceptable level.

Various LTMD refinement runs were conducted which included additional constraints to improve projected LTMD results and operational feasibility of the LTMD:

- to balance wood flow through time;
- to optimize caribou habitat and landscape class areas through time;
- to balance the funding available for forest renewal treatments to the projected Forest Renewal Trust Fund;
- to maintain the area in the PRW forest unit;
- to fine-tune SFMM deferral timing for marten core areas, large landscape patches and operational deferrals to the dynamic caribou habitat schedule;
- to improve projected forest unit area by age grouping;
- correction of the classification of 16,000 ha SBL forest unit area (erroneously classified as SPD in the BMI) which resulted in a better correlation between strategic SFMM modelling and the OLT model, and achievement of SRNV targets, and
- reclassification of estimated previous bypass area from the available forest to reserve forest or deferrals in SFMM to better approximate the area actually feasible for allocation in this plan period. Refinement of SPF targets was also done at this time to better balance projected volumes through time.

CONCLUSION: The resulting scenario, 27d_OLTMS, was reviewed at length by the Strategic Task Team, regional advisors and Planning Team and considered a viable LTMD option. It provided a good balance of objective achievement and included forest management activities of harvest and renewal that were reasonable for the forest and had the potential to be successfully implemented.

Scenario 27d_OLTMS was selected as the Proposed Long-term Management Direction.

The following sections describe the projected forest condition, social and economic benefits and objective achievement related to LTMD 27d_OLTMS.

3.6.0.2 Forest Condition for the Crown Productive Forest

The forest condition for the Crown Productive Forest projected in the LTMD is documented in Table FMP-5 by forest unit and age class. The productive Crown forest includes managed area as well as parks and protected areas. The productive forest at 2012 Plan Start is 745,534 hectares in size. It is projected to decrease only 0.2% over 100 years to 744,231 hectares. This overall minor decrease in productive forest area is a result of projected conversion of harvested area to new (non-productive) roads and landings, and also involves an adequate program to offset needed new roads by the reclamation of unnecessary existing roads, landings, and slash/chipper debris areas (Section 4.5.8).

The Long-term Management Direction projects an increase in proportion of conifer versus hardwood leading forest units through time (ratio of 75:25 conifer to hardwood at Plan Start, and increased conifer of 81:19 at Year 100). This minor increase in conifer dominated forest unit area is consistent with movement towards the desirable level of increased conifer forest in accordance with OLT simulated range of natural variation projections. There is also a shift in forest unit areas to purer forest units with a decrease in mixedwood forest units. The CMX and HMX forest units are projected for the most significant decrease in the LTMD (33 and 57% decreases over 100 years respectively).

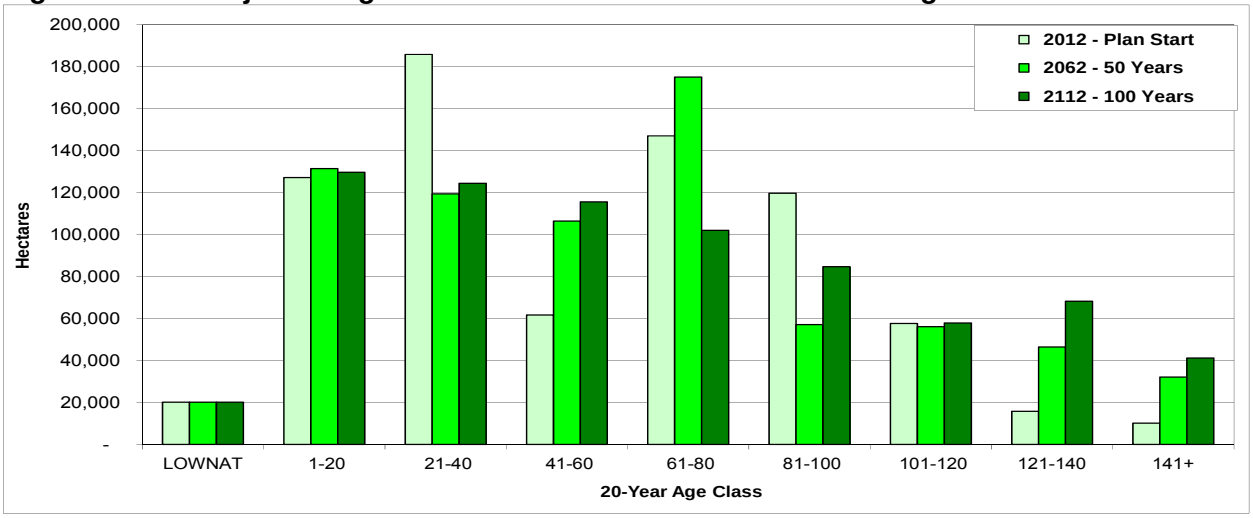
Significant increases are projected for SPM, PJM, POD and SPD forest units as a result of shifting forest composition after harvest from mixedwoods to purer forest units. This change in forest composition through time is consistent with management objectives and OLT simulated natural forest condition projections. It also is in keeping with silvicultural strategies developed by the Planning Team (Section 4.2.2.1 Silvicultural Ground Rules).

The age class distribution of the productive forest is illustrated in Figure 25 for 2012 (Plan Start), 2062 (50 years in the future) and 2112 (100 years). At Plan Start there is a disproportionately large amount of area in the 21-40 (primarily PJD resulting from 1976-1983 burns) and 61-100 year old age classes, primarily located in the HMX and CMX forest units. Through implementation of the LTMD, the age class distribution of the Whiskey Jack Forest is projected to become more normalized, with less area in the age classes below 40 years old, a gradual decrease in areas 61-100 years, and an increase in older forest area greater than 120 years old. This projected age class distribution allows for the achievement of management objectives for forest composition, age structure and provision of wildlife habitat (Section 3.5.2 and Section 3.6.3) within the simulated range of natural variation.

A discussion of changes in each forest unit area projected over the next 100 years, including a comparison between the Long-term Management Direction (LTMD)(SFMM run 27d_OLTMS) and the Simulated Range of Natural Variation (SRNV Lower Limit and SRNV Upper Limit) follows. The desirable level for indicator achievement is to maintain area by forest unit equal to or above the lower Simulated Range of Natural Variation through time. The upper SRNV is illustrated for comparison purposes, but does not form a binding target limit.

Projections for individual forest units are summarized alphabetically below and illustrated in Figure 26 (four groups of three forest units located after the forest unit summaries). LOWNAT area contributes to the productive forest area, but is considered to be constant at 20,140 hectares (all forest units combined) through time in the LTMD. LOWNAT area is not discussed in the forest unit summaries below and was also added into Table FMP-5 separate from the forest unit projected areas.

Figure 25 Projected Age Class Distribution of the LTMD Through Time



BFM Forest Unit

2012 Productive Area – 27,150 ha (4% of the total productive land base).
2112 Productive Area – 17,056 ha (2% of the total productive land base).
Trend over Time – Plan Start above SRNV range with decrease of 37% to within SRNV over 100 years.
Impact - Potential positive management implications as a reduced amount of BFM may reduce extent or duration of future spruce budworm infestations, and BFM stand harvest volumes are often lower on average than other stands. Projected BFM area closer to SRNV median through implementation of LTMD than at Plan Start.

CMX Forest Unit

2012 Productive Area – 88,492 ha (12% of the total productive land base, 2nd largest forest unit).
2112 Productive Area – 59,516 ha (8% of the total productive land base, 3rd largest forest unit).
Trend over Time – Plan Start above SRNV range with decrease of 33% to within SRNV in 80 years and sustained near SRNV median level thereafter.
Impact - Implementation of the LTMD improves the forest unit composition relative to the OLT simulated natural forest condition median level. The silviculture strategy is to direct these stands to more pure species stands. It is recognized that there are increased treatment cost implications related to hardwood vegetative control and conversion to, or maintenance of, conifer dominated forest areas. Stands with a high probability of naturally regenerating to hardwood will be left for natural regeneration, those more suitable for conifer will be regenerated to jack pine or spruce based on suitability of sites. The majority of this forest unit will be maintained in a conifer dominated condition and will still available for wildlife habitat for those species favouring conifer dominated forest types.

HMX Forest Unit

2012 Productive Area – 107,239 ha (15% of the total prod. land base, 3rd largest forest unit).
2112 Productive Area – 46,480 ha (6% of the total productive land base).

Trend over Time – Plan Start above SRNV range with decrease of 57% to within SRNV in 30 years and sustained within SRNV thereafter, trending to the lower SRNV level.
Impact - Implementation of the LTMD improves the forest unit composition relative to the OLT simulated natural forest condition. The silviculture strategy for the HMX forest unit will be to cut and naturally regenerate healthy hardwood stands to more pure hardwoods and to regenerate poor and off site hardwood stands to more suitable conifer species. There are no negative management implications related to the decrease in HMX area as the majority will be converted to poplar dominated stands.

OCL Forest Unit

2012 Productive Area – 2,217 ha (<1% of the total productive land base).
2112 Productive Area – 2,205 ha (<1% of the total productive land base).
Trend over Time – Plan Start level remains stable above the lower SRNV. This forest unit is forest composition and ecosite-based therefore it is not expected to have any changes to the area occupied by OCL.
Impact - The silviculture strategy for the OCL forest unit will be to primarily leave for natural regeneration or plant to black spruce if the site is suitable. There are no specific management implications for the OCL forest unit as the change in area through time is projected to be minimal.

OTH Forest Unit

2012 Productive Area – 1,995 ha (<1% of the total productive land base).
2112 Productive Area – 1,995 ha (<1% of the total productive land base).
Trend over Time – Plan Start within lower SRNV range and remains stable throughout planning horizon.
Impact - Black ash reproduces vegetatively very well after harvesting and fire, therefore the forest unit area is expected to remain stable through time with no impacts of implementing the LTMD.

PJD Forest Unit

2012 Productive Area – 182,832 ha (25% of the total productive land base, largest forest unit).
2112 Productive Area – 171,417 ha (24% of the total productive land base).
Trend over Time – Plan Start above the lower SRNV range and remains relatively stable through time.
Impact – There are no expected impacts due to the stability of area in the PJD forest unit within the OLT SRNV. The primary silviculture strategy for the PJ1 forest unit will be to regenerate it back to jack pine primarily through aerial seeding. This management strategy will ensure a future supply of jack pine harvest volumes and maintained provision of habitat in the future for those species favouring jack pine dominated habitat (e.g. moose favouring young seral stages of jack pine, and all other selected species (except deer) favouring mature and late seral stages of jack pine).

PJM Forest Unit

2012 Productive Area – 61,845 ha (9% of the total productive land base).

2112 Productive Area – 84,655 ha (12% of the total productive land base).
Trend over Time – Forest unit area at Plan Start starts marginally below the lower SRNV, then increases during this plan period to within the SRNV. Long-term trend is a gradual increase of 37% over 70 years, then remaining stable at this level within the SRNV.
Impact - The increase and maintenance of the PJM forest unit area is in accordance with the SRNV. The primary silviculture strategy for the PJM forest unit will be to regenerate it back to jack pine through aerial seeding. There may be some sites with heavier competition or finer soils that will be more suitable for planting black spruce. The maintenance of this forest unit area provides a stable future supply of timber and habitat for those many species that prefer upland conifer habitat (e.g. moose favouring young seral stages of jack pine, and all other selected species (except deer) favouring mature and late seral stages of jack pine).

POD Forest Unit

2012 Productive Area – 73,977 ha (10% of the total productive land base).
2112 Productive Area – 92,120 ha (13% of the total productive land base).
Trend over Time – Plan Start POD area is above the upper SRNV and increases 25% over 100 years.
Impact – The POD forest unit after harvest will generally be left for natural poplar regeneration. The increase in purer poplar dominated stands will produce more economical harvest opportunities to supply poplar markets in the future as there are less secondary tree species harvested that need to be marketed in small quantities. Poplar harvest volume is expected to be fully utilized regardless if it is harvested from the POD forest unit area (increases through time), or if it is harvested from the CMX and HMX forest unit areas (decrease through time). The stand structure of POD stands is less diverse than HMX or CMX. The provision of wildlife habitat is similar for these forest units with no significant negative implications on wildlife habitat expected through implementation of the poplar renewal strategies and reduction in area of mixedwood forest in this LTMD, consistent with the OLT simulated natural forest condition for those forest units.

PRW Forest Unit

2012 Productive Area – 3,312 ha (<1% of the total productive land base).
2112 Productive Area – 3,923 ha (1% of the total productive land base).
Trend over Time – PRW area increases slightly over the next 100 years (18%, 600 ha). The OLT SRNV did not correlate well to the PRW forest unit land base therefore the projection is not compared to the SRNV.
Impact – The strategic modelling for the LTMD was constrained to ensure that there was no decrease in the PRW forest unit area from the Plan Start level in order to maintain of the forest unit area through time. The silviculture strategy will be to plant sites that have a component of white pine and/or red pine in the parent stand and sites that are suitable to increase the presence of this forest unit over time. Red pine is not difficult to regenerate, however, white pine is more difficult to regenerate with survival to maturity due to the white pine weevil and white pine blister rust infection and mortality. Renewal strategies will primarily focus efforts on regenerating red pine mixed with other species in order to increase the PRW forest unit area in the future. Minimal white pine is expected to be planted in harvest areas due to the challenges in survival to maturity. Management strategies and conservation of existing forest must be considered including the retention of any white pine trees encountered in harvest areas. The retention of these white pine trees will aid the maintenance and restoration of this forest unit.

SBL Forest Unit

2012 Productive Area – 17,611 ha (2% of the total productive land base).
2112 Productive Area – 17,620 ha (2% of the total productive land base).
Trend over Time – SBL forest unit productive area is stable within the SRNV from Plan Start throughout the entire planning horizon.
Impact – The SBL forest unit is defined by lowland ecosites dominated by black spruce therefore there is minimal conversion of harvest area into or out of the SBL forest unit through time. By harvesting lowland sites, water tables can increase and convert these areas to non-forest if trees are not promptly regenerated. The silvicultural strategy for the SBL forest unit will be to leave these stands for natural regeneration after harvest unless there are some suitable areas for planting to black spruce. It is expected that on most sites black spruce will promptly naturally regenerate or will have sufficient advance growth to re-establish productive stands, with minimal increase in the level of the water table.

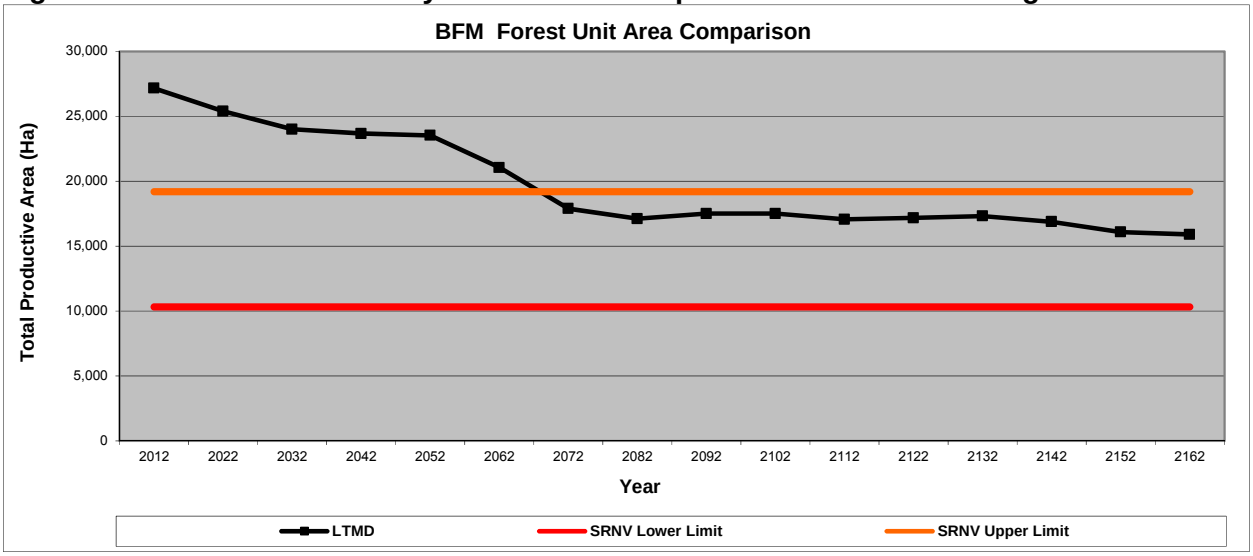
SPD Forest Unit

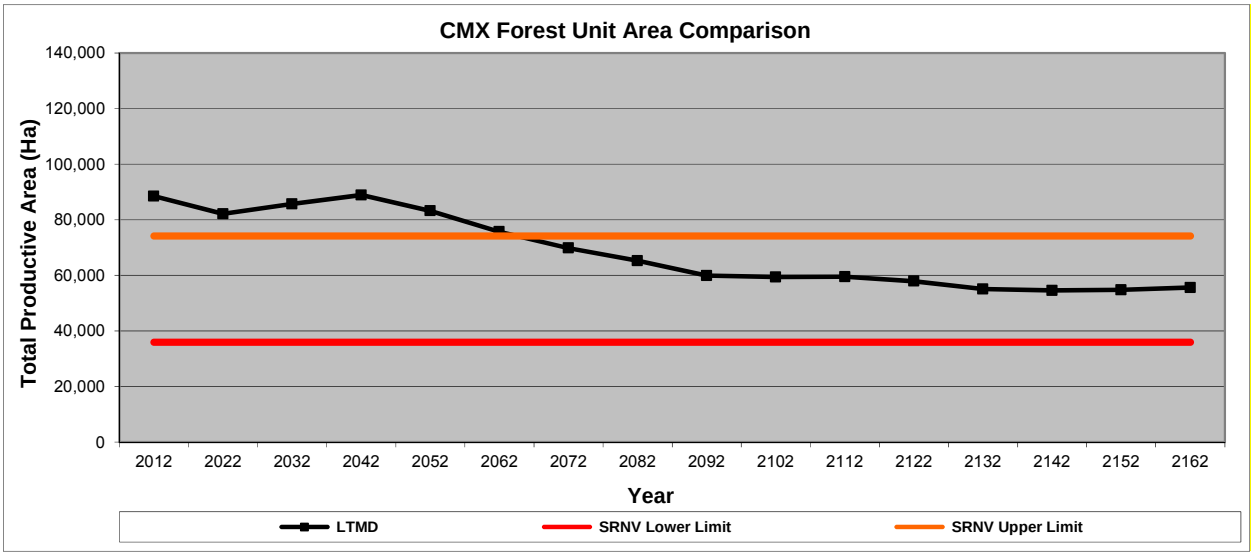
2012 Productive Area – 112,785 ha (16% of the total prod. land base, 2nd largest forest unit).
2112 Productive Area – 136,698 ha (19% of the total productive land base).
Trend over Time –SPD productive area is above the upper SRNV at Plan Start and continues to increase (21%) over the next 100 years.
Impact – OLT SRNV related plan objectives, particularly for upland conifer dominated forest and caribou habitat, contribute to the significant increase projected for the SPD forest unit area. The amount of reserved forest area (e.g. parks, protected areas, riparian reserves, nest reserves) through time with natural forest succession contribute to the increase in SPD area. The silviculture strategy for the SPD forest unit will be to plant to spruce unless the sites are coarse and dry and more suitable for regeneration to jack pine. Herbicide will be necessary where hardwood regeneration threatens to inhibit spruce growth and development. An increase in spruce composition through renewal treatments will convert some SPM sites to the SPD forest unit after treatment. Older SPD area is a preferred wildlife habitat for many wildlife species in the Boreal Forest. The increase in SPD forest unit area may have a moderately positive impact on wildlife habitat as most of this increase in SPD area is a result of conversion of SPM to a more pure forest unit.

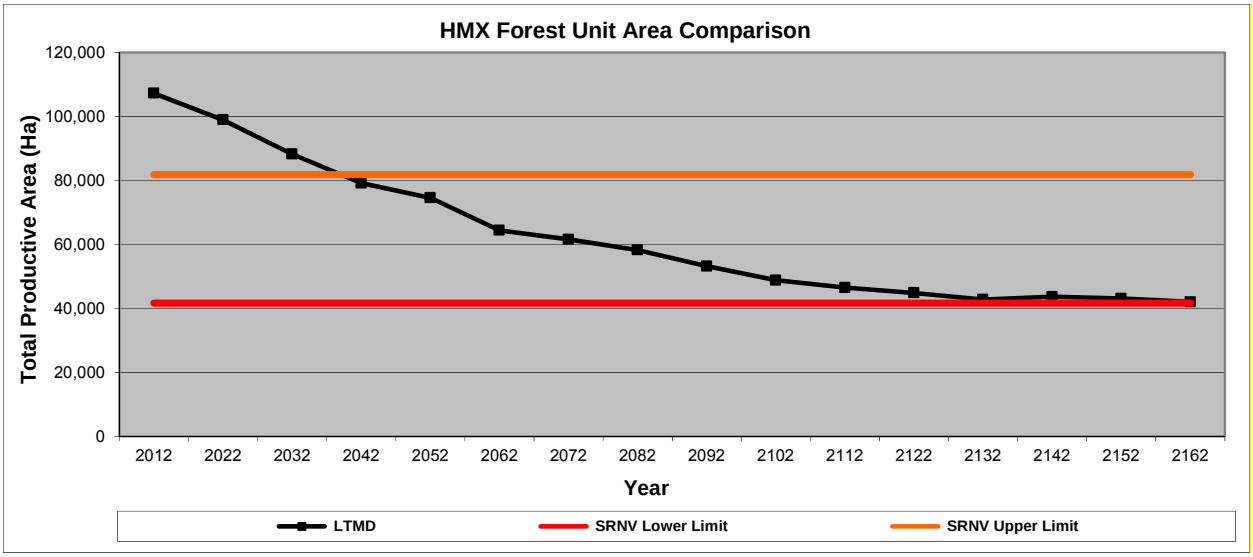
SPM Forest Unit

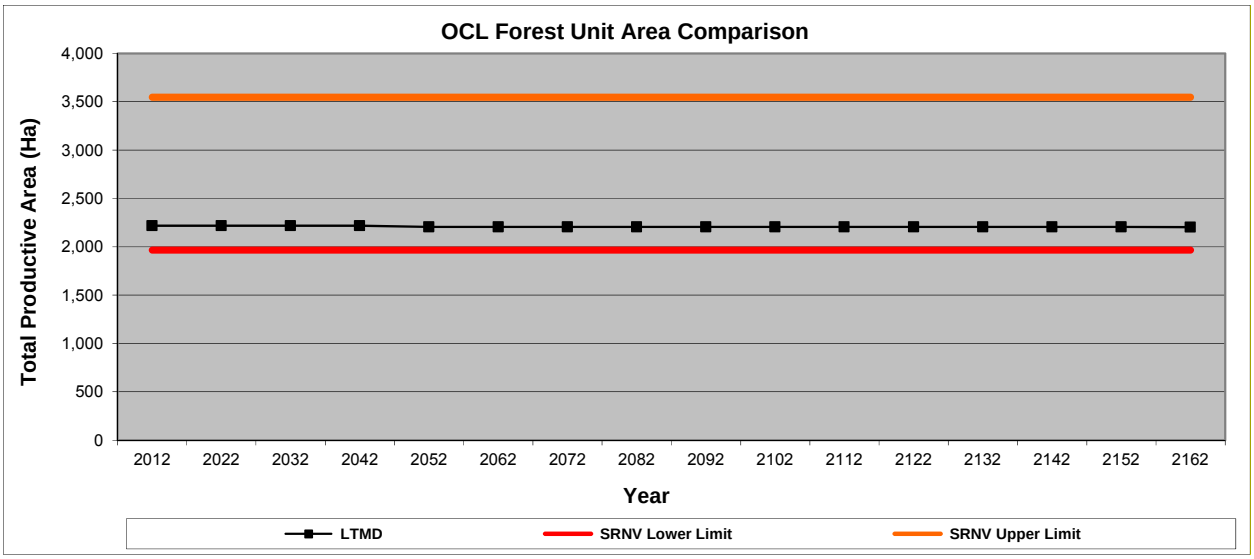
2012 Productive Area – 45,937 ha (6% of the total productive land base).
2112 Productive Area – 90,406 ha (12% of the total productive land base).
Trend over Time – Plan Start productive area is at the lower SRNV. SPM area increases 80 years to the upper SRNV level. At that time it is projected to increase slightly and stabilize above the upper SRNV.
Impact – The silviculture strategy for the SPM forest units will be to plant these areas after harvest to black spruce unless the sites are coarse and dry and more suitable for regeneration to jack pine. The increase of this SPM forest unit area is projected to contribute to the desirable levels for upland conifer forest and caribou habitat on the forest. Implementation of the LTMD to increase the SPM and SPD forest unit areas is consistent with the OLT simulated natural forest condition.

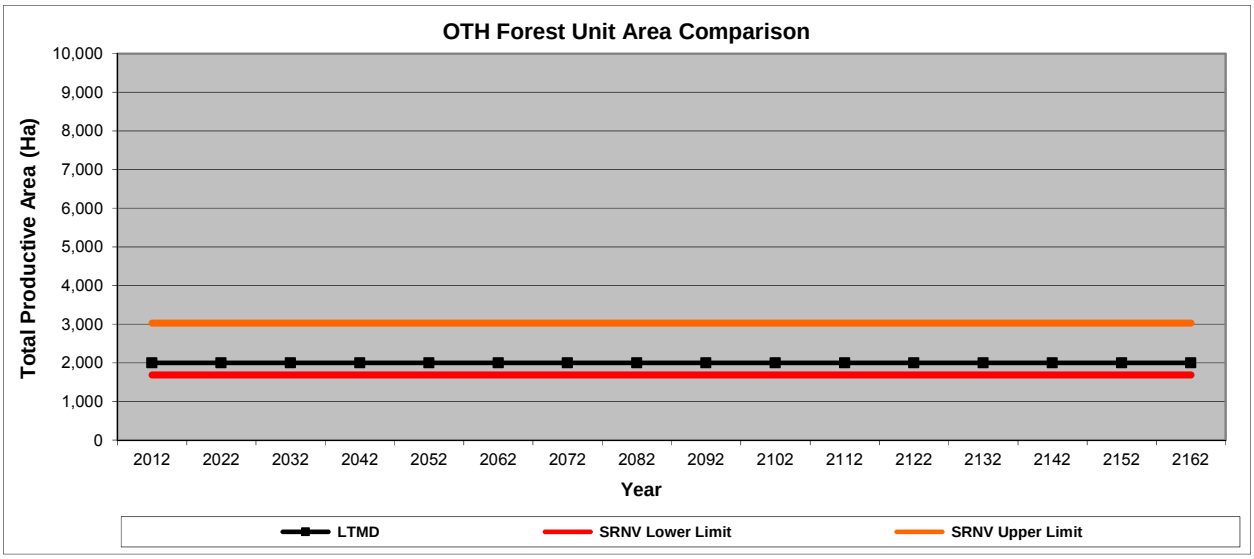
Figure 26 Productive Forest by Forest Unit Comparison to the SRNV Range

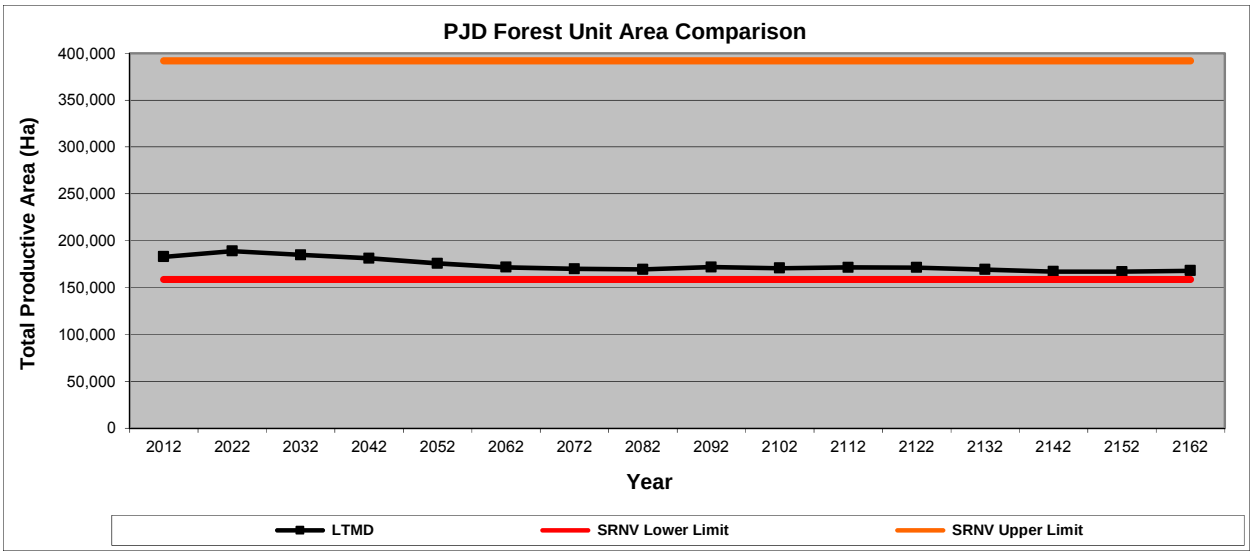


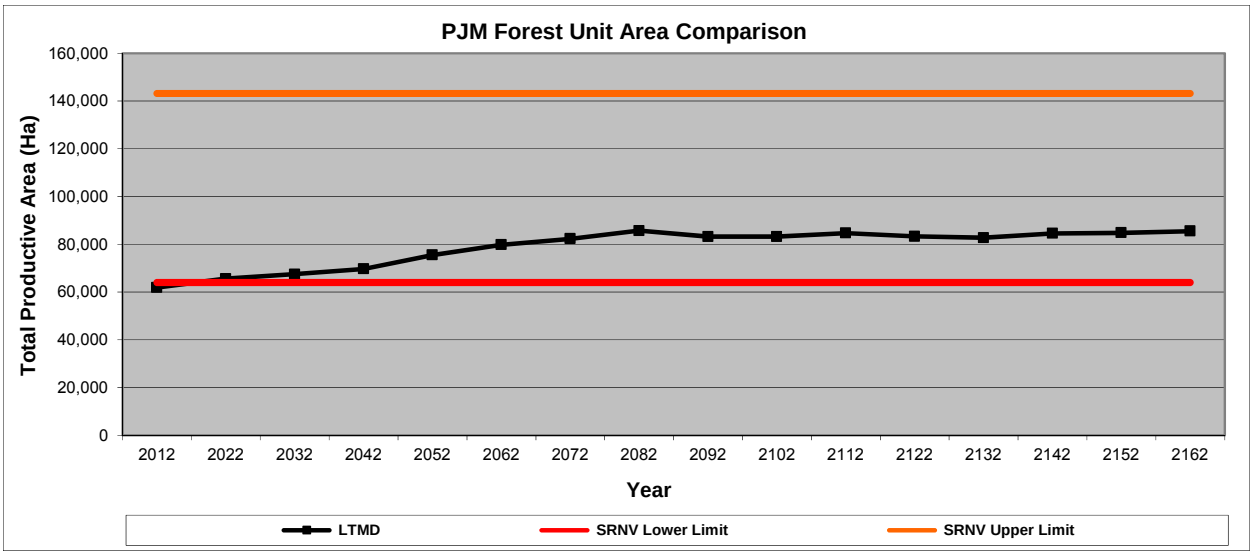




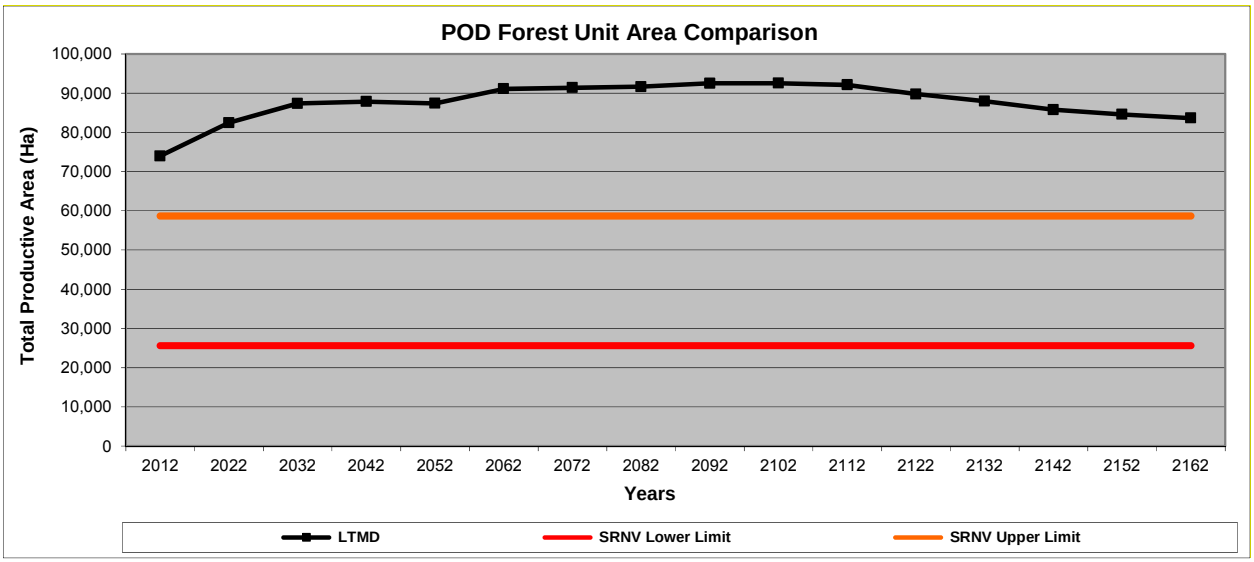

OCL Forest Unit Area Comparison
Total Productive Area (Ha)
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
2012 2022 2032 2042 2052 2062 2072 2082 2092 2102 2112 2122 2132 2142 2152 2162
Year
LTMD
SRNV Lower Limit
SRNV Upper Limit


OTH Forest Unit Area Comparison
Total Productive Area (Ha)
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2012 2022 2032 2042 2052 2062 2072 2082 2092 2102 2112 2122 2132 2142 2152 2162
Year
LTMD
SRNV Lower Limit
SRNV Upper Limit

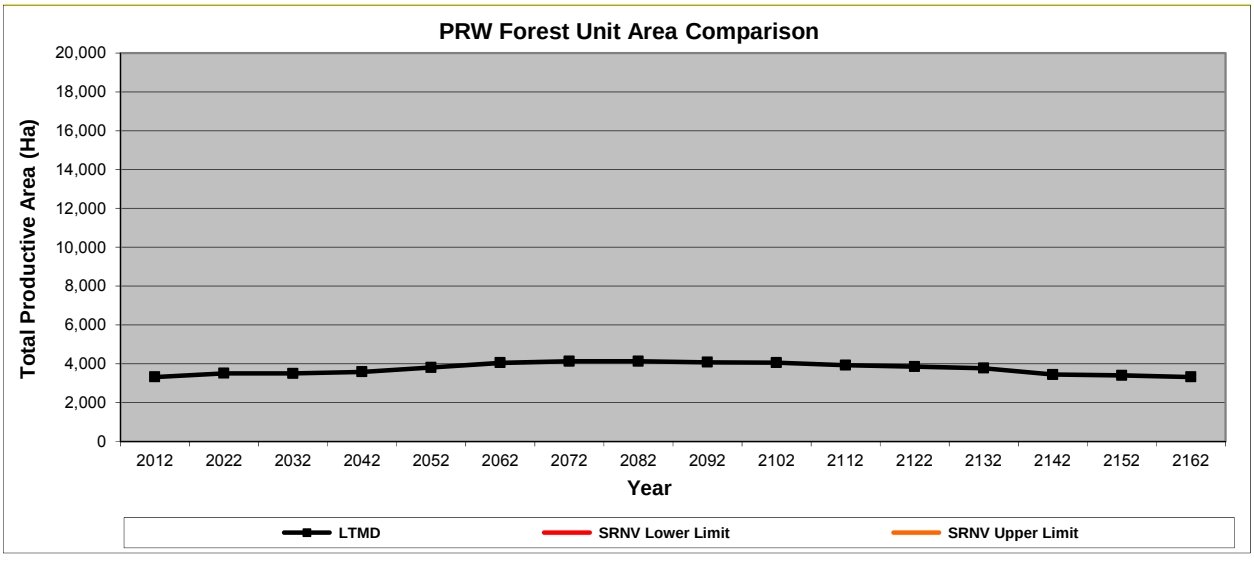

PJD Forest Unit Area Comparison
Total Productive Area (Ha)
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
2012 2022 2032 2042 2052 2062 2072 2082 2092 2102 2112 2122 2132 2142 2152 2162
Year
LTMD
SRNV Lower Limit
SRNV Upper Limit


PJM Forest Unit Area Comparison
Total Productive Area (Ha)
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
2012 2022 2032 2042 2052 2062 2072 2082 2092 2102 2112 2122 2132 2142 2152 2162
Year
LTMD
SRNV Lower Limit
SRNV Upper Limit

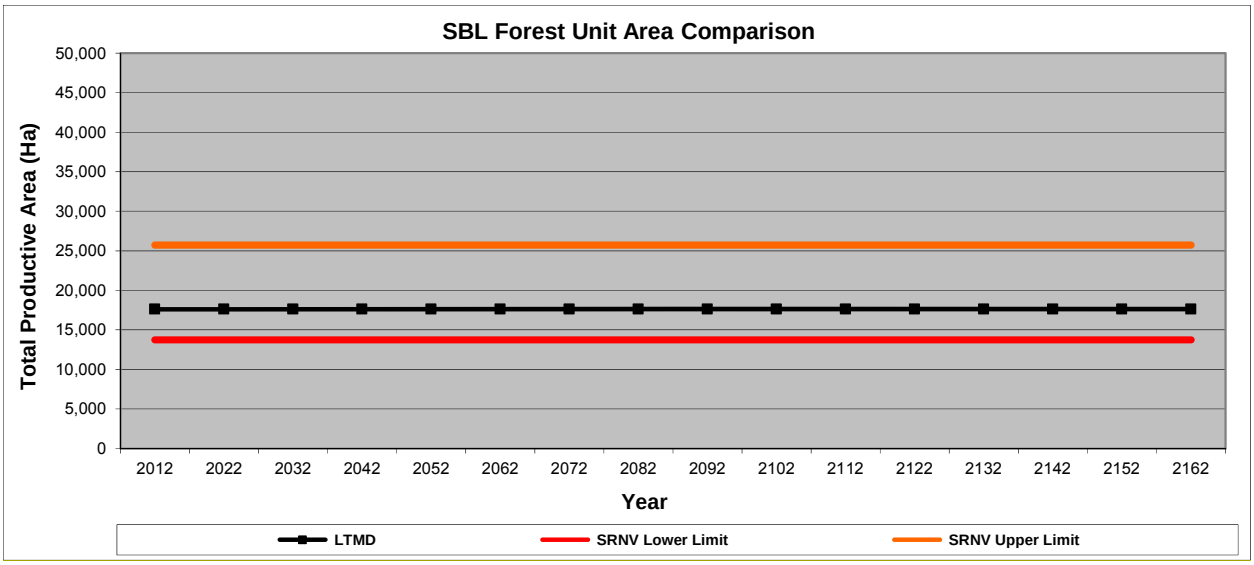
1
2


POD Forest Unit Area Comparison
Total Productive Area (Ha)
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
2012 2022 2032 2042 2052 2062 2072 2082 2092 2102 2112 2122 2132 2142 2152 2162
Years
LTMD
SRNV Lower Limit
SRNV Upper Limit

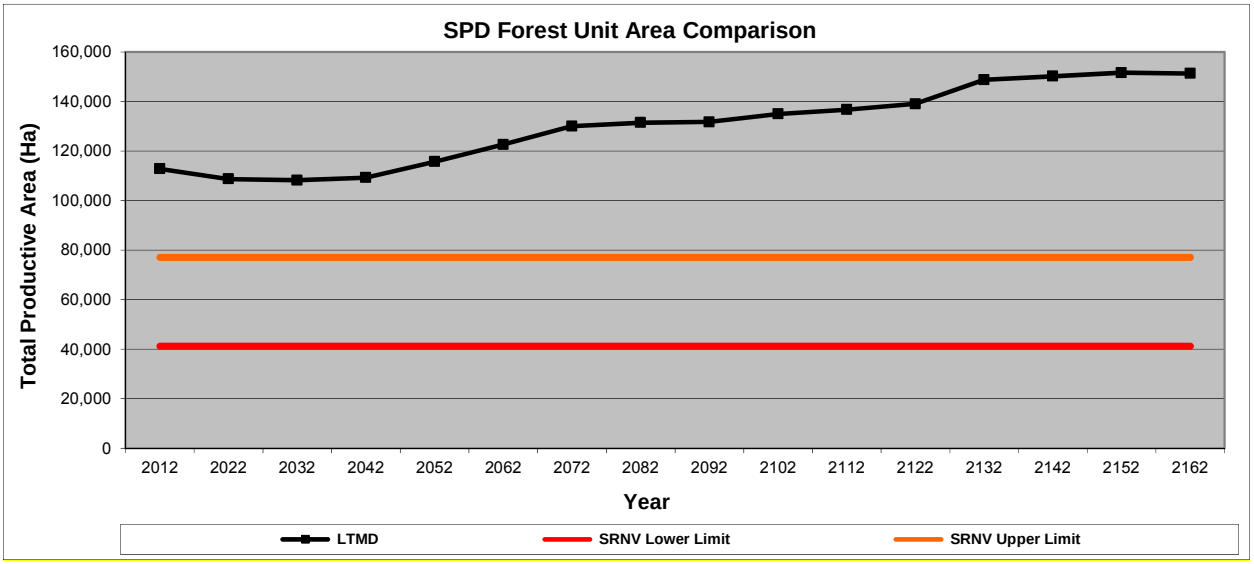
3
4


PRW Forest Unit Area Comparison
Total Productive Area (Ha)
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
2012 2022 2032 2042 2052 2062 2072 2082 2092 2102 2112 2122 2132 2142 2152 2162
Year
LTMD
SRNV Lower Limit
SRNV Upper Limit

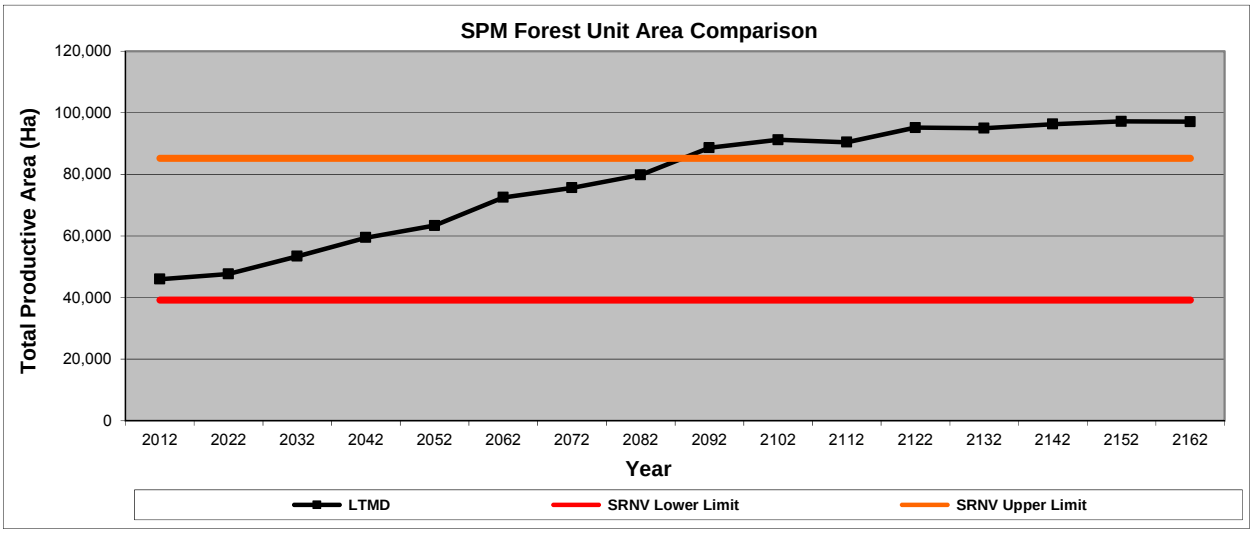
5
6


SBL Forest Unit Area Comparison
Total Productive Area (Ha)
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
2012 2022 2032 2042 2052 2062 2072 2082 2092 2102 2112 2122 2132 2142 2152 2162
Year
LTMD
SRNV Lower Limit
SRNV Upper Limit

1
2


SPD Forest Unit Area Comparison
Total Productive Area (Ha)
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
2012 2022 2032 2042 2052 2062 2072 2082 2092 2102 2112 2122 2132 2142 2152 2162
Year
LTMD
SRNV Lower Limit
SRNV Upper Limit

3
4


SPM Forest Unit Area Comparison
Total Productive Area (Ha)
120,000
100,000
80,000
60,000
40,000
20,000
0
2012 2022 2032 2042 2052 2062 2072 2082 2092 2102 2112 2122 2132 2142 2152 2162
Year
LTMD
SRNV Lower Limit
SRNV Upper Limit

5

3.6.0.3 Habitat for Species At Risk and Selected Wildlife Species

The projected habitats for the Species At Risk (SARs) and selected wildlife species for this FMP are documented in Table FMP-6. FMP-6 documents habitat from Plan Start through the 100-year projections. The following text describes the changes in habitat levels over the next 100 years, and any implications of the projected habitat level changes. The projected area of habitat for species at risk and selected wildlife species (FMP-6) is portrayed graphically in this section of the plan.

The woodland caribou is the only species at risk with habitat managed at the landscape level and modelled strategically through time in the LTMD. Habitat reported in this FMP for the woodland caribou includes caribou refuge habitat and caribou winter habitat (both used and preferred classifications reported). Caribou habitat through time is discussed below in relation to the desirable level which is the OLT Simulated Range of Natural Variation (SRNV).

Caribou Refuge Habitat – Whiskey Jack Forest caribou refuge habitat at Plan Start is lower than the OLT SRNV lower limit, however through implementation of the LTMD, projected caribou refuge habitat reaches and sustains SRNV levels throughout the rest of the 160-year planning horizon (Figure 27). Strategic modelling inputs were included to ensure desirable results for caribou refuge habitat through time.

Caribou Winter Habitat – Caribou used winter habitat at Plan Start is at the upper SRNV and increases above the SRNV throughout the 160-year planning horizon as projected in the LTMD (Figure 28). Caribou preferred winter habitat at Plan Start is below the SRNV and is projected to increase over 30-40 year to within the desirable SRNV level, and remain within the SRNV throughout the planning period (Figure 29). Since caribou is a threatened species, the Planning Team agreed to not force a reduction in caribou winter used habitat in the LTMD, just to match the SRNV. In this case, overachievement of caribou habitat through time was considered a positive LTMD outcome and supported by the Planning Team, MNR and the LCC.

Implementation of the LTMD is projected to improve and sustain desirable levels of caribou refuge and winter habitat through time.

Figure 27 Species At Risk Habitat Through Time – Caribou Refuge

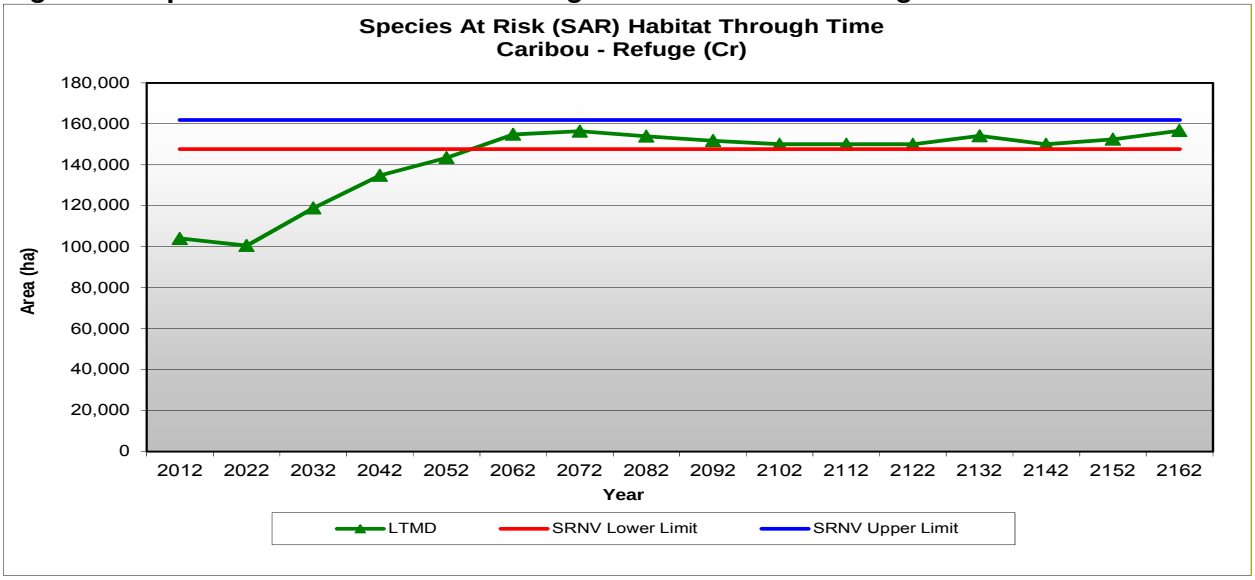


Figure 28 Species At Risk Habitat Through Time – Caribou Winter Used

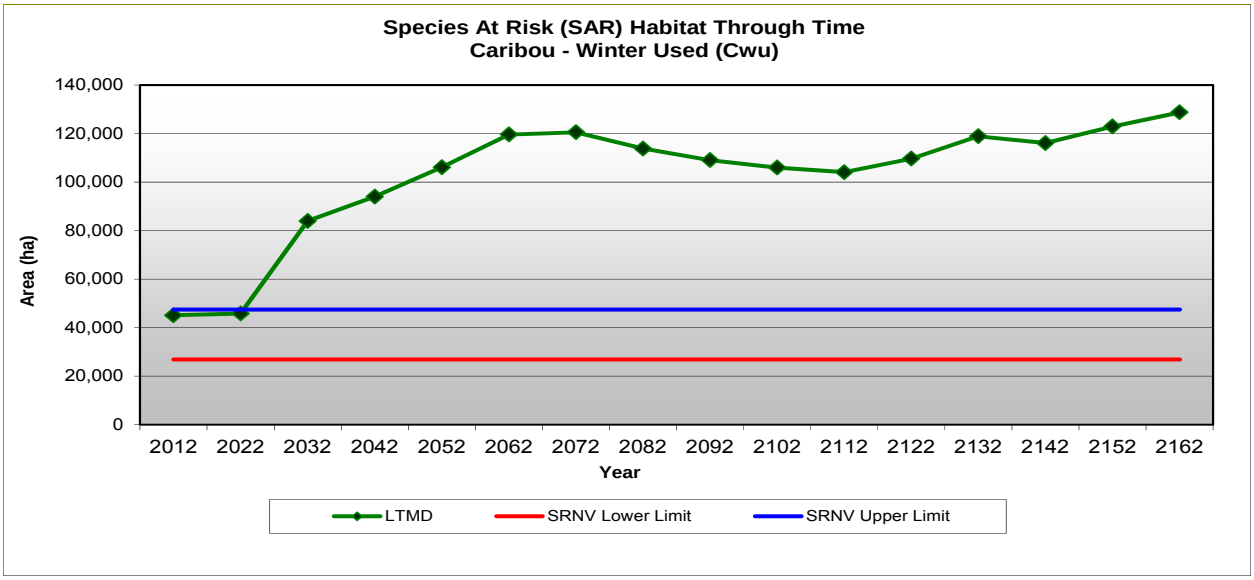
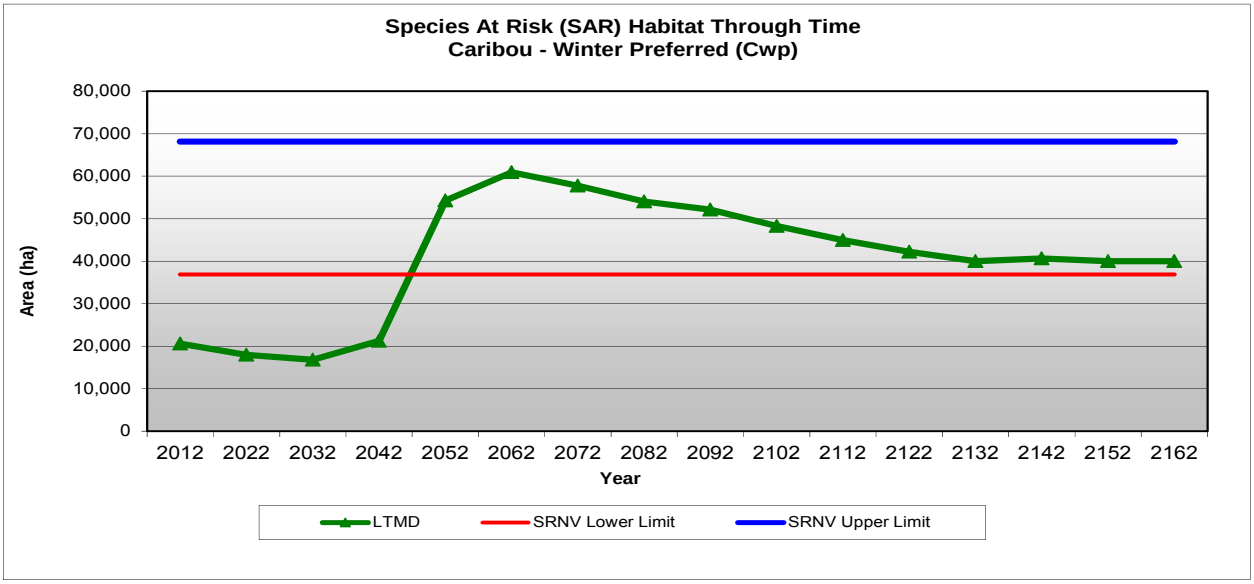


Figure 29 Species At Risk Habitat Through Time – Caribou Winter Preferred



3.6.1 Available Harvest Area

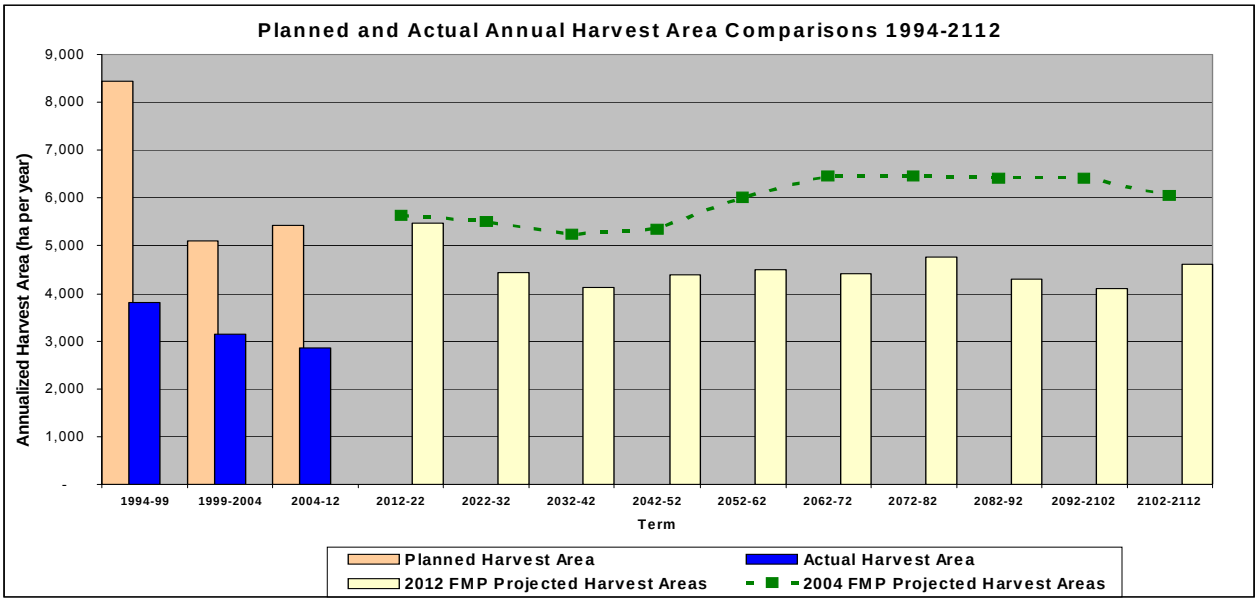
The Long-term Management Direction (27d_OLTMS) projects a harvest of 5,483 hectares per year from 2012-2022. The projected available harvest area over the next 100 years is documented in Table FMP-7.

The projected annual harvest area in the LTMD was compared to the historical planned and actual total harvest areas for 1994 through to 2112 (Figure 30). The total available harvest area planned for 2012-2022 (5,483 ha per year) is comparable to the total available harvest area projected in the 2004 FMP (5,657 ha per year), and slightly lower than the available harvest area approved in the previous 1999 forest management plan (6,692 ha per year). This level of harvest for the 2012-2022 plan period was determined in response to identified management considerations for short-term harvest volumes (Indicator 4c) while balancing long-term objective achievement and forest sustainability.

Long-term Harvest Areas 2022-2112

The total annual harvest area (AHA) is projected to average approximately 4,500 hectares per year for the next 100 years, lower than projections in the 2004 FMP (average of 5,950 ha per year over 100 years). The lower long-term projected harvest area in this plan is a result of (a) a major revision to the objective indicators and desirable levels based on the OLT model simulated ranges of natural variation and (b) the balancing of socio-economic benefits from the Whiskey Jack Forest within the context of overall forest sustainability.

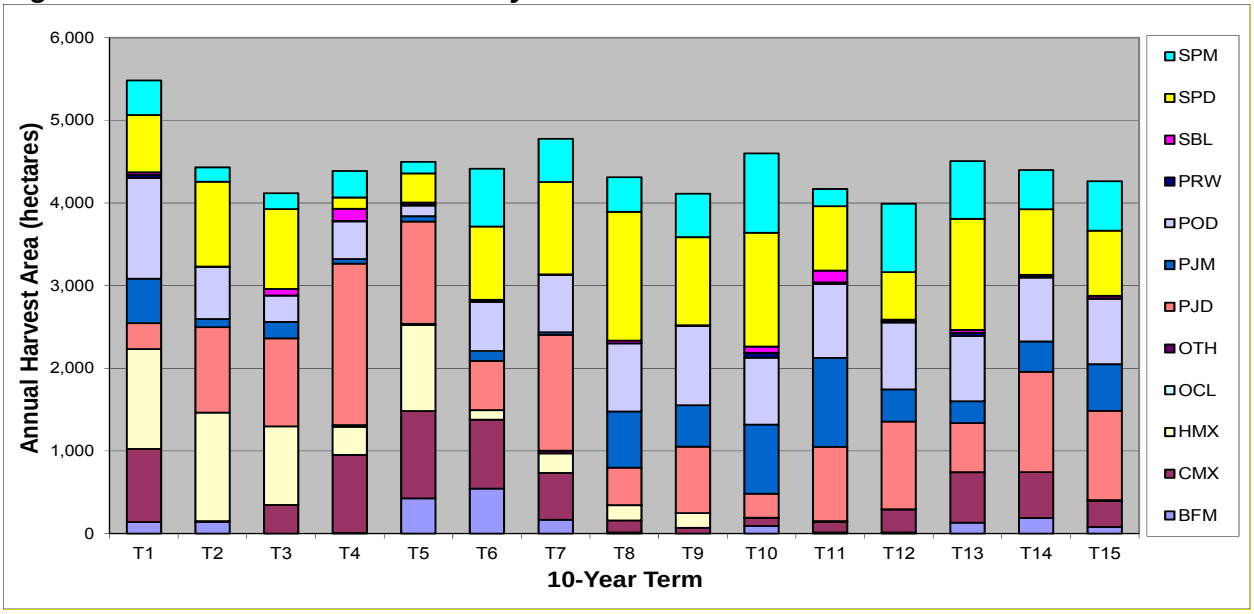
Figure 30 Planned and Actual Annual Harvest Area Comparisons 1994-2112



The available harvest area through the 160-year planning horizon is portrayed graphically by forest unit in Figure 31. The harvest area by forest unit varies from term to term as the projected harvest volume and total harvest area was considered by the Planning Team to be more important than consistent areas between terms for individual forest units. In keeping with movement towards the Simulated Range of Natural Variation for forest composition objective indicators for forest unit, age groupings (including old forest) and future caribou habitat, the short-term harvest area is projected to be primarily in the HWD, POD and CMX forest units. This proportion of harvest by forest unit facilitates a reasonably quick conversion of some areas

to purer conifer forest units, or purer hardwood (POD) which creates the best balance of objective achievement for the long-term.

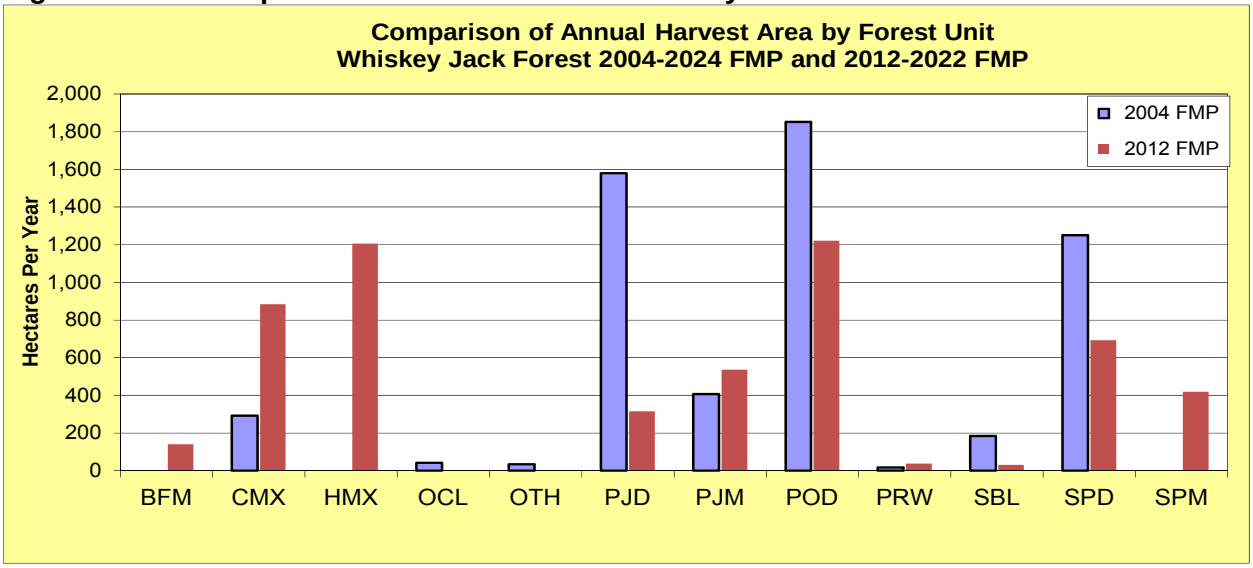
Figure 31 Annual Harvest Area by Forest Unit 2012-2112



The annual available harvest areas by forest unit from the 2004 and 2012 FMPs are compared in Figure 32. The change in numbers of forest units between plan (reduced from 9 to 12 for 2012 plan) and the change in definitions, particularly in the mixedwood forest units, prohibits a meaningful comparison of AHA by forest unit between plans.

The PJD, SPD and POD forest units appear to have decreased in harvest area, but again, this is a result of forest unit definition changes and some areas previously classified as these forest units are now classified as SPM, PJM, CMX and HMX which appear to have increased in AHA area.

Figure 32 Comparison of Annual Harvest Area by Forest Unit 2004 to 2012



3.6.1.1 Available Harvest Volume By Species Group

Short-term Harvest Volume 2012-2022

The 2012-2022 Long-term Management Direction annual harvest area is projected to yield approximately 574,000 cubic metres of timber each year from 2012-2022 (TOTAL, Figure 33). This is comprised of 340,000 cubic metres of Spruce-Pine-Fir (SPF), 190,000 cubic metres of Poplar (PO), 33,000 cubic metres White Birch (BW) per year and 4,000 cubic metres per year of Red Pine and White Pine (PWR). Incidental species (cedar, larch and black ash) total approximately 7,000 cubic metres per year but are not considered major species groups.

The annual total harvest volume level in the LTMD for the 2012 Whiskey Jack FMP (574,600 cubic metres) is 20% lower than the harvest volumes projected in the selected management alternative for the 2004-2024 FMP (718,300 cubic metres per year). The decrease in harvest area and associated harvest volume is a result of desired forest and benefits while balancing other socio-economic indicators and forest sustainability. The Planning Team carefully considered the impact of the 2012-2022 projected harvest area on long-term harvest area/volume and future desired forest and benefits. The Planning Team supports this balance of long-term objective achievement.

Associated with the available harvest volumes are additional potential volumes of defect volume (branches, twigs, leaves, bark) and undersize volumes (top wood). These defect and undersized volumes were estimated through use of a MNR NW Region spreadsheet calculation based on the available harvest volume in the Long-term Management Direction. As reported in Table FMP-8, there are an estimated 104,400 m3 per year of defect volume and 20,700 m3 per year of undersized volume potentially available through harvest of the full available harvest area during this 10-year plan period. The total of available harvest volume, defect and undersized volume is estimated to be 6,997,400 m3 for this plan period 2012-2022 (699,700 m3 per year).

Long-term Harvest Volume 2022-2112

The LTMD projects that the total harvest volume will be sustained at 501,000 m3 per year from 2022-2032, later decreasing to approximately 477,000 m3 per year from 2032 through to 2112. Strategic total harvest volumes projections are lower in this FMP as compared to the 2004 forest management plan. Spruce-Pine-Fir volume is projected to be comparable for 2012-2052 period as was projected in the 2004 FMP but then volumes are projected to be lower than the 2004 FMP for the following 60 years to 2112. Poplar volumes are projected to be significantly lower than 2004 projected levels. This variance is attributed to the refinement of the growth and yield curves and revision of modelling assumptions for the 2012 FMP and also due to the maximization of harvest area and total volumes, rather than forcing constant levels for any particular volume species groups. White Birch harvest volume is projected to be variable in this 2012 FMP but is on average comparable to 2004 FMP volume projections for the next 50 years.

OFAAB Benchmark Levels

The projected volume in the LTMD was compared to the historical and benchmark levels identified in the Ontario Forest Accord Advisory Board (OFAAB) report. The following graphs show the historical and benchmark harvest levels which have occurred on the Whiskey Jack Forest from 1994 to the present. The planned and actual harvest volumes are also illustrated by 10-year FMP term from 1994 to 2012 (includes three additional years for 2009-2012 Contingency Plan period), and planned volumes from 2012 to 2112. Volume comparisons are included for all volumes (TOTAL, Figure 33), Spruce-Pine-Fir (Figure 34), Poplar, (Figure 35, White Birch (Figure 36) and White Pine and Red Pine, (Figure 37).

LTMD projections for Spruce-Pine-Fir harvest volumes are above the OFAAB level in this plan period, but then are projected to be comparable or marginally lower than the benchmark level through the long-term. Poplar harvest volumes are projected to be greater than the OFAAB benchmark level for this plan period, then are projected to be lower than the benchmark through the long-term. The fluctuation in poplar volume is a result of revised modelling assumptions and yield curves and the maximization of short-term harvest volume (not by species group) noted above. White Birch projections are consistently above the OFAAB benchmark. Red Pine – White Pine is also projected to exceed the OFAAB benchmark level for this 10-year plan period, then to be comparable to the benchmark over the following 80 years (except 2032-2042 when no PWR is projected to be harvested). Total harvest volume (not a provincial species group, but informative) is projected to be sustainable at a level slightly below the OFAAB total volume benchmark level.

Figure 33 Planned and Actual Harvest Volume Comparisons, Species Group – TOTAL

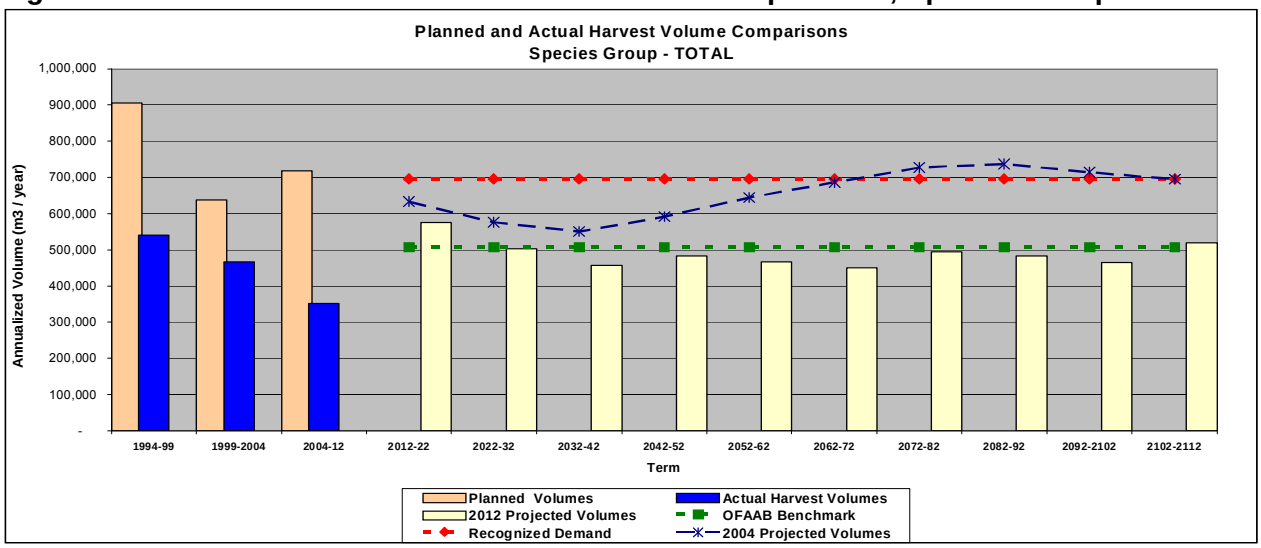


Figure 34 Planned and Actual Harvest Volume Comparisons, Species Group – Spruce-Pine-Fir

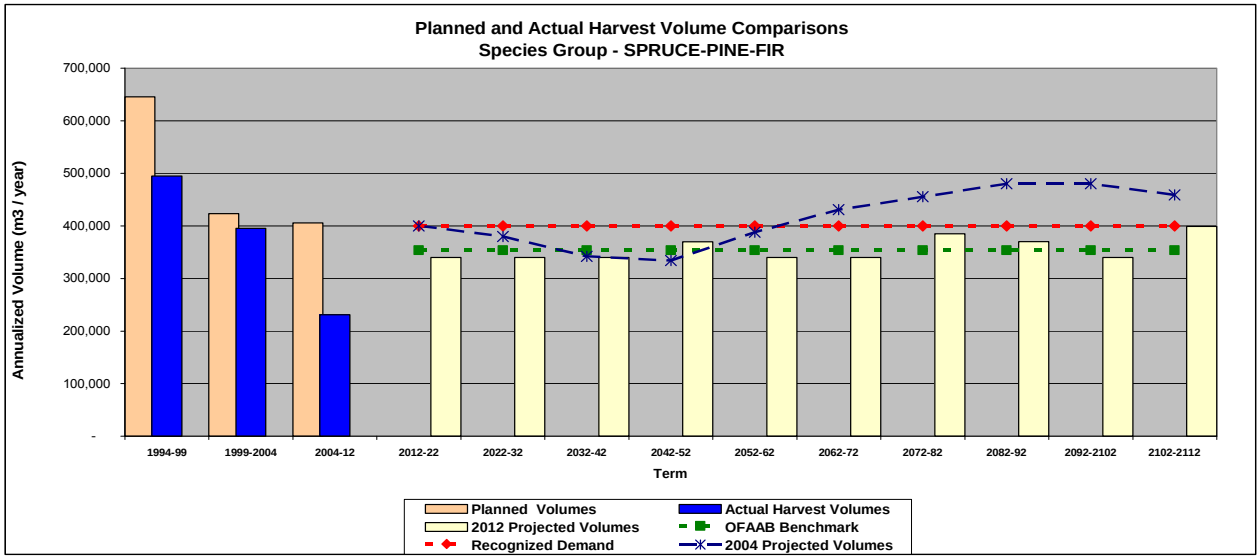


Figure 35 Planned and Actual Harvest Volume Comparisons, Species Group – Poplar

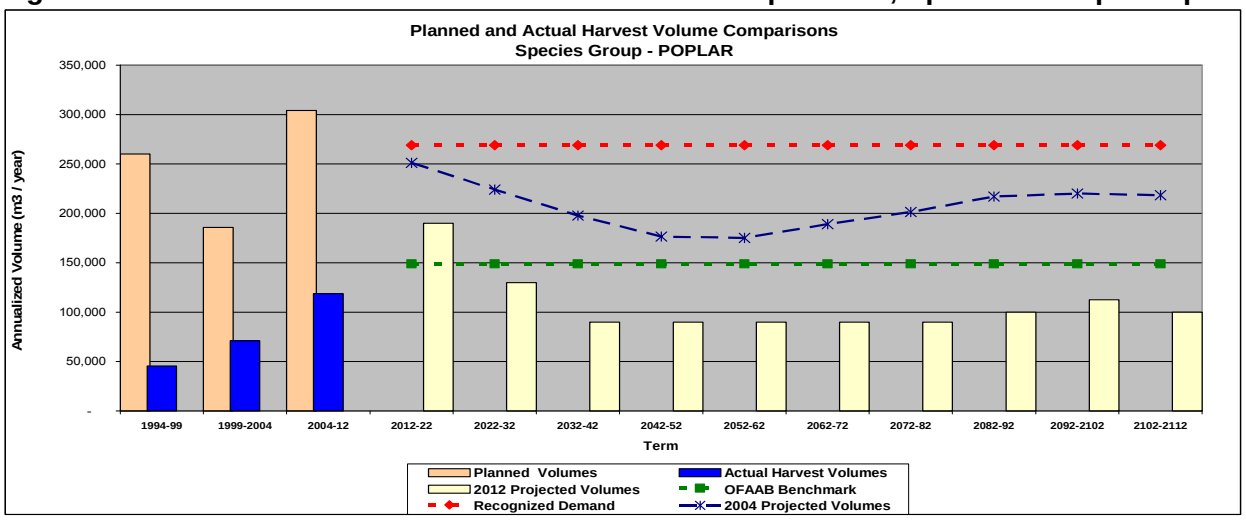


Figure 36 Planned and Actual Harvest Volume Comparisons, Species Group – White Birch

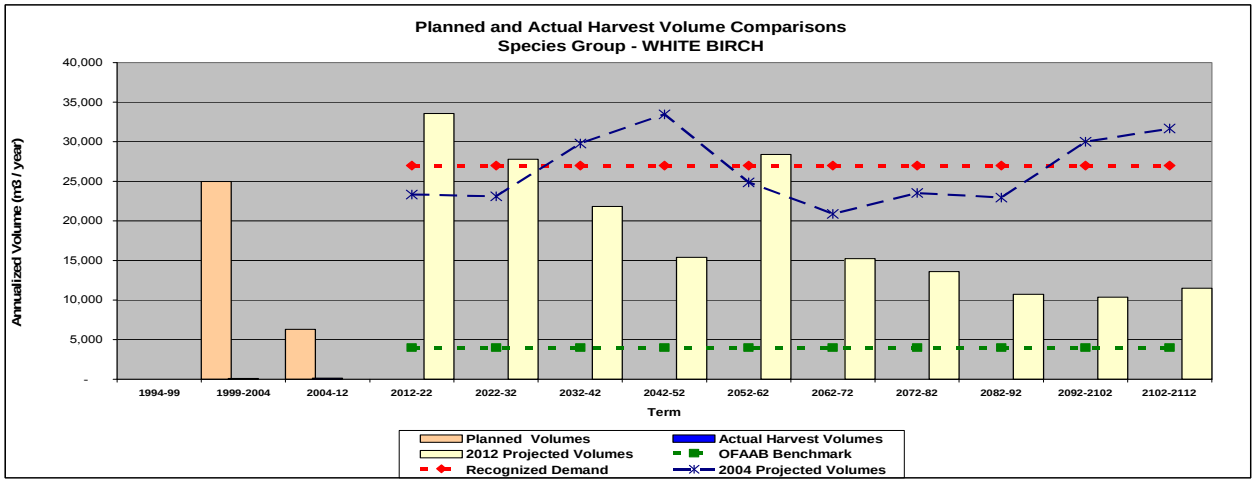
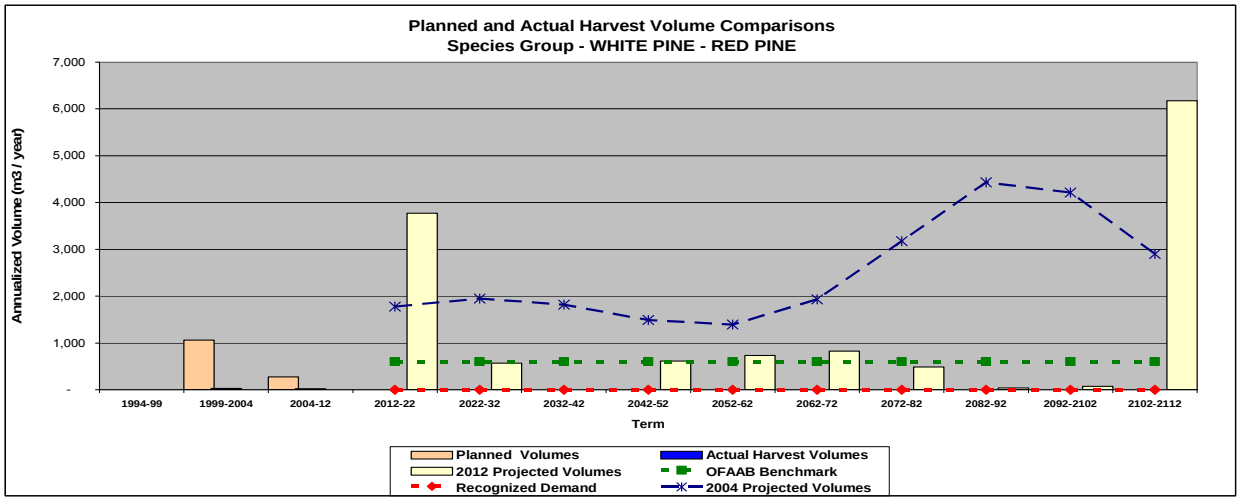


Figure 37 Planned and Actual Harvest Volume Comparisons, Species Group – White Pine and Red Pine



3.6.2 Selection of Areas for Harvest

A set of criteria was developed in order to identify the areas that could reasonably be harvested during the 2012-2022 period of the Whiskey Jack Forest Management Plan. The Available Harvest Area (AHA) by forest unit (which was derived from the Strategic Forest Management Model outputs for the LTMD) was the primary criterion for the selection of preferred and optional harvest areas. The Ministry of Natural Resources' *Forest Management Guide for Natural Disturbance Pattern Emulation*, *Forest Management Guidelines for the Conservation of Woodland Caribou: A Landscape Approach, Forest Management Guidelines for the Provision of Marten Habitat* and other guides and decisions provided additional direction. The criteria used for the selection of preferred and optional harvest areas are found in the following Sections 3.6.2.1 and 3.6.2.2.

Based on these eligibility and selection criteria, 51,971 hectares of planned harvest areas were identified for the 10-year plan period during for Stage Four of plan production.

3.6.2.1 Harvest Area Eligibility Criteria

The Long-Term Management Direction provides the strategic, long-term direction for management of the Whiskey Jack Forest. In order for the LTMD to be successfully implemented, areas eligible for harvest operations during the ten-year period of the plan are identified. These eligibility criteria are consistent with the strategic modelling for the LTMD using the SFMM model.

All eligible areas that were not identified as preferred areas for harvest were considered to be optional harvest areas. The eligibility maps represent the stands eligible for harvest during the 10-year period of the plan.

The allocated areas for harvest for the 10-year plan period have been portrayed on a composite summary map located in the electronic version of the FMP. This summary map includes a breakdown of the harvest area for each of the two five-year terms. The summary map also includes optional harvest areas during the ten-year period. Further refinements to the planned harvest allocation required for subsequent stages of plan development (Stage Three and Stage Four) are discussed in Section 4.3.

For this forest management plan, areas eligible for harvest operations during the ten-year period must meet the following eligibility criteria:

a) The first, and most important criterion is that the area must be managed, Crown land ownership. While the possibility of harvest is somewhat unlikely, all shoreline reserves and areas previously classified as bypassed or inoperable are considered eligible for harvest.
b) The second eligibility criterion was to have harvest allocations from areas located outside marten core habitat areas.
c) The third consideration was to ensure stands eligible for harvest are in the active subunits, including active subunits in the Dynamic Caribou Habitat Schedule (for 2012-2022 these active subunits are LOW, PAK, PAT, Car06, Car07, Car08, Car09 and Car10).

d) All eligible areas should meet the lower operability age limits by forest unit during the ten-year period (Table 18).
e) Younger stands are considered eligible for harvest where they are spatially associated with older stands and their harvest at the same time as the rest of the area is beneficial for landscape pattern or operational reasons (harvest, road access or consideration for other forest uses); and
f) All areas in which timber has been damaged by blow down, insects, or disease.

Lower harvest operability limits have been set by forest unit to guide planning of operations and are applied consistently to all subunits. Ages are measured at the beginning of 10-year plan periods. The lower harvest operability limits are as follows in Table 18:

Table 18 Lower Harvest Eligibility Ages for 2012 FMP

Forest Unit	Lower Operability Age
BFM	60 years
CMX	55 years
HMX	55 years
OCL	90 years
OTH	70 years
PJD	55 years
PJM	60 years
POD	55 years
PRW	65 years
SBL	90 years
SPD	70 years
SPM	60 years

The operability limits were set in order to maximize volume while the blocks are available for harvest. This has been done taking into consideration that a 10-year planning horizon will provide some opportunity for the younger wood to grow for a period of time before harvest occurs in the second five-year term of the plan. In most cases, the younger wood has been scheduled for harvest in the second five years to maximize the size and yield from these stands.

These operability ages were included in the base model and were consistent throughout the SFMM investigations that involved harvest operations. Generally, the minimal volume yield was considered to be 80 cubic metres per hectare for a stand to be operational. These minimum volume requirements were related to yield curves for each forest unit and estimated product piece size to determine the minimum operability limits for the SFMM modelling and eligibility criteria. The minimum operability age of certain forest units were increased above the age which would produce 80 cubic metres per hectares to reflect the desire to harvest larger piece sizes and volumes in some of the conifer forest units. The minimum operability age was reduced slightly for BFM, CMX and SBL to allow greater flexibility in clean-up and spatial harvest allocations for these forest units.

3.6.2.2 Harvest Area Selection Criteria

The preferred harvest areas were selected and separated into the first 5-year term (Phase I) and the second 5-year term (Phase II), for the 10-year plan period. Contingency areas have been identified from the optional harvest areas and have received detailed area of concern planning.

The areas for harvest operations were selected from within the areas that passed through the eligibility criteria filter. The stands deemed eligible had to meet specific stand characteristics. The application of this set of selection criteria aided the application of sustainable forest management and enhanced plan continuity from the previous term to the current plan term. It is important to recognize that the following selection criteria were applied after the potential harvest stands met the eligibility criteria based on harvest timing according to the dynamic caribou habitat schedule and the marten core habitat area harvest deferral criteria.

The following are the selection criteria that were used to direct the harvest allocation from within the eligible areas (geographic and time). The order in which these criteria are presented represents a general ranking of importance.

1) Maturity of forest stands.
   a) Allocate the full available harvest area for each forest unit as projected by SFMM in order to align with the Long-term Management Direction (approximate age class projections as much as is operationally possible) (i.e. SFMM Annual Available Harvest Area by forest unit by age class).
   b) Stand age at plan start should meet minimum harvest operability age.
   c) Avoid allocating stands less than 15 metres tall unless they are associated with adjacent operable stands.

2) Operability of the area.
   a) Allocate areas that can be reasonably accessed within the plan period.
   b) Select all merchantable timber in active caribou subunits.
   c) Schedule harvest allocations associated with Grassy Narrows First Nation (Asubpeeschoseewagong Netum Anishinabek) in the second five-year term.

      Note: The 2012-2022 Forest Management Plan identifies access, harvest, renewal and tending activities in the “Keewatin Lands” (north of the English River system). An earlier court decision held that Ontario could not authorize land uses in the Keewatin Area that would significantly impact the ability of Treaty 3 beneficiaries to exercise their Treaty-protected rights, without First Nation consent or Federal Authorization. On March 18, 2013, the Ontario Court of Appeal reversed that earlier decision. The appeal court’s decision is subject to an appeal to the Supreme Court of Canada to be heard in Spring 2014. In areas closest to the community of Grassy Narrows, south of the Keewatin Lands, the majority of the allocations have been scheduled for Phase 2 to provide for the final court decision and further consultation.

   d) Utilize geographical boundaries such as patent land, streams, lakes, non-productive areas, topography and stand boundaries to define the boundaries of the harvest area.
   e) To ensure harvest areas are economical, the average harvest block size is preferred to be at least 70-100 ha.

f) Haul distances must be balanced in an attempt to control fibre costs. The harvest blocks must be made accessible with a road construction and maintenance program that will be balanced annually.
g) Isolated harvest areas less than 40 hectares in size are not generally economical in which to operate. Avoid allocating areas that leave less than 40 ha. patches in a geographical area (i.e. bordered by lakes, streams, patent land etc.) to avoid 'orphaning' future harvest areas.
h) Where stands are 50% or lower in stocking, increase economic feasibility by ensuring that these stands do not make up of more than 30% of the area in a harvest block.
i) Where access is remote or costly, design larger harvest areas to increase operational feasibility and utilize opportunity to create larger disturbance sizes to emulate natural disturbance patterns.
j) Create a balance of summer and winter wood to provide continuous year round harvest opportunities, and volume and delivery requirements of destination mills.
k) Attempt to reasonably balance harvest allocations equally between the two 5-year phases of the ten-year period.
l) Allocate harvest area to meet the area and volume needs of specific harvest operators and overlapping licensees.
m) Allocate areas of natural disturbance for salvage harvest operations where feasible.
    a. Salvage operations will consider strategic landscape objectives.
    b. When finalizing boundaries of a salvage operation that results from wildfire, the area of undisturbed forest included in the salvage operation will be minimized.
    c. When finalizing boundaries of a salvage operation that results from blowdown, insect infestation, or other factors (e.g., ice storms), the area of the salvage operation can include undisturbed forest.
    d. When salvage operations include undisturbed area, the direction for residual forest retention during regular operations will apply to the maximum extent possible given the undisturbed forest present.

3) Emulation of natural disturbance patterns
a) Allocate harvest areas in size classes that indicate movement towards the landscape pattern frequency distribution as determined in the natural disturbance template for the forest.
b) Allocate areas that have previous depletion (< 20 yrs. old) and look for opportunities to complete the harvest in an area in order that the area has the potential to become future large, landscape patches or caribou habitat subunits.
c) Follow direction in the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* in regards to leaving mapped residual patches.

4) Wildlife Habitat
a) Within designated Moose Emphasis Areas (i.e. Large Landscape Patches) allocate harvest areas that show movement towards meeting moose habitat management objectives.

5) Visual Aesthetics
a) When allocating near large high usage lakes attempt to minimize the visibility of the harvest area.

6) Tourism Agreements
a) Allocate in accordance with agreements with tourist operators.

7) Fuelwood Opportunities
   a) Allocate fuelwood opportunities accessible to the public.

The balancing of these selection criteria does not always follow the same order depending on location, access, agreements with tourist operators, and balancing forest units and age classes. While determining harvest allocations, the relative proportion of winter and summer wood was considered important for the two five-year terms, as well as road access and planned clearcut sizes (the NDPEG standard for planned clearcuts states that 80% of the total number of planned clearcuts in the Boreal Forest are to be equal to or less than 260 ha in size).

The description of the achievement of the natural disturbance pattern template as required by the FMPM is discussed in Section 3.6.3.1 as natural disturbance pattern is an indicator of objective achievement.

The selection criteria for contingency areas are:
   a) Maximum of two years available harvest area to be allocated as contingency area.
   b) Areas must be accessed or expected to be accessed in a reasonable timeframe.
   c) Areas must be able to be harvested year-round.

Harvest areas were selected as closely as possible to match the available harvest area for the 10-year period by forest unit as projected by the Long-term Management Direction (Table **19**). Overall, 50% of the 10-year planned harvest will occur in the first five-year term, with the remaining 50% occurring in the second five-year term. During planning for Phase 2 operations when areas of concern are planned and reserves finalized, the total of the Phase 1 harvest area and the planned harvest area for Phase 2 will be equal to the full available harvest area for the 10-year period. Any areas allocated in Phase 1, but not yet harvested, will remain approved for harvest during the second five-year term. By forest unit, the breakdown of harvest area by five-year term is as recorded in Table **19.** The distribution of harvest area by forest unit between the two five-year terms is variable between forest units and their geographic location. The smaller forest units tend to have less balanced harvest area between the two five-year terms (i.e. PRW, SBL) as full stands are allocated in one term or the other. Additional rationale on the harvest allocations is detailed in Section 3.6.2.3.

Table 19 Summary of Planned Harvest Area by Forest Unit and Five-Year Term

Forest Unit	LTMD 10-YEAR TOTAL	Planned Allocations 10-YEAR TOTAL	Variance to LTMD	Planned Allocations 1st Term, 2012-2017		Proposed Allocations 2nd Term, 2017-2022	
				ha (5-year)	%	ha (5-year)	%
BFM	1,408	1,353	55	638	47%	716	53%
CMX	8,845	8,622	223	4,282	50%	4,341	50%
HMX	12,064	11,039	1026	5,675	51%	5,364	49%
OCL	-	-	0	-		-	
OTH	-	-	0	-		-	
PJD	3,149	3,100	49	1,594	51%	1,507	49%
PJM	5,369	5,097	271	2,515	49%	2,582	51%
POD	12,208	11,349	859	5,899	52%	5,450	48%
PRW	364	204	160	70	34%	134	66%
SBL	302	297	5	195	66%	102	34%
SPD	6,932	6,791	140	3,364	50%	3,427	50%
SPM	4,192	4,118		2,008	49%	2,109	51%
Grand Total	**54,834**	**51,971**	**2,789**	**26,240**	**50%**	**25,732**	**50%**

3.6.2.3 Rationale for Planned Harvest Areas by Forest Unit and Age Class

During the selection of harvest areas, consideration was given to projected available harvest area by forest unit from the Long-Term Management Direction, current forest conditions, desired forest and benefits, stakeholder comments, fish and wildlife habitat, water quality, cultural heritage values, tourism values, caribou habitat, retention of old forest area, marten core area deferrals and overall natural disturbance pattern. A comparison of planned harvest to the projected LTMD harvest areas by forest unit and age class are included in Table 20.

The comparison of the planned harvest area to the available harvest area shows good correlation with projected age classes however there is some age class substitution in certain forest units. The allocated harvest area that does not exactly match the LTMD projected age classes shows a minor trend to stands younger (0% of harvest area) or older (3% of the planned harvest) than the projected LTMD age classes by forest unit. Only 14 ha of SBL are allocated in an age class lower than projected in the LTMD. All other planned harvest area meets or exceeds the ages projected in the LTMD. The LTMD projected 22% of harvest area in stands less than 80 years of age. The planned allocations project 42% of harvest area to be less than 80 years old.

Table 20 Comparison of Harvest Allocations to the LTMD by 20-year Age Class

Forest Unit	10-Year Available Harvest Area (ha)	Age Class	Planned Harvest Area (10-year period, ha)
BFM	-	0-20	-
	-	21 - 40	-
	-	41 - 60	-
	20	61 - 80	31
	876	81 - 100	834
	512	101 - 120	420
	-	121-140	69
	-	141+	-
	1,408	Subtotal	1,353
CMX	-	0-20	-
	-	21 - 40	-
	37	41 - 60	-
	322	61 - 80	4,061
	5,694	81 - 100	2,602
	2,792	101 - 120	1,564
	-	121-140	187
	-	141+	208
	8,845	Subtotal	8,622
HMX	-	0-20	-
	-	21 - 40	-
	100	41 - 60	1,432
	5,976	61 - 80	6,788
	3,862	81 - 100	1,743
	2,126	101 - 120	998
	-	121-140	78
	-	141+	-
	12,064	Subtotal	11,039
OCL	-	0-20	-
	-	21 - 40	-
	-	41 - 60	-
	-	61 - 80	-
	-	81 - 100	-
	-	101 - 120	-
	-	121-140	-
	-	141+	-
	-	Subtotal	-

Forest Unit	10-Year Available Harvest Area (ha)	Age Class	Planned Harvest Area (10-year period, ha)
OTH	-	0-20	-
	-	21 - 40	-
	-	41 - 60	-
	-	61 - 80	-
	-	81 - 100	-
	-	101 - 120	-
	-	121-140	-
	-	141+	-
	-	Subtotal	-
PJD	-	0-20	-
	-	21 - 40	-
	5	41 - 60	-
	263	61 - 80	272
	635	81 - 100	1,050
	2,246	101 - 120	1,277
	-	121-140	298
	-	141+	203
	3,149	Subtotal	3,100
PJM	-	0-20	-
	-	21 - 40	-
	-	41 - 60	-
	113	61 - 80	791
	2,988	81 - 100	2,615
	2,267	101 - 120	1,591
	-	121-140	99
	-	141+	-
	5,369	Subtotal	5,097
POD	-	0-20	-
	-	21 - 40	-
	2	41 - 60	31
	3,475	61 - 80	6,444
	4,940	81 - 100	2,589
	3,791	101 - 120	2,285
	-	121-140	-
	-	141+	-
	12,208	Subtotal	11,349

Forest Unit	10-Year Available Harvest Area (ha)	Age Class	Planned Harvest Area (10-year period, ha)
PRW	-	0-20	-
	-	21 - 40	-
	-	41 - 60	-
	-	61 - 80	-
	135	81 - 100	87
	47	101 - 120	-
	182	121-140	61
	-	141+	56
	364	Subtotal	204
SBL	-	0-20	-
	-	21 - 40	-
	-	41 - 60	-
	-	61 - 80	14
	69	81 - 100	11
	58	101 - 120	17
	175	121-140	45
	-	141+	211
	302	Subtotal	297
SPD	-	0-20	-
	-	21 - 40	-
	-	41 - 60	-
	1,485	61 - 80	1,950
	1,647	81 - 100	3,595
	2,558	101 - 120	678
	1,222	121-140	497
	20	141+	71
	6,932	Subtotal	6,791
SPM	-	0-20	-
	-	21 - 40	-
	-	41 - 60	-
	173	61 - 80	235
	327	81 - 100	1,822
	3,199	101 - 120	1,734
	462	121-140	305
	31	141+	22
	4,192	Subtotal	4,118
TOTAL	54,834		51,971

Effort was made during the allocation process to minimize the amount of forest stands allocated

for this plan that are younger than LTMD projections, though all these stands do meet the harvest eligibility and selection age criteria (Section 3.6.2.1 and 3.6.2.2). This younger timber was not specifically targeted during allocation selection but was considered logical to incorporate into operating blocks. The younger aged harvest area in the POD and SPD forest units were allocated to create operationally feasible blocks and to clean up areas from previous operations.

All eligible stands for harvest in this plan were reviewed to determine operability, access concerns, seasonal wood flow, maturing adjacent stands (younger wood coming on line) and stakeholder concerns and commitments. In addition most of the selected harvest areas were visually inspected through the use of a helicopter or were ground checked by MNR staff. Most areas are in close proximity to previous harvest areas. The selection/allocation of stands was not performed by a generic computer/GIS exercise of those stands SFMM generated, rather a specific site related approach to allocations, was utilized. This resulted in a level of confidence in the suitability of allocated areas and will form an operational foundation critical during successful implementation of the plan.

When age class substitution was necessary, the allocation of stands older than the SFMM LTMD projected age was considered more favourable than a trend to allocate younger stands. There were a variety of reasons why age class substitution in the planned harvest occurred. These reasons include:

1) Interested stakeholders were engaged in the planning process and changes were made through negotiations and/or minor changes to protect resource values, and increasing lakeshore buffers. Interested stakeholders (who made their concerns known) were consulted on several occasions throughout the planning process, to discuss concerns with access, view aesthetics and harvest scheduling. These concerns have been addressed through AOC planning or harvest scheduling. Appropriate prescriptions were applied to protect fisheries and water quality, wildlife and tourism values and adjusted road use strategies. Other public correspondence was received that required detailed review of certain areas of interests, which resulted in minor changes to the selection of harvest areas.

2) For a harvest block to be economically feasible a minimum size of 70 hectares is generally preferred. The economic feasibility of harvest areas depend on a number of factors, such as proximity to a road, the quality of the fibre, age of adjacent stands, etc. Harvest blocks are then created around stands that meet the age classes preferred in the LTMD. However what occurs frequently is there are younger, yet operable stands adjacent to the older stands that if not allocated become “orphaned” in the future. In order to not fragment the forest, these younger stands are generally allocated before the ideal scheduling projected in the LTMD. In some areas the opposite occurs, where stands older than projected by the LTMD are allocated in association with other eligible stands.

3) The *Forest Management Guide for Natural Disturbance Pattern Emulation (MNR, 2001)*, requires that 80% of the planned clearcuts by frequency are less than 260 hectares in size. This has an effect of spatially limiting areas of older wood that are adjacent to existing ‘planned clearcuts’ that are slightly less than 260 ha. in size. In the assessment of the “80% under 260 hectares” standard, the assessment has identified 76% of planned clearcuts to be equal to or under 260 hectares in size, leaving 24% of planned clearcuts greater than 260 ha. This result is lower than the 80% standard, but is

acceptable to the Planning Team as it results from strategic landscape pattern direction (e.g. dynamic caribou habitat schedule, marten core areas, moose / deer emphasis areas) and projected harvest allocations that balance consideration for all desired forest and benefits and operational challenges.

4) Small allocations such as SPL (300 ha.) are considerably fragmented. Although there were larger older eligible stands that could have made an operable block, the AHA was totally utilized by picking up small "orphan" stands adjacent to stands made up of other forest units.

5) Negotiations with several stakeholders have resulted in the delayed harvest of some mature stands that they utilize as part of their recreational activities (i.e. contain recreational trails therefore no harvest will occur in this plan period).

6) Some stands are mistyped and resulted in not being allocated. Generally, the mistyped stands fall in two categories: Younger than FRI indicates or should have been reclassified as 'protection forest'.

Reasons for the age class substitution can be attributed to many factors. Certain factors apply broadly to the forest and its landscape pattern (i.e. road access, geographic location of concentrations of mature eligible forested stands), and other factors apply specifically to individual operating areas. The combination of these factors has been reviewed in detail and supported by the Whiskey Jack Forest 2012 FMP Strategic Task Team and Operations Task Team and it is felt that based on environmental and operational considerations, harvest allocations have been selected in conjunction with provincial guides and direction, consultation with the public, and sound operational logistics.

Preliminary harvest allocations were determined prior to the First Information Centre (Public Review of Proposed Operations). Harvest allocations were again refined between the information centre and the draft plan submission. Several new factors influenced a minor change in planned harvest areas. For example, as a result of public and stakeholder consultation, several shoreline reserves were increased to enhance protection of tourism values. The reduction of allocated harvest area in these tourism areas had to be balanced with new allocations elsewhere. Some of this replacement harvest area was in younger or older age classes (but still eligible for allocation as per Section 3.6.2.1 and 3.6.2.2). This age class substitution was considered reasonable as the protection of tourism values was considered more important than the age class distribution of harvest areas.

The analysis of harvest allocations by forest unit and age class show that of the 51,971 hectares of harvest area allocated for this 10-year plan period, 0% (14 ha) is in age classes lower than projected in the LTMD and 3% (approx. 1,400 ha) is in age classes older than the LTMD projections. It is important to note that the younger allocated harvest areas still do meet all the harvest area eligibility and selection criteria, but are younger than the suggested age classes projected in the LTMD.

The potential impact of this level of age class substitution in the harvest allocations was analyzed through a "Final Test of Sustainability" by including the actual planned harvest, by forest unit and 10-year age class, into the SFMM model with the same constraints and assumptions as the Long-term Management Direction run. The Final Test analysis confirmed that 'the planned allocations do not negatively impact upon overall objective achievement, definition of the desired future forest condition, nor do they compromise the long-term

sustainability of the Whiskey Jack Forest'. Results of this analysis are detailed in Section 4.9. Given the specific rationale discussed with MNR district staff, and the confirmation of forest sustainability (Section 4.9), this level of age class substitution was considered acceptable to MNR given the varied issues to be considered. The concept, and amount, of age class substitution was presented to the Planning Team and no concerns were noted.

In general there are many constraints in matching the age class specific allocations generated through the LTMD. However the constraints are valid as they are based on economic, environmental and societal values that are important to a balanced forest management plan.

The impact of implementation of the planned harvest areas, including age class substitution compared to the LTMD, was analyzed and documented in Section 4.9 Comparison of Proposed Operations to the LTMD, and in Section 5.0 Determination of Sustainability. Analysis results support that implementation of the 10-year planned harvest, including variances in area by age classes, does not negatively impact objective achievement or the long-term sustainability of the Whiskey Jack Forest.

3.6.3 Assessment of Objective Achievement

The long-term management direction (LTMD) for the forest provides guidance on levels of access, harvest, renewal and tending activities required to achieve a balance of objectives over time and meet the desired future forest and benefits. In the development of the LTMD, management objectives and indicators were developed/established and target levels identified through various analytical methodologies (models and tools) with regard to forest guidelines, social and economic assessment, wildlife habitat, and landscape management over time. The overall goals are to provide for biological diversity, sustainable forest management, social and economic benefits/development, and protection of natural resources and the forest ecosystem condition on the Whiskey Jack Forest.

This section of the forest management plan documents the results of the assessment of objective achievement for each of the management objectives and indicators, scheduled for assessment during the preparation and approval of the forest management plan. Objective achievement and the relationship to desirable levels and targets, including any differences, are also documented. If the level of objective achievement is outside of the desirable level for an objective, rationale is provided. A summary of the projected objective achievement, desirable levels and targets in the long-term management direction is recorded in Table FMP-9.

The achievement of individual management objectives was assessed using the results of the forest modelling for the Long-term Management Direction, the results of the preliminary spatial assessment, and other plan components developed during preparation of the plan.

The assessment of objective achievement was based on the extent to which the established desirable levels for each indicator have been satisfied within the 10-year plan period. The management objective information and an assessment of objective achievement are documented in Table FMP-9.

Of the 30 indicators included in Table FMP-9, 18 of the indicators can be assessed during plan development. The remaining 12 indicators (and reassessment of some of the original 18 indicators) will be assessed in the future: after plan implementation as appropriate (specific indicator timing of assessment is noted in Table FMP-9 and in plan text Section 3.5.2).

Of the 30 plan indicators assessed:

- 11 indicators ACHIEVE desirable and target levels in this 10-year plan period;
- 6 indicators are projected to ACHIEVE target levels in a target timeframe longer than this 10-year plan period;
- 1 indicator is projected to NOT ACHIEVE desirable or target levels at some point in the 100-year strategic planning horizon; and
- 12 indicators will be assessed in the FUTURE after plan implementation.

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The following is a brief discussion of the objectives, indicators and achievement of desirable and target levels for each indicator with a summary of the assessment and relevant detail provided.

3.6.3.1 Objective 1: Landscape Pattern

Indicator: (1a) % of polygons with >60% mature and old forest

This landscape pattern indicator for mature and old forest is assessed to determine whether the proposed plan activities will create a landscape pattern consistent with simulated natural disturbances. This objective is carried forward from the 2004 FMP in accordance with the *Forest Management Guide for Natural Disturbance Pattern Emulation (2001*) and also addresses a landscape pattern indicator from the *Forest Management Planning Manual (2009)* required for this FMP. This indicator is intended to influence the supply and arrangement of mature and older conifer-dominated forest across the forest. Mature and old forest indicator is used to provide habitat for certain song birds and wildlife habitat that requires this seral stage.

Desirable and Target Levels: The desirable level is to have the landscape pattern consistent with minimum OLT percentage projections for mature/old forest established for the forest Table 21) and the target level is to show movement towards these levels by Plan End. The minimum desirable level for proportions of mature and old forest was derived from the Ontario Landscape Tool for the Whiskey Jack Forest and accepted by the Planning Team as the best estimation of the natural forest condition.

The following table reports the projected percentage of mature or old forest polygons at Plan Start 2012 and Plan End 2022, as analyzed at the 500 ha and 5,000 ha hexagon scales.

Table 21 Analysis for Percent of Polygons with >60% Mature or Old Forest

Analysis Scale	Plan Start 2012 Percentage	Minimum Desirable Percentage	Projected Plan End 2022 Percentage
Scale: 500 ha hexagon	27%	35%	29%
Scale: 5,000 ha hexagon	18%	28%	24%

ASSESSMENT - Indicator 1a – Mature and Old Forest Landscape Pattern:
Desirable level not achieved in this plan period. Target level is projected to be **ACHIEVED** during the plan period with movement towards the minimum desirable percentages.

Spatial assessment using the OLT model showed that implementation of planned operations would result in a landscape pattern of mature and old forest that is moving towards desirable level from plan start level during this plan period.

Indicator: (1b) Frequency Distribution of Young Forest Patches by Size Class

Desirable and Target Levels: The desirable level is to have young forest landscape pattern consistent with OLT projections of young forest patches by size class calculated for the forest (Table 22). The target level is adjusted to recognize movement towards desirable level during this plan period. This target flexibility considered that achievement of the template distribution during the next 10-years was limited by the current landscape pattern, other considerations related to short-term landscape pattern management (e.g. caribou habitat management, marten

core habitat management, frequency of planned clearcuts <260 hectares in size), and operational considerations or timing limitations to road access and harvest allocations during the plan period.

Additional operational consideration was given to the reduction in the number of larger patches of young forest in response to concerns of the Kenora LCC.

The percentage distribution of young forest patches by size class is presented for plan start (2012); forecasted for plan end (2022) with only ageing of the forest (no harvest); forecasted for plan end (2022) with ageing and planned harvest operations; and for the "natural" forest template, as derived from the Ontario Landscape Tool model specifically for the Whiskey Jack Forest. This information is presented graphically in Figure 38 and in tabular form in Table 22 including an assessment of movement towards the desirable level of natural template distribution.

Figure 38 Frequency Distribution of Young Forest Patches by Size Class

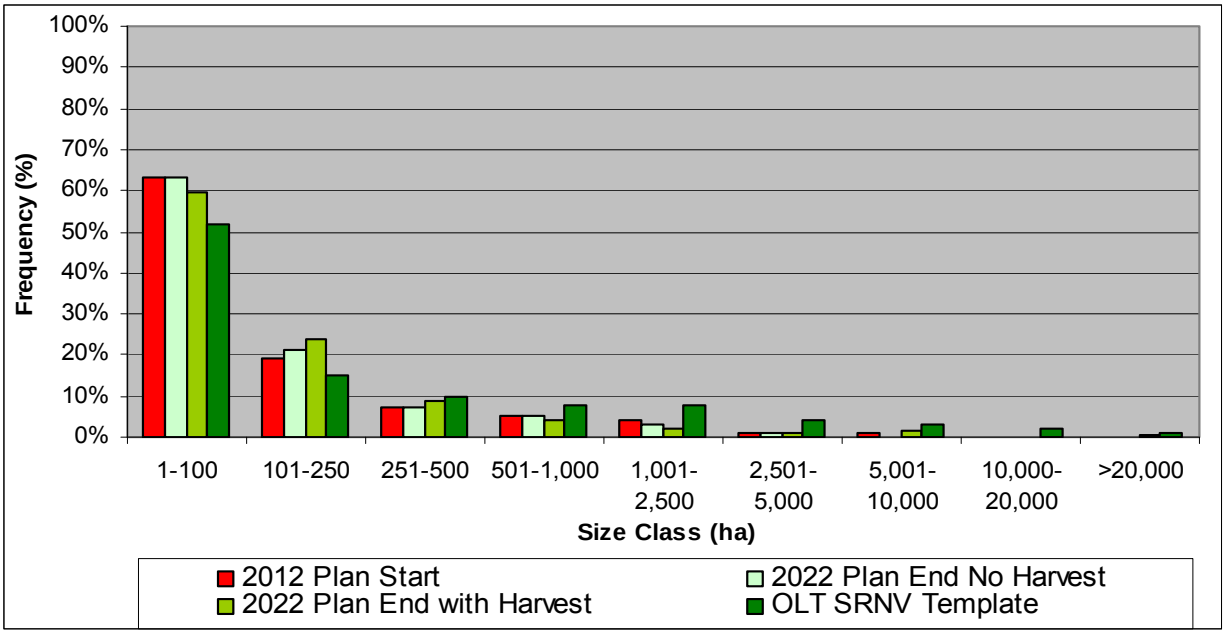


Table 22 Young Forest Frequency Percentage by Size Class

	As a Percent				Assessment
Size Class (ha)	2012 Plan Start	2022 Plan End No Harvest	2022 Plan End with Harvest	OLT SRNV Template	Assessment of Movement Towards Natural SRNV Template
1-100	63%	63%	60%	52%	Movement towards
101-250	19%	21%	24%	15%	Movement away
251-500	7%	7%	9%	10%	Movement towards
501-1,000	5%	5%	4%	8%	Minor movement away
1,001-2,500	4%	3%	2%	8%	Minor movement away
2,501-5,000	1.0%	1.0%	1.1%	4.0%	Towards - but no significant change
5,001-10,000	1.0%	0.0%	1.3%	3.0%	Towards - but no significant change
10,000-20,000	0.0%	0.0%	0.2%	2.0%	Towards - but no significant change
>20,000	0.0%	0.2%	0.3%	1.0%	Towards - but no significant change
Total					

Six of nine young forest patch size classes project movement from Plan Start distribution towards the Simulated Range of Natural Variation (SRNV) through implementation of planned harvest areas for this plan period. Four of these size classes that show movement towards the SRNV do not change significantly from the Plan Start frequency. Three size classes project movement away from the SRNV at the end of this plan period. The 101-250 ha class increases in frequency from 19% to 24% whereas the template suggests a reduction to 15%. The 501-1,000 and 1,001-2,500 ha class frequencies decrease slightly at Plan End compared to higher desirable levels, but only change by 1-2%.

There are several areas of young forest that have resulted from past natural disturbances, including the large 1991 blowdown (114,000 ha). This blowdown is now 21 years old and the OLT model counts all young forest less than 36 years of age. As this blowdown and other pre-NDPEG harvest areas age there will be a significant change in the distribution of young forest by size classes. Therefore the current distribution of young forest is considered socially acceptable for this plan period.

Overall assessment is that while it will take many future plan periods to reach the desirable level, the target level for this indicator is achieved in this plan period, as the movement toward the template frequency distribution is greater than the minor shortfalls in 3 classes.

Additional documentation of the landscape pattern spatial analysis is included in Supplementary Documentation N – Spatial Analysis: Part 3: Landscape Pattern OLT.

ASSESSMENT - Indicator 1b – Frequency Distribution of Young Forest Patches by Size Class:
Desirable level not achieved in this plan period. Target level is projected to be **ACHIEVED** during the plan period.

The desirable level could not be achieved within the 10-year period of this plan therefore the target level was determined to allow movement towards the template distribution in this plan period. Five of nine size classes demonstrated movement towards the desirable frequencies, and the remaining four size classes remained constant at 0%, the same as the Plan Start values for these four size classes.

Indicator: (1c) % of polygons with >60% mature and old conifer forest

The Planning Team decided to include one additional indicator to approximate the landscape pattern of concentrated (>60%) mature and old conifer in addition to the other indicators suggested by the Science and Information in support of Ontario's Forest Management Guide for Boreal Landscapes. There was concern that the combination of indicators for mature/old landscape pattern (spatial), mature/late conifer landscape class (non-spatial), and upland pine and spruce (non-spatial) may not cover all the area currently assessed according to the marten habitat guide. This concentrated conifer indicator area is similar to marten core habitat but allows a greater range in sizes and distribution of this older conifer area. The conifer dominated forest is composed of PJD, PJM, SPD and SPM forest unit areas.

Desirable and Target Levels: The desirable level is to have the landscape pattern consistent with minimum OLT percentage projections for mature/old conifer forest established for the forest (Table 11) and the target level is to show movement towards the desirable level by Plan End. The minimum desirable level for proportions of mature and old conifer forest was derived from the Ontario Landscape Tool for the Whiskey Jack Forest and accepted by the Planning Team as the best estimation of the natural forest condition.

The following table reports the projected percentage of mature or old conifer forest polygons at Plan Start 2012 and Plan End 2022, as analyzed at the 500 ha and 5,000 ha hexagon scales.

Table 23 Analysis for Percent of Polygons with >60% Mature or Old Conifer Forest

Analysis Scale	Plan Start 2012 Percentage	Minimum Desirable Percentage	Projected Plan End 2022 Percentage
Scale: 500 ha hexagon	4%	19%	6%
Scale: 5,000 ha hexagon	1%	9%	1.3%

For the 500 hectare hexagon, the plan start is at 4% moving to 6% at plan end. The SRNV for this indicator is 19% therefore there is some movement towards the SRNV. For the 5,000 hectare hexagon, the plan start is at 1% moving to 1.3%, again showing very marginal movement towards the desirable SRNV level of 9%. The limited movement towards the desirable level was not negatively influenced by harvest allocations. The Planning Team planned for the maximum amount and arrangement of conifer-dominated marten core areas that the Whiskey Jack Forest is currently capable of supporting; planned harvest areas spatially to defragment (clean up) previously harvested areas and to not fragment any new large areas. It will take several more 10-year planning terms for the forest to age and create more mature and old forest, which will result in the desirable level being achieved in the future. So while this indicator is technically achieved for this plan period with some movement toward the desirable level being measured, more time is needed for the forest to grow older and more significantly achieve this indicator.

ASSESSMENT - Indicator 1c – Mature and Old Conifer Forest Landscape Pattern:
Desirable level not achieved in this plan period. Target level is projected to be **ACHIEVED** during the plan period with some demonstrated movement towards the minimum desirable level.

3.6.3.2 Objective 2: Forest Composition

Indicator: (2a) Crown Productive Forest by Landscape Class

Desirable and Target Levels: The desirable level is to achieve and maintain the mature and late successional landscape class areas at or above the minimum of the lower interquartile hectare range (Simulated Range of Natural Variation)(SRNV) for each mature and late successional landscape class as projected by the Ontario Landscape Tool for the Whiskey Jack Forest (Table 24). The target level is the same as the desirable level, measured at the end of the plan period.

The projected productive forest area by landscape class at the end of this FMP period (2022)

and through the long-term (2112) are reported in the following table. Minimum desirable and target levels for the mature/late successional landscape classes are met or exceeded for two classes at Plan Start, and with the other two classes (smallest landscape classes) having projected areas approximating the desirable levels within 40-80 years.

ASSESSMENT - Indicator 2a – Crown Productive Forest by Landscape Class:
Desirable level is not met for all classes in this plan period. The desirable and target levels are **ACHIEVED** and maintained within the 100-year planning horizon.

Two mature/late (ML) landscape classes achieve minimum desirable and target levels at Plan Start. Remaining two classes are the smallest of ML classes and achieve and sustain desirable levels in medium-term (40-80 years) and sustain levels through long-term. Some achievement was increased to improve trends closer to OLT medians rather than minimums. Target levels ACHIEVED in the medium term indicator timeframe.

Table 24 Projected Area by Landscape Class

(2a) Productive Area by Landscape Class (ha)							
Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional:			
				Balsam	Lowland	Hardwood	Conifer
T1	201,015	152,743	62,934	8,361	12,695	104,760	182,885
T2	171,969	189,752	49,376	8,119	12,135	104,326	189,168
T3	138,737	241,002	71,996	7,427	11,865	81,752	171,623
T4	146,918	242,746	85,555	9,531	10,701	65,542	163,411
T5	149,715	216,333	89,065	19,031	9,608	60,325	180,326
T6	160,000	174,648	92,415	18,367	10,306	46,191	222,475
T7	160,000	154,174	95,307	13,704	12,653	43,100	245,438
T8	160,000	167,839	84,745	12,869	12,850	49,794	236,161
T9	160,484	174,591	77,674	13,725	12,850	54,135	230,730
T10	160,000	172,977	75,700	13,855	12,884	51,090	237,633
T11	160,000	177,997	77,266	13,212	12,850	49,208	233,558
T12	160,000	177,323	73,300	14,617	12,850	48,631	237,310
T13	160,000	180,100	71,180	16,350	12,948	47,318	236,136
T14	160,000	181,572	69,777	15,794	12,850	45,228	238,812
T15	160,000	174,065	70,528	14,287	12,850	43,100	249,202
T16	160,000	167,768	69,660	13,731	12,850	43,100	256,923
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

Where projections fall below the min. target, the data is shaded yellow;
where projections exceed max. targets, the data is shaded green.

Indicator: (2b) Crown Productive Forest by Forest Unit and Age Grouping

Desirable and Target Levels: The desirable level is to achieve and maintain productive forest area by forest unit and age grouping at or above the minimum SRNV area projected by OLT (Immature in Table 25, Mature+ in Table 26). The target level is the same as the desirable level to be measured in the medium term (40-80 years). Where projections in the following tables fall below the minimum range (desirable level), the data is shaded yellow; where projections exceed the upper simulated bounds of the range, the data is shaded green (still within desirable level).

While the desirable level for every forest unit – age grouping combination were not met during the plan period, most groupings (19 of 24) achieved desirable levels with Plan start conditions. All other groupings achieve desirable levels within the planning horizon. The young BFM and HMX groupings underachieve the SRNV for several terms 120-160 years in the future, however these groupings do achieve the desirable level from Plan Start for the next 120 years so these projections are acceptable.

On average, the desirable level and target level are projected to be achieved for this objective. Overall indicator achievement of area by forest unit and age grouping is projected to be very good while managing for landscape class area and old forest area.

ASSESSMENT - Indicator 2b – Crown Productive Forest by Forest Unit:
Desirable level and target level projected to be **ACHIEVED** over the target time frame of 40-80 years (medium term).

Table 25 Desirable and Projected Area by Forest Unit and Age Grouping – Immature

Immature Productive Forest

Forest Unit:

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	416,693	18,788	57,387	51,632	187	162	133,098	29,870	26,658	635	6,945	67,038	24,292
T2	411,097	17,267	48,579	36,443	243	192	138,579	36,813	42,418	1,207	7,447	55,619	26,291
T3	451,735	16,568	45,195	38,054	308	232	149,888	41,223	57,528	1,193	7,652	61,424	32,471
T4	475,218	14,137	44,672	36,870	371	287	151,681	45,986	66,291	1,330	8,753	67,407	37,432
T5	455,113	4,488	41,760	31,265	590	318	132,221	52,186	72,041	1,690	9,628	68,780	40,146
T6	427,063	2,674	35,303	31,896	649	402	106,784	54,776	78,957	2,075	8,870	60,495	44,183
T7	409,481	4,181	28,810	32,741	608	455	108,167	53,968	78,644	2,296	6,564	53,196	39,849
T8	412,583	4,232	30,350	31,257	649	745	116,762	58,135	70,038	2,185	6,326	50,567	41,338
T9	412,750	3,771	28,955	26,444	648	745	119,276	55,628	66,339	2,219	6,327	56,983	45,414
T10	408,677	3,647	28,531	23,608	641	745	118,147	55,669	67,907	1,800	6,300	58,458	43,225
T11	415,263	3,844	27,966	21,905	637	745	118,917	57,155	68,737	2,214	6,338	62,178	44,628
T12	410,623	2,549	26,915	17,947	478	745	118,851	55,784	69,229	2,191	6,497	63,060	46,378
T13	411,280	958	25,890	15,259	468	745	116,602	55,138	69,370	2,171	6,409	68,198	50,072
T14	411,348	1,081	27,741	17,056	468	527	114,505	57,008	68,562	1,985	6,507	66,128	49,781
T15	404,594	1,792	29,265	18,754	468	511	114,410	57,222	67,255	1,960	6,507	56,251	50,198
T16	397,428	2,157	30,954	19,124	513	549	115,452	57,933	64,858	1,893	6,462	45,515	52,019
	Max OLT	3,260	31,472	42,688	1,328	1,063	292,834	96,487	30,987	115,789	10,363	18,903	44,874
	Min OLT	1,948	11,696	21,591	465	448	106,124	36,541	12,670	45,886	3,667	6,479	17,441

Table 26 Desirable and Projected Area by Forest Unit and Age Grouping – Mature +

Mature+ Productive Forest

Forest Unit:

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	308,701	8,361	31,106	55,608	2,029	1,833	49,734	31,975	47,319	2,677	10,666	45,748	21,645
T2	313,748	8,119	33,502	62,497	1,974	1,803	50,246	28,691	40,026	2,293	10,161	53,072	21,364
T3	272,667	7,427	40,495	50,160	1,909	1,763	34,942	26,214	29,829	2,302	9,957	46,759	20,910
T4	249,184	9,531	44,229	42,287	1,846	1,707	29,465	23,644	21,547	2,246	8,855	41,828	21,999
T5	269,290	19,031	41,416	43,270	1,616	1,676	43,471	23,284	15,379	2,116	7,991	46,860	23,179
T6	297,339	18,367	40,355	32,470	1,557	1,592	64,812	24,979	12,129	1,968	8,750	62,085	28,277
T7	314,895	13,704	41,019	28,809	1,597	1,540	61,735	28,270	12,751	1,830	11,056	76,809	35,776
T8	311,673	12,869	34,905	26,935	1,557	1,250	52,500	27,500	21,609	1,935	11,293	80,890	38,430
T9	311,439	13,725	30,960	26,723	1,557	1,250	52,500	27,500	26,162	1,852	11,293	74,733	43,185
T10	315,462	13,855	30,883	25,187	1,564	1,250	52,500	27,500	24,653	2,248	11,320	76,537	47,964
T11	308,828	13,212	31,550	24,575	1,568	1,250	52,500	27,500	23,383	1,709	11,282	74,520	45,778
T12	313,409	14,617	30,980	26,849	1,727	1,250	52,500	27,500	20,532	1,658	11,123	75,945	48,727
T13	312,753	16,350	29,161	27,477	1,737	1,250	52,500	27,500	18,591	1,594	11,211	80,528	44,854
T14	312,684	15,794	26,831	26,558	1,737	1,468	52,500	27,500	17,202	1,453	11,113	84,037	46,491
T15	319,439	14,287	25,513	24,303	1,737	1,484	52,500	27,500	17,314	1,435	11,113	95,322	46,932
T16	326,604	13,731	24,659	22,876	1,689	1,446	52,500	27,500	18,778	1,419	11,161	105,825	45,020
	Max OLT	15,933	42,682	39,118	2,219	1,962	99,173	46,652	27,723	1,131	15,367	58,117	40,301
	Min OLT	8,361	24,197	19,993	1,499	1,240	52,493	27,435	12,933	452	10,078	34,643	21,733
Mature Onset Age:		60	70	60	70	60	70	70	60	80	70	70	70

Indicator: (2c) Amount and Distribution of Old Forest

Desirable and Target Levels: The desirable level is to achieve and maintain old forest area by forest unit group at or above the minimum desirable hectares in accordance with the Ontario Landscape Tool (OLT) projected range of forest types/age class structure for the Whiskey Jack Forest (Table 27). After review, the Planning Team determined that the area in the red pine and white pine forest area (PRW) is not well represented in the OLT model. Therefore the desirable level for PRW Old Forest was set to maintain a minimum of area as existed at Plan Start. The target level allows overall movement towards the desirable level within this 10-year plan period, with allowance for minor deviations by individual old forest groupings.

Desirable and targets levels of old forest are achieved and maintained from Term 6 onwards (or earlier) for all forest unit groupings. Some achievement was improved to trend closer to OLT medians. All old forest groups move towards SRNV in this plan period except BFo and SPo that decrease for 10 years then increase again T3-T6 to the SRNV. The deviation is acceptable given the overall improvement for this indicator.

Table 27 Desirable and Projected Area Old Forest Area by Forest Unit Grouping

(2c) Area of Old Forest Area by Grouping of Productive Forest (ha)									
	Lower Old Forest Age (Years):								
	80	100	100	100	90	100	160	110-120	140
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo	PRW
T1	3,707	1,851	8,730	16,931	1,252	23,267	2,007	10,155	457
T2	3,371	1,920	10,699	18,716	1,575	43,275	3,780	9,032	688
T3	5,091	1,883	15,779	18,952	1,700	42,449	5,459	13,810	808
T4	6,232	1,835	23,526	15,403	1,658	38,602	6,416	19,703	1,123
T5	6,870	1,581	28,705	23,966	1,631	34,808	5,962	25,622	1,373
T6	4,698	1,516	29,306	20,002	1,500	26,997	5,883	33,178	1,600
T7	10,049	1,466	27,528	12,867	1,452	21,000	4,630	41,072	1,654
T8	10,436	1,450	22,721	9,223	1,135	31,626	3,893	34,094	1,582
T9	10,545	1,402	21,962	10,737	1,144	44,420	3,562	39,700	1,579
T10	10,999	1,438	22,518	9,172	1,094	40,879	3,402	45,082	1,506
T11	11,206	1,400	21,000	12,341	1,094	32,809	3,413	58,659	1,387
T12	10,855	1,406	21,570	15,667	1,017	33,812	3,950	68,510	1,287
T13	6,885	1,412	21,000	17,089	1,019	29,179	4,290	78,789	1,174
T14	6,735	1,418	21,000	13,784	1,000	23,000	4,558	79,911	1,162
T15	10,699	1,562	21,000	9,996	1,086	28,120	4,418	86,796	1,102
T16	11,146	1,518	21,000	9,410	1,045	35,290	4,417	93,429	1,067
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427	inf
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840	457

ASSESSMENT - Indicator 2c – Amount and Distribution of Old Forest:
Desirable level is not projected to be achieved within the plan period. Desirable level of old forest is **ACHIEVED** (or higher achievement) and maintained from Term 6 onwards (or earlier) for all forest unit groupings.

The target level is **ACHIEVED** with overall old forest area for the old forest groupings moving toward the desirable level in the plan period, except BFo and SPo (noted above) that decrease for only Term 2 (acceptable in short-term to planning team).

The projected achievement of old forest by forest unit group is also documented in Table FMP-9. The availability of a reasonable amount of old forest was considered important to the Planning Team, LCC and the public.

Indicator: (2d) Amount of Red Pine and White Pine Forests

Desirable and Target Levels: The desirable level is to maintain a minimum of the Plan Start area of the PRW forest unit (3,312 ha)(OLT SRNV not used for PRW. See Section 3.5.2.2 2d for further rationale). The Planning Team recognized the need to maintain the current area of red pine and white pine forest and preferably increase the PRW forest area through time. Strategic modelling suggested the desirable level was achievable and therefore the target level was the same as the desirable level.

The desirable level is sustained through the planning horizon at a level greater than the Plan start level of 3,312 ha (
Table **28**). The desirable level of the Plan Start amount of red pine and white pine forest area is increased for the next 100 years.

Table 28 Desirable and Projected Amount of Red Pine and White Pine Forests

2d Productive Area (ha):		
Term	Total	PRW
T1	725,394	3,312
T2	724,845	3,500
T3	724,402	3,495
T4	724,402	3,576
T5	724,402	3,806
T6	724,402	4,043
T7	724,375	4,126
T8	724,257	4,121
T9	724,189	4,071
T10	724,139	4,048
T11	724,091	3,923
T12	724,032	3,848
T13	724,032	3,765
T14	724,032	3,438
T15	724,032	3,395
T16	724,032	3,312

ASSESSMENT – **Indicator 2d - Amount of Red Pine and White Pine Forests**:
Desirable level and target level are **ACHIEVED** with the Plan Start condition.

Indicator: (2e) Amount of Upland Pine and Spruce Forest

Desirable and Target Levels: The desirable level is to maintain a minimum of 403,400 ha upland pine and spruce as per OLT minimum SRNV projections for upland conifer. Strategic modelling confirmed that this desirable level was achievable, though the Planning Team and plan advisors were very aware that the magnitude of the increase in upland conifer as compared to the Plan Start level (403,400 ha) would be a significant consideration during development of Silvicultural Ground Rules (Section 4.2.2.1, Table FMP-4) and Operational Planning (harvest Section 4.3 and Renewal and Tending Section 4.4). The target level is to move towards the desirable level during this 10-year plan period.

ASSESSMENT – **Indicator 2e - Amount of Upland Pine and Spruce Forest**:

Desirable level is not ACHIEVED in the plan period however the target level is **ACHIEVED** through a projected increase in upland pine and spruce forest area.

The desirable level is achieved in Term 7 and sustained throughout the remainder of the 160-year planning horizon (Table 31).

Table 29 Desirable and Projected Amount of Upland Pine and Spruce Forest

Productive (ha):		(2e) Upland
Term	Total	Conifer
T1	725,394	403,400
T2	724,845	410,674
T3	724,402	413,831
T4	724,402	419,442
T5	724,402	430,127
T6	724,402	446,390
T7	724,375	457,770
T8	724,257	466,121
T9	724,189	475,219
T10	724,139	480,000
T11	724,091	483,176
T12	724,032	488,745
T13	724,032	495,391
T14	724,032	497,951
T15	724,032	500,334
T16	724,032	501,764
OLT Max.		497,902
OLT Min.		457,260

3.6.3.3 Objective 3: Wildlife Habitat

Indicator: (3a) Area of Habitat for Forest-dependent Species At Risk

Desirable and Target Levels: The desirable level is to achieve and then maintain preferred habitat for modelled Species At Risk (woodland caribou) at or above minimum OLT SRNV level (Table 30). The target level is to move towards the desirable level over the next 30 years.

Projected habitat and desirable levels for caribou refuge habitat (Cr), caribou winter used habitat (Cwu) and caribou winter preferred habitat (Cwp) are presented in Table 30. Minimum desirable levels of used caribou winter habitat (Cwu) are sustained through the planning horizon. Caribou refuge habitat (Cr) and caribou winter preferred (Cwp) achieves the desirable levels by Term 6, and sustains the desirable levels thereafter.

Caribou habitat generally increases from Plan Start to exceed min. desirable levels by Term 6 onwards. During this plan period, there is clean-up occurring in 4 caribou blocks which accounts for the short-term reduction in refuge and preferred winter habitat. Increased habitat is then projected from T3-6 to within SRNV levels to ACHIEVE target levels of movement within the 30-year target timeframe.

ASSESSMENT – Indicator 3a – Area of Habitat for Forest-dependent Species At Risk:
Desirable level **ACHIEVED** for caribou winter used habitat with Plan Start levels for Cwu. Desirable level for Cr and Cwp projected to be ACHIEVED by Term 6 (50 years), therefore target level of movement towards SRNV is assessed as ACHIEVED in the 30-year target timeframe.

Table 30 Minimum Desirable Habitat for Species At Risk

(3a) Caribou Habitat Through Time:			
Term	Cr	Cwu	Cwp
T1	103,969	45,055	20,581
T2	100,503	45,782	17,975
T3	118,856	83,974	16,824
T4	134,757	94,007	21,230
T5	143,406	106,123	54,271
T6	154,830	119,609	60,933
T7	156,352	120,501	57,788
T8	153,900	113,803	54,020
T9	151,766	109,010	52,131
T10	150,000	105,966	48,294
T11	150,000	104,075	44,972
T12	150,000	109,674	42,243
T13	154,070	118,882	40,000
T14	150,000	116,052	40,619
T15	152,438	122,894	40,000
T16	156,614	128,719	40,000
OLT Max.	161,804	47,453	68,169
OLT Min.	147,605	26,809	36,912

Where projections fall below the min. target, the data is shaded yellow;
where projections exceed max. targets, the data is shaded green.

Indicator: (3b) % of Polygons with >60% Caribou Refuge Habitat in Caribou Zone

Desirable and Target Levels: The desirable level is to have the spatial landscape pattern consistent with OLT percentage projections for caribou refuge habitat in the caribou zone established for the forest (Table 31). The target level is to show movement towards desirable level during this plan period.

Table 31 Desirable and Projected Levels for Percent of Polygons with >60% Caribou Refuge Habitat

Caribou refuge habitat in caribou zone	Plan Start (%)	Minimum Desirable Level (%)	Projected Plan End 2022 (%)
Scale: 6,000 ha hexagon	36%	87%	37%
Scale: 30,000 ha hexagon	25%	92%	24%

Spatial assessment shows 1% movement towards the desirable level for analysis at the 6,000 ha scale. The second analysis shows 1% movement away from the desirable level which is not considered significant. There is clean-up occurring in four caribou blocks which accounts for the reduction in refuge habitat at the 300 km2 scale over this plan period.

While implementation of the dynamic caribou habitat schedule is expected to result in improved caribou habitat in the future, there are several other factors that affect the provision of caribou habitat in the short- and medium-term (approx. 50 years). The time needed to age a significant portion of the forest into suitable habitat conditions is a major factor – one that cannot be accelerated through management strategies (i.e. not conducting harvesting in the caribou zone). The Planning Team did utilize an expanded caribou management and recovery zone as compared to the 2004 FMP. The Planning Team considered the projected results for this plan period to be acceptable due to the spatial results achieved, the expanded caribou management and recovery zone, the past disturbance history on the Whiskey Jack Forest, the time needed to age the forest into older patches of mature and old forest, and the fact that "doing nothing" in this plan period would not improve caribou habitat.

ASSESSMENT - Indicator 3b –
% of polygons with >60% caribou refuge habitat in caribou zone:
Desirable level NOT ACHIEVED during the 10-year plan period, but target level is **ACHIEVED** during the plan period.

Indicator: (3c) % of Polygons with >60% Caribou Winter Habitat in Caribou Zone

Desirable and Target Levels: The desirable level is to have the landscape pattern consistent with OLT percentage projections for caribou winter habitat in the caribou zone established for the forest (Table 32). The target level is to show movement towards desirable level during this plan period.

This indicator measures the caribou winter habitat pattern in the caribou management zone of the forest at two analysis scales. Spatial assessment shows movement towards the desirable level for analysis at the 6,000 ha scale. Second analysis at the 30,000 ha scale shows no movement (toward or away) from the Plan Start 0% level (constant). Implementation of the dynamic caribou habitat schedule is expected to improve caribou habitat in the future, therefore projected results for this plan period are acceptable. Overall target assessed as ACHIEVED in this plan period.

As discussed for Indicator 3b, the Planning Team considered the projected results for this plan period to be acceptable due to the spatial results achieved, the expanded caribou management and recovery zone, the past disturbance history on the Whiskey Jack Forest, the time needed to age the forest into older patches of mature and old forest, and the fact that "doing nothing" in this plan period would not improve caribou habitat.

Table 32 Desirable and Projected Levels for Percent of Polygons with >60% Caribou Winter Habitat

Caribou winter habitat in caribou zone	Plan Start (%)	Minimum Desirable Level (%)	Projected Plan End 2022 (%)
Scale: 6,000 ha hexagon	0%	45%	4%
Scale: 30,000 ha hexagon	0%	40%	0%

ASSESSMENT - Indicator 3c –
% of polygons with >60% caribou winter habitat in caribou zone:
Desirable level NOT ACHIEVED during the 10-year plan period. Overall target is **ACHIEVED** during this plan period.

Indicator: (3d) Landscape Pattern - Interior, Marten Core Habitat

Desirable and Target Levels: The desirable level is to retain 10-20% of capable marten habitat area in suitable conditions in core areas of 3,000 to 5,000 ha. The target level acceptable in this plan is 10-20% of capable marten habitat area in suitable conditions in core areas of greater than 1,000 ha moving towards the desirable level measured in 2072.

Marten cores were developed to meet guideline levels and to incorporate the best concentrations of suitable habitat, spatially distributed across the forest for the next 60 years. The percentage suitable habitat in cores of total capable habitat is measured spatially using OMA-2. The Whiskey Jack Forest currently lacks sufficient concentrations of conifer forest to meet the desirable level.

The percentage of capable habitat in suitable condition in core areas is 4.9% in 2012 at the start of this FMP. It is expected that the deferral of these 25 cores for the next 60 years, providing there is no natural disturbance, will provide for an increase of suitable marten habitat to 9.1% capable) by 2072. While this scenario does not meet the 10-20% marten habitat objectives, it does represent the best case scenario for the Whiskey Jack Forest. Preliminary assessment indicates that the minimum target of 10% should be available in 60-80 years. Overall, the selected marten cores provide adequate spatial distribution of marten habitat over the forest.

ASSESSMENT – Indicator 3d - Landscape Pattern - Interior, Marten Core Habitat:
Desirable level **NOT ACHIEVED** but target level is projected to be **ACHIEVED** through the 60-year target timeframe).

A more detailed analysis of marten core habitat areas is included in the Supplementary Documentation N – Spatial Analysis: Part 2: Marten Habitat Analysis. A map of the marten core areas management for this plan is included in Section 2.1.2.3, Wildlife Habitat Management Zones.

3.6.3.4 Objective 4: Wood Supply

Projected harvest volumes are discussed in Section 3.6.1.1 in text and associated graphs. The discussion in Section 3.6.1.1 includes comparisons to the planned and actual volumes from the three previous forest management plans including the 2004 FMP, the Ontario Forest Accord Board (OFAAB) benchmark harvest levels, recognized industrial volume demand and the Long-term Management Direction. Projected wood supply by species group associated with the LTMD is documented in Tables FMP-8 and FMP-9.

Indicator: (4a) Long-term projected available harvest area

Desirable and Target Levels: The desirable level is to maintain an average total available harvest area above 4,100 ha/year. Target level is the same as the desirable level measured over the long-tem (100 years).

ASSESSMENT - Indicator 4a – Long-term Projected Available Harvest Area:
Desirable level and target level projected to be **ACHIEVED** (achieved with the plan start level and maintained through 100-year target timeframe).

Desirable and target levels are projected to be achieved in all terms. Harvest area decreases from 5,483 hectares per year in 2012 to 4,168 hectares per year in 2112 and stays above 4,100 hectares per year in all terms over the next 100 years. The comparison of these harvest area levels to historic levels and the past management plan is included in Section 3.6.1 Available Harvest Area.

Indicator: (4b) Long-term projected available harvest volume by species group

Desirable and Target Levels: The desirable level is to achieve the highest possible long-term annual harvest volumes by species group while maintaining a balance of objective achievement. Target level is the same as the desirable level measured over the long-term (100 years).

Scoping investigations and development of the LTMD provided indication that the forest would be able to increase Spruce-Pine-Fir harvest volume from the current 279,000 cubic metres per year to sustainable levels of approximately 340,000 cubic metres per year (with a few terms higher, up to as much as 400,000 cubic metres per year). Projected poplar harvest volume decreased from the short-term (200,000 cubic metres per year) to the medium-term (90,000 – 100,000 cubic metres per year). The rate of decrease in poplar volume was managed in the LTMD while balancing achievement other management objectives.

An acceptable balance of volume by species group is projected to be achieved in all terms, which projects the meeting of the desirable and target levels for this indicator (Table 33). SPF and PO species groups were considered a higher priority than volume by other species groups or total volumes. Spruce-Pine-Fir volumes are projected to remain over 450,000 cubic metres per year over the next 100 years. Poplar volumes decrease from 190,000 to 90,000 cubic metres per year over the next 30 years then stabilize at that level for 50 years before increasing again. White Birch volumes are generally limited on the Whiskey Jack Forest and are projected to decrease from 33,000 to 7,000 cubic metres per year over the next 100 years.

Table 33 Projected Annual Harvest Volumes by Major Species Groups

Annual Harvest Volumes by Major Species Groups (1,000s net merchantable cubic metres)					
Term	TOTAL	SPF	PO	BW	PRW
T1 (4c)	574.6	340.0	190.0	33.6	3.8
T2	501.6	340.0	130.0	27.8	0.6
T3	456.2	340.0	90.0	21.8	0.0
T4	482.5	369.9	90.0	15.4	0.6
T5	466.5	340.0	90.0	28.4	0.7
T6	449.4	340.0	90.0	15.2	0.8
T7	494.5	385.1	90.0	13.6	0.5
T8	483.3	370.4	100.0	10.7	0.0
T9	464.7	340.0	112.6	10.4	0.1
T10	518.8	399.0	100.0	11.5	6.2
T11 (4b)	451.9	340.0	100.0	7.0	1.5
T12	450.9	340.0	100.0	8.0	1.2
T13	459.1	340.0	100.0	11.0	4.9
T14	454.3	340.0	100.0	9.5	2.1
T15	452.2	340.3	100.0	9.1	0.5
Average	477.4	351.0	105.5	15.5	1.6

ASSESSMENT - Indicator 4b – Long-term Projected Available Harvest Volume by Species Group: Desirable level and target level **ACHIEVED** (achieved with the plan start level and maintained through 100-year target timeframe).

Indicator: (4c) Short-term Projected Harvest Volume Per Year

Desirable and Target Levels: The desirable level is to maintain harvest volume (all species combined) at or above 510,000 cubic metres per year for this plan (2012-2022).

The desirable and target level of a minimum of 510,000 cubic metres per year was achieved in the LTMD with 574,600 cubic metres per year from 2012-2022 (Table 33). This target was specifically addressed during strategic modelling and during development of the LTMD.

The planned net merchantable harvest volume (Table FMP-13, Section 4.3.5 Harvest Volume) for this 10-year plan period averages 538,000 net merchantable cubic metres per year for all tree species combined. Therefore desirable and target levels were achieved with the planned operations.

ASSESSMENT - Indicator 4c – Short-term Projected Harvest Volume Per Year: Desirable level and target level **ACHIEVED** in this 10-year plan period.

3.6.3.5 Objective 6: Aboriginal Involvement in Planning

Indicator: (6a) Representation on the Planning Team

Desirable and Target Levels: The desirable and target levels are to have five Aboriginal Communities located in or adjacent to the Whiskey Jack Forest with representation on the planning team, measured during plan development.

ASSESSMENT - Indicator 6a – Aboriginal Representation on the Planning Team:
Desirable level and target level **ACHIEVED** during the target timeframe of plan development with participation and or representation of the planning team by five Aboriginal communities.

Five communities have representation on the planning team. Participation at planning team meetings and information centres varied based upon each representatives schedule and availability. The Aboriginal involvement on the planning team is greater than was experienced for the 2004 FMP. This is considered a significant step in effectively engaging Aboriginal communities.

Indicator: (6b) Aboriginal Communities that Contribute Information to the Planning Process

Desirable and Target Levels: The desirable and target levels are to have five Aboriginal Communities located in or adjacent to the Whiskey Jack Forest contribute information to the planning process, as measured during plan development.

ASSESSMENT - Indicator 6b – Aboriginal Communities that Contribute Information to the Planning Process:
Desirable level and target level **NOT ACHIEVED** during the target timeframe of plan development, though multiple opportunities were offered to all affected Aboriginal communities.

Three communities accepted the offer to review detailed operational plans at the LTMD stage and community information sessions were held. The Aboriginal Background reports were available for review by community members at the information sessions.

During plan development, FMP information was provided by MNR and the planning team to all affected Aboriginal communities. Aboriginal Communities that are in the Whiskey Jack Forest were generally more engaged and provided more input throughout the planning process. Regular communication between MNR and Aboriginal communities facilitated the exchange of information. MNR efforts were directed at all affected communities to get the best response possible.

3.6.3.6 Objective 7: Local Citizens Committee Involvement

Indicator: (7a) Local Citizens Committee's Self-evaluation of its Effectiveness in Plan Development

Desirable and Target Levels: The desirable level is to have the LCC Effectiveness Survey results indicate at least 60-80% effectiveness in the development of the management plan.

ASSESSMENT - Indicator 7a – Local Citizens Committee's Self-evaluation of its Effectiveness in Plan Development:
Desirable level and target level **ACHIEVED** during the target timeframe of plan development.

Desirable and target level assessment occurred during plan development at the draft plan stage. The individual members of the LCC completed a self-evaluation survey regarding their effectiveness in plan development prior to draft plan submission (survey results included in Supplementary Documentation J – LCC Report).

Areas being assessed included the functioning of the LCC, their involvement, their influence, representation of their opinions, functioning of the LCC and overall satisfaction with opportunities for public involvement in the forest management planning process. Results of this survey are summarized in Table 34. Overall, the LCC members indicated a very good level of involvement and effectiveness in the development of the FMP with an average 82% positive satisfaction response.

Table 34 Summary of Local Citizens Committee Effectiveness Self-Evaluation Survey

	Question Number																				
KLCC Member	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	*Avg. (%)*
1	3	5	5	3	4	5	2	3	2	1	1	N/A	N/A	2	3	4	2	1	2	3	57
2	4	4	3	4	4	4	4	4	3	4	3	4	4	5	4	5	5	4	4	5	81
3	5	5	4	5	5	5	5	5	5	4	4	4	3	5	5	4	4	5	5	5	92
4	4	4	4	3	4	4	5	5	5	4	4	5	4	5	2	5	4	5	5	3	84
5	5	5	4	5	4	5	5	5	4	4	4	5	4	2	4	4	5	5	4	4	87
6	5	4	4	5	5	4	5	4	5	4	4	5	5	5	4	4	4	4	5	4	89
7	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	100
8	2	2	2	3	2	4	4	3	2	2	2	2	5	5	4	5	4	2	2	4	61
9	4	4	3	4	4	5	4	5	3	2	3	4	4	4	4	4	4	4	4	4	77
10	5	4	3	4	5	5	5	5	5	3	4	5	4	5	5	4	5	4	5	4	89
Total	42	42	37	41	42	46	44	44	39	33	34	39	38	43	40	44	42	39	41	41	817
Avg/Ques.	4.2	4.2	3.7	4.1	4.2	4.6	4.4	4.4	3.9	3.3	3.4	4.3	4.2	4.3	4.0	4.4	4.2	3.9	4.1	4.1	4.1
																				%	**82.0**

3.6.3.7 Summary of Indicators Measured After Plan Implementation

The following indicators are measured after the forest management plan implementation. See Section 3.5.2 for details on the desirable and target levels. The planned harvest, renewal, tending, and road construction and decommissioning activities for this FMP period have been planned to aid in the achievement of these objective indicators.

Objective 1: Landscape Pattern

Indicator: (1a) % of Polygons with >60% mature and old forest
Timing of Assessment: Year 10 Annual Report.

Indicator: (1b) Frequency Distribution of Young Forest Patches by Size Class
Timing of Assessment: Year 10 Annual Report.

Indicator: (1c) % of Polygons with >60% mature and old conifer forest
Timing of Assessment: Year 10 Annual Report.

Objective 2: Forest Composition

Indicator: (2a) Crown Productive Forest by Landscape Class
Timing of Assessment: Year 7 and Year 10 Annual Reports.

Indicator: (2b) Crown Productive Forest by Forest Unit and Age Grouping
Timing of Assessment: Year 7 and Year 10 Annual Reports.

Indicator: (2c) Amount and Distribution of Old Forest
Timing of Assessment: Year 7 and Year 10 Annual Reports.

Indicator: (2d) Amount of Red Pine and White Pine Forests
Timing of Assessment: Year 7 and Year 10 Annual Reports.

Indicator: (2e) Amount of Upland Pine and Spruce Forest
Timing of Assessment: Year 7 and Year 10 Annual Reports.

Objective 3: Wildlife Habitat

Indicator: (3a) Area of Habitat for Forest-dependent Species At Risk
Timing of Assessment: Year 10 Annual Report.

Indicator: (3b) % of Polygons with >60% Caribou Refuge Habitat in Caribou Zone
Timing of Assessment: Year 10 Annual Report.

Indicator: (3c) % of Polygons with >60% Caribou Winter Habitat in Caribou Zone
Timing of Assessment: Year 10 Annual Report.

Indicator: (3d) Landscape Pattern - Interior, Marten Core Habitat
Timing of Assessment: Year 7 and Year 10 Annual Reports.

Indicator: (3e) % of Conifer Dominated Forest Units in the Caribou Zone
Timing of Assessment: Year 7 and Year 10 Annual Reports.

Indicator: (3f) % of Jack Pine and Spruce Species Composition by Forest Unit in the Caribou Zone
Timing of Assessment: This assessment is long-term and will continue over future planning periods. The assessment of conifer purity at Year 7 and 10 provide trends through time.

Objective 4: Wood Supply

Indicator: (4d) Actual Harvest Area, by Forest Unit (% of planned harvest area)
Timing of Assessment: Year 7 and Year 10 Annual Reports.

Indicator: (4e) Actual Harvest Volume, By Species Group (% of planned harvest volume)
Timing of Assessment: Year 7 and Year 10 Annual Reports.

Objective 5: Managed Crown Forest

Indicator: (5a) Managed Crown Forest Available for Timber Production
Timing of Assessment: Year 7 and Year 10 Annual Reports.

Objective 8: Road Access

Indicator: (8a) Kilometres of SFL Road per Square Kilometre of Crown Forest
Timing of Assessment: Year 7 and Year 10 Annual Reports.

Objective 9: Forest Renewal

Indicator: (9a) Regeneration Success: Percent of Harvested Forest Area Assessed as Free-Growing by Forest Unit
Timing of Assessment: Year 7 and Year 10 Annual Reports.

Indicator: (9b) Silviculture Intensity: Planned and Actual Percent of Harvested Area Treated by Silvicultural Intensity
Timing of Assessment: Year 7 and Year 10 Annual Reports.

Indicator: (9c) Silvicultural Success: Planned and Actual Percent of Harvested Forest Area Assessed as Free-Growing and Successfully Regenerated to the Projected Forest Unit
Timing of Assessment: Year 7 and Year 10 Annual Reports.

Objective 10: Forest Values

Indicator: (10a) % of Forest Operation Inspections in Non-Compliance, By Activity and Remedy Type (i.e. severity)
Timing of Assessment: Year 7 and Year 10 Annual Reports.

Objective 11: Soil and Water Resources

Indicator: (11a) % of Forest Operations Inspections in Non-Compliance with Management Practices that Prevent, Minimize or Mitigate Site Damage (by remedy type)
Timing of Assessment: Year 7 and Year 10 Annual Reports.

Indicator: (11b) % of Forest Operations Inspections in Non-Compliance with Prescriptions Developed for the Protection of Water Quality and Fish Habitat (by remedy type)
Timing of Assessment: Year 7 and Year 10 Annual Reports.

3.6.3.8 Conclusion on the Assessment of Objective Achievement

Based on the assessment of objective achievement documented in Table FMP-9, the majority of the indicators of objective achievement that could be assessed in the forest management plan were within or exceeded minimum desirable levels. For any indicators that had targets for this plan period established below desirable levels, the reason for the variance was documented in Section 3.5.2. Certain desirable levels could not be reached in specific terms due to incompatible management objectives or where the land base of the Whiskey Jack Forest did not allow achievement of desirable levels in the short or medium-term such as Landscape Pattern.

Of the 30 indicators included in Table FMP-9, 18 of the indicators can be assessed during plan development. The remaining 12 indicators (and reassessment of some of the original 18 indicators) will be assessed in the future: after plan implementation as appropriate (specific indicator timing of assessment is noted in Table FMP-9 and in plan text Section 3.5.2).

Of the 30 plan indicators assessed:

11 indicators ACHIEVE desirable and target levels in this 10-year plan period;
6 indicators are projected to ACHIEVE target levels in a target timeframe longer than this 10-year plan period;
1 indicator is projected to NOT ACHIEVE desirable or target levels at some point in the 100-year strategic planning horizon; and
12 additional indicators (not already assessed in this FMP) will be assessed in the FUTURE after plan implementation.

Total: 30

The indicator that is not achieving desirable and target levels is the indicator for Aboriginal Communities that Contribute Information to the Planning Process (6b). All affected Aboriginal communities were contacted for comment on products during development of the plan, however some communities chose to not comment on information products or Aboriginal values. This resulted in one indicator “not achieving” desirable levels because the goal is to have five Aboriginal communities contribute information or comments on the plan and only three communities contributed. Multiple opportunities for input were offered and will continue to be offered to all affected Aboriginal communities.

3.6.4 Social and Economic Assessment

A component of forest sustainability is provision for the needs of the people who receive benefits from the forest. Decisions in a forest management plan have significant impacts on the local economy, as well as the regional and provincial economies. Therefore it is important to be knowledgeable about the social and economic impacts, which can result from decisions that are made in forest management plans.

The *Forest Management Planning Manual* (2009) requires that a Social & Economic Assessment (SEA) be prepared to identify the expected social and economic impacts of implementing the Long-term Management Direction included in the forest management plan (FMP). The assessment examines how the quantity of timber supplied to the wood-processing facilities, and the silvicultural investment requirements for the LTMD may affect the communities identified in the Social & Economic Description. The Social & Economic Assessment of timber volumes and silvicultural expenditures is based on a comparison of the annual planned levels for the 2004 FMP and the annual levels shown in the Long-term Management Direction for the 2012 FMP.

The implementation of the long-term management direction of the forest management plan affects the social and economic environments associated with several communities that receive benefit from forestry operations on the Whiskey Jack Forest. This section attempts to measure some of the impacts the implementation of this forest management plan may have on the areas social and economic values.

This social and economic assessment has been prepared for the LTMD by the MNR. This assessment summarizes the expected social and economic impacts associated with the LTMD. The Social and Economic Assessment evaluates the social and economic impacts associated with respect to:

Section 3.6.4.1	Timber Value Assessment and Impacts,
Section 3.6.4.2	Silviculture Value Assessment, and
Section 3.6.4.3	Non-timber Value Impact Assessment.

3.6.4.1 Timber Value Assessment and Impacts

The Socio-economic Impact Model (SEIM) was used by MNR to evaluate the socio-economic impacts of the preferred forest management scenario. The basis of the analysis was the quantity of timber harvested and supplied to the various wood-processing facilities and the silvicultural investments required to support that level of harvest.

The intent of the socio-economic analysis is to account for as many forest users as possible. It attempts to predict the impacts of computer simulated forestry operations over the ten-year implementation period of the FMP. While the model cannot provide an in-depth socio-economic analysis for every business sector and community in the district, it does provide resources managers with a sense of the relative benefits and/or disadvantages that various management strategies could have in the local, regional and provincial economies. The Socio-economic Impact Model provides the multi-dimensional framework through which the extensive socio-economic impact can be identified, at least in part, and quantified. This framework supports informed decision making based on a holistic perception of the forest management undertaking,

providing insight into the possible trade-offs associated with the proposed long-term management direction. A comparison of the 2012 SEIM output is then made to the 2004 FMP to see if the trend has shifted.

In general, socio-economic model results indicated that the less the volume of wood harvested from the Whiskey Jack Forest, the less the positive socio-economic impact that the forest industry had on the Kenora District. Decreased harvest volumes resulted in lower industry output, person years of employment and gross domestic product (GDP). These same indicators for the Northwest Region and Province of Ontario were also decreased proportionately with decreased wood volumes.

The economic impacts, provincially and regionally, associated with the proposed long-term management direction were analyzed by MNR using the Socio-economic Impact Model (SEIM).

Compared to the 2004 Whiskey Jack Forest Management Plan SEIM output, there was a general downward trend to the economic impact at the District and Regional scale. This trend is also observed in the environmental impacts, most notably the Green GDP Cost which had a reduction of 86%. The impacts on the social scale were either positive e.g. Average Wages increased by 53% compared to the 2004 output even with the reduction of volume harvested, or negative trends e.g. Pulp & Paper Sector Dependency 100% due to the closure of the Abitibi-Bowater Inc. facility in Kenora. The decision to implement a long-term management direction that results in lower economic activity is related partly to the time scale over which the two models, namely SFMM and SEIM operate and partly to the measures used to determine sustainability. The SFMM projects outcomes and identifies levels of objective achievement at scales of ten years as the first operating term of the FMP plan period, roughly 50-100 years as the point in time where the desirable levels for future forest condition are achieved and finally 150 years for the full strategic modelling planning horizon. The SEIM model on the other hand operates on a scale of five years. Effectively the SEIM considers the specific volumes to be harvested annually, the silviculture costs annually and the industrial outputs annually for the first five-year term of the 10-year FMP. The difficulty with these different time scales is that management strategies or the long-term management direction are developed and chosen on the basis of long-term objective achievement (usually 100 years) and the outputs from SEIM in terms of objective achievement cannot be ranked on the same scale.

The ‘measure of sustainability’ as applied to different objectives and therefore the long-term management direction varies based on the measurable variables of the objective. The socio-economic objectives in the FMP begins with wood supply to meet the initial identified target, which is usually based on past history and current industrial demand, and then considers how well that target can be met through time in the context of balancing other objectives.

When the overall achievement of plan objectives and the full measure of sustainability is considered, SFMM LTMD run 27d_OLTMS projects the best balance and has been confirmed as the Proposed Long-term Management Direction.

The second part of the assessment of sustainability of wood supply considers whether the supply is ‘continuous and predictable’. If the LTMD cannot achieve the strategy level for wood supply through all future terms then the second measure is whether the supply is continuous and predictable. The choice to rank any given management strategy based on wood supply then must consider both parts of the sustainability measure.

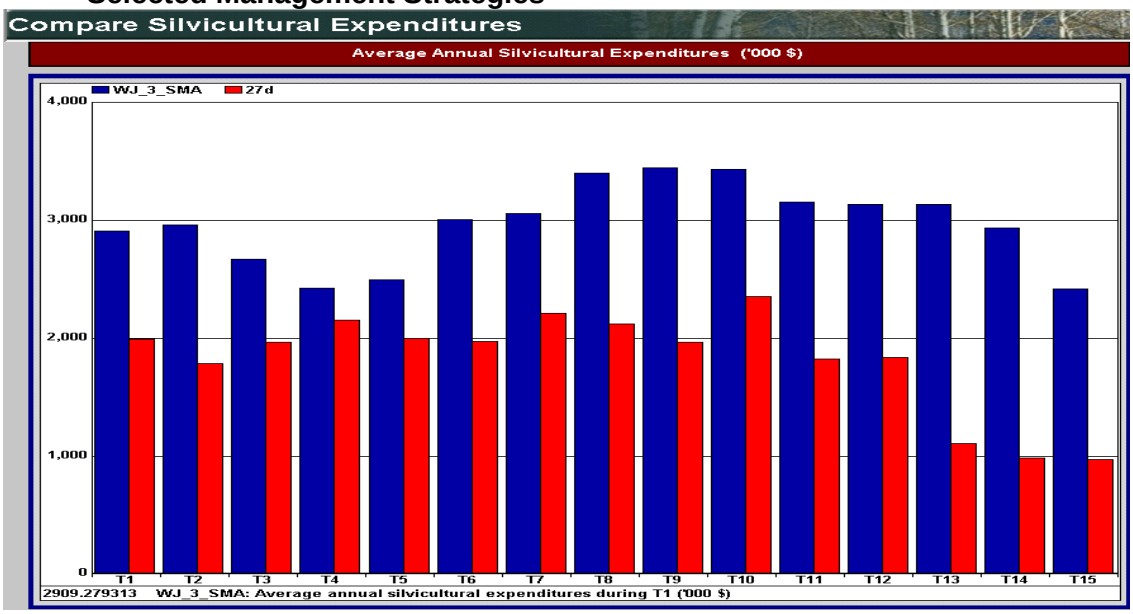
None of the scenarios provided sufficient wood to fully meet the regional strategy in the wood supply objective in the short to mid-term. The planning team decided upon a scenario which ensured long-term forest health and identified the best continuous and predictable wood supply available from that forest. The LTMD provides the best wood supply while lessening the impact that sudden, significant declines in projected harvest volumes would have on the communities which depend upon wood from the Whiskey Jack Forest.

The LTMD will have significant positive socio-economic impacts on the communities directly receiving timber from the Whiskey Jack Forest. The relationship between the economic activity engendered through the forest management expenditures and the manufacture of the timber into processed products creates a chain of events which have an extensive positive impact on the social and economic dimension of the community, the region and the province.

3.6.4.2 Silviculture Value Assessment

The silvicultural renewal and tending impacts of the Long-term Management Direction also have social and economic impacts on contractors doing the work. The projections from the 2004 FMP suggest 926 ha per year would be treated extensively (cut and walk away treatments) and 4,673 ha per year would be treated either basically or intensively (cut with some form of renewal and potentially tending). The 2012 FMP revised the level of renewal and tending to reflect 3,126 ha/year be treated extensively and 2,298 ha/year be treated basically or intensively. This increase in extensive treatment is appropriate given the increased level of harvest of HMX and POD since the 2004 plan (in keeping with plan objectives, Section 3.5) and the projected success of natural regeneration of poplar on the Whiskey Jack Forest. The projected renewal expenditures reflect an overall decrease in spending to $913,000 per year for the next ten years; an average decrease in silviculture spending of 46% between plans. Of that difference in silviculture expenditures is a representative decrease in employment to complete the work and the spin off impact of reduced purchase of products.

Figure 39 Silviculture Expenditure Comparison for the 2004 (blue) and 2012 (red) Selected Management Strategies



The main impact of the decreased silvicultural program is on the community of Kenora. The main concentration of people performing the work is located in Kenora with some of the other spin offs such as consulting, tree seed extraction, tree seedling production, etc. being from the Thunder Bay area, other locations in Ontario and outside the province (mainly Manitoba).

3.6.4.3 Non-timber Value Impact Assessment

Due to the nature of the non-timber values in the area and no existing approved model to evaluate the impacts of forestry and forest operations on these values, it was decided that a qualitative assessment would be used to assess the impacts on non-timber values. This qualitative assessment will look at different classes of values and identify potential impacts (positive and negative). Where forest operations are identified in proximity to certain values or directly impact these non-timber values, the potential impacts will be identified specifically for that value.

Summary of First Nations Use of Other Resources

First Nation community members actively use portions of the Whiskey Jack Forest for many resource-based activities.

i) Fishing
Several First Nation communities hold commercial fishing licences on Lake of the Woods and inland lakes. Lake of the Woods and surrounding lakes are used for subsistence fishing by community members. Surrounding tourist lodges provide some employment opportunities for First Nation residents as guides in the sport fishery.

ii) Trapping
First Nation community individuals hold registered trap lines located all or partially within Kenora District.

iii) Wild Rice
Wild rice is harvested annually by community members for personal use and re-sale from various lakes throughout the area.

iv) Cultural and Social, other Wildlife
Special sites within the forest are used for traditional cultural purposes such as fasting, vision quests and offerings. The specific location of these sites are known to community members, and the community is encouraged to participate in the forest management planning process to ensure these values are considered in proposed forest management activities.

Certain wildlife species, such as the bald eagle, have a cultural and social significance to First Nation people. The protection and management of these species and their habitats is important.

While the subsistence hunting, fishing, and gathering of resources from within the forest are an integral part of community existence, there are no accurate records of the level of such harvest. The harvest of deer, moose, waterfowl, rabbits and grouse provides an important source of food to community members.

Recreation and Tourism

The impacts of forest management and operations on recreation and tourism are dependent on the value (Table 35). Some values benefit from increased access to previously un-accessed areas whereas others that rely on remoteness can be negatively impacted. Similarly, harvest areas may be desirable to improve certain opportunities such as hunting or berry picking, but may also be temporarily detrimental to the natural aesthetics or carrying capacity for certain wildlife species that favour mature forest habitat. Harvesting operations tend to be noisy which most recreationalists and the tourism industry do not approve of, particularly during certain times of the year.

These activities have significant impacts on the local Kenora economy. There are 362 tourist operators in Kenora District, of which 143 are associated with the Whiskey Jack Forest. These tourism operations offer activities such as hunting, fishing and ATV riding. See Table 35 for impacts of the forestry on the tourism industry. Qualitative analysis suggests that forestry has a **net neutral impact** on the tourism industry, specifically when recent initiatives, such as Resource Stewardship Agreements (RSAs) are developed coupled with an open and transparent forest management planning process.

There are seven provincial parks or protected areas adjacent to or surrounded by the Whiskey Jack Forest. These parks include the West English River, Eagle-Dogtooth, Tide Lake and the Maynard Lake Parks. The Pakwash Provincial Park is located adjacent to the northeast corner of the unit, Rushing River Provincial Park is located in the southern portion of the forest, and Woodland Caribou Provincial Park is located in the northwest portion of the unit.

Table 35 Summary of Recreation and Tourism Impacts

Value	Positive Impacts	Negative Impacts
Non-Remote Tourist Outfitters	• New road access to be used for accessing fishing, hunting and other recreational activities.	• Harvest operations are noisy and can affect the natural experience outfitter offer. • Aesthetics and noise levels are affected when harvest activities occur adjacent to lakes utilized by tourism operators.
Remote Tourism Outfitters	• Reduced road densities would have a positive impact on remote based ecotourism.	• New road access in proximity to camps and outfitters affect the selling points of their business.
Fishing	• New access may open up previously inaccessible areas which would be desirable to road based fishing	• Decreased road densities could potentially lead to over fishing in some areas due to less roads and fishing efforts being concentrated. • Potential shoreline disturbances due to logging activities. • Greater potential of reducing fish population levels due to higher water temperatures, destruction of spawning areas resulting from road construction and increased sedimentation in water courses.
Hunting	• Moose and deer hunting opportunities increase for the short term after an area is	• Decrease in road densities will mean less opportunities for road-based hunting and efforts may become

Value	Positive Impacts	Negative Impacts
	harvested. • Habitat protection and/or improvement due to implementation of forest management guides.	concentrated. • Increased access may result in higher hunting pressures on wildlife populations resulting in population decline. • Harvest operations in the fall may disrupt hunting opportunities.
Cottagers	• Decreased road densities could mean less non owner traffic in vicinity of cottages. • Increased road access may increase recreational opportunities for cottagers. • Regeneration of forest in proximity to cottages may temporarily reduce forest fire risk.	• Reduced road densities may limit recreational opportunities for cottagers and may limit access to their cottages. Transfer of road responsibility to the cottagers is an option but will expensive for the cottagers to maintain roads. • Aesthetics and noise levels are affected when harvest activities occur adjacent to cottages. • Increased road access could reflect higher traffic and increase potential for vandalism.
Recreation, Ecotourism and Natural Adventure	• Increased road access may increase recreational opportunities. • Decommissioning of roads may increase the opportunities to create trails for other users. • Change in forest cover may change the wildlife viewing opportunities.	• Aesthetics and noise levels are affected when harvest activities occur adjacent to values • Existing trails can be destroyed or aesthetic values may be altered by forest operations. • Additional road access reduces the remoteness aspect of backcountry tourism and recreation activities.
Berry Picking and Wild rice picking	• Increased road access may increase opportunities to access natural food harvest areas. • Removal of forest cover may improve berry production potential in an area.	• Change in forest cover may reduce the abundance and potential for certain types of plant production • Application of herbicide may reduce the areas of potential berry production. • Decommissioning of roads can limit access to recent harvest areas that yield good blueberry crops

Mining and Mineral Exploration

Historically, mining and mineral exploration have been an important activity in this management unit and historically gold, silver and copper were the predominant commodities mined. Currently there are four granite producers in operation which have been and continue to be a significant contributor to the economy of the area. In addition to historical and current mineral production there are significant concentrations of gold, nickel, copper, silver and uranium contained within documented mineral deposits throughout the management unit.

The impacts of forest management on mining and mineral exploration are mainly positive. The maintaining of exiting road systems allow for continue access to the forest. The creation of new roads can open new areas to possible mineral exploration and tends to expose sediment and rock formation for prospectors to investigate for mineralization. Negative effects consist of the potential to decommission a road which may affect exploration opportunities in the area.

Impacts of road construction are mitigated by consultation. Plan development allows the MNR to transfer road responsibility to mining parties prior to decommissioning.

With more roads, increased access for timber harvesting can clear areas for mining sampling and mapping, but potentially it would increase the chance or removing mining survey lines, and destruction of claim posts could occur. The disruption of existing mining survey monuments are mitigated by consulting MNDM area office and the CLAIMS website prior to operations and training for operator to identify these values.

There are 54 aggregate sites located in the Whiskey Jack Forest. Forest operations, such as timber harvesting and construction of forest roads, increase the chance of finding aggregates. More road network ultimately increases access to aggregates.

Hydro Electricity Generation

The implementation of this forest management plan is not expected to have any impacts on current hydro-electric generation stations. The potential impact is a temporary increase in water deposited into the generation stations watershed area due to lower levels of evapotranspiration as result of removing portions of forest cover in the watershed. These areas generally recover within a few years after harvest. Only small amounts of harvest are expected in the vicinity of these watersheds therefore not having any significant effect.

Trappers and Traplines

The overall harvest area levels have little impact on trappers. Of more significance is the location of forest operations, type of renewal and locations of roads. The land base is occupied by traplines. Forest operations will directly affect certain traplines and not others. These operations may have both a positive and negative impact to one or more trappers and their traplines. The strategic allocation of some larger harvest blocks has the potential of completely eliminating the mature forest of a trapline. This will eliminate the potential for trapping of certain species that desire older forest in that area, such as marten. However, other trapped species that prefer young forest may increase in population. Also, new guidelines around harvesting near shorelines may improve beaver habitat and populations in certain areas, however no cutting to the shoreline is proposed in this plan period. The partial harvest of a trapline can be beneficial to trappers. The combination of mature and immature forest can diversify trapping opportunities or increase populations of certain species. These increased opportunities can be translated in higher trapping success and economic benefit to the trapper.

Associated with harvesting is road access. Road management can create or remove access to trap lines. However, it is likely that many trappers use ATVs and snow machines to access their lines and this will continue to be possible, even following road decommissioning, subject to conditions which may be negotiated between the trapper, the SFL and MNR. Trap cabins are also protected by Area of Concern prescriptions. All trappers were invited to public information centers and informed that forestry operations may have an impact on their business and were encouraged to comment. Trappers that feel they may be affected by road management strategies can have their concerns addressed during the public consultation opportunities.

Baitfish Operators

Similarly to trappers, the overall harvest levels of the plan have little impact on the baitfish operator. The harvest operations and roads are more of an impact on baitfish operators. With increased road access created to extract timber, these roads may also increase access to new baitfish lakes and ponds that baitfish licensees did not have previously. This may decrease the cost of accessing these ponds or open up higher productive baitfish areas. This translates into higher production levels and profits.

Improved access to some of these areas may also increase pressure on baitfish blocks by other users, such as anglers. It may also increase the potential of introducing invasive species to these newly accessed areas.

Bear Management Area Operators

Bear Management Area (BMA) operators may be affected by both the harvest operations and road access. Road access may be increased or decreased in the area of a BMA. The improved access may result in higher pressure on bear populations through more opportunities for public hunting access. However, the creation of more access may improve the BMA operators access to an area that was previously inaccessible.

The removal or decommissioning of roads should have little impact on most BMA operators as many operator use trails and ATVs to access bait stations and hunting stands. BMA operators also have the opportunity to assume responsibility for a road should the road be considered for decommissioning through the public consultation process.

Forest cover changes and harvesting operations can also impact the BMA operator by increasing or decreasing habitat. Denning areas can be destroyed or created through harvesting operations. The removal of mature forest cover may affect the potential for creating hunting stands and bait stations. The change in forest cover can also influence the population of bears in an area. The creation of a desirable habitat and food source such as blueberries may increase the populations of bears in a given area. However, the changing of forest cover to a less desirable condition may reduce the population of bears in an area. This can considerably affect the BMA success. Harvest operations and silviculture in the fall season may also affect hunting. The disruption in the vicinity of the BMA may reduce hunting success. The operator should negotiate seasonal restrictions when necessary with the plan author to mitigate any impacts to the hunt.

3.6.4.4 Summary of Social and Economic Impact Assessment

The overall social and economic impacts of implementing the 2012 FMP as compared to the 2004 FMP are generally good. The social and economic assessment for this FMP indicates that current levels of social or economic benefits are projected to be generally maintained or increased for the 2012-2022 plan period, in comparison with the 2004-2009 FMP.

The LTMD will have significant positive socio-economic impacts on the communities directly receiving timber from the Whiskey Jack Forest. The relationship between the economic activity engendered through the forest management expenditures and the manufacture of the timber into processed products creates a chain of events which have an extensive positive impact on the social and economic dimension of the community, the region and the province.

Compared to the 2004 Whiskey Jack Forest Management Plan SEIM output, there was a general downward trend to some of the economic and environmental impacts at the District and Regional scales. Positive or negative social impacts were projected, depending on the indicator being measured. When the overall achievement of plan objectives and the full measure of sustainability is considered, SFMM LTMD run 27d_OLTMS projects the best balance of achievement and has been confirmed through this analysis as the Proposed Long-term Management Direction.

The impacts of forest management and operations on recreation and tourism are not dependant on the harvest level but rather how the specific value has been addressed. Some values benefit from increased access to previously un-accessed areas whereas others that rely on remoteness can be negatively impacted. The impacts of forest management on mining and mineral exploration and baitfish operations are mainly positive. Forest operations will directly affect certain traplines and not others depending on where harvest allocations are planned. These operations may have both a positive and negative impact to one or more trappers and their traplines. Bear management area (BMA) operators may also be affected by both the harvest operations and road access. Stakeholder involvement during plan development will allow consideration for other values and users to be incorporated in the FMP to minimize potential negative impacts from forest operations.

4.0 PLANNED OPERATIONS

4.1 Introduction

This section of the plan describes the planned harvest, renewal and tending for this 2012-2022 forest management plan. Also summarized is a description of the prescriptions for operations, planned clearcuts, harvest volumes, wood utilization, forest access and road use management, road maintenance, road decommissioning, forestry aggregate pits, and monitoring and assessment activities.

The plan text describes the areas planned for operations for the first and second five-year terms (2012-2017 and 2017-2022) including area of concern planning. The planned operations for the second five-year term will be reviewed, updated as required, and approved for operations during Phase II Planned Operations.

Contingency harvest areas and associated contingency harvest volumes are also discussed in this section. There is no second-pass harvest planned in this FMP.

All planned operations are provided in digital format as per the requirements of the *Forest Information Manual (2009)*. The information products for harvest, renewal and tending operations will serve as the stand listing.

4.2 Prescriptions for Operations

4.2.1 Operational Prescriptions for Areas of Concern

An “area of concern” (AOC) is defined as a geographic area associated with an identified natural resource feature, land use or value that may be affected by forest management activities. A detailed prescription is developed for the area of concern in order to prevent, minimize or mitigate adverse effects of forest management operations on the value. MNR guidelines, site inspection by ground or air, regular and supplementary aerial photographs, contour and elevation maps, slope analysis, and local knowledge of trappers, Aboriginal groups, tourist operators and forestry workers were used to develop area of concern prescriptions in order to consider and protect identified values.

The area of concern prescriptions for this FMP have been prepared by the Operations Task Team to address identified values that may be affected by planned operations. Prescriptions have also been prepared in advance for values not currently identified on the forest, but which may be encountered during the course of operations (e.g. previously unidentified stick nests, or low potential sensitivity (LPS) streams).

Operational prescriptions for areas of concern within the areas of operations are documented in Table FMP-10. Table FMP-10 presents for each AOC, among other things, the unique identifier which is illustrated on maps, a description of the value, the operational prescription, the source of the prescription, and identifies if there are conditions on roads, landings and forestry aggregate pits. AOC operational prescriptions related to roads, landings and aggregate pits

within the areas of operations are documented in Table FMP-19. Where required, AOC operational prescriptions are documented in Supplementary Documentation Section H.

The spatial locations of areas of concern are included in the FMP in two information formats: illustrated on maps and included in the digital coverages of electronic information to be viewed with the planned harvest layer of information.

Some of the AOC prescriptions associated with the protection of tourism values were based on previously negotiated Resource Stewardship Agreements (RSAs). The RSAs are no longer in effect due to the Whiskey Jack Forest reverting to a Crown Unit. However, the planning team is still committed to maintaining the viability of the tourism industry by protecting tourism values in the areas of operations through the application of the *Management Guidelines for Forestry and Resource-Based Tourism* as one method of protecting and sustaining these values.

The selection and planning of harvest, renewal, tending operations and road locations was conducted in consideration of all currently identified values. Phase II planning will include refinement of area of concern prescriptions, updating of values information and implementation of relevant direction provided by any new or updated forest management guides. While Phase II estimated areas of concern are portrayed on operations maps in this FMP, they are not approved prescriptions. Complete AOC planning will occur prior to approval of Phase II operations and any Phase II prescriptions currently shown are subject to change.

The AOC prescriptions were applied to known values and common prescriptions from the previous FMP were used where possible and relevant. New prescriptions were created based on new direction in new forest management guides and new values found on the forest. Prescriptions can be one of the following:

- Reserve – no harvest, renewal or tending operations.
- Modified – modified forest management activity – timing, operational conditions.
- Regular – no conditions on harvest, renewal or tending operations.

Discovery of Cultural Heritage Values During Forest Operations

If a cultural heritage value is discovered during operations then operations must immediately stop and the district MNR staff is to be contacted. The value class of the discovery will determine who of the following will be contacted: Ontario Ministry of Culture staff, the local Aboriginal community, Registrar of Cemeteries, and/or the provincial cultural heritage specialist.

As per the Guide, if human remains are discovered, operations at the site must stop immediately. Contact will be made with MNR district staff, the local or Ontario Provincial Police, and the Registrar of the Cemeteries Regulation Section of the Ministry of Consumer and Business Services at (416) 326-8393 as soon as possible. The police will investigate the report to determine if the human remains are of forensic interest or represent a burial site as defined by the Cemeteries Act. All involved parties must act to safeguard the location until the police attend the site, and to limit media contact or display. In addition, if the protection measures for an area of archaeological potential are not complied with, operations must immediately cease within the area of concern and a Stage 2 archaeological assessment per the Ontario Ministry of Culture's current standards and guidelines for consultant archaeologists shall occur.

The following is related to some of the values as documented in Table FMP-10. Refer to Table FMP-10 for the actual prescriptions that apply:

Archaeological Potential Areas (AOC A01)

Forest management activities are to be planned and carried out in a manner to prevent adverse effects on cultural heritage values. Area of concern planning for cultural heritage values will be carried out in accordance with the *Forest Management Guide for Cultural Heritage Values (2007)*.

Archaeological Potential Areas (APAs) for the Whiskey Jack Forest were determined through the use of an archaeological potential area modelling tool. The model predicts areas where archaeological sites are likely to exist based on the presence of specific landscape features that resemble the location and site conditions of known sites on the forest management unit. Each archaeological potential area on the Whiskey Jack Forest is an area of concern. The APA areas of concern are identified on maps as AOC A01 and their prescription is found in Table FMP-10.

Furbearer Dens (AOCs D01 to D05)

In accordance with the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* (MNR, 2010), prescriptions for the protection of furbearer dens have been included in Table FMP-10 as AOCs D01 to D05. These prescriptions apply to identified black bear, grey fox, cougar, wolf and wolverine dens. In general, regular harvest, renewal, and tending operations are permitted within the AOC outside the denning period (varies by species) and are subject to the general direction for the protection of dens of furbearing mammals (text Section 4.2.2.2 Conditions on Regular Operations).

Mineral Licks (AOC M01)

In accordance with the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* (MNR, 2010), a prescription has been included in Table FMP-10 (AOC M01) to protect known mineral licks.

Bird Nests (AOC numbers starting with N, ON, BH, BG, HO, or NO)

Bird nests that have been identified are recorded in the current Natural Resource Values Information System (NRVIS) values information. Each nest has a unique identifier as per NRVIS numbering system and NRVIS maps (not shown on FMP maps). Other bird nests will be identified during forest operations as encountered.

In accordance with the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* (MNR, 2010), prescriptions have been included in Table FMP-10 to protect identified bird nests. The level of protection around the nests are based on many factors: the bird species associated with the nest(s), location of the nest (trees or ground), whether the nest is a primary, alternate or inactive nest, the nest occupancy, the timing since the nest was known to be occupied, timing of identification of the nest (before or during operations), timing of the critical breeding period (varies by bird species), and the relative impact of harvest, renewal or tending operations on the birds and their nests.

Of note is the AOC prescription for whip-poor wills (AOC NO04) which are classified as a "threatened" species. When the habitat description under the Species At Risk Act becomes available these conditions may be updated prior to plan approval if this is necessary to address the habitat description. If the habitat description becomes available after final plan approval, a plan amendment for this AOC may be submitted if necessary to address the habitat description.

Growth and Yield Plot (AOC PGP01)

The FESC PGP Growth and Yield Trial Plot is a value that has an associated prescription in Table FMP-10 for adjacent harvest, renewal or tending operations.

Land Ownership or Non-timber Use Values (AOCs FL01, PL01, NG01, RR01, HB01)

Areas were identified that were not owned by the Crown (patent land, federal land) or Crown land with management uses other than or in addition to timber production (e.g. provincial parks, railway right of way, natural gas transmission pipelines, highway corridors). Where these land ownership/management use areas were in proximity to planned operations on the Whiskey Jack Forest, area of concern prescriptions were developed to protect the values. Prescriptions included in Table FMP-10 include precautions to identify the location of the land value, slash management adjacent to railway right of ways, communication with natural gas pipeline staff prior to operations on pipelines and delay of harvest adjacent to highway corridors until adjacent forest is a minimum height.

Tourism Values (AOC numbers starting with TV)

Prescriptions for the enhancement of tourism values were developed through consultation with the affected stakeholders and tourist outfitters, either as a component of Resource Stewardship Agreement negotiations or through regular communication with stakeholders during area of concern prescription development.

The Operations Task Team, with input from interested tourist outfitters and/or the public, applied varied prescriptions around various tourism values. These prescriptions included increased riparian reserves in specific locations to enhance shoreline aesthetics, conditions on operational roads to address access concerns, seasonal restrictions on harvest, road construction or mechanical site preparation.

All the tourism areas of concern prescriptions have followed the direction and recommendations provided in the *Management Guidelines for Forestry and Resource-Based Tourism* as well as direction from the *Ontario's Crown Land Use Policy Atlas*.

All negotiated areas of concern are included in the Area of Concern (AOC) Planning Supplementary Documentation H.

Lakes, Ponds, Streams and Rivers (AOCs starting with WL and WS)

Values associated with lakes, ponds, streams, and rivers were identified in accordance with definitions included in the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* (MNR, 2010). The values are classified based on the type of water body, as well as the relative potential impact from forest management activities (low, moderate or high potential impact from operations).

Areas of concern are identified adjacent to the specific aquatic values. Depending on the value being protected, some AOCs are of a fixed dimension (e.g. 15 metres from ponds with low potential sensitivity to forest management operations) or are variable width based on shoreline slope (e.g. 30-90 metres AOC on lakes with high potential sensitivity to forest management operations).

Within the AOC, the width of the reserve or permitted harvest, renewal or tending activities will be dependent on the value being protected and the potential sensitivity of the value to forest management operations.

Wetlands Occupied by Breeding Black Terns and Least Bittern (AOC WW01)

Specific restrictions are identified for wetlands occupied by breeding black terns and Least Bittern (Species At Risk).

4.2.1.1 Operational Prescription for Areas of Concern Information Products

The spatial locations of areas of concern are included in the forest management plan in two information formats: illustrated on maps and included in the digital coverages of electronic information to be viewed with the planned harvest layer of information.

In both formats, the (a) area of concern identifier, and (b) the area of concern type are identified. The spatial location of the area of concern when cross referenced with the operation prescription for the area of concern (Table FMP-10) identifies the operational prescriptions for harvest, renewal and tending to be applied to the specific AOC.

For bridging areas originally approved in the 2012-2014 Contingency Plan, the appropriate AOC prescription from this 2012 FMP Table FMP-10 has been applied.

There is no second-pass harvest planned in this FMP.

4.2.2 Prescriptions for Harvest, Renewal and Tending Areas

Prescriptions for harvest, renewal and tending operations are discussed in the following sub-sections:

Section 4.2.2.1 Silvicultural Ground Rules
Section 4.2.2.2 Conditions on Regular Operations
Section 4.2.2.3 Silvicultural Treatments of Special Public Interest

Digital spatial information products for harvest, renewal and tending operations that are included with the FMP will serve as the stand list for forest operations. The information product for the harvest, renewal and tending areas is the SGR field in the planning composite (PCM) coverage and linked information for the planned harvest is in the PHR coverage.

4.2.2.1 Silvicultural Ground Rules (SGRs)

Silvicultural Ground Rules (SGRs) are defined as "Specifications, standards, and other instructions, that direct silvicultural activities on a management unit during the period of the forest management plan" (FMPM, 2009).

SGRs were developed to reflect planned silvicultural intent and are consistent with the development information used in the LTMD strategic model projections. SGRs are not included for unplanned future forest conditions (e.g. resulting from unintentional treatment failures), though the impact of estimated failures was factored into the calculation of the available harvest area in the Long-term Management Direction.

Silvicultural ground rules which identify a unique combination of current forest unit/ecosite and future forest unit, are documented in Table FMP-4. Silvicultural Ground Rules were established to specify the silvicultural systems, types of harvest, renewal and tending treatments that will be used to manage forest cover on the Whiskey Jack Forest.

The prescriptions for harvest, renewal and tending presented in Table FMP-4 will serve as the prescriptions for operations, including naturally depleted areas that are salvaged, for the ten-year period of the forest management plan.

Table FMP-4 includes renewal and forest development information for native tree species to the Whiskey Jack Forest. Exotic tree species, not naturally found on the forest, will not be planted or otherwise encouraged through renewal efforts.

The silvicultural ground rules identify the type of forest that is expected to develop over time and the regeneration standards used to measure renewal success (see Section 4.7.3 Assessment of Regeneration Success).

Regeneration Standards:

- MNR report NWSI TM-009 was used to assist in the development of renewal standards and to ensure that provincially consistent terminology was used.
- It is expected, with a reasonable level of confidence that achievement of the regeneration standards will result in the stated future forest conditions at maturity (Forest Unit, Stand Characteristics, Silvicultural Intensity, and Projected Yields) in Table FMP-4.

- Acceptable tree species are compatible with the stand objectives, and where competitive tree species are considered acceptable, they are limited to a specific proportion of the stand's species composition to align with the forest conditions represented in the stated stand characteristics and projected volume yields at maturity.
- Balsam Fir has not been included as an acceptable species, unless it is stated in the future stand characteristics.
- Regeneration standards include a minimum target of 80% of site occupancy (target and acceptable species).
- Regeneration standards include a measure of tree distribution. The use of density versus stocking targets depends on the type of treatments employed. Areas that receive extensive or basic treatments will receive regular free-to-grow or ocular surveys and contain an estimate of tree stocking. Areas treated intensively and are density regulated will receive a well-spaced free-growing survey or survey with Large Scale Photography and Photo Interpretation (methodology in Supplementary Documentation F).

The planned SGR represents the best estimate of the proposed operations at the time of FMP preparation, and will not limit the selection of any of the acceptable alternative silvicultural treatments in the silvicultural ground rules at the time of implementation of operations. For each forest unit, the most common silvicultural treatment package in Table FMP-4 is considered to be the package of treatments most likely to be used that will reflect the silviculture strategy for each forest unit. The most common treatment packages are the most likely treatments to be applied (summarized in Table 36). Overall the most common silvicultural treatment packages are designed to meet the Long-term Management Direction strategy of moving the forest to a more natural (pre-fire suppression) state where there are fewer mixedwood stands and more pure conifer and hardwood stands.

Acceptable alternative treatments are also identified in the silvicultural ground rules. It is recognized that individual treatments within a silvicultural treatment package or alternate identified acceptable treatments are implemented in succession, and therefore it may take longer than a five-year phase of the FMP for an entire silvicultural treatment package to be implemented.

As harvested areas are regenerated, operational roads, where in accordance with the use management strategy for the road, will also be regenerated where possible. Site preparation will cross ungravelled roads and they will be planted or seeded. Those roads that cannot be site prepared will be planted tightly to the edge.

All 1:20,000 maps (FMP Maps) show ecosite type and proposed silvicultural ground rule (for each stand planned for harvest or renewal). The information products (i.e. PHR & PRT layers) for harvest, renewal and tending operations will serve as the stand listing. Silvicultural Ground Rules are found in the field "SGR" in the Planning Composite inventory (PCM) coverage.

There are some silvicultural treatments that are of special public interest (also discussed in Section 4.2.2.3 Silvicultural Treatments of Special Public Interest). These activities include the aerial application of herbicides. The aerial application of herbicide as a tending operation is proposed in this plan, with the location of eligible areas identified on renewal and tending maps in FMP Maps – Composite Maps. The identification of areas for aerial chemical tending will be approved annually by MNR in the Annual Work Schedules. Approvals by the Ministry of the Environment (MOE) will be required prior to the aerial application of registered herbicides on the Whiskey Jack Forest.

Table 36 Most Common Silvicultural Treatment Packages by Forest Unit

Forest Unit		Most Common Silvicultural Treatments	
Forest Unit	**Stand Description**	**SGR Code ***	**SGR Description**
BFM	balsam fir mixedwood stands	BFM-BA1-PJM	(No BFM area planned for harvest in this plan.) Conventional harvest, followed by mechanical site preparation and planting, resulting in a jack pine dominated mixedwood (includes a spruce component).
CMX	conifer mixedwood stands	CMX-BA1-PJM	Conventional harvest, followed by mechanical site preparation and jack pine seeding, resulting in a jack pine dominated mixedwood.
HMX	mixed hardwood dominated stands	HMX-EXT-POD	Conventional harvest, followed by natural regeneration, resulting in a poplar dominated stand.
OCL	larch and cedar dominated lowland stands	OCL-EXT-OCL	(No OCL area planned for harvest in this plan.) Conventional harvest, followed by natural regeneration, resulting in a larch and cedar dominated lowland stand.
OTH	other hardwood mixedwood stands	OTH-EXT-OTH	(No OTH area planned for harvest in this plan.) Conventional harvest, followed by natural regeneration, resulting in an other hardwood mixedwood stand.
PJD	jack pine dominated stands with minimal hardwood component	PJD-BA1-PJD	Conventional harvest, followed by mechanical site preparation and jack pine seeding, resulting in a jack pine dominated stand.
PJM	jack pine dominated mixedwood stands with minimal hardwood	PJM-BA1-PJD	Conventional harvest, followed by mechanical site preparation and jack pine seeding, resulting in a jack pine dominated stand.
POD	poplar dominated stands	POD-EXT-POD	Conventional harvest, followed by natural regeneration, resulting in a poplar dominated stand.
PRW	red pine and white pine mixedwood stands	PRW-BA1-PRW	Conventional harvest, followed by mechanical site preparation and planting, resulting in a red pine and/or white pine dominated stand.
SBL	lowland black spruce stands	SBL-EXT-SBL	Conventional harvest, followed by natural regeneration, resulting in a lowland black spruce stand.
SPD	upland black (or white) spruce dominated stands with minimal hardwood component	SPD-BA1-SPD	Conventional harvest, followed by mechanical site preparation and planting, resulting in a spruce dominated stand.
SPM	spruce dominated mixedwood stands with minimal hardwood	SPM-BA1-SPD	Conventional harvest, followed by mechanical site preparation and planting, resulting in a spruce dominated stand.

* **SGR CODE** reflects the [current forest unit] - [silvicultural intensity] - [future forest unit]

4.2.2.1.1 Exceptions

Any silvicultural ground rules involving treatments that are “not recommended” (NR) in the approved silvicultural guides are documented as “exceptions” in Table FMP-4 and in the List of Exceptions following the Title, Certification and Approval page for this plan. “Not Recommended” activities cannot be implemented until the associated rationale and effectiveness monitoring plan is approved in an FMP.

Any silvicultural ground rule involving treatments that are “conditionally recommended” (CR) in the approved silvicultural guides are identified in Table FMP-4. The conditions under which these guideline recommendations apply, and any associated conditions or best management practices that must be applied during the implementation of the silvicultural treatment are identified for each silvicultural ground rule included in Table FMP-4. Through implementation of any stated conditions, the treatments for the specific sites are not considered “exceptions” to approved guides.

Monitoring of Silvicultural Treatments Not Recommended in Guides

The following activities are not recommended in the *Silvicultural Guide to Managing Black*

as exceptions: artificial seeding of black spruce on ES 14 and 21, aerial seeding of jack pine on ES 14 and 21, and natural regeneration of jack pine on ES 21. Results will be submitted as part of the Annual Report.

Areas receiving treatments considered “exceptions” in table FMP-4 would be monitored for the effectiveness of the treatment to the site on which it was applied. In the event that any exceptions to the silvicultural guides do occur, they will be monitored as required with the results documented. Inspections will involve a visual evaluation of indicative sites by experienced foresters to evaluate whether the effectiveness of the respective renewal treatment is satisfactory. If the silvicultural results are in question, a regeneration survey will be conducted in accordance with corresponding Forest Operations Prescriptions.

The assessment of these surveys will be documented in the annual report under AR-13 with a discussion on the progress toward completing the forecast assessments of regeneration success (comparison to Table FMP-21).

Full Tree Logging on Ecosites 11 and 12

“Full tree logging on NWO Ecosites 11 and 12, where total organic matter plus soil depth is less than 20 cm, is designated as a ‘not recommended’ practice in the *Silvicultural Guide to Managing for Black Spruce, Jack Pine, and Aspen on Boreal Forest Ecosites in Ontario (MNR, 1997).*

The forest industry and MNR are contributing to a comprehensive, region wide initiative to monitor the impacts of this treatment on these site conditions. As part of this monitoring program these shallow soil sites have been identified in this plan and operations will be conducted in accordance with the Best Management Practices approved for these conditions' as per the letter from the NWR Regional Director of 3 Oct 2007:*Full Tree Harvesting of Ecosites 11 & 12 in Northwestern Ontario: Monitoring Procedures and Best Management Practices April 1, 2001* (Supplementary Documentation E - Monitoring Programs for Exceptions).

Ecosites in the Whiskey Jack Forest are identified in the forest resources inventory and are identified within the planned operations digital information associated with the FMP. Actual Ecosite 11 and 12 areas scheduled for activities will be identified on the Annual Work Schedule maps.

The rationale for using full tree harvesting on these sites is that it is currently the common method of harvest and it would be uneconomical to bring in specialized equipment to harvest scattered areas of shallow soils. The shallow soil sites on the Whiskey Jack Forest are, for the most part, productive and, it is felt, that using full tree logging in a careful manner will preserve the sites’ nutrient capacity.

Artificial seeding on ES 14 is listed as an exception. This site is prone to draught which will limit the success of seeding.

Natural regeneration of jack pine or spruce on ES 21 is an exception. Advance black spruce growth is not of sufficient distribution to regenerate this site and jack pine does not regenerate under a closed canopy.

4.2.2.2 Conditions on Regular Operations (CROs)

This section of the plan documents conditions on regular operations that have been developed through application of the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010). Where these conditions on regular operations apply to a specific management zone, the text identifies the management zone where the condition is applied. For example, Moose Emphasis Areas are such management zones and the associated CROs for these zones are included in the following table.

MNR has not identified any S1, S2, or S3 Natural Heritage Information Centre vegetation communities or other uncommon vegetation communities identified which are likely to occur in areas of planned operations. Therefore CROs as per page 13 of the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales, 2010* have not been developed. If any of these communities are identified in the future, the MNR Species At Risk and Regional Biologists will be consulted to develop CROs (or an AOC if determined appropriate). See Section 2.1.3.2.2 Rare Species and Section 2.1.3.2 Species At Risk for additional species information.

Conditions on Regular Operations

NOTES: Conditions on regular operations apply to all harvest, renewal and tending operations.
Additional conditions may apply as documented in Table FMP-10 Operational Prescriptions for Areas of Concern and Table FMP-4 Silvicultural Ground Rules.
Conditions on roads, landings and aggregate pits are documented in Table FMP-19 (within AOCs) and FMP Section 4.5.7 (all areas of operations).

Biofibre Harvest:

Forest biofibre refers to forest resources from Crown lands that are not being utilized for other forest products and that are made available under an approved FMP, forest biofibre is comprised of:

1. Unmerchantable timber such as undersized wood, cull trees or portions of trees,
2. Individual trees and stands of trees that are merchantable, and
3. Trees that may be salvaged as a result of a natural disturbance.

Biofibre may be the primary (e.g., otherwise unmarketable stand of low-grade hardwoods) or secondary (e.g., undersized material after optimizing recovery of pulpwood, veneer and/or sawlog) product of a planned harvest operation.

- Direction applies to all planned harvest areas regardless of the product derived.
- Stumps and all below ground portions of a tree are not available for utilization as a forest product; movement or removal associated with normal operations (skid trails, renewal and tending, slash piling, etc., including incidental movement or removal during harvest operations), is permitted but will be minimized to that required for efficient operations; removal for forest health purposes is permitted.
- Organic matter that is not part of a harvested tree (including boles, branches, roots, bark, leaves, needles, debris, soil carbon, etc.) will remain on site; movement of such material for silvicultural purposes is permitted.

Salvage Harvest:

The direction in this section will apply to all salvage operations, regardless of the origin or type of natural disturbance that led to the decision to engage in salvage operations.

- Consistent with direction in Wildlife Trees – Clearcut Silviculture System, salvage harvest will normally retain a minimum average of ≥25 stems/ha ≥3 m in height and ≥10 cm dbh. This is the minimum average for the harvest block (or minimum average per 20 ha if the harvest block ≥20 ha) contingent upon sufficient numbers and types of standing stems being available and in a condition suitable for retention.
- In fire salvage areas, preferably retain conifers such as jack pine and black spruce as wildlife trees.
- Salvage operations will consider strategic landscape objectives.
- When finalizing boundaries of a salvage operation that results from wildfire, the area of undisturbed forest included in the salvage operation will be minimized.
- When finalizing boundaries of a salvage operation that results from blowdown, insect infestation, or other factors (e.g., ice storms), the area of the salvage operation can include undisturbed forest. When salvage operations include undisturbed area,

Conditions on Regular Operations

NOTES: Conditions on regular operations apply to all harvest, renewal and tending operations.
Additional conditions may apply as documented in Table FMP-10 Operational Prescriptions for Areas of Concern and Table FMP-4 Silvicultural Ground Rules.
Conditions on roads, landings and aggregate pits are documented in Table FMP-19 (within AOCs) and FMP Section 4.5.7 (all areas of operations).

conditions on residual forest retention, wildlife trees, and downed woody material apply.

- The trees retained following salvage operations will have a range of distribution patterns (relatively even-spaced to some clumping), recognizing operational limitations, and subject to the availability of standing trees.
  - Whenever possible, the trees retained following harvest will be the same species and size classes as trees that would have been retained following normal harvest (as per direction below 'Wildlife Trees – Clearcut Silviculture System').
- Adjust the timing of entry and/or other operational factors to minimize unnecessary site disturbance that could potentially result in ecological damage (e.g., avoid salvaging a swamp in the frost-free period).
- Reasonable efforts will be made to avoid windrowing or crushing of downed woody material.

Downed Woody Material:

Material that was traditionally referred to as downed woody debris.
Downed woody material refers to wood above the soil and on the ground: coarse woody material refers to sound and rotting branches, boles, logs, and stumps, generally ≥7.5 cm in diameter at the small end; fine woody material refers to stems and twigs generally <7.5 cm in diameter at the small end.

- Stems retained as wildlife trees that fall down, or are felled for worker safety reasons, become downed woody material and will be left on site; moving such trees for silvicultural purposes is permitted.
- Dead trees present prior to harvest, including those lowered to the ground for safety considerations should be left on site.
- Downed trees (or pieces of trees) present prior to harvest will be left on site; moving such trees for silvicultural purposes is permitted.
- Trees leaning and downed by a recent disturbance (windstorms or other natural events e.g. snow, ice), which normally would have been available for harvest, may be harvested and utilized.
- Minimize the windrowing of downed woody material; where long windrows do occur, breaks should be provided to allow animals, other forest users and operations unobstructed access routes across the right of way e.g. a 10 m break for every 100 m of windrow.
- Where compatible with logging methods, unmerchantable logs, or portions of logs, should be left on site, at the stump.
- Dead trees present prior to harvest, including those lowered to the ground for safety considerations, should be left on site (only safe dead trees will remain standing).

Erosion:

Erosion can be defined as the overland movement of soil particles by water, wind or gravity.
Erosion can be the result of either natural causes or human site alterations.

Conditions on Regular Operations

NOTES: Conditions on regular operations apply to all harvest, renewal and tending operations.
Additional conditions may apply as documented in Table FMP-10 Operational Prescriptions for Areas of Concern and Table FMP-4 Silvicultural Ground Rules.
Conditions on roads, landings and aggregate pits are documented in Table FMP-19 (within AOCs) and FMP Section 4.5.7 (all areas of operations).

- Skid trails will avoid steep slopes (>30% slope) where possible.
- Shallow soil sites that are particularly susceptible to erosion (i.e. moderate to steep slopes) will be harvested in winter.
- Wood will be winched or reached with a feller buncher on areas where the skidder operator feels the slope is unsafe for operations.
- Forest operations will not be conducted on extremely steep slopes.
- Green wildlife trees, organic matter and surface vegetation will be preserved on steep slopes (>30% slope).
- Stable slopes will be maintained on ditch lines, road fills and cuts.
- Slopes and banks will be reinforced (re-vegetate or use logging debris).
- Site disturbance associated with forest operations will be minimized on shallow soil sites.
- Skid trails will be kept to a minimum, with an emphasis on the protection of advanced regeneration.
- Post-harvest prescriptions and renewal efforts will be carried out as quickly as possible on shallow soil sites to encourage full site occupancy. This will minimize problems with erosion and loss of nutrients.
- Heavy mechanical site preparation (i.e. blading, heavy drags or continuous disc trenching with down pressure) will not be used on shallow soil sites.
- Harvest and site preparation will be scheduled for the appropriate season for the site. Sensitive sites will be cut in winter (or drier periods in summer).
- Decommission main skid trails constructed on steep slopes by installing water bars, diversion ditches, straw bales, etc. at appropriate intervals or critical landform junctures to filter runoff water through surrounding vegetation.
- Minimize mineral soil exposure to that required for efficient operations and effective silviculture (consistent with SGR for the site).
- Mitigate or rehabilitate areas of significant erosion that are transporting, or are likely to transport, sediment into a water feature.

Forest Composition

- Harvest, renewal and tending treatments to maintain existing tree species composition at forest unit level unless strategic direction to do otherwise.
- Forest unit conversion within moose emphasis areas to move towards desired forest composition ranges.

Furbearing Mammal Dens(other than red foxes, skunks, wolves, wolverines) – in caves, excavated burrows, under large piles of coarse woody material or other **enduring features** – known to have been occupied at least once within the past 5 years:

- Harvest, renewal, and tending operations are not permitted within 20 m of the den entrance.

Conditions on Regular Operations

NOTES: Conditions on regular operations apply to all harvest, renewal and tending operations.
Additional conditions may apply as documented in Table FMP-10 Operational Prescriptions for Areas of Concern and Table FMP-4 Silvicultural Ground Rules.
Conditions on roads, landings and aggregate pits are documented in Table FMP-19 (within AOCs) and FMP Section 4.5.7 (all areas of operations).

Furbearing Mammal Dens (other than red foxes, skunks, wolves, wolverines) – in tree cavities, hollow logs, brush piles, other **transitory features** – known to be occupied: • Known occupied dens encountered during operations will not be destroyed; in this context, destruction means the complete or partial damage of the den structure or its contents (i.e. adults or young). • To minimize disturbance harvest, renewal, and tending operations will be avoided within 3 metres of dens known to be occupied that are encountered during operations; this will include the following: retaining trees within 3 m (patch may be counted as a clump of wildlife tees), not felling trees into the area within 3m, heavy equipment will not travel within 3m.
Hydrological Impacts: • Based on local conditions, take reasonable precautions to ensure harvest, renewal, and tending operations will not result in disturbance of the forest floor that impedes, accelerates, or diverts water movement within recognizable ephemeral streams, springs, seeps, and other areas of groundwater discharge connect to lakes, ponds, rivers, or streams. • Based on local conditions, explore reasonable alternatives to crossing organic and saturated mineral soils during the frost-free period. • Minimize the potential for hydrological disruption when crossing during the frost-free period cannot be avoided (See conditions listed under the section titled “Rutting and Compaction” found in this table.). • Train field staff, especially equipment operators, in the recognition and significance of disruption of hydrological function. • On very dry sites, careful logging practices that retain some trees, shrubs, advanced growth, and slash can reduce overall ground temperature and reduce excess drying. • Where possible, locate roads and landings so skidding and forwarding does not have to cross natural drainage patterns. • Regenerate susceptible sites as quickly as possible to restore transpiration and moderate hydrological changes.
Large Landscape Patches – Deer Emphasis Areas (DEAs) The following direction will apply to areas of operations in DEAs: • If practical and feasible, the block will be scheduled for harvest in the winter season • All bur oak will be retained except where required to be cleared for road right-of-way • Operations will preferentially retain mature white spruce, white pine and cedar as wildlife trees, priority given to retaining small clumps of trees, as opposed to individual trees, if they occur. • All blocks were reviewed by the District Biologist. Locations of the DEAs are portrayed on the MU490_2012_FMP_P0_MAP_MEA_DEA_00 index map.

Conditions on Regular Operations

NOTES: Conditions on regular operations apply to all harvest, renewal and tending operations.
Additional conditions may apply as documented in Table FMP-10 Operational Prescriptions for Areas of Concern and Table FMP-4 Silvicultural Ground Rules.
Conditions on roads, landings and aggregate pits are documented in Table FMP-19 (within AOCs) and FMP Section 4.5.7 (all areas of operations).

Large Landscape Patches – Moose Emphasis Areas (MEAs)

The following direction will apply to areas of operations in MEAs:

- Residual shoreline forest (see FMP-10, WS and WL AOCs) (see Section 4.3.1, the operations maps and Residual, Mapped and Residual, Unmapped in this table) should be retained preferentially when it:
  - is adjacent to higher quality moose aquatic feeding areas (MAFAs) (i.e., class 4 MAFAs or class 3 MAFAs),
  - is adjacent to larger MAFAs (i.e., MAFAs > 8 ha are better than MAFAs 4-8 ha which are better than MAFAs < 4 ha),
  - is adjacent to MAFAs without features that restrict access such as steep terrain,
  - will provide screening from roads,
  - connects MAFAs to other residual forest (especially identified patches of summer thermal shelter and/or travel corridors), or
  - minimizes the distance between the aquatic vegetation and cover.
- Residual patches required to meet residual forest guidelines (see Section 4.3.1, the operations maps and Residual, Mapped and Residual, Unmapped in this table) can be used to manage for summer cover in areas where forest operations are planned, using the following criteria:
  - Size and Distribution: minimum 2 ha
  - Location: Summer cover habitat will normally be adjacent to MAFAs moose are most likely to use (i.e., ≤ 200 m, measured from the edge of the MAFA to the nearest edge of the patch of summer cover). If high quality MAFAs (Class 3 or 4) are not present, suitable summer cover will be adjacent (≤ 200 m) to other MAFAs, or natural openings (e.g., beaver meadows). Link summer cover to immature, mature, old, or residual forests, particularly shoreline forests. Linkages are considered adequate when the distance from the edge of a patch of summer cover to immature, mature or residual forests is ≤ 200 m and the terrain is traversable by moose (e.g., the terrain is relatively flat).
  - Characteristics: Maintain or retain the best summer cover habitat available. In general, lowland conifer > upland conifer > lowland or upland>hardwood > mixed woods.
- Location of the afore-mentioned unmapped residual patches required to meet residual forest guidelines will be determined in consultation with the MNR district biologist at the AWS submission stage. This will include either mapping them on the AWS operations maps or providing more specific direction in the AWS text on a block by block basis.
- Silvicultural prescriptions will be consistent with moose habitat management objectives.
- Locations of the MEAs are portrayed on the MU490_2012_FMP_P0_MAP_MEA_DEA_00 index map.

Loss of Productive Land:

Loss of productive land can be described as the conversion of previously productive forest land to a long-term or permanently non-forested condition as a result of forest management operations. Some loss of productive land through the conversion to other land

Conditions on Regular Operations

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Additional conditions may apply as documented in Table FMP-10 Operational Prescriptions for Areas of Concern and Table FMP-4 Silvicultural Ground Rules.
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types (e.g., permanent roads) is inevitable.

- Sites will normally be regenerated within three years of harvest and FTG by the age of FTG in the SGR.
- Minimize the amount of area being converted to non-forest (e.g., roads and landings) to the minimum required for efficient operations.
- Placement of landings should consider bedrock or other existing non-productive land and the creation of landings will be minimized.
- Pile unutilized fibre on non-productive rock or use in the production and/or reclamation of roadways where possible.
- Exposure of bedrock should be minimized.
- Ponding created by operations and roads will be mitigated where possible.

Slash and Chip Debris Piles:

- Slash and chip debris piles will not accumulate through time or result in a permanent loss of production land.
- The production land base will be recovered from new slash and chip piles (and existing piles as noted below) and these areas will be renewed except where they were not part of the production land base originally (e.g. rock outcrops).
- Operations will be conducted in a manner to prevent or minimize the creation of slash debris piles where full tree and/or tree-length logging is identified as an acceptable logging method in the SGRs.
- Operations will be conducted to remove slash and chip debris piles and recover the production land base from these areas (e.g. biofibre harvest, slash pile burning, spreading, site preparation, or planting/seeding).
- Slash/chip treatment operations are planned to be completed while equipment is still within the harvest area with renewal planned to be completed within one year of slash/chip pile treatment. Slash/chip treatment operations will be completed no later than two years following the completion of harvest operations and renewal will be completed no later than three years following the completion of harvest operations.
- The most applicable SGR will be applied to renew the area, based on the specific site conditions of areas formerly occupied by slash and/or chip piles, and the renewal including regeneration treatments should complement the treatments on the adjacent treated areas.
- Existing slash and chip piles (three years old or less) will be treated and regenerated as noted above usually within three years of the completion of harvest operations.
- Older existing slash and chip piles (more than three years old) will be reviewed and where practical treated and regenerated as noted above using the most applicable SGR unless a different rehabilitation strategy including regeneration standards have been documented in Section 4.2.2.1 Silvicultural Ground Rules.

Conditions on Regular Operations

NOTES: Conditions on regular operations apply to all harvest, renewal and tending operations.
Additional conditions may apply as documented in Table FMP-10 Operational Prescriptions for Areas of Concern and Table FMP-4 Silvicultural Ground Rules.
Conditions on roads, landings and aggregate pits are documented in Table FMP-19 (within AOCs) and FMP Section 4.5.7 (all areas of operations).

Slash Piles:

- Unutilized woody material, which accumulates at roadside and is expected to remain unutilized, will be piled, redistributed, or otherwise treated to increase the area available for regeneration.
- Avoid piling unutilized fibre on productive non-forest cover types (e.g., brush, alder or wet areas).
- Pile unutilized fibre on non-productive rock where possible.

Chip Debris:

- Suitable chipping pads and landings will be selected prior to the commencement of operations.
- Bedrock and/or non-productive areas are preferred locations for chipper pads.
- Windrowing and piling of chip debris on productive land must be limited in application (extraordinary circumstances).
- Piles are to be located to maximize skid distance and minimize the number of chipper pads.
- Piles will be no larger than 3 metres by 3 metres and a maximum of 3 metres high;
- Piles will be located at least 30m from standing timber or previously regenerated areas to reduce the fire hazard.
- When the skidder is returning to the harvest area for the next bundle, the operator will distribute logging debris back into the cutover. The debris will be dropped in front of the next bundle of trees and the bundle will be dragged over the newly dropped debris pile.
- In all other cases debris is to be carried as far as possible back into the harvest area.
- Mechanical site preparation through chipper pads will be done with the intent of exposing down to mineral soil for follow-up regeneration treatment.
- Incorporate debris into road construction or brush matting for crossing swamps, in accordance with the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales*.
- Rehabilitate gravel pits, borrow pits, and blow sand areas with chipper debris. Debris thickness should not exceed 15 cm.
- Use chipper debris as fill for road construction, landscape material for aggregate site rehabilitation, and road bank or ditch stabilization as appropriate.
- Use of chipper debris to prevent rutting and compaction.
- Renew area following most appropriate SGR.
- For any chip debris remaining at chipping site the following measures may be taken following discussion with a representative of the forest manager:
  - Pile unutilized fibre on non-productive rock where possible.
  - Push up clean piles of remaining chipper debris for use by grinding operation or for burning.
  - For areas scheduled to receive site preparation, spread out any remaining chipper debris on the landing to a

Conditions on Regular Operations

NOTES: Conditions on regular operations apply to all harvest, renewal and tending operations.
Additional conditions may apply as documented in Table FMP-10 Operational Prescriptions for Areas of Concern and Table FMP-4 Silvicultural Ground Rules.
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depth of 15 cm or less.
- For areas not scheduled for site preparation, pile all clean debris for burning and distribute the remaining dirty debris back into the cut over.
- Windrow the remaining chipper debris with a minimum 2.5 metre distance between rows.
- Pile all the clean debris for grinding operations or burning and windrow the remaining dirty debris with a minimum 2.5 metre distance between rows.
- After grinding operations are complete on each landing, spread out any remaining debris on the landing to a maximum depth of 15 cm. to prepare the landing for site preparation. Alternatively, windrow the remaining debris to prepare site for renewal.
- All chipper debris management must be completed before the harvest operation leaves the block. This will prevent the accumulation of backlog areas, especially for winter operations and improve the sequencing of harvest, debris management and silviculture. The FRL holder will notify the MNR contact, **10 days prior** to the cessation of operations.

Roundwood Slash:
- Slash piles will be aerated (or "fluffed") and piled for burning. Soil mixing will be minimized during the piling process.
- Pushed or fluffed piles will be in a location that is suitable for fall burning (away from wet ponds, drainage, or standing timber) and free of soil/foreign materials.
- Roundwood slash will not be placed on or near chipper pads so that burning operations will not be hampered.
- Use slash for brush mates to prevent rutting or compaction when available.
- Incorporate slash into road operational road sub-grades during construction where possible.
- Use slash to create access restrictions, consistent to road use strategies.
- Carry out prescribed burn plan.
- Renew area following most appropriate SGR.

Note: It is understood some of the above listed methods are dependent on weather or proximity to heavy equipment. Although completion within 3-years is expected, the ability to complete these procedures within this time frame is not always feasible. In the event that unplanned circumstances arise, and debris management activities are not practical (unplanned loss of access, or new area of concern prescription implement), the following will apply:

- The location of the logging debris will be tracked.
- A follow-up silvicultural assessment will be carried out and once the debris has undergone sufficient decomposition to permit

Conditions on Regular Operations

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Conditions on roads, landings and aggregate pits are documented in Table FMP-19 (within AOCs) and FMP Section 4.5.7 (all areas of operations).

a follow-up silviculture treatment and renewal. Existing regeneration success will be a consideration.
Nests – Inactive Nest - **great grey owl, northern goshawk, red-shouldered hawk**: nests not known or suspected to have been occupied at least once within the past 5 years that are >400m from a primary nest, or <=400m from a primary nest but in poor repair; primary and alternate nests within nesting areas where all nests within the nesting area have been documented as unoccupied for >=3 consecutive years • If the nest is in good repair, harvest is not permitted within 20m (the patch may be counted as residual forest); otherwise, the nest tree will be retained as a wildlife tree. • There is no timing restriction on harvest, renewal, and tending activities.
Nests - Unoccupied Stick Nests known or suspected to have been built or used by **broad-winged hawk, merlin, sharp-shinned hawk,** unknown species **small** stick nest <75cm diameter • The nest tree will be retained as a wildlife tree if the nest is in good repair or the nest tree contains a good fork. • There is no timing restriction on harvest, renewal, and tending activities.
Nests - Unoccupied Stick Nests known or suspected to have been built or used by **barred owl, Cooper's hawk, common raven, great horned owl, long-eared owl, red-tailed hawk**, unknown species **large** stick nest >=75cm diameter • The nest tree will be retained in an unharvested residual patch ≥20 m radius if the nest is in good repair (the patch may be counted as residual forest); otherwise, the nest tree will be retained as a wildlife tree. • There is no timing restriction on harvest, renewal, and tending activities.
Nests - Unoccupied Nests in cavities known or suspected to have been used by **American kestrel, boreal owl, eastern screech-owl, northern hawk owl, northern saw-whet owl** • The nest tree will be retained as a wildlife tree if not a safety concern. • There is no timing restriction on harvest, renewal, and tending activities.
Nests – Unoccupied Nests/communal roosts in cavities known or suspected to have been used by **barred owl, great horned owl, chimney swift** • The nest/communal roost tree will be retained in an unharvested residual patch>=20m radius (the patch may be counted as residual forest). • There is no timing restriction on harvest, renewal, and tending activities.

Conditions on Regular Operations

NOTES: Conditions on regular operations apply to all harvest, renewal and tending operations.
Additional conditions may apply as documented in Table FMP-10 Operational Prescriptions for Areas of Concern and Table FMP-4 Silvicultural Ground Rules.
Conditions on roads, landings and aggregate pits are documented in Table FMP-19 (within AOCs) and FMP Section 4.5.7 (all areas of operations).

Nests – waterfowl, grouse – known nests containing eggs encountered during forest management operations • Known nests will not be destroyed; in this context, destruction means the complete or partial damage of the nest structure or its contents (i.e., attendant birds, eggs, or young). • To minimize disturbance harvest, renewal, and tending operations will be avoided within 10 metres of known nests containing eggs; this will include the following: retaining trees within 10 m (patch may be counted as a clump of wildlife tees), not felling trees into the area within 10 m, heavy equipment will not travel within 10 m.
Nests – Song Birds or other small birds – known nests containing eggs or young encountered during forest management operations • Known nests will not be destroyed; in this context, destruction means the complete or partial damage of the nest structure or its contents (i.e. attendant birds, eggs, or young). • To minimize disturbance harvest, renewal, and tending operations will be avoided within 3 metres of nests known to contain eggs or young; this will include the following: retaining trees within 3 m (patch may be counted as a clump of wildlife tees), not felling trees into the area within 3 m, heavy equipment will not travel within 3 m.
Nutrient Retention on Shallow Soil Sites • All ES11 & ES12 areas greater than 8 hectares will be identified in the Annual Work Schedule. • Harvesting of shallow soil sites is preferred in the winter. • Avoid harvesting and skidding on steep slopes with shallow soils and modify skidding patterns (i.e. along the contour) where possible. • Site disturbance associated with forest operations will be minimized on shallow soil sites. • Mechanical site preparation will not be used if there is adequate disturbance of the site for renewal purposes. Heavy mechanical site preparation (i.e. blading, heavy drags or continuous disc trenching with down pressure) will not be used on these sites. Planting or aerial seeding without site preparation may be an alternative to mechanical site preparation. • Careful Logging Around Advance Growth (CLAAG) will be used where applicable. • Wildlife trees will be left favouring green hardwood trees. • Renewal efforts will be carried out as quickly as possible to encourage full site occupancy. This should also help to prevent problems with erosion and loss of nutrients. • Establish lower nutrient demanding trees (i.e. jack pine) on nutrient poor sites where appropriate. • The application of chemical aerial tending will be carefully assessed on shallow soil sites prior to use to determine if appropriate

Conditions on Regular Operations

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Additional conditions may apply as documented in Table FMP-10 Operational Prescriptions for Areas of Concern and Table FMP-4 Silvicultural Ground Rules.
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for the site.
Residual Forest – definition Residual Forest is defined in the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* (MNR 2010) as: • 35 years old or > 10 m tall • >= 0.1 ha in size • >= 30% crown closure, unless harvested with in the last 20 years, then >=50% crown closure
Residual, Mapped – movement of mapped residual (note that there are currently no mapped residual areas required to meet the 25 ha in 500 ha Stand and Site Guide rule in this forest management plan, areas where moveable residual required to meet the 0.5 ha in 50 ha requirement are shown on the operations maps, but the residual patches are not mapped specifically – see next row in this table re Residual, Unmapped) • Mapped residual that is not serving any other purpose (e.g. AOC, specific habitat function, etc.), and would otherwise be available for harvest, can be moved during operational implementation as long as: o The residual requirements from the Stand and Site Guide are still met after the residual is moved (i.e. 25 ha. residual in 500 ha. circle, or 0.5 ha. residual in 50 ha. circle); o The planned harvest area is not exceeded; o The mapped residual polygon is specifically identified in the FMP as eligible for movement; o The Annual Work Schedule will identify eligible residual areas for movement.
Residual, Unmapped - for areas where residual is not mapped in advance. (see the operations maps, Section 4.3.1 and Large Landscape Patches – Moose Emphasis Areas (MEAs) in this table) • Implementation of the harvest plan will ensure that any point within a new clearcut harvest area will have at least 0.5 ha of residual within a 50 ha circle about that point. • When locating unmapped residual forest, preference will be given to locations connected to habitat features encountered during operations such as bird nests, furbearer dens, woodland pools, MAFAs, etc. When additional habitat features are not encountered, give preference to uncommon forest types, locations connected to known values (water, nests, etc.), or located consistent with expected disturbance behaviour.
Rich Lowland Hardwood-Dominated Forest (black ash) – mapped and unmapped pockets greater than or equal to 0.5 ha.

Conditions on Regular Operations

NOTES: Conditions on regular operations apply to all harvest, renewal and tending operations.
Additional conditions may apply as documented in Table FMP-10 Operational Prescriptions for Areas of Concern and Table FMP-4 Silvicultural Ground Rules.
Conditions on roads, landings and aggregate pits are documented in Table FMP-19 (within AOCs) and FMP Section 4.5.7 (all areas of operations).

encountered during operations • Harvest will follow direction for rich lowland hardwood-dominated forest found in FMP-4 Silvicultural Ground Rules (Forest Unit: OTH). • No harvest, renewal or tending is permitted that: does not meet the 'rutting and compaction' conditions outlined in this table or that disrupts hydrological function (see above). • Extraction trail crossings are not permitted during the frost-free period. During winter conditions extraction trails will be minimized and will follow the conditions listed under the section titled "Rutting and Compaction" found in this table to minimize potential site damage and effects on hydrological function.
Rutting and Compaction: • No more than 50% of any 0.1 ha circle is permitted in ruts. • No ruts permitted that channel water into, or within 15 m of lakes, ponds, rivers, streams, woodland pools, or those portions of mapped non-forested wetlands dominated by open water or non-woody vegetation. • Shallow soils (<30cm): No more than 5% of any 20 ha area (or the operating block if less than 20 ha) is permitted in ruts. • All other soils: No more than 10% of any 20 ha area (or the operating block if less than 20 ha) is permitted in ruts. • The area of rutting and compaction will be minimized. • In advance of any operations, MNR and industry staff will agree to an approach to measuring the percent coverage, depth and length of a rut, definition of roadside work area, and percent coverage of extraction trails. • Harvest and site preparation will be scheduled for the appropriate season for the site. Sensitive sites will be cut in winter (or drier periods in summer). • During spring break-up, operations will be limited to frozen or dry ground conditions. • In large complex blocks where a return winter cut is planned, organic and wet lowland areas will be harvested after freeze-up. • There will be no mechanical site preparation of organic sites in summer conditions. • Where advanced regeneration is a significant contributor to future forest development (e.g. CLAAG, white pine advanced regeneration) the area in extraction trails will be minimized. On sites susceptible to rutting, achievement will be balanced against the increased rutting that may occur when extraction is concentrated on fewer trails. • Skid trails will be planned in advance. Where conditions warrant due to a high potential of compaction or rutting, skidding will be limited to main trails to reduce the overall disturbance across the block. • Main skid trails will be located on upland areas, wherever possible. Non-productive areas such as rock outcrops shall be selected for skid trails. • Log loading areas, and turn-around areas should be located on high ground to avoid rutting and blocking of drainage paths.

Conditions on Regular Operations

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Additional conditions may apply as documented in Table FMP-10 Operational Prescriptions for Areas of Concern and Table FMP-4 Silvicultural Ground Rules.
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- Brush mats, slash, or corduroy maybe be placed on heavy traffic areas such as main skid trails and organic sites to reduce rutting.
- If damage occurs, operations will shift to less sensitive areas.
- High floatation tires or other low impact equipment will be used on organic sites, during the spring and fall.
- Drainage will be maintained in areas with sub-surface water flow.
- The size of skidder loads will be decreased to prevent breaking through of the organic mat.
- Advanced regeneration will be protected, wherever possible, to minimize the area travelled by harvesting equipment.

Wetlands – mapped permanent non-forested (polygon types OMS, TMS, and BSH) (See FMP-19 WW01 and FMP-10 WW01 and FMP Section 4.5)

- No harvest, renewal, or tending operations are permitted that will result in significant damage to wetland vegetation or disruption of hydrological function.
- Operations specifically prohibited include:
    - Machine travel during the frost-free period within 3 m of those portions of the wetland dominated by open water or non-woody vegetation (i.e., vegetation communities with <25% canopy cover of trees, tall (≥1 m high) woody shrubs such as alder or willow, or low (<1 m high) woody evergreen shrubs such as Labrador tea or leatherleaf);
    - Excessive removal or damage of sapling-sized trees (<10 cm dbh) and shrubs within 3 m of those portions of the wetland dominated by open water or non-woody vegetation;
    - Felling of trees during the frost-free period into, or within, 3 m of those portions of the wetland dominated by open water or non-woody vegetation; trees accidentally felled into those portions of the wetland dominated by open water or non-woody vegetation will be left where they fall;
    - Operations that leaves ruts, a significant area of exposed mineral soil, or disrupt hydrological function within the wetland itself or within forest that is within 15 m of those portions of the wetland dominated by open water or non-woody vegetation. Ruts or significant patches of exposed mineral soil will be promptly rehabilitated.
- No contamination of wetlands by foreign materials is permitted.
    - The use and storage of fuels will be carried out in accordance with the Liquid Fuels Handling Code;
    - No equipment maintenance (e.g., washing or changing oil) is permitted within 15 m of non-forested wetlands.
- Extraction trail crossings are not permitted during the frost-free period. During winter conditions, crossings will be minimized and will follow the appropriate operating practices described in rutting and compaction to minimize potential site damage and effects on hydrological function.

Conditions on Regular Operations

NOTES: Conditions on regular operations apply to all harvest, renewal and tending operations.
Additional conditions may apply as documented in Table FMP-10 Operational Prescriptions for Areas of Concern and Table FMP-4 Silvicultural Ground Rules.
Conditions on roads, landings and aggregate pits are documented in Table FMP-19 (within AOCs) and FMP Section 4.5.7 (all areas of operations).

Wildlife Trees – Clearcut Silvicultural System

The following is required in any given 20 ha area within a block where harvest has occurred or for the entire block when the block is less than 20 ha:

- Because trees or stems desirable as wildlife trees may not always be present, all requirements below include the provision 'when available'; in situations where wildlife tree requirements cannot be achieved because trees are too small, requirements will be considered to be met if suitable types of trees are retained from the largest size class available.
- Wildlife trees must be >=10cm dbh and >=3m in height unless 'large' wildlife trees/stubs or cavity, veteran trees or supercanopy trees are to be retained in which case the minimum dbh is >=25cm.
- Retain an average of ≥ 25 stems/ha; wildlife trees will generally be well dispersed; retain an average of at least 15 individual stems/ha; the remaining stems may occur in clumps.
- Retain an average of ≥ 10 large stems/ha with a minimum of 5 large living trees on each ha; large wildlife trees must be a minimum of >=25 cm dbh and ≥ 38 cm dbh are preferred, however supercanopy trees will generally be >=60cm dbh; the 10 large trees/ha will be a mix of living cavity trees, stubs, supercanopy trees, veteran trees, mast trees, diversity trees, and safe dead trees.
- Large hollow trees and those providing existing nesting or denning sites are preferred as cavity trees.
- When the number of large wildlife trees averages < 25/ha, additional wildlife tree requirements may be met by retaining small safe standing dead trees, small stubs or any other living trees.
- Stubs may be left on shallow sites (ES11/12) or on sites that are susceptible to windthrow. Prior to stubbing MNR Kenora District must be contacted.
- Do not stub or knock down trees retained to meet specific wildlife functions such as cavity trees, mast trees, veteran trees and supercanopy trees (preferred trees for stubbing are jack pine and black spruce).
- Do not stub trees being relied upon as a seed source.
- When stubbing, stub to a minimum height of ≥ 3 m (5 m is preferred) and have stubs scattered throughout the harvest area.

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Conditions on Regular Operations

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Woodland Pools – encountered during operations

- No harvest, renewal, or tending operations are permitted that will result in deposition of sediment within, or reduction of the water-holding capacity of, woodland pools
- Operations specifically prohibited include:
    - Machine travel within 3 m of the high-water mark of pools during the frost-free period.
    - Excessive removal or damage of sapling-sized trees (<10 cm dbh) and shrubs within 3 m of the high-water mark of pools.
    - Felling of trees into pools or within 3 m of the high-water mark of pools during the frost-free period; trees accidentally felled into pools will be left where they fall.
    - Disturbance of the forest floor that leaves ruts or a significant area of exposed mineral soil within 15 m of the high-water mark of pools; ruts or significant patches of exposed mineral soil will be promptly rehabilitated.
- Unmapped residual patches required to meet the direction outlined above [Residual – for areas where residual is not mapped in advance] will preferentially be connected to pools; when connecting residual patches to pools, trees will be retained in and within 3 m of the high-water mark to provide overhead shade and residual forest will be retained within at least 15 m of the high-water mark to provide amphibian cover.
- No contamination of pools by foreign materials is permitted.
- The use and storage of fuels will be carried out in accordance with the Liquid Fuels Handling Code.
- No equipment maintenance (e.g., washing or changing oil) is permitted within 15 m of the high-water mark of pools.

4.2.2.3 Silvicultural Treatments of Special Public Interest

There are some silvicultural treatments that are of special public interest. These activities include the aerial application of herbicides for vegetation management, the application of insecticides for pest management, and the areas available for fuelwood.

The **aerial application of herbicides** as a tending operation is proposed in this plan. The locations of eligible areas are identified on the MU490_2012_FMP_P1_MAP_Herb_Comp_00 index map. The identification of areas for chemical tending will be approved annually by MNR in the Annual Work Schedules. Approvals by the Ministry of the Environment (MOE) will be required prior to the aerial application of registered herbicides on the Whiskey Jack Forest.

Areas available for Fuelwood - Fuelwood is available at any approved FMP block. Fuelwood from these areas includes cull wood brought to roadside or wood in slash piles. The public is to obtain personal use fuelwood licences from the MNR prior to harvesting fuelwood.

Fuelwood will only be available if timber was not left on site for a specific reason. In all blocks, timber will be left standing intentionally to enhance wildlife habitat and natural disturbance patterns and will be unavailable for fuelwood. No fuelwood will be considered available within a block once renewal activities have commenced, or after a period of two years after harvest operations have ended. This strategy is intended for the protection of regenerating trees, whether they were initiated naturally or artificially.

There are no areas planned for **candidate high complexity prescribed burns** or **insect pest management**.

If any new operations of special public interest were to be required on the unit during this plan period, an amendment would occur to the FMP where affected stakeholders would be consulted.

4.3 Harvest Operations

This section of the FMP describes the planned harvest operations for the first five-year term (2012-2017) and those planned for the second five-year term (2017-2022) of the ten-year period of the plan. Although the strategic level planning has been conducted for this FMP for the ten-year period (2012-2022), the approval and implementation of harvest operations is divided into two Phases:

- Phase I of the forest management planning process facilitates the "approval" of the first five-year term (2012-2017) forest operations. Term 1 forest operations are referred to as "planned" operations. Area of concern planning has been completed for these planned harvest areas.
- Phase II of the forest management planning process facilitates the "approval" of the second term (2017-2022) forest operations following MNR Regional Director Endorsement of the Year 3 Annual Report. Term 2 forest operations are selected and form part of the 10-year total planned harvest operations in this FMP. They will be confirmed and changed if necessary when Phase II planning and the associated public consultation is completed. Preliminary area of concern planning has been done for these second term harvest areas in this FMP, however all Term 2 areas of concern prescriptions are not approved until Phase II planning is complete and approved. This Phase II planning process will include the review and AOC planning consideration for all updated values identified at that time.

Surplus harvest areas, bridging or second-pass harvest areas (completion of on-going harvest operations from the previous plan), salvage and contingency harvest areas are discussed in Sub-sections 4.3.2, 4.3.3, 4.3.7 and 4.3.8 respectively.

4.3.1 Harvest Areas

There were a number of management considerations and variables influencing operational planning on the Whiskey Jack Forest (as discussed in detail in Sections 3.2 and 3.4). MNR conducted its operational planning with the following considerations:

- Adherence to harvest eligibility and consideration for selection criteria (Sections 3.6.2.1 and 3.6.2.2);
- Adherence to the dynamic caribou habitat schedule areas and timing;
- Adherence to marten core habitat area deferrals;
- Selection of harvest areas to be consistent with the ten-year LTMD available harvest area by forest unit, with secondary consideration for age class;
- Consideration of all currently identified values through area of concern planning, including the implementation of no harvest reserve area of concern prescriptions;
- Consultation and negotiation with the public and other stakeholders;
- Consideration for residual forest pattern requirements and natural disturbance pattern emulation, wildlife habitat and cover to cover distances, etc.; and
- Identifying other operational considerations and conditions for specific harvest areas.

The areas planned for harvest operations for the first five-year term, and the areas proposed for harvest operations for the second five-year term are identified on the operations maps (FMP

Maps – Operations Maps). No areas were identified for harvest as a result of an insect pest management strategy at this time.

The FMPM stand listing requirement has been met through the provision of a spatial Planned Harvest Layer (PHR) and the Planning Composite inventory (PCM).

The available harvest area and the planned harvest area for the ten-year period, and the planned harvest area for the first five-year term is documented in Table FMP-11 by forest unit and age class. Minor deviations or under allocation between the planned 10-year harvest area and the Available Harvest Area (AHA) will be addressed during the planning of operations for the second five-year term. Slight variation in harvest area between five-year terms occurs for all forest units since harvest areas are allocated in operational patches. Depending on stand size and location, allocated harvest area may be below or above the projected five-year total available harvest area by forest unit in order to avoid needless splitting of stands in order to mathematically match the AHA.

The total available harvest area (AHA) for the ten-year period projected by the Long-term Management Direction is 54,834 hectares. The total planned harvest area for the ten-year plan period is under the total available harvest area (53,471 ha, Table FMP-11, 97.5% of LTMD AHA). The majority of the planned harvest for this 10-year period is in the POD forest unit (11,887 ha), followed by the HMX (11,360 ha), CMX (8,814 ha) and SPD (6,821 ha) forest units.

The planned harvest area for the first five-year term is 27,306 hectares, and the proposed harvest area for the second 5-year term is 26,164 hectares, for a total planned harvest area of 53,471 ha for the ten-year period of the plan. Term 1 and Term 2 planned harvest areas are well balanced with 51% and 49% of the 10-year planned harvest allocated for each of the five-year terms respectively.

The actual planned harvest area by forest unit generally approximates five-years of annual available harvest area by forest unit, except for the PRW and SBL forest units that have significantly less or more than half (50%) of the 10-year planned harvest area projected for the first five-year term (34% and 66% respectively). This split of harvest scheduling between the two five-year terms of the FMP period reflects several considerations:

- Allocation of full stands for forest units with small available harvest areas is logical and economical, but creates a percentage area imbalance of allocations between the two five-year terms (small areas involved).
- To provide flexibility in harvest scheduling. Allocations that are not harvested in the first 5-years will remain available in the second 5-year term.

The average harvest area associated with the 10-year plan period and each 5-year term is compared to the average 10-year and 5-year Available Harvest Area (AHA) in Figure 40 And Figure 41. Forest units have been split alphabetically into two groups of six forest units in order to more simply portray graphed data. These figures illustrate the average annual harvest area split between plan terms for each forest unit(s), and that the areas selected for operations in each five-year term are generally balanced with the average annual available harvest area for the ten-year period. It must be noted once again, that the area of concern planning for the second five-year term has not been finalized or approved at the time of FMP approval.

Allocations for the second five-year term are not approved for implementation until after MNR Regional Director Endorsement of the Year Three Annual Report and Phase II of the forest management planning process is completed and approved.

The comparison of the ten-year available harvest area and planned harvest area by 20-year age class is illustrated in Figure 41. During operational planning, minimal age class variance by forest unit occurred as compared to the age classes projected for harvest from the Strategic Forest Management Model LTMD (27d_OLTMS). In general, there was very little age class substitution into stands younger than those projected for harvest by the strategic modelling. More stands 81-100 years old are planned for harvest compared to the LTMD, and fewer younger 61-80 year old stands. A discussion of this variance and associated rationale is detailed in Section 3.6.2.3.

Figure 40 Comparison of 10-Year Harvest Area by Forest Unit (Group 1)

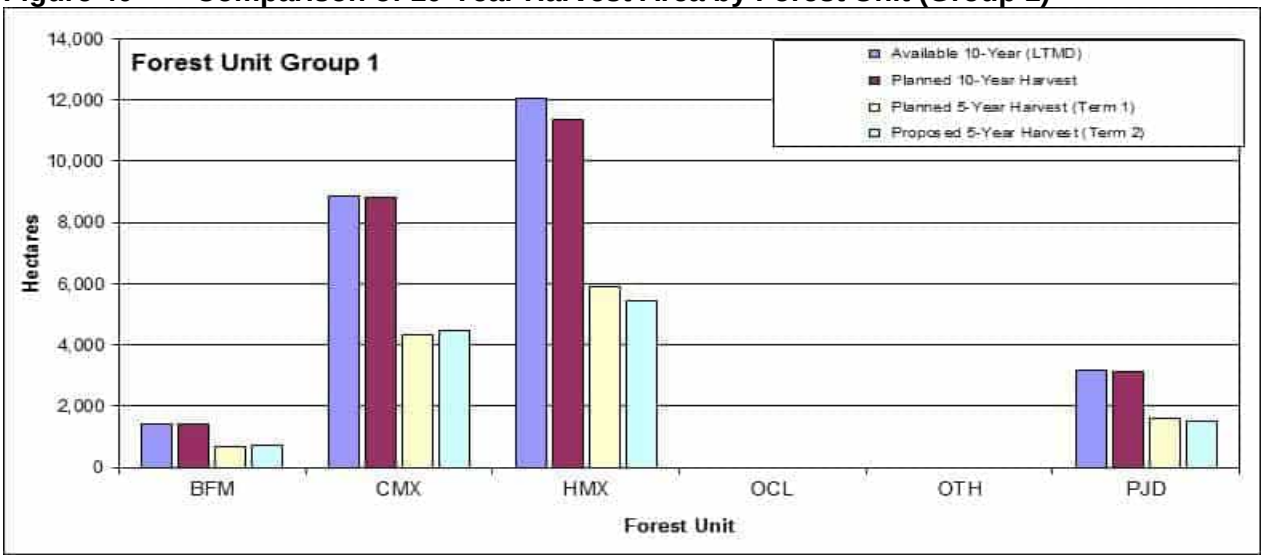


Figure 41 Comparison of 10-Year Harvest Area by Forest Unit (Group 2)

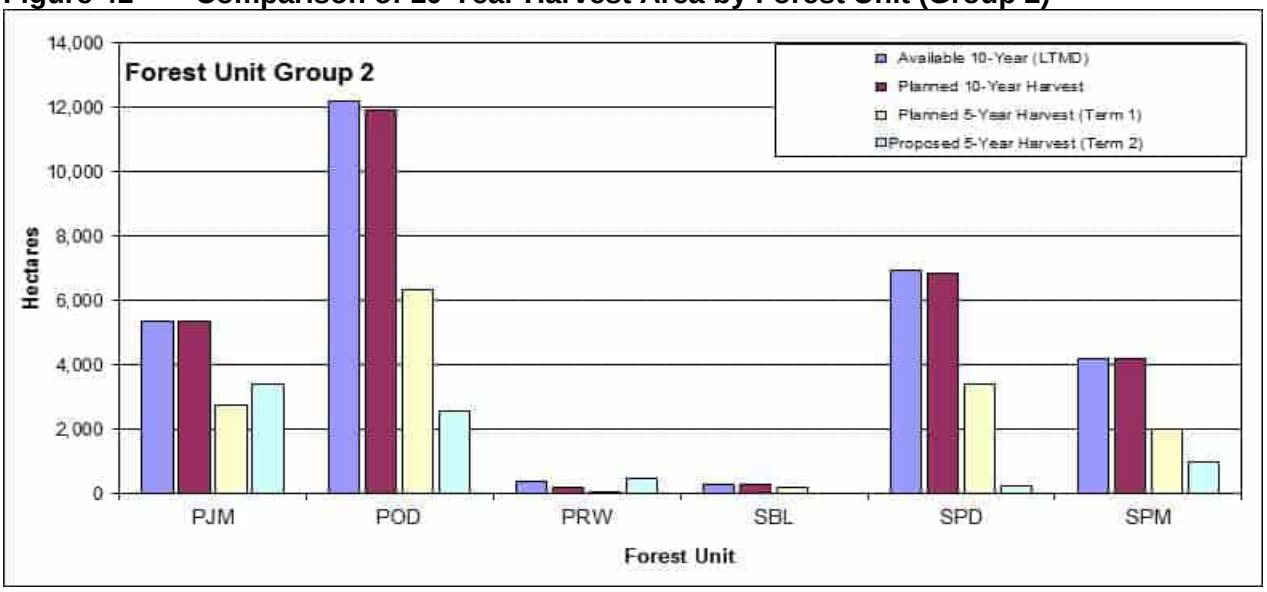
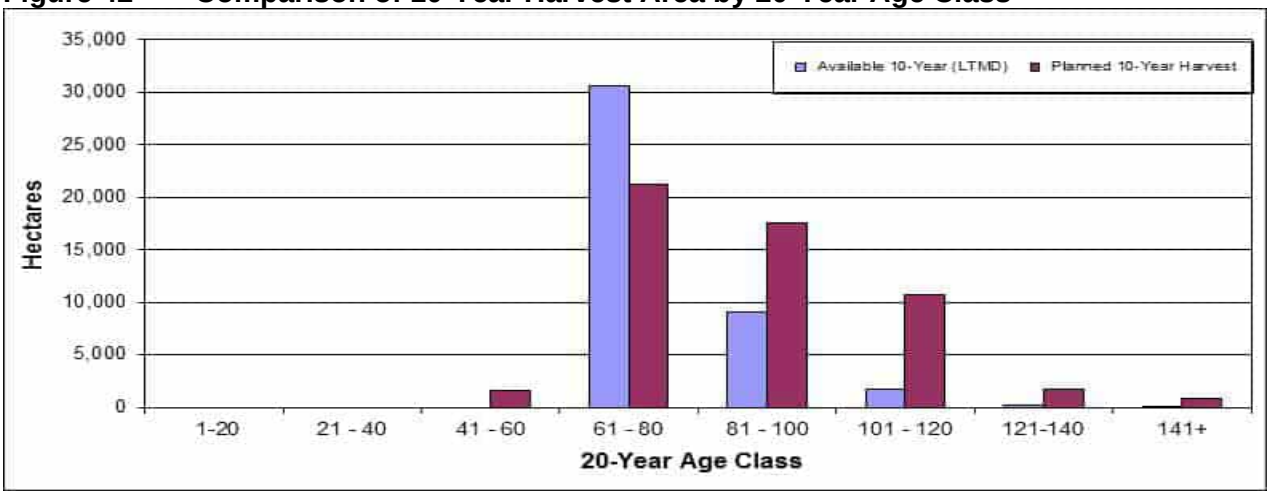


Figure 42 Comparison of 10-Year Harvest Area by 20-Year Age Class



The effect of planned harvest on objective achievement was assessed. A detailed summary of LTMD objective assessment is documented in Section 3.6.3. A comparison of the planned operations to the LTMD is documented in Section 4.9, including the effect of age class distribution and projected harvest volumes of planned harvest area on the achievement of LTMD. It was confirmed that implementation of the planned harvest will aid in the achievement of objectives related to future forest composition and age structure, harvest areas and volumes.

4.3.1.1 Stand Level Residual in Harvest Areas

MNR Forest Policy Section has developed a series of guiding documents to assist forest managers in the planning and implementation of forest management activities so that forestry activities are consistent with direction contained within the Crown Forest Sustainability Act.

The *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* is one of such documents, and has been developed to provide forest management planning guidance to forest managers at the stand and site level. Of particular relevance to this section of the forest management plan is the requirement to maintain residual forest within clearcut harvest areas. The *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* directs the amount and distribution of stand level residual.

NOTE: *The residual requirement from the Stand and Site Guide does not apply in the caribou emphasis area, which is the area covered by the Dynamic Caribou Habitat Schedule (caribou mosaic area). Wildlife tree requirements, detailed in the Conditions on Regular Operations (CROs, Section 4.2.2.2), still apply, but not the patch sized residual requirements detailed below in this section. In the caribou emphasis area, caribou habitat management strategies take precedence over other landscape pattern strategies.*

MNR analyzed the amount of stand level residual associated with the planned harvest for first five years of the 10-year plan period through the use of an MNR-developed computer spatial analysis program.

The Stand and Site Guide states that residual forest will be retained as follows:

- **"25 in 500 ha Analysis"** - Operational planning will ensure that any point within a planned clearcut harvest area will have at least 25 ha of mapped residual forest within a 500 ha circle (or hexagon) about that point (results discussed in Section 4.3.1.1.1).
- **"5 of 25 ha Analysis"** - A minimum of 5 ha of the mapped residual (minimum 25 ha) within any 500 ha circle (or hexagon) will belong to a patch greater than 5 ha (results discussed in Section 4.3.1.1.2).
- **"20% Residual Analysis"** - Operational planning will ensure the area of residual forest averaged over all planned clearcut harvest areas outside of large landscape patches for habitat management, using a 500 ha moving window assessment, is greater than or equal to 20% of the Crown forested area (results discussed in Section 4.3.1.1.3).
- **"0.5 in 50 ha Analysis"** - Implementation of the harvest plan will ensure that any point within a new clearcut harvest area will have at least 0.5 ha of residual within a 50 ha circle (or hexagon) about that point. This residual may or may not be mapped in advance of operations (results discussed in Section 4.3.1.1.4). The conditions on residual, unmapped in Section 4.2.2.2 CROs table apply.
- **Mapped residual** that is not serving any other purpose (AOC, specific habitat function, etc.), and would otherwise be available for harvest, can be moved during operational implementation. Refer to Section 4.2.2.2 CROs table for conditions that apply to movement of Residual, mapped (documents general direction from guide, however , as noted below, there are no mapped residual patches in this FMP).

There were no mapped residual patches required for the planned harvest operations, therefore no associated map product was required or included in the FMP.

4.3.1.1.1 25 in 500 ha Analysis Results

Requirement: *Operational planning will ensure that any point within a planned clearcut harvest area will have at least 25 hectares of **mapped** residual forest within a 500 hectare circle (or hexagon) about that point.*

Results: MNR ran the Evaluate Forest Residual Tool (EFRT) on the Phase 1 allocations, resulting in no planned harvest areas being identified as requiring additional residual forest. Since there are no blocks requiring additional ***mapped*** residual, the associated map and digital file were not produced.

4.3.1.1.2 5 of 25 ha Analysis Results

Requirement: *A minimum of 5 hectares of the mapped residual within any 500 hectare circle (or hexagon) will belong to a patch greater than 5 hectares.*

Results: MNR ran the Evaluate Forest Residual Tool on the Phase 1 allocations and there were no planned harvest areas identified as requiring additional residual greater than 5 hectares (therefore no mapped residual shown on operations maps).

The Operations Task Team discussed that the Residual Tool was designed to include lakes in its assessment (i.e. consider lake area as though it were land) in order to put more weight in leaving residual near water as this is considered to be valuable habitat. However as a consequence, the Residual Tool includes patent land/First Nations reserves next to small parcels in its assessment and treats it like a lake (i.e. not classified as residual). The Operations Task Team felt that adjacent patent land/First Nations do provide residual stands in most cases and should not be treated the same as a lake. However, this situation was not evident in the actual planned harvest allocations for this FMP period.

The residual patches or locations of the range of residual movement within each block are identified on the 1:20,000 scale operations maps.

4.3.1.1.3 20% Residual Analysis Results

Requirement: *Operational planning will ensure the area of residual forest averaged over all planned clearcut harvest areas where Section 3.2.2.2 of the Stand and Site Guide applies, using a 500 hectare moving window assessment, is greater than or equal to 20% of the Crown forested area.*

Results: The Evaluate Forest Residual Tool run by MNR calculated that the area of residual forest averaged over all planned clearcut harvest areas is 38%. This exceeds the minimum average residual requirement by 18%.

4.3.1.1.4 0.5 in 50 ha Analysis Results

Requirement: *Implementation of the harvest plan will ensure that any point within a new clearcut harvest area will have at least 0.5 hectare of residual within a 50 hectare circle (or hexagon) about that point.*

Results:

MNR ran the Evaluate Forest Residual Tool on the Phase 1 allocations and identified the planned harvest areas (129 records) that require a minimum 0.5 hectare patch of residual to be retained during operations.

The designated areas where the 0.5 hectare patch of residual are required to be left are identified on 1:20,000 scale operations maps by a polygon, somewhere in which the required residual patch(es) will be left during operations.

The 0.5 hectare patches will **not** be in the Planned Residual Patches layer (MU490_12_PRP00) as they are **unmapped**. Before harvest operations begin, the operators will be given a map showing the above identified areas where a 0.5 hectare residual patch will be required to be placed during operations.

The operators must follow the conditions on regular operations (Section 4.2.2.2) for "residual, unmapped", and "Large Landscape Patches – Moose Emphasis Areas (MEAs)" in determining the location of unmapped residual within the designated boundary.

4.3.1.2 Licensing of Harvest Areas

Forest Resource Licensees are allocated 100% of the planned harvest area as the Whiskey Jack Forest is a Crown Unit. Based on the allocation of planned harvest blocks for the ten-year period, FRL licensees can harvest the full 53,471 hectares during the ten-year term of the plan.

4.3.2 Surplus Harvest Area

The Whiskey Jack Forest available harvest area is planned to be fully utilized over this ten-year period. The full ten-year and five-year planned harvest areas were classified to be harvested therefore there is no surplus area.

4.3.3 Completion of On-going Harvest Operations from Previous Plan

Areas of bridging operations are identified to allow for the completion of harvest operations from the previous forest management plan to the next FMP. Since operations from 2012-2014 (first two years of this plan period) were conducted under the approved 2012-2014 Contingency Plan, there are no bridging areas being identified in this forest management plan.

Second pass harvesting is not carried out on the Whiskey Jack Forest.

4.3.4 Planned Clearcuts

The disturbance frequency by size class analysis was conducted during development of the Long-Term Management Direction. The analysis was updated for the draft and final plans. The analysis is described in Section 3.6.3.1 Assessment of Objective Indicators (Objective 1: Natural Disturbance and Landscape Pattern).

Consistent with the requirements of the *Forest Management Guide for Natural Disturbance Pattern Emulation (MNR, 2001)*, an assessment was also conducted to evaluate whether 80% of the planned clearcuts by frequency were less than 260 hectares in size. The definition of a planned clearcut is similar to that of a disturbance (i.e. less than 20 years old and less than 3 metres in height), except that a planned clearcut does not include naturally depleted areas, and is based on the net area disturbed. A "planned clearcut" must be separated an average of 200 metres (minimum 100 metres) and will include forest greater than or equal to 3 metres in height and 30% stocking or greater than 20 years old in order not to be part of the same planned clearcut. The guideline also states that, although less than 80% of fires in the Boreal Forest are smaller than 260 hectares, this direction recognizes the public sensitivity concerning large clearcuts.

Areas selected for harvest operations have been selected in accordance with landscape disturbance pattern requirements in the *Forest Management Guide for Emulating Natural Disturbance Patterns (MNR, 2001),* and according to the harvest eligibility and selection criteria outlined in Section 3.6.2.1 and 3.6.2.2.

The analysis of planned clearcuts identified planned clearcuts projected to be present in 2017, the end of the first five-year term of the plan. In the assessment of the "80% under 260 hectares" standard, the assessment has identified 76% of planned clearcuts to be equal to or under 260 hectares in size, leaving 24% of planned clearcuts greater than 260 ha. This result is lower than the 80% standard, but is acceptable to the Planning Team as it results from strategic landscape pattern direction (e.g. dynamic caribou habitat schedule, marten core areas, moose / deer emphasis areas) and projected harvest allocations that balance consideration for all desired forest and benefits and operational challenges.

Planned clearcuts range from 2 to 7,904 hectares in size, with an average of 302 hectares. It should be noted that planned clearcuts contain both new and older harvest areas (up to 20 years old). For those planned clearcuts over 260 hectares (average size 964 ha), the average size of "new cut" in these planned clearcuts is 533 hectares (55% of planned clearcut area).

Each proposed planned clearcut that exceeds 260 hectares is identified in Table FMP-12. These planned clearcuts over 260 hectares will provide large landscape patches for forest diversity and wildlife habitat in the future and contribute to a range of disturbance sizes on the forest which emulates a more natural disturbance pattern than if all planned clearcuts were the same size. These planned clearcuts result from the consolidation of eligible new cut harvest area adjacent to harvest areas from the past 20 years, or the allocation of a concentration of eligible harvest area in this plan period.

A map of this planned clearcut spatial landscape pattern analysis is located in the electronic FMP maps: Map MU490_2012_FMP_P1_MAP_LandPat_05.pdf.

4.3.5 Harvest Volume

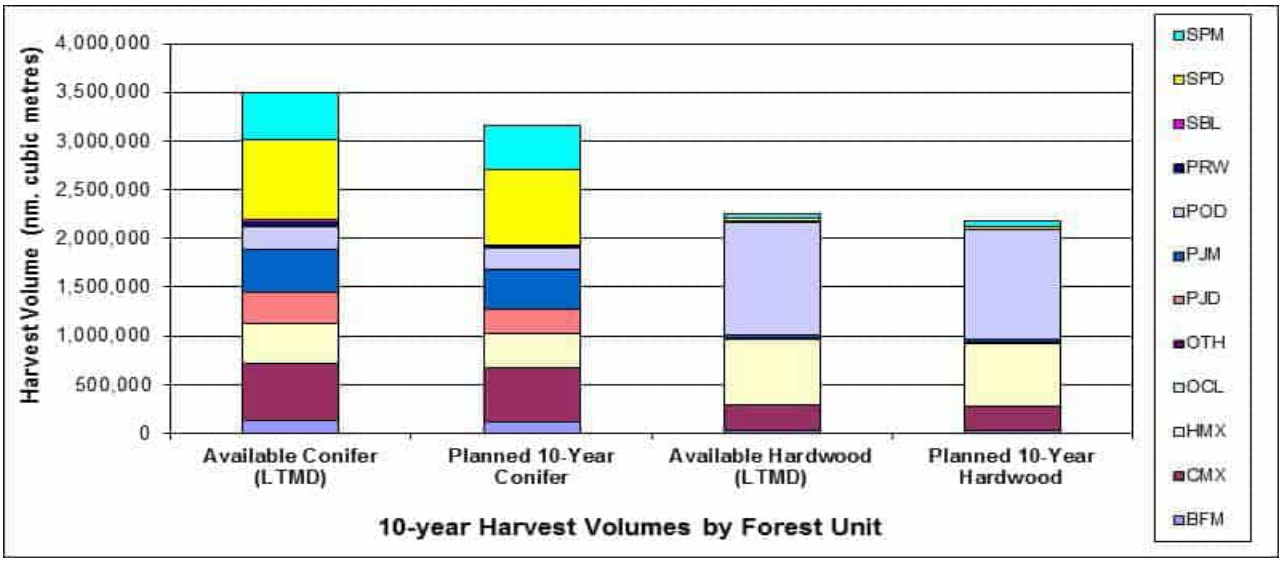
The available harvest volume and an estimate of the harvest volume for the planned harvest area for the 10-year period are recorded in Table FMP-13.

The LTMD projected an available harvest volume of 5,745,949 net merchantable cubic metres for the ten-year period of the plan (3,490,380 cubic metres conifer and 2,255,569 cubic metres hardwood). An additional 1,044,785 cubic metres of defect (e.g. defect/cull, branches, twigs, leaves and bark) and 206,668 cubic metres of undersized volume (e.g. top wood) are estimated to be generated from the LTMD available harvest volume.

The total planned harvest volume for the 10-year period of the plan is 5,334,717 cubic metres net merchantable volume with an additional 1,028,395 cubic metres volume of defect and 212,256 cubic metres of undersized volume (Table FMP-13).

Based on the 10-year planned harvest operations, the total net merchantable conifer volume projected for harvest is 3,156,893 cubic metres, and the net merchantable hardwood volume is projected to be 2,177,824 cubic metres. On an annual basis, the average volume will be a total of 533,472 net merchantable cubic metres per year. Available and planned volumes for the 10-year plan period are portrayed in Figure 43.

Figure 43 Available and Planned Harvest Volumes 2012-2022 by Forest Unit



The planned harvest volumes are below the projected harvest volumes in the LTMD by 10% for conifer and 3% for hardwood species. The minor variance in planned harvest volumes is a result of the 3% under allocation of harvest areas and also some minor age class substitution to younger and/or older stands that have less volume than the age classes projected by the LTMD. Rationale for the harvest allocations was described in Section 3.6.2.3.

The available harvest volume (LTMD from SFMM) projects 105 cubic metres per hectare and the actual allocations for the 10-year period are comparable with an average of 100 cubic

metres per hectare. The volume trade-offs through age class substitution resulted in a very minor volume loss. If during implementation of the plan, residual areas are minimized while meeting applicable guides or if yield curve projections prove to be conservative, then additional volume may potentially result from harvesting the planned harvest areas.

Merchantable Harvest Volumes were calculated based in a combination of estimated yields (SFMM yield curves by forest unit and silvicultural intensity), estimated volumes losses for stand level residual, wildlife trees and inoperable areas (SFMM unharvested volume percentages) and also based on the species composition of the allocated stands. For each forest unit and silvicultural intensity, the total volume from the yield curve was reduced by the applicable unharvested volume percentages. This resulted in a netted down total volume per hectare for each 10-year age class within each forest unit. This net total volume per hectare was then prorated by stand based on the actual species composition for each allocated stand for the 10-year period. While SFMM provides a good strategic estimate of volumes, it bases all calculations on the average condition for each forest unit. By pro-rating net harvested volumes based on each individual allocated stand's species composition, the estimated harvest volumes are significantly more relevant at the stand and operating block levels. These volumes by stand were used and summarized for all harvest volume tables in the FMP.

Undersized and Defect Volumes also known as unmerchantable volume represent all of the volume that is not merchantable by the minimum utilization standards defined in the scaling manual. In general, this includes components of the tree that have not traditionally been utilized (i.e. stem tops (below minimum diameter limit based on CFSA standard, and DBH/Height from Plonski), defect or cull, branches, leaves, twigs and bark).

MNR developed a science-based approach to estimate the undersize and defect volumes. This methodology for estimating undersize and defect volumes by species group and management unit was provided to the Planning Team to estimate volumes for this forest management plan.

The methodology uses species specific biomass and stem form equations and eco-regional calibration factors for each major species group. Resulting factors provide an operational estimate of unmerchantable volume that is available for harvest. Factors include ecological and operational netdown factors that address volumes that are not removed from the harvest site due to residual trees, coarse and fine woody debris, operational losses due to breakage and/or harvesting system limitations (i.e. cut to length operations, bark availability).

These individual tree biomass equations relate mensurational variables for the average tree (i.e. diameter at breast height (DBH) and tree height) to oven-dry mass for each biomass component of the tree. Tree biomass components predicted using these equations include: whole tree, stem wood, branches, bark, twigs and leaves.

Sources of biomass that are not included in the total volume calculation include trees left on site for ecological reasons, undersized trees in stands, downed wood debris, stumps and estimated breakage and loss due to operations.

As more experience is gained with operations in Ontario and more information is available, volume estimates (merchantable and unmerchantable) will be adjusted to reflect the most current knowledge.

4.3.6 Wood Utilization

The harvest volume for the five-year term planned harvest area is recorded by volume type, product, and species in Table FMP-14.

The total utilized volume for the five-year term of the plan is estimated to be 3,302,889 cubic metres, which is comprised of 1,869,979 cubic metres of conifer (1,543,520 cubic metres net merchantable and 326,459 cubic metres defect/undersize) and 1,432,920 cubic metres of hardwood (1,133,647 cubic metres net merchantable and 299,273 cubic metres defect/undersized). Markets are currently available or will be sought for all allocated volume. All species are considered utilized at this time, including the defect and undersized volumes. The approval of the forest management plan is not an agreement to make areas available for harvest to a particular licensee, or an agreement to supply wood to a particular mill.

The proportion of harvest volume planned for the first five-year term is 50% of the total planned net merchantable volume for this 10-year plan period. All planned harvest volumes are assigned to Forest Resource Licensees in Table FMP-14 since the Whiskey Jack Forest is a Crown Unit. As discussed in Section 4.3.1.2, FRLs harvest 100% of the planned harvest area and volume. This proportion was used to determine the planned harvest volumes by licensee reported in Table FMP-14.

Table FMP-14 presents the estimates of volume that will be utilized from the planned harvest area by fibre species and product. A portion of total stand volumes associated with the allocations will not be available at the time of harvest. Due to wildlife habitat management and the emulation of natural disturbance pattern guidelines, timber volume is expected to be left on site to enhance wildlife habitat and natural disturbance residual patterns. This anticipated unutilized volume associated with wildlife habitat (wildlife tree retention, downed woody material) and natural residual patches was not included in total allocated volumes in Table FMP-14, and was identified as unharvested volumes in the strategic SFMM modelling. All available merchantable, live trees from allocated stands are anticipated to be utilized. However, certain areas may have residual wood left on site after logging operations have been completed, due to operating conditions (inoperable) such as steep slopes, etc.

FMP-14 reports estimated volumes for utilized unmerchantable (undersized and defect) material. Markets are developing regionally for this material and it is expected that the Weyerhaeuser – Kenora mill will purchase unmerchantable material to supply biofuel to their planned co-generation plant on an “as required” basis.

The harvesting of roadside unmerchantable fibre for biofuel will be permitted in blocks which have been closed to harvest activity, including those outside of the current FMP where the areas have been identified for renewal and tending. Any such activity will comply with existing areas of concern (Table FMP-10), conditions on regular operations (CROs Section 4.2.2.2 applies to piles), conditions on roads, landings and aggregate pits (CRLAPs Section 4.5.7, applies to landings)and all road use management strategies (Table FMP-18). Roadside unmerchantable fibre within 30 metres of the road centerline is acceptable to be harvested, and no standing timber will be harvested. Renewal of these areas will occur and will be consistent with the SGR for the stand; however spot planting of conifer trees on sites left for natural regeneration may be allowed where coppice growth is not occurring. These areas are small and planting conifer along the landings will not impact the achievement of the intended SGR.

Table FMP-15 lists the mills and the anticipated volumes each will utilize from the planned harvest area for the five-year term. Volumes are summarized by species and product type. This table also shows volume commitments to each mill. The source of information for this table is FMP-13 and FMP-14 and a combination of known mill commitments and traditional mill levels previously supplied from the management unit. Based on the planned harvest volume identified in Table FMP-15, the forest can supply sufficient wood fibre to satisfy identified commitments.

Table FMP-15 volumes are subdivided by species and product committed by year. Planned deliveries to specific mills were calculated based on wood supply commitments, partially calculated by Appendix "E" of the previous SFL agreement and historic and projected deliveries to mills and more recent ministerial letters and the Wood Supply Competitive Process (2007). The identification of "Open Market" volume in Table FMP-15 does not record a surplus area or volume condition.

Weyerhaeuser - Kenora is planned to receive all net merchantable poplar fibre harvested from the Whiskey Jack Forest (estimated at 983,637 cubic metres) for their timberstrand engineered lumber facility in Kenora during the five-year term of the plan.

Prendiville Industries - Kenora Forest Products Division in Kenora is projected to receive 665,000 cubic metres of Spruce-Pine-Fir during the five-year term in accordance with a ministerial directive. They are projected to receive an additional 851,334 cubic metres in accordance with the Wood Supply Competitive Process (2007).

During this first five-year term, 45,000 cubic metres of conifer sawlogs are projected to be delivered to Wincrief Forestry Products Ltd. and 37,500 cubic metres of conifer sawlogs delivered to 1358807 Ontario Ltd. (D. Riffel Harvesting).

During this five-year plan term, there is 39,529 cubic metres of conifer (red pine, white pine, cedar, larch) net merchantable volume not allocated to any specific mill. There is 256,807 cubic metres net merchantable hardwood (mostly white birch, some black ash). There is also an estimated 658,265 cubic metres of defect and undersized volume associated with the planned harvest that is being included in this FMP as utilized fibre. These conifer and hardwood volumes are all identified as being Open Market volumes for this plan period.

Implications of Volume Underutilization: If all the planned harvest volume is not harvested and utilized, there will be negative socio-economic impacts. Reduced volumes from the Whiskey Jack Forest will impact production at wood processing mills, direct and indirect employment rates and reduced socio-economic benefits to local communities. These economic impacts may be partially offset if local mills arrange to receive wood from other sources and can maintain their production levels. If planned harvest levels are not achieved in this plan period, there may be a short-term delay in achievement of management objectives and slower progress towards the desired forest condition.

4.3.7 Salvage

Salvage operations in areas of natural depletion were not included in planned harvest area or volumes (Tables FMP-11 to FMP-15), nor are they counted against the available harvest area. The Strategic Forest Management Model incorporates an allowance for natural depletions in the Long-term Management Direction, and therefore, estimated natural depletions are already considered in the determination of the sustainable area available for harvest during the five-year term of this plan.

No salvage operations are planned on the Whiskey Jack Forest at this time. A snow damage event occurred in October 2012, but the majority of the area on the Whiskey Jack Forest was relatively young and there are currently no plans for a salvage harvest. If any additional natural depletions occurs during this term, that are suited to salvage harvest operations, appropriate planning and approval procedures will be followed to facilitate the salvage of the wood fibre.

4.3.8 Contingency Area and Volume

During the 10-year period of the forest management plan, unforeseen circumstances (e.g. wildfire, blowdown) may cause some of the planned harvest areas to be unavailable for harvest. In order to accommodate such circumstances, “contingency areas” for harvest have been identified and portrayed on the operations maps (FMP MAPS – Composite Maps and Operations Maps). This contingency area will serve as a replacement area for harvest, and will be used only if needed. This area is not in addition to the regular allocated harvest. It is identified as substitute areas, which have already been subjected to public consultation and area of concern planning. Reclassification of these areas from contingency to planned harvest area requires an amendment to the forest management plan.

Sufficient contingency area was selected from the optional harvest areas, to support approximately 20months of harvest operations. Areas were chosen that have access along primary or branch roads for easy substitution. The area and volume of the contingency area is summarized in Table FMP-16. A total of 9,147 hectares of contingency area have been identified in the management plan, with an associated total contingency volume of 929,200 cubic metres (558,269 cubic metres conifer, 370,931 cubic metres hardwood). Contingency areas are included digitally in the Planned Harvest Layer information supplied to MNR. (Note: The FMPM stand listing requirement has been met through the provision of a spatial data layer.)

Areas allocated as contingency blocks may be allocated for harvest at the beginning of the next ten-year period (2022-2032) if they are not harvested during this 10-year plan period. Most of the contingency blocks are near current allocations, and some are near primary roads to facilitate a spring haul of wood to the mills. A variety of forest units have been allocated as contingency area.

4.4 Renewal and Tending Operations

4.4.1 Renewal and Tending Areas

The planned levels of renewal and tending associated with harvest and natural disturbance are discussed in this text section.

The types and levels of renewal and tending operations planned for the ten-year period, and the proposed levels for the first five-year term are summarized in Table FMP-17. The identified renewal program represents the Long-term Management Direction of reducing mixedwood (HMX, CMX) and increasing pure conifer and pure hardwood dominated forest units. The proposed silvicultural work is based on areas depleted through harvesting, prior to the beginning of this plan term, that have not had silvicultural activities completed. Preliminary silvicultural treatment packages, from Table FMP-4, will be confirmed, or changed to reflect actual site conditions if required, at the Annual Work Schedule stage upon site inspection by a Registered Professional Forester.

During the preparation of the Annual Work Schedule, MNR will review all identified values, and confirm that proposed renewal activities are planned so that all known values are protected.

The *Forest Management Planning Manual* states that a registered professional forester (R.P.F. licenced by the Ontario Professional Foresters Association) will undertake an analysis to determine the necessary levels of renewal and tending activities, and associated expenditures required, to achieve the management objectives.

Kurt Pochailo, R.P.F., MNR Management Forester, a Registered Professional Forester, undertook a review to determine the necessary level of renewal and tending activities and the associated expenditures required in the long-term management direction to achieve a balance of the management objectives.

In addition, during development of the 2012 FMP, all wood supply model assumptions were reviewed and supported by the Planning Team and the Strategic Task Team made up of representatives from the MNR and industry, which included four (4) Registered Professional Foresters. As well, a number of Registered Professional Foresters from MNR Northwest Region provided input and review. Model assumptions are documented in the Analysis Package, Supplementary Documentation A of the 2012 FMP.

The assessment and associated Table FMP-17 is based on the projected renewal levels and associated expenditures for the five-year term of an FMP, as an output from the Strategic Forest Management Model (SFMM) based on the long-term management direction. Harvest areas planned in this forest management plan requiring artificial regeneration will be treated in subsequent years either in this phase of operations or the next. Although the levels of some individual treatments are lower than the annualized five-year average, the silvicultural strategies being employed are the same as the long-term management direction for each forest unit being treated but have been reduced to reflect actual area harvested from 2009-2012. This is not a reflection of a change in the long-term management direction and does not move away from the desired future forest condition.

Table FMP-17 estimates that in the first five-year term approximately 27,306 ha will be renewed. Of that, approximately 12,911 ha will be naturally regenerated, and approximately 14,394 ha will be artificially regenerated after site preparation (planting – 10,420 ha; seeding – 3,974 ha.). Generally, hardwood areas are regenerated naturally, and conifer areas are artificially regenerated. Tending levels are projected to be approximately 1,284 ha for the 2012-2017 plan term, half of which will be aerial application of herbicides, half ground application.

Slash piles created in blocks harvested will be burned in accordance with the conditions on regular operations (Section 4.2.2.2). Once exact site locations and hectares are known, the AWS will be revised following the September submission and approval of the Prescribed Burn Plan for Slash Pile Burning. Approximately 523 hectares of slash piles are projected to be burnt during the first 5-year term, and another 546 hectares in the second five-year term of the FMP.

Index map MU490_2012_FMP_P1_MAP_ Index_00 shows all areas eligible for renewal and tending during the term of the plan. This includes all areas harvested from 1997 to 2012. More detail on locations of actual planned renewal and tending treatments will be provided in the Annual Work Schedule.

There are currently no supplemental treatments or retreatments anticipated or planned. Aerial herbicide spray is considered a silvicultural treatment of special public interest. Areas that are considered eligible to receive this type of treatment are outlined on Index Map MU490_2012_FMP_P1_MAP_Herb_Comp_00. This includes areas previously harvested or planned for harvest in the first phase of operations that are managed for conifer production.

4.4.1.1 Eligibility and Selection Criteria for Renewal and Tending Activities

Eligibility Criteria

Renewal operations eligibility criteria are closely linked to eligibility criteria for harvest operations. All areas eligible for harvest operations are considered eligible for renewal operations during the ten-year period of the plan. In addition, all previously harvested or naturally depleted areas, which have not been deemed free-to-grow prior to plan approval date are also eligible for renewal treatments.

The eligibility criteria for **tending or cleaning operations** include all areas eligible for harvest operations during this plan period. Additional areas harvested during the 2004 to 2009 plan term, approved allocations in the 2009 – 2012 Contingency Plan and the 2012-2014 Contingency Plan are also eligible for tending operations. All harvested areas that have planting stock being suppressed by competing vegetation are eligible for tending operations. Priority will be given to those area planted with improved stock and more productive sites.

Selection Criteria

The selection criteria for renewal and tending activities are:

a) Renew areas that will have been recently harvested at the beginning of this plan term, that have not had renewal work done or completed.
b) Conduct renewal operations on areas harvested or naturally depleted during this term.

c) Tending will be considered on all harvest depletions that have planting stock that is experiencing severe suppression due to competing vegetation.

d) Tending will be considered on all naturally depleted sites, regardless of whether or not any renewal treatments are/were conducted.

4.4.2 Renewal Support

Renewal support includes those activities which are necessary to support the planned types and levels of renewal and tending operations during the five-year term of this FMP. Renewal support includes activities such as tree seed collection, planting stock production and tree improvement operations which will be conducted on the Whiskey Jack Forest.

There are no tree improvement activities planned during the next 10 years due to the poor access to the orchards. When forest operations improve the roads accessing the orchards tree improvements may be amended into the plan.

MNR is responsible for seed collection, planting stock planning, procurement and payment. Planting stock will be procured from container nurseries under contract to MNR. The planting stock will be monitored to ensure it meets the minimum specifications in the contract. Seedlings will be monitored for survival. Planting stock procurement for this forest management plan will be completed annually, one year in advance of planting. A mixture of seedlings consisting of black spruce, white spruce, jack pine red pine and white pine will be ordered depending on the areas forecasted for harvest the following year. Current inventories of seed are adequate. MNR may initiate a collection program for red pine or white pine if seed crop conditions are favourable. Table 37 summarizes the amount of seed required per year by seed zone. The forecast of planting stock to be grown by year for this five-year term is included in Table 38.

Table 37 Tree Seed Collection Forecast 2012-2017

	SEED REQUIREMENT FORECAST (hectolitres)					
	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
Pj seed	21.4	1.4	26.1	26.1	26.1	26.1
Sb seed	0.5	1.1	0.7	0.7	0.7	0.7
Sw seed	0.4	-	0.4	0.4	0.4	0.4
Pr seed	-	0.1	0.1	0.1	0.1	0.1
Pw seed						
Ce seed						
TOTAL SEED	22	3	27	27	27	107

Table 38 Planting Stock Forecast 2012-2017

	PLANTING STOCK FORECAST (thousands of seedlings)					
Species-stock	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
	2012-13	2013-14	2014-15	2015-16	2016-17	2012-17
Pj container	98	134	100	100	100	100
Sb container	160	325	200	200	200	200
Sw container	103		75	75	75	75
Pr container		5	5	5	5	5
Pw container						
Ce container	-					-
TOTAL SEEDLINGS	362	464	380	380	380	1,966

4.5 Roads

The planning requirements for new primary, branch, and operational roads that are required to access harvest areas, including contingency area that will be constructed during the ten-year period of the forest management plan are described in Section 4.5.1 Primary and Branch Roads and Section 4.5.2 Operational Roads.

This section outlines the planning requirements for new primary, branch and operational roads that will be constructed during the ten-year term of the FMP. These roads are required to access planned and future harvest areas. Plan text and Table FMP-18 include those activities planned for this 2012-2022 forest management plan.

Existing and proposed roads, landings and aggregate pits are considered in AOC planning. If there are any conditions on any of these features, they are noted in Table FMP-10, and documented in Table FMP-19. Proposed road locations were considered with regard to all currently identified values. Sections 4.5.1 and 4.5.3 include discussions on the primary and branch roads proposed for construction during this plan period and conditions and analysis of any planned area of concern crossings. A summary of the operational road construction in this FMP period, and conditions and analysis of any planned area of concern crossings of these roads is included in Sections 4.5.2 and 4.5.4. Existing forest access roads are discussed in Section 4.5.5. Operational standards for forestry aggregate pits are included in Section 4.5.6.

Any primary or branch road crossing of an AOC requires completion of road supplementary documentation form Part D. Supplementary documentation for area of concern prescriptions can be found in Supplementary Documentation Section H.

Where a new or existing primary road, branch road, operational road, landing or aggregate pit does not intersect an area of concern for a value, any conditions on the primary road, branch road, operational road, landing or aggregate pit as described in the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* are documented in Section 4.5.7 - Conditions on Roads, Landings and Aggregate Pits.

No new primary roads, branch roads or operational roads are required for forest management purposes that will traverse a provincial park or conservation reserve.

4.5.1 Primary and Branch Roads

4.5.1.1 Primary Road Corridors

The *Forest Management Planning Manual for Ontario's Crown Forests (MNR, 2009)* defines a **primary** forest access road as a road that provides principal access for the management unit and are constructed, maintained and used as the main road system on the management unit. Primary roads are normally permanent roads, although there may be significant periods of time when specific primary roads are not required for forest management purposes.

Each planned new primary road required for the twenty-year period (2012-2032) is identified in Table FMP-18 along with the use management strategy for the road and the length of road to be

constructed during the first five-year term of the plan. The planned corridor for each primary road is portrayed on the operational maps and Planned Road Corridor layer.

Final locations of the one-kilometre wide corridors for primary roads are based on the environmental analysis of alternative corridors and public comments received during the planning process. Primary road use management strategies were also finalized after public consultation. The rationale for the proposed corridor and the associated use management strategy are documented in Supplementary Documentation G - Road Planning Documentation.

During the 2012-2032 period, no primary roads are being considered for transfer from the forest manager to the Crown.

Where a new primary road or landing does not intersect an area of concern (AOC) for a value, any conditions on the primary road or landing as described in MNR's guide(s) relating to conserving biodiversity at the stand and site scales are documented in the forest management plan. These conditions on roads, landings and aggregate pits (CRLAPs) are shown in Section 4.5.7 in this FMP.

The Whiskey Jack Forest is generally well accessed at Plan Start, with minimal construction of primary access roads required in the next twenty-year period (2012-2032). There are only three new primary roads planned for construction during the 2012-2022 plan period: the Yellow Girl Road, the Bug Lake Road and the Witch Bay/Loon Lake Road.

4.5.1.2 Branch Road Corridors

Branch roads are roads, other than primary roads, designed for all-weather access that branch off existing or new primary or branch roads, providing access to and through areas of operations on a management unit.

Each planned new branch road required for the 10-year period is identified in Table FMP-18 along with the length of road to be constructed and the use management strategy for the road. The planned corridor for each branch road is portrayed on the operational maps and Planned Road Corridor layer.

During the 2012-2022 period, no branch roads are being considered for transfer from the forest manager to the Crown.

There are two branch roads planned for construction during the 2012-2022 plan period: the April South Road, and the Aesthetic Road.

Where a new branch road, or landing does not intersect an area of concern (AOC) for a value, any conditions on the primary road, branch road or landing as described in MNR's *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* (MNR, 2010) will be documented in the forest management plan. These conditions on roads, landings and aggregate pits (CRLAPs) are shown in Section 4.5.7 in this FMP.

4.5.2 Operational Roads

Operational roads are roads, other than a primary or branch roads that provide short-term access for harvest, renewal and tending operations. Operational roads are normally not maintained after they are no longer required for forest management purposes, and are often decommissioned.

Table FMP-18 lists the new and existing operational road boundaries that will be required for the 10-year term of the plan. Planned construction, maintenance, monitoring, access control and future use management are recorded in the table. Any extensions to existing roads (construction during the plan period), or changes to the use management strategy for an existing road are documented in Table FMP-18.

The areas within which new operational roads are to be constructed during the 10-year plan period will be identified by **operational road boundaries** (ORBs). An operational road boundary identifies the perimeter of the harvest area and the area from an existing road or planned road corridor to the harvest area. Operational road boundaries for the FMP are identified on the operations maps and shown in the legend as “Operational Road Boundary”.

Each operational road boundary within which an operational road will be constructed during the plan period and the associated use management strategy (UMS) for the road(s) is recorded in Table FMP-18. Documentation of the use management strategy for each operational road or networks of operational roads is included in Supplementary Documentation G.

During the 2012-2022 period, operational road boundaries being considered for abandonment or decommissioning are identified in Table FMP-18. All operational roads within the identified ORBs will be decommissioned.

The operational road boundaries are delineated on the 1:20,000 Operational Maps. The applicable road use strategy is outlined in Table FMP-18 and will be the road use strategy for that particular road or network of roads for the period of this plan. Operational roads will be built in the most appropriate location to facilitate harvest.

Where a new operational road or landing does not intersect an area of concern (AOC) for a value, any conditions on the operational road or landing as described in MNR’s *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* (MNR, 2010) will be documented in the forest management plan. These conditions on roads, landings and aggregate pits (CRLAPs) are shown in Section 4.5.7 in this FMP.

4.5.3 Area of Concern Crossings – Primary and Branch Roads

This section documents the planning requirements that were applied to each crossing of an area of concern (AOC) by a proposed corridor for a new primary or branch road. These AOC crossings are planned for the portion of the road that will be constructed during the first five-year term. Preliminary crossings of areas of concern for the second five-year term were also developed and mapped. During Phase II planning, the preliminary crossings of areas of concern will be reviewed, confirmed and updated or revised if necessary.

There is one primary road and two branch roads planned for construction in this FMP. Table FMP-10 identifies if there are conditions on a crossings, landings or aggregate pits within an AOC associated with the planned primary or branch road. Table FMP-19 contains the conditions and locations of the AOC crossings on the Yellow Girl Road, the April South Road, the Bug Lake Road.

AOCs are individual or grouped according to the value(s) and are assigned a common code identifying the AOC. For each crossing of an AOC within a primary and branch road corridor, the conditions on construction and acceptable variations to locations and conditions are documented in Table FMP-19, organized by the same AOC codes used in Table FMP-10.

Where primary or branch roads cross the above AOCs, the rationale for the crossing is documented in Supplementary Documentation H – Areas of Concern (AOC) Documentation. Supplementary Documentation H also includes reference to any public comments received and how they were considered in the AOC prescription.

AOC crossings are illustrated on the Operational Map series and include the following:

- Preferred 100-metre wide crossing location of the road;
- Restricted crossing areas, if applicable;
- Acceptable variations to the crossing area (remainder of area where there are no restricted areas or area already identified as the preferred crossing location (as above)); and
- Crossing reference number.

The portrayed 100-metre wide road locations and documented conditions on road construction in the forest management plan for area of concern crossings are preliminary locations and conditions. The locations and conditions will be finalized in the applicable Annual Work Schedules consistent with the acceptable variations described in the FMP.

No new roads required for forest management purposes will traverse a Provincial Park or Conservation Reserve during the 10-year period of the management plan. There are no new primary or branch roads planned for construction within Enhanced Management Areas.

4.5.4 Area of Concern Crossings – Operational Roads

For new operational road crossings of areas of concern, any necessary conditions on the location(s) and/or construction of the crossings are identified for individual areas of concern or groups of areas of concern. Table FMP-10 identifies if there are conditions on operational road crossings of an area of concern, or landings in an area of concern. AOCs are individual or grouped according to the value(s) and are assigned a common code identifying the AOC.

For operational road crossings of areas of concern, conditions on the location(s) or construction of the crossing(s) for individual areas of concern, or groups of areas of concern, are documented in Table FMP-19, organized by the same AOC codes used in Table FMP-10. Conditions on a landing within an AOC are also documented in Table FMP-19.

Operational road locations and conditions on construction will be identified in the annual work schedule, consistent with the conditions described in the FMP.

4.5.5 Existing Roads

Each existing road or road network, and the associated use management strategy, is documented in Table FMP-18. Documentation of new or revised use management strategies, and the associated rationale, is included in the Supplementary Documentation G. All roads information for the FMP is included in a single GIS layer submitted electronically with the plan.

If an existing road, landing or aggregate pit within an area of concern is planned to be used for forest management purposes during the period of FMP, Table FMP-10 identifies if there are conditions on the roads, landings or aggregate pit. Details of the conditions on the road, landing or aggregate pit as described in MNR's guide entitled *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* (MNR, 2010), are documented in Table FMP-19.

If an existing road and/or landing is planned to be used for forest management purposes during the period of FMP, and where the road and/or landing does not intersect an area of concern for a value, conditions on the road and/or landing as described in MNR's guide entitled *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* (MNR, 2010) are documented in Section 4.5.7.

There are no primary or branch roads scheduled for removal over the ten-year period of this FMP.

There are no other existing roads planned for additional restrictions or modifications to existing access restrictions, decommissioning or road transfers during this plan term. All existing access restrictions (e.g. Aesthetic Road, Lennan Road, Mac Lake Road, Tide Road, Unexpected Road and the Sydney Lake Road) will remain in place, as shown in Table FMP-18.

Existing operational road boundaries and their use management strategies are also summarized in Table FMP-18. During the 2012-2022 period, operational road boundaries being considered for abandonment or decommissioning are identified in Table FMP-18. All operational roads within the identified ORBs will be decommissioned.

Changes to road use management strategies approved in the 2012-2014 Whiskey Jack Forest Contingency Plan are carried forward and documented in this FMP. The use management strategies for road networks are summarized in Supplementary Documentation G.

4.5.6 Forestry Aggregate Pits

The criteria for a Forestry Aggregate Pit apply as per regulations under the *Aggregate Resources Act,* however, Forestry Aggregate Pits (previously Category 14) are exempt from the requirement for an aggregate permit under the Aggregate Resources Act (ARA) as per the exemption criteria below. Previously operated Forestry Aggregate Pits may be utilized for a ten-year period starting from the initial aggregate extraction from the pit. Forestry Aggregate Pits must remain within the road corridor or area of operations that was identified in the AWS at the time the site was established.

The extraction of aggregate from Forestry Aggregate Pits for use on forest access roads on the management unit will comply with the exemption criteria as outlined below:

Exemption Criteria

By regulations under the *Aggregate Resources Act*, a person engaged in forest operations on Crown land is exempt from subsection 34(1) of that Act, if the following criteria are satisfied. Those criteria are the following:

- A Forest Management Plan (FMP) for the management unit has been approved;
- The aggregate is required for a forest access road in a management unit;
- Aggregate is extracted:
  - (a) no closer than 1.5 metres above the established groundwater table; or
  - (b) closer than 1.5 metres above the established groundwater table if:
    - (i) the proposed site is remote or isolated; and
    - (ii) the excavation limit of the site is not within:
      - 500 metres of a cold-water stream;
      - 1,000 metres of a water well, whether dug or drilled; and
      - 5,000 metres of a receptor;
- Aggregate extraction will be completed within 10 years from the commencement of the pit; and
- The pit is or has been established within:
  - (a) An approved new primary or branch road corridor in the Forest Management Plan and the Annual Work Schedule;
  - (b) An approved area of operations in the Forest Management Plan and in the Annual Work Schedule;
  - (c) An approved operational road boundary in the Forest Management Plan and in the Annual Work Schedule; or
  - (d) An approved aggregate extraction area in the Forest Management Plan and in the Annual Work Schedule that is located within 500 metres of an existing forest access road.

Aggregate pits that satisfy these criteria are referred to as “Forestry Aggregate Pits”.

Aggregate Extraction Areas

Forestry Aggregate Pits are established according to the criteria previously listed. If aggregate pits are required in areas outside those areas covered by the stated criteria, aggregate extraction areas may be identified. If needed, aggregate extraction areas are to be identified for the five-year term of the FMP and are to be shown on the operations maps. They must also be identified in the Annual Report for the year that they were established and the Annual Work Schedule(s) for the following year.

No aggregate extraction areas are identified in for this plan period.

If aggregate is required from an area not identified as an aggregate extraction area, an amendment to the forest management plan will be required to identify the new aggregate extraction area. The amendment will be consistent with the requirements for an aggregate extraction area identified in the *Forest Management Planning Manual*.

4.5.7 Conditions on Roads, Landings and Aggregate Pits

If an existing road, landing and/or forestry aggregate pit is planned to be used for forest management purposes during the period of the forest management plan, and where the road, landing and/or forestry aggregate pit does not intersect an area of concern, any conditions on the road and/or landing as described in the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* (MNR, 2010) are documented in this section of the forest management plan. This section also includes the Operational Standards for Forestry Aggregate Pits both within and outside AOCs.

Where a new primary road, branch road, operational road or landing does not intersect an area of concern for a value, any conditions on the primary road, branch road, operational road or landing as described in the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* (MNR, 2010) are documented in this section of the forest management plan.

The extraction of aggregate from forestry aggregate pits for use on forest access roads within the forest management unit will comply with the operational standards in this FMP as outlined in this section.

When a forestry aggregate pit intersects an area of concern, Table FMP-10 identifies if there are conditions on operations. Any operational conditions related to aggregate pits intersecting with area or concerns are stated in Table FMP-19.

The conditions on operations for forestry aggregate pits must take into consideration the *Endangered Species Act, 2007*, including any applicable habitat regulations and relevant policy direction.

All existing forestry aggregate pits will be identified in each Annual Work Schedule.

The following table documents the Forestry Aggregate Pit Operational Standards as well as conditions on roads, landings and forestry aggregate pits outside of areas of concern. Reclamation of Landings (Section 4.5.7 Conditions on Roads, Landings and Aggregate Pits) applies to conditions on new (primary, branch, operational) and existing roads and landings (outside of AOCs).

Forestry Aggregate Pit Operational Standards (all pits inside and outside of AOCs as applicable):

- Topsoil and overburden, where present, must be stripped and stored on site.
- Aggregate material may be removed only within areas where access, harvest, renewal, or aggregate extraction has been planned and approved, with no removal occurring within 15 metres of the boundary of any planned area.
- Aggregate material must not be removed from an area of concern or within 15 metres of the boundary of an area of concern, except:
    - *for a cultural heritage landscape or historic Aboriginal value, as defined in the Forest Management Guide for Cultural Heritage Values, if,*
        - *Table FMP-19 of the forest management plan documents conditions on location, construction or use of the Forestry Aggregate Pit, as per the advice of a qualified individual as defined by the Forest Management Guide for Cultural Heritage Values, and*
        - *the aggregate material is removed in accordance with such conditions; and*
    - *for all other values, if,*
        - Table FMP-19 of the forest management plan documents conditions on location, construction or use of the Forestry Aggregate Pit, and
        - the aggregate material is removed in accordance with such conditions.
- Notwithstanding Standard 3 above, aggregate material must not be removed from an area of concern or within 15 metres of the boundary of an area of concern for the following values, as defined in the *Forest Management Guide for Cultural Heritage Values*:
    - archaeology site;
    - cemetery; or
    - archaeological potential area.
- When operating within 15 metres of a proposed roadside ditch, no excavation is to take place below the elevation of the planned depth of the proposed ditch; all excavations must be immediately sloped to no steeper than a 2:1 (horizontal: vertical) angle.
- During extraction, no undercutting of the working face is permitted and:
    - the working face must be sloped at the angle of repose; or
    - the vertical height of the working face must not be more than 1.5 metres above the maximum reach of the equipment.
- All trees within 5 metres of the excavation face must be removed.
- The maximum disturbed pit area (harvested area including excavation area) must not exceed 3 ha. When a pit or a portion of a pit is rehabilitated (silviculturally treated), it is no longer part of the pit.
- When the site is inactive, all pit faces must be sloped at the angle of repose.
- Within the excavation area, no ponding is allowed and offsite drainage must be designed to prevent sediment from entering any water feature.

- Unless an aggregate permit (e.g. Category 9) has been issued, by the end of the 10-year period starting from the commencement of the Forestry Aggregate Pit:
  - buildings, structures, or processing equipment must be removed from the site; and
  - rehabilitation of the site must be completed.
- Notwithstanding standard 11 above, MNR may direct that a Forestry Aggregate Pit be rehabilitated prior to the end of the above-noted 10-year period where the responsibility for the road and associated Forestry Aggregate Pit is being transferred back to MNR.

- Final rehabilitation must include:
  - sloping of all pit faces to a minimum of 3:1(horizontal: vertical);
  - re-spreading of any topsoil and overburden that was stripped from the site; and
  - mitigative measures, to the satisfaction of MNR, to prevent erosion (e.g. establishment of vegetation).
- Existing or proposed Forestry Aggregate Pits within areas of concern, or in the vicinity of features that are addressed by conditions on operations, as described in MNR's forest management guide(s) relating to conserving biodiversity at the stand and site scales, must not be constructed or operated except in circumstances as identified in the conditions on operations in the forest management plan. This includes any restrictions on the construction of new Forestry Aggregate Pits and timing of aggregate extraction, rehabilitation, or other associated operations in existing pits.
- Progressive rehabilitation of the site must be ongoing during the 10-year period, starting from the commencement of the Forestry Aggregate Pit.

Reclamation of Landings

- The production land base will be recovered from landings and these areas will be renewed except where they were not part of the production land base originally (e.g. rock outcrops).
- Operations will be conducted in a manner to minimize the establishment of landings through operational block planning and road layout.
- For any landings that are created the following will occur:
  - Operations will be conducted to recover the production land base from landings (e.g. site preparation, planting/seeding).
  - Woody material (logging debris), which accumulates at roadside is expected to be utilized during this plan, but if not utilized, this material will be piled, redistributed or burnt to increase the area available for regeneration.
  - Avoid piling unutilized fibre on productive non-forest cover types (e.g., brush and alder).
  - Landing treatment operations will be completed no later than two years following the completion of harvest operations and renewal will be completed no later than three years following the completion of harvest operations.
  - The most applicable SGR will be applied to renew the area, based on the specific site conditions of areas formerly

occupied by the landing, and the renewal treatments including regeneration should complement the treatments on the adjacent treated areas.
- o Existing landings (three years old or less) will be treated and regenerated as noted above within three years of the completion of harvest operations.
- o Older existing landings (more than three years old) will be treated and regenerated as noted above using the most applicable SGR.
- o Operations are to be completed no later than the decommissioning timelines outlined in the adjacent roads' UMS.
- o The AWS will identify the location of landings scheduled for operations, the operations to be conducted, and the scheduled regeneration treatments.
- o The AWS will identify the inspection of landing treatments and subsequent regeneration as a compliance priority and will indicate how the inspections will be completed.

The following conditions apply outside of Areas of Concern:

General Conditions on Road Planning, Construction and Maintenance; Landings; Forestry Aggregate Pits:

- These conditions include the mitigative measures/design principles to minimize the risk of sediment/disruption of hydrological function referred to below for LPS ponds/streams, rich lowland hardwood-dominated forest, wetlands, woodland pools.
- Plan and construct roads to minimize costs associated with decommissioning (e.g., use temporary re-useable bridges).
- Engineering safety considerations will be incorporated into road planning.
- When practical and feasible, access should be planned to prevent or minimize site damage (e.g., build roads well in advance of operations so lack of access is not a recurring reason for off-season operations on susceptible sites).
- Road right-of-way widths for all primary and branch roads will be a maximum of 40 metres through unallocated stands, with the exception for landings which may be increased to a maximum of 50 metres.
- Road right-of-way widths for all operational roads will be a maximum of 30 metres through unallocated stands, with the exception for landings which may be increased to a maximum of 50 metres.
- Haul roads and skid trails will avoid steep slopes.
- Materials moved during construction, such as grubbed or earth fill material, will not be piled where they block drainage courses.
- Fill material for roads built below the high water level, within the floodplain of a water feature, will be erosion resistant and/or protected from erosion.
- Any exposed mineral soil between the height of land and a water crossing, or within 100 m of a water crossing, whichever is less, will be trimmed to a stable angle and be protected from erosion so sediment will not enter the water after construction.
- Mitigation techniques will be used to prevent or stop erosion in ditches, on steep slopes, etc.

- When all-weather roads must cross wetlands, frequent cross drainage culverts will be provided to ensure that surface water is equalized on both sides of the road and impacts to hydrologic flow and wetland function are minimized.
- When the road location and landings within the approved corridor are being finalized, avoid recognizable ephemeral streams, springs, seeps, and other areas of groundwater discharge that are connected to lakes, ponds, rivers, or streams and small unmapped wetlands (e.g. woodland pools)
- If recognizable ephemeral streams, springs, seeps, and other areas of groundwater discharge that are connected to lakes, ponds, rivers, or streams, or small unmapped wetlands must be crossed, use construction and maintenance techniques and practices to minimize impacts to hydrologic flow and wetland function; natural water movements will not be impeded, accelerated, or diverted
- Identify areas of concentrated surface water flow and prevent blockage through appropriate use of cross drainage culverts; some of these locations may be determined the following spring when ponding is evident at unpredicted locations along a new road.
- Where ditches leading downhill from rock cuts pass over earth material, techniques will be used to protect the earth/rock interface from erosion.
- Grubbing of low vegetative cover between the height of land (e.g., the high point on a ditch line) and a water crossing, or within 100 m of a water crossing, whichever is less, will be limited to that required to address engineering issues and safety concerns, such as the removal of hazards.
- Where explosives and blasting are required, this work will be planned to ensure rock or earth remains within the right of way
- Windrows or grubbing materials will not be placed across known migration paths of wildlife in a manner that could impede their travel
- Minimize the windrowing of downed woody material; if long windrows (e.g. of slash or rock) are created, breaks should be provided to allow animals, other forest users and operations unobstructed access routes across the right of way e.g. a 10 m break for every 100 m of windrow.
- Decommission main skid trails constructed on steep slopes by installing water bars, diversion ditches, straw bales, etc. at appropriate intervals or critical landform junctures to filter runoff water through surrounding vegetation.
- During decommissioning, workers will prevent contamination of a water feature by foreign materials such as lumber, nails, logs, brush, fuel and oil.
- Minimize the amount of area being converted to non-forest (e.g., roads and landings) to that required for efficient operations.
- MNR will ensure that the signs used to identify travel restrictions under the Public Lands Act are maintained.
- Harvest of rare tree species (e.g. white pine, yellow birch, bur oak and white elm) will be avoided where practical, but may occur if encountered during road construction or gravel extraction.
- Roads on Crown Land maintained by cottagers and/or public groups (i.e. Local Roads Boards (LRB)) that are planned for harvest block access will at a minimum maintain a pre-harvest condition or any other negotiated agreements between the Forest Manager and those responsible for the maintenance of the road following the completion of hauling operations.
- Implement a monitoring program for roads or road networks (see Monitoring and Assessment Section 4.7.4 Roads and Water Crossings).

· The planning, construction, and maintenance of primary and branch road corridors and road network locations, and their applicable use management strategies, will consider:
i) the strategic direction associated with other resource plans, policies and directives (e.g., *Crown Land Use Policy Atlas*);
ii) the strategic direction being addressed through the use of LLPs resulting from the application of the Landscape Guide;
iii) the management objectives, and emphasis for specific areas (e.g., direction provided by the *Crown Land Use Policy Atlas*; LLPs as described in Section 3.3 of this guide); and iv) the potential impact (including benefits) to other natural resource features, land uses, and values (e.g. lakes and streams, cottage sites, boat caches.

Roads Crossing Recreational Portage Routes, Trails used for Accessing and Working Traplines that are not AOCs:

- Ensure that identified recreational portage routes and trails used for accessing and working traplines are passable following forest management operations.

Biofibre Harvest

- Direction applies to all planned harvest areas regardless of the product derived
- Stumps and all below ground portions of a tree are not available for utilization as a forest product; movement or removal associated with construction of roads or landings is permitted but will be minimized to that required for efficient operations
- Organic matter that is not part of a harvested tree (including boles, branches, roots, bark, leaves, needles, debris, soil carbon, etc.) will remain on site; movement of such material for access is permitted.

Furbearing Mammal Dens (other than red foxes, skunks, wolves, wolverines) – in caves, excavated burrows, under large piles of coarse woody material or other **enduring features** – known to have been occupied at least once within the past 5 years

- New roads/road construction, landings, and aggregate pits/aggregate extraction are not permitted within 20 m of an occupied den entrance.
- Hauling and road maintenance operations of existing roads are not permitted within 20 m of an occupied den entrance unless the road predates the den or is required for safety reasons or environmental protection.

Furbearing Mammal Dens (other than red foxes, skunks, wolves, wolverines) – in tree cavities, hollow logs, brush piles, other **transitory features** – known to be occupied

- Known occupied dens encountered during operations will not be destroyed; in this context, destruction means the complete or partial damage of the den structure or its contents (i.e. adults or young)
- New roads, landings, and aggregate pits are not permitted within 3 m of the den entrance.

Nests – Inactive Nest - **great grey owl, northern goshawk, red-shouldered hawk**: nests not known or suspected to have been occupied at least once within the past 5 years that are >400m from a primary nest, or <=400m from a primary nest but in poor repair; primary and alternate nests within nesting areas where all nests within the nesting area have been documented as unoccupied for >=3 consecutive years • New roads, landings and aggregate pits will not be constructed within 20 m • No timing restriction on operations associated with existing roads, landings and aggregate pits
Nests - Unoccupied Stick Nests known or suspected to have been built or used by **broad-winged hawk, merlin, sharp-shinned hawk,** unknown species **small** stick nest <75cm diameter • Reasonable efforts will be made to avoid constructing new roads, landings, and aggregate pits within 20 m of nests**.** • No timing restriction on operations associated with existing roads, landings and aggregate pits.
Nests - Unoccupied Stick Nests known or suspected to have been built or used by **barred owl, Cooper's hawk, common raven, great horned owl, long-eared owl, red-tailed hawk**, unknown species **large** stick nest >=75cm diameter • New roads, landings and aggregate pits will not be constructed within 20 m • No timing restriction on operations associated with existing roads, landings and aggregate pits
Nests - Unoccupied Nests in cavities known or suspected to have been used by **American kestrel, boreal owl, eastern screech-owl, northern hawk owl, northern saw-whet owl** • Reasonable efforts will be made to avoid constructing new roads, landings, and aggregate pits within 20 m of nests. • No timing restriction on operations associated with existing roads, landings and aggregate pits.
Nests – Unoccupied Nests/communal roosts in cavities known or suspected to have been used by **barred owl, great horned owl, chimney swift** • New roads, landings, and aggregate pits will not be constructed within 20 m • No timing restriction on operations associated with existing roads, landings and aggregate pits
Nests – waterfowl, grouse – known nests containing eggs encountered during forest management operations • Known nests will not be destroyed; in this context, destruction means the complete or partial damage of the nest structure or its contents (i.e. attendant birds, eggs, or young). • Reasonable efforts will be made to minimize disturbance of known nests encountered during operations including: New

roads, landings and aggregate pits will not be constructed within 10 m; and No heavy equipment within 10 m of known nests with eggs. • No timing restriction on operations associated with existing roads, landings and aggregate pits.
Nests – Song Birds or other small birds – known nests containing eggs or young encountered during forest management operations • Known nests will not be destroyed; in this context, destruction means the complete or partial damage of the nest structure or its contents (i.e. attendant birds, eggs, or young) • Reasonable efforts will be made to minimize disturbance of known nests encountered during operations including: New roads, landings and aggregate pits will not be constructed within 3 m; and No heavy equipment within 3m of known nests with eggs, young. • No timing restriction on operations associated with existing roads, landings and aggregate pits.
Rich Lowland Hardwood-Dominated Forest(black ash, – mapped and unmapped pockets encountered during operations • reasonable efforts will be made to avoid constructing new roads (i.e. unless excessive steep terrain prohibits road construction); when construction of roads is necessary, it will follow design principles to minimize disruption of hydrological function outlined above under 'General Conditions on Road Planning, Construction and Maintenance'. • Landings and aggregate pits are not permitted.
Wetlands – mapped permanent non-forested (polygon types OMS, TMS, and BSH) • reasonable efforts will be made to avoid construction of new all-weather roads within wetlands or portions of the wetlands characterized by open water or non-woody vegetation (i.e. unless excessive steep terrain prohibits road construction); when this is necessary it will follow the design principles outlined above under 'General Conditions on Road Planning, Construction and Maintenance' to minimize risk of sediment entering the wetland and disruption of hydrological function • Landings are not permitted within the wetland itself or within adjacent forest that is <15 m from those portions of the wetland dominated by open water or non-woody vegetation • Aggregate pits are not permitted within 15 m.
Woodland Pools – encountered during operations • New roads are not permitted within 15 m of the high-water mark of pools unless there is no practical or feasible alternative (i.e. excessive steep terrain prohibits road construction) and the mitigative measures outlined above under 'General Conditions on Road Planning, Construction and Maintenance' are taken to minimize the risk of sediment entering pools and disruption of hydrological function • Landings and aggregate pits are not permitted within 15 m of the high-water mark of pools.

4.5.8 Decommissioning of New and Existing Roads and Road Networks

The following standard conditions are applied to all new and existing roads inside and outside of AOCs and are documented in Table FMP-18 if applicable:

- The expected period of use of all roads has been considered during access planning. In certain circumstances (e.g. tourism, dynamic caribou habitat schedule blocks), MNR made a preliminary determination of whether or not the road will be maintained for public use.
- Preliminary decommissioning provisions, including regeneration conditions and timelines, have been documented for all roads where MNR has indicated the road will not be maintained for public use.
- Road classification and construction standards are consistent with the expected period of use of all roads and will facilitate road regeneration where this is required.
- Progressive road decommissioning has been used where progressive harvest is applied and priority zones to focus decommissioning and renewal efforts have been considered and documented where applicable.
- Natural access traps, winter roads, corduroy and portable bridges have been used where practical to assist with future road renewal and regeneration.
- Signage will be posted to identify planned future decommissioning including regeneration at time of construction.

In addition to the above, the following conditions apply to all roads planned to be decommissioned and regenerated (including roads not identified for transfer):

- Specific use management conditions are included in Table FMP-18 and/or Supplementary Documentation G – Road Planning Documentation.
- The production land base will be recovered and these areas will be renewed except where they were not part of the production land base originally (e.g. rock outcrops).
- Operations to be conducted to recover the production land base include the following: site preparation, planting/seeding.
- The decommissioning (including renewal) will be completed no later than 5 years from the end of the FMP period in which decommissioning took place.
- The most applicable SGR will be applied to renew the road, based on the specific site conditions of areas formerly occupied by the road, and the renewal treatments including regeneration should complement the treatments on the adjacent treated areas.
- The Annual Work Schedule (AWS) will identify the location of the road scheduled for decommissioning, the operations to be conducted, including the scheduled regeneration treatments.
- The AWS will identify the inspection of decommissioning treatments including regeneration as a compliance priority and will indicate how the inspections will be completed.

4.6 Expenditures

This section of the plan discusses projected expenditures required for renewal and tending operations, insect pest management and renewal support for the five-year term of the plan, 2012-2017. The expenditure data for the five-year term is presented in Table FMP-20. The following text provides the rationale and methodology for the economic data calculation.

The planned expenditures required to complete the planned silvicultural activities, renewal support and regeneration assessments for the five-year term of this plan (as reported in Tables FMP-17 and FMP-20) are $12.6 million. These projected expenditures include $3.2 million for site preparation, $7.4 million for artificial regeneration (planting and seeding), and $1.5 million for tending activities. No expenditures are currently projected for renewal support, or other eligible activities. Road construction and maintenance costs are not included in the planned expenditure total.

Rationale for the calculation of silvicultural expenditures includes consideration for:

- Estimated expenditures per unit are based on past experience on the Whiskey Jack Forest.
- Projected cost of all mechanical site preparation activities, including the proportion of area renewed with and without mechanical site preparation, and slash pile burning;
- Projected costs of tree seed collection and processing, and the quantity of seed required for aerial seeding and sowing of tree seedlings for planting;
- Projected tree planting costs, including the cost of planting stock production, based on projected densities and proportion of tree species planted in a given future forest unit, as well as the proportion of area planted with and without mechanical site preparation;
- Projected cost of manual tending and tending by chemical herbicide application, including the cost of the herbicide;
- Projected cost of on-the-ground surveys, Free-To-Grow surveys, and forest operations prescription (FOP) verification; and
- Administrative costs for silviculture.

MNR evaluated the silvicultural requirements for areas treated prior to 2012, based on existing information and silvicultural ground rule prescriptions and regeneration standards. This evaluation was made to determine outstanding treatments (not yet completed) and their associated costs. For areas planned to be harvested in the 2012-2022 FMP, preliminary silvicultural ground rules were assigned to each area. The regeneration treatments and expenditures were planned based on average annual harvest by forest unit and an estimate of area to be treated during the plan period. The rates for the Forest Renewal Trust Fund (FRTF) will be monitored annually by the MNR and adjusted, if necessary, to maintain the fund above the minimum balance for the account in order to fund the projected silvicultural program.

Expenditures funded through the Forestry Futures Trust Fund (FFTF) will include various eligible projects or expenditures approved on an annual basis during implementation of the plan, and a portion of the costs associated with the maintenance of the Forest Resources Inventory (FRI) for the management unit (Forest Trust Forest Resources Inventory, FTFRI).

4.7 Monitoring and Assessment

This section discusses the monitoring and assessment program for the ten-year forest management plan period for forest operations inspections, exceptions monitoring, assessment of regeneration success and monitoring of roads and water crossings.

Forest management operations are regularly monitored to ensure compliance with the management plan, with particular emphasis on prescriptions for operations including: area of concern prescriptions, any restrictions on operations, water crossings and adherence to harvest boundary lines. Monitoring is also conducted to evaluate silvicultural activities, renewal success and changes in forest cover. MNR also conducts surveys of forest values to support forest management planning. Monitoring of exceptions to silvicultural guides and other guidelines is also conducted.

MNR's web-based Forest Operations Information Program (FOIP) will be used to document inspections and operational issues associated with identified compliance issues, and to ensure that appropriate actions have been carried out when operational issues are identified.

All Forest Resource Licence (FRL) holders and contractors are required to report all new values encountered during operations. The general public will be encouraged to report new values in the Whiskey Jack Forest, and will be provided opportunities to review the annual work schedules at any time of the year.

4.7.1 Forest Operations Inspections

The goal for Ontario's forest is "to ensure the long term health of our forest ecosystems for the benefit of the local and global environments, while enabling present and future generations to meet their material and social needs." (Source: *Policy Framework for Ontario Forests*, MNR).

To help meet this goal, the MNR has prepared a Forest Compliance Strategy, which has as its goal: "to encourage and ensure adherence to rules and requirements which contribute to the sustainable management of Ontario's forests." (Source: *A Forest Compliance Strategy*, 1997, MNR).

A requirement of both the *Forest Management Planning Manual* and the *Forest Information Manual* is that a Forest Compliance Plan for planning, monitoring, reporting, and education/prevention on forest management operations be prepared to ensure compliance with all applicable legislation, regulation, the forest management plan, and with MNR manuals and guidelines affecting those operations.

FRL holders and contractors will comply with legislation, regulated manuals and all requirements described within this FMP (including but not limited to Forest Operations Inspection procedures outlined in Section 4.7.1) and accompanying Annual Work Schedule (AWS). If the Licensee fails to abide by the requirements outlined in Section 4.7.1, they will be ordered by MNR to stop activities until the issue has been resolved and corrected.

As a Crown forest, the MNR Kenora District is responsible for the monitoring of all forest operations on the Whiskey Jack Forest and the preparation of Forest Operations Inspection Reports, for each operation inspected. The MNR will investigate all operational issues identified

by the public and FRL holders. The MNR will continue to develop an annual compliance plan at the district level and focus on priority areas identified in that plan as appropriate.

There are a variety of methods and procedures that can be employed as part of the overall monitoring program, including direct methods, such as field inspections and observations, as well as indirect methods such as the use of aerial photography. Both formal and informal procedures will contribute to an effective monitoring program. The Compliance Plan for the Whiskey Jack Forest provides specific details of monitoring and assessment to be conducted during the 2012-2014 period.

4.7.1.1 Compliance Goal

The goal of the compliance plan is to encourage and ensure adherence to rules and requirements which contribute to the sustainable management of Ontario's forests. In doing so, this plan will meet the compliance requirements as set forth in the Forest Compliance Handbook section FOR 07 02 04.

4.7.1.2 Background

The Whiskey Jack Forest has been a Crown managed forest since the fall of 2009 and as a Crown Forest the Ontario Ministry of Natural Resources, Kenora District is responsible for all obligations and responsibilities described within the FMP.

The compliance strategy outlined within the FMP will assist in improving operating practices throughout the forest. It will guide and direct all FRL holders, and contracted activities. In support of this MNR Kenora District will be responsible for:

- All forest management activities (planning, renewal, roads, etc.) on the Whiskey Jack Forest;
- Implementation of the compliance plan including education, monitoring, FOIP maintenance and updates; and
- Reporting of the Whiskey Jack Forest compliance program.

Compliance priorities will be based on three levels. Issues associated with the 2004-2009 Independent Forest Audit (IFA), along with historical and/or current trends that highlight potential areas for improvement. These focus areas are summarized below along with their associated action plans that are ongoing. A priority for compliance inspection will be to identify harvest operations, slash/chip debris pile, landings and road decommissioning operations, and winter water crossings.

i. **Winter Water Crossing Installations**: During the 2004-2009 Independent Forest Audit (IFA) concerns were identified with permanent watercourse crossing installations performed during winter months. The opportunities for improvement involve ensuring that proper culverts and associated approaches were stable in the spring after thawing.
Action Plan: A specific *Stream Crossing Toolkit* is in place with all operators on the Whiskey Jack Forest. It works in conjunction with all requirements of the guidelines contained within the provincial documents *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* (MNR, 2010), and the "CSP Culvert Installation at Water Crossings on Forest Access Roads". All crossing installations are inspected during and after installation to ensure they are aligned with expectations, followed by an

early spring inspection to ensure road bank / shoulder stability of the site and to mitigate any erosion issues.

ii. **Category 9 Pit and Forest Industry Aggregate Pits**: During the 2004-2009 Independent Forest Audit (IFA) there was concerns with the improper sloping and steep pit faces on some Category 9 and Forest Industry pits.
Action Plan: All FRL holders and contractors are required to follow Category 9 site plans and the Aggregate Resources Act, Operating Standards. All Category 9 pits are inspected annually and Compliance Assessment Reports are submitted to the MNR Aggregate Specialist. Forest Industry Pits are specifically monitored in the field, managed in accordance with these requirements and entered into FOIP.

iii. **Decked Wood**: During the 2011-2012 Operating Season two harvest blocks had the timber harvested using feller buncher however, due to an early spring this wood remained in the harvest block in buncher piles.
Action Plan: This is now a formal part of the pre-work review conducted on each block. Whiskey Jack Forest Compliance Inspectors will work with FRL holders on the scheduling of their operations to ensure the decked wood is utilized in a timely manner. If necessary, FRL's may be withheld if movement of this fibre is not prioritized by the licensee and/or contractor.

iv. **Slash/Chipper Debris Management**: In-block field chipping has been occurring on the forest for several years and the continued proper management of this debris in accordance with standards will continue to be a key focus.
Action Plan: Management of this issue has resulted in an evolving process to limit the amount of productive land lost to large piles of accumulated debris. As a result practices and options have been built into the FMP. MNR forestry staff and FRL holders have been working closely to distribute debris back into the cutover. Specific direction through the Chipper Debris Management Guidelines is built into the FMP. These requirements form part of the pre-work meeting and are audited during compliance checks and feedback given to the contractor to form the continual improvement loop.

v. **Road and Landing Decommissioning**: Operational roads and landings where applicable will be site prepared and regenerated and any associated water crossings will be removed.
Action Plan: This issue will be monitored to ensure that as much road/landing area is reclaimed as possible.

vi. **Review of Silvicultural Activities:** It is the responsibility of the forest manager to ensure that the silvicultural activities on the forest are as planned in the FMP.
Action Plan: All silvicultural activities will be monitored for compliance with the plan, as well for effectiveness.

4.7.1.3 Compliance Objectives, Strategies and Actions

The goal of the compliance plan is to encourage and ensure adherence to rules and requirements which contribute to the sustainable management of Ontario's forests. There are a number of specific compliance objectives, strategies, and actions set forth in support of achieving this goal;

Objective: **Resource Protection**

- Strategy: To prioritize forest ecosystem integrity in the planning and implementation of all harvest, access, renewal-maintenance and protection activities
  - Utilize sound management techniques, adhere to established operating procedures and management standards
- Strategy: To continuously evaluate forest operations for impacts on the environment
  - Reviewing pre-work requirements with operators
  - Ongoing inspections and audits of active operations
  - Monitoring operations on shallow soils
- Strategy: To manage and protect against fire, disease and insects
  - Prepare and implement a fire prevention plan as part of the AWS
  - Monitor and report any changes to the forest cover as a result of disease and/or insect infestation.

Objective: Risk Management

- Strategy: To perform a risk assessment for each operation that will rank the operations potential to have a compliance issue.
  - Review each operations environmental and operational components
  - Rank operations from high to low based on complexity, AOC numbers and operators experience and compliance history.
  - Implement compliance monitoring program that puts an emphasis on the higher risk operations and focuses inspector's efforts to these operations.

Objective: Staff & Operator Training

- Strategy: To ensure appropriate training is supplied to those with forest management responsibilities regarding current and upcoming standards
  - Staff, FRL holders and/or contractors participate in training workshops and site visits
  - Ensure that FRL holder employees who are actually doing the work in the field are participating in pre-work and field training sessions.
- Strategy: To ensure staff, licensees and/or contractors are trained to recognize and implement environmentally sound practices.
  - Staff licensees and/or contractors are trained at least annually in standard operating procedures, environmental policy, and emergency response processes.
  - Pre-harvest reviews with each new block and/or work project
  - Requiring that licensees and contractors train their employees in all applicable standards and procedures.

Objective: Education and Communication

- Strategy: To ensure management personnel and operators are knowledgeable and competent in the regulations, guidelines and policies related to compliance.
  - Promote open communication with MNR staff and contractors.
  - Staff to participate in all applicable MNR training sessions (i.e. compliance courses, stand & site guideline training, watercourse crossings, etc.)
  - Facilitating training sessions as required for various safety and environmental standards that exist on the forest.
  - Continued focus on self-reporting by operators
- Strategy: To ensure management personnel are current and updated on the new forest science, planning process and operational techniques related to ecosite management and forest operations.

- Ensure operational and operational issues are identified in a timely manner and appropriate action is taken to identify, document, and mitigate concerns.
- Staff to participate in all applicable MNR training sessions (i.e. compliance courses, stand & site guideline training, watercourse crossings, etc.)

Objective: Compliance Efficiency

- Strategy: To conduct compliance activities in a cost effective and efficient manner
  - Utilize multiple techniques (aerial, ground, photography, etc.) to monitor operational activities
  - Utilize the risk analysis to focus efforts on the high risk areas.
  - Encourage joint inspections or joint time in the field to ensure calibration
  - Ensuring timely submission of FOIP reports

Objective: Compliance with Legislation, Plans, Policies

- Strategy: To stay current with changes in compliance policies, procedures and guidelines.
  - Participate in MNR training sessions which relate to the compliance program
- Strategy: To conduct activities in a manner that meets or exceeds existing standards
  - Implement all applicable legislation, policies, and procedures
  - Conduct pre-work reviews with each new block and/or work project
  - Maintain and continually update operational procedures

Objective: Overcome Historical Compliance Problems

- Strategy: To actively monitor forest operations, evaluate results, and take corrective action as required.
  - Analyze forest operations compliance information report data
  - Include within each AWS focused compliance monitoring areas based upon historical trends and/or changes to compliance standards.
  - Incorporate focus areas from this compliance plan into field inspections to proactively manage historical trends.

Objective: Continuous Improvement

- Strategy: To develop benchmarks, both locally and regionally within the forest operations to measure the improvements and performance
  - Collect appropriate field data to be able to analyze and verify required changes to the compliance program
  - Identify and recommend solutions that will improve the overall compliance program
  - Continue to work with licensees and/or contractors in the process of compliance monitoring and self-reporting.

4.7.1.4 Risk Analysis and Management

"Risk management is defined as the balancing of assessed risks against expected benefits so the best decisions are made for a given resource allocation (people, equipment, money) and degree of tolerance." *Forest Compliance Handbook FOR 07 02 03.* Risk management in forest management consists of the balancing of operational and environmental risks, ranking the associated operations as to the potential risk and associated tolerance levels, to determine the level of monitoring for the given operation.

Assessment of Risk

In forestry, environmental and operational components influence the inherent risk of any given operation. Environmental components consist of the planned Areas of Concerns (AOC's) utilized to protect values and public concerns and Conditions of Regular Operations (CRO's). These are assessed in detail during planning phases and are built into the Forest Management Plan and if applicable, are implemented at time of operations. The inherent risk for the environmental component is assessed at the Annual Work Schedule (AWS) level and depending on complexity and number of AOC's within any given operation will depend on the level of monitoring applied to the operation.

The operational component consists of aspects such as, operator experience, compliance history, season of harvest and harvest method. The operational aspects influence compliance monitoring levels greatly and is applied at the AWS level during the risk analysis. Operators with good history and lots of experience may receive less monitoring.

Operational Control System(s)

The Whiskey Jack forest is a Crown forest and does not have additional certification systems (EMS, ISO) that industry operated forests have in place to monitor and track forest operations. Forest compliance reporting is the responsibility of the Ministry of Natural Resources, Kenora District (MNR) and the MNR's Forest Compliance Information Program (FOIP) is the method utilized to track and document forest operations. During operations it is the forest operator's responsibility to abide by all legislation and FMP requirements, additional compliance responsibilities also apply to all harvest operators who operate under the authority of a Forest Resource Licence.

In order to minimize risk, the MNR has established pre-work authorization for all Forest Resource Licenses issued. The pre-work authorizations are carried out on site, prior to the start of operations, and include MNR forest compliance inspectors, company supervisors and equipment operators. The pre-work form consists of a detailed harvest/silviculture map, list of applicable AOC's and CRO's. The MNR forest compliance inspector reviews all information that pertains to operation and the form is signed off in duplicate by both parties. This process allows all parties to discuss operations and clarify concerns and operating procedures prior to commencement.

Risk Analysis

The risk analysis is completed during the preparation of the Annual Work Schedule, where operations (i.e. harvest blocks) will be analyzed to determine the level of operational and environmental risk. The risk ranking system is utilized, which assigns a numeric value to the operation based on criteria such as, type of operation (harvest, access, renewal), season of operation, operator compliance history, forest stand and soil conditions, water crossings and the number of Area of Concerns or values present.

Areas of Concern are scored individually, per occurrence and are given an assigned numeric value from zero to three based on the complexity and value being protected. Each operation is tallied for a total score, which ranks the operations risk from high to low, high rankings have a greater chance of having a compliance issue, therefore requiring a higher level of monitoring and low rankings requiring less monitoring.

Risk analysis will be prepared for all operations during the preparation of the AWS and at this time the MNR will determine the level of compliance monitoring that will apply to each operation. Because there is no other means of documentation for compliance monitoring on the Whiskey Jack Forest reporting will occur for every operation within FOIP.

4.7.1.5 Roles and Responsibilities

Compliance Plan Preparation and Updates

As a Crown Forest the MNR, Kenora District is responsible for the compliance plan and any amendments to the plan. The MNR will complete any required amendments to the compliance plan. The Area Forester is responsible for this area.

Identification of Certified Inspectors

The English River Area, Area Supervisor, Shawn Stevenson is responsible for ensuring that certified inspectors are trained and identified to conduct inspections on the Whiskey Jack Forest.

The MNR has three approved forest compliance inspections on this Crown Forest, those being Todd Skene, Integrated Resource Management Specialist, John Myshrall and Fred Zroback, Area Technicians. Shawn Stevenson, English River Area Supervisor is designated to review and approve FOIP inspections reports for submission into the MNR database.

Prevention, Monitoring and Reporting

The MNR is responsible for all prevention, monitoring, and reporting activities in relation to compliance obligations on the Crown Forest. The Integrated Resource Management Specialist will be the main communications linkage between the MNR and FRL holders / contractors for this area of responsibility.

Forest Resource Licence (FRL) Holders

FRL holders are independent operators who are fully responsible for all operations performed within their licensed harvest area. The Whiskey Jack Forest currently has two FRL holders: Makoose Wood Innovations Inc. and Wincrief Forest Products Ltd. prior to the start of each operation, an operations foreman will be designated as the main contact for FRL holder.

As describer in Section 4.1.7.5 Notification of status, FRL holders are required to contact MNR 5 days prior to the start-up of operations so that a pre-work meeting can be scheduled.

Operations cannot begin until an on-site pre-work meeting has been completed with FRL holder employees and a MNR Representative.

Preventative, Mitigative and Follow-Up Action

The MNR is responsible for all preventative, mitigative, and follow-up activities in relation to compliance obligations on the Crown Forest. The MNR Forest Compliance Inspectors will act as the communications linkage with FRL holders and contractors. . Where operational issues arise, the Integrated Resource Management Specialist and Area Forester will be brought into the situation.

As Forest Resource License holders all harvest contractors are responsible and liable for all operations. Harvest contractors are to ensure that all operators are knowledgeable of the issues within the harvest area and are aware of the preventative and mitigative measures while operating.

Training Responsibilities

The FRL holders and contractors are independent and are fully responsible to ensure that their employees are trained to the standards required to perform the forest operation being conducted.

The MNR will work closely with the FRL holders for ensuring that those who operate on the Crown Forest are properly trained. This will involve, at a minimum, annual operator meetings, pre-work reviews, and inclusion in any focussed training offered by the MNR or other entities in the region.

4.7.1.6 Notification of Status

The Forest Compliance Handbook, section FOR 07 03 05 outlines the specific requirements regarding notification of operational status. Notification will be given to the MNR by the FRL holders when:

- Operations are about to commence (Start-Up Notification). Such notification will be provided within 5 working days of the beginning of a new operation so that on site pre-work meetings can be scheduled with operators.
- Operations are temporarily stopped but not finished (Suspended). Such notification will be made within 20 days of suspending an operation or activity, and will clearly describe the operation being suspended, its location, the reason for the suspension, and the likely date of activities being resumed.
- Operations are within 10 days of completion and the forest operation is ready for released for final MNR inspection (Release). This will ensure that MNR inspectors can be on site with operators and mitigate any issues prior to moving equipment.

Notifications will generally take the form of an email or verbal notification by the FRL holder. All verbal notifications will be documented by the MNR inspector and confirmed through email to the FRL holder.

4.7.1.7 Prevention, Avoidance, and Mitigation

It is the responsibility of the FRL holder to take action to prevent and avoid potential operational issues in a decisive, timely and appropriate manner.
Where any industry operating personnel, during ongoing monitoring of operations, identify a situation they believe could be an operational issue(s), they will undertake one of the following actions:

1. If they feel it is a violation of the approved plan or a threat to the environment, they will immediately stop the operation and take the necessary steps to stop further possible non-compliance/harm.
2. They will immediately report the situation to MNR staff who will arrange for an immediate compliance inspection of the issue. MNR staff will determine if the situation is a violation of an approved plan or Annual Work Schedule (AWS) or a threat to the environment and what further action to take.
3. If the situation cannot be immediately corrected, the MNR certified inspector will submit a report in FOIP that documents their findings as an operational issue.

4.7.1.8 Compliance Reporting Areas (CRAs)

FOIPS will be submitted by each individual harvest block. Silvicultural operations will be reported on a project basis identifying the silviculture blocks within the FOIP report.

4.7.1.9 Monitoring Compliance of Forest Operations

As per the actions plans outlined in the section on OBJECTIVES, STRATEGIES AND ACTIONS, monitoring of compliance activities will take place on a continual basis as a means of achieving the overall compliance objectives. These actions are in support of the direction set forth in the Forest Compliance Handbook, section FOR 07 03 04 and FOR 07 03 05, the directive and procedure on compliance inspecting and reporting.

Harvest and Access Operations

- The MNR will conduct forest operations inspections on all harvest and access operations during the period covered by this FMP. Inspectors will perform spot checks and/or audits as directed by the risk management analysis. High risk operations will be inspected weekly on each ongoing operation and low risk operations will be inspected as required. At a minimum one FOIP report will be submitted upon completion of each forest operation.
- Access operations will receive several spot checks during construction and will receive a final FOIP inspection at the end of the project.
- If an operational issue is encountered, that cannot be immediately repaired a FOIP report will be prepared to track the operational issue until repaired or until a remedy is applied.

Silviculture Operations

- Priorities during the review of silviculture activities will include determining:
  - Whether actual operations at the AWS level are in accordance with the assigned SGR and appropriate silvicultural treatments from the Forest Operation Prescription (FOP).
  - Whether the SGR being implemented was changed from that assigned in the FMP to reflect actual site conditions; whether the assigned SGR and silvicultural treatments from the FOP are appropriate for the actual site conditions.
  - Whether the approved silvicultural program identified in SFMM is being implemented by forest unit and intensity as required by the FMP strategic LTMD, including application of tending operations on competitive sites.

4.7.1.10 Opportunities for LCC Involvement

The Terms of Reference for the Kenora Local Citizens Committee (LCC) does not contain specific commitments regarding the involvement of committee members in forest operations inspections and MNR District monitoring of forest operations. Committee members are, however, provided with an annual overview of forest operations compliance activities during the presentation of Annual Reports and are encouraged to participate in the Independent Forest Audit process. A standing invitation will be offered for LCC members to join inspection personnel on field inspections by appointment.

The LCC will also be given the opportunity to review the forest operations inspections summary (Table AR-6) which forms part of each year's Annual Report. Significant non-compliance issues that concern the LCC will be brought to the committee's attention at regular or specially scheduled meetings.

4.7.2 Exceptions

Exceptions monitoring will be carried out to determine the effectiveness of prescriptions included in the management plan that are not recommended (NR) in MNR forest management guides. These exceptions monitoring programs are identified below.

The exception monitoring may occur at either the district, regional or provincial levels, depending on the significance of the exception. A good example of this is the monitoring procedures and best practices for full tree harvesting on shallow soil sites (see below). The *Full Tree Harvesting of Ecosites 11 and 12 In Northwestern Ontario: Monitoring Procedures and Best Management Practices (April 1, 2001)*is a carryover from the 2004 FMP and 2009 FMP.

The LCC will be given the opportunity to review the results of exceptions monitoring. Significant exceptions monitoring issues that concern the LCC will be brought to the committee's attention at regular or specially scheduled meetings. If the Local Citizens Committee would like to include some surveyed areas in a field visit, the data and maps would be provided.

Monitoring of Full Tree Logging on Shallow Sites

The full tree logging of ecosites 11 and 12 where total organic matter plus soil depth is less than 20 cm. is designated as a 'not recommended' practice in the *Silvicultural Guide to Managing for Black Spruce, Jack Pine, and Aspen on Boreal Forest Ecosites in Ontario (MNR, 1997)*. This practice has been identified as an "exception" in this plan. Where this activity occurs, the monitoring program, including timing and duration, described in *Full Tree Harvesting of Ecosites 11 and 12 In Northwestern Ontario: Monitoring Procedures and Best Management Practices (April 1, 2001)* will be implemented(Supplementary Documentation E). MNR Science and Information staff as well as licensees on other Sustainable Forest Licences have been and will continue to implement the monitoring procedure.

The forest industry is contributing to a comprehensive, region-wide initiative to monitor the impact of this treatment on these site conditions, as outlined in this forest management plan. As part of this monitoring program, these shallow soil sites have been identified in this forest management plan and operations will be conducted in accordance with the best management practices.

Ecosites in the Whiskey Jack Forest are identified in the forest resources inventory and are identified within the planned operations digital information supplied with the plan. Actual Ecosite 11 and 12 areas scheduled for activities in the Annual Work Schedules will be identified through interpretation of aerial photographs and field checked prior to harvest.

The rationale for using full tree harvesting on these sites is that it is currently the common method of harvest and it would be uneconomical to bring in specialized equipment to harvest scattered areas of shallow soils. The shallow soil sites on the Whiskey Jack Forest are, for the most part, productive and, it is felt, that using full tree logging in a careful manner will preserve the sites nutrient capacity.

Not Recommended Renewal Treatments

The following treatments are included in Silvicultural Ground Rules (FMP-4) and are exceptions to the *Silvicultural Guide to Managing Black Spruce, Jack Pine, and Aspen on Boreal Forest Ecosites in Ontario, 1997*. The application of these treatments on these ecosites is not planned but they may form a very minor component of renewal options for forest unit areas being treated in this plan period. Exceptions monitoring programs will be implemented as described below and results will be submitted as part of the Annual Report if any of the following treatments are planned to be implemented:

- Artificial seeding on ES 14.
- Natural regeneration of jack pine or spruce on ES 21.

Areas receiving treatments considered "exceptions" in Table FMP-4 would be monitored for the effectiveness of the treatment to the site on which it was applied. In the event that any exceptions to the silvicultural guides do occur, they will be monitored as required with the results documented. Inspections will involve a visual evaluation of indicative sites by experienced staff to evaluate whether the effectiveness of the respective renewal treatment is satisfactory. If the silvicultural results are in question, a regeneration survey will be conducted for designated sites and/or further renewal treatment may be prescribed in accordance with corresponding Forest Operations Prescriptions.

4.7.3 Assessment of Regeneration Success

An important component of the monitoring program is determining the success of the harvest, renewal and tending operations in regenerating the forest to the desired future forest condition. Assessments are conducted to determine the status of the regeneration on particular sites, the effectiveness of silvicultural treatments and the need for any additional treatments. The monitoring program will assess the success of silvicultural activities in the achievement of standards contained in the silvicultural ground rules (Table FMP-4).

"**Silvicultural Success**" is defined as meeting the regeneration standards for a desired future forest unit, by means of an intended silvicultural prescription and treatment, as per the silvicultural ground rules (SGRs) in Table FMP-4. The overall intent is to achieve a successful regeneration standard for all harvested areas. Although some areas may achieve a free-to-grow status, they may not necessarily be considered "successful" with respect to the desired future forest unit or the intended silvicultural prescription and treatment (e.g. the regeneration standards for the intended future forest unit were not met, however regeneration standards for another forest unit were met called "**Regeneration Success"**).

Silvicultural effectiveness monitoring is used to create a new stand description which will be used to update the forest resources inventory. Once an area has been harvested, it is classified as depleted and is not reclassified as forested area until it has been regenerated and assessed as free-growing. The requirements for free-to-grow status include a measurement of species composition, average height and stand density (as per the SGRs in Table FMP-4).

Another purpose of silvicultural effectiveness monitoring is to confirm not only the success of the applied treatment, but to confirm growth and yield development information. Data collected is used to confirm the yield curve and future forest condition (i.e. species composition, stocking) on which the stand is expected to track.

The results of assessments are the basis for determining if the regeneration levels associated with the Long-term Management Direction have been met. These results can be used to adjust modelling assumptions and silvicultural strategies in future forest management plans.

4.7.3.1 Assessment Methods

Assessments are conducted to determine the status of the regeneration on particular sites, the effectiveness of silvicultural treatments and the need for any additional treatments. The monitoring program will assess the success of silvicultural activities in the achievement of standards contained in the silvicultural ground rules (Table FMP-4).

There are a variety of methods and procedures which can be utilized as part of a regeneration success monitoring program. They may apply either informal or formal survey methodologies (i.e. professional observations/ocular estimates or intensive surveys with plot measurements) that are generally conducted through ground field inspections/surveys, aerial surveys and/or aerial photography assessments. The survey methodology used will depend on the type and cost of the silvicultural treatment(s) which were applied and the degree of information to be collected. A comprehensive program of surveys for the assessment of regeneration and silvicultural effectiveness will be applied on this forest for this plan period. Information to be collected and survey methodologies are based on professionally accepted and reviewed methods. Different survey methodologies may be employed during the term of the plan based on the availability of new technology/procedures.

The monitoring program including methodologies, procedures, documentation and reporting is included in Supplementary Documentation F. The five survey methodologies are:

- Pre-free growing survey;
- Ocular Estimate Survey;
- Large Scale Photography and Photo Interpretation;
- Regular Free-to-Grow Survey; and
- *Well-Spaced Free-Growing Regeneration Assessment Procedure for Ontario* (MNR 2005).

<u>Additional Assessment of Slash/chip Debris Areas, Landings, Decommissioned Roads</u>

- Slash/chip debris areas, landings, and decommissioned roads will be assessed for the effectiveness of treatments during regeneration and free–to-grow assessments and will be considered in the determination of the free-to-grow status for the area.
- The methodology to be undertaken is outlined in this section of the FMP and will ensure that a minimum site occupancy standard is achieved across the entire assessment area. The assessment area will include all harvested areas, landings, slash and chip debris piles and roads that are to be renewed, excluding only those areas that did not originally support production forest (rock outcrops) and retained roads. Assessment areas with more than 20% gaps (16 m2 circular plot areas without a single target or acceptable tree species over 30 cm in height) would not be identified as free-to-grow.
- The regeneration standards to be achieved on new or existing slash/chip debris areas or landings (three years old or less) will be the same as those in the applicable SGR.
- The regeneration standards to be achieved on older slash/chip pile debris areas (more than three years old), landings and decommissioned roads will be the same as those in the applicable SGR.
- The monitoring program includes the creation and maintenance of an inventory of new and

existing slash debris piles, chip debris piles and landings by location (mapped), age and category (biofibre or debris).

- The monitoring program requires reporting of the effectiveness of slash/chip debris, landings, and decommissioned road treatment and regeneration annually, and reporting on the loss of production land base (objective achievement) in the year 3, 7, and 10 Annual Report.

All Other Silviculture Operations

- This plan includes a clear and concise survey assessment methodology for both intensive and extensive evaluations (including block stratification, calibration methods, ground truthing, quality control, and documentation). The assessment methodology provides results that can be evaluated against MNR's silvicultural effectiveness monitoring assessments which are used to verify the results reported (assessment methodologies in Supplementary Documentation F – Assessment of Regeneration Success).
- Site occupancy will be determined as a component of the regeneration assessment and in determining the free-to-grow status for the area.
- In determining site occupancy, the assessment area will include all harvested areas, landings, slash and chip debris piles and roads that are to be renewed, excluding only those areas that did not originally support production forest (rock outcrops) and retained roads. Assessment areas with more than 20% gaps (16 m2 circular plot areas without a single target or acceptable tree species over 30 cm in height) would not be identified as free-to-grow.
- Silvicultural effectiveness monitoring (SEM) will be undertaken by MNR. SEM information will be used to verify results reported in year-3/7/10 Annual Reports, to review or determine changes to renewal rates, to determine any necessary modification for Phase II operations (e.g. to address silvicultural shortfalls), and to verify or make adjustment to the silvicultural inputs and yield curves for future FMPs.
- Regeneration surveys will be considered to verify establishment (e.g. competition, site occupancy and species composition) and to determine if additional treatments are necessary to ensure projected stand development is in accordance with the SGR and FMP strategic long term management direction (LTMD) with an emphasis on sites with high potential risk of failure and those of high value (i.e. intensive treatments that are of strategic importance to the LTMD).

4.7.3.2 Area to be Assessed for Regeneration Success

A summary of the area to be assessed for the determination of regeneration success during this ten-year plan period is presented in Table FMP-21. The areas listed in the table will be assessed for free-to-grow (FTG) status. These areas are generally assessed 10 years after harvest and renewal. The area in FMP-21 is based on the area available for FTG surveys, reflecting areas that were harvested between 2002-2012.

The total area planned for assessment during the 2012-2022 plan period is projected to be 16,223 hectares of harvested area; no salvage harvest area and no natural depletion area.

The results of the assessment of regeneration success will be documented and reported annually through the annual reporting process (AR-13).The annual report will be presented to the Local Citizens Committee. If the Local Citizens Committee would like to include some surveyed areas in a field visit, the data and maps would be provided.

4.7.4 Roads and Water Crossings

All existing and newly constructed primary, branch and operational roads, and associated water crossings are subject to inspection and monitoring, to ensure no environmental or public concerns arise. Table FMP-18, Road Construction and Use Management, summarizes planned new forestry road construction and use management for all primary, branch, and operational roads or operational road boundaries, for the five-year plan term. Existing roads are also identified.

While the road/road network is in use for forest management purposes (e.g. Harvest, Renewal, Tending, Transportation and Hauling activities), it will be monitored on an ongoing basis with bridges used for 'heavy truck hauls' inspected by a certified inspector at least once a year. When the road is not in use for forest management purposes, monitoring will be based on a yearly schedule of specific roads to be inspected. This yearly schedule will be based upon a risk assessment approach with emphasis on the potential values which could be impacted (fish habitat) and the potential for public safety concerns and, at a minimum, these roads (including bridges open to public travel) will be inspected at least once every three years. Monitoring may occur as part of other forest management work such as an aerial survey of values or reforestation (i.e. stick nest survey or FTG regeneration survey). In addition, all staff and contractors (i.e. harvest, renewal and tending contractors) are to report any existing or potential concerns regarding the road/road network and water crossings encountered while travelling on/or over roads throughout the forest. Reports from the general public and other user groups will also contribute to the monitoring of the condition of the roads and water crossings. Additional monitoring will be considered based upon a risk assessment approach following severe weather conditions (e.g. heavy rainfall).

Monitoring of road construction (new and maintenance) and water crossing (new and maintenance) will also be carried out through forest operations compliance inspections and reported through the Forest Operations Inspection Program (See Section 4.7.1.8 Monitoring Compliance of Forest Operations).

4.8 Fire Prevention and Preparedness

This section describes the forest fire prevention and preparedness measures to be implemented during the period of the forest management plan. These measures apply to the entire management unit. These measures will address how MNR, Licensees and Contractors will prevent the start of wildfires, and how forest workers will be prepared to take immediate action to suppress small fires. These measures will include any business practices and guidelines for modifying industrial operations; developed for fire prevention, preparedness and suppression purpose.

MNR recognizes that any forest operation undertaken in Ontario must be done with careful consideration to the prevention of forest fires. Accidental wildfire can have a large impact on annual operations or timber sustainability. Operators must also be prepared to safely take initial action to prevent fire spread, should a fire occur.

MNR, Licensees and Contractors shall adhere to the Forest Fire Prevention Act, associated regulations, Modified Industrial Operations Protocol and Forest Fire Operations by Forest Industry - Business Practices. As an operational guideline, MNR, Licensees and Contractors will utilize the Modifying Industrial Operations Protocol when determining restrictions on operations, as well as, the standard to meet for minimum fire suppression equipment requirements. Ultimately, the Modifying Industrial Operations Protocol outlines the minimum standard for fire prevention and preparedness that will be achieved by all industrial forest operations associated with this forest management plan.

4.8.1 Fire Prevention

It is the responsibility of MNR, Licensees and Contractors to understand and comply with the Forest Fires Prevention Act and the Modifying Industrial Operations Protocol.

The Modifying Industrial Operations Protocol will be used on a daily basis by all MNR, Licensees and Contractors during the Fire Season; so that industrial activities are modified as fire danger increases; to reduce the risk of igniting a wildfire.

4.8.1.1 Fire Situation Awareness

Due to the variability of each harvest operation, the Licensee will do an evaluation of the Fuel Group (1 to 5) for the different areas in their operating area and the Operational Risk (low, moderate, high or very high) for each operation, based on the *Modifying Industrial Operations Protocol*.

The MNR weather station closest to each operation will be utilized to determine the woods modification that applies to each operation on a daily basis. No other weather station will be considered or authorized for use unless agreed upon by the MNR.

Daily communication will occur with the MNR by all Licensees and Contractors working in the Whiskey Jack Forest during the Fire Season to determine the Fire Intensity Codes on a daily basis. The MNR will normally publish the Fire Intensity Codes by 3 pm CDT; by internet, telephone or faxed/emailed report.

It is the responsibility of all Licensees and Contractors to know the Fire Intensity Codes for the weather stations used by each area of operations daily (the closest weather station to the operation) and determine the operational modifications for that day.

Should the Fire Intensity Codes not be available in a timely manner, operators will contact the MNR Sector Response Officer or the MNR Kenora District office to determine the appropriate woods modification that will be in place for their operations prior to commencing work the next day. Operations will be modified on site the following day according to the daily Fire Intensity Code report (available after 3:00 p.m. daily).

4.8.1.2 Operational Modifications

Operational modifications may include one of the following measures, which will be used to modify operations on the Whiskey Jack Forest:

P = Prevention (Normal Operations)

Site Foreman will:

- Monitor operations compliance to the Forest Fires Prevention Act and other fire related conditions that are specified within their Annual Work Schedule.
- Correct any deficiencies to ensure that all fire related conditions are being adhered to.
- Ensure staff are notified daily of hazard.
- Consolidate operations where practical.

Welding/Acetylene Cutting:

- Situate equipment on mineral soil and remove all flammable materials from work area.
- Ensure the correct size and number of extinguishers is on hand.
- Ensure that 1 shovel and 1 back pack pump is on site.
- Use welding blankets to prevent spread of burning material where it is not possible to situate equipment on mineral soil.
- For areas of possible fire spread, establish a fire watch during work and one hour after completion of the job.

Smoking:

- Sit down before lighting smoking material. Use a lighter instead of wooden matches.
- Remain seated until smoking material is extinguished.
- Double check to ensure smoking material is dead out before standing up.
- Equipment operators must not smoke in their machine as this is considered to be an extension of the workplace – they must exit the cab and follow the above procedure.

Open Fires:

- Open fires will not be allowed during the period that prevention measures are in place.

Power Saws:

- Must have operable muffler.
- Be kept clean and in good running order.
- Hot power saws are to be set on mineral soil or a stump; never on forest litter.
- Power saws are to be allowed to cool for five minutes before refuelling.
- Power saws are to be refueled on mineral soil, and not to be started within 3 metres of the fuelling site.
- Power saw operators will have a minimum (225 grams) of dry chemical fire extinguisher (ABC type) readily available during the fire season.

Equipment Maintenance

- Check daily for accumulation of flammable material and remove any accumulation found in a safe manner.
- Conduct weekly inspection of electrical systems.
- Park equipment on a mineral site when not being used.

Fire Extinguishers:

- All operators must keep a serviceable fire extinguisher rated at least 6A-80BC on the equipment or within five metres from it.
  - When operations are shut down, fire extinguishers maybe removed for security reasons (theft & vandalism).

Patrols:

- During normal operations and prevention measures patrols will be conducted by staff as they leave the operating area for the day.

SS = Short Shift Operations are not permitted between 12:00 and 19:00, local daylight savings time. Prevention measures still apply and a dedicated patrol of the area must be carried out for one hour after operations shut down.

RS = Restricted Shift Operations are not permitted between 08:00 and 22:00, local daylight savings time. Prevention measures still apply and a dedicated patrol of the area must be carried out for one hour after operations shut down. Identify water sources close to operations prior to commencing any operations.

SD = Shutdown Operations are not permitted starting at 06:00, local daylight savings time, on the first day of shutdown. Operations will remain suspended until conditions change and Prevention, Short Shift or Restricted Shift is indicated. Prevention measures still apply and a dedicated patrol of the area must be carried out for one-hour after operations cease. Once this initial patrol is complete, lower risk operations working in the vicinity can offer dedicated fire patrols during the shutdown period.

Should any licensees be operating during periods of high fire hazard, resulting in Modified Operations restrictions, their travel to and from the work site will also serve as a daily fire detection patrol. Any wildfires will be reported immediately to the MNR District Fire Management Headquarters (Telephone (807) 548-5837 or 310-FIRE (3473)).

The following table (Table 39) outlines the work modifications for limited and trained and capable operations by Operational Risk and Fire Intensity Code.

Table 39 Work Modifications by Operational Risk and Intensity Code

Operational Risk	Fire Intensity Code	Work Modifications	
		Limited	Trained
Very High Risk	A	SD	SD
	B	SD	RS
	C	SD	SS
	D	P	P
	E	P	P
High Risk	A	SD	RS
	B	SD	SS
	C	SS	P
	D	P	P
	E	P	P
Moderate Risk	A	SD	SS
	B	SS	SS
	C	P	P
	D	P	P
	E	P	P
Low Risk	A,B,C,D,E	P	P
P= Prevention SS=Short Shift RS= Restricted Shift SD= Shut Down			

4.8.1.3 Determining Operational Risk and Fire Danger

The Modifying Industrial Operations Protocol provides guidance for determining Operational Risk in section 2.0 Determining Operational Risk & Fire Danger. The following are the steps used in making the operational risk and fire danger determination:

1. Determine Operational Risk using Table 2 of the *Modifying Industrial Operations Protocol*
2. Determine if the forest is in Leaf On/Leaf Off condition through the local MNR Fire Management Supervisor.
3. Determine Fuel Group (1-5) on the worksite using the Fuel Group Decision Keys – Section 6.0 of the Modifying Industrial Operations Protocol.
   - Determine initial fuel group
   - Account for applicable modifiers (+1/-1)
   - Determine final fuel group
4. Obtain the fire intensity code:
   - using the closes weather station
   - based on the worksite fuel group
   - reported each afternoon for the next day
5. Determine work modifications, for the next day - using section 4.0 Operational Modifications Table – Table 5 – of the *Modifying Industrial Operations Protocol*.
6. Modify operations the next day as necessary.

4.8.2 Fire Preparedness

Annually, a spring meeting (March 15 – April 15) with representative from the MNR Fire Management Headquarters and members of the MNR Kenora District is organized to prepare for the upcoming fire season, identify training needs, and convey awareness of fire prevention plans and initiatives.

4.8.2.1 Trained and Capable, and Limited Operators

As per the *Forest Fire Prevention Act* and the Provincial *Modifying Industrial Operations Protocol*, Licensees and Contractors will be considered either a) trained and capable or b) limited operators. A forest operation, to be considered trained and capable, must meet each of the following criteria:

1) **Prevention**: Implementation of an effective prevention program for the type of operation.

2) **Suppression:** Minimum resource and equipment availability as identified in Section 1.2 of the *Modifying Industrial Operations Protocol*.

3) **Communication**: The ability to communicate and report fires **immediately*** and to receive or obtain updated information on the fire danger. Satellite phones and FM two-way-radio phones are acceptable means of communication. Cell phones are not advised as their reach is poor outside of the immediate Kenora area.

*** Immediately** - means two way radio or telephone capabilities from the site to the MNR office.

4) **Training:** A minimum 25% of all staff involved in forest operations on a particular site must be trained to the MNR SP-102 standard. Training will involve initial training or refresher courses completed within the past three years.

Operations that do not meet all of the above criteria will be considered Limited Operators with respect to the modifications that will apply to their operations.

4.8.2.2 Fire Suppression Equipment

As part of the Compliance Plan, all Licensees and Contractors will inspect their operations to ensure that there is the proper amount and type of forest fire suppression equipment as per Modifying Industrial Operations Protocol Table 1, and that it is in good working order.

Fire suppression equipment requirements are outlined in Section 1.2 Fire Suppression Equipment of the *Modifying Industrial Operations Protocol*. The minimum fire suppression equipment requirements are as follows:

A serviceable fire extinguisher will be on or within 5 metres of all mechanical equipment operating in the forest.

For groups of workers in the same general area, equipment for the suppression of wildfires may be stored in a centrally located fire equipment cache, no more than 10km from the operations, and accessible by ground transportation in fewer than 20 minutes. This includes those operations which are working independently, but in close proximity of one another. *i.e.* two or more separate operations may aggregate their fire suppression equipment, provided that their operations are within the 10 km radius of the fire cache. A fire equipment cache* contains at a minimum:

- one pumping unit, and
- 3 shovels.

In the event the fire cache is used, the fire cache will be replenished to a serviceable state before operations begin the following day.

The following table (Table 40) outlines the required equipment by type of operations and number of machines.

Table 40 Required Equipment by Type of Operations and Number of Machines

Operations	Number of Machines	Number of Equipment Caches	Back Pack Pumps*
Heavy Equipment with tire chains or tracks, working in forest fuels	1 to 5	0	1/machine
	6+	1	
OR** Heavy Equipment at work within a 10km radius of each other (includes hot work).	1 to 9	0	1/machine or hot work operations
	10+	1	
Tree Plant, manual tending or other labour-intensive operations	n/a	0	1 for every 4 workers, to a maximum of 10/site

* A serviceable pressurized water delivery system located on a machine can replace a backpack pump.

**Only one fire equipment cache will be required on site, providing it is within 20 minutes (by ground transportation of all equipment.

Most non-mechanical, low-risk forest activities such as timber cruising or regeneration surveying do not require fire suppression equipment. However, labour-intensive activities such as hand tending and tree planting do require some suppression tools, as outlined in the table above.

4.9 Comparison of Proposed Operations to the Long-Term Management Direction

This section of the plan text documents the assessment of the expected effect of planned types and levels of harvest, renewal and tending operations on the progress towards meeting the objectives in the long-term management direction (Section 3.5 and 3.6). The assessment includes:

(a) Section 4.9.1 - Comparison of the planned harvest, renewal and tending operations to the projections in the long-term management direction;

(b) Section 4.9.2 - Comparison of the stand conditions (e.g., species composition, site class) of the planned harvest areas to the eligible harvest areas;

(c) Section 4.9.3 - Examination of the effect of the age class distribution and the projected harvest volume of the planned harvest area, on the achievement of the long-term management direction; and

(d) Section 4.9.4 - Examination of the effect of the amount of surplus harvest area on the achievement of the long-term management direction.

(e) Section 4.9.5 - Discussion of the effects on objective achievement and sustainability. *NOTE: only required by FMPM if planned types and levels of operations deviate from the projections in the long-term management direction*.

4.9.1 Comparison of Planned Operations to the LTMD

4.9.1.1 Comparison of Planned Harvest Area to the LTMD

Planned Harvest Area (Table FMP-11) was discussed in Section 4.3.1. The total available harvest area (AHA) for the ten-year period projected by the Long-term Management Direction is 54,834 hectares. The total planned harvest area for the ten-year plan period is under the total available harvest area (51,971 ha, Table FMP-11, 95% of LTMD AHA). The majority of the planned harvest for this 10-year period is in the POD forest unit (11,349 ha), followed by the HMX (11,038 ha), CMX (8,622 ha) and SPD (6,791 ha) forest units.

The comparison of the planned harvest area to the available harvest area shows good correlation with projected age classes however there is some age class substitution in certain forest units (Table 41). The allocated harvest area that does not exactly match the LTMD projected age classes shows a minor trend to stands younger (0% of harvest area) or older (3% of the planned harvest) than the projected LTMD age classes by forest unit. Only 14 ha of SBL are allocated in an age class lower than projected in the LTMD. All other planned harvest area meets or exceeds the ages projected in the LTMD. The LTMD projected 22% of harvest area in stands less than 80 years of age. The planned allocations project 42% of harvest area to be less than 80 years old.

Reasons for the age class substitution can be attributed by many factors. Certain factors apply broadly to the forest and its landscape pattern (i.e. road access, geographic location of

concentrations of mature eligible forested stands), and other factors apply specifically to individual operating areas (i.e. consultation with the public/stakeholders, operational logistics).

Effort was made during the allocation process to minimize the amount of forest stands allocated for this plan that are younger than LTMD projections, though all these stands do meet the harvest eligibility and selection age criteria (Section 3.6.2.1 and 3.6.2.2). This younger timber was not specifically targeted during allocation selection but was considered logical to incorporate into operating blocks. The younger aged harvest area in the POD and SPD forest units were allocated to create operationally feasible blocks and to clean up areas from previous operations. Additional rationale is included in Section 3.6.2.3.

It is acknowledged that the requirement in the FMPM (2009) is to not exceed the available harvest area by forest unit, not by age class. The planned harvest area by forest unit and age classes of allocated harvest area were reviewed and accepted by the Planning Team.

Table 41 Comparison of Planned Harvest Area to LTMD Projections by Forest Unit

Forest Unit	10-Year Available Harvest Area (ha)	Age Class	Planned Harvest Area (10-year period, ha)
BFM	-	0-20	-
	-	21 - 40	-
	-	41 - 60	-
	20	61 - 80	31
	876	81 - 100	834
	512	101 - 120	420
	-	121-140	69
	-	141+	-
	1,408	Subtotal	1,353
CMX	-	0-20	-
	-	21 - 40	-
	37	41 - 60	-
	322	61 - 80	4,061
	5,694	81 - 100	2,602
	2,792	101 - 120	1,564
	-	121-140	187
	-	141+	208
	8,845	Subtotal	8,622
HMX	-	0-20	-
	-	21 - 40	-
	100	41 - 60	1,432
	5,976	61 - 80	6,788
	3,862	81 - 100	1,743
	2,126	101 - 120	998
	-	121-140	78
	-	141+	-
	12,064	Subtotal	11,039
OCL	-	0-20	-
	-	21 - 40	-
	-	41 - 60	-
	-	61 - 80	-
	-	81 - 100	-
	-	101 - 120	-
	-	121-140	-
	-	141+	-
	-	Subtotal	-

Forest Unit	10-Year Available Harvest Area (ha)	Age Class	Planned Harvest Area (10-year period, ha)
OTH	-	0-20	-
	-	21 - 40	-
	-	41 - 60	-
	-	61 - 80	-
	-	81 - 100	-
	-	101 - 120	-
	-	121-140	-
	-	141+	-
	-	Subtotal	-
PJD	-	0-20	-
	-	21 - 40	-
	5	41 - 60	-
	263	61 - 80	272
	635	81 - 100	1,050
	2,246	101 - 120	1,277
	-	121-140	298
	-	141+	203
	3,149	Subtotal	3,100
PJM	-	0-20	-
	-	21 - 40	-
	-	41 - 60	-
	113	61 - 80	791
	2,988	81 - 100	2,615
	2,267	101 - 120	1,591
	-	121-140	99
	-	141+	-
	5,369	Subtotal	5,097
POD	-	0-20	-
	-	21 - 40	-
	2	41 - 60	31
	3,475	61 - 80	6,444
	4,940	81 - 100	2,589
	3,791	101 - 120	2,285
	-	121-140	-
	-	141+	-
	12,208	Subtotal	11,349

Forest Unit	10-Year Available Harvest Area (ha)	Age Class	Planned Harvest Area (10-year period, ha)
PRW	-	0-20	-
	-	21 - 40	-
	-	41 - 60	-
	-	61 - 80	-
	135	81 - 100	87
	47	101 - 120	-
	182	121-140	61
	-	141+	56
	364	Subtotal	204
SBL	-	0-20	-
	-	21 - 40	-
	-	41 - 60	-
	-	61 - 80	14
	69	81 - 100	11
	58	101 - 120	17
	175	121-140	45
	-	141+	211
	302	Subtotal	297
SPD	-	0-20	-
	-	21 - 40	-
	-	41 - 60	-
	1,485	61 - 80	1,950
	1,647	81 - 100	3,595
	2,558	101 - 120	678
	1,222	121-140	497
	20	141+	71
	6,932	Subtotal	6,791
SPM	-	0-20	-
	-	21 - 40	-
	-	41 - 60	-
	173	61 - 80	235
	327	81 - 100	1,822
	3,199	101 - 120	1,734
	462	121-140	305
	31	141+	22
	4,192	Subtotal	4,118
TOTAL	**54,834**		**51,971**

NOTE: The planned harvest for the draft plan was 53,471 and was reduced to 51,971 hectares for the final forest management plan. The Planning Team decided to not re-run the draft plan Final Test of Sustainability for the final plan as there would not be any significant difference in the results. Therefore, the remainder of this section has not been changed from the draft plan analysis and harvest areas.

4.9.1.2 Comparison of Planned Renewal and Tending Area to the LTMD

Planned Renewal and Tending Operations (Table FMP-17) were discussed and compared to projected LTMD levels in Section 4.4.

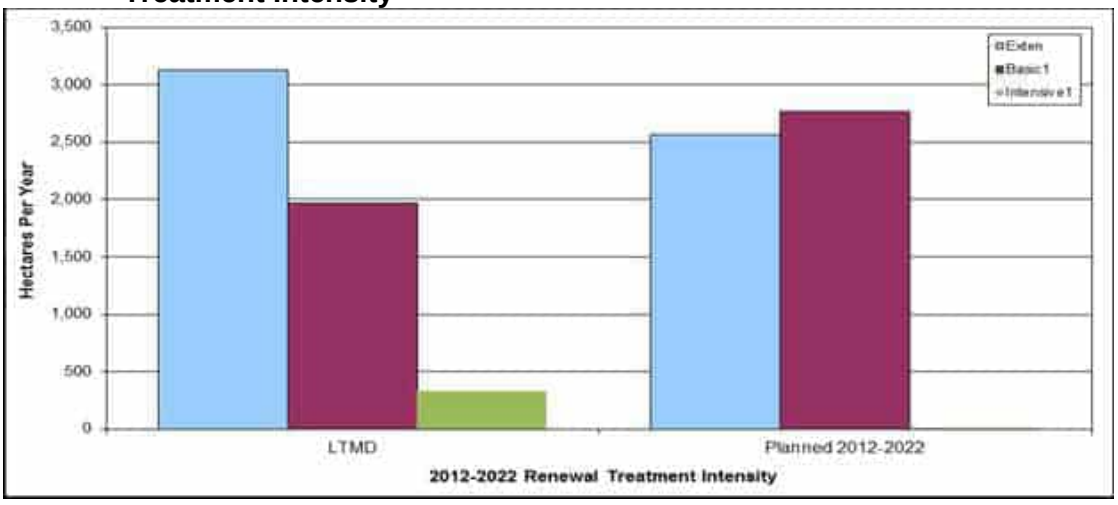
The LTMD for the Whiskey Jack Forest 2012-2022 Forest Management Plan estimates that 54,286 hectares will be renewed during the 10-year plan period. Of the 54,286 hectares being renewed, 31,264 hectares (58%) are projected to be renewed with an Extensive treatment (natural regeneration), 19,710 hectares (36%) treated with a Basic treatment of planting or seeding and 3,312 hectares (6%) are projected to be treated intensively.

A total of 34,493 hectares is planned for renewal during the 10-year plan period (Table FMP-17). Of the 34,493 hectares being renewed, 25,631 hectares are projected to be renewed with an Extensive treatment (natural, regeneration 48%) and 27,839 hectares treated with a Basic or Intensive treatment of planting or seeding (52%). Of the 10-year renewal total, 27,306 hectares are planned for renewal during the first five-year term (51%).

These levels of extensive natural regeneration and basic treatment of planting and seeding are consistent with or better than the SFMM model LTMD results that projected 58% extensive treatments and 42% basic or intensive renewal treatments (planned renewal is 48% extensive and 52% basic or intensive intensity(cannot differentiate basic and intensive treatments in Table FMP-17)).

The annual planned silviculture program for this 10-year plan period is consistent with the Long-term Management Direction. A comparison of the projected annual renewal area by treatment intensity associated with the LTMD is included in Figure 44 for 2012-2022.

Figure 44 Comparison of 2012-2022 Planned Renewal Area to LTMD Projections by Treatment Intensity



Tending treatment are blended into Basic Intensity post-renewal forest unit transitions and costs in the LTMD, therefore there is no specific LTMD tending area to which to compare planned tending activities. During this 10-year plan period, tending is planned to occur mechanically on 1,600 hectares, through the aerial application of herbicides on 4,726 hectares

and on 1,600 hectares by ground application. This level of tending is consistent with the projected silvicultural treatments and silvicultural success developed in the LTMD. Implementation of this tending program is expected to result in a similar future forest condition as the LTMD and provide for achievement of management objectives related to forest condition and renewal indicator.

4.9.2 Comparison of Stand Conditions of Planned Harvest Areas to the Eligible Harvest Areas

This section of the plan provides a comparison of stand conditions (e.g., species composition, site class) of the planned harvest areas to the eligible harvest areas. Differences in average stand characteristics between the eligible and selected planned harvest stands, coupled with age class substitution, can influence the volume forecasted to be harvested from the planned harvest stands. The 10-year planned harvest areas were selected with consideration for the available harvest area by age class and forest unit, and the other eligibility criteria discussed in Section 3.6.2.1.

Table 42 presents a summary of the area weighted average by forest unit for tree species composition and site class for the eligible harvest area and the planned harvest area. This analysis shows that the stand attributes of average species composition and site class for the planned harvest area by forest unit are comparable to the average of the stands eligible for harvest in this plan period. It is clear that the planned harvest is representative of areas eligible and does not include only the best or worst stands.

Table 42 Comparison of Stand Conditions for Eligible and Planned Harvest Areas

Forest Unit	Harvest Area	Average Species Composition (area weighted avg)	Average Site Class
BFM	Eligible:	Bf5 Sb3 Sw1 Po1	SC 2
	Planned:	Sb3 Bf2 Sw2 Po1 Bw1 Pj1	SC 2
CMX	Eligible:	Sb3 Pj3 Po2 Bw1 Bf1	SC 2
	Planned:	Sb3 Po2 Pj2 Bw1 Bf1 Sw1	SC 2
HMX	Eligible:	Po4 Bw2 Sb2 Bf1 Pj1	SC 3
	Planned:	Po4 Bw2 Sb2 Bf1 Pj1	SC 2
OCL	Eligible:	Ce5 La3 Sb2	SC 3
	Planned:	n/a	
OTH	Eligible:	Ab6 Po2 Sb1 Ce1	SC 3
	Planned:	n/a	SC 2
PJD	Eligible:	Pj9 Sb1	SC 2
	Planned:	Pj8 Sb2	SC 2
PJM	Eligible:	Pj5 Sb4 Po1	SC 2
	Planned:	Pj5 Sb4 Po1	SC 2
POD	Eligible:	Po8 Sb1 Pj1	SC 2
	Planned:	Po8 Sb1 Bf1	SC 2
PRW	Eligible:	Pr4 Pw2 Po1 Pj1 Sb1 Bf1	SC 2
	Planned:	Pw3 Pr2 Po2 Bw1 Sb1 Bf1	SC 2
SBL	Eligible:	Sb9 La1	SC 2
	Planned:	Sb9 La1	SC 2
SPD	Eligible:	Sb8 Pj1 Bf1	SC 1
	Planned:	Sb8 Pj1 Sw1	SC 1
SPM	Eligible:	Sb6 Pj3 Po1	SC 1
	Planned:	Sb6 Pj3 Po1	SC 1

4.9.3 Effect of Age Class Distribution and Projected Harvest Volumes of Planned Harvest Area on the Achievement of LTMD

In order to assess the effects of planned harvest age class distribution and projected harvest volumes of the planned harvest area on achievement of the LTMD, an additional SFMM scenario was investigated that had the same Term 1 10-year harvest area by forest unit and 10-year age class as the planned harvest (Table FMP-11). This investigation is required by the *Forest Management Planning Manual (2009)*, Section 1.3.9, therefore this investigation is referred to as the "1 – 3 – 9 Run" or the "Final Test Run". This investigation was conducted and saved as "Final_Test_Draft" (input and results files included in the electronic FMP, folder MU490_2012_P1_MODEL). A three-page summary of wj_SFMM_Final_Test_Draft_Results is also included in that folder.

The Final Test scenario was run with the LTMD scenario adjusted with the actual planned harvest areas included for Term 1 2012-2022 (98% of FMP planned harvest successfully imported as variance was due to SFMM also calculating natural disturbance depletions on areas in Term 1). Since the actual harvest areas were included, the harvest volume targets for Term 1 were not needed and were deleted.

The comparison of projected forest stand conditions between the Long-term Management Direction and the Final Test scenario with 2012-2022 planned harvest allocations are discussed in the following subsections in relation to productive forest area by forest unit, productive forest landscape class area, age class structure and proportion of old forest (Sections 4.9.3.1 to 4.9.3.4). Also, the effect of age class substitution of the planned harvest area is discussed in relation to planned harvest volumes in Section 4.9.3.5.

These comparisons of the forest condition and harvest volumes were reviewed to assess the effect of the age class distribution (including the age class substitution) and projected harvest volumes of the planned harvest area, on the achievement of the long-term management direction. The comparison of projected results of planned operations to the Long-Term Management Direction do not indicate any negative impacts on desired future forest condition (forest unit composition and distribution, landscape class area, age class distribution, old forest conditions) resulting from the implementation of planned operations during the 2012-2022 period. The age class distribution of planned harvest area resulted in a minor difference between harvest volume projections for the first 10-year term only.

4.9.3.1 Productive Forest Composition

The productive forest area by forest unit projected for the Final Test allocations investigation and the Long-term Management Direction were compared. Projected areas by forest unit for 2012 Plan Start, 2061 and 2111 are illustrated in Figure 45 and Figure 46. The comparison was made to 100 years in the future, consistent with the assessment period used in Table FMP-9 to assess long-term objective achievement. Data for 50 years in the future, Year 2062, was also included to provide an indication of area trends half way through the planning horizon.

Based on the comparison of the productive forest unit area associated with the LTMD to the model run including the proposed operations (Final Test), there are no significant difference in how the forest unit area changes over the next 100 years. Differences in forest unit area between the two model runs were considered to be negligible. As demonstrated in the figures, the proposed operations do not compromise the achievement of the desired future species composition associated with the LTMD. Differences at Year 100 (2112) are negligible for all forest units.

Figure 45 Comparison of Productive Forest Area by Forest Unit (Group 1)

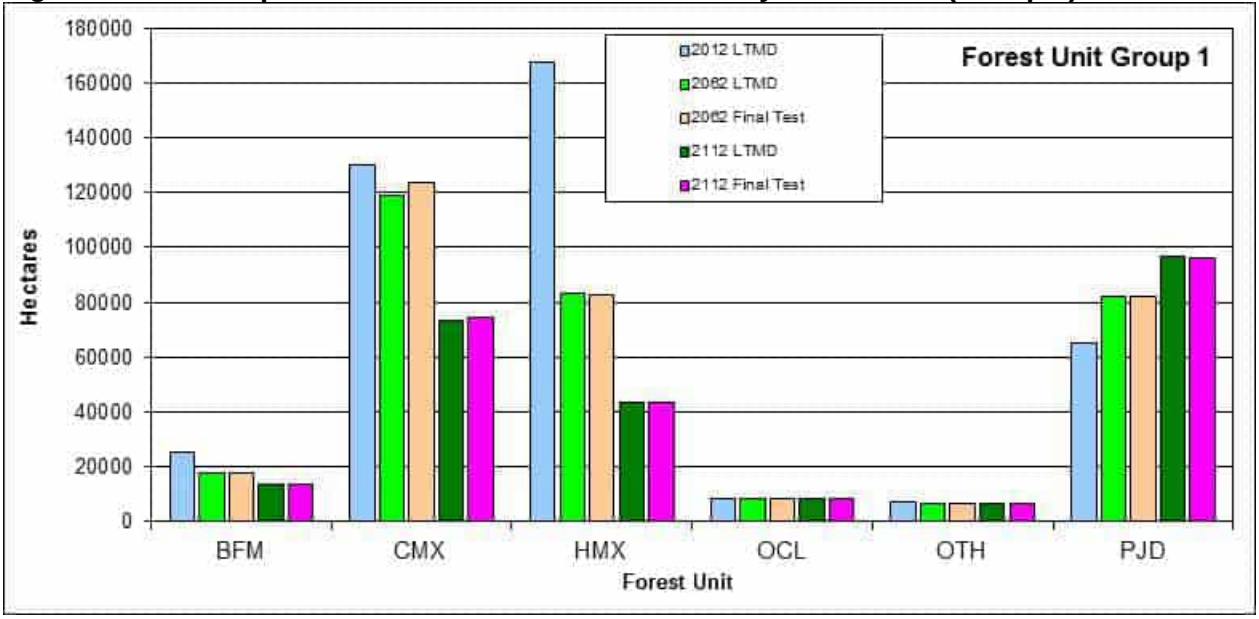
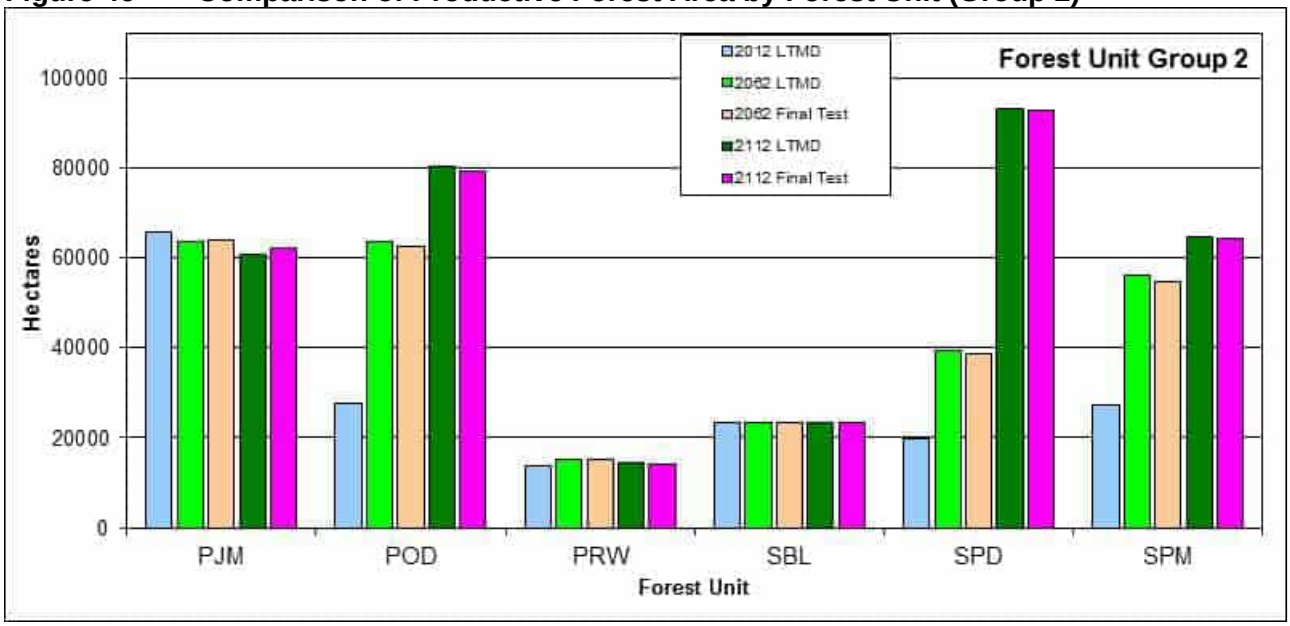


Figure 46 Comparison of Productive Forest Area by Forest Unit (Group 2)



4.9.3.2 Productive Forest by Landscape Class

The productive forest area by Ontario Landscape Tool landscape class projected for the Final Test allocations investigation and the Long-term Management Direction were compared (Table 43 and Table 44).

Based on the comparison of the productive forest landscape class area associated with the LTMD to the model run including the proposed operations (Final Test), there are no significant difference in how the landscape class area changes over the next 100 years. There is marginally more mature and late successional hardwood and conifer in the Final Test at 2012. Differences in landscape class area between the two model runs were considered to be negligible.

As demonstrated in the figures, the proposed operations do not compromise the achievement of the desired future species composition associated with the LTMD. Differences at Year 100 (2112) are negligible for all landscape classes.

Where projections in the following tables fall below the min. target, the data is shaded yellow; where projections exceed max. targets, the data is shaded green.

Table 43 Productive Forest by Landscape Class – LTMD

Productive Area by Landscape Class (ha)							
Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional:			
				Balsam	Lowland	Hardwood	Conifer
T1	201,015	152,743	62,934	8,361	12,695	104,760	182,885
T2	171,969	189,752	49,376	8,119	12,135	104,326	189,168
T3	138,737	241,002	71,996	7,427	11,865	81,752	171,623
T4	146,918	242,746	85,555	9,531	10,701	65,542	163,411
T5	149,715	216,333	89,065	19,031	9,608	60,325	180,326
T6	160,000	174,648	92,415	18,367	10,306	46,191	222,475
T7	160,000	154,174	95,307	13,704	12,653	43,100	245,438
T8	160,000	167,839	84,745	12,869	12,850	49,794	236,161
T9	160,484	174,591	77,674	13,725	12,850	54,135	230,730
T10	160,000	172,977	75,700	13,855	12,884	51,090	237,633
T11	160,000	177,997	77,266	13,212	12,850	49,208	233,558
T12	160,000	177,323	73,300	14,617	12,850	48,631	237,310
T13	160,000	180,100	71,180	16,350	12,948	47,318	236,136
T14	160,000	181,572	69,777	15,794	12,850	45,228	238,812
T15	160,000	174,065	70,528	14,287	12,850	43,100	249,202
T16	160,000	167,768	69,660	13,731	12,850	43,100	256,923
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

Table 44 Productive Forest by Landscape Class – Final Test

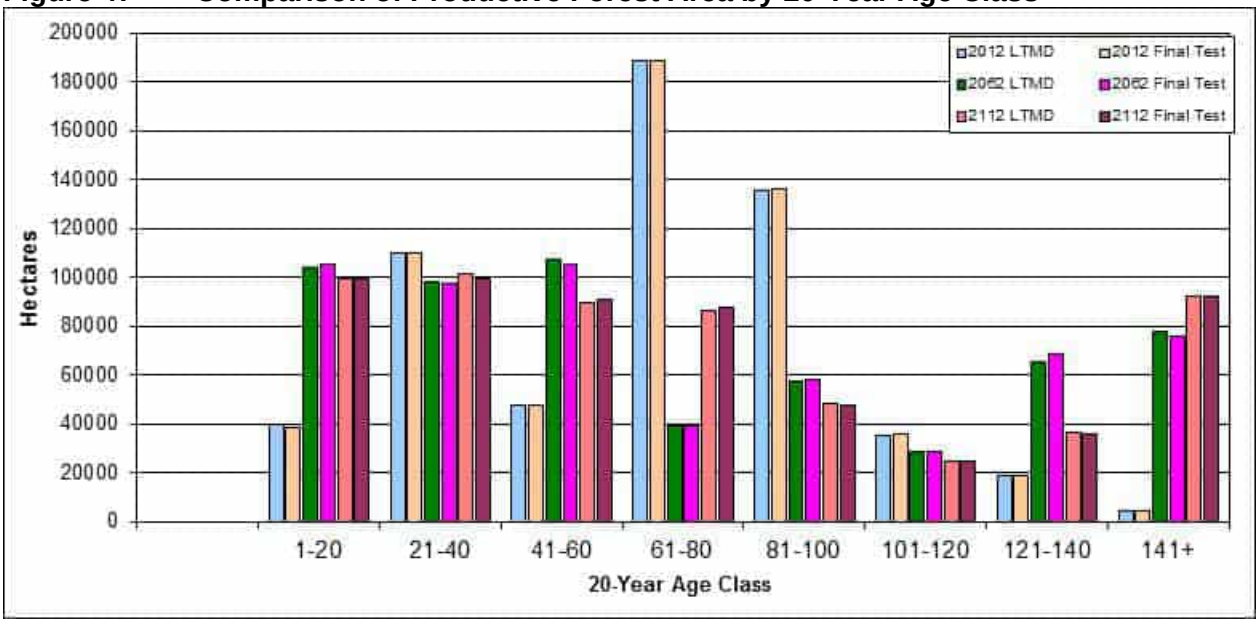
Productive Area by Landscape Class (ha)							
Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional:			
				Balsam	Lowland	Hardwood	Conifer
T1	201,015	152,743	62,934	8,361	12,695	104,760	182,885
T2	169,734	189,793	49,376	8,138	12,140	105,838	189,849
T3	138,585	240,519	71,471	7,515	11,870	84,030	170,429
T4	149,171	241,898	82,445	9,635	11,412	66,180	163,678
T5	149,619	215,778	86,586	19,151	9,834	61,854	181,598
T6	160,000	175,063	88,508	19,342	10,108	47,171	224,227
T7	160,000	155,454	91,407	13,754	12,653	43,100	248,024
T8	160,000	168,885	82,834	12,907	12,850	48,632	238,162
T9	160,000	173,350	77,633	13,517	12,980	51,243	235,476
T10	160,000	169,394	75,503	13,622	13,009	50,060	242,566
T11	160,000	177,714	77,066	13,230	12,850	47,099	236,151
T12	160,000	178,122	72,959	14,392	12,850	46,850	238,890
T13	160,000	180,349	70,025	15,908	12,850	46,333	238,598
T14	160,000	182,201	68,398	15,600	12,850	44,932	240,081
T15	160,000	174,024	68,958	14,189	12,850	43,100	250,942
T16	160,000	166,884	68,388	13,810	12,850	43,100	259,031
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

4.9.3.3 Age Class Structure

The productive forest area by 20-year age class projected for the Final_Test allocations investigation and the Long-term Management Direction were compared. Projected areas by 20-year age class for 2012 Plan Start, 2062 and 2112 are illustrated in Figure 47. Data for 50 years in the future was included to provide an indication of age class trends half way through the planning horizon. The comparison was made to 100 years in the future, consistent with the assessment period used in Table FMP-9 to assess long-term objective achievement. The age class distribution of the initial land base for 2012 for the Long-term Management Direction and the Final Test are very similar (Figure 47).

Based on the comparison of the age class area associated with the LTMD to the model run including the proposed operations (Final Test) there is no significant difference in how the age class structure changes over the 100-year planning horizon. Very little difference in age class structure is evident in 50 years between the LTMD and the Final Test (incorporating actual planned harvest allocation 2012-2022). Planned operations in this 10-year plan period, including the age class substitution as previously discussed and rationalized (Section 3.6.2.3), will not affect the future age class structure of the remaining forest or have any medium or long-term impacts on forest age class distribution.

Figure 47 Comparison of Productive Forest Area by 20-Year Age Class



4.9.3.4 Old Forest

A comparison was made between the projected amount of old forest in the Long-Term Management Direction and impacts of the planned allocations included in this plan. The results of this comparison are included in Table 45 and Table 46. Old forest achievement proportions are based on the amount of productive forest that is at or above minimum old forest onset ages for each forest unit group.

As previously discussed in Section 3.5.2.2 Indicator 2c, the trends for old forest are variable by forest unit. Some forest units are conducive to creating more old forest condition than others due to tree species longevity. In most cases, old forest increases through time. The only forest unit groupings that had difficulty achieving desirable old forest levels in the short-term were Balsam Fir (BFo), conifer mixedwood (CMo) and spruce (SPo).

The projected old forest areas for the planned operations and the LTMD are almost the same through time. There is no statistical difference in the projected old forest condition by forest unit due to planned operations. Overall, old forest objective desirable levels are met for all forest unit groupings within 50 years or less.

Table 45 Productive Forest Old Forest Area – LTMD

Area of Old Forest Area by Grouping of Productive Forest (ha)									
	Lower Old Forest Age (Years):								
	80	100	100	100	90	100	160	110-120	140
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo	PRW
T1	3,707	1,851	8,730	16,931	1,252	23,267	2,007	10,155	457
T2	3,371	1,920	10,699	18,716	1,575	43,275	3,780	9,032	688
T3	5,091	1,883	15,779	18,952	1,700	42,449	5,459	13,810	808
T4	6,232	1,835	23,526	15,403	1,658	38,602	6,416	19,703	1,123
T5	6,870	1,581	28,705	23,966	1,631	34,808	5,962	25,622	1,373
T6	4,698	1,516	29,306	20,002	1,500	26,997	5,883	33,178	1,600
T7	10,049	1,466	27,528	12,867	1,452	21,000	4,630	41,072	1,654
T8	10,436	1,450	22,721	9,223	1,135	31,626	3,893	34,094	1,582
T9	10,545	1,402	21,962	10,737	1,144	44,420	3,562	39,700	1,579
T10	10,999	1,438	22,518	9,172	1,094	40,879	3,402	45,082	1,506
T11	11,206	1,400	21,000	12,341	1,094	32,809	3,413	58,659	1,387
T12	10,855	1,406	21,570	15,667	1,017	33,812	3,950	68,510	1,287
T13	6,885	1,412	21,000	17,089	1,019	29,179	4,290	78,789	1,174
T14	6,735	1,418	21,000	13,784	1,000	23,000	4,558	79,911	1,162
T15	10,699	1,562	21,000	9,996	1,086	28,120	4,418	86,796	1,102
T16	11,146	1,518	21,000	9,410	1,045	35,290	4,417	93,429	1,067
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427	inf
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840	457

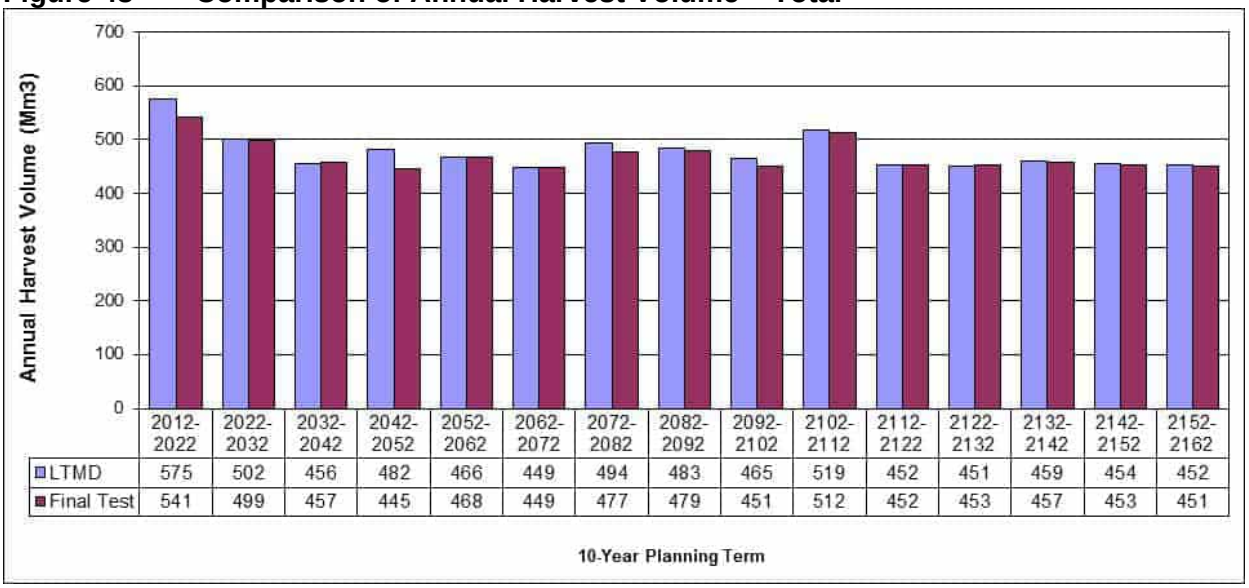
Table 46 Productive Forest Old Forest Area – Final Test

Area of Old Forest Area by Grouping of Productive Forest (ha)									
	Lower Old Forest Age (Years):								
	80	100	100	100	90	100	160	110-120	140
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo	PRW
T1	3,707	1,851	8,730	16,931	1,252	23,267	2,007	10,155	457
T2	3,390	1,920	12,808	23,906	1,575	44,216	3,635	12,063	685
T3	5,171	1,883	16,036	20,388	1,700	44,350	5,262	14,294	869
T4	6,419	1,835	23,796	15,861	1,658	39,239	6,554	20,603	1,181
T5	6,886	1,785	28,933	24,048	1,631	35,415	5,654	26,782	1,448
T6	5,545	1,583	29,550	20,171	1,500	27,155	5,560	34,854	1,533
T7	10,090	1,530	27,732	12,938	1,452	21,000	4,509	42,735	1,654
T8	10,465	1,512	21,000	9,246	1,135	30,654	3,831	35,766	1,625
T9	10,579	1,468	21,368	10,785	1,144	42,748	3,747	41,298	1,603
T10	10,865	1,502	22,170	8,885	1,094	39,945	3,552	47,155	1,506
T11	11,214	1,400	21,000	12,241	1,094	33,685	3,504	60,757	1,387
T12	10,903	1,400	21,507	15,752	1,017	33,576	4,025	70,268	1,287
T13	6,899	1,406	21,000	14,985	1,019	28,984	4,413	80,359	1,174
T14	6,799	1,412	21,000	12,927	1,034	23,000	4,670	81,334	1,162
T15	10,762	1,400	21,000	9,187	1,119	25,839	4,526	88,218	1,102
T16	11,195	1,467	21,000	9,375	1,130	34,772	4,563	94,672	1,066
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427	inf
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840	457

4.9.3.5 Harvest Volumes Projections

The total harvest volume through time for the Final Test investigation was compared to the projected volumes in the Long-Term Management Direction. The difference between harvest volume projections for the two runs occurs in the first term only – this plan period (Figure 48). The variation in planned harvest allocations compared to the LTMD accounts for the difference in Term 1 projected harvest volumes. The minor projected reduction in harvest volume (24,000 cubic metres or 6% variance from LTMD)

Figure 48 Comparison of Annual Harvest Volume – Total

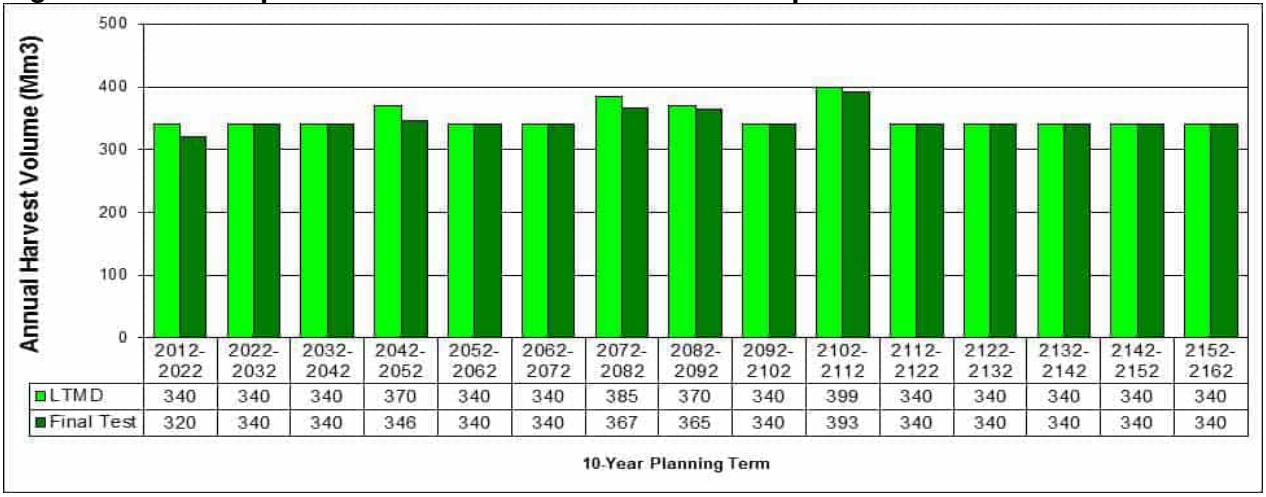


	2012-2022	2022-2032	2032-2042	2042-2052	2052-2062	2062-2072	2072-2082	2082-2092	2092-2102	2102-2112	2112-2122	2122-2132	2132-2142	2142-2152	2152-2162
LTMD	575	502	456	482	466	449	494	483	465	519	452	451	459	454	452
Final Test	541	499	457	445	468	449	477	479	451	512	452	453	457	453	451

Comparisons of the projected harvest volumes by major species groups are included in Figure 49 for the Spruce-Pine-Fir volume group, in Figure 50 for the Poplar volume group and Figure 51 for White Birch. Similar trends through time are evident for all species groups as were projected for total harvest volume through the planning horizon.

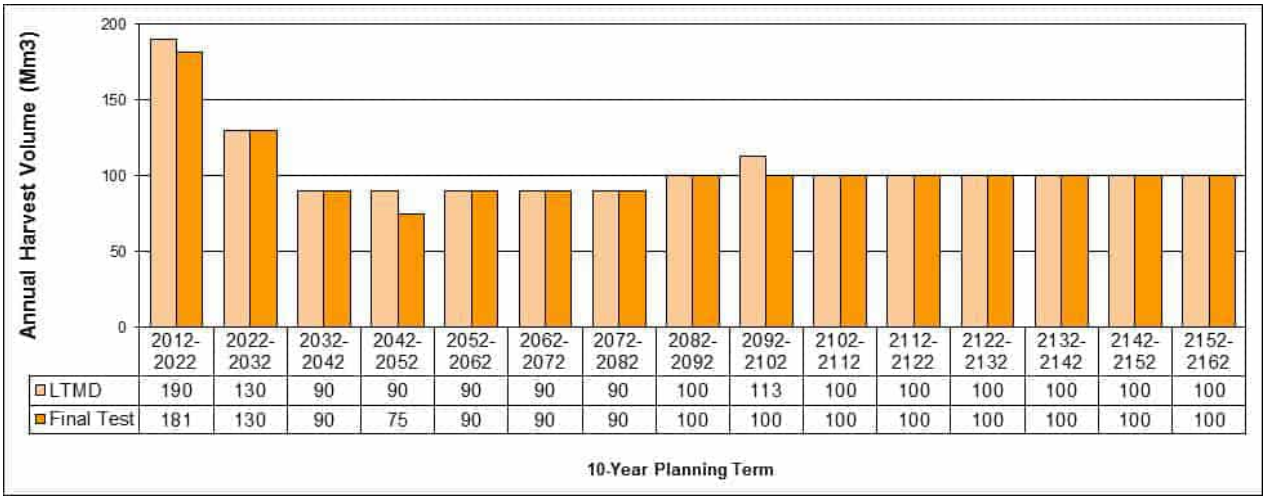
Overall, there is no significant difference between the two model runs on a long-term basis and the minor difference in Term 1 harvest volumes does not continue into Term 2 and will not impact the availability of fibre to local mills. The variation is due to minor under allocation and minor age class substitution of the planned harvest area. The comparison of the proposed harvest operations to the projections associated with the LTMD confirmed the achievement of long-term wood supply objectives, and that long-term wood supply sustainability has been provided for in the management plan.

Figure 49 Comparison of Annual Harvest Volume – Spruce-Pine-Fir



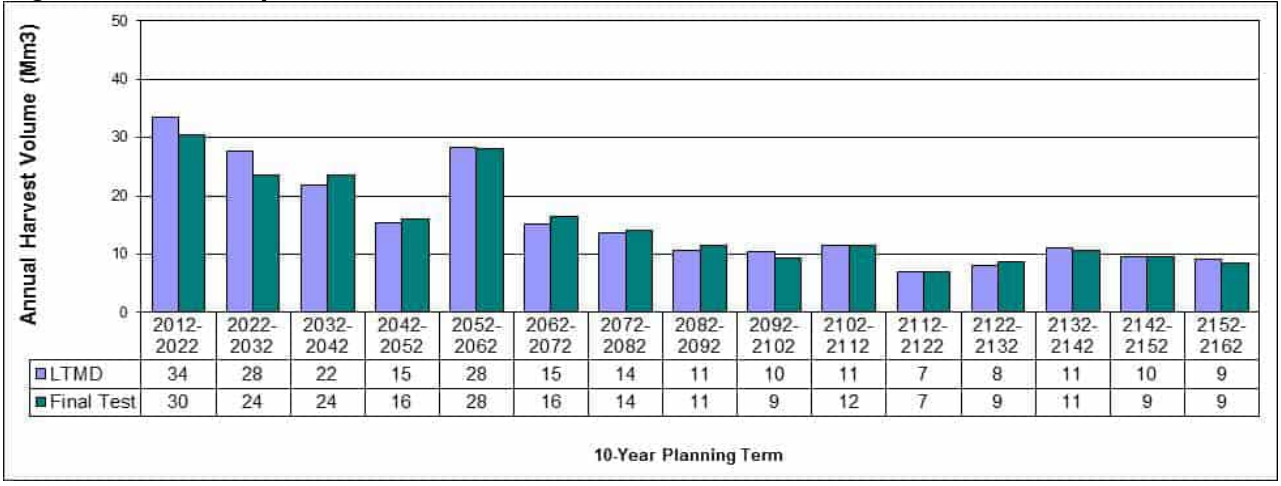
	2012-2022	2022-2032	2032-2042	2042-2052	2052-2062	2062-2072	2072-2082	2082-2092	2092-2102	2102-2112	2112-2122	2122-2132	2132-2142	2142-2152	2152-2162
LTMD	340	340	340	370	340	340	385	370	340	399	340	340	340	340	340
Final Test	320	340	340	346	340	340	367	365	340	393	340	340	340	340	340

Figure 50 Comparison of Annual Harvest Volume – Poplar



	2012-2022	2022-2032	2032-2042	2042-2052	2052-2062	2062-2072	2072-2082	2082-2092	2092-2102	2102-2112	2112-2122	2122-2132	2132-2142	2142-2152	2152-2162
LTMD	190	130	90	90	90	90	90	100	113	100	100	100	100	100	100
Final Test	181	130	90	75	90	90	90	100	100	100	100	100	100	100	100

Figure 51 Comparison of Annual Harvest Volume – White Birch



	2012-2022	2022-2032	2032-2042	2042-2052	2052-2062	2062-2072	2072-2082	2082-2092	2092-2102	2102-2112	2112-2122	2122-2132	2132-2142	2142-2152	2152-2162
LTMD	34	28	22	15	28	15	14	11	10	11	7	8	11	10	9
Final Test	30	24	24	16	28	16	14	11	9	12	7	9	11	9	9

4.9.4 Effect of Surplus Area on the Achievement of LTMD

The Whiskey Jack Forest available harvest area is planned to be fully utilized over this ten-year period. The full ten-year and five-year planned harvest areas were classified to be harvested (no surplus area) since markets are expected to exist for all fibre available from the Whiskey Jack Forest.

The under allocation of the planned harvest area (Table FMP-11, 1,364 hectares not allocated spread over nine forest units) will not impact projected forest condition, objective achievement or forest sustainability as this area is available to be allocated for Phase II operations (2017-2022).

4.9.5 Effect of Varied Planned Activities on Objective Achievement and Sustainability

This section compares the projected achievement of desirable levels for management objectives for planned allocations for 2012-2022 to the Long-term Management Direction. If planned types and levels of operations deviate from the projections in the long-term management direction, a discussion of the effects on objective achievement and sustainability will be provided. Otherwise the FMPM does not require additional assessment in this section.

Sections 4.9.1, 4.9.2, 4.9.3 and 4.9.4 document that planned operations closely match those projected in the Long-term Management Direction (run 27d_OLTMS) with no significant implications of implementation of planned operations therefore no discussion of objective achievement is required in this section. Objective achievement through implementation of planned operations in this FMP is expected to be comparable to that described in Section 3.6.3 for the LTMD.

4.9.6 Conclusion on the Comparison of Proposed Operations on the LTMD

The comparison of projected results of planned operations to the LTMD indicate no negative impact on the desired future forest condition (forest composition, landscape class area, age class structure, old forest) are expected to result from the implementation of planned operations during the 2012-2022 period.

The planned harvest allocations in this plan result in marginally lower Term 1 estimated harvest volumes, but do not cause a decrease in the projected volume through time in future terms.

No appreciable difference was evident in projected forest sustainability between the results of planned allocations in this plan and those projected in the Long-term Management Direction (27d_OLTMS). The planned allocations do not negatively impact upon objective achievement, definition of the desired future forest condition, nor do they compromise the long-term sustainability of the Whiskey Jack Forest. Implementation of the planned harvest allocations will positively impact the spatial landscape pattern of the Whiskey Jack Forest.

5.0 DETERMINATION OF SUSTAINABILITY

The overall determination of sustainability is based on the collective assessment of objective achievement, the spatial assessment, the social and economic assessment and prescriptions for the protection of values. A favourable determination of sustainability allows for the conclusion of forest sustainability and documents how the forest management plan has regard for plant life, animal life, water, soil, air, and social and economic values, including recreational values and heritage values. A summary of the components considered during the determination of sustainability follows:

5.1 Assessment of Management Objective Achievement

The FMP objectives, indicators, desirable levels and targets were established to address the *Crown Forest Sustainability Act* objective categories. The Assessment of Objective Achievement is documented in Table FMP-9 and Section 3.6.3 for each indicator that can be assessed at this time through strategic modelling or operational planning. The assessment of objective achievement was based on the extent to which the established desirable levels for each indicator were satisfied within the 10-year plan period.

Plan objectives that have been addressed in the Long-term Management Direction for this plan are summarized as:

Assessed During Plan Preparation:

1. Landscape Pattern;
2. Forest Composition and age class structure, incl. old forest, and red pine/white pine;
3. Wildlife Habitat, including habitat for caribou (Species At Risk), marten cores;
4. Wood Supply (projections);
6. Aboriginal Involvement in Planning; and
7. Local Citizens Committee Involvement.

Assessed After Plan Implementation:

1. Landscape pattern;
2. Forest composition and age class structure, including old forest, and red pine/white pine;
3. Wildlife habitat, including habitat for caribou (SAR), marten cores;
4. Wood Supply (comparison to actual achievement);
5. Managed Crown Forest available for timber production;
8. Road access;
9. Forest Renewal;
10. Forest Values; and
11. Soil and Water Resources.

Of the 30 indicators included in Table FMP-9, 18 of the indicators can be assessed during plan development. The remaining 12 indicators (and reassessment of some of the original 18 indicators) will be assessed in the future: after plan implementation as appropriate (specific indicator timing of assessment is noted in Table FMP-9 and in plan text Section 3.5.2).

Of the 30 plan indicators assessed:

11 indicators ACHIEVE desirable and target levels in this 10-year plan period;
6 indicators are projected to ACHIEVE target levels in a target timeframe longer than this 10-year plan period;
1 indicator is projected to NOT ACHIEVE desirable or target levels at some point in the 100-year strategic planning horizon; and
12 indicators will be assessed in the FUTURE after plan implementation.
30

The only indicator that is not achieving desirable and target levels is the indicator for Aboriginal Communities that Contribute Information to the Planning Process (6b). All affected Aboriginal communities were contacted for comment on products during development of the plan, however some communities chose to not comment on information products or Aboriginal values. This resulted in one indicator "not achieving" desirable levels because the goal is to have five Aboriginal communities contribute information or comments on the plan and only three communities contributed. Multiple opportunities for input were offered and will continue to be offered to all affected Aboriginal communities.

Assessment Notes:

Indicator 1a – Mature and Old Forest Landscape Pattern - Desirable level not achieved in this plan period, but target level is projected to be **ACHIEVED** during the plan period with movement towards the minimum desirable percentages.

Indicator 1b – Young forest patch size by size class – Desirable level not met but target level met showing overall movement towards desirable level. Six of nine size classes demonstrated movement towards the desirable frequencies, though four do not show significant change. The remaining three size classes project movement away from the SRNV at the end of this plan period, however two of the three change negatively by only 1-2%. Overall assessment is that while it will take many future plan periods to reach the desirable level, the target level for this indicator is achieved in this plan period, as the movement toward the template frequency distribution is greater than the minor shortfalls in 3 classes.

Indicator 2e - Amount of Upland Pine and Spruce Forest - Desirable level is not achieved in the plan period however the target level is achieved through a projected increase in upland pine and spruce forest area. The desirable level is achieved in Term 7 and sustained throughout the remainder of the 160-year planning horizon

Indicator 3b – % of polygons with >60% caribou refuge habitat in caribou zone –
Indicator 3c – % of polygons with >60% caribou winter habitat in caribou zone –
Desirable levels for both indicators were not met but minor movement was evident towards desirable levels (target achieved.)

Indicator 3d - Landscape Pattern - Interior, Marten Core Habitat – Desirable level is not achieved, movement towards the desirable level is projected by 2072. While this scenario does not meet the 10-20% marten habitat objectives, it does represent the best case scenario for the Whiskey Jack Forest. Preliminary assessment indicates that the minimum target of 10% should be available in 60-80 years. Overall, the selected marten cores provide adequate spatial distribution of marten habitat over the forest.

Indicator 6b Aboriginal Communities that contribute information to the planning process
Desirable and target levels for this indicator were NOT ACHIEVED. Only three of the five Aboriginal communities accepted the offer to review detailed operational plans at the LTMD

stage and community information sessions were held. The Aboriginal Background reports were available for review by community members at the information sessions.

During the development of the 2012-2022 Whiskey Jack Forest FMP, the achievement of plan objectives was balanced and all plan objectives have achieved established targets, and demonstrated progress towards the desired forest and benefits. The levels of achievement will not negatively affect the long-term sustainability of the forest.

The proposed operations were compared to the projections for the LTMD including an evaluation of the effect of proposed types and levels of harvest, renewal and tending operations on the achievement or movement towards the LTMD. The overall conclusion is that the planned operations in the 2012-2022 Whiskey Jack Forest FMP are consistent with those projected with the Long-term Management Direction and similar projected results are expected.

5.2 Preliminary Spatial Assessment

A number of preliminary spatial assessments were conducted to analyze achievement of management objectives that are influenced by the location of planned harvest areas. Documentation of these spatial analyses is included as Supplementary Documentation N – Spatial Analyses. Brief summaries for each analysis follow.

Caribou Habitat Management

The Caribou Conservation Plan (CPP) has been developed by MNR to meet the requirements under subsection 11(8) of the Endangered Species Act (ESA) 2007 to identify and prioritize the actions the government intends to take in response to the final Recovery Strategy for Woodland Caribou (forest-dwelling, boreal population) in Ontario. The CPP provides direction to manage the quality, quantity and location of caribou habitat in the area of continuous extent of caribou occurrence. (Photo Credit: MNR)

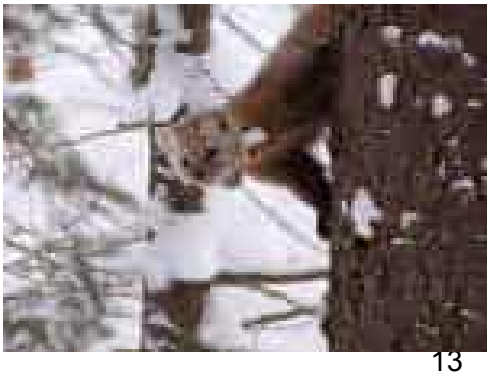
Caribou habitat tracts were used to plan a series of disturbances (harvest areas) on the landscape in such a manner as to:

i) maintain a current habitat supply,
ii) ensure a continuous supply of large areas containing winter (40-120 years old) or summer habitat, and
iii) account for existing distribution of caribou and alternate future habitat.

The result of the caribou habitat tract analysis is the Caribou Dynamic Habitat Schedule (caribou mosaic blocks with associated operational timing restrictions) that was incorporated into the Base Model Inventory and strategic SFMM modelling. Each mosaic block was identified based on factors such as forest composition, age class, ecosite and use or potential use by caribou.

The analysis completed for management objective indicators for caribou refuge and winter habitat landscape pattern are discussed in the Landscape Pattern portion of this section.

Marten Core Habitat Management



Marten core habitat areas were developed to meet habitat guideline levels and to incorporate the best concentrations of suitable habitat, spatially distributed across the forest through the next 60 years. Not all of the Whiskey Jack Forest can provide large cores that meet the desired level and core size, therefore the target level allows for the inclusion of some smaller, higher quality cores. This target level for marten core habitat is projected to be met for the next 60 years (full planning period associated with this analysis). (Photo Credit: MNR)

The percentage of capable habitat in suitable condition in core areas is 4.9% in 2012 at the start of this FMP. It is expected that the deferral of these 25 cores for the next 60 years, providing there is no natural disturbance, will provide for an increase of suitable marten habitat to 9.1% capable) by 2072. While this scenario does not meet the 10-20% marten habitat objectives, it does represent the best case scenario for the Whiskey Jack Forest. Preliminary assessment indicates that the minimum target of 10% should be available in 60-80 years. Overall, the selected marten cores provide adequate spatial distribution of marten habitat over the forest.

Landscape Pattern

The landscape pattern objective is carried forward from the 2006 FMP in accordance with the *Forest Management Guide for Natural Disturbance Pattern Emulation (2001*) and also addresses a landscape pattern indicator from the *Forest Management Planning Manual (2009)* required for this FMP. Analyses were conducted and are summarized in two groups: those related to the Science and Information in support of Ontario's Forest Management Guide for Boreal Landscapes and OLT model, and those required by the NDPE Guide.

Draft Boreal Landscape Guide and Ontario Landscape Tool Analyses

The draft ***Forest Management Guide for Boreal Landscapes*** guide was considered by 2012 Planning Teams as a guide for maintaining or enhancing natural landscape structure, composition and patterns that provide for the long term health of forest ecosystems in an efficient and effective manner. When approved, the Landscape Guide will replace existing landscape, stand and site scale direction previously found in several other documents. In the meantime, the science package developed by MNR to support the Landscape Guide is considered the best available science and information for many of the landscape related indicators. The Planning Team also relied on the Ontario Landscape Tool (OLT) that was developed by MNR to support the Landscape Guide (when approved) for the determination of desirable levels for many management indicators. The OLT projections of the simulated natural forest condition were considered more appropriate for the forest than just relying on broad descriptions included in the historic forest condition or results of non-spatial modelling.

The Landscape Guide suggests several new spatial indicators of forest biodiversity be included in each forest management plan. Summaries of these four assessments follow:

Mature and Old Forest Landscape Pattern – This objective is carried forward from the 2006 FMP in accordance with the *Forest Management Guide for Natural Disturbance Pattern Emulation (2001*) and also addresses a landscape pattern indicator from the *Forest Management Planning Manual (2009)* required for this FMP.

Spatial assessment using the OLT model showed that implementation of planned operations would result in a landscape pattern of mature and old forest above the minimum desirable level (with movement towards desirable level from plan start level). ACHIEVED. The similar indicator for **mature and old conifer forest** is also ACHIEVED.

Young Forest Patch Size by Size Class - Spatial assessment of the frequency of young forest by patch size using the OLT model shows movement towards the OLT desirable level in most size classes. ACHIEVED.

Plan start **Caribou Refuge Habitat Texture (Pattern)** is below the desirable level for the caribou zone, as is achievement at the end of the 10-year period as measured with the OLT model. There is minimal harvesting within the caribou zone in this plan therefore results are not expected to change significantly – Minimal movement towards desirable ACHIEVED.

Forest Management Guide for Natural Disturbance Pattern Emulation (NDPE) Analyses

Landscape direction from the NDPE Guide was included in the 2012 FMP and was measured through use of the NDPE Tool model. (Note: This guide is intended to be replaced by the Landscape Guide, but the Landscape Guide has not been approved for implementation in this FMP.)

The *Forest Management Guide for Natural Disturbance Pattern Emulation (NDPE) (MNR, 2001)* standard for frequency of **planned clearcuts equal to or less than 260 ha** (80%) has been assessed at 76% of planned clearcuts under 260 hectares. This result is slightly lower than the 80% standard, but is acceptable to the Planning Team as it results from strategic landscape pattern direction and projected harvest allocations that balance consideration for all desired forest and benefits and operational challenges.

A **sliding scale assessment** was conducted on forest disturbances (required by NDPE guide) to evaluate the spatial separation of planned disturbances across the landscape. This analysis identifies the average distance between disturbances in each size class at Plan End with Harvest (2022) and measures how well like-sized disturbances are spread out over the landscape. The results of this sliding scale analysis project that the six size classes with planned disturbances (all disturbance classes up to 10,000 ha in size) are well distributed and have median distances that exceed the minimum target distances. Since there are no measured disturbances in the 5,000-10,000 ha or >10,000 ha) size classes, the median distances are recorded as 0 for these classes as a median distance cannot be calculated unless there are two points (Supp Doc N).

Spatial Analyses Conclusion – The spatial distribution of caribou habitat, marten core habitat, and landscape pattern (measured by OLT and NDPE Tool) is improved through implementation of the planned harvest allocations.

5.3 Social and Economic Assessment

The *Forest Management Planning Manual (2009)* requires that a Social and Economic Assessment (SEA) be prepared to identify the expected social and economic impacts of implementing the Long-term Management Direction (LTMD) proposed in the Forest Management Plan (FMP). The assessment examines how the quantity of timber supplied to the wood-processing facilities, and the silvicultural investment requirements for the proposed long-term management direction may affect the communities identified in the Social & Economic Description. The Social and Economic Assessment of timber volumes and silvicultural expenditures is based on a comparison of the planned levels for the 2004 FMP and the levels shown in the LTMD for the 2012 FMP. This assessment outlines the expected social and economic impacts associated with the proposed LTMD. The social and economic assessment is included in plan text Section 3.6.4.

The overall social and economic impacts of implementing the 2012 FMP as compared to the 2004 FMP are generally good. The social and economic assessment for this FMP indicates that current levels of social or economic benefits are projected to be generally maintained or increased for the 2012-2022 plan period, in comparison with the 2004-2009 FMP. The Planning Team confirmed that maintaining this level in this plan period did not negatively impact objective achievement or long-term sustainability of the Whiskey Jack Forest. Positive socio-economic benefits and positive objective achievement are maintained.

The implementation of the Long-term Management Direction should at least maintain the current plan's level of employment and employment income from the wood processing facilities and maintain the current job and net employment income. These gains represent direct positive social and economic impacts in the primary wood manufacturing facilities and will occur in communities that receive fibre from the Whiskey Jack Forest.

The impacts of forest management and operations on recreation and tourism are not dependant on the harvest level but rather how the specific value has been addressed. Some values benefit from increased access to previously un-accessed areas whereas others that rely on remoteness can be negatively impacted. The impacts of forest management on mining and mineral exploration and baitfish operations are mainly positive. Forest operations will directly affect certain traplines and not others depending on where harvest allocations are planned. These operations may have both a positive and negative impact to one or more trappers and their traplines. Bear management area (BMA) operators may also be affected by both the harvest operations and road access. Stakeholder involvement during plan development will allow consideration for other values and users to be incorporated in the FMP to minimize potential negative impacts from forest operations.

5.4 Prescriptions for the Protection of Values

Prescriptions for the protection of values from the potential impacts of forest operations have been included in the Area of Concern (AOC) Planning Documentation in Supplementary Documentation H and the operational prescriptions included in Table FMP-10. These prescriptions have been developed to prevent, minimize, or mitigate the impact to values associated with planned forest operations. Specific "compliance" indicators have been developed to ensure that values are being protected on the Whiskey Jack Forest. Compliance indicators are used to assess operational practices on the forest, to identify compliance issues and to determine training needs of forestry workers. Compliance indicators are also used to determine if operational practices are compromising the long-term sustainability of the forest, and implement a course of corrective action, where required. The Planning Team has developed compliance indicators to assess:

- Percent of forest operation inspections in non-compliance with management practices that prevent, minimize or mitigate site damage (by remedy type); and
- Percent of forest operations inspections in non-compliance with prescriptions developed for the protection of water quality and fish habitat (by remedy type).

The procedures that will be used to monitor the above-mentioned AOC prescriptions, as well as any other AOC prescriptions included in the plan are outlined in plan text Section 4.7.

5.5 Conclusion on the Sustainability of the FMP

Overall, based on the quantitative and qualitative objectives (Table FMP-9) that can be assessed during preparation of the forest management plan, there has been achievement in meeting or exceeding the desirable levels and associated targets for most indicators (forest condition, and goods and services). From a spatial perspective, the objectives related to landscape pattern (caribou habitat, distribution of landscape disturbance and clearcut sizes, marten core habitat) have been achieved or movement towards achievement has been demonstrated through projected implementation of the LTMD. The *Forest Management Guide for Natural Disturbance Pattern Emulation (MNR, 2001)* standard for frequency of planned clearcuts equal to or less than 260 ha (80%) is underachieved with 76% of planned clearcuts under 260 hectares in size. This result was acceptable given the initial landscape pattern, the strategic landscape objectives, public comments and operational considerations.

The social and economic assessment for this FMP indicates that current levels of social or economic benefits are projected to be maintained or increased for the 2012-2022 plan period, in comparison with the 2004-2024 FMP. The evaluation of the proposed operations for the 2012-2022 FMP indicates that they are consistent with those projected in the LTMD.

Overall, the assessment of objective achievement, the social and economic assessment and the Long-term Management Direction have all demonstrated that the 2012-2022 Forest Management Plan for the Whiskey Jack Forest has regard for plant life, animal life, water, soil, air, social and economic values, including recreational and heritage values. As a result, it can be concluded that this forest management plan provides for the sustainability of Ontario's Crown Forest on the Whiskey Jack Forest.

6.0 DOCUMENTATION

6.1 Supplementary Documentation

Supplementary Documentation accompanies this Forest Management Plan, and its contents are listed at the beginning of this plan with the Table of Contents.

6.2 Other Documentation

Some documentation was developed or referenced by the Planning Team during preparation of this forest management plan, but does not form part of the FMP.

The public correspondence related to the development of the plan is retained on file at the MNR Kenora District Office. The Aboriginal Background Information Reports for each Aboriginal community and Report on the Protection of Identified Aboriginal Values are also retained at the Kenora District MNR Office.

7.0 FOREST MANAGEMENT PLAN SUMMARY

The Forest Management Plan Summary is prepared as a separate document and is retained on file at the Kenora District MNR office in Kenora. The FMP Summary is available in English and French.

The FMP Summary files are as follows:

File Name:	Plan Component:
MU490_2012_FMP_P1_TXT_Sum.PDF	FMP Summary Text (English)
MU490_2012_FMP_P1_MAP_Sum_00.PDF	FMP Summary Map (English)
MU490_2012_FMP_P1_TXT_SumFR.PDF	FMP Summary Text (French)
MU490_2012_FMP_P1_MAP_SumFR_00.PDF	FMP Summary Map (French)

8.0 PLANNED OPERATIONS FOR THE SECOND FIVE-YEAR TERM

Prior to March 31, 2017, planned operations for the second five-year term will be prepared. The following forest management plan components will be completed at that time:

8.1 Introduction
8.2 Prescriptions for Operations
8.3 Harvest Operations
8.4 Renewal and Tending Operations
8.5 Roads
8.6 Expenditures
8.7 Monitoring and Assessment
8.8 Fire Prevention and Preparedness
8.9 Supplementary Documentation
8.10 Other Documentation
8.11 Planned Operations Summary

9.0 FOREST MANAGEMENT PLAN TABLES

The following is a listing of the tables required by the *Forest Management Planning Manual (2009)* included in this section:
(submitted in FMP file: MU490_2012_FMP_P1_TBL_Tables.PDF)

FMP-1	Management Unit Crown Land Summary
FMP-2	Description of Forest Units
FMP-3	Summary of Managed Crown Production Forest by Forest Unit
FMP-4	Silvicultural Ground Rules
FMP-5	Projected Forest Condition for the Crown Productive Forest
FMP-6	Projected Habitat for Species at Risk and Selected Wildlife Species
FMP-7	Projected Available Harvest Area by Forest Unit
FMP-8	Projected Available Harvest Volume by Species Group
FMP-9	Assessment of Objective Achievement
FMP-10	Operational Prescriptions for Areas of Concern
FMP-11	Planned Harvest Area
FMP-12	Planned Clearcuts > 260 Ha (5-Year)
FMP-13	Planned Harvest Volume by Species (10-Year)
FMP-14	Planned Harvest Volume and Wood Utilization (5-Year)
FMP-15	Planned Wood Utilization by Mill (5-Year)
FMP-16	Contingency Area: Harvest Area and Volume
FMP-17	Planned Renewal and Tending Operations
FMP-18	Road Construction and Use Management
FMP-19	Road Crossings, Landings and Aggregate Pits in Areas of Concern
FMP-20	Planned Expenditures (5-Year)
FMP-21	Area Planned for Assessment of Regeneration Success (10-Year)

Court File No. **446 / 15**

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

APPLICATION RECORD

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DECEMBER 10, 2021

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16.	The law of the land: Amnesty International Canada's position on the conflict over logging at Grassy Narrows (2007)	2849-2881
17.	Grassy Narrows First Nation – Primary Area of Interest (Forestry) (2011)	2882- 2883
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21.	Key ANA Correspondences to Ontario from 2018 to 2021: 1. The Hon. Greg Rickford, Minister of Northern Development, Mines, Natural Resources and Forestry Minister of Indigenous Affairs Re Mining Exploration Permits Issued in Grassy Narrows Traditional Territory dated July 7, 2021 2. ANA Letter to Ministers Wilkinson, Bennett, Yakabuski, Yurek, and Rickford RE: Ongoing Need to Establish a Governance Table on Land Protection and Related Self-	2912-2989

	Determination, dated March 29, 2021; 3. ANA Letter to Regional Manager, Ministry of Energy, Northern Development and Mines RE: Trillium Gold Leo Project Drilling Program, dated December 18, 2020 4. ANA Letter to Hon. Greg Rickford, Minister of Energy, Northern Development and Mines RE: Request to Exercise Mining Acts. 35(1) Withdrawal of Lands Power, dated November 13, 2020 5. ANA Letter to Hon. Greg Rickford, Minister of Energy, Northern Development and Mines RE: Request to Exercise Mining Act s. 35(1) Withdrawal of Lands Power, dated October 1, 2020 6. ANA Letter to Hon. Greg Rickfod, Minister of Energy, Northern Development and Mines RE: Request to exercise Mining Acts 35(1) withdrawal of lands power, dated February 26, 2020 7. ANA Open Letter Re: Moratorium on industry in our Traditional Territory, and opposition to MNR Tender Process, dated January 17, 2007 8. ANA Letter to Mr. Holmes, Mr. Brown, Ms. Stuart, Ms. Bjorgan, and Ms. Capling, dated December 20, 2019 9. Email communications from Lara Koerner-Yeo to Mr. Holmes, Mr. Brown, Ms. Stuard, Ms. Bjorgan and Ms. Capling dated February 25, 2020, February 6, 2020, January 28, 2020 and December 23, 2019 10. ANA Letter to Hon. Rod Phillips, Minister of Environment, Conservation and Parks, dated March 25, 2019 11. Email communication from David Sone to Hon. Jeff Yurek and Rod Phillips, dated October 11, 2018 12. ANA Letter to Hon. Jeff Yurek, Minister of Natural Resources and Forestry and The Honourable Rod Phillips Minister of Environment, Conservation and Parks, dated September 18, 2018	
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Court File No. **446 / 15**

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO),
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

APPLICATION UNDER Section 2(1)
of the *Judicial Review Procedure Act*
R.S.O. 1990, c. J.1

APPLICATION RECORD
VOLUME 2 OF 5

CANADIAN ENVIRONMENTAL LAW ASSOCIATION
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Joseph F. Castrilli (26123A)
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Court File No.

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
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2012 - 2022
Forest Management Plan
for the
Whiskey Jack Forest

Tables

Whiskey Jack Forest

2012 – 2022

Forest Management Plan

FMP Tables

Ontario

9.0 FOREST MANAGEMENT PLAN TABLES

The following is a listing of the tables required by the *Forest Management Planning Manual (2009)*:

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FMP-2	Description of Forest Units
FMP-3	Summary of Managed Crown Production Forest by Forest Unit
FMP-4	Silvicultural Ground Rules
FMP-5	Projected Forest Condition for the Crown Productive Forest
FMP-6	Projected Habitat for Species at Risk and Selected Wildlife Species
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FMP-8	Projected Available Harvest Volume by Species Group (10-Year)
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FMP-11	Planned Harvest Area
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FMP-20	Planned Expenditures (5-Year)
FMP-21	Area Planned for Assessment of Regeneration Success (10-Year)

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

FMP-1 MANAGEMENT UNIT CROWN LAND SUMMARY

Land Ownership and Type	Land Ownership (Hectares)				FRI Fields Used for Classification	
	Crown		Patent	Total		
	Managed (Owner = 1)	Other * (Owner = 5,7)	Crown Timber (Owner = 2)		POLY_TYPE	DEVSTAGE
Unsurveyed	0	0	0	0	UNS	
Non-forested						
Water	161,668	41,371	0	203,040	WAT	
Other Land						
Agricultural Land	0	0	0	0	DAL	
Grass & Meadow	13	0	0	13	GRS	
Unclassified	3,396	93	0	3,489	UCL, RRW, BFL, PIT	
Other (non-forested islands)	0	0	0	0	RCK	ACCESS1 = ISL
Subtotal Non-Forested	165,077	41,464	0	206,541		
Forested						
Non-Productive Forest						
Treed Muskeg	21,401	669	0	22,070	TMS	
Open Muskeg	32,104	1,489	0	33,594	OMS	
Brush & Alder	25,808	953	0	26,761	BSH	
Rock	17,347	1,654	0	19,001	RCK	ACCESS1 <> ISL
Subtotal Non-Productive	96,661	4,765	0	101,426		
Productive Forest						
Protection Forest						
Site	29,184	4,642	0	33,827	FOR	PF, ACCESS1 <> ISL
Islands	208	114	0	322	FOR	ACCESS1 = ISL
Non-Protection Forest Islands	3,123	2,003	0	5,126	FOR	ACCESS1 = ISL
Subtotal Protection	32,515	6,760	0	39,275		
Production Forest						
Recent Disturbance	20,766	0	0	20,766	FOR, FORMOD=RP	DEPHARV, DEPNAT
(1) Below Regeneration Standards - Older low stocked stands	20,140	3,750	0	23,890	FOR, FORMOD=RP	LOWMGMT, LOWSEED, LOWPLANT, LOWNAT
(2) Below Regeneration Standards - Recent not yet FTG	28,246	27	0	28,273	FOR, FORMOD=RP	NEWMGMT, NEWSEED, NEWPLANT, NEWNAT
Forest Stands	600,816	32,529	0	633,344	FOR, FORMOD=RP, MR	All except 3 lines above.
Subtotal Production	669,967	36,306	0	706,273		
Subtotal Productive	702,482	43,066	0	745,548		
Subtotal Forested	799,143	47,831	0	846,974		
Total	964,220	89,295	0	1,053,515		
	Total Crown:	1,053,515				

* Other: All Crown land that is not available for forest management purposes through legal designation. This includes provincial parks and conservation reserves regulated under the Provincial Parks and Conservation Reserves Act. It also includes areas established by policy direction (where forest management activity is not permitted) and higher order land use decisions (e.g., Ontario Living Legacy).

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

FMP-2 DESCRIPTION OF FOREST UNITS

Forest Unit		NW FEC Ecosite(s) (descending order of occurrence, only areas >100 ha)	Regional Forest Unit (descending order of occurrence)	Silvicultural System	FRI Parameters & Criteria (Script to be applied in specific sort order.)	Additional Information
Code	Name					
PRW	Red Pine and White Pine Mixedwood	15, 24, 11, 18, 20.	PrwMx, PwDom, PrDom	Clearcut	SORT ORDER 1: PW+PR >= 40	
CMX	Conifer Mixedwood	20, 14, 13, 26, 21, 19, 12, 17, 11, 22, 28, 27, 25, 16, 31, 23, 29, 32.	ConMx, UplCe	Clearcut	SORT ORDER 2: CE>=20 And (ECOSITE1 Like 'NW17*') SORT ORDER 13: SB+PJ+BF+SW+CE+PW+PR+LA+HE>=50	
OCL	Other Conifer Lowland	36, 34, 35.	OCLow	Clearcut	SORT ORDER 3: ((CE+LA>=50 Or WG='Ce' Or WG='La')) And PR+PW+PJ+SW+BW<10	
SBL	Black Spruce Lowland	36, 35, 34.	SbLow	Clearcut	SORT ORDER 4: (((ECOSITE1 Like 'NW34*' And PR+PW+PJ+SW+BF<=20) Or (ECOSITE1 Like 'NW35*' Or ECOSITE1 Like 'NW36*' Or ECOSITE1 Like 'NW37*') Or (ECOSITE1 Like 'NW38*' And (WG='Sx' Or WG='Sb' Or WG='Ce' Or WG='La'))))	
SPD	Spruce Dominated Upland	20, 26, 13, 35, 22, 31, 12, 14, 21, 34, 27, 28, 19, 36, 25, 29, 11, 32, 24, 23.	SbDee, SbSha, SbMx1, BfMx1	Clearcut	SORT ORDER 5: SB+SW>=70 And PO+PB+BW<=20	
PJD	Jack Pine Dominated		PjSha, PjDee	Clearcut	SORT ORDER 6: ((PJ>=70 And PO+PB+BW<=20) Or (PJ>=50 And PO+PB+BW<=20 And AGE>=120) Or (PJ>=70 And (ECOSITE1 Like 'NW13*' Or ECOSITE1 Like 'NW14*')))	
POD	Poplar Dominated		PoDee, PoSha	Clearcut	SORT ORDER 7: PO+PB>=70	
OTH	Other Hardwood	30, 38, 37, 36.	OthHd	Clearcut	SORT ORDER 8: MS+AB+EW+OW+QR+BD>=30	
SPM	Spruce Dominated Mixedwood	20, 13, 12, 26, 14, 22, 21, 19, 31, 11, 25, 28, 27, 24, 29, 32.	SbMx1	Clearcut	SORT ORDER 9: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And (SB+SW)>PJ	
PJM	Jack Pine Mixedwood	13, 14, 11, 12, 20, 25, 21, 26, 22, 19, 31.	PjMx1	Clearcut	SORT ORDER 10: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And PJ>=(SB+SW)	
BFM	Balsam Fir Mixedwood	21, 27, 14, 26, 20, 22, 12, 19, 29, 13, 31.	BfMx1, BfPur, ConMx	Clearcut	SORT ORDER 11: PR+SB+PJ+SW+BF+PW+CE+LA+HE>=70 And BF>10 And BF+SW>=30	
HMX	Hardwood Mixedwood	19, 28, 16, 29, 23, 20, 13, 14, 12, 21, 27, 26, 33, 22, 25, 11, 15, 30.	HrdMw, HrDom, BwDee, BwSha	Clearcut	SORT ORDER 12: PO+PB+BW+MS+AB+EW+OW+QR+BD>=50	

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

FMP-3 SUMMARY OF MANAGED CROWN PRODUCTIVE FOREST BY FOREST UNIT

Forest Unit	Age Class	Protection Forest (ha)	Production Forest		
			Unavailable (ha)	Stage of Management	Available (ha)
BFM	1-20	53	67	Clearcut	6,577
	21-40	3	41	Clearcut	15,935
	41-60		23	Clearcut	2,017
	61-80		62	Clearcut	4,513
	81-100		21	Clearcut	2,477
	101-120		36	Clearcut	893
	121-140		2	Clearcut	177
	141+			Clearcut	95
BFM Subtotal		55	252		32,684
CMX	1-20	95	52	Clearcut	16,733
	21-40	470	105	Clearcut	18,051
	41-60	313	54	Clearcut	8,041
	61-80	662	175	Clearcut	18,401
	81-100	1,059	235	Clearcut	12,091
	101-120	422	237	Clearcut	5,838
	121-140	33	10	Clearcut	1,004
	141+			Clearcut	333
CMX Subtotal		3,053	868		80,493
HMX	1-20	118	2	Clearcut	10,091
	21-40	629	30	Clearcut	14,126
	41-60	569	257	Clearcut	24,278
	61-80	2,551	426	Clearcut	30,738
	81-100	1,577	357	Clearcut	8,888
	101-120	355	153	Clearcut	5,668
	121-140			Clearcut	307
	141+			Clearcut	
HMX Subtotal		5,798	1,225		94,097
OCL	1-20			Clearcut	161
	21-40			Clearcut	83
	41-60			Clearcut	
	61-80			Clearcut	17
	81-100	6		Clearcut	145
	101-120	11		Clearcut	269
	121-140	99		Clearcut	669
	141+	101		Clearcut	550
OCL Subtotal		217	0		1,895

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

FMP-3 SUMMARY OF MANAGED CROWN PRODUCTIVE FOREST BY FOREST UNIT

Forest Unit	Age Class	Protection Forest (ha)	Production Forest		
			Unavailable (ha)	Stage of Management	Available (ha)
OTH	1-20			Clearcut	134
	21-40			Clearcut	31
	41-60			Clearcut	53
	61-80			Clearcut	182
	81-100	18		Clearcut	952
	101-120	11		Clearcut	409
	121-140			Clearcut	103
	141+	18		Clearcut	17
OTH Subtotal		47	0		1,880
PJD	1-20	123	29	Clearcut	20,471
	21-40	5,673	68	Clearcut	90,330
	41-60	109	33	Clearcut	6,656
	61-80	767	34	Clearcut	9,677
	81-100	2,838	550	Clearcut	24,963
	101-120	999	132	Clearcut	6,508
	121-140	81	155	Clearcut	3,218
	141+	97	3	Clearcut	558
PJD Subtotal		10,687	1,004		162,380
PJM	1-20	67		Clearcut	14,484
	21-40	390		Clearcut	8,544
	41-60	106		Clearcut	2,876
	61-80	1,140	28	Clearcut	4,731
	81-100	3,047	123	Clearcut	12,711
	101-120	708	160	Clearcut	8,680
	121-140		28	Clearcut	402
	141+			Clearcut	52
PJM Subtotal		5,458	340		52,479
POD	1-20	8	41	Clearcut	15,048
	21-40	320	27	Clearcut	4,374
	41-60	36	59	Clearcut	6,610
	61-80	493	627	Clearcut	22,013
	81-100	193	632	Clearcut	10,017
	101-120	238	319	Clearcut	8,297
	121-140			Clearcut	26
	141+			Clearcut	
POD Subtotal		1,289	1,704		66,385

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

FMP-3 SUMMARY OF MANAGED CROWN PRODUCTIVE FOREST BY FOREST UNIT

Forest Unit	Age Class	Protection Forest (ha)	Production Forest		
			Unavailable (ha)	Stage of Management	Available (ha)
PRW	1-20			Clearcut	260
	21-40			Clearcut	28
	41-60			Clearcut	25
	61-80			Clearcut	70
	81-100	33		Clearcut	398
	101-120	2	3	Clearcut	117
	121-140	24		Clearcut	321
	141+		12	Clearcut	297
PRW	**Subtotal**	59	15		1,514
SBL	1-20	33	2	Clearcut	4,483
	21-40	13		Clearcut	2,963
	41-60			Clearcut	135
	61-80			Clearcut	302
	81-100	63		Clearcut	862
	101-120	139	1	Clearcut	667
	121-140	781	10	Clearcut	2,044
	141+	1,431	19	Clearcut	4,051
SBL	**Subtotal**	2,460	33		15,505
SPD	1-20	90	27	Clearcut	32,411
	21-40	43	43	Clearcut	18,579
	41-60		36	Clearcut	4,256
	61-80		69	Clearcut	29,882
	81-100	6	109	Clearcut	17,327
	101-120	16	80	Clearcut	6,553
	121-140	29	27	Clearcut	3,871
	141+	4	17	Clearcut	1,764
SPD	**Subtotal**	188	408		114,645
SPM	1-20	81	4	Clearcut	13,279
	21-40	1		Clearcut	3,810
	41-60			Clearcut	1,976
	61-80		22	Clearcut	8,967
	81-100		102	Clearcut	8,503
	101-120		34	Clearcut	5,102
	121-140		28	Clearcut	1,385
	141+			Clearcut	73
SPM	**Subtotal**	82	190		43,095

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

FMP-3 SUMMARY OF MANAGED CROWN PRODUCTIVE FOREST BY FOREST UNIT

Forest Unit	Age Class	Protection Forest (ha)	Production Forest		
			Unavailable (ha)	Stage of Management	Available (ha)
Total All Forest Units	1-20	667	225	clearcut	134,133
	21-40	7,542	314	clearcut	176,854
	41-60	1,132	462	clearcut	56,921
	61-80	5,613	1,444	clearcut	129,492
	81-100	8,840	2,129	clearcut	99,334
	101-120	2,900	1,154	clearcut	48,999
	121-140	1,047	261	clearcut	13,528
	141+	1,651	51	clearcut	7,789
Total All Forest Units		29,392	6,039		667,051
				Total Production Forest:	673,090
				Total Productive Forest:	702,482

NOTE: The above table reflects the base model inventory (Dec11_BMI_OPDEF) availability data.
* The available data includes 20,140 hectares of Crown Managed, DEVSTAGE LOWNAT area that has been classified as non-forest in the strategic modelling (SFMM) land base (see Analysis Package for rationale). This LOW area is split 20,036 ha available, 104 ha unavailable.
* Forested islands (3,123 ha) are included with Protection Forest (PF) in FMP-1 and SFMM modelling, but classified as unavailable in the Base Model Inventory and FMP-3.
* Estimated bypass, AOC reserves, Mgmt Res and inaccessible are classified as available in the BMI and FMP-3, but considered unavailable reserve in SFMM for strategic modelling purposes (33,417+76,265+1,389+124 = 109,692 ha)(Table FMP-1a).

The comparable sub-totals for this OWNERSHIP 1 Crown Managed forest table considering the reclassification of LOWNAT area, forested islands, estimated bypass/reserves for SFMM modelling are:

Protection Forest - 32,515 ha (includes forested islands, matches FMP-1).
Unavailable - 131,335 ha (includes unavailable (non-forest) LOWNAT area, estimated bypass/reserves/inaccessible).
Available - 538,618 (excl. unavail. LOWNAT and est. bypass/reserves, matches reconciliation of SFMM land base).

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

Reconciliation of SFMM Initial Land Base to Tables FMP-1 and FMP-3.

SFMM Classification	Area in Hectares		Inventory Classification (OWNER, and POLYTYPE)
	SFMM Model	FMP-1 and FMP-3	
Available	538,619	667,051	OWNER = 1, POLYTYPE = FOR.
			Available breakdown from FMP-3.
Reserve (Unavailable)			Includes OWNER = 1, LOWNAT DEVSTAGE area (20,036 ha).
Slope-based Riparian	64,763		Estimated reserve areas in SFMM are classified as available in FMP-3.
Tourism	10,373		Estimated reserve areas in SFMM are classified as available in FMP-3.
Nests	1,129		Estimated reserve areas in SFMM are classified as available in FMP-3.
Pass	33,417		Estimated reserve areas in SFMM are classified as available in FMP-3.
Protf	34,149	34,149	FORMOD = PF, OWNER = 1, 5, 7 (excludes forested islands)
Forested Islands - Crown Managed	3,123		ACCESS1 = ISL, OWNER = 1
Forested Islands - Park		2,003	ACCESS1 = ISL, OWNER = 5, 7.
Parks	38,309	36,306	FORMOD = FOR, OWNER = 5 or 7 only. (includes forested islands in SFMM)
Management Reserve	1,389		
Access	124		POLYTYPE = FOR, ACCESS1=LUD, NAT, PEN. OWNER = 1.
		6,039	Unavailable in Table FMP-3, OWNER = 1
Reserve (Unavailable) Subtotal	186,776	78,496	(unavailable includes 104 ha LOWNAT and 3,123 ha Forested Islands).
Non-forest and Non-Productive			
OpMsk	33,594	33,594	POLYTYPE = OMS, OWNER = 1, 5, or 7.
TrMsk	22,070	22,070	POLYTYPE = TMS, OWNER = 1, 5, or 7.
BrsAld	26,761	26,761	POLYTYPE = BSH, OWNER = 1, 5, or 7.
Grass & Meadow	13	13	POLYTYPE = GRS, OWNER = 1, 5, or 7.
Rock	19,001	19,001	POLYTYPE = RCK, OWNER = 1, 5, or 7.
Agricultural Land	0	0	POLYTYPE = DAL, OWNER = 1, 5, or 7.
Water	203,040	203,040	POLYTYPE = WAT, OWNER = 1, 5, or 7.
UCL	3,489	3,489	POLYTYPE = UCL, RRW, or BFL, OWNER = 1, 5, or 7.
Older LOWNAT	20,140		OWNER=1 only.
Non-forested Islands ISL	0	0	POLYTYPE = RCK, ACCESS1 = ISL, OWNER = 1, 5, or 7.
Subtotal	328,108	307,967	
TOTAL SFMM AREA	1,053,501	1,053,515	Total Ownerships 1, 5, and 7.
TOTAL CROWN LAND BASE	**1,053,501**	**1,053,515**	10 ha variance due to rounding convention during SFMM area import. Acceptable.
Patent Land	0	0	Total Patent Ownership = 2 (not included in SFMM land base).
TOTAL LAND BASE OF THE FOREST	**1,053,501**	**1,053,515**	

Hierarchy for Classification of SFMM Initial Land Base: (unique sort - once an area is tagged, it is not retagged.)

Order:

1 **Patent** - Sort for non-Crown ownership 2, all land types. (not included in SFMM land base, but is included in land base reconciliation to Table FMP-1)
NOTE: Non-Crown ownerships 6, 8, 9, and Patent ownership 3, 4, all land types, are not included in SFMM land base and not included in Table FMP-1.

2 **RESERVE - ProtF** - Sort for Protection Forest

3 **NON-FOREST** - Sort for non-productive forest classes based on POLYTYPE, includes:

ISL POLYTYPE = RCK and ACCESS1 = ISL (sorted before rock is tagged)
LOW LOWNAT and LOWMGMT (team decision to consider Crown, managed, non-productive for SFMM modelling).
OMS Open Muskeg
TMS Treed Muskeg
BSH Brush & Alder
GRS Grass & Meadow
DAL Designated Agricultural Land
UCL UCL, PIT, RRW, BFL
WAT Water
RCK Rock

4 Sort for unavailable **RESERVE** classifications:

PARKS Productive Crown park land (ownership 5 and 7)
ISLND Forested islands (Ownership 1)
RIPAR Estimated slope-based Riparian reserve
TOURS Estimated Tourism Reserve
NESTS Estimated Nest Reserve
Access Classified actual areas with access issues.
MgRes Classified Management Reserves not otherwise classified as reserve (above).

5 **AVAIL** - Remainder of forest available for timber production
- Crown, managed ownership 1 only
- productive, forested land and not otherwise estimated to be reserved from harvest or non-forest.
(deferrals for large landscape patches and delay in availability of certain stands (harvest deferral) is applied to this AVAIL land base only.)

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

General Notes for the Silvicultural Ground Rules for the 2012-2022 Whiskey Jack Forest

Notes
1. Ecosites listed in the SGR are based on the Forest Ecosite Classification for vegetation and soils types for Terrestrial and Wetland Ecosites of Northwestern Ontario (Racey et al., May 1996). Ecosite classification will be confirmed prior to implementation of a silvicultural ground rule.
2. The most prominent ecosites that will receive the treatment are identified in **bold text.**
3. Regeneration Standard: a. These are the standards for determining regeneration success (e.g. acceptable species, the timeframes required, site occupancy). The standards of regeneration success are consistent with the development information associated with the desired future forest unit. b. FTG – Free-to-Grow - meaning the stand has met the indicated criteria and the regenerating crop is essentially healthy and free from competition. Stands are still monitored. c. Density – the use of density vs. stocking targets depends on the type of treatments employed. For treatments that uses extensive and basic, will receive regular free to grow, Large Scale Photography (LSP) or ocular survey and contain stocking. For areas treated intensively, will receive well-spaced free growing survey and will be density regulated.
4. Silvicultural System and Silvicultural Treatments: a. Silvicultural System – the Clearcut Silvicultural System is noted by the code “CC”. b. Silvicultural Treatments - For each silvicultural ground rule, the most common series of silvicultural and acceptable alternative treatments have been identified. Where a silvicultural treatment differs from the recommendations in the appropriate silvicultural guide, that treatment will be identified as an exception.
5. Harvest Method: Refers to the variant of the general silviculture system (e.g. conventional or strip clearcut, uniform shelterwood) as well as any reference to commercial thinning.
6. Logging Method: Describes the type of timber extraction, which is typically tree length.
7. Site Preparation: Describes the treatments that may be used to prepare harvested sites for renewal. Treatments may be used in combinations.
8. Regeneration: Describes the treatments that may be used to regenerate the site for renewal. Treatments may be used in combinations.
9. Tending: Describes the treatments used to control competition/enhance growth. Treatments may be used in combinations.
10. Site Occupancy: See monitoring program for regeneration success Supplementary Documentation F. A minimum of 80% site occupancy is the target.

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	BFM-EXT-BFM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
BFM	NW21, 34% NW27, 21% **NW14, 16%** **NW26, 11%** NW20, 7%	BFM	Species Comp.: Bf40Sb20Po20Pj10Sw5Bw5 Average Stocking: 60% Age of Min. Operability: 65 yrs Min. Operability Volume: 65 m3 Age of Max Volume: 95 yrs Max Volume: 97 m3	<u>Species Composition</u> Target Species: Bf+Ce+La+Pr+Pj+Pw+Sb+Sw Acceptable Species: Po+Bw<30
<u>Preferred Sites</u> Site Class: 3 <u>Present Stand Characteristics</u> Spec. Comp.: Bf50Sb30Sw10Po5Bw5 Stocking: 71% Site Class: 2		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: BFM - Extensive - 35% Percent Application Term 1: 18% Forest Unit Definition: PR+SB+PJ+SW+BF+PW+CE+LA+HE>=70 And BF>10 And BF+SW>=30		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target and Acceptable Species)</u> Minimum Stocking: 60% Target Stocking: 80% <u>Survey Methodology</u> Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A	**ES14 ES26**	**N/A**	**N/A**	**N/A**

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	BFM-EXT-CMX	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
BFM	NW21, 34% NW27, 21% **NW14, 16%** **NW26, 11%** NW20, 7%	CMX	Species Comp.: Sb40Pj20Po20Ce10Bw10 Average Stocking: 54% Age of Min. Operability: 65 yrs Min. Operability Volume: 72 m3 Age of Max Volume: 95 yrs Max Volume: 88 m3	<u>Species Composition</u> Target Species: Ce+Pj+Pw+Pr+Sb+Sw+Ce+La Acceptable Species: Po+Bw<50
<u>Preferred Sites</u> Site Class: 3 <u>Present Stand Characteristics</u> Spec. Comp.: Bf50Sb30Sw10Po5Bw5 Stocking: 71% Site Class: 2		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: CMX - Extensive - 15% Percent Application Term 1: 8% Forest Unit Definition: CE>=20 And (ECOSITE1 Like 'NW17*') OR SB+PJ+BF+SW+CE+PW+PR+LA+HE>=50		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target and Acceptable Species)</u> Minimum Stocking: 60% Target Stocking: 80% <u>Survey Methodology</u> Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A	ES14 ES26	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	BFM-EXT-HMX	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
BFM	NW21, 34% **NW27, 21%** NW14, 16% NW26, 11% NW20, 7%	HMX	Species Comp.:Po40Sb20Bw20Bf10Pj5Sw5 Average Stocking: 62% Age of Min. Operability: 65 yrs Min. Operability Volume: 84 m3 Age of Max Volume: 85 yrs Max Volume: 89 m3	Species Composition Target Species: Bw+Po+Ms+Ab Acceptable Species: Bf+Ce+La+Pj+Pr+Pw+Sb+Sw<50
Preferred Sites Site Class: 3 Present Stand Characteristics Spec. Comp.: Bf50Sb30Sw10Po5Bw5 Stocking: 71% Site Class: 2		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: HMX - Extensive - 30% Percent Application Term 1: 15% Forest Unit Definition: PO+PB+BW+MS+AB+EW+OW+QR+BD>=50		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 70% Target Stocking: 80% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A	N/A	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	BFM-BA1-PJM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
BFM	NW21, 34% NW27, 21% NW14, 16% **NW26, 11%** NW20, 7%	PJM	Species Comp.:Pj70Sb30 Average Stocking: 71% Age of Min. Operability: 55 yrs Min. Operability Volume: 104 m3 Age of Max Volume: 65 yrs Max Volume: 110 m3	Species Composition Target Species: Pj+Sb+Sw Acceptable Species: Pw+La+(Po+Bw<=10)<=20
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Bf50Sb30Sw10Po5Bw5 Stocking: 71% Site Class: 2		Silvicultural Intensity: Basic Future Forest Unit Development Rate: PJM - Basic - 40% Percent Application Term 1: 20% Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And PJ>=(SB+SW)		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 80% Target Stocking: 90% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length			Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A	ES26	ES26	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	BFM-EXT-POD	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
BFM	NW21, 34% **NW27, 21%** NW14, 16% NW26, 11% NW20, 7%	POD	Species Comp.:Po90Sb10 Average Stocking: 76% Age of Min. Operability: 55 yrs Min. Operability Volume: 105 m3 Age of Max Volume: 75 yrs Max Volume: 133 m3	Species Composition Target Species: Po Acceptable Species: Ce+La+Pj+Pr+Pw+Sb+Sw<30
Preferred Sites Site Class: 3 Present Stand Characteristics Spec. Comp.: Bf50Sb30Sw10Po5Bw5 Stocking: 71% Site Class: 2		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: POD - Extensive - 10% Percent Application Term 1: Incidental Treatment Forest Unit Definition: PO+PB>=70		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 80% Target Stocking: 90% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package		Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A	N/A	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	BFM-BA1-SPD	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
BFM	NW21, 34% NW27, 21% **NW14, 16%** **NW26, 11%** NW20, 7%	SPD	Species Comp.:Sb80Pj10Bw10 Average Stocking: 75% Age of Min. Operability: 60 yrs Min. Operability Volume: 98 m3 Age of Max Volume: 105 yrs Max Volume: 166 m3	Species Composition Target Species: Sb+Sw Acceptable Species: Ce+La+Pj+Pr+Pw+(Po+Bw<=20)<=30
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Bf50Sb30Sw10Po5Bw5 Stocking: 71% Site Class: 2		Silvicultural Intensity: Basic Future Forest Unit Development Rate: SPD - Basic - 10% Percent Application Term 1: Incidental Treatment Forest Unit Definition: SB+SW>=70 And PO+PB+BW<=20		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 80% Target Stocking: 90% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A	ES14 ES26	ES14 ES26	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	BFM-BA1-SPM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
BFM	NW21, 34% NW27, 21% **NW14, 16%** **NW26, 11%** NW20, 7%	SPM	Species Comp.:Sb60Pj30Po10 Average Stocking: 75% Age of Min. Operability: 60 yrs Min. Operability Volume: 82 m3 Age of Max Volume: 105 yrs Max Volume: 163 m3	Species Composition Target Species: Sb+Sw+Pj Acceptable Species: Pw+La+(Po+Bw<=20)<=30
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Bf50Sb30Sw10Po5Bw5 Stocking: 71% Site Class: 2		Silvicultural Intensity: Basic Future Forest Unit Development Rate: SPM - Basic - 20% Percent Application Term 1: 10% Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And (SB+SW)>PJ		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 80% Target Stocking: 90% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length			Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A	ES14 ES26	ES14 ES26	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	CMX-EXT-CMX

Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	Species Composition Target Species: Ce+Pj+Pw+Pr+Sb+Sw+Ce+La Acceptable Species: Po+Bw<50
CMX	NW20, 19% **NW14, 16%** NW13, 14% **NW26, 9%** **NW21, 8%**	CMX	Species Comp.: Sb40Pj20Po20Ce10Bw10 Average Stocking: 54% Age of Min. Operability: 65 yrs Min. Operability Volume: 72 m3 Age of Max Volume: 95 yrs Max Volume: 88 m3	
Preferred Sites Site Class: 3 Present Stand Characteristics Spec. Comp.: Sb40Pj20Po20Bf10Bw10 Stocking: 63% Site Class: 2		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: CMX - Extensive - 40% Percent Application Term 1: 10% Forest Unit Definition: CE>=20 And (ECOSITE1 Like 'NW17*') OR SB+PJ+BF+SW+CE+PW+PR+LA+HE>=50		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 60% Target Stocking: 80% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES21	ES13 ES14 ES26	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	CMX-BA1-CMX	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
CMX	NW20, 19% **NW14, 16%** NW13, 14% **NW26, 9%** **NW21, 8%**	CMX	Species Comp.: Sb40Pj20Po20Ce10Bw10 Average Stocking: 71% Age of Min. Operability: 60 yrs Min. Operability Volume: 72 m3 Age of Max Volume: 85 yrs Max Volume: 111 m3	<u>Species Composition</u> Target Species: Ce+Pj+Pw+Pr+Sb+Sw+Ce+La Acceptable Species: Po+Bw<50
<u>Preferred Sites</u> Site Class: X, 1 or 2 <u>Present Stand Characteristics</u> Spec. Comp.: Sb40Pj20Po20Bf10Bw10 Stocking: 63% Site Class: 2		Silvicultural Intensity: Basic Future Forest Unit Development Rate: CMX - Basic - 14% Percent Application Term 1: 7% Forest Unit Definition: CE>=20 And (ECOSITE1 Like 'NW17*') OR SB+PJ+BF+SW+CE+PW+PR+LA+HE>=50		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target and Acceptable Species)</u> Minimum Stocking: 80% Target Stocking: 90% <u>Survey Methodology</u> Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length			Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES21	**ES13 ES14 ES26**	**ES13 ES14 ES21**	**N/A**	**N/A**

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	CMX-EXT-HMX	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
CMX	NW20, 19% NW14, 16% NW13, 14% NW26, 9% NW21, 8%	HMX	Species Comp.:Po40Sb20Bw20Bf10Pj5Sw5 Average Stocking: 62% Age of Min. Operability: 65 yrs Min. Operability Volume: 84 m3 Age of Max Volume: 85 yrs Max Volume: 89 m3	<u>Species Composition</u> Target Species: Bw+Po+Ms+Ab Acceptable Species: Bf+Ce+La+Pj+Pr+Pw+Sb+Sw<50
<u>Preferred Sites</u> Site Class: 3 <u>Present Stand Characteristics</u> Spec. Comp.: Sb40Pj20Po20Bf10Bw10 Stocking: 63% Site Class: 2		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: HMX - Extensive - 30% Percent Application Term 1: 7% Forest Unit Definition: PO+PB+BW+MS+AB+EW+OW+QR+BD>=50		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target and Acceptable Species)</u> Minimum Stocking: 70% Target Stocking: 80% <u>Survey Methodology</u> Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A	N/A	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	CMX-BA1-PJD	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
CMX	NW20, 19% **NW14, 16%** NW13, 14% NW26, 9% NW21, 8%	PJD	Species Comp.:Pj80Sb20 Average Stocking: 85% Age of Min. Operability: 50 yrs Min. Operability Volume: 105 m3 Age of Max Volume: 75 yrs Max Volume: 128 m3	Species Composition Target Species: Pj Acceptable Species: Ce+La+Pr+Pw+Sb+Sw+(Po+Bw<=10)<=20
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Sb40Pj20Po20Bf10Bw10 Stocking: 63% Site Class: 2		Silvicultural Intensity: Basic Future Forest Unit Development Rate: PJD - Basic - 10% Percent Application Term 1: 6% Forest Unit Definition: ((PJ>=70 And PO+PB+BW<=20) Or (PJ>=50 And PO+PB+BW<=20 And AGE>=120) Or (PJ>=70 And (ECOSITE1 Like 'NW13*' Or ECOSITE1 Like 'NW14*')))		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 90% Target Stocking: 100% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Seeding	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical	Plant (1.8x1.8m Spacing)	Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES14	ES13 ES14	ES13 ES14	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	CMX-INT-PJD	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
CMX	NW20, 19% **NW14, 16%** NW13, 14% NW26, 9% NW21, 8%	PJD	Species Comp.:Pj90Sb10 Average Stocking: 95% Age of Min. Operability: 50 yrs Min. Operability Volume: 118 m3 Age of Max Volume: 75 yrs Max Volume: 143 m3	<u>Species Composition</u> Target Species: Pj Acceptable Species: Ce+La+Pr+Pw+Sb+Sw+(Po+Bw<=10)<=20
<u>Preferred Sites</u> Site Class: X, 1 or 2 <u>Present Stand Characteristics</u> Spec. Comp.: Sb40Pj20Po20Bf10Bw10 Stocking: 63% Site Class: 2		Silvicultural Intensity: Intensive Future Forest Unit Development Rate: PJD - Intensive - 10% Percent Application Term 1: Incidental Treatment Forest Unit Definition: ((PJ>=70 And PO+PB+BW<=20) Or (PJ>=50 And PO+PB+BW<=20 And AGE>=120) Or (PJ>=70 And (ECOSITE1 Like 'NW13*' Or ECOSITE1 Like 'NW14*')))		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target Species)</u> Minimum Density: 1500 sph Maximum Density: 2500 sph <u>Survey Methodology</u> Well Spaced Free Growing

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	Spacing
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES14	ES13 ES14	ES13 ES14	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	CMX-EXT-PJM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
CMX	NW20, 19% NW14, 16% NW13, 14% **NW26, 9%** **NW21, 8%**	PJM	Species Comp.:Pj60Sb20Po20 Average Stocking: 65% Age of Min. Operability: 60 yrs Min. Operability Volume: 90 m3 Age of Max Volume: 65 yrs Max Volume: 98 m3	Species Composition Target Species: Pj+Sb+Sw Acceptable Species: Pw+La+(Po+Bw<=20)<=30
Preferred Sites Site Class: 3 Present Stand Characteristics Spec. Comp.: Sb40Pj20Po20Bf10Bw10 Stocking: 63% Site Class: 2		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: PJM - Extensive - 20% Percent Application Term 1: Incidental Treatment Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And PJ>=(SB+SW)		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 70% Target Stocking: 80% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES21	ES26	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	CMX-BA1-PJM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
CMX	NW20, 19% NW14, 16% NW13, 14% **NW26, 9%** **NW21, 8%**	PJM	Species Comp.:Pj70Sb30 Average Stocking: 71% Age of Min. Operability: 55 yrs Min. Operability Volume: 104 m3 Age of Max Volume: 65 yrs Max Volume: 110 m3	Species Composition Target Species: Pj+Sb+Sw Acceptable Species: Pw+La+(Po+Bw<=10)<=20
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Sb40Pj20Po20Bf10Bw10 Stocking: 63% Site Class: 2		Silvicultural Intensity: Basic Future Forest Unit Development Rate: PJM - Basic - 45% Percent Application Term 1: 25% Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And PJ>=(SB+SW)		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 80% Target Stocking: 90% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Seeding	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical	Plant (1.8x1.8m Spacing)	Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES21	ES26	ES26	ES21 (1) ES21 (2)	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	CMX-INT-PJM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
CMX	NW20, 19% NW14, 16% NW13, 14% **NW26, 9%** **NW21, 8%**	PJM	Species Comp.:Pj70Sb30 Average Stocking: 90% Age of Min. Operability: 55 yrs Min. Operability Volume: 128 m3 Age of Max Volume: 75 yrs Max Volume: 139 m3	Species Composition Target Species: Pj+Sb+Sw Acceptable Species: Pw+La+(Po+Bw<=10)<=20
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Sb40Pj20Po20Bf10Bw10 Stocking: 63% Site Class: 2		Silvicultural Intensity: Intensive Future Forest Unit Development Rate: PJM - Intensive - 14% Percent Application Term 1: Incidental Treatment Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And PJ>=(SB+SW)		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target Species) Minimum Density: 1500 sph Maximum Density: 2500 sph Survey Methodology Well Spaced Free Growing

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	Spacing
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES21	ES26	ES26	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	CMX-EXT-POD	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
CMX	**NW20, 19%** NW14, 16% NW13, 14% NW26, 9% NW21, 8%	POD	Species Comp.:Po90Sb10 Average Stocking: 76% Age of Min. Operability: 55 yrs Min. Operability Volume: 105 m3 Age of Max Volume: 75 yrs Max Volume: 133 m3	<u>Species Composition</u> Target Species: Po Acceptable Species: Ce+La+Pj+Pr+Pw+Sb+Sw<30
<u>Preferred Sites</u> Site Class: 3 <u>Present Stand Characteristics</u> Spec. Comp.: Sb40Pj20Po20Bf10Bw10 Stocking: 63% Site Class: 2		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: POD - Extensive - 10% Percent Application Term 1: Incidental Treatment Forest Unit Definition: PO+PB>=70		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target and Acceptable Species)</u> Minimum Stocking: 80% Target Stocking: 90% <u>Survey Methodology</u> Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A	N/A	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	CMX-BA1-PRW	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
CMX	**NW20, 19%** NW14, 16% NW13, 14% NW26, 9% NW21, 8%	PRW	Species Comp.:Pr70Pw30 Average Stocking: 65% Age of Min. Operability: 65 yrs Min. Operability Volume: 118 m3 Age of Max Volume: 105 yrs Max Volume: 166 m3	Species Composition Target Species: Pr+Pw Acceptable Species: Ce+La+Pj+Sb+Sw+Po+Bw<60
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Sb40Pj20Po20Bf10Bw10 Stocking: 63% Site Class: 2		Silvicultural Intensity: Basic Future Forest Unit Development Rate: PRW - Basic - 1% Percent Application Term 1: Incidental Treatment Forest Unit Definition: PW+PR >= 40		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 70% Target Stocking: 80% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A			N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	CMX-INT-PRW	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
CMX	**NW20, 19%** NW14, 16% NW13, 14% NW26, 9% NW21, 8%	PRW	Species Comp.:Pr70Pw30 Average Stocking: 70% Age of Min. Operability: 65 yrs Min. Operability Volume: 146 m3 Age of Max Volume: 145 yrs Max Volume: 206 m3	Species Composition Target Species: Pr+Pw Acceptable Species: Ce+La+Pj+Sb+Sw+Po+Bw<60
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Sb40Pj20Po20Bf10Bw10 Stocking: 63% Site Class: 2		Silvicultural Intensity: Intensive Future Forest Unit Development Rate: PRW - Intensive - 1% Percent Application Term 1: Incidental Treatment Forest Unit Definition: PW+PR >= 40		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target Species) Minimum Density: 1500 sph Maximum Density: 2500 sph Survey Methodology Well Spaced Free Growing

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	Spacing
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A			N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	CMX-BA1-SPD	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
CMX	NW20, 19% **NW14, 16%** **NW13, 14%** **NW26, 9%** NW21, 8%	SPD	Species Comp.:Sb80Pj10Bw10 Average Stocking: 75% Age of Min. Operability: 60 yrs Min. Operability Volume: 98 m3 Age of Max Volume: 105 yrs Max Volume: 166 m3	Species Composition Target Species: Sb+Sw Acceptable Species: Ce+La+Pj+Pr+Pw+(Po+Bw<=20)<=30
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Sb40Pj20Po20Bf10Bw10 Stocking: 63% Site Class: 2		Silvicultural Intensity: Basic Future Forest Unit Development Rate: SPD - Basic - 10% Percent Application Term 1: 6% Forest Unit Definition: SB+SW>=70 And PO+PB+BW<=20		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 80% Target Stocking: 90% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A	ES13 ES14 ES26	ES13 ES14 ES26	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	CMX-INT-SPD	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
CMX	NW20, 19% **NW14, 16%** **NW13, 14%** **NW26, 9%** NW21, 8%	SPD	Species Comp.:Sb90Pj10 Average Stocking: 85% Age of Min. Operability: 60 yrs Min. Operability Volume: 110 m3 Age of Max Volume: 105 yrs Max Volume: 187 m3	Species Composition Target Species: Sb+Sw Acceptable Species: Ce+La+Pj+Pr+Pw+(Po+Bw<=10)<=20
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Sb40Pj20Po20Bf10Bw10 Stocking: 63% Site Class: 2		Silvicultural Intensity: Intensive Future Forest Unit Development Rate: SPD - Intensive - 40% Percent Application Term 1: 6% Forest Unit Definition: SB+SW>=70 And PO+PB+BW<=20		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target Species) Minimum Density: 1500 sph Maximum Density: 2500 sph Survey Methodology Well Spaced Free Growing

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	Spacing
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A	ES13 ES14 ES26	ES13 ES14 ES26	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	CMX-BA1-SPM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
CMX	NW20, 19% **NW14, 16%** **NW13, 14%** **NW26, 9%** NW21, 8%	SPM	Species Comp.:Sb60Pj30Po10 Average Stocking: 75% Age of Min. Operability: 60 yrs Min. Operability Volume: 82 m3 Age of Max Volume: 105 yrs Max Volume: 163 m3	Species Composition Target Species: Sb+Sw+Pj Acceptable Species: Pw+La+(Po+Bw<=20)<=30
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Sb40Pj20Po20Bf10Bw10 Stocking: 63% Site Class: 2		Silvicultural Intensity: Basic Future Forest Unit Development Rate: SPM - Basic - 20% Percent Application Term 1: 12% Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And (SB+SW)>PJ		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 80% Target Stocking: 90% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A	ES13 ES14 ES26	ES13 ES14 ES26	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	CMX-INT-SPM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
CMX	NW20, 19% **NW14, 16%** **NW13, 14%** **NW26, 9%** NW21, 8%	SPM	Species Comp.:Sb60Pj30Po10 Average Stocking: 85% Age of Min. Operability: 60 yrs Min. Operability Volume: 94 m3 Age of Max Volume: 105 yrs Max Volume: 186 m3	Species Composition Target Species: Sb+Sw+Pj Acceptable Species: Pw+La+(Po+Bw<=10)<=20
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Sb40Pj20Po20Bf10Bw10 Stocking: 63% Site Class: 2		Silvicultural Intensity: Intensive Future Forest Unit Development Rate: SPM - Intensive - 30% Percent Application Term 1: Incidental Treatment Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And (SB+SW)>PJ		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target Species) Minimum Density: 1500 sph Maximum Density: 2500 sph Survey Methodology Well Spaced Free Growing

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	Spacing
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A	ES13 ES14 ES26	ES13 ES14 ES26	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	HMX-EXT-CMX	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
HMX	**NW19, 35%** **NW28, 29%** NW16, 9% NW29, 7% NW23, 6%	CMX	Species Comp.: Sb40Pj20Po20Ce10Bw10 Average Stocking: 54% Age of Min. Operability: 65 yrs Min. Operability Volume: 72 m3 Age of Max Volume: 95 yrs Max Volume: 88 m3	<u>Species Composition</u> Target Species: Ce+Pj+Pw+Pr+Sb+Sw+Ce+La Acceptable Species: Po+Bw<50
<u>Preferred Sites</u> Site Class: 3 <u>Present Stand Characteristics</u> Spec. Comp.: Po40Sb20Bw20Pj10Bf10 Stocking: 70% Site Class: 3		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: CMX - Extensive - 5% Percent Application Term 1: Incidental Treatment Forest Unit Definition: CE>=20 And (ECOSITE1 Like 'NW17*') OR SB+PJ+BF+SW+CE+PW+PR+LA+HE>=50		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target and Acceptable Species)</u> Minimum Stocking: 60% Target Stocking: 80% <u>Survey Methodology</u> Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A	N/A	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	HMX-BA1-CMX	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
HMX	**NW19, 35%** **NW28, 29%** NW16, 9% NW29, 7% NW23, 6%	CMX	Species Comp.: Sb40Pj20Po20Ce10Bw10 Average Stocking: 71% Age of Min. Operability: 60 yrs Min. Operability Volume: 72 m3 Age of Max Volume: 85 yrs Max Volume: 111 m3	Species Composition Target Species: Ce+Pj+Pw+Pr+Sb+Sw+Ce+La Acceptable Species: Po+Bw<50
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Po40Sb20Bw20Pj10Bf10 Stocking: 70% Site Class: 3		Silvicultural Intensity: Basic Future Forest Unit Development Rate: CMX - Basic - 5% Percent Application Term 1: Incidental Treatment Forest Unit Definition: CE>=20 And (ECOSITE1 Like 'NW17*') OR SB+PJ+BF+SW+CE+PW+PR+LA+HE>=50		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 80% Target Stocking: 90% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A	N/A	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	HMX-EXT-HMX	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
HMX	**NW19, 35%** NW28, 29% NW16, 9% NW29, 7% NW23, 6%	HMX	Species Comp.:Po40Sb20Bw20Bf10Pj5Sw5 Average Stocking: 62% Age of Min. Operability: 65 yrs Min. Operability Volume: 84 m3 Age of Max Volume: 85 yrs Max Volume: 89 m3	<u>Species Composition</u> Target Species: Bw+Po+Ms+Ab Acceptable Species: Bf+Ce+La+Pj+Pr+Pw+Sb+Sw<50
<u>Preferred Sites</u> Site Class: 3 <u>Present Stand Characteristics</u> Spec. Comp.: Po40Sb20Bw20Pj10Bf10 Stocking: 70% Site Class: 3		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: HMX - Extensive - 30% Percent Application Term 1: 27% Forest Unit Definition: PO+PB+BW+MS+AB+EW+OW+QR+BD>=50		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target and Acceptable Species)</u> Minimum Stocking: 70% Target Stocking: 80% <u>Survey Methodology</u> Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A	N/A	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	HMX-BA1-PJM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
HMX	**NW19, 35%** NW28, 29% NW16, 9% NW29, 7% NW23, 6%	PJM	Species Comp.:Pj70Sb30 Average Stocking: 71% Age of Min. Operability: 55 yrs Min. Operability Volume: 104 m3 Age of Max Volume: 65 yrs Max Volume: 110 m3	Species Composition Target Species: Pj+Sb+Sw Acceptable Species: Pw+La+(Po+Bw<=10)<=20
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Po40Sb20Bw20Pj10Bf10 Stocking: 70% Site Class: 3		Silvicultural Intensity: Basic Future Forest Unit Development Rate: PJM - Basic - 65% Percent Application Term 1: 7% Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And PJ>=(SB+SW)		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 80% Target Stocking: 90% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A	N/A	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	HMX-EXT-POD	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
HMX	**NW19, 35%** NW28, 29% NW16, 9% NW29, 7% NW23, 6%	POD	Species Comp.:Po90Sb10 Average Stocking: 76% Age of Min. Operability: 55 yrs Min. Operability Volume: 105 m3 Age of Max Volume: 75 yrs Max Volume: 133 m3	<u>Species Composition</u> Target Species: Po Acceptable Species: Ce+La+Pj+Pr+Pw+Sb+Sw<30
<u>Preferred Sites</u> Site Class: 3 <u>Present Stand Characteristics</u> Spec. Comp.: Po40Sb20Bw20Pj10Bf10 Stocking: 70% Site Class: 3		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: POD - Extensive - 65% Percent Application Term 1: 59% Forest Unit Definition: PO+PB>=70		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target and Acceptable Species)</u> Minimum Stocking: 80% Target Stocking: 90% <u>Survey Methodology</u> Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A	N/A	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	HMX-BA1-SPM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
HMX	**NW19, 35%** NW28, 29% NW16, 9% NW29, 7% NW23, 6%	SPM	Species Comp.:Sb60Pj30Po10 Average Stocking: 75% Age of Min. Operability: 60 yrs Min. Operability Volume: 82 m3 Age of Max Volume: 105 yrs Max Volume: 163 m3	Species Composition Target Species: Sb+Sw+Pj Acceptable Species: Pw+La+(Po+Bw<=20)<=30
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Po40Sb20Bw20Pj10Bf10 Stocking: 70% Site Class: 3		Silvicultural Intensity: Basic Future Forest Unit Development Rate: SPM - Basic - 30% Percent Application Term 1: Incidental Treatment Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And (SB+SW)>PJ		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 80% Target Stocking: 90% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A	N/A	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	OCL-EXT-OCL	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
OCL	**NW36, 62%** NW34, 26% NW35, 5%	OCL	Species Comp.: Ce4 La4 Sb2 Average Stocking: 60% Age of Min. Operability: 90 yrs Min. Operability Volume: 41 m3 Age of Max Volume: 105 yrs Max Volume: 48 m3	<u>Species Composition</u> Target Species: Ce, La Acceptable Species: Ab, Sb, Sw, Po, Bw (Sb<5)
<u>Preferred Sites</u> Site Class: 3 <u>Present Stand Characteristics</u> Spec. Comp.: Ce48 La29 Sb18 Ab5 Stocking: 68% Site Class: 3		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: OCL - Extensive - 95% Percent Application Term 1: 100% Forest Unit Definition: (CE+LA>=50 Or WG='Ce' Or WG='La')) And PR+PW+PJ+SW+BW<10		<u>Minimum Height at 12 yrs. From Disturbance</u> Ce, La, Sb, Sw: 0.8 m Po, Bw, Ab: 2.0 m <u>Stocking (Target and Acceptable Species)</u> Minimum Stocking: 60% Target Stocking: 70% <u>Survey Methodology</u> Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments	Seed Tree	Tree Length Cut to Length		CLAAG (Careful Logging Around Advanced Regeneration)	

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A	ES 36	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	OTH-EXT-OTH	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
OTH	NW30, 41% **NW38, 25%** **NW37, 14%** NW36, 6%	OTH	Species Comp.: Ab6 Po2 Sb1 Bf1 Average Stocking: 65% Age of Min. Operability: 70 yrs Min. Operability Volume: 81 m3 Age of Max Volume: 105 yrs Max Volume: 127 m3	Species Composition Target Species: Ab Acceptable Species: (Ce+La+Sb+Sw+Bf+Po+Bw<70%)
Preferred Sites Site Class: 3 Present Stand Characteristics Spec. Comp.: Ab63 Po14 Sb8 Ce7 Bw3 Bf2 Stocking: 71% Site Class: 3		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: BFM - Extensive - 100% Percent Application Term 1: 100% Forest Unit Definition: MS+AB+EW+OW+QR+BD>=30		Minimum Height at 12 yrs. From Disturbance Ce, La, Sb, Sw, Bf: 0.8 m Po, Bw, Ab: 2.0 m Stocking (Target and Acceptable Species) Minimum Stocking: 60% Target Stocking: 70% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length		CLAAG (Careful Logging Around Advanced Regeneration)	

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A	ES 37 ES 38	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	PJD-EXT-PJD	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
PJD	**NW13, 48%** **NW14, 24%** **NW11, 14%** **NW12, 7%**	PJD	Species Comp.:Pj80Sb20 Average Stocking: 75% Age of Min. Operability: 55 yrs Min. Operability Volume: 100 m3 Age of Max Volume: 75 yrs Max Volume: 110 m3	<u>Species Composition</u> Target Species: Pj Acceptable Species: Ce+La+Pr+Pw+Sb+Sw+(Po+Bw<=20)<30
<u>Preferred Sites</u> Site Class: 3 <u>Present Stand Characteristics</u> Spec. Comp.: Pj90Sb10 Stocking: 85% Site Class: 2		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: PJD - Extensive - 75% Percent Application Term 1: 7% Forest Unit Definition: ((PJ>=70 And PO+PB+BW<=20) Or (PJ>=50 And PO+PB+BW<=20 And AGE>=120) Or (PJ>=70 And (ECOSITE1 Like 'NW13*' Or ECOSITE1 Like 'NW14*')))		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target and Acceptable Species)</u> Minimum Stocking: 80% Target Stocking: 90% <u>Survey Methodology</u> Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES11 ES12	**ES11 ES12 ES13 ES14**	**N/A**	**N/A**	**N/A**

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	PJD-BA1-PJD	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
PJD	**NW13, 48%** **NW14, 24%** **NW11, 14%** **NW12, 7%**	PJD	Species Comp.:Pj80Sb20 Average Stocking: 85% Age of Min. Operability: 50 yrs Min. Operability Volume: 105 m3 Age of Max Volume: 75 yrs Max Volume: 128 m3	<u>Species Composition</u> Target Species: Pj Acceptable Species: Ce+La+Pr+Pw+Sb+Sw+(Po+Bw<=10)<=20
<u>Preferred Sites</u> Site Class: X, 1 or 2 <u>Present Stand Characteristics</u> Spec. Comp.: Pj90Sb10 Stocking: 85% Site Class: 2		Silvicultural Intensity: Basic Future Forest Unit Development Rate: PJD - Basic - 90% Percent Application Term 1: 72% Forest Unit Definition: ((PJ>=70 And PO+PB+BW<=20) Or (PJ>=50 And PO+PB+BW<=20 And AGE>=120) Or (PJ>=70 And (ECOSITE1 Like 'NW13*' Or ECOSITE1 Like 'NW14*')))		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target and Acceptable Species)</u> Minimum Stocking: 90% Target Stocking: 100% <u>Survey Methodology</u> Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Seeding	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical	Plant (1.8x1.8m Spacing)	Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES11 ES12	ES11 ES12 ES13 ES14	ES11 ES12 ES13 ES14	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	PJD-INT-PJD	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
PJD	**NW13, 48%** **NW14, 24%** **NW11, 14%** **NW12, 7%**	PJD	Species Comp.:Pj90Sb10 Average Stocking: 95% Age of Min. Operability: 50 yrs Min. Operability Volume: 118 m3 Age of Max Volume: 75 yrs Max Volume: 143 m3	<u>Species Composition</u> Target Species: Pj Acceptable Species: Ce+La+Pr+Pw+Sb+Sw+(Po+Bw<=10)<=20
<u>Preferred Sites</u> Site Class: X, 1 or 2 <u>Present Stand Characteristics</u> Spec. Comp.: Pj90Sb10 Stocking: 85% Site Class: 2		Silvicultural Intensity: Intensive Future Forest Unit Development Rate: PJD - Intensive - 95% Percent Application Term 1: 9% Forest Unit Definition: ((PJ>=70 And PO+PB+BW<=20) Or (PJ>=50 And PO+PB+BW<=20 And AGE>=120) Or (PJ>=70 And (ECOSITE1 Like 'NW13*' Or ECOSITE1 Like 'NW14*')))		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target Species)</u> Minimum Density: 1500 sph Maximum Density: 2500 sph <u>Survey Methodology</u> Well Spaced Free Growing

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package		Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	Spacing
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES11 ES12	ES11 ES12 ES13 ES14	ES11 ES12 ES13 ES14	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	PJD-EXT-PJM

Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
PJD	NW13, 48% NW14, 24% **NW11, 14%** **NW12, 7%**	PJM	Species Comp.:Pj60Sb20Po20 Average Stocking: 65% Age of Min. Operability: 60 yrs Min. Operability Volume: 90 m3 Age of Max Volume: 65 yrs Max Volume: 98 m3	<u>Species Composition</u> Target Species: Pj+Sb+Sw Acceptable Species: Pw+La+(Po+Bw<=10)<=20
<u>Preferred Sites</u> Site Class: 3 <u>Present Stand Characteristics</u> Spec. Comp.: Pj90Sb10 Stocking: 85% Site Class: 2		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: PJM - Extensive - 15% Percent Application Term 1: Incidental Treatment Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And PJ>=(SB+SW)		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target and Acceptable Species)</u> Minimum Stocking: 70% Target Stocking: 80% <u>Survey Methodology</u> Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES11 **ES 12**	**ES12**	**N/A**	**N/A**	**N/A**

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	PJD-BA1-PJM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
PJD	NW13, 48% NW14, 24% **NW11, 14%** **NW12, 7%**	PJM	Species Comp.:Pj70Sb30 Average Stocking: 71% Age of Min. Operability: 55 yrs Min. Operability Volume: 104 m3 Age of Max Volume: 65 yrs Max Volume: 110 m3	<u>Species Composition</u> Target Species: Pj+Sb+Sw Acceptable Species: Pw+La+(Po+Bw<=10)<=20
<u>Preferred Sites</u> Site Class: X, 1 or 2 <u>Present Stand Characteristics</u> Spec. Comp.: Pj90Sb10 Stocking: 85% Site Class: 2		Silvicultural Intensity: Basic Future Forest Unit Development Rate: PJM - Basic - 5% Percent Application Term 1: Incidental Treatment Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And PJ>=(SB+SW)		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target and Acceptable Species)</u> Minimum Stocking: 80% Target Stocking: 90% <u>Survey Methodology</u> Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES11 **ES 12**	**ES12**	**ES12**	**N/A**	**N/A**

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	PJD-INT-SPD	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
PJD	**NW13, 48%** **NW14, 24%** **NW11, 14%** **NW12, 7%**	SPD	Species Comp.:Sb90Pj10 Average Stocking: 85% Age of Min. Operability: 60 yrs Min. Operability Volume: 110 m3 Age of Max Volume: 105 yrs Max Volume: 187 m3	Species Composition Target Species: Sb+Sw Acceptable Species: Ce+La+Pj+Pr+Pw+(Po+Bw<=10)<=20
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Pj90Sb10 Stocking: 85% Site Class: 2		Silvicultural Intensity: Intensive Future Forest Unit Development Rate: SPD - Intensive - 5% Percent Application Term 1: Incidental Treatment Forest Unit Definition: SB+SW>=70 And PO+PB+BW<=20		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target Species) Minimum Density: 1500 sph Maximum Density: 2500 sph Survey Methodology Well Spaced Free Growing

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	Spacing
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES11 **ES 12**	**ES12 ES13 ES14**	**ES12 ES13 ES14**	**N/A**	**N/A**

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	PJM-EXT-CMX	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
PJM	NW13, 42% NW14, 16% **NW11, 12%** **NW12, 11%** NW20, 10%	CMX	Species Comp.: Sb40Pj20Po20Ce10Bw10 Average Stocking: 54% Age of Min. Operability: 65 yrs Min. Operability Volume: 72 m3 Age of Max Volume: 95 yrs Max Volume: 88 m3	<u>Species Composition</u> Target Species: Ce+Pj+Pw+Pr+Sb+Sw+Ce+La Acceptable Species: Po+Bw<50
<u>Preferred Sites</u> Site Class: 3 <u>Present Stand Characteristics</u> Spec. Comp.: Pj60Sb30Po10 Stocking: 70% Site Class: 3		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: CMX - Extensive - 10% Percent Application Term 1: Incidental Treatment Forest Unit Definition: CE>=20 And (ECOSITE1 Like 'NW17*') OR SB+PJ+BF+SW+CE+PW+PR+LA+HE>=50		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target and Acceptable Species)</u> Minimum Stocking: 60% Target Stocking: 80% <u>Survey Methodology</u> Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES11 **ES 12**	**ES12**	**N/A**	**N/A**	**N/A**

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	PJM-EXT-PJD	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
PJM	NW13, 42% NW14, 16% **NW11, 12%** **NW12, 11%** NW20, 10%	PJD	Species Comp.:Pj80Sb20 Average Stocking: 75% Age of Min. Operability: 55 yrs Min. Operability Volume: 100 m3 Age of Max Volume: 75 yrs Max Volume: 110 m3	Species Composition Target Species: Pj Acceptable Species: Ce+La+Pr+Pw+Sb+Sw+(Po+Bw<=20)<30
Preferred Sites Site Class: 3 Present Stand Characteristics Spec. Comp.: Pj60Sb30Po10 Stocking: 70% Site Class: 3		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: PJD - Extensive - 20% Percent Application Term 1: Incidental Treatment Forest Unit Definition: ((PJ>=70 And PO+PB+BW<=20) Or (PJ>=50 And PO+PB+BW<=20 And AGE>=120) Or (PJ>=70 And (ECOSITE1 Like 'NW13*' Or ECOSITE1 Like 'NW14*')))		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 80% Target Stocking: 90% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES11 **ES12**	**ES12**	**N/A**	**N/A**	**N/A**

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	PJM-BA1-PJD	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
PJM	NW13, 42% NW14, 16% **NW11, 12%** **NW12, 11%** NW20, 10%	PJD	Species Comp.:Pj80Sb20 Average Stocking: 85% Age of Min. Operability: 50 yrs Min. Operability Volume: 105 m3 Age of Max Volume: 75 yrs Max Volume: 128 m3	Species Composition Target Species: Pj Acceptable Species: Ce+La+Pr+Pw+Sb+Sw+(Po+Bw<10)<=20
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Pj60Sb30Po10 Stocking: 70% Site Class: 3		Silvicultural Intensity: Basic Future Forest Unit Development Rate: PJD - Basic - 90% Percent Application Term 1: 63% Forest Unit Definition: ((PJ>=70 And PO+PB+BW<=20) Or (PJ>=50 And PO+PB+BW<=20 And AGE>=120) Or (PJ>=70 And (ECOSITE1 Like 'NW13*' Or ECOSITE1 Like 'NW14*')))		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 90% Target Stocking: 100% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Seeding	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical	Plant (1.8x1.8m Spacing)	Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES11 **ES12**	**ES12**	**ES12**	**N/A**	**N/A**

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	PJM-INT-PJD	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
PJM	NW13, 42% NW14, 16% **NW11, 12%** **NW12, 11%** NW20, 10%	PJD	Species Comp.:Pj90Sb10 Average Stocking: 95% Age of Min. Operability: 50 yrs Min. Operability Volume: 118 m3 Age of Max Volume: 75 yrs Max Volume: 143 m3	Species Composition Target Species: Pj Acceptable Species: Ce+La+Pr+Pw+Sb+Sw+(Po+Bw<=10)<=20
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Pj60Sb30Po10 Stocking: 70% Site Class: 3		Silvicultural Intensity: Intensive Future Forest Unit Development Rate: PJD - Intensive - 25% Percent Application Term 1: Incidental Treatment Forest Unit Definition: ((PJ>=70 And PO+PB+BW<=20) Or (PJ>=50 And PO+PB+BW<=20 And AGE>=120) Or (PJ>=70 And (ECOSITE1 Like 'NW13*' Or ECOSITE1 Like 'NW14*')))		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target Species) Minimum Density: 1500 sph Maximum Density: 2500 sph Survey Methodology Well Spaced Free Growing

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	Spacing
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES11 **ES12**	**ES12**	**ES12**	**N/A**	**N/A**

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	PJM-EXT-PJM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
PJM	NW13, 42% NW14, 16% **NW11, 12%** **NW12, 11%** NW20, 10%	PJM	Species Comp.:Pj60Sb20Po20 Average Stocking: 65% Age of Min. Operability: 60 yrs Min. Operability Volume: 90 m3 Age of Max Volume: 65 yrs Max Volume: 98 m3	Species Composition Target Species: Pj+Sb+Sw Acceptable Species: Pw+La+(Po+Bw<=20)<=30
Preferred Sites Site Class: 3 Present Stand Characteristics Spec. Comp.: Pj60Sb30Po10 Stocking: 70% Site Class: 3		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: PJM - Extensive - 70% Percent Application Term 1: 14% Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And PJ>=(SB+SW)		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 70% Target Stocking: 80% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES11 **ES12**	**ES12**	**N/A**	**N/A**	**N/A**

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	PJM-BA1-PJM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
PJM	NW13, 42% NW14, 16% **NW11, 12%** **NW12, 11%** NW20, 10%	PJM	Species Comp.:Pj70Sb30 Average Stocking: 71% Age of Min. Operability: 55 yrs Min. Operability Volume: 104 m3 Age of Max Volume: 65 yrs Max Volume: 110 m3	<u>Species Composition</u> Target Species: Pj+Sb+Sw Acceptable Species: Pw+La+(Po+Bw<=10)<=20
<u>Preferred Sites</u> Site Class: X, 1 or 2 <u>Present Stand Characteristics</u> Spec. Comp.: Pj60Sb30Po10 Stocking: 70% Site Class: 3		Silvicultural Intensity: Basic Future Forest Unit Development Rate: PJM - Basic - 5% Percent Application Term 1: Incidental Treatment Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And PJ>=(SB+SW)		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target and Acceptable Species)</u> Minimum Stocking: 80% Target Stocking: 90% <u>Survey Methodology</u> Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
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Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES11 **ES12**	**ES12**	**ES12**	**N/A**	**N/A**

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	PJM-INT-PJM

Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
PJM	NW13, 42% NW14, 16% **NW11, 12%** **NW12, 11%** NW20, 10%	PJM	Species Comp.:Pj70Sb30 Average Stocking: 90% Age of Min. Operability: 55 yrs Min. Operability Volume: 128 m3 Age of Max Volume: 75 yrs Max Volume: 139 m3	Species Composition Target Species: Pj+Sb+Sw Acceptable Species: Pw+La+(Po+Bw<=10)<=20
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Pj60Sb30Po10 Stocking: 70% Site Class: 3		Silvicultural Intensity: Intensive Future Forest Unit Development Rate: PJM - Intensive - 25% Percent Application Term 1: Incidental Treatment Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And PJ>=(SB+SW)		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target Species) Minimum Density: 1500 sph Maximum Density: 2500 sph Survey Methodology Well Spaced Free Growing

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	Spacing
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES11 **ES12**	**ES12**	**ES12**	**N/A**	**N/A**

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	PJM-INT-SPD	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
PJM	NW13, 42% NW14, 16% **NW11, 12%** **NW12, 11%** NW20, 10%	SPD	Species Comp.:Sb90Pj10 Average Stocking: 85% Age of Min. Operability: 60 yrs Min. Operability Volume: 110 m3 Age of Max Volume: 105 yrs Max Volume: 187 m3	Species Composition Target Species: Sb+Sw Acceptable Species: Ce+La+Pj+Pr+Pw+(Po+Bw<=10)<=20
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Pj60Sb30Po10 Stocking: 70% Site Class: 3		Silvicultural Intensity: Intensive Future Forest Unit Development Rate: SPD - Intensive - 5% Percent Application Term 1: Incidental Treatment Forest Unit Definition: SB+SW>=70 And PO+PB+BW<=20		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target Species) Minimum Density: 1500 sph Maximum Density: 2500 sph Survey Methodology Well Spaced Free Growing

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES11 **ES12**	**ES12**	**ES12**	**N/A**	**N/A**

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	PJM-INT-SPM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
PJM	NW13, 42% NW14, 16% **NW11, 12%** **NW12, 11%** NW20, 10%	SPM	Species Comp.:Sb60Pj30Po10 Average Stocking: 85% Age of Min. Operability: 60 yrs Min. Operability Volume: 94 m3 Age of Max Volume: 105 yrs Max Volume: 186 m3	Species Composition Target Species: Sb+Sw+Pj Acceptable Species: Pw+La+(Po+Bw<=10)<=20
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Pj60Sb30Po10 Stocking: 70% Site Class: 3		Silvicultural Intensity: Intensive Future Forest Unit Development Rate: SPM - Intensive - 45% Percent Application Term 1: Incidental Treatment Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And (SB+SW)>PJ		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target Species) Minimum Density: 1500 sph Maximum Density: 2500 sph Survey Methodology Well Spaced Free Growing

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES11 **ES12**	**ES12**	**ES12**	**N/A**	**N/A**

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	POD-EXT-POD	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
POD	**NW19, 44%** NW28, 28% NW23, 9% NW29, 7% NW16, 5%	POD	Species Comp.:Po90Sb10 Average Stocking: 76% Age of Min. Operability: 55 yrs Min. Operability Volume: 105 m3 Age of Max Volume: 75 yrs Max Volume: 133 m3	Species Composition Target Species: Po Acceptable Species: Ce+La+Pj+Pr+Pw+Sb+Sw<30
Preferred Sites Site Class: 3 Present Stand Characteristics Spec. Comp.: Po90Sb10 Stocking: 76% Site Class: 3		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: POD - Extensive - 100% Percent Application Term 1: 100% Forest Unit Definition: PO+PB>=70		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 80% Target Stocking: 90% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);

NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A	N/A	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	PRW-EXT-CMX	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
PRW	NW15, 55% NW24, 12% **NW11, 11%** NW18, 10% NW20, 5%	CMX	Species Comp.: Sb40Pj20Po20Ce10Bw10 Average Stocking: 54% Age of Min. Operability: 65 yrs Min. Operability Volume: 72 m3 Age of Max Volume: 95 yrs Max Volume: 88 m3	<u>Species Composition</u> Target Species: Ce+Pj+Pw+Pr+Sb+Sw+Ce+La Acceptable Species: Po+Bw<50
<u>Preferred Sites</u> Site Class: 3 <u>Present Stand Characteristics</u> Spec. Comp.: Pr50Pw20Pj10Sb10Po10 Stocking: 62% Site Class: 2		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: CMX - Extensive - 40% Percent Application Term 1: Incidental Treatment Forest Unit Definition: CE>=20 And (ECOSITE1 Like 'NW17*') OR SB+PJ+BF+SW+CE+PW+PR+LA+HE>=50		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target and Acceptable Species)</u> Minimum Stocking: 60% Target Stocking: 80% <u>Survey Methodology</u> Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES11	**ES11**	**N/A**	**N/A**	**N/A**

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	PRW-BA1-PJM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
PRW	NW15, 55% NW24, 12% **NW11, 11%** NW18, 10% NW20, 5%	PJM	Species Comp.:Pj70Sb30 Average Stocking: 71% Age of Min. Operability: 55 yrs Min. Operability Volume: 104 m3 Age of Max Volume: 65 yrs Max Volume: 110 m3	Species Composition Target Species: Pj+Sb+Sw Acceptable Species: Pw+La+(Po+Bw<=10)<=20
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Pr50Pw20Pj10Sb10Po10 Stocking: 62% Site Class: 2		Silvicultural Intensity: Basic Future Forest Unit Development Rate: PJM - Basic - 5% Percent Application Term 1: Incidental Treatment Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And PJ>=(SB+SW)		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 80% Target Stocking: 90% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES11	ES11	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	PRW-EXT-PRW	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
PRW	**NW15, 55%** NW24, 12% **NW11, 11%** NW18, 10% NW20, 5%	PRW	Species Comp.:Pr50Pw20Pj10Sb10Po10 Average Stocking: 57% Age of Min. Operability: 65 yrs Min. Operability Volume: 103 m3 Age of Max Volume: 105 yrs Max Volume: 147 m3	<u>Species Composition</u> Target Species: Pr+Pw Acceptable Species: Ce+La+Pj+Sb+Sw+Po+Bw<60
<u>Preferred Sites</u> Site Class: 3 <u>Present Stand Characteristics</u> Spec. Comp.: Pr50Pw20Pj10Sb10Po10 Stocking: 62% Site Class: 2		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: PRW - Extensive - 30% Percent Application Term 1: Incidental Treatment Forest Unit Definition: PW+PR >= 40		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target and Acceptable Species)</u> Minimum Stocking: 60% Target Stocking: 80% <u>Survey Methodology</u> Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES11	ES11 ES15	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	PRW-BA1-PRW	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
PRW	**NW15, 55%** NW24, 12% **NW11, 11%** NW18, 10% NW20, 5%	PRW	Species Comp.:Pr70Pw30 Average Stocking: 65% Age of Min. Operability: 65 yrs Min. Operability Volume: 118 m3 Age of Max Volume: 105 yrs Max Volume: 166 m3	Species Composition Target Species: Pr+Pw Acceptable Species: Ce+La+Pj+Sb+Sw+Po+Bw<60
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Pr50Pw20Pj10Sb10Po10 Stocking: 62% Site Class: 2		Silvicultural Intensity: Basic Future Forest Unit Development Rate: PRW - Basic - 90% Percent Application Term 1: 77% Forest Unit Definition: PW+PR >= 40		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 70% Target Stocking: 80% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES11	ES11 ES15	ES11 ES15	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	PRW-INT-PRW	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
PRW	**NW15, 55%** NW24, 12% **NW11, 11%** NW18, 10% NW20, 5%	PRW	Species Comp.:Pr70Pw30 Average Stocking: 70% Age of Min. Operability: 65 yrs Min. Operability Volume: 146 m3 Age of Max Volume: 145 yrs Max Volume: 206 m3	<u>Species Composition</u> Target Species: Pr+Pw Acceptable Species: Ce+La+Pj+Sb+Sw+Po+Bw<60
<u>Preferred Sites</u> Site Class: X, 1 or 2 <u>Present Stand Characteristics</u> Spec. Comp.: Pr50Pw20Pj10Sb10Po10 Stocking: 62% Site Class: 2		Silvicultural Intensity: Intensive Future Forest Unit Development Rate: PRW - Intensive - 98% Percent Application Term 1: 15% Forest Unit Definition: PW+PR >= 40		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target Species)</u> Minimum Density: 1500 sph Maximum Density: 2500 sph <u>Survey Methodology</u> Well Spaced Free Growing

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	Spacing
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES11	ES11 ES15	ES11 ES15	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	PRW-BA1-SPM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
PRW	NW15, 55% NW24, 12% **NW11, 11%** NW18, 10% NW20, 5%	SPM	Species Comp.:Sb60Pj30Po10 Average Stocking: 75% Age of Min. Operability: 60 yrs Min. Operability Volume: 82 m3 Age of Max Volume: 105 yrs Max Volume: 163 m3	<u>Species Composition</u> Target Species: Sb+Sw+Pj Acceptable Species: Pw+La+(Po+Bw<=20)<=30
<u>Preferred Sites</u> Site Class: X, 1 or 2 <u>Present Stand Characteristics</u> Spec. Comp.: Pr50Pw20Pj10Sb10Po10 Stocking: 62% Site Class: 2		Silvicultural Intensity: Basic Future Forest Unit Development Rate: SPM - Basic - 5% Percent Application Term 1: Incidental Treatment Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And (SB+SW)>PJ		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target and Acceptable Species)</u> Minimum Stocking: 80% Target Stocking: 90% <u>Survey Methodology</u> Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES11	ES11	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	SBL-EXT-SBL	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
SBL	**NW35, 65%** NW34, 25% **NW36, 10%**	SBL	Species Comp.:Sb80Ce10La10 Average Stocking: 60% Age of Min. Operability: 90 yrs Min. Operability Volume: 59 m3 Age of Max Volume: 125 yrs Max Volume: 82 m3	Species Composition Target Species: Sb Acceptable Species: Ce+La+Po+Pr+Pw+Pj+Sw<=20 Additional Information: SBL if Ecosites = 35,36, or 37 OR Ecosites = NW38+WG = Sx,Sb,Ce, or La
Preferred Sites Site Class: 3 Present Stand Characteristics Spec. Comp.: Sb100 Stocking: 64% Site Class: 3		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: SBL - Extensive - 100% Percent Application Term 1: 80% Forest Unit Definition: (((ECOSITE1 Like 'NW34*' And PR+PW+PJ+SW+BF<=20) Or (ECOSITE1 Like 'NW35*' Or ECOSITE1 Like 'NW36*' Or ECOSITE1 Like 'NW37*') Or (ECOSITE1 Like 'NW38*' And (WG='Sx' Or WG='Sb' Or WG='Ce' Or WG='La'))))		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 60% Target Stocking: 80% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length		CLAAG (Careful Logging Around Advanced Growth)	Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A	ES35 ES36	N/A	ES35 ES36	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	SBL-BA1-SBL	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
SBL	**NW35, 65%** NW34, 25% **NW36, 10%**	SBL	Species Comp.:Sb90Po10 Average Stocking: 65% Age of Min. Operability: 90 yrs Min. Operability Volume: 91 m3 Age of Max Volume: 115 yrs Max Volume: 121 m3	Species Composition Target Species: Sb Acceptable Species: Ce+La+Po+Pr+Pw+Pj+Sw<=20 Additional Information: SBL if Ecosites = 35,36, or 37 OR Ecosites = NW38+WG = Sx,Sb,Ce, or La
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Sb100 Stocking: 64% Site Class: 3		Silvicultural Intensity: Basic Future Forest Unit Development Rate: SBL - Basic - 100% Percent Application Term 1: 20% Forest Unit Definition: (((ECOSITE1 Like 'NW34*' And PR+PW+PJ+SW+BF<=20) Or (ECOSITE1 Like 'NW35*' Or ECOSITE1 Like 'NW36*' Or ECOSITE1 Like 'NW37*') Or (ECOSITE1 Like 'NW38*' And (WG='Sx' Or WG='Sb' Or WG='Ce' Or WG='La'))))		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 70% Target Stocking: 80% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual	CLAAG (Careful Logging Around Advanced Growth)	Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
N/A	ES35 ES36	N/A	ES35 ES36	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	SPD-EXT-CMX	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
SPD	NW20, 34% **NW26, 15%** **NW13, 13%** NW22, 9% NW31, 8% **NW12, 7%**	CMX	Species Comp.: Sb40Pj20Po20Ce10Bw10 Average Stocking: 54% Age of Min. Operability: 65 yrs Min. Operability Volume: 72 m3 Age of Max Volume: 95 yrs Max Volume: 88 m3	Species Composition Target Species: Ce+Pj+Pw+Pr+Sb+Sw+Ce+La Acceptable Species: Po+Bw<50
Preferred Sites Site Class: 3 Present Stand Characteristics Spec. Comp.: Sb90Pj10 Stocking: 65% Site Class: 1		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: CMX - Extensive - 15% Percent Application Term 1: 8% Forest Unit Definition: CE>=20 And (ECOSITE1 Like 'NW17*') OR SB+PJ+BF+SW+CE+PW+PR+LA+HE>=50		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 60% Target Stocking: 80% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES12	ES12 ES13 ES26	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	SPD-EXT-PJM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
SPD	NW20, 34% **NW26, 15%** NW13, 13% NW22, 9% NW31, 8% **NW12, 7%**	PJM	Species Comp.:Pj60Sb20Po20 Average Stocking: 65% Age of Min. Operability: 60 yrs Min. Operability Volume: 90 m3 Age of Max Volume: 65 yrs Max Volume: 98 m3	Species Composition Target Species: Pj+Sb+Sw Acceptable Species: Pw+La+(Po+Bw<=20)<=30
Preferred Sites Site Class: 3 Present Stand Characteristics Spec. Comp.: Sb90Pj10 Stocking: 65% Site Class: 1		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: PJM - Extensive - 20% Percent Application Term 1: 11% Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And PJ>=(SB+SW)		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 70% Target Stocking: 80% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES12	ES12 ES26	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	SPD-BA1-PJM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
SPD	NW20, 34% **NW26, 15%** NW13, 13% NW22, 9% NW31, 8% **NW12, 7%**	PJM	Species Comp.:Pj70Sb30 Average Stocking: 71% Age of Min. Operability: 55 yrs Min. Operability Volume: 104 m3 Age of Max Volume: 65 yrs Max Volume: 110 m3	<u>Species Composition</u> Target Species: Pj+Sb+Sw Acceptable Species: Pw+La+(Po+Bw<=10)<=20
<u>Preferred Sites</u> Site Class: X, 1 or 2 <u>Present Stand Characteristics</u> Spec. Comp.: Sb90Pj10 Stocking: 65% Site Class: 1		Silvicultural Intensity: Basic Future Forest Unit Development Rate: PJM - Basic - 10% Percent Application Term 1: Incidental Treatment Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And PJ>=(SB+SW)		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target and Acceptable Species)</u> Minimum Stocking: 80% Target Stocking: 90% <u>Survey Methodology</u> Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES12	ES12 ES26	ES12 ES26	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	SPD-EXT-SPD	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
SPD	NW20, 34% **NW26, 15%** **NW13, 13%** NW22, 9% **NW31, 8%** **NW12, 7%**	SPD	Species Comp.:Sb80Pj10Bf10 Average Stocking: 60% Age of Min. Operability: 70 yrs Min. Operability Volume: 97 m3 Age of Max Volume: 105 yrs Max Volume: 132 m3	Species Composition Target Species: Sb+Sw Acceptable Species: Bf+Ce+La+Pj+Pr+Pw+(Po+Bw<=20)<=30
Preferred Sites Site Class: 3 Present Stand Characteristics Spec. Comp.: Sb90Pj10 Stocking: 65% Site Class: 1		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: SPD - Extensive - 15% Percent Application Term 1: 8% Forest Unit Definition: SB+SW>=70 And PO+PB+BW<=20		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 60% Target Stocking: 80% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES12	ES12 ES13 ES26 ES31	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	SPD-BA1-SPD	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
SPD	NW20, 34% **NW26, 15%** **NW13, 13%** NW22, 9% **NW31, 8%** **NW12, 7%**	SPD	Species Comp.:Sb80Pj10Bw10 Average Stocking: 75% Age of Min. Operability: 60 yrs Min. Operability Volume: 98 m3 Age of Max Volume: 105 yrs Max Volume: 166 m3	Species Composition Target Species: Sb+Sw Acceptable Species: Ce+La+Pj+Pr+Pw+(Po+Bw<=20)<=30
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Sb90Pj10 Stocking: 65% Site Class: 1		Silvicultural Intensity: Basic Future Forest Unit Development Rate: SPD - Basic - 55% Percent Application Term 1: 18% Forest Unit Definition: SB+SW>=70 And PO+PB+BW<=20		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 80% Target Stocking: 90% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES12	ES12 ES13 ES26 ES31	ES12 ES13 ES26 ES31	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	SPD-INT-SPD	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
SPD	NW20, 34% **NW26, 15%** **NW13, 13%** NW22, 9% **NW31, 8%** **NW12, 7%**	SPD	Species Comp.:Sb90Pj10 Average Stocking: 85% Age of Min. Operability: 60 yrs Min. Operability Volume: 110 m3 Age of Max Volume: 105 yrs Max Volume: 187 m3	Species Composition Target Species: Sb+Sw Acceptable Species: Ce+La+Pj+Pr+Pw+(Po+Bw<=10)<=20
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Sb90Pj10 Stocking: 65% Site Class: 1		Silvicultural Intensity: Intensive Future Forest Unit Development Rate: SPD - Intensive - 90% Percent Application Term 1: 9% Forest Unit Definition: SB+SW>=70 And PO+PB+BW<=20		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target Species) Minimum Density: 1500 sph Maximum Density: 2500 sph Survey Methodology Well Spaced Free Growing

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES12	ES12 ES13 ES26 ES31	ES12 ES13 ES26 ES31	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	SPD-EXT-SPM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
SPD	NW20, 34% **NW26, 15%** **NW13, 13%** NW22, 9% NW31, 8% **NW12, 7%**	SPM	Species Comp.:Sb50Pj30Po10Bw10 Average Stocking: 55% Age of Min. Operability: 70 yrs Min. Operability Volume: 82 m3 Age of Max Volume: 105 yrs Max Volume: 124 m3	Species Composition Target Species: Sb+Sw+Pj Acceptable Species: Pw+La+(Po+Bw<=20)<=30
Preferred Sites Site Class: 3 Present Stand Characteristics Spec. Comp.: Sb90Pj10 Stocking: 65% Site Class: 1		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: SPM - Extensive - 44% Percent Application Term 1: 25% Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And (SB+SW)>PJ		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 60% Target Stocking: 80% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES12	ES12 ES13 ES26	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	SPD-BA1-SPM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
SPD	NW20, 34% **NW26, 15%** **NW13, 13%** NW22, 9% NW31, 8% **NW12, 7%**	SPM	Species Comp.:Sb60Pj30Po10 Average Stocking: 75% Age of Min. Operability: 60 yrs Min. Operability Volume: 82 m3 Age of Max Volume: 105 yrs Max Volume: 163 m3	Species Composition Target Species: Sb+Sw+Pj Acceptable Species: Pw+La+(Po+Bw<=20)<=30
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Sb90Pj10 Stocking: 65% Site Class: 1		Silvicultural Intensity: Basic Future Forest Unit Development Rate: SPM - Basic - 30% Percent Application Term 1: 10% Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And (SB+SW)>PJ		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 80% Target Stocking: 90% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES12	ES12 ES13 ES26	ES12 ES13 ES26	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	SPD-INT-SPM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
SPD	NW20, 34% **NW26, 15%** **NW13, 13%** NW22, 9% NW31, 8% **NW12, 7%**	SPM	Species Comp.:Sb60Pj30Po10 Average Stocking: 85% Age of Min. Operability: 60 yrs Min. Operability Volume: 94 m3 Age of Max Volume: 105 yrs Max Volume: 186 m3	Species Composition Target Species: Sb+Sw+Pj Acceptable Species: Pw+La+(Po+Bw<=10)<=20
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Sb90Pj10 Stocking: 65% Site Class: 1		Silvicultural Intensity: Intensive Future Forest Unit Development Rate: SPM - Intensive - 10% Percent Application Term 1: Incidental Treatment Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And (SB+SW)>PJ		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target Species) Minimum Density: 1500 sph Maximum Density: 2500 sph Survey Methodology Well Spaced Free Growing

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES12	ES12 ES13 ES26	ES12 ES13 ES26	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	SPM-EXT-CMX	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
SPM	NW20, 43% **NW13, 16%** **NW12, 14%** **NW26, 9%** **NW14, 7%**	CMX	Species Comp.: Sb40Pj20Po20Ce10Bw10 Average Stocking: 54% Age of Min. Operability: 65 yrs Min. Operability Volume: 72 m3 Age of Max Volume: 95 yrs Max Volume: 88 m3	<u>Species Composition</u> Target Species: Ce+Pj+Pw+Pr+Sb+Sw+Ce+La Acceptable Species: Po+Bw<50
<u>Preferred Sites</u> Site Class: 3 <u>Present Stand Characteristics</u> Spec. Comp.: Sb60Pj30Po10 Stocking: 59% Site Class: 1		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: CMX - Extensive - 10% Percent Application Term 1: Incidental Treatment Forest Unit Definition: CE>=20 And (ECOSITE1 Like 'NW17*') OR SB+PJ+BF+SW+CE+PW+PR+LA+HE>=50		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target and Acceptable Species)</u> Minimum Stocking: 60% Target Stocking: 80% <u>Survey Methodology</u> Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES12	ES12 ES13 ES14 ES26	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	SPM-EXT-HMX	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
SPM	NW20, 43% **NW13, 16%** **NW12, 14%** **NW26, 9%** **NW14, 7%**	HMX	Species Comp.:Po40Sb20Bw20Bf10Pj5Sw5 Average Stocking: 62% Age of Min. Operability: 65 yrs Min. Operability Volume: 84 m3 Age of Max Volume: 85 yrs Max Volume: 89 m3	<u>Species Composition</u> Target Species: Bw+Po+Ms+Ab Acceptable Species: Bf+Ce+La+Pj+Pr+Pw+Sb+Sw<50
<u>Preferred Sites</u> Site Class: 3 <u>Present Stand Characteristics</u> Spec. Comp.: Sb60Pj30Po10 Stocking: 59% Site Class: 1		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: HMX - Extensive - 5% Percent Application Term 1: Incidental Treatment Forest Unit Definition: PO+PB+BW+MS+AB+EW+OW+QR+BD>=50		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target and Acceptable Species)</u> Minimum Stocking: 70% Target Stocking: 80% <u>Survey Methodology</u> Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES12	ES12 ES13 ES14 ES26	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	SPM-BA1-PJD	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
SPM	NW20, 43% **NW13, 16%** **NW12, 14%** **NW26, 9%** **NW14, 7%**	PJD	Species Comp.:Pj80Sb20 Average Stocking: 85% Age of Min. Operability: 50 yrs Min. Operability Volume: 105 m3 Age of Max Volume: 75 yrs Max Volume: 128 m3	<u>Species Composition</u> Target Species: Pj Acceptable Species: Ce+La+Pr+Pw+Sb+Sw+(Po+Bw<=10)<=20
<u>Preferred Sites</u> Site Class: X, 1 or 2 <u>Present Stand Characteristics</u> Spec. Comp.: Sb60Pj30Po10 Stocking: 59% Site Class: 1		Silvicultural Intensity: Basic Future Forest Unit Development Rate: PJD - Basic - 5% Percent Application Term 1: Incidental Treatment Forest Unit Definition: ((PJ>=70 And PO+PB+BW<=20) Or (PJ>=50 And PO+PB+BW<=20 And AGE>=120) Or (PJ>=70 And (ECOSITE1 Like 'NW13*' Or ECOSITE1 Like 'NW14*')))		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target and Acceptable Species)</u> Minimum Stocking: 90% Target Stocking: 100% <u>Survey Methodology</u> Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Seeding	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical	Plant (1.8x1.8m Spacing)	Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES12	ES12 ES13 ES14 ES26	ES12 ES13 ES14	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	SPM-INT-PJD	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
SPM	NW20, 43% **NW13, 16%** **NW12, 14%** **NW26, 9%** **NW14, 7%**	PJD	Species Comp.:Pj90Sb10 Average Stocking: 95% Age of Min. Operability: 50 yrs Min. Operability Volume: 118 m3 Age of Max Volume: 75 yrs Max Volume: 143 m3	<u>Species Composition</u> Target Species: Pj Acceptable Species: Ce+La+Pr+Pw+Sb+Sw+(Po+Bw<=10)<=20
<u>Preferred Sites</u> Site Class: X, 1 or 2 <u>Present Stand Characteristics</u> Spec. Comp.: Sb60Pj30Po10 Stocking: 59% Site Class: 1		Silvicultural Intensity: Intensive Future Forest Unit Development Rate: PJD - Intensive - 5% Percent Application Term 1: Incidental Treatment Forest Unit Definition: ((PJ>=70 And PO+PB+BW<=20) Or (PJ>=50 And PO+PB+BW<=20 And AGE>=120) Or (PJ>=70 And (ECOSITE1 Like 'NW13*' Or ECOSITE1 Like 'NW14*')))		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target Species)</u> Minimum Density: 1500 sph Maximum Density: 2500 sph <u>Survey Methodology</u> Well Spaced Free Growing

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	Spacing
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES12	ES12 ES13 ES14 ES26	ES12 ES13 ES14	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	SPM-EXT-PJM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
SPM	NW20, 43% **NW13, 16%** **NW12, 14%** **NW26, 9%** **NW14, 7%**	PJM	Species Comp.:Pj60Sb20Po20 Average Stocking: 65% Age of Min. Operability: 60 yrs Min. Operability Volume: 90 m3 Age of Max Volume: 65 yrs Max Volume: 98 m3	Species Composition Target Species: Pj+Sb+Sw Acceptable Species: Pw+La+(Po+Bw<=20)<=30
Preferred Sites Site Class: 3 Present Stand Characteristics Spec. Comp.: Sb60Pj30Po10 Stocking: 59% Site Class: 1		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: PJM - Extensive - 15% Percent Application Term 1: Incidental Treatment Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And PJ>=(SB+SW)		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 70% Target Stocking: 80% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES12	ES12 ES13 ES14 ES26	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	SPM-BA1-PJM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
SPM	NW20, 43% **NW13, 16%** **NW12, 14%** **NW26, 9%** **NW14, 7%**	PJM	Species Comp.:Pj70Sb30 Average Stocking: 71% Age of Min. Operability: 55 yrs Min. Operability Volume: 104 m3 Age of Max Volume: 65 yrs Max Volume: 110 m3	Species Composition Target Species: Pj+Sb+Sw Acceptable Species: Pw+La+(Po+Bw<=10)<=20
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Sb60Pj30Po10 Stocking: 59% Site Class: 1		Silvicultural Intensity: Basic Future Forest Unit Development Rate: PJM - Basic - 30% Percent Application Term 1: 27% Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And PJ>=(SB+SW)		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 80% Target Stocking: 90% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES12	**ES12 ES13 ES14 ES26**	**ES12 ES26**	**N/A**	**N/A**

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	SPM-EXT-SPD	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
SPM	NW20, 43% **NW13, 16%** **NW12, 14%** **NW26, 9%** **NW14, 7%**	SPD	Species Comp.:Sb80Pj10Bf10 Average Stocking: 60% Age of Min. Operability: 70 yrs Min. Operability Volume: 97 m3 Age of Max Volume: 105 yrs Max Volume: 132 m3	Species Composition Target Species: Sb+Sw Acceptable Species: Bf+Ce+La+Pj+Pr+Pw+(Po+Bw<=20)<=30
Preferred Sites Site Class: 3 Present Stand Characteristics Spec. Comp.: Sb60Pj30Po10 Stocking: 59% Site Class: 1		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: SPD - Extensive - 5% Percent Application Term 1: Incidental Treatment Forest Unit Definition: SB+SW>=70 And PO+PB+BW<=20		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 60% Target Stocking: 80% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES12	ES12 ES13 ES14 ES26	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	SPM-BA1-SPD	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
SPM	NW20, 43% **NW13, 16%** **NW12, 14%** **NW26, 9%** **NW14, 7%**	SPD	Species Comp.:Sb80Pj10Bw10 Average Stocking: 75% Age of Min. Operability: 60 yrs Min. Operability Volume: 98 m3 Age of Max Volume: 105 yrs Max Volume: 166 m3	Species Composition Target Species: Sb+Sw Acceptable Species: Ce+La+Pj+Pr+Pw+(Po+Bw<=20)<=30
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Sb60Pj30Po10 Stocking: 59% Site Class: 1		Silvicultural Intensity: Basic Future Forest Unit Development Rate: SPD - Basic - 35% Percent Application Term 1: 31% Forest Unit Definition: SB+SW>=70 And PO+PB+BW<=20		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 80% Target Stocking: 90% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES12	ES12 ES13 ES14 ES26	ES12 ES13 ES14 ES26	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	SPM-INT-SPD	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
SPM	NW20, 43% **NW13, 16%** **NW12, 14%** **NW26, 9%** **NW14, 7%**	SPD	Species Comp.:Sb90Pj10 Average Stocking: 85% Age of Min. Operability: 60 yrs Min. Operability Volume: 110 m3 Age of Max Volume: 105 yrs Max Volume: 187 m3	Species Composition Target Species: Sb+Sw Acceptable Species: Ce+La+Pj+Pr+Pw+(Po+Bw<=10)<=20
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Sb60Pj30Po10 Stocking: 59% Site Class: 1		Silvicultural Intensity: Intensive Future Forest Unit Development Rate: SPD - Intensive - 85% Percent Application Term 1: 9% Forest Unit Definition: SB+SW>=70 And PO+PB+BW<=20		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target Species) Minimum Density: 1500 sph Maximum Density: 2500 sph Survey Methodology Well Spaced Free Growing

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES12	ES12 ES13 ES14 ES26	ES12 ES13 ES14 ES26	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	SPM-EXT-SPM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
SPM	NW20, 43% **NW13, 16%** **NW12, 14%** **NW26, 9%** **NW14, 7%**	SPM	Species Comp.:Sb50Pj30Po10Bw10 Average Stocking: 55% Age of Min. Operability: 70 yrs Min. Operability Volume: 82 m3 Age of Max Volume: 105 yrs Max Volume: 124 m3	<u>Species Composition</u> Target Species: Sb+Sw+Pj Acceptable Species: Pw+La+(Po+Bw<=20)<=30
<u>Preferred Sites</u> Site Class: 3 <u>Present Stand Characteristics</u> Spec. Comp.: Sb60Pj30Po10 Stocking: 59% Site Class: 1		Silvicultural Intensity: Extensive Future Forest Unit Development Rate: SPM - Extensive - 64% Percent Application Term 1: 23% Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And (SB+SW)>PJ		<u>Minimum Height at 10 yrs. From Disturbance</u> Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 <u>Stocking (Target and Acceptable Species)</u> Minimum Stocking: 60% Target Stocking: 80% <u>Survey Methodology</u> Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	None	Natural	None
Acceptable Alternative Treatments		Tree Length Cut to Length			Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES12	ES12 ES13 ES14 ES26	N/A	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	SPM-BA1-SPM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
SPM	NW20, 43% **NW13, 16%** **NW12, 14%** **NW26, 9%** **NW14, 7%**	SPM	Species Comp.:Sb60Pj30Po10 Average Stocking: 75% Age of Min. Operability: 60 yrs Min. Operability Volume: 82 m3 Age of Max Volume: 105 yrs Max Volume: 163 m3	Species Composition Target Species: Sb+Sw+Pj Acceptable Species: Pw+La+(Po+Bw<=20)<=30
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Sb60Pj30Po10 Stocking: 59% Site Class: 1		Silvicultural Intensity: Basic Future Forest Unit Development Rate: SPM - Basic - 25% Percent Application Term 1: Incidental Treatment Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And (SB+SW)>PJ		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target and Acceptable Species) Minimum Stocking: 80% Target Stocking: 90% Survey Methodology Regular Free to Grow, LSP or Ocular Estimate

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES12	ES12 ES13 ES14 ES26	ES12 ES13 ES14 ES26	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

FMP-4 Silvicultural Ground Rules

SGR Code	SPM-INT-SPM	Silvicultural System	CC

Current Condition		Future Condition		Regeneration Standards
Forest Unit	**Ecosite(s)**	**Forest Unit**	**Stand Characteristics**	
SPM	NW20, 43% **NW13, 16%** **NW12, 14%** **NW26, 9%** **NW14, 7%**	SPM	Species Comp.:Sb60Pj30Po10 Average Stocking: 85% Age of Min. Operability: 60 yrs Min. Operability Volume: 94 m3 Age of Max Volume: 105 yrs Max Volume: 186 m3	Species Composition Target Species: Sb+Sw+Pj Acceptable Species: Pw+La+(Po+Bw<=10)<=20
Preferred Sites Site Class: X, 1 or 2 Present Stand Characteristics Spec. Comp.: Sb60Pj30Po10 Stocking: 59% Site Class: 1		Silvicultural Intensity: Intensive Future Forest Unit Development Rate: SPM - Intensive - 25% Percent Application Term 1: Incidental Treatment Forest Unit Definition: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And (SB+SW)>PJ		Minimum Height at 10 yrs. From Disturbance Pj, Pr, Pw, Bf: 1.0 Sb, Sw, Ce, La: 0.8 Po, Bw: 2.0 Stocking (Target Species) Minimum Density: 1500 sph Maximum Density: 2500 sph Survey Methodology Well Spaced Free Growing

	Silvicultural Treatments				
	Harvest Method	**Logging Method**	**Site Preparation**	**Regeneration**	**Tending**
Most Common Treatment Package	Conventional	Full Tree	Mechanical	Plant (1.8x1.8m Spacing)	None
Acceptable Alternative Treatments		Tree Length Cut to Length	None Manual Chemical		Cleaning-Chemical Ground Cleaning-Chemical Aerial Cleaning-Manual Cleaning-Mechanical

Exception to Silvicultural Guide to Managing for Black Spruce, Jack Pine and Aspen on Boreal Forest Ecosites in Ontario (OMNR, 1997);
NOTE: A list of rationales to the exceptions and conditions applicable to this Silvicultural Ground Rule can be found at the back of FMP-4.

Exceptions:	Conditions on Harvest:	Conditions on SIP:	Conditions on Regeneration:	Conditions on Cleaning:
ES12	ES12 ES13 ES14 ES26	ES12 ES13 ES14 ES26	N/A	N/A

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

List of Exceptions and Conditions to the Silvicultural Ground Rules for the 2012-2022 Whiskey Jack Forest

Exceptions
ES11: Full tree is Not Recommended where total soil depth (mineral and surface organic) is < 20 cm.
ES12: Full tree is Not Recommended where total soil depth (mineral and surface organic) is < 20 cm.
ES14: Artificial seeding is Not Recommended. This site is prone to draught which will limit the success of seeding.
ES21: Natural Regeneration Not Recommended for Sb or Pj . Advance Sb growth is not of sufficient or distribution to regenerate this site and Pj does not regenerate under a closed canopy.

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

List of Exceptions and Conditions to the Silvicultural Ground Rules for the 2012-2022 Whiskey Jack Forest

Conditions On Harvest
ES11: Full tree is permitted (Conditionally Recommended) where total soil depth exceeds 20 cm, provided that a winter harvest is employed or when other measures such as high floatation equipment are used to minimize disturbance of the organic layer. No restrictions apply on moderately deep to deep soils where mineral soil depth exceeds 30 cm and the thickness of the surface layer is > 5 cm.
ES12: Full tree is permitted (Conditionally Recommended) where total soil depth exceeds 20 cm, provided that a winter harvest is employed or when other measures such as high floatation equipment are used to minimize disturbance of the organic layer. No restrictions apply on moderately deep to deep soils where mineral soil depth exceeds 30 cm and the thickness of the surface layer is > 5 cm.
ES13: Full Tree Harvesting is Conditionally Recommended provided that “best practices” are used to minimize disturbance of the surface organic layer. Where surface organic thickness averages <5 cm, winter harvest and/or use of high flotation equipment should be considered to maintain the integrity of the surface organic layer.
ES14: Full-tree harvesting is Conditionally Recommended provided "best practices" are used to minimize disturbance and/or displacement of the surface organic layer.
ES15: Full tree harvesting is Conditionally Recommended provided "best practices" are used to minimize disturbance and/or displacement of the surface organic layer. Where surface organic thickness averages < 5cm, winter harvest and/or the use of high flotation equipment should be considered to maintain the integrity of the surface organic layer.
ES26: All logging methods are Conditionally Recommended. Fine textured soils are susceptible to rutting and compaction when saturated during the frost free season. Harvest on frozen ground or use low-impact equipment when soils are saturated.
ES31: All logging methods are Conditionally Recommended. Fine textured soils are susceptible to rutting and compaction when saturated during the frost free season. Harvest on frozen ground or use low-impact equipment when soils are saturated.
ES35: Logging is Conditionally Recommended. Harvest on frozen ground because organic soils are susceptible to rutting on fibric peatymor soils, low impact equipment may allow summer harvest.
ES36: Logging is Conditionally Recommended. Harvest on frozen ground because organic soils are susceptible to rutting on fibric peatymor soils, low impact equipment may allow summer harvest.
ES37: Logging is Conditionally Recommended. Harvest on frozen ground because organic soils are susceptible to rutting on fibric peatymor soils, low impact equipment may allow summer harvest.
ES38: Logging is Conditionally Recommended. Harvest on frozen ground because organic soils are susceptible to rutting on fibric peatymor soils, low impact equipment may allow summer harvest.

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

List of Exceptions and Conditions to the Silvicultural Ground Rules for the 2012-2022 Whiskey Jack Forest

Condition on Site Preparation (SIP)
ES11: Mechanical site preparation is Conditionally Recommended as sufficient seedbed may be created as a result of the harvest. Apply techniques that maintain a high percentage of intact forest floor to limit the loss of nutrients.
ES12: Mechanical site preparation is Conditionally Recommended as sufficient seedbed may be created as a result of the harvest. Apply techniques that maintain a high percentage of intact forest floor to limit the loss of nutrients.
ES13: Mechanical site preparation is Conditionally Recommended. Apply techniques that maintain a high percentage of intact forest floor to limit the loss of nutrients. A good distribution of mineral soil seedbeds created by mechanical site preparation will contribute to successful natural and/or direct seeding.
ES14: Mechanical site preparation is Conditionally Recommended provided techniques maintain a high percentage of intact forest floor to limit loss of nutrients.
ES15: Mechanical site preparation is Conditionally Recommended. Sufficient seedbed may be created as a result of the harvest. Apply techniques that maintain a high percentage of intact forest floor to limit nutrient loss.
ES21: Mechanical site preparation is Not Recommended for Po as scarification in cut Aspen stands where suckering has started there will be reduced growth in the replacement suckers.
ES26: Mechanical site preparation is Conditionally Recommended. Techniques, timing and sequencing of treatments should be carefully considered. Minimize mineral soil exposure on clays to reduce the incidence of soil baking/ frost heaving and to prevent increased competition from non-crop vegetation on a mixed mineral/organic microsite. Fine textured soils are susceptible to rutting and compaction when saturated during the frost free season.
ES31: Mechanical Site Preparation is Conditionally Recommended. Techniques, timing and sequencing of treatments should be carefully considered. Minimize mineral soil exposure on clays to reduce the incidence of soil baking and/or frost heaving, and to prevent increased competition from non-crop vegetation on a mixed mineral/organic microsite. Fine textured soils are susceptible to rutting and compaction when saturated during the frost free season.

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 TO March 31, 2022

List of Exceptions and Conditions to the Silvicultural Ground Rules for the 2012-2022 Whiskey Jack Forest

Conditions on Regeneration
ES21(1): Seeding Conditionally Recommended for Pj. Shelter seeding only. Good selection of seedbed microsites will contribute to success. Smothering seedbeds with hardwood litter will limit success. The distribution, abundance and vigour of competitive non-crop species will affect the survival of the seed origin Pj.
ES21(2): Artificial seeding is Conditionally Recommended. Shelter seeding only. Good selection of seedbed microsites will contribute to success. Smothering of seedbeds with hardwood litter will limit success. The distribution, abundance and vigour of competitive non-crop vegetation will affect the survival and growth of seed origin jack pine.
ES35: Seed-tree Harvest Method will be supplemented with leaving advanced growth.
ES36: Seed-tree Harvest Method will be supplemented with leaving advanced growth.
ES37: Seed-tree Harvest Method will be supplemented with leaving advanced growth.

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

FMP-5 PROJECTED FOREST CONDITION FOR THE CROWN PRODUCTIVE FOREST

Forest Unit	Age Class	Area (ha)					
		2012	2032	2052	2072	2092	2112
BFM							
	1-20	4,106	929	28	3,343	621	340
	21-40	12,617	3,840	869	26	3,126	580
	41-60	2,065	11,800	3,591	812	25	2,923
	61-80	4,654	2,336	12,161	3,655	3,180	2,006
	81-100	2,505	3,691	2,540	7,581	2,716	2,451
	101-120	928	938	3,482	1,255	6,787	2,540
	121-140	179	382	821	1,213	1,040	6,216
	141+	95	80	27	1	1	-
	Subtotal	27,150	23,995	23,519	17,886	17,496	17,056
CMX							
	1-20	16,951	8,275	8,274	10,915	8,675	6,777
	21-40	19,344	15,853	7,738	7,738	10,208	8,113
	41-60	8,745	18,129	14,840	7,323	7,269	9,550
	61-80	20,413	8,185	17,256	7,035	6,895	6,843
	81-100	14,309	19,470	6,362	9,290	4,905	7,234
	101-120	7,074	11,653	14,814	10,048	12,936	7,422
	121-140	1,301	3,384	13,466	17,460	8,949	13,523
	141+	355	741	425	20	77	55
	Subtotal	88,492	85,690	83,176	69,829	59,915	59,516
HMX							
	1-20	9,914	12,832	8,881	11,857	7,010	4,590
	21-40	15,498	9,271	12,000	8,305	11,088	6,556
	41-60	26,220	15,951	10,385	12,580	8,346	10,759
	61-80	36,543	24,427	18,668	9,635	12,147	7,737
	81-100	12,078	15,433	9,600	9,940	6,436	9,757
	101-120	6,642	7,178	12,894	4,732	7,047	4,890
	121-140	345	2,799	2,107	4,450	832	2,190
	141+	-	323	0	53	261	-
	Subtotal	107,239	88,214	74,535	61,551	53,168	46,480
OCL							
	1-20	128	144	337	155	149	145
	21-40	48	119	134	315	145	139
	41-60	-	45	112	126	295	135
	61-80	27	-	42	104	117	276
	81-100	163	26	-	39	98	110
	101-120	304	152	21	-	37	91
	121-140	843	285	63	19	-	200
	141+	704	1,446	1,497	1,447	1,365	1,109
	Subtotal	2,217	2,217	2,206	2,205	2,205	2,205
OTH							
	1-20	78	129	129	221	425	154
	21-40	31	73	121	121	207	397
	41-60	52	29	68	113	113	193
	61-80	204	49	27	64	106	106
	81-100	1,028	226	110	333	348	107
	101-120	449	962	246	107	544	475
	121-140	113	420	899	195	70	496
	141+	37	106	393	841	182	66
	Subtotal	1,995	1,995	1,995	1,995	1,995	1,995

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

FMP-5 PROJECTED FOREST CONDITION FOR THE CROWN PRODUCTIVE FOREST

Forest Unit	Age Class	Area (ha)					
		2012	2032	2052	2072	2092	2112
PJD							
	1-20	20,065	32,251	44,186	34,066	36,919	35,017
	21-40	100,704	18,764	30,161	41,323	31,859	34,526
	41-60	6,962	94,178	17,548	28,206	38,645	29,794
	61-80	11,494	5,924	61,915	9,517	19,769	30,216
	81-100	31,264	8,519	3,267	47,699	8,842	18,488
	101-120	8,153	17,940	7,084	2,750	31,939	4,330
	121-140	3,493	4,672	9,766	3,980	890	18,053
	141+	697	2,582	1,765	2,359	2,914	992
	Subtotal	182,832	184,830	175,692	169,902	171,776	171,417
PJM							
	1-20	14,700	17,383	17,048	20,254	16,848	17,788
	21-40	8,999	13,748	16,256	15,943	18,942	15,756
	41-60	3,109	8,416	12,857	15,203	14,910	17,714
	61-80	6,551	4,935	8,417	11,141	15,186	11,165
	81-100	17,562	5,700	4,699	7,786	8,567	12,800
	101-120	10,422	10,113	3,595	3,706	3,705	2,904
	121-140	450	6,835	10,138	4,983	1,801	6,143
	141+	52	308	2,461	3,221	3,170	387
	Subtotal	61,845	67,437	75,470	82,237	83,128	84,655
POD							
	1-20	13,943	39,555	22,855	22,676	25,144	25,391
	21-40	5,275	13,040	36,992	21,374	21,207	23,515
	41-60	7,440	4,933	12,195	34,594	19,989	19,832
	61-80	25,548	6,955	4,614	6,177	17,877	9,897
	81-100	11,827	14,221	1,800	2,941	5,688	8,226
	101-120	9,905	4,433	7,818	872	2,127	4,487
	121-140	38	4,183	1,147	2,760	101	774
	141+	-	36	0	-	369	-
	Subtotal	73,977	87,357	87,420	91,395	92,501	92,120
PRW							
	1-20	361	796	606	762	327	793
	21-40	28	338	744	567	713	306
	41-60	36	26	316	696	530	667
	61-80	210	33	24	272	649	447
	81-100	843	197	31	7	252	135
	101-120	787	606	163	16	6	181
	121-140	591	692	549	152	15	6
	141+	457	808	1,373	1,654	1,579	1,387
	Subtotal	3,312	3,495	3,806	4,126	4,071	3,923
SBL							
	1-20	4,167	1,421	3,324	1,591	1,458	1,935
	21-40	2,496	3,897	1,329	3,108	1,487	1,364
	41-60	139	2,334	3,644	1,243	2,907	1,391
	61-80	302	130	2,183	3,408	1,162	2,718
	81-100	955	282	122	2,041	3,187	1,087
	101-120	812	828	191	26	1,909	2,723
	121-140	2,904	705	477	83	24	1,503
	141+	5,838	8,011	6,349	6,120	5,485	4,898
	Subtotal	17,611	17,608	17,619	17,620	17,620	17,620

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

FMP-5 PROJECTED FOREST CONDITION FOR THE CROWN PRODUCTIVE FOREST

Forest Unit	Age Class	Area (ha)					
		2012	2032	2052	2072	2092	2112
SPD							
	1-20	29,292	13,910	12,078	14,046	21,776	22,152
	21-40	17,119	27,394	13,008	11,295	13,136	20,365
	41-60	4,563	16,071	25,691	12,222	10,588	12,301
	61-80	31,260	8,238	23,356	33,772	21,128	14,115
	81-100	17,940	25,759	8,321	18,312	19,881	9,704
	101-120	6,761	8,148	14,805	5,413	13,098	14,047
	121-140	4,053	3,874	8,787	15,364	5,211	12,815
	141+	1,797	4,788	9,592	19,580	26,898	31,199
	Subtotal	112,785	108,183	115,640	130,005	131,715	136,698
SPM							
	1-20	13,502	12,526	10,136	11,793	13,752	14,697
	21-40	3,742	12,627	11,714	9,480	11,029	12,860
	41-60	2,409	3,500	11,809	10,955	8,865	10,314
	61-80	9,873	6,528	12,980	21,197	23,040	16,561
	81-100	9,303	9,215	7,179	12,687	19,235	14,674
	101-120	5,468	6,714	5,256	4,719	8,959	13,822
	121-140	1,532	1,677	3,669	3,606	2,886	6,315
	141+	108	596	581	1,189	833	1,163
	Subtotal	45,937	53,381	63,325	75,625	88,599	90,406
LOWNAT	ALL for units	20,140	20,140	20,140	20,140	20,140	20,140
Total All Forest Units		745,534	744,542	744,542	744,515	744,329	744,231

NOTES: Data from Proposed Management Strategy 27d_OLTMS.
Area data reported for the beginning of each 20-year period.
Crown, managed LOWNAT and LOWMGMT area (20,140 ha) was classified as non-forest area in the strategic modellir (SFMM LTMD), but is classified as productive forest in Tables FMP-1 and 2.
Total productive forest area in Year 2012 is comparable to totals in Tables FMP-1 and FMP-2. SFMM land base reconciled 754,534 ha (14 ha lower than FMP-1 and FMP-2 due to rounding within SFMM model inputs).

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

FMP-6 PROJECTED HABITAT FOR SPECIES AT RISK AND SELECTED WILDLIFE SPECIES

Selected Wildlife Species	Species Abbrev.	Preferred Habitat Area (ha)					
		2012	2032	2052	2072	2092	2112
Caribou - refuge	Cr	103,969	118,856	143,406	156,352	151,766	150,000
Caribou - winter used	Cwu	45,055	83,974	106,123	120,501	109,010	104,075
Caribou - winter preferred	Cwp	20,581	16,824	54,271	57,788	52,131	44,972

NOTE:

Data derived from results of the SFMM Proposed Management Strategy 27d_OLTMS. Habitat reported for beginning of each 20-year period.

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

FMP-7 PROJECTED AVAILABLE HARVEST AREA BY FOREST UNIT (10-Year)

Forest Unit	Total Available Harvest Area (ha) for First 10-Year Term of Each 20-Year Period					
	2012	2032	2052	2072	2092	2112
BFM	1,408	0	4,257	1,679	0	141
CMX	8,845	3,481	10,573	5,659	699	1,263
HMX	12,064	9,488	10,437	2,377	1,774	0
OCL	0	0	13	0	0	0
OTH	0	0	98	303	13	93
PJD	3,149	10,658	12,385	14,041	8,031	8,991
PJM	5,369	1,991	644	291	5,002	10,761
POD	12,208	3,187	1,286	6,955	9,638	8,961
PRW	364	0	71	44	6	182
SBL	302	800	274	0	61	1,428
SPD	6,932	9,653	3,551	11,179	10,630	7,782
SPM	4,192	1,910	1,390	5,223	5,259	2,082
Total	54,834	41,167	44,980	47,753	41,114	41,682

NOTE:
Data derived from results of the SFMM Proposed Management Strategy 27d_OLTMS.

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

FMP-8 PROJECTED AVAILABLE HARVEST VOLUME BY SPECIES GROUP (10-YEAR)

Species Group	Available Harvest Volume (cubic metres) Total for First 10-year Term of Each 20-Year Period					
	2012	2032	2052	2072	2092	2112
Net Merchantable Volume:						
White Pine - Red Pine	37,745	0	7,338	4,848	748	15,245
Spruce-Pine-Fir	3,400,000	3,400,000	3,400,000	3,851,087	3,400,000	3,400,000
* Other Conifer (Cedar, Larch)	52,635	31,370	56,301	25,927	5,246	19,299
Poplar	1,900,000	900,000	900,000	900,000	1,125,946	1,000,000
White Birch	335,674	218,323	284,104	135,873	103,633	69,726
* Tolerant hardwood (Black Ash)	19,896	12,152	17,238	27,025	11,829	15,169
Sub-total All Species	5,745,949	4,561,845	4,664,980	4,944,760	4,647,402	4,519,438
Defect (Branches, Twigs, Leaves, Bark)						
White Pine - Red Pine	1,985	0	388	260	37	757
Spruce-Pine-Fir	538,328	508,623	496,982	562,477	506,239	475,488
* Other Conifer (Cedar, Larch)	3,147	1,787	3,378	1,570	308	985
Poplar	414,011	196,110	196,110	196,110	245,344	217,900
White Birch	86,128	56,018	72,896	34,862	26,590	17,890
* Tolerant hardwood (Black Ash)	1,187	725	1,029	1,613	706	905
Sub-total All Species	1,044,785	763,264	770,783	796,893	779,224	713,926
Undersized (Top Wood)						
White Pine - Red Pine	2,777	0	531	338	64	1,280
Spruce-Pine-Fir	116,739	107,824	103,308	117,922	107,491	97,644
* Other Conifer (Cedar, Larch)	1,034	1,602	972	284	162	2,270
Poplar	50,234	23,795	23,795	23,795	29,769	26,439
White Birch	32,372	21,055	27,399	13,103	9,994	6,724
* Tolerant hardwood (Black Ash)	3,512	2,145	3,043	4,770	2,088	2,677
Sub-total All Species	206,668	156,421	159,048	160,213	149,567	137,034
TOTAL	6,997,402	5,481,530	5,594,811	5,901,866	5,576,193	5,370,397

NOTE:

Data derived from results of the SFMM Proposed Management Strategy 27d_OLTMS with regional calculations for defect and undersized volumes.

* Volumes for Other Conifer (Larch, Cedar) and Tolerant Hardwood (Black Ash) are reported but are not considered major species groups on the Whiskey Jack Forest.

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

FMP-9 ASSESSMENT OF OBJECTIVE ACHIEVEMENT

SFMM data based on scenario 27d_OLTMS.cas

Management Objective:					CFSA Category:					Source:
Indicator / Measure(s)	Plan Start Level	Desirable Level	Timing of Assessment	Target	LTMD - Projected Achievement: Short-term (10 years)	Medium-term (20-70 years): Term when desirable level achieved and sustained:	Medium-term (20-70 years): Range of Values at achievement (or 20-70 year range of values if not achieved.)	Long-term (80-100 years): Term when desirable level achieved and sustained:	Long-term (80-100 years): Value at achievement or Year 100 value	Assessment
Management Objective:	**1. Landscape Pattern:** To emulate natural disturbance and landscape patterns characteristic of the management unit.				**CFSA Category:**	**Forest Diversity** - Natural Landscape Patterns				**Source:** 1a, 1b, 1c: Draft Landscape Guide 1b: NDPE Guide
Landscape Pattern **(1a) % of polygons with >60% mature and old forest**	**Percentage**	Landscape pattern consistent with OLT percentage projections for mature/old forest. **Min. Desirable %**	- Completion of proposed LTMD - Completion of Phase I Operational Planning - Year 10 Annual Report	Movement towards desirable level measured at Plan End 2022.	**Target: Percentage**	**Term**	**Percentage**	**Term**	**Percentage**	Spatial assessment showed that implementation of planned operations would result in a landscape pattern of mature and old forest moving towards the desirable level from plan start level. Target level **ACHIEVED** in this plan period.
Scale: 500 ha hexagon	27%	35%			29%	n/a	n/a	n/a	n/a	
Scale: 5,000 ha hexagon	18%	28%			24%	n/a	n/a	n/a	n/a	
(1b) Young forest patch size by size class. **Size Class:**	**Percentage**	Young forest landscape pattern consistent with OLT projections by size class. **Desirable %**	- Completion of proposed LTMD - Completion of Phase I Operational Planning - Year 10 Annual Report	Movement towards desirable level measured at Plan End 2022.	**Target: Percentage**	**Term**	**Percentage**	**Term**	**Percentage**	Spatial assessment of young forest by patch size shows movement towards the OLT desirable level in 6 of the 9 size classes. The 101-250 ha class increases in frequency whereas the template suggests a reduction. The 501-1,000 and 1,001-2,500 ha class frequencies decrease slightly at Plan End compared to higher desirable levels. Overall the movement toward the template frequency distribution is greater than the minor shortfalls in 3 classes. Target level is **ACHIEVED** in this plan period.
1 - 100 ha	63%	52%			60%	n/a	n/a	n/a	n/a	
101 - 250 ha	19%	15%			24%	n/a	n/a	n/a	n/a	
251 - 500 ha	7%	10%			9%	n/a	n/a	n/a	n/a	
501 - 1,000 ha	5%	8%			4%	n/a	n/a	n/a	n/a	
1,001 - 2,500 ha	4%	8%			2%	n/a	n/a	n/a	n/a	
2,501 - 5,000 ha	1%	4%			1.1%	n/a	n/a	n/a	n/a	
5,001 - 10,000 ha	1%	3%			1.3%	n/a	n/a	n/a	n/a	
10,000 - 20, 000 ha	0%	2%			0.2%	n/a	n/a	n/a	n/a	
> 20,000 ha	0%	1%			0.3%	n/a	n/a	n/a	n/a	
(1c) % of polygons with >60% mature and old conifer forest	**Percentage**	Landscape pattern consistent with OLT percentage projections for mature/old conifer forest. **Min. Desirable %**	- Completion of proposed LTMD - Completion of Phase I Operational Planning - Year 10 Annual Report	Movement towards desirable level measured at Plan End 2022.	**Target: Percentage**	**Term**	**Percentage**	**Term**	**Percentage**	Spatial assessment showed that implementation of planned operations would result in a landscape pattern of mature and old conifer forest moving marginally towards the desirable level from plan start level. The target level is marginally **ACHIEVED** in this plan period. Planned harvest is not negatively impacting achievement. More significant achievement will require aging of the forest over several plan periods.
Scale: 500 ha hexagon	4%	19%			6%	n/a	n/a	n/a	n/a	
Scale: 5,000 ha hexagon	1%	9%			1.3%	n/a	n/a	n/a	n/a	
Management Objective:	**2. Forest Composition:** To maintain or move towards a natural range of forest composition and age distribution.				**CFSA Category:**	**Forest Diversity** - Forest Structure and Composition - Distribution and Abundance of Forest Ecosystems				**Source:** 2a, 2d, 2e: Draft Landscape Guide 2b, 2c: FMPM
Area by OLT Forest Unit and Development Stage **(2a) Crown Productive Forest by Landscape Class:** **Landscape Class:**	**Hectares**	Achieve and maintain at or above the minimum of the lower interquartile hectare range (SRNV) for each Mate-Late landscape class as projected by OLT. **Minimum Desirable Ha.**	- Completion of proposed LTMD - Year 7 and Year 10 Annual Reports	Same as desirable level.	**Ha.**	**Target is Medium-term.** **Term**	**Ha.**	**Term**	**Ha.**	2 mature/late landscape classes achieves min. desirable and target levels at Plan Start. Remaining 2 ML classes are the smallest of ML classes and achieve and sustain desirable levels in medium-term (T4-T8) and sustain levels through long-term. Some achievement was increased to improve trends closer to OLT medians rather than minimum. Target levels **ACHIEVED** in the medium term indicator timeframe.
Mature/Late Balsam	8,361	8,706			8,119	T4	7,427 - 19,031	-	13,212	
Mature/Late Lowland	12,695	12,845			12,135	-	9,608 - 12,653	T8	12,850 - 12,884	
Mature/Late Hardwood	104,760	43,021			104,326	T1	43,100 - 104,760	-	49,208	
Mature/Late Conifer	182,885	178,461			189,168	T5	180,326 - 245,438	-	233,558	

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

FMP-9 ASSESSMENT OF OBJECTIVE ACHIEVEMENT

SFMM data based on scenario 27d_OLTMS.cas

Management Objective:					CFSA Category:					Source:
Indicator / Measure(s)	Plan Start Level	Desirable Level	Timing of Assessment	Target	LTMD - Projected Achievement: Short-term (10 years)	Medium-term (20-70 years)		Long-term (80-100 years)		Assessment
(2b) Crown Productive Forest by Forest Unit:		Forest area consistent with OLT projections by forest unit and age grouping:	- Completion of proposed LTMD - Year 7 and Year 10 Annual Reports	Same as desirable level.		**Target is Medium-term.**				Min. desirable and target levels met for 19 of 24 forest unit/age groupings within this plan period (most with Plan Start conditions).
Forest Unit:	**Hectares**	**Minimum Desirable Ha.**			**Ha.**	**Term**	**Ha.**	**Term**	**Ha.**	
BFM - Young/Immature	18,788	1,948			17,267	-	2,674 - 16,568	-	3,844 - 4,232	Desirable and target levels are met and sustained for all forest unit/age groupings except as noted below: - Young BFM underachieved T13-14. - Young HMX underachieved T12-16. - Young OCL underachieves T1-4. - Young OTH underachieves T1-6. - Young PJM underachieves T1. - Mature PJD underachieves T1-5. - Mature PJM underachieves T3-6. - Mature POD underachieves T6-7. - Mature SBL underachieves T3-6. - Mature SPM underachieves T1-3. Target levels **ACHIEVED** in target timeframe (majority within this plan period). Overall desirable level achievement of area by forest unit and age grouping very good while managing for landscape class and old forest areas.
- Mature/Late	8,361	8,361			8,119	T4	9,531 - 19,031	-	13,212	
CMX - Young/Immature	57,387	11,696			48,579	T1	28,810 - 45,195	-	27,966	
- Mature/Late	31,106	24,197			33,502	T1	40,355 - 44,229	-	31,550	
HMX - Young/Immature	51,632	21,591			36,443	-	31,265 - 38,054	-	21,905 - 31,257	
- Mature/Late	55,608	19,993			62,497	T1	28,809 - 50,160	-	24,575	
OCL - Young/Immature	187	465			243	T5	590 - 649	-	637	
- Mature/Late	2,029	1,499			1,974	T1	1,557 - 1,909	-	1,568	
OTH - Young/Immature	162	448			192	T7	455	-	745	
- Mature/Late	1,833	1,240			1,803	T1	1,540 -1,763	-	1,250	
PJD - Young/Immature	133,098	106,124			138,579	T1	106,784 - 151,681	-	118,917	
- Mature/Late	49,734	52,493			50,246	T6	61,735 - 64,812	-	52,500	
PJM - Young/Immature	29,870	36,541			36,813	T2	41,223 - 54,776	-	57,155	
- Mature/Late	31,975	27,435			28,691	T7	28,270	-	27,500	
POD - Young/Immature	26,658	12,670			42,418	T1	57,528 - 78,957	-	68,737	
- Mature/Late	47,319	12,933			40,026	-	12,129 - 29,829	T8	21,609 - 26,162	
PRW - Young/Immature	635	635			1,207	T4	1,330 - 2,296	-	2,214	
- Mature/Late	2,677	1,367			2,293	T1	1,830 - 2,302	-	1,709	
SBL - Young/Immature	6,945	3,667			7,447	T1	6,564 - 9,628	-	6,338	
- Mature/Late	10,666	10,078			10,161	T7	11,056	-	11,282	
SPD - Young/Immature	67,038	6,479			55,619	T1	53,196 - 68,780	-	62,178	
- Mature/Late	45,748	34,643			53,072	T1	41,828 - 76,809	-	74,520	
SPM - Young/Immature	24,292	17,441			26,291	T1	32,471 - 44,183	-	44,628	
- Mature/Late	21,645	21,733			21,364	T5	21,999 - 35,776	-	45,778	
(2c) Amount and Distribution of Old Forest		Maintain old forest area by forest unit group at or above the minimum desirable Ha.:	- Completion of proposed LTMD - Year 7 and Year 10 Annual Reports	Overall movement towards desirable level as projected for the end of the plan period.	**Target:**					Desirable and targets levels of old forest achieved and maintained from Term 6 onwards (or earlier) for all forest unit groupings. Some achievement was improved to trend closer to OLT medians. All old forest groups move towards SRNV in this plan period except BFo and SPo that decrease for 10 years then increase again T3-T6 to the SRNV. Acceptable deviation given overall improvement for indicator. Target level **ACHIEVED** in this plan period.
Forest Unit/ Onset Age (years):	**Plan Start Level (ha)**	**Minimum Desirable Ha.**			**Ha.**	**Term**	**Ha.**	**Term**	**Ha.**	
OLD - BFo >80 years	3,707	5,315			3,371	T7	10,049	-	11,206	
OLD - CLo >100 years	1,851	1,328			1,920	T1	1,466 - 1,883	-	1,400	
OLD - CMo >100 years	8,730	20,665			10,699	T4	23,526 - 29,306	-	21,000	
OLD - HWo >100 years	16,931	7,050			18,716	T1	12,867 - 23,966	-	12,341	
OLD - OHo >90 years	1,252	992			1,575	T1	1,452 - 1,700	-	1,094	
OLD - PJo >100 years	23,267	20,800			43,275	T1	21,000 - 42,449	-	32,809	
OLD - SLo >160 years	2,007	3,319			3,780	T2	4,630 - 6,416	-	3,413	
OLD - SPo >110-120 years	10,155	25,840			9,032	T6	33,178 - 41,072	-	58,659	
OLD - PRW >140 years	457	457			688	T1	808 - 1,654	-	1,387	
(2d) Amount of red pine and white pine forest (all ages, PRW forest unit)	3,312 ha.	Maintain area of the PRW forest unit (minimum 3,312 ha.).		Same as desirable level.	**Target:** 3,500 ha.	3,495 - 4,126 ha.		3,923 - 4,121 ha.		Desirable and target levels **ACHIEVED** with Plan Start area. Additional red pine and white pine will be planted but not necessarily result in increased forest unit area.
(2e) Amount of upland pine and spruce forests (all ages, total of PJD, PJM, SPD, and SPM forest units)	403,400 ha.	Maintain minimum of 457,260 ha upland conifer as per OLT min. SRNV projection.		Movement towards desirable level during this plan period.	**Target:** 410,674 ha.	T7 457,770 ha.		466,121 - 483,176 ha.		Steady increase towards desirable level. Target level **ACHIEVED** in this plan period.

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

FMP-9 ASSESSMENT OF OBJECTIVE ACHIEVEMENT

SFMM data based on scenario 27d_OLTMS.cas

Management Objective:					CFSA Category:				Source:
Indicator / Measure(s)	Plan Start Level	Desirable Level	Timing of Assessment	Target	LTMD - Projected Achievement: Short-term (10 years)	Medium-term (20-70 years)		Long-term (80-100 years)	Assessment
Management Objective:	**3. Wildlife Habitat:** To maintain forest function for wildlife habitat in the management unit.				**CFSA Category:**	**Forest Diversity** and **Provision of Forest Cover** - Habitat for animal life			**Source:** 3a, 3b, 3c: Draft Landscape Guide 3d: Marten Habitat Guide
(3a) Area of habitat for forest-dependent Species At Risk **Wildlife Species in caribou zone:**	**Plan Start Level (ha)**	Achieve and maintain min. OLT projected SRNV ha for caribou habitat (as below). **Minimum Desirable Ha.**	- Completion of proposed LTMD - Year 10 Annual Report	Move towards desirable level over next 30 years.	**Ha.**	**Target is Medium-term.** **Term**	**Ha.**	**Term**	**Ha.**	Caribou habitat generally increases from Plan Start to exceed min. desirable levels by Term 6 onwards. During this plan period, there is clean-up occurring in 4 caribou blocks which accounts for the short-term reduction in refuge and preferred winter habitat. Increase then projected from T3-6 to within SRNV levels to **ACHIEVE** target levels within the 30-year target timeframe.
Caribou - refuge	103,969	147,605			100,503	T6	154,830 - 156,352	-	150,000	
Caribou - winter used	45,055	26,809			45,782	T1	83,974 - 120,501	-	104,075	
Caribou - winter preferred	20,581	36,912			17,975	T5	54,271 - 60,933	-	44,972	
(3b) % of polygons with >60% caribou refuge habitat in caribou zone.	**Plan Start (%)**	Maintain min. OLT projected SRNV percentage for caribou refuge habitat pattern (as below). **Desirable %**		Move towards desirable level.	**Target: Percentage**	**Term**	**Percentage**	**Term**	**Percentage**	Spatial assessment shows 1% movement towards the desirable level for analysis at the 6,000 ha scale. The second analysis shows 1% movement away from the desirable level which is not considered significant. There is clean-up occurring in four caribou blocks which accounts for the reduction in refuge habitat at the 300 km2 scale. Overall target assessed as **ACHIEVED** in this plan period.
Scale: 6,000 ha hexagon	36%	87%			37%	n/a	n/a	n/a	n/a	
Scale: 30,000 ha hexagon	25%	92%			24%	n/a	n/a	n/a	n/a	
(3c) % of polygons with >60% caribou winter habitat in caribou zone.	**Plan Start (%)**	Maintain min. OLT projected SRNV percentage for caribou winter habitat pattern (as below). **Desirable %**		Move towards desirable level.	**Target: Percentage**	**Term**	**Percentage**	**Term**	**Percentage**	Spatial assessment shows movement towards desirable level for analysis at the 6,000 ha scale. Second analysis shows no movement away from the Plan Start 0% level (constant). Overall target assessed as **ACHIEVED** in this plan period.
Scale: 6,000 ha hexagon	0%	45%			4%	n/a	n/a	n/a	n/a	
Scale: 30,000 ha hexagon	0%	40%			0%	n/a	n/a	n/a	n/a	
(3d) Landscape pattern - interior, Marten Core Habitat	Year 2012: 4.9% of 676,469 ha. capable habitat in suitable conditions in core areas.	10-20% of capable Marten habitat area in suitable conditions in core areas of 3,000 to 5,000 ha.		10-20% of capable Marten habitat area in suitable conditions in core areas of greater than 1,000 ha moving towards the desirable level measured in 2072.	4.9% (same as Plan Start as is measured at 20 year term intervals)	**Target is Medium-term**: Over next 60 years, achievement is: 4.9% for Plan Start (2012), 8.6% for Year 20, 9.0% for Year 40, and 9.1% for Year 60. Preliminary assessment indicates that the min. target 10% should be available in 60-80 years.				Marten cores were developed to meet guideline levels and to incorporate the best concentrations of suitable habitat, spatially distributed across the forest for the next 60 years. The Whiskey Jack Forest currently lacks sufficient concentrations of conifer forest to meet the desirable level. The target level is expected to be **ACHIEVED** in 60-80 years based on preliminary assessment of projected suitable marten habitat.
Management Objective:	**4. Wood Supply:** To provide a predictable and continuous supply of wood products to the forest products industry from the management unit.				**CFSA Category:**	**Social and Economic** - Long-term harvest levels			**Source:** 4a, 4b: FMPM 4c: optional, Planning Team, previous FMPs	
Long-term projected available harvest area and volume, by species group **(4a) Long-term projected available harvest area**	**Average Ha/Year** 5,483 ha	Maintain an average total harvest area above 4,100 hectares per year.	- Completion of proposed LTMD	Same as desirable level.	Term 2: 4,431 ha/year.	4,117 - 4,775 ha/year.	**Target is Long-term: 4,111 - 4,601 ha/year.**		Long-term desirable level and target level for annual available harvest area **ACHIEVED.**	
(4b) Long-term projected available harvest volume by species group	**Annual Harvest Volume (m3)**	Achieve highest possible long-term harvest volumes while maintaining a balance of objective achievement reported by species group.	- Completion of proposed LTMD	Same as desirable level.	**m3/year**	**m3/year**	**Target is Long-term:**		Long-term desirable level and target level for annual available harvest volumes **ACHIEVED.** Sustainable, predictable harvest volumes projected. SPF and PO species groups were considered a higher priority than volume by other species groups or total volumes.	
Spruce-Pine-Fir	340,000				340,000	340,000 - 385,100	340,000 - 399,000			
Poplar	190,000				130,000	90,000	100,000 - 112,600			
White Birch	33,600				27,800	13,600 - 28,400	7,000 - 11,500			
Red Pine - White Pine	3,800				600	0 - 800	0 - 6,200			
TOTAL (info only, not a species	574,600				501,600	494,500 - 482,500	451,900 - 518,800			

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

FMP-9 ASSESSMENT OF OBJECTIVE ACHIEVEMENT

SFMM data based on scenario 27d_OLTMS.cas

Management Objective:					CFSA Category:					Source:
Indicator / Measure(s)	Plan Start Level	Desirable Level	Timing of Assessment	Target	LTMD - Projected Achievement: Short-term (10 years)	Medium-term (20-70 years)		Long-term (80-100 years)		Assessment
(4c) Short-term projected harvest volume per year	**Annual Harvest Volume (m3)** 574,600 m3	Maintain harvest volume (all species combined) at or above 510,000 m3 per year for this plan (2012-2022).	- Completion of proposed LTMD	Same as desirable level.	**Target:** 574,600 m3/yr	n/a	n/a	n/a	n/a	Term 1 desirable and target harvest volume levels were **ACHIEVED** in this plan period.
Management Objective:	**6. Aboriginal Involvement:** To work with local Aboriginal peoples, whose communities are situated in or adjacent to the management unit, to identify and implement forest operations (harvest, access, renewal, maintenance and protection) that will maintain or enhance social and economic benefits to Aboriginal peoples.				**CFSA Category:**	**Social and Economic** - Involvement in forest management planning				**Source:** 6a, 6b: FMPM
Opportunities for involvement provided to, and involvement of Aboriginal Communities in the plan development process. **(6a) Representation on the Planning Team**	n/a	Five Aboriginal Communities located in or adjacent to the WJF with representation on the planning team, measured during plan development.	- Draft Plan (FMP-9)	Same as desirable level.	**Target:** Five communities have identified representatives to the Planning Team.	n/a	n/a	n/a	n/a	Five communities assigned a representative to the planning team. Participation at planning team meetings and information centres varied based upon each representatives schedule and availability. Desirable and target levels **ACHIEVED** during the target timeframe of plan development.
(6b) Aboriginal Communities that contribute information to the planning process (e.g. to a tailored consultation process, Values Maps, the Aboriginal Background Information Report, Report on the Protection of Identified Aboriginal Values).	n/a	Five Aboriginal Communities located in or adjacent to the WJF that contribute information to the planning process, measured during plan development.	- Draft Plan (FMP-9)	Same as desirable level.	**Target:** Three communities contributed information to the planning process.	n/a	n/a	n/a	n/a	Three communities accepted the offer to review detailed operational plans at the LTMD stage and community information sessions were held. The Aboriginal Background reports were available for review by community members at the information sessions. Desirable and target levels **NOT ACHIEVED** during the target timeframe of plan development.
Management Objective:	**7. LCC Involvement:** To have the Local Citizens Committee effectively participate in the development of the FMP.				**CFSA Category:**	**Social and Economic** - Involvement in forest management planning				**Source:** 7a: FMPM
(7a) Local citizens committee's self-evaluation of its effectiveness in plan development.	n/a	LCC Effectiveness survey results indicate a minimum of 60-80% effectiveness in the development of the FMP.	- Draft Plan (FMP-9)	Same as desirable level.	**Target:** Overall result of the LCC survey was 82%.	n/a	n/a	n/a	n/a	**ACHIEVED**. Overall, the LCC members indicated a very good level of involvement and effectiveness during FMP development with 82% positive response.

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

FMP-9 ASSESSMENT OF OBJECTIVE ACHIEVEMENT

SFMM data based on scenario 27d_OLTMS.cas

Management Objective:					CFSA Category:			Source:
Indicator / Measure(s)	Plan Start Level	Desirable Level	Timing of Assessment	Target	LTMD - Projected Achievement: Short-term (10 years)	Medium-term (20-70 years)	Long-term (80-100 years)	Assessment

The Following Indicators Are Measured After Implementation of the Forest Management Plan:

Management Objective:	3. Wildlife Habitat: To maintain forest function for wildlife habitat in the management unit.				CFSA Category: Silviculture, Forest Diversity, and Provision of Forest Cover - Habitat for animal life	Source: 3e, 3f: Endangered Species Act, CCP
(3e) % of conifer dominated forest units in the caribou zone. Forest Unit Proportion:		Maintain or increase percentage of specific conifer dominated forest units in the caribou zone.	- Year 7 and Year 10 Annual Reports	Same as desirable level.	Target year is Short-term (10 years). **FUTURE** assessment by forest unit based on actual harvest and forest inventory updates during plan period. Assessment: This indicator is calculated from an updated Base Model Inventory. In the caribou zone, total productive forest area of targeted conifer forest units (only PJD, PJM, SBL, SPD and SPM forest units) divided by the total productive area, expressed as a percentage. Information is reported by forest unit, but indicator is for combined total percentage of the targeted forest units in the caribou zone (not individually).	
PJD	33%					
PJM	11%					
SBL	3%					
SPD	21%					
SPM	7%					
Total for Targeted Forest Units:	75%					
(3f) % jack pine and spruce species composition by forest unit in the caribou zone. Proportion of PJ/SB/SW:		Maintain or increase percentage of jack pine and spruce species composition in the caribou zone.	- Year 7 and Year 10 Annual Reports	Same as desirable level.	Target year is Short-term (10 years) for reporting but assessment continues through long-term through future plan periods. **FUTURE** assessment by stand level conifer species composition based on actual harvest and forest inventory updates during plan period. Assessment: Forest composition to be derived using the Base Model Inventory with the species composition string parsed out. Indicator calculated for only PJD, PJM, SBL, SPD and SPM forest units within the caribou zone: the combined species composition percentage for jack pine, black spruce and white spruce (only) is calculated, based on the area weighted average tree species composition by forest unit.	
PJD	97%					
PJM	92%					
SBL	95%					
SPD	92%					
SPM	89%					

Management Objective:	4. Wood Supply: To provide a predictable and continuous supply of wood products to the forest products industry from the management unit.				CFSA Category: Social and Economic - Planned harvest levels - Community well-being	Source: 4e, 4f: FMPM
(4d) Actual harvest area, by forest unit (% of planned harvest area) **Forest Unit:**		Minimum % of the planned harvest area by forest unit actually harvested the 10-year plan period (2012-2022) based on FMP-11.	- Year 7 and Year 10 Annual Reports	Same as desirable level.	Target year is Short-term (10 years). **FUTURE** assessment based on actual harvest levels during plan period. NOTE: Planned harvest area includes internal areas to be left unharvested during operations (inoperable, residual, etc.) therefore the desired and target levels for actual harvest area reflect the anticipated reductions for unharvested areas for each forest unit.	
BFM	n/a	80 - 100%				
CMX	n/a	90 - 100%				
HMX	n/a	90 - 100%				
OCL	n/a	n/a (no AHA area)				
OTH	n/a	n/a (no AHA area)				
PJD	n/a	80 - 100%				
PJM	n/a	80 - 100%				
POD	n/a	90 - 100%				
PRW	n/a	80 - 100%				
SBL	n/a	80 - 100%				
SPD	n/a	80 - 100%				
SPM	n/a	80 - 100%				
(4e) Actual harvest volume, by species group (% of planned harvest volume) Volume Species Group:	n/a	% of the planned harvest volume by species group actually harvested during the 10-year plan period (2012-2022) based on FMP-13.	- Year 7 and Year 10 Annual Reports	Same as desirable level.	Target year is Short-term (10 years). **FUTURE** assessment based on actual harvest volumes during plan period.	
Spruce-Pine-Fir		min. 90%				
Poplar		min. 90%				
White Birch		min. 80%				
Red Pine - White Pine		min. 80%				

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

FMP-9 ASSESSMENT OF OBJECTIVE ACHIEVEMENT

SFMM data based on scenario 27d_OLTMS.cas

Management Objective:					CFSA Category:			Source:
Indicator / Measure(s)	Plan Start Level	Desirable Level	Timing of Assessment	Target	LTMD - Projected Achievement: Short-term (10 years)	Medium-term (20-70 years)	Long-term (80-100 years)	Assessment
Management Objective:	**5. Managed Crown Forest:** To provide continuous social benefits resulting from the managed Crown forest available for timber production on the management unit.				**CFSA Category:** Social and Economic - Harvest levels - Community well-being			**Source:** 5a: FMPM
(5a) Managed Crown forest available for timber production	572,035 ha.	Maintain a minimum of 570,000 ha of Managed, Crown forest available for timber production.	- Year 7 and Year 10 Annual Reports	Same as desirable level.	Target year is Long-term (100 years). **FUTURE** assessment at completion of 10-year plan period based on updated Base Model Inventory based on updated Planning Inventory (e.g. actual depletions, non-productive areas, FTG survey results, etc.) and added forecasts and estimated reserves included for the BMI.			
Management Objective:	**8. Road Access:** To provide road-based access, land use and recreational opportunities through road maintenance and development of access to areas planned for harvest and renewal within the plan period.				**CFSA Category:** Social and Economic - Community well-being			**Source:** 8a: FMPM Endangered Species Act, CCP.
(8a) Kilometres of SFL road per square kilometre of Crown forest	**Non-caribou Zone:** 0.11 km SFL road per km2 productive forest	Maintain SFL primary and branch forest access road density in the non-caribou zone at a minimum of 0.11 km/km2 productive Crown area.	- Year 7 and Year 10 Annual Reports	Same as desirable level measured at Plan End 2022.	**FUTURE** assessment based on actual primary and branch road construction program and decommissioning measured after completion of 10-year plan period. (The degree to which individual roads contribute to this objective will be subject to MNR. District Land Use Guidelines and Fisheries Management Plan direction and the road decommisioning strategy).			
	Caribou Zone: 0.12 km SFL road per km2 productive forest	Maintain SFL primary and branch forest access road density in the caribou zone at a maximum of 0.13 km/km2 productive Crown area.						
Management Objective:	**9. Forest Renewal:** To successfully regenerate harvest areas to Free-Growing status in a manner that is consistent with the regeneration standards outlined in the Silvicultural Ground Rules.				**CFSA Category:** Silviculture			**Source:** 9a, 9b, 9c: FMPM
(9a) Regeneration Success: Percent of Harvested Forest Area Assessed as Free-Growing by Forest Unit	n/a	minimum of 95% of harvest area successfully regenerated to free-growing status within 10 years of harvest.	- Year 7 and Year 10 Annual Reports	Same as desirable level.	Target year is Short-term (10 years). **FUTURE** assessment based on actual renewal achievements during plan period. How to measure: - Identify Ha harvested by term from previous Annual Report and year 7/10 Annual Reports, identify Ha declared successfully regenerated by term and determine % success by Forest Unit, compare to target % by Forest Unit			
(9b) Silviculture Intensity: Planned and Actual Percent of Harvested Area Treated by Silvicultural Intensity	n/a	minimum of 80% of area treated by planned silvicultural treatment intensity for each 5-year plan term (2012-2017, 2017-2022).	- Year 7 and Year 10 Annual Reports	Same as desirable level.	Target year is Short-term (10 years). **FUTURE** assessment based on actual renewal achievements during plan period. How to measure: - Planned (target): Identify silvicultural intensity for planned harvest areas by term from composite plan inventory, express as percent of total harvest area - Actual: Identify Ha treated by silvicultural intensity from Annual reports and express as percent of total harvest area.			
(9c) Silvicultural Success: Planned and Actual Percent of Harvested Forest Area Assessed as Free-Growing and Successfully Regenerated to the Projected Forest Unit	n/a	70-100% of harvest area successfully regenerated to free-growing status and to the projected forest units within 10 years of harvest.	- Year 7 and Year 10 Annual Reports	Same as desirable level.	Target year is Short-term (10 years). **FUTURE** assessment based on actual renewal achievements during plan period. How to measure: - Planned (target): percentages used in strategic modelling by FU - Actual: Identify Ha harvested by term by FU from previous Annual Reports and year 7/10 Annual Reports, identify Ha declared successfully regenerated by term and FU and determine % of harvested area by Forest Unit, Compare to planned rates by FU.			
Management Objective:	**10. Forest Values:** To implement forestry operations in a manner that minimizes negative impacts on all identified resource users, and protects all identified values.				**CFSA Category:** Ecological Sustainability - Healthy forest ecosystems			**Source:** 10a: FMPM
(10a) % of forest operation inspections in non-compliance, by activity and remedy type (i.e. severity).	n/a	Maximum 5% of forest inspections reported in non-compliance reported for each 5-year plan term (2012-2017, 2017-2022).	- Year 7 and Year 10 Annual Reports	Same as desirable level.	Target year is Short-term (10 years). **FUTURE** assessment based on actual compliance levels during plan period.			

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

FMP-9 ASSESSMENT OF OBJECTIVE ACHIEVEMENT

SFMM data based on scenario 27d_OLTMS.cas

Management Objective:					CFSA Category:			Source:
Indicator / Measure(s)	Plan Start Level	Desirable Level	Timing of Assessment	Target	LTMD - Projected Achievement: Short-term (10 years)	Medium-term (20-70 years)	Long-term (80-100 years)	Assessment
Management Objective:	**11. Soil and Water Resources:** To maintain productivity of soil function, and to protect water quality and fisheries habitat where forest management activities occur in the Forest.				**CFSA Category:**	**Ecological Sustainability** - Healthy forest ecosystems		**Source:** 11a, 11b: FMPM
(11a) % of forest operations inspections in non-conpliance with management practices that prevent, minimize or mitigate site damage (by remedy type)	n/a	Max. 5% of inspections related to prescriptions in the FMP that were developed using the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* reported as not in compliance.	- Year 7 and Year 10 Annual Reports	Same as desirable level.	Target year is Short-term (10 years). **FUTURE** assessment based on actual compliance levels during plan period.			
(11b) % of forest operations inspections in non-compliance with prescriptions developed for the protection of water quality and fish habitat (by remedy type)	n/a	Max. 5% of inspections related to water quality and fish habitat protection prescriptions not in compliance.	- Year 7 and Year 10 Annual Reports	Same as desirable level.	Target year is Short-term (10 years). **FUTURE** assessment based on actual compliance levels during plan period.			

Management Unit Name: Whiskey Jack Forest [X] Phase 1 (Year 1-5)
Plan Period: April 1, 2012 to March 31, 2022 [ ] Phase 2 (Year 6-10)

FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value

List of AOCs in order of appearance in this table:

A01	Archaeological Potential Area
D01	Occupied black bear dens
D02	Occupied grey fox dens
D03	Occupied cougar dens
D04	Wolf dens
D05	Wolverine dens
M01	Mineral licks
N01	Bald eagle - primary nests - Identified Prior to Operations
N02	Bald eagle - alternate nests
N03	Bald eagle - inactive nests
N04	Bald Eagle Primary Nest - Discovered During Operations
ON01	Osprey - primary nests - Identified Prior to Operations
ON02	Osprey - alternate nests
ON03	Osprey - inactive nests
ON04	Primary Osprey Nest - Discovered During Operations
BH01	Active Great Blue Heron colonies
BH02	Inactive Great Blue Heron colonies
BG01	Active colonies of Bonaparte's gull
BS01	Active large colonies of bank swallows (≥100 pairs)
BS02	Barn Swallow Nests
HO01	Primary nests of great grey owl, northern goshawk, or red-shouldered hawk
HO02	Alternate nests of great grey owl, northern goshawk, or red-shouldered hawk
NO01	Stick nests occupied by barred owl, broad-winged hawk, common raven, Cooper's hawk, great horned owl, long-eared owl, merlin, red-tailed hawk, or sharp-shinned hawk.
NO02	Nests/ communal roosts in cavities occupied by American kestrel, barred owl, boreal owl, eastern screech-owl, great horned owl, northern hawk owl, northern saw-whet owl or chimney swift.
NO03	Ground nests occupied by northern harrier, short-eared owl, or turkey vulture
NO04	Whip-poor-will nest sites
NO05	Common nighthawk nest sites
NO06	Olive-sided flycatcher nest sites

Management Unit Name: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
Plan Period: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10)**

FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value
NO07	**Canada warbler nest sites**
NO08	**Bat Hibernacula** known to be suitable and to have been used at least once within the past 20 years by ≥ 50 **Little Brown Myotis** (Little Brown Bats) or ≥ 20 **Northern Myotis** (Northern long-eared bats)
PGP01	**FESC PGP G&Y Trial Plot**
PL01	**Patent Land**
RR01	**Railroad Right of Way**
NG01	**Natural Gas Transmission Pipeline**
HB01	**Highway Corridor Aesthetics**
LS01	**Tourism – Lac Seul Shoreline (Remoteness, aesthetics, fisheries, water quality, cultural heritage)**
TV01	**Tourism – Aesthetics Along Large High Volume Tourism Lakes, recognized canoe routes, recreational lakes**
TVgl	**Tourism- Gibi Lake**
TVnsl	**Tourism- North Star Lodge**
TVw	**Tourism – timing restriction**
TVwl	**Tourism – Wine Lake**
TVal	**Tourism – Aerobus Lake**
TVer	**Tourism – English River Waterway Park**
TVp	**Tourism - portage**
TVc	**Tourism - campsite**
WL01	**Large lakes, Medium lakes, Small lakes, Ponds - high or moderate potential sensitivity (HPS or MPS) to forest management operations**
WL02	**Ponds – low potential sensitivity (LPS) to forest management operations**
WS01	**Rivers, Stream segments -high or moderate potential sensitivity (HPS or MPS) to forest management operations**
WS02	**Stream segments -low potential sensitivity (LPS) to forest management operations**
WW01	**Wetlands occupied by breeding black terns, golden-winged warblers, least bitterns, or yellow rails**
WW02	**Woodland pools known to support flooded jellyskin**
FL01	**First Nation Reserve Land**
NE9	**Trumpeter Swan Nesting Site**
NE10	**Snapping Turtle nesting Site**

Management Unit Name: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
Plan Period: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10)**

FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
A01	**Archaeological Potential Area** Identified on the final archaeolgical potential area map Secondary Value (when water crossing is involved): Lakes, ponds, streams, rivers– high, moderate or low potential sensitivity (HPS, MPS, LPS) to forest management operations	Group	Forest Management Guide for Cultural Heritage Values (*MNR 2006)* pp. 33-35	No	Yes. See FMP-19	Yes	No aggregate extraction is permitted. No new aggregate pits are permitted.

Operational Prescription

Within each mapped area on operational maps one of the following will be done:

- a reserve

OR

- operations where the harvest, skidding, and renewal activities do not cause more than 5% mineral soil disturbance (on a weighted average basis) within the harvested portion of the area of concern within the block.
- Skid trails will minimize the skid distance out of the area of concern and sharp corners will be avoided.

OR

- Within blowdown areas the mineral soil disturbance (weighted average) may exceed 5% within the area of concern. Root mats are to be put back into place wherever possible,

OR

- If a Ministry of Culture Stage 2 archaeological assessment is completed, nothing is found and the recommendation is that no further archaeological works is required and Ministry of Culture has reviewed the report THEN regular operations can proceed in the assessed area. Copies of any archaeological assessment reports will be provided to the MNR area forester and provincial cultural heritage specialist.

If the protection measures for an area of archaeological potential are not complied with, operations must immediately cease within the area of concern and a Stage 2 archaeological assessment per Ministry of Culture's current standards and guidelines for consultant archaeologists shall occur.

If a cultural heritage value is discovered during operations (e.g. an arrowhead, cemetery, or old logging camp) then operations must immediately stop and the district MNR staff will be contacted as per the Forest Information Manual. The value class of the discovery will determine who of the following will be contacted: Ministry of Culture staff, the local Aboriginal community, Registrar of Cemeteries, and/or the provincial cultural heritage specialist. When the class of cultural heritage value is established, the appropriate protection measure(s) will be applied.

When human remains are discovered, work at the site must be suspended and the police notified. It is also appropriate to notify the MNR district staff. The police will investigate the report to determine if the human remains are of forensic interest or represent a burial site as defined by the *Cemeteries Act*. All involved parties must act to safeguard the location until the police attend the site, and to limit media contact or display.

Management Unit Name: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
Plan Period: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10)**

FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
D01	**Occupied black bear dens**	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010),* Pages 94-95.	No	No crossings or landings permitted in the AOC.	Yes	Yes

Operational Prescription

- 100 m radius AOC centred on the den entrance.

Regular harvest, renewal, and tending operations are permitted within the AOC subject to timing restrictions during the denning period(see below).

October 15 to April 30 (Denning Period)

- Harvest, renewal, and tending operations involving heavy equipment are not permitted within the AOC.
- The only operations permitted during the first four weeks of the denning period (October 15 to November 15) are boundary marking and regeneration surveys with no ATV use. Harvest, renewal and tending operations that do not involve heavy equipment are permitted after November 15.

D02	**Occupied grey fox dens**	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010),* Page 95.	No	No crossings or landings permitted in the AOC.	Yes	Yes

Operational Prescription

- 100 m radius AOC centred on the den entrance.

April 15 to September 15 (Denning Period)
Harvest, renewal, and tending operations are not permitted within the AOC during the denning period.

September 16 to April 14 (Not Denning Period)
Regular harvest, renewal, and tending operations are permitted within the AOC outside the denning period and are subject to the general direction for the protection of dens of furbearing mammals (Plan text Section 4.2.2.2 Conditions on Regular Operations).

Management Unit Name: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
Plan Period: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10)**

FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
D03	**Occupied cougar dens**	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010),* Page95-96.	No	No crossings or landings permitted in the AOC.	Yes	Yes

Operational Prescription

- 200 m radius AOC centred on the den entrance.

Denning Period (see below)
Harvest, renewal, and tending operations are not permitted within the AOC during the denning period.

Kittens are typically born between April and September, but occupied dens may be located at any time of year. Thus, the denning period is potentially different for each occupied den encountered and is considered to extend for 8 weeks from the date an occupied den is located, or until a den is known to be no longer occupied.

Not Denning Period
Regular harvest, renewal, and tending operations are permitted within the AOC outside the denning period and are subject to the general direction for the protection of dens of furbearing mammals (Plan text Section 4.2.2.2 Conditions on Regular Operations).

D04	**Wolf dens**	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010),* Pages 96-97.	No	No crossings or landings permitted in the AOC.	Yes	Yes

Operational Prescription

- 200 m radius AOC centred on the den entrance.

0–100 m from den entrance
Harvest operations are not permitted.

If required, renewal and tending operations are allowed outside of the denning period (July 16-April 14) subject to wildlife trees and downed woody material requirements (plan text Section 4.2.2.2). Renewal and tending activities that reduce the mature forest to<60% relatively uniform canopy closure (canopy openings not to exceed individual tree crowns) are not permitted. All other renewal and tending operations are permitted.

101-200 m from den entrance, April 15-July 15 (Denning Period):
Harvest, renewal, and tending operations are not permitted.

101-200 m from den entrance, July 16-April 14 (Outside of Denning Period):
Harvest, renewal or tending operations permitted subject to residual pattern, wildlife trees and downed woody debris requirements (Plan text Section 4.2.2.2).

Management Unit Name: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
Plan Period: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10)**

FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
D05	**Wolverine dens**	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010)* Page 127	No	No crossings or landings permitted in the AOC.	Yes	Yes
Operational Prescription • 4 km radius AOC centered on the den entrance. • No harvest, renewal and tending operations permitted within the AOC. • If a wolverine den is encountered during operations all operations will stop within a 4km radius AOC and the Kenora District Office MNR will be immediately notified of the presence of a wolverine den in proximity to forest operations. • No further harvest, renewal or tending activities are permitted within the AOC. • The FMP may be amended following the above by developing a new AOC in consultation with MNR biologists that includes a den site management plan for the specific location and in consideration of the following: o The specific dimensions of the wolverine den AOC; o Normally harvest, renewal and tending operations will be prohibited in the AOC, however, some operations may be permitted to meet ecological, social or economic objectives. Where operations will be permitted the AOC will outline the extent and timing of any harvest, renewal and tending operations; o Denning generally occurs between February and May when snow depth is usually at its greatest. • Reasonable efforts will be made to incorporate the AOC into a large block of unharvested and unroaded forest (i.e. marten core, caribou block).						
M01	**Mineral licks** (natural mineral licks known or encountered during operations. Excludes mineral licks created by salt accumulation along roadways)	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010),* Page 93.	No	No crossings or landings permitted in the AOC.	Yes	Yes
Operational Prescription • 120 m radius AOC measured from the edge of woody vegetation averaging at least 2 m tall and with ≥25% canopy cover. No harvest, renewal, or tending operations are permitted within the AOC.							
N01	**Bald eagle primary nests** (see definition below) **Identified Prior to Operations**	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010),* Pages 64-66.	No	No	Yes	Yes
Bald Eagle Primary Nests (AOC N01) are nests known or suspected to have been occupied at least once within the past 5 years (i.e., active nests), unless the nest and all associated nests within the nesting area have been documented as unoccupied for ≥3 consecutive years, in which case the nest is considered **inactive** (see AOC N03). When ≥2 active nests occur in sufficiently close proximity to be considered part of the nesting area of an individual pair, the nest with the most recent known or suspected history of occupancy within this nesting area is the **primary nest** (AOC N01); the other active nest(s) is (are) considered **alternate nests** (AOC N02).							

Management Unit Name: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
Plan Period: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10)**

FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions

Operational Prescription

- 400 m radius AOC centred on primary nests.
- The critical breeding period for bald eagles is February 15 to August 31.

BALD EAGLE NEST IDENTIFIED PRIOR TO OPERATIONS:

0-200 m from primary nest

Critical breeding period and the nest is occupied:

- Harvest is not permitted within 200 m of a primary nest.
- No renewal and tending operations are permitted within 100 m of a primary nest.
- Only "low potential impact" renewal and tending activities (see Table FMP-10.1) are allowed 100-200 m from the nest in previously harvested areas.
- All renewal and tending operations within 100-200 metres of the nest are subject to wildlife trees and downed woody material requirements outlined in FMP text Section 4.2.2.2.
- Preferentially retain wildlife trees that may function as potential nest, perch or roost sites based on the following order of priority: 1) supercanopy trees, 2) veteran trees, 3) cavity trees, and 4) other live dominant or co-dominant trees that are windfirm. White pines, red pines, and poplars will be favoured when available.
- Renewal and tending operations that will leave a residual stand structure below the minimum described above are not permitted.

Critical breeding period and nest is not occupied, or outside of critical breeding period:

- Harvest is not permitted within 200 m of a primary nest.
- All renewal and tending operations are subject to wildlife trees and downed woody material requirements outlined in FMP text Section 4.2.2.2.
- Preferentially retain wildlife trees that may function as potential nest, perch or roost sites based on the following order of priority: 1) supercanopy trees, 2) veteran trees, 3) cavity trees, and 4) other live dominant or co-dominant trees that are windfirm. White pines, red pines, and poplars will be favoured when available.
- Renewal and tending operations that will leave a residual stand structure below the prescribed minimum (see text Section 4.2.2.2) are not permitted.

201-400 m from primary nest

Harvest, renewal and tending operations that will leave a residual stand structure below the minimum described below are not permitted.

Critical breeding period and the nest is occupied: Harvest and renewal and tending operations that are within the "high potential impact" category (see Table FMP-10.1) are not permitted within 201-400 m of occupied primary nests during the critical breeding period. Operations categorized in Table FMP-10.1 as "low potential impact" or "moderate potential impact" are allowed between 201-400 m of occupied primary nests during the critical breeding period subject to wildlife tree and downed woody material requirements outlined in FMP text Section 4.2.2.2.

Critical breeding period and nest is not occupied, or outside of critical breeding period: Harvest, renewal or tending operations are permitted subject to residual pattern (see note 2 above) and wildlife trees and downed woody material requirements outlined in FMP text Section 4.2.2.2. Preferentially retain wildlife trees that may function as potential nest, perch and roost sites based on the following order of priority: 1) supercanopy trees, 2) veteran trees, 3) cavity trees, and 4) other live dominant or co-dominant trees that are windfirm. White pines, red pines, and poplars will be favoured when available.

See AOC N04 for the area of concern prescription for bald eagle nests discovered during operations but after harvesting has occurred within 200 m of the nest.

Management Unit Name: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
Plan Period: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10)**

FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
N02	**Bald eagle alternate nests** (see definition below)	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010),* Page 66.	No	No crossings or landings permitted in the AOC.	Yes	Yes

Bald Eagle Alternate Nests (AOC N02) are nests known or suspected to have been occupied at least once within the past 5 years that are not primary nests (AOC N01), unless the nest and all associated nests within the nesting area have been documented as unoccupied for ≥3 consecutive years, in which case the nest is considered **inactive** (see AOC N03).

Operational Prescription
- 200 m radius AOC centred on alternate nests.

0-200 m from nest
No harvest is permitted. If harvest that retains <60% relatively uniform canopy closure occurs within 200m of an alternate nest prior to its discovery, an additional patch of unharvested forest equivalent to the area harvested will be retained, preferably attached to the remaining unharvested forest surrounding the nest (to provide a supply of potential nest and roost trees). Renewal and tending are permitted in previously harvested areas subject to wildlife tree and downed woody material requirements outlined in FMP text Section 4.2.2.2.

N03	**Bald eagle inactive nests** (see definition below)	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010),* Page 67.	No	Nonew crossings or landings permitted in the AOC, existing crossing 002.	Yes	Yes

Bald Eagle Inactive Nests (AOC N03) are nests not known or suspected to have been occupied at least once within the past 5 years, and primary and alternate nests within nesting areas where all nests within the nesting area have been documented as unoccupied for >=3 consecutive years.

Operational Prescription
- 100 m radius AOC centred on inactive nests.

0-100 m from nest
Harvest is not permitted in the AOC.
Renewal and tending are permitted in previously harvested areas subject to wildlife tree and downed woody material requirements outlined in FMP text Section 4.2.2.2.

Management Unit Name: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
Plan Period: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10)**

FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
N04	**Bald Eagle Primary Nest Discovered During Operations**	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010), Pages 64-66.*	No	No crossings or landings permitted in the AOC.	Yes	Yes

Operational Prescription

- 400 m radius AOC centred on primary nests.
- The critical breeding period for bald eagles is February 15 to August 31.

BALD EAGLE NEST DISCOVERED DURING OPERATIONS BUT AFTER HARVEST HAS OCCURRED WITHIN 200 METRES OF NEST:

0-200 m from primary nest

If harvesting operations are on-going, harvesting is to stop immediately and no further harvesting is permitted. Harvested trees remaining in the harvested area are not permitted to be removed during the critical breeding period. An additional patch of unharvested forest equivalent to the area harvested between 0-200 m from the nest is to be retained within 201-400 m of the nest. This patch will preferably be attached to the remaining unharvested forest.

If the nest is not occupied, or it is outside of the critical breeding period, renewal and tending activities are permitted as long as no standing trees are knocked over and the renewal and tending operations are subject to wildlife trees and downed woody material requirements outlined in FMP text Section 4.2.2.2.

If the nest is occupied and it is during the critical breeding period:

- No renewal and tending operations are permitted within 100 m of a primary nest.
- Only "low potential impact" renewal and tending activities (see Table FMP-10.1) are allowed 100-200 m from the nest in previously harvested areas.
- All renewal and tending operations within 100-200 metres of the nest are subject to wildlife trees and downed woody material requirements outlined in FMP text Section 4.2.2.2.

201-400 m from primary nest (*outside of additional patch described above*)

Harvest, renewal and tending operations that will leave a residual stand structure below the minimum described in Section 4.2.2.2 are not permitted.

Critical breeding period and the nest is occupied: Harvest and renewal and tending operations that are within the "high potential impact" category (see Table FMP-10.1) are not permitted within 201-400 m of occupied primary nests during the critical breeding period, Operations categorized in Table FMP-10.1 as "low potential impact" or "moderate potential impact" are allowed between 201-400 m of occupied primary nests during the critical breeding period subject to residual pattern (see Note 2 above) and wildlife trees and downed woody material requirements outlined in FMP text Section 4.2.2.2.

Critical breeding period and nest is not occupied, or outside of critical breeding period: Harvest, renewal or tending operations are permitted subject to residual pattern (see Note 2 above) and wildlife trees and downed woody material requirements outlined in FMP text Section 4.2.2.2. Preferentially retain wildlife trees that may function as potential nest, perch or roost sites based on the following order of priority: 1) supercanopy trees, 2) veteran trees, 3) cavity trees, and 4) other live dominant or co-dominant trees that are windfirm. White pines, red pines, and poplars will be favoured when available.

Management Unit Name: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
Plan Period: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10)**

FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
ON01	**Osprey primary nests** (see definition below) **Identified Prior to Operations**	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010)*, Pages 68-69.	No	No crossings or landings permitted in the AOC.	Yes	Yes

Osprey Primary Nests (AOC ON01)are nests known or suspected to have been occupied at least once within the past 5 years (i.e., active nests), unless the nest and all associated nests within the nesting area have been documented as unoccupied for ≥3 consecutive years, in which case the nest is considered **inactive** (AOC ON03). When ≥2 active nests occur in sufficiently close proximity to be considered part of the nesting area of an individual pair, the nest with the most recent known or suspected history of occupancy within this nesting area is the **primary nest** (AOC ON01); the other active nest(s) is(are) considered **alternate nests** (AOC ON02).

Operational Prescription

- 300 m radius AOC centred on primary nests.
- The critical breeding period for osprey is April 15 to August 31.

OSPREY NEST IDENTIFIED PRIOR TO OPERATIONS:

0-150 m from nest
Harvest is not permitted at any time.
If the nest is not occupied, or it is outside of the critical breeding period:

- Renewal and tending activities are permitted in previously harvested areas subject to wildlife tree and downed woody material requirements outlined in FMP text Section 4.2.2.2.

If the nest is occupied and it is during the critical breeding period:

- Only "low potential impact" renewal and tending activities (see Table FMP-10.1) are allowed 75-150 m from the nest in previously harvested areas.
- All renewal and tending operations within 75-150 metres of the nest are subject to residual pattern (see Note 2 above) and wildlife trees and downed woody material requirements outlined in FMP text Section 4.2.2.2.

151-300 m from nest
Harvest, renewal and tending operations that will leave a residual stand structure below the minimum described below are not permitted.

Critical breeding period and nest is occupied: Harvest and renewal and tending operations that are within the "high potential impact" category (see Table FMP-10.1) are not permitted within 151-300 m of occupied primary nests during the critical breeding period, Renewal and tending operations categorized as "low potential impact" or "moderate potential impact" are allowed between 151-300 m of occupied primary nests during the critical breeding period subject to meeting wildlife trees and downed woody material requirements outlined in Section 4.2.2.2 of the FMP.

Management Unit Name: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
Plan Period: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10)**

FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
	Critical breeding period and nest is not occupied, or outside of critical breeding period: Harvest, renewal and tending operations are permitted subject to residual pattern (see Note 2 above) and wildlife trees and downed woody material requirements outlined in FMP text Section 4.2.2.2. Preferentially retain wildlife trees that may function as potential nest, perch or roost sites based on the following order of priority: 1) supercanopy trees, 2) veteran trees, 3) cavity trees, and 4) other live dominant or co-dominant trees that are windfirm. White pines, red pines, and poplars will be favoured when available. **See AOC ON04 for the area of concern prescription for osprey nests discovered during operations, but after harvesting has occurred within 150 m of the nest.**						
ON02	**Osprey alternate nests** (see definition below)	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010)*, Pages 69-70.	No	No crossings or landings permitted in the AOC.	Yes	Yes
Osprey Alternate Nests (AOC ON02) are nests known or suspected to have been occupied at least once within the past 5 years that are not primary nests (AOC ON01), unless the nest and all associated nests within the nesting area have been documented as unoccupied for ≥3 consecutive years, in which case the nest is considered **inactive** (AOC ON03). **Operational Prescription** • 150 m radius AOC centred on alternate nests. **0-150 m from nest** No harvest is permitted. If harvest that retains <60% relatively uniform canopy closure occurs within 150m of an alternate nest prior to its discovery, an additional patch of unharvested forest equivalent to the area harvested will be retained, preferably attached to the remaining unharvested forest surrounding the nest (to provide a supply of potential nest and roost trees). Renewal and tending are permitted in previously harvested areas subject to wildlife tree and downed woody material requirements outlined in FMP text Section 4.2.2.2.						
ON03	**Osprey inactive nests** (see definition below)	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010),* Pages 70-71.	No	No crossings or landings permitted in the AOC.	Yes	Yes
Osprey Inactive Nests (AOC ON03) are nests not known or suspected to have been occupied at least once within the past 5 years and primary and alternate nests within nesting areas where all nests within the nesting area have been documented as unoccupied for >=3 consecutive years. **Operational Prescription** • 75 m radius AOC centred on inactive nests. **0-75 m from nest** No harvest is permitted. Renewal and tending are permitted in previously harvested areas subject to wildlife tree and downed woody material requirements outlined in FMP text Section 4.2.2.2.						

Management Unit Name: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
Plan Period: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10)**

FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
ON04	**Primary Osprey Nest Discovered During Operations**	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010)*, Pages 68-69.	No	No crossings or landings permitted in the AOC.	Yes	Yes

Operational Prescription

- 300 m radius AOC centred on primary nests.
- The critical breeding period for osprey is April 15 to August 31.

OSPREY NEST DISCOVERED DURING OPERATIONS BUT AFTER HARVEST HAS OCCURRED WITHIN 150 METRES OF NEST:

0-150 m from nest

If harvesting operations are on-going, harvesting is to stop immediately and no further harvesting is permitted. Harvested trees remaining in the harvested area are not permitted to be removed during the critical breeding period. An additional patch of unharvested forest equivalent to the area harvested between 0-150 m from the nest is to be retained within 151-300 m of the nest. This patch will preferably be attached to the remaining unharvested forest.

If the nest is not occupied, or it is outside of the critical breeding period:

- Renewal and tending activities are permitted in previously harvested areas subject to wildlife tree and downed woody material requirements outlined in FMP text Section 4.2.2.2.

If the nest is occupied and it is during the critical breeding period:

- Only "low potential impact" renewal and tending activities (see Table FMP-10.1) are allowed >75 metres from the nest in previously harvested areas.
- All renewal and tending operations are subject to wildlife trees and downed woody material requirements outlined in FMP text Section 4.2.2.2.

151-300 m from nest (*outside of additional patch described above*)

Harvest, renewal and tending operations that will leave a residual stand structure below the minimum described below are not permitted.

Critical breeding period and nest is occupied: Harvest and renewal and tending operations that are within the "high potential impact" category (see Table FMP-10.1) are not permitted within 151-300 m of occupied primary nests during the critical breeding period. Renewal and tending operations categorized as "low potential impact" or "moderate potential impact" are allowed between 151-300 m of occupied primary nests during the critical breeding period subject to meeting wildlife trees and downed woody material requirements outlined in Section 4.2.2.2 of the FMP.

Critical breeding period and nest is not occupied, or outside of critical breeding period:

Harvest, renewal and tending operations are permitted subject to residual pattern (see Note 2 above) and wildlife trees and downed woody material requirements outlined in Section 4.2.2.2 of the FMP. Preferentially retain wildlife trees that may function as potential nest, perch or roost sites based on the following order of priority: 1) supercanopy trees, 2) veteran trees, 3) cavity trees, and 4) other live dominant or co-dominant trees that are windfirm. White pines, red pines, and poplars will be favoured when available.

Management Unit Name: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
Plan Period: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10)**

FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
BH01	**Active Great Blue Heron colonies** (see definition below)	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010),* Pages 73-74.	No	No new crossings or landings permitted in the AOC, existing crossing 001.	Yes	Yes

Active Great Blue Heron Colonies are defined as:

- Large heron colonies (≥4 occupied nests) known or suspected to have been occupied at least once within the past 10 years (unless documented as unoccupied for ≥5 years).
- Small heron colonies (<4 occupied nests) known or suspected to have been occupied at least once within the past 5 years (unless documented as unoccupied for ≥3 years).

Operational Prescription

- 300 m radius AOC measured from peripheral nests.
- The critical breeding period for great blue heron is April 1 to August 15.

<u>0-150 m from colony</u>

- No harvest is permitted.

Critical breeding period and nest is not occupied, or outside of critical breeding period:

- Renewal and tending activities are permitted in previously harvested areas subject to wildlife tree and downed woody material requirements outlined in FMP text Section 4.2.2.2.

Critical breeding period and the nest is occupied:

- Only "low potential impact" renewal and tending activities (see Table FMP-10.1) are allowed >75-150 metres from the nest in previously harvested areas.
- All renewal and tending operations within 75-150 metres of the nest are subject to wildlife trees and downed woody material requirements outlined in FMP text Section 4.2.2.2.

<u>151-300 m from colony</u>

- For large colonies - no harvest is permitted.
- For small colonies - harvest, renewal and tending operations that will leave a residual stand structure below the minimum described below are not permitted.

Critical breeding period and the nests are occupied:

- No harvest is permitted within 151-300 m of occupied nests during the critical breeding period..
- Renewal and tending operations that are within the "high potential impact" category (see Table FMP-10.1) are not permitted within 151-300 m of occupied nests during the critical breeding period.
- Renewal and tending operations categorized as "low potential impact" or "moderate potential impact" are allowed between 151-300 m of occupied nests during the

Management Unit Name: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
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FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
	critical breeding period subject to meeting wildlife trees and downed woody material requirements outlined in Section 4.2.2.2 of the FMP text. **Critical breeding period and nest is not occupied, or outside of critical breeding period:** • Harvest, renewal or tending operations permitted subject to residual pattern, wildlife trees and downed woody material requirements outlined in Section 4.2.2.2 of the FMP text.						
BH02	**Inactive Great Blue Heron colonies** (see definition below)	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010)*, Pages 74-75.	No	No new crossings or landings permitted in the AOC.	Yes	Yes
	Inactive Great Blue Heron Colonies are defined as: • Large colonies (≥4 nests) in suitable habitat not known or suspected to have been occupied at least once within the past 10 years or documented as unoccupied for 5 or more consecutive years. • Small colonies (< 4 nests) in suitable habitat not known or suspected to have been occupied at least once within the past 5 years or documented as unoccupied for 3 or more consecutive years. **Operational Prescription** • 30 m radius AOC measured from peripheral nests. Harvest is not permitted within the AOC. In previously harvested areas renewal and tending operations that will knock down desired residual trees are not permitted within the AOC; all other renewal and tending operations are permitted.						
BG01	**Active colonies of Bonaparte's gull** known or suspected to have been occupied at least once within the past 5 years (unless documented as unoccupied for ≥3 consecutive years).	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010),* Pages 75-76.	No	No crossings or landings permitted in the AOC.	Yes	Yes
	Operational Prescription • 150 m radius AOC measured from peripheral nests. No harvest, renewal or tending is permitted within the AOC.						

Management Unit Name: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
Plan Period: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10)**

FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
BS01	**Active large colonies of bank swallows (≥100 pairs)** known or suspected to have been occupied at least once within the past 5 years (unless documented as unoccupied for >=3 consecutive years).	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010),* Page 76-77.	No	No crossings or landings permitted in the AOC.	Yes	Yes

Operational Prescription

- 50 m radius AOC measured from peripheral nests.
- The critical breeding period for bank swallows is May 1 to July 31.

Critical Breeding Period and the Nests are Occupied:

- Forest operations that are within the "high potential impact" category (see Table FMP-10.1) are not permitted within 50 m of occupied nests. Renewal and tending operations categorized as "moderate potential impact" are allowed between 25-50 m of occupied nests.
- Renewal and tending operations categorized in as "low potential impact" are allowed between 10-50 m of occupied nests.

Outside the Critical Breeding Period; or Within the Critical Breeding Period and the Nests are Not Occupied:

- Regular harvest, renewal and tending operations are permitted within the AOC.

BS02	**Barn Swallow Nests**	Group		N/A	No	Yes	No

Operational Prescription

Not applicable, conditions on roads only, refer to FMP-19.

HO01	**Primary nests of great grey owl, northern goshawk, or red-shouldered hawk** (see definition below)	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010)*, Pages 77-80.	No	No crossings or landings permitted in the AOC.	Yes	Yes

Primary Nests (AOC HO01) are defined as nests known or suspected to have been occupied at least once within the past 5 years (i.e., active nests) unless the nest and all associated nests within the nesting area have been documented as unoccupied for ≥3 consecutive years, in which case the nest is considered **inactive** (AOC HO03). When ≥2 active nests occur in sufficiently close proximity to be considered part of the nesting area of an individual pair, the nest with the most recent known or suspected history of occupancy within this nesting area is the **primary nest** (AOC HO01); the other active nest(s) is(are) considered **alternate nest(s)** (AOC HO02). When inventory data are

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FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions

insufficient to determine which nest in a nesting area has been most recently occupied the nest in the best condition is considered the primary nest.

Operational Prescription

- 400 m radius AOC centred on primary nests.
- The critical breeding period for great grey owl, northern goshawk and red-shouldered hawk is March 15 to July 15.

Harvest, renewal and tending operations that will leave a residual stand structure below the minimum (described below and in Section 4.2.2.2) are not permitted.

0-300 m from primary nest

Critical Breeding Period and the nest is occupied:

- No harvest is permitted. If harvest occurred prior to discovery of the nest, see below.
- Renewal and tending operations that are within the "high potential impact" category (see Table FMP-10.1) are not permitted within 200 m of occupied primary nests. Renewal and tending operations categorized as "moderate potential impact" are not allowed within 100 m of occupied primary nests.
- Renewal and tending operations categorized as "low potential impact" are not allowed within 50 m of occupied primary nests.
- Wildlife trees and downed woody material requirements outlined in Section 4.2.2.2 of the FMP apply.

Outside of Critical Breeding Period; or Critical Breeding Period and the nest is not occupied:

- No harvest is permitted within 50m of a primary nest. If harvest occurred prior to discovery of the nest, see below.
- All renewal and tending operations are subject to wildlife trees and downed woody material requirements outlined in FMP text Section 4.2.2.2.
- A total of 28 ha of *suitable nesting habitat* will be retained within the AOC. 7 ha of the 28 ha of *suitable nesting habitat* will be retained within 200 m of the primary nest; any harvest will follow the residual stand structure targets for creation of old growth forest conditions the remaining 21 ha of *suitable nesting habitat* may be located anywhere within the AOC.
    - *Suitable nesting habitat* will be retained as a contiguous patch that encompasses the primary nest.
    - *Suitable nesting habitat* will be retained that is classified as *preferred* based on the regional habitat matrices.
    - *Suitable nesting habitat* will be retained as a circular patch centred on the primary nest (300 m radius circle) if the primary nest occurs in a large uniform block of habitat. *Suitable nesting habitat* will be retained as an irregularly-shaped patch (contained within the 400 m AOC) if this configuration better encompasses primary and alternate nests as well as preferred habitat.

If some harvest occurs within 300 m of a primary nest prior to its discovery, or if there are notable amounts of area within 300 m of the nest that are not suitable nesting habitat:

- Any harvest that occurs within 300m of a nest prior to its discovery is to stop immediately upon discovery of the nest and no further harvest is permitted. Harvested trees remaining in the harvested area are not permitted to be removed within 200 metres of the nest from during the critical breeding period.
- The 0-300 m part of the AOC will be extended to a maximum of 400 m from the nest (in an irregular shape) for a total retention of 28 ha of suitable nesting habitat.
- If any of the harvest occurred within 50 m of a primary nest prior to its discovery, the primary nest will be retained in a 0.8 ha unharvested patch that is as nearly circular as possible (to minimize edge).

300 – 400 m from nest (or outside of the additional 28 ha area, as above):

- Harvest, renewal or tending operations are permitted subject to residual pattern, wildlife trees and downed woody material requirements outlined in FMP Section 4.2.2.2.

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FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
HO02	**Alternate nests of great grey owl, northern goshawk, or red-shouldered hawk** (see definition below)	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010)*, Pages 80-81.	No	No crossings or landings permitted in the AOC.	Yes	Yes

Alternate nests (AOC HO02) are defined as nests known or suspected to have been occupied at least once within the past 5 years that are not primary nests (AOC HO01) unless the nest and all associated nests within the nesting area have been documented as unoccupied for ≥3 consecutive years, in which case the nest is considered **inactive** (AOC HO03). Any nest in good repair within 400m of primary nest.

Operational Prescription

- 50 m radius AOC centred on alternate nests.

Harvest is not permitted within the AOC. If harvest occurred prior to discovery of the nest, see below.

If some harvest occurs within 50 m of an alternate nest prior to its discovery:

- Harvest is to stop immediately upon discovery of the nest and no further harvest is permitted.
- The alternate nest will be retained in a 0.8 ha unharvested patch that is as nearly circular as possible (to minimize edge).

In previously harvested areas or areas harvested prior to discovery of the nest renewal and tending operations that kill or knock down any trees are not permitted; all other renewal and tending operations are permitted.

NO01	**Stick nests occupied by barred owl, broad-winged hawk, common raven, Cooper's hawk, great horned owl, long eared owl, merlin or red-tailed hawk**	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010)*, Page 82.	No	No crossings or landings permitted in the AOC.	Yes	Yes

Operational Prescription

- 50-200 m radius AOC as mapped centred on the occupied nest based on species as shown in Table A below:

Table A

Species	Radius of AOC
(a) Barred owl	200 m
(b) Broad-winged hawk	100 m
(c) Cooper's hawk	100 m
(d) Great horned owl	100 m
(e) Long-eared owl	100 m
(f) Red-tailed hawk	100 m
(g) Common raven	50 m
(h) Merlin	50 m
(i) Sharp-shinned hawk	50 m

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FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions

Regular harvest, renewal, and tending operations are permitted around nests subject to timing restrictions (see Table C below) and retention of the nest tree as shown in Table B below:

Table B

Species	Retain
(a) Barred owl (c) Cooper's hawk (d) Great horned owl (e) Long-eared owl (f) Red-tailed hawk (g) Common raven	The nest tree will be retained in an unharvested residual patch (≥20 m radius) if the nest is in good repair (may be counted as residual forest). If the nest is in poor repair, the nest tree will be retained as a wildlife tree.
(b) Broad-winged hawk (h) Merlin (i) Sharp-shinned hawk	The nest tree will be retained as a wildlife tree if the nest is in good repair or the nest tree contains a good fork.

0-200 m of *occupied* nests during Critical Breeding Period

Harvest, renewal, and tending operations are not permitted within 10-200 m of *occupied* nests during the *critical breeding period* based on species and potential impact of the operation. Table C below shows the distance from a nest that high impact, moderate impact, or low impact operations are not allowed within, if the nest is occupied during the critical breeding period. Refer to Supplementary Table 10.1 for an explanation of which operations are high, moderate, or low impact.

Table C

Species	Critical Breeding Period	High Impact Operations	Moderate Impact Operations	Low Impact Operations
(a) Barred owl	March 15 – July 15	200 m	100 m	50 m
(b) Broad-winged hawk	April 1 – July 31	100 m	50 m	25 m
(c) Cooper's hawk	April 1 – July 31	100 m	50 m	25 m
(d) Great horned owl	February 1 – May 31	100 m	50 m	25 m
(e) Long-eared owl	March 15 – July 15	100 m	50 m	25 m
(f) Red-tailed hawk	March 15 – July 15	100 m	50 m	25 m
(g) Common raven	February 15 – June 15	50 m	25 m	10 m
(h) Merlin	April 1 – July 31	50 m	25 m	10 m
(i) Sharp-shinned hawk	April 1 – July 31	50 m	25 m	10 m

If the nest is not occupied during the Critical Breeding Period:
No timing restrictions on operations apply. Refer to Table B that describes the area to be retained around the nest.

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FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
NO02	**Nests/ communal roosts in cavities occupied by American kestrel, barred owl, boreal owl, eastern screech-owl, great horned owl, northern hawk owl, northern saw-whet owl or chimney swift.**	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010),* Pages 85-86.	No	No crossings or landings permitted in the AOC.	Yes	Yes

Operational Prescription

- **25-100 m radius AOC as mapped based on species as shown in Table A below:**

Table A

Species	Radius of AOC
(a) Barred owl	100 m
(b) Great horned owl	50 m
(c) Northern hawk owl	50 m
(d) Chimney swift	50 m
(e) American kestrel	25 m
(f) Boreal owl	25 m
(g) Eastern screech-owl	25 m
(h) Northern saw-whet owl	25 m

- Regular harvest, renewal, and tending operations are permitted around nests/communal roosts subject to timing restrictions (see Table C below) and retention of the nest tree as shown in Table B below:

Table B

Species	Retain
Trees used by: (c) Northern hawk owl (e) American kestrel (f) Boreal owl (g) Eastern screech-owl (h) Northern saw-whet owl	The nest tree will be retained as a wildlife tree if not a safety concern.
Trees used by: (a) Barred owl (b) Great horned owl (d) Chimney swift	The nest/communal roost tree will be retained in an unharvested residual patch (≥20 m radius) (may be counted as residual forest).

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FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions

0-100 m of *occupied* nests/communal roosts during Critical Breeding Period

Harvest, renewal, and tending operations are not permitted within 0-100 m of *occupied* nests/communal roosts during the *critical breeding/roosting period* based on species and potential impact of the operation (see Table C below). Table C below shows the distance from a nest that high impact, moderate impact, or low impact operations are not allowed within, if the nest is occupied during the critical breeding period. Refer to Table FMP-10.1 for an explanation of which operations are high, moderate, or low impact.

Table C

Species	Critical Breeding Period	High Impact Operations	Moderate Impact Operations	Low Impact Operations
(a) Barred owl	March 15 - July 15	100 m	50 m	25 m
(b) Great horned owl	February 1 – May 31	50 m	25 m	10 m
(c) Northern hawk owl	March 15 - July 15	50 m	25 m	10 m
(d) Chimney swift	May 1 – September 30	50 m	25 m	10 m
(e) American kestrel	April 1 – July 31	25 m	10 m	0 m
(f) Boreal owl	April 1 – July 31	25 m	10 m	0 m
(g) Eastern screech-owl	March 15 – July 15	25 m	10 m	0 m
(h) Northern saw-whet owl	March 15 – July 15	25 m	10 m	0 m

If the nest is not occupied during the Critical Breeding Period
No timing restrictions on operations apply. Refer to Table B that describes the area to be retained around the nest.

NO03	**Ground nests occupied by northern harrier, short-eared owl, or turkey vulture**	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010)*, Pages 87-88.	No	No crossings or landings permitted in the AOC.	Yes	Yes

Operational Prescription

50-150 m AOC as mapped based on species as shown in Table A below:

Table A

Species	Radius of AOC
(a) Turkey vulture	150 m
(b) Short-eared owl	100 m
(c) Northern harrier	50 m

Regular harvest, renewal, and tending operations are permitted with timing restrictions (see Table B below).
Harvest, renewal, and tending operations are not permitted within 10-150 m of *occupied* nests during the *critical breeding period* based on species and potential impact of the operation as shown in Table B below:

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FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions

Table B

		Distance from Nest (m) with Timing Restriction During Critical Breeding Period if Nest is *Occupied*		
Species	**Critical Breeding Period**	**High Impact Operations**	**Moderate Impact Operations**	**Low Impact Operations**
(a) Turkey vulture	May 1 – August 31	150 m	75 m	40 m
(b) Short-eared owl	March 15 – July 15	100 m	50 m	25 m
(c) Northern harrier	April 1 – July 31	50 m	25 m	10 m

NO04	**Whip-poor-will Nesting Sites**	Group	Supplementary Documentation H AOC's	No	No crossings or landings permitted in the AOC.	Yes	No new aggregate pits are permitted.

Operational Prescription

When the habitat description under the ESA becomes available these conditions may be updated prior to plan approval if this is necessary to address the habitat description. If the habitat description becomes available after final plan approval, a plan amendment for this AOC may be submitted if necessary to address the habitat description.

- 200 m radius AOC centred on nesting sites identified in NRVIS or encountered by field operations. Upon discovery of a whip-poor-will nesting site, the local MNR biologist will be notified so that they can confirm the species using the nesting site.
- The critical breeding period for Whip-poor-will is May 1st to August 14th.
- The following operational prescription will be followed:
  - No forest harvest operations permitted within 200 m from the nesting site.
  - Site preparation, renewal and tending operations of previously harvested areas within the AOC are only permitted outside of the critical breeding period (August 15to April 30th).
  - Residual pattern, wildlife trees and downed woody material will be retained as prescribed in the FMP text Section 4.2.2.2.

NO05	**Common Nighthawk Nesting Sites**	Group	Supplementary Documentation H AOC's	No	No crossings or landings permitted in the AOC	Yes	No new aggregate pits are permitted.

Operational Prescription

When the habitat description under the ESA becomes available these conditions may be updated prior to plan approval if this is necessary to address the habitat description. If the habitat description becomes available after final plan approval, a plan amendment for this AOC may be submitted if necessary to address the habitat description.

• 200 m radius AOC centered on nesting sites identified in NRVIS or encountered by field operations. Upon discovery of a common nighthawk nesting site, the local MNR biologist will be notified so that they can confirm the species using the nesting site.
• The critical breeding period for Common Nighthawk is May 15th to August 15th.

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FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
• The following operational prescription will be followed: o No forest harvest operations permitted within 200 m from the nesting site. o Site preparation, renewal and tending operations of previously harvested areas within the AOC are only permitted outside of the critical breeding period (August 16th to May 14th). o Residual pattern, wildlife trees and downed woody material will be retained as prescribed in the FMP text Section 4.2.2.2.							
NO06	**Olive-sided flycatcher nest sites**	Yes	Supplementary Documentation H AOC's	No	No (none proposed)	Yes	Yes
Operational Prescription When the habitat description under the ESA becomes available these conditions may be updated prior to plan approval if this is necessary to address the habitat description. If the habitat description becomes available after final plan approval, a plan amendment for this AOC may be submitted if necessary to address the habitat description. • 100 m radius AOC centered on nesting sites identified in NRVIS or encountered by field operations. Upon discovery of an olive-sided flycatcher nesting site, the local MNR biologist will be notified so that they can confirm the species using the nesting site. • The critical breeding period for olive-sided flycatcher is May 1st to August 31st. • The following operational prescription will be followed: o No forest harvest operations permitted within 100 m from the nesting site. o Site preparation, renewal and tending operations of previously harvested areas within the AOC are only permitted outside of the critical breeding period (September 1st to April 30th). o Residual pattern, wildlife trees and downed woody material will be retained as prescribed in the FMP text Section 4.2.2.2.							
NO07	**Canada warbler nest sites**	Yes	Supplementary Documentation H AOC's	No	No (none proposed)	Yes	Yes
Operational Prescription When the habitat description under the ESA becomes available these conditions may be updated prior to plan approval if this is necessary to address the habitat description. If the habitat description becomes available after final plan approval, a plan amendment for this AOC may be submitted if necessary to address the habitat description. • 100 m radius AOC centered on nesting sites identified in NRVIS or encountered by field operations. Upon discovery of a Canada warbler nesting site, the local MNR biologist will be notified so that they can confirm the species using the nesting site. • The critical breeding period for Canada warbler is May 15th to August 15th. • The following operational prescription will be followed: o No forest harvest operations permitted within 100 m from the nesting site. o Site preparation, renewal and tending operations of previously harvested areas within the AOC are only permitted outside of the critical breeding period (August 16th to May 14th).							

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FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
	o Residual pattern, wildlife trees and downed woody material will be retained as prescribed in the FMP text Section 4.2.2.2.						
NO08	**Bat Hibernacula** known to be suitable and to have been used at least once within the past 20 years by ≥ 50 **Little Brown Myotis** (Little Brown Bats) or ≥ 20 **Northern Myotis** (Northern long-eared bats)	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010)*, Pages 99-100.	No	Not applicable (none proposed)	Yes	Yes
Operational Prescription 200m radius AOC centred on the entrance to the hibernaculum. ▪ 0-100m radius – harvest, renewal and tending operations are not permitted at any time. ▪ 101-200m radius – No harvest, renewal and tending operations permitted September 1 – May 30.							
PGP01	**FESC PGP Growth and Yield Trial Plot**	Group	Supplementary Documentation H AOC's	No	No crossings or landings permitted in the AOC.	Yes	No new aggregate pits are permitted.
Operational Prescription <u>Circular plot</u>: No harvest, renewal or tending within a 75m radius measured from the PGP centre, squared off such that the final reserve is 150m by 150m (2.25ha). As required of FMP-19 adjust the AOC boundary to follow the edge of the road right-of-way if a road is permitted outside of the 75m radius from the plot centre yet within the squared off AOC boundary (i.e. do not extend the AOC to include area on the opposite side of the road to the PGP centre). **<u>OR</u>** No harvest, renewal or tending within a 75m radius measured from the PGP centre (1.77ha) <u>Rectangular plot</u>: No harvest, renewal or tending 65m from each boundary (side) of the PGP. A separate AOC must be developed and approved for any harvest, renewal or tending activities within a PGP AOC. • The Growth & Yield Program may permit some forest management activities within a PGP AOC, such as partial harvest, renewal or tending operations, in order to monitor the impact of these activities. Discussions with the MNR Regional Growth & Yield Specialist will determine where and when this may occur. Permission to carry out such activities must be documented in writing by the Regional Growth & Yield Specialist and will be used for a separate AOC prescription to be developed and approved. • If the following forest management activities are planned in the area <u>adjacent</u> to a PGP AOC, contact the MNR Regional Growth & Yield Specialist for							

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FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
	consideration of these activities in a PGP AOC: 1) selection or shelterwood harvest, 2) commercial thinning harvest, or 3) tending activities (e.g. herbicide application, pre-commercial thinning). • Forest Ecosystem Science Co-operative (Forest Co-op) PGPs may also be considered for clearcut harvest if three measurements have been conducted on a plot. Discussions with the Forest Co-op and MNR Regional Growth & Yield Specialists will determine the status of a Forest Co-op PGP and any clearcut harvest treatment. Permission to clearcut harvest a Forest Co-op PGP must be documented in writing by the Regional Growth & Yield Specialist and will be used for a separate AOC prescription to be developed and approved.						
PL01	**Patent Land**	Group	Supplementary Documentation H AOC's	No	No crossings or landings permitted in the AOC.	Yes	No new aggregate pits are permitted.
Operational Prescription • AOC width is 30 metres from the boundary of mapped patent land adjacent to allocated harvest blocks. Harvest operations are permitted subject to the procedure below being implemented in the following order: 1) If the property boundary had been previously established by a licenced surveyor and the boundary markers and monuments can be located then the harvest boundary will be established along the boundary markers and monuments. Regular harvest, renewal and tending operations are permitted in allocated blocks. 2) If there is an agreement with the neighbouring landowner regarding the placement of the limit of forest operations then the harvest boundary will be placed according to the agreement. Regular harvest, renewal and tending operations are permitted in allocated blocks subject to this agreement. 3) If neither 1) or 2) above apply, the harvest boundary will be established so that a buffer is put in between the mapped boundary and the harvest block. The size of the buffer will be no more than 30 metres wide, will be marked and will be determined by the forest operator's level of uncertainty regarding the true location of the property boundary. Regular harvest, renewal and tending operations are permitted outside of the marked reserve buffer.							
RR01	**Railroad Right of Way**	Group	Supplementary Documentation H AOC's	No	No crossings or landings permitted in the AOC.	Yes	No new aggregate pits are permitted.
Operational Prescription • 50 metre AOC from railway right of way. • Clear cut harvest to railway right of way within AOC, while leaving the 50 m AOC as a slash free zone. • All forest management activities permitted; however slash piles or chipper debris piles are to be removed. No slash piles or chipper debris piles are allowed to remain in landing for more than one year.							

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FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
NG01	**Natural Gas Transmission Pipeline**	Group	Supplementary Documentation H AOC's	No	No crossings or landings permitted in the AOC.	Yes	No new aggregate pits are permitted.
Operational Prescription • 30-metre AOC from a natural gas transmission pipeline right-of-way. • All forest management activities are permitted however a representative from TransCanada Pipelines is required to be notified before operations begin. TransCanada Pipelines will mark the pipeline outside edge of right-of-way to ensure that the proper location is identified. **Contact Information:** TransCanada Pipelines Lakewood Area Pipeline Technician Lakewood Area Manager Office # 807-548-4241Office # 807- 548-6025 Cell # 807-466-7212Cell # 807-466-7330							
HB01	**Highway Corridor Aesthetics**	Group	Supplementary Documentation H AOC's	No	No crossings or landings permitted in the AOC.	Yes	No new aggregate pits are permitted.
Operational Prescription • 60 m AOC from highway right-of way. • Harvest operations are permitted in the AOC only when adjacent forest/cutover is a minimum of 2 metres tall. Regular renewal and tending operations as per SGRs are permitted.							
LS01	**Tourism – Lac Seul Shoreline (Remoteness, aesthetics, fisheries, water quality, cultural heritage)**	Group	Supplementary Documentation H AOC's	No	None proposed.	Yes	Yes
Operational Prescriptions No timber harvested within 120 meters of the shoreline of Lac Seul. No conditions on Harvest renewal or tending between 121 – 650 m from the shoreline; conditions on roads only, refer to table FMP-19.							
TV01	**Tourism – Aesthetics Along Large High Volume Tourism Lakes, recognized canoe routes, recreational lakes**	Group	Supplementary Documentation H AOC's	No	No crossings or landings permitted in the AOC.	No roads/landings are permitted in AOC.	No aggregate pits are permitted in the AOC.
Operational Prescription . A 90 m AOC measured from the edge of standing timber along the shoreline, as mapped. No harvest, renewal or tending operations are permitted within the AOC.							

Management Unit Name: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
Plan Period: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10)**

FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
TVgl	**Tourism – Gibi Lake**	Individual	Supplementary Documentation H AOC's	No	None proposed.	Yes	Yes
Operational Prescriptions 60 meters no-harvest reserve from Witch Bay road. No harvest and mechanical site preparation operations are permitted between Victoria Day and Labour Day holidays. No restrictions of timing of low-noise renewal activities. All operations are permitted between Labour Day (September) and Victoria Day (May) with the exception of no weekend operations permitted between Labour Day and Thanksgiving (Friday 5 p.m. to Sunday 6 p.m.). As mapped, boundaries of blocks 12.168 (contingency) and 12.170.							
TVnsl	**Tourism – North Star Lodge**	Individual		No	None proposed.	Yes	No
Operational Prescription No conditions on harvest, renewal or tending, conditions on roads only (application of previously negotiated RSA), refer to FMP-19.							
TVw	**Tourism – timing restriction**	Group	Supplementary Documentation H AOC's	No	None proposed.	Yes	Yes
Operational Prescription • Seasonal restriction on harvest and mechanical site preparation operations between May 1st and October 31st. No restriction on timing of other low-noise renewal activities. All operations are permitted between November 1st and April 30th. As mapped, boundaries of blocks 12.130, 12.131, 12.181, 12.498, 12.503, 12.513, 12.339, 12.162, 12.158, 12.160.							
TVwl	**Tourism – Wine Lake**	Individual	Supplementary Documentation H AOC's	Nope	None proposed	Yes	Yes
Operational Prescription No harvest or mechanical site preparation operations between May 1 and October 31. No restrictions on timing of low-noise renewal activities. All operations are permitted between November 1 and April 30th. A 200 m no-harvest reserve as mapped along top end of Wabauskang Lake and river leading into Wine Lake. Wine Lake Camp owners are to be notified prior to harvest. As mapped, boundaries of blocks 12.354.							
TVal	**Tourism – Aerobus Lake**	Individual	Supplementary Documentation H AOC's	No	None proposed.	Yes	Yes
Operational Prescription No harvest or mechanical site preparation operations between May 1 and October 31. No restrictions of timing of low-noise renewal activities. All operations are permitted between November 1 and April 30th. As mapped, boundaries of blocks 04.389.							

Management Unit Name: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
Plan Period: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10)**

FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
TVer	**Tourism – English River Waterway Park**	Individual	Supplementary Documentation H AOC's	No	None proposed.	Yes	Yes
Operational Prescriptions Within 500 m of the park boundary, no harvest will occur between April 1 and September 30.							
TVp	**Tourism - portage**	Group	Supplementary Documentation H AOC's	No	None Proposed	Yes	No new aggregate pits are permitted in the AOC.
Operational Prescription No harvest, renewal or tending permitted in the AOC. Measured from the edge of the identified portage as mapped, 30 to 90 m AOC based on slope as follows: Slope (%) — Slope Angle (degrees) — Width of AOC 0 - 15 — 0 - 8.5 — 30 m >15 - 30 — 8.6 – 16.7 — 50 m >30 - 45 — 16.8 – 24.2 — 70 m > 45 — > 24.2 — 90 m							
TVc	**Tourism - campsite**	Group	Supplementary Documentation H AOC's	No	Not applicable (none proposed)	Not applicable (none proposed)	Not applicable (none proposed)
Operational Prescription • 70 metre reserve from campsite centre. No harvest, renewal or tending operations permitted.							

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Plan Period: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10)**

FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
WL01	Large lakes, Medium lakes, Small lakes, Ponds - high or moderate potential sensitivity (HPS or MPS) to forest management operations	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010)*, Pages 39-44.	No	No crossings or landings permitted in the AOC.	Yes	No aggregate pits are permitted.

Operational Prescription

For *large lakes, medium lakes, small lakes,* and *HPS* ponds, 30 to 90 m AOC as mapped based on slope as follows:

Slope (%)	Slope Angle (degrees)	Width of AOC
0 - 15	0 - 8.5	30 m
>15 - 30	8.6 – 16.7	50 m
>30 - 45	16.8 – 24.2	70 m
> 45	> 24.2	90 m.

For *MPS ponds*, 30 m AOC as mapped.

- The AOC is measured in the field from the edge of vegetation communities capable of providing an effective barrier to the movement of sediment. This will normally be those communities with >=25% canopy cover of trees, tall (>= 1 m high) woody shrubs such as alder or willow, or low (< 1 m high) woody evergreen shrubs such as Labrador tea or leatherleaf. For mapping purposes, the AOC may be measured from the edge of polygons identified as FOR, TMS, or BSH. If the inner edge of the AOC will be ≥300 m from the shoreline of the lake or pond when these criteria are used, an AOC is not required adjacent to those sections of shoreline, unless the intervening wetland is known to provide components of fish habitat for which there is a high species' dependence (e.g., spawning habitat).

- No harvest, renewal, or tending operations are permitted within the AOC that will result in damage to littoral zones or shorelines and associated stabilizing vegetation, or deposition of sediment within lakes or ponds. Operations specifically prohibited within the AOC include:
  - Machine travel within the inner 3 m of the AOC.
  - Felling of trees into lakes or ponds or the inner 3 m of the AOC. Trees accidentally felled into lakes or ponds will be left where they fall.
  - Excessive removal or damage of sapling-sized trees (< 10 cm dbh) and shrubs within the inner 3 m of the AOC.
  - Disturbance of the forest floor that leaves ruts or a significant area of exposed mineral soil within the inner 15 m of the AOC. Ruts and significant patches of exposed mineral soil will be promptly rehabilitated to prevent sediment from entering a water feature. Patches of mineral soil exposed by natural events are excluded.
  - Disturbance of the forest floor that disrupts hydrological function (i.e., impedes, accelerates, or diverts water movement) within recognizable ephemeral streams, springs, seeps, and other areas of groundwater discharge connected to lakes or ponds.

- Harvest is permitted within the AOC subject to the following conditions:
  - Areas within the AOC that can have harvest, renewal and tending operations (subject to all AOC conditions) will be mapped as a modified AOC.
  - Reserve areas within the AOC will also be mapped.
  - ≥ 50% of the area of the AOC (based on delineation of the AOC around the entire water feature both inside and outside the harvest area) associated with *small lakes, HPS ponds,* and *MPS ponds,*≥ 75% of the area of the AOC associated with *medium lakes,* and ≥ 90% of the area of the AOC associated with *large lakes* will be

Management Unit Name: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
Plan Period: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10)**

FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions

retained as forest that meets the definition of residual (see FMP text Section 4.2.2.2).
- The residual forest to be retained will be mapped as reserve (no harvest, renewal or tending permitted) (residual defined in FMP Section 4.2.2.2).
- When retaining residual shoreline forest, the inner 15 m will be mature forest with a relatively uniform canopy closure ≥60% (canopy openings not to exceed individual tree crowns) unless the adjacent harvest area outside the AOC meets the definition of residual forest.
- Conventional harvesting is permitted within the AOC only where the slope is ≤ 30%.
- For each ha of shoreline forest harvested that does not meet the definition of residual (e.g., conventionally harvested) 1 ha of residual shoreline forest will be retained that has not been harvested within 20 years.
- Within the AOC, direction for the retention of downed woody material as outlined in FMP text Section 4.2.2.2 will be followed.

- Some or all of the requirements for retention of residual forest within the AOC may be met by residual shoreline forest outside the harvest area, residual shoreline forest retained in overlapping AOCs, or residual shoreline forest retained in areas with steep slopes (>30%). Additional requirements for residual shoreline forest may be met by:
  - Retaining residual shoreline forest that meets the special habitat requirements of wildlife associated with lakes and ponds. For example,
    - Preferentially retaining residual shoreline forest adjacent to moose aquatic feeding areas (MAFAs), especially in specific areas (e.g., LLPs) identified for enhanced moose management.
    - Preferentially retaining residual shoreline forest where there is a high potential for ephemeral streams, springs, seeps, and other areas of groundwater discharge.
  - Retaining residual shoreline forest that maintains internal and external connectivity. To the extent practical and feasible within the AOC, a relatively continuous corridor (average width of gaps <50 m; maximum width of gaps <200 m) of residual forest at least 30 m wide will be retained along the length of lakes and ponds to connect special habitat features (e.g., osprey nests, MAFAs) associated with the lake or pond and link with residual forest on connected lakes, ponds, rivers, and streams.
  - Retaining residual shoreline forest to emulate natural patterns such as those created by wildfire. For example:
    - Preferentially retaining residual shoreline forest on the leeward side of a lake or pond.
    - Preferentially retaining residual shoreline forest comprised of less flammable forest types (e.g., hardwood, lowland conifer).
    - Preferentially retaining residual shoreline forest where there is an opportunity to incorporate it into a larger patch of residual forest.
  - Retaining residual shoreline forest that has the highest likelihood of being windfirm.

- Harvest, renewal, and tending operations will follow appropriate operating practices to minimize rutting, compaction, and mineral soil exposure that could lead to erosion and subsequent transport and deposition of sediment in lakes or ponds. Particularly,
  - Reasonable efforts (e.g. Pre-harvest skid trail planning) will be undertaken in order to avoid extraction trails crossing recognizable ephemeral streams, springs, seeps, and other areas of groundwater discharge when not solidly frozen. However if these features are required to be crossed, special care will be taken; temporary crossing structures that do not impede, accelerate, or divert water movement will be used when appropriate.

- Harvest, renewal, and tending operations will, to the extent practical and feasible, encourage perpetuation of the distinctive character of the shoreline forest while emulating natural disturbances and/or succession (unless conversion is required to meet other ecological objectives.)

- Within the inner 15 m of the AOC, at least 10 trees/100 m of shoreline spaced about 10 m apart will be retained, and identified (flagged) prior to harvesting, as a potential source of future aquatic coarse woody material. Living trees with the following characteristics will be preferentially retained:

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FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions

- At least 15 m tall (or the tallest of those available).
- Close to the shoreline (ideally within ½ the height of the tree).
- Leaning toward the shoreline.
- Coniferous supercanopy trees, scattered conifers, and veterans, especially large cedars, white pines, red pines, white spruces, and jack pines.
- Machine travel should be minimized within the inner 15 m of the AOC.
- Felled trees should not be piled within the inner 15 m of the AOC.

- Within the remainder of the AOC (beyond the inner 15 m), the general direction for retention of wildlife trees in as outlined in FMP text Section 4.2.2.2 will be followed. However, the focus will be on living trees with preferential retention of windfirm trees that provide the following special habitat features for wildlife:
  - Supercanopy trees of value to eagles and ospreys such as white pines, red pines, and poplars.
  - Large living hardwood trees with existing cavities or the potential to develop cavities.
  - Scattered veteran trees.

- No contamination of lakes or ponds by foreign materials is permitted. Specifically,
  - The use and storage of fuels will be carried out in accordance with the *Liquid Fuels Handling Code.*
  - No equipment maintenance (e.g., washing or changing oil) is permitted within 30 m of lakes or ponds.
  - Aerial application of pesticides for renewal, tending, or protection is permitted within the AOC but will follow spray buffer zones for *significant areas* or *sensitive areas* (as appropriate) as prescribed in the *Ontario Ministry of the Environment/Ontario Ministry of Natural Resources Buffer Zone Guidelines for Aerial Application of Pesticides in Crown Forests of Ontario (1992)*. Machine-based ground application of herbicides (e.g., air-blast sprayers mounted on skidders) is permitted within the AOC; spray buffer zones will be 30 m for *significant areas* and 60 m for *sensitive areas*. Hand-based ground application of herbicides (e.g., back-pack sprayers) is permitted within the AOC; spray buffer zones will be 3 m. All spray buffer zones will be measured from the inner boundary of the AOC.

WL02	Ponds – low potential sensitivity (LPS) to forest management operations	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010)*, Pages 44.	No	No new roads or landings permitted	Yes	No aggregate pits are permitted.

Operational Prescription
15 metre AOC as mapped

- No harvest, renewal, or tending operations are permitted that will result in damage to littoral zones or shorelines and associated stabilizing vegetation, or the deposition of sediment within ponds. Operations specifically prohibited include:
  - Machine travel within 3 m of ponds.
  - Excessive removal or damage of sapling-sized trees (<10 cm dbh) and shrubs within 3 m of ponds.
  - Felling of trees into ponds or within 3 m of ponds. Trees accidentally felled into ponds will be left where they fall.
  - Disturbance of the forest floor that leaves ruts or a significant area of exposed mineral soil within 15 m of ponds. Ruts and significant patches of exposed mineral soil will be promptly rehabilitated to prevent sediment from entering a pond. Patches of mineral soil exposed by natural events are excluded.

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FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
• No contamination of ponds by foreign materials is permitted. Specifically, o The use and storage of fuels will be carried out in accordance with the *Liquid Fuels Handling Code.* o No equipment maintenance (e.g., washing or changing oil) is permitted within 15 m of ponds.							
WS01	Rivers Stream segments - high or moderate potential sensitivity (HPS or MPS) to forest management operations	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010)*, Pages 48-53.	No	Yes	Yes	No aggregate pits are permitted

Operational Prescription

For *rivers* and *HPS* streams, 30-90 m AOC as mapped based on slope as follows:

Slope (%)	Slope Angle (degrees)	Width of AOC
0 - 15	0 - 8.5	30 m
>15 - 30	8.6 – 16.7	50 m
>30 - 45	16.8 – 24.2	70 m
> 45	> 24.2	90 m.

For *MPS streams,* 30 m AOC as mapped.

- The AOC is measured in the field from the edge of vegetation communities capable of providing an effective barrier to the movement of sediment. This will normally be those communities with >=25% canopy cover of trees, tall (>= 1 m high) woody shrubs such as alder or willow, or low (< 1 m high) woody evergreen shrubs such as Labrador tea or leatherleaf. For mapping purposes, the AOC may be measured from the edge of polygons identified as FOR, TMS, or BSH.If the inner edge of the AOC will be ≥300 m from the river shoreline or stream edge when these criteria are used, an AOC is not required adjacent to those sections of river shoreline or stream edge, unless the intervening wetland is known to provide components of fish habitat for which there is a high species' dependence (e.g., spawning habitat).

- No harvest, renewal, or tending operations are permitted within the AOC that will result in damage to river or stream beds or banks and associated stabilizing vegetation, or deposition of sediment within rivers or streams. Operations specifically prohibited within the AOC include:
  - Machine travel within the inner 3 m of the AOC.
  - Felling of trees into rivers or streams or the inner 3 m of the AOC. Trees accidentally felled into rivers or streams will be left where they fall.
  - Excessive removal or damage of sapling-sized trees (<10 cm dbh) and shrubs within the inner 3 m of the AOC.
  - Disturbance of the forest floor that leaves ruts or a significant area of exposed mineral soil within the inner 15 m of the AOC. Ruts and significant patches of exposed mineral soil will be promptly rehabilitated to prevent sediment from entering a water feature. Patches of mineral soil exposed by natural events are excluded.
  - Disturbance of the forest floor that disrupts hydrological function(i.e., impedes, accelerates, or diverts water movement) within recognizable ephemeral streams, springs, seeps, and other areas of groundwater discharge connected to rivers or streams.

- Harvest is permitted within the AOC subject to the following conditions:
  - Areas within the AOC that can have harvest, renewal and tending operations (subject to all AOC conditions) will be mapped as a modified AOC.

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FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
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AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions

- Reserve areas within the AOC will also be mapped.
- Forest that meets the definition of residual must be retained within the AOC (based on delineation of the AOC along the entire water feature, both within and outside the harvest area) on at least 1 side of *rivers, HPS streams*, and *MPS streams* to provide a travel corridor.
- The residual forest to be retained will be mapped as reserve (no harvest, renewal or tending permitted)(residual defined in FMP Section 4.2.2.2).
  - Mature forest with relatively uniform canopy closure ≥60%(canopy openings not to exceed individual tree crowns) must be retained within the inner 15 m of the AOC on both sides of *HPS* and *MPS streams* to provide shade, unless the inner boundary of the AOC is >15 m from the active channel. If forest is not mature or does not have an initial canopy closure ≥60%, no harvest is permitted.
  - Conventional clearcutting is permitted within the AOC only where the slope is ≤30%.
  - Within the AOC, direction for the retention of downed woody material as outlined in FMP text Section 4.2.2.2 will be followed.

- Some or all of the requirements for retention of residual forest within the AOC may be met by residual shoreline forest outside the harvest area, residual shoreline forest retained in overlapping AOCs, or residual shoreline forest retained in areas with steep slopes (>30%). Additional requirements for residual shoreline forest may be met by:
  - Retaining residual shoreline forest that meets the special habitat requirements of wildlife associated with rivers and streams. For example,
    - Preferentially retaining residual shoreline forest adjacent to moose aquatic feeding areas (MAFAs), especially in specific areas (e.g., LLPs) identified for enhanced moose management.
    - Preferentially retaining residual shoreline forest where there is a high potential for ephemeral streams, springs, seeps, and other areas of groundwater discharge.
  - Retaining residual shoreline forest that maintains internal and external connectivity. To the extent practical and feasible within the AOC, a relatively continuous corridor (average width of gaps <50 m; maximum width of gaps <200 m) of residual forest at least 30 m wide will be retained along the length of rivers and streams to connect special habitat features (e.g., osprey nests, MAFAs) associated with the river or stream and link with residual forest on connected lakes, ponds, rivers, and streams.
  - Retaining residual shoreline forest that has the highest likelihood of escaping natural disturbances such as wildfire. For example:
    - Preferentially retaining residual shoreline forest on the leeward side of a river.
    - Preferentially retaining residual shoreline forest comprised of less flammable forest types (e.g., hardwood, lowland conifer).
    - Preferentially retaining residual shoreline forest where there is an opportunity to incorporate it into a larger patch of residual forest.
  - Retaining residual shoreline forest that has the highest likelihood of being windfirm.

- Harvest, renewal, and tending operations will follow appropriate operating practices to minimize rutting, compaction, and mineral soil exposure that could lead to erosion and subsequent transport and deposition of sediment in rivers and streams. Particularly,
  - Reasonable efforts (e.g. Pre-harvest skid trail planning) will be undertaken so that extraction trails will avoid crossing recognizable ephemeral streams, springs, seeps, and other areas of groundwater discharge when not solidly frozen. However if these features are required to be crossed, special care will be taken; temporary crossing structures that do not impede, accelerate, or divert water movement will be used when appropriate.
- Harvest, renewal, and tending operations will, to the extent practical and feasible, encourage perpetuation of the distinctive character of the shoreline forest while emulating natural disturbances and/or succession (unless conversion is required to meet other ecological objectives).

- Within the inner 15 m of the AOC, at least 10 trees/100 m of shoreline spaced about 10 m apart will be retained as a potential source of future aquatic coarse woody material. Living trees with the following characteristics will be preferentially retained:

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FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
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AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions

- At least 15 m tall (or the tallest of those available).
- Close to the active channel (ideally within ½ the height of the tree).
- Leaning toward the river or stream.
- Coniferous supercanopy trees, scattered conifers, and veterans, especially large cedars, white pines, red pines, white spruces and jack pines.
- Machine travel should be minimized within the inner 15 m of the AOC.
- Felled trees should not be piled within the inner 15 m of the AOC.

- Within the remainder of the AOC beyond the inner 15 m, the general direction for retention of wildlife trees in harvest areas will be followed. However, the focus will be on living trees with preferential retention of windfirm trees that provide the following special habitat features for wildlife:
  - Supercanopy trees of value to eagles and ospreys such as white pine, red pines and poplars.
  - Large living hardwood trees with existing cavities or the potential to develop cavities.
  - Veteran trees.

- No contamination of rivers or streams by foreign materials is permitted. Specifically,
  - The use and storage of fuels will be carried out in accordance with the *Liquid Fuels Handling Code.*
  - No equipment maintenance (e.g., washing or changing oil) is permitted within 30 m of rivers or streams.
  - Aerial application of pesticides for renewal, tending, or protection is permitted within the AOC but will follow spray buffer zones for *significant areas* or *sensitive areas* (as appropriate) as prescribed in the *Ontario Ministry of Environment/Ontario Ministry of Natural Resources Buffer Zone Guidelines for Aerial Application of Pesticides in Crown Forests of Ontario* (1992). Machine-based ground application of herbicides (e.g., air-blast sprayers mounted on skidders) is permitted within the AOC; spray buffer zones will be 30 m for *significant areas* and 60 m for *sensitive areas*. Hand-based ground application of herbicides (e.g., back-pack sprayers) is permitted within the AOC; spray buffer zones will be 3 m. All spray buffer zones will be measured from the inner boundary of the AOC.

WS02	Stream segments - low potential sensitivity (LPS) to forest management operations	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010)*, Pages 53-54.	No	No crossings or landings permitted in the AOC.	Yes	Yes

Operational Prescription
This AOC code and AOC is applied to low potential sensitivity stream segments both mapped during the planning process and to those identified during plan implementation.

- 15 metre AOC as mapped.

- No harvest, renewal, or tending operations are permitted that will result in damage to stream channels or banks and stabilizing vegetation, or deposition of sediment within streams. Operations specifically prohibited include:
  - Machine travel within 3 m of the active channel (except at appropriate extraction trail crossings – refer to FMP-19)
  - Extraction trails may cross LPS streams. However, crossings will be minimized and operating practices will be followed that minimize rutting, compaction, and mineral soil exposure that could lead to erosion and subsequent transport and deposition of sediment in streams. Temporary crossing structures will be used when appropriate.

Management Unit Name: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
Plan Period: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10)**

FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
	o Excessive removal or damage of sapling-sized trees (<10 cm dbh) and shrubs within 3 m of the active channel. o Felling of trees into streams or within 3 m of the active channel. Trees accidentally felled into streams will be left where they fall. o Disturbance of the forest floor which leaves ruts or a significant area of exposed mineral soil within 15 m of the active channel. Ruts and significant patches of exposed mineral soil will be promptly rehabilitated to prevent sediment from entering a water feature. Patches of mineral soil exposed by natural events are excluded. • No contamination of streams by foreign materials is permitted. Specifically, o The use and storage of fuels will be carried out in accordance with the *Liquid Fuels Handling Code.* o No equipment maintenance (e.g., washing or changing oil) is permitted within 15 metres of the active channel.						
WW01	**Wetlands occupied by breeding black terns, golden-winged warblers, least bitterns, or yellow rails** (see further description below)	Group	*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (MNR, 2010)*, Pages 59-60, 125-126.	No	No new roads or landings permitted.	Yes	No new aggregate pits permitted.
	Description Delineated (mapped) habitat comprises the AOC. • Suitable habitat occupied by breeding black terns, golden-winged warblers, least bitterns, or yellow rails within the past 20 years (least bittern) or 10 years (black tern, golden-winged warbler, yellow rail) defined by either o suitable habitat occupied by breeding birds as delineated through field survey. o a 5 ha (least bittern), 10 ha (golden-winged warbler), 15 ha (yellow rail) or 20 ha (black tern) patch of suitable non-forested wetland habitat (or the entire wetland polygon if <5/10/15/20 ha) associated with individual *Element of Occurrence* observation points or other reliable sightings associated with breeding activity, or o as otherwise defined by an Endangered Species Act habitat description or habitat regulation. **Operational Prescription** Harvest, renewal and tending operations are permitted with the following conditions: • No harvest, renewal or tending operations are permitted that will result in significant damage to wetland vegetation or disruption of hydrological function. Operations specifically prohibited include: o Machine travel during the frost-free period within 3 m of those portions of the wetland dominated by open water or non-woody vegetation (i.e. vegetation communities with <25% canopy of trees, tall (>=1m high) woody shrubs such as alder or willow, or low (<1 m high) woody evergreen shrubs such as Labrador tea or leatherleaf. o Excessive removal or damage of sapling-sized trees (<10 cm dbh) and shrubs within 3 m of those portions of the wetland dominated by open water or non-woody vegetation. o Felling of trees during the frost-free period into, or within 3 m of those portions of the wetland dominated by open water or non-woody vegetation. Trees accidentally felled into those portions of the wetland dominated by open water or non-woody vegetation will be left where they fall. o Operation leaving ruts, a significant area of exposed mineral soil, or disrupt hydrological function within the wetland itself or with forest that is within 15 m of those portions of the wetland dominated by open water or non-woody vegetation. Ruts or significant patches of exposed mineral soil will be promptly rehabilitated. • No contamination of wetlands by foreign materials is permitted. Specifically: o The use and storage of fuels will be carried out in accordance with the *Liquid Fuels Handling Code.* o No equipment maintenance (e.g. washing or changing oil) is permitted within 15 m of non-forested wetlands.						

Management Unit Name: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
Plan Period: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10)**

FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
WW02	**Woodland pools known to support flooded jellyskin**	Group	Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (p. 103-104)	No	No road crossings proposed	Yes	Yes

Operational Prescription

Delineated habitat comprises the AOC.

- Regular harvest, renewal and tending operations are permitted within the AOC with the following conditions:
  - Harvest, renewal and tending operations are not permitted within 30m of the high-water mark of woodland pools (see CRO-16) known to support Flooded Jellyskin. Trees will not be felled into this area, trees accidentally felled into this area will be left where they fall.
  - Direction for woodland pools will be applied to all other woodland pools (CROs Section 4.2.2.2) with a surface area ≥200m^2 (about a 15m diameter). In all forest units, all trees will be retained in and within 3m of pools and residual forest will be retained within 15m of pools.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
FL01	**First Nation Reserve (Federal) Land**	Group	Supplementary Documentation H AOC's	No	No crossings or landings permitted in the AOC.	Yes	Yes

Operational Prescription

- AOC width is 30 metres from the boundary of mapped First Nation Reserve land adjacent to allocated harvest blocks.

Harvest operations are permitted subject to the procedure below being implemented in the following order:

1) If the property boundary had been previously established by a licenced surveyor and the boundary markers and monuments can be located then the harvest boundary will be established along the boundary markers and monuments. Regular harvest, renewal and tending operations are permitted in allocated blocks.
2) If there is an agreement with the First Nation regarding the placement of the limit of forest operations then the harvest boundary will be placed according to the agreement. Regular harvest, renewal and tending operations are permitted in allocated blocks subject to this agreement.
3) If neither 1) or 2) above apply, the harvest boundary will be established so that a buffer is put in between the mapped boundary and the harvest block. The First Nation Reserve boundary will be checked against information provided by both MNR and INAC. The more restrictive of the two boundaries will be used if agreement cannot be reached as to the proper boundary location. The size of the buffer will be no more than 30 metres wide, will be marked and will be determined by the forest operator's level of uncertainty regarding the true location of the property boundary. Regular harvest, renewal and tending operations are permitted outside of the marked reserve buffer.

Management Unit Name: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
Plan Period: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10)**

FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions
NE9	**Trumpeter Swan Nesting Site** Secondary Values: Fish habitat, Water quality	Group	Supplementary Documentation H AOC's	No	No road crossings proposed	None permitted	None permitted

Operational Prescription

Reserve Zone
Measured from the edge of the standing timber as mapped, 30 to 90 m AOC based on slope as follows:

Slope (%)	Slope Angle (degrees)	Width of AOC
0 - 15	0 - 8.5	30 m
>15 - 30	8.6 – 16.7	50 m
>30 - 45	16.8 – 24.2	70 m
> 45	> 24.2	90 m

No forest management operations are permitted within the reserve.

Modified Zone
Outside of the slope-based reserve, within a 120 metre modified operations zone, measured from the high water mark, where the following restrictions apply;
i. Harvesting, mechanical site preparation, and aerial spray operations are permittted between August 15th and April 15th,
ii. Tree planting is permitted but limited to one (1) crew of four (4) planters and ATV use is to be kept to a minimum. Tree caches are to be located as far from the nest as possible.

NE10	**Snapping Turtle Nesting Site** Secondary Values: Fish habitat, Water quality	Group		No	No road crossings proposed	Yes	Yes

Operational Prescription

Not applicable, conditions on roads, landings, forestry aggregate pits only.

Management Unit Name: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
Plan Period: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10)**

FMP-10 OPERATIONAL PRESCRIPTIONS FOR AREAS OF CONCERN

Note 1: Where the Road Crossings and Landings or Forestry Aggregate Pit conditions columns indicate "yes", additional information is provided in Table FMP-19.
Note 2: Residual pattern, wildlife trees and downed woody material requirements are detailed in the forest management plan in Section 4.2.2.2.
Note 3: Table FMP-10.1 Harvest, Renewal and Tending Activities and their Potential Impact is located at the end of Table FMP-10.

AOC or AOC Group Identifier	Description of Natural Resource Feature, Land Use or Value	Group AOC	Source	Exception	Road Crossings and Landings		Forestry Aggregate Pit
					Primary or Branch Road Crossing/Landing Conditions	Operational Road/Landing Conditions	Conditions

TABLE FMP-10.1: Harvest, Renewal and Tending Activities and their Potential Impacts

Potential Impact:	High	Moderate	Low
Activities:	Harvest operation Large tree plant (≥5 people) if visible Mechanical site preparation	Large tree plant (≥5 people) if not visible Small tree plant (<5 people) if visible Small crew using brush saws Ground (airblast) herbicide application	Ground(hand-held) application of herbicides Boundary/tree marking Small tree plant (<5 people) if not visible Regeneration Survey

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

☑ Phase I (Years 1-5)
☐ Phase II (Years 6-10)

FMP-11 PLANNED HARVEST AREA

Forest Unit	10-Year Available Harvest Area (ha)	Age Class	Planned Harvest Area 10-year period (ha)	Planned Harvest Area 5-year term (ha)
BFM		1-20	-	-
		21 - 40	-	-
		41 - 60	-	-
		61 - 80	30.8	-
		81 - 100	833.9	424.7
		101 - 120	419.5	171.3
		121-140	69.1	41.7
		141+	-	-
	1,408.4	Subtotal	1,353.3	637.7
CMX		1-20	-	-
		21 - 40	-	-
		41 - 60	-	-
		61 - 80	4,060.6	2,230.9
		81 - 100	2,602.1	1,120.3
		101 - 120	1,564.2	666.1
		121-140	187.1	56.2
		141+	208.4	208.4
	8,845.4	Subtotal	8,622.4	4,281.9
HMX		1-20	-	-
		21 - 40	-	-
		41 - 60	1,432.2	711.5
		61 - 80	6,788.4	3,471.2
		81 - 100	1,742.8	842.8
		101 - 120	997.6	571.6
		121-140	77.7	77.7
		141+	-	-
	12,064.3	Subtotal	11,038.7	5,674.8
OCL		1-20	-	-
		21 - 40	-	-
		41 - 60	-	-
		61 - 80	-	-
		81 - 100	-	-
		101 - 120	-	-
		121-140	-	-
		141+	-	-
	-	Subtotal	-	-
OTH		1-20	-	-
		21 - 40	-	-
		41 - 60	-	-
		61 - 80	-	-
		81 - 100	-	-
		101 - 120	-	-
		121-140	-	-
		141+	-	-
	-	Subtotal	-	-
PJD		1-20	-	-
		21 - 40	-	-
		41 - 60	-	-
		61 - 80	272.0	101.7
		81 - 100	1,050.2	444.3
		101 - 120	1,277.3	824.1
		121-140	298.3	156.5
		141+	202.6	67.2
	3,149.5	Subtotal	3,100.4	1,593.8

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

☑ Phase I (Years 1-5)
☐ Phase II (Years 6-10)

FMP-11 PLANNED HARVEST AREA

Forest Unit	10-Year Available Harvest Area (ha)	Age Class	Planned Harvest Area 10-year period (ha)	Planned Harvest Area 5-year term (ha)
PJM		1-20	-	-
		21 - 40	-	-
		41 - 60	-	-
		61 - 80	791.2	298.2
		81 - 100	2,615.1	1,369.2
		101 - 120	1,591.4	791.9
		121-140	99.4	55.9
		141+	-	-
	5,368.5	Subtotal	5,097.1	2,515.2
POD		1-20	-	-
		21 - 40	-	-
		41 - 60	31.4	31.4
		61 - 80	6,443.5	3,515.6
		81 - 100	2,589.3	1,154.5
		101 - 120	2,284.6	1,197.1
		121-140	-	-
		141+	-	-
	12,208.0	Subtotal	11,348.8	5,898.6
PRW		0-20	-	-
		21 - 40	-	-
		41 - 60	-	-
		61 - 80	-	-
		81 - 100	86.7	41.1
		101 - 120	-	-
		121-140	61.2	11.9
		141+	56.4	17.2
	364.1	Subtotal	204.3	70.2
SBL		0-20	-	-
		21 - 40	-	-
		41 - 60	-	-
		61 - 80	14.1	-
		81 - 100	11.3	11.3
		101 - 120	16.7	16.7
		121-140	44.5	20.9
		141+	210.6	146.2
	302.5	Subtotal	297.2	195.1
SPD		0-20	-	-
		21 - 40	-	-
		41 - 60	-	-
		61 - 80	1,950.4	776.1
		81 - 100	3,595.2	2,023.4
		101 - 120	677.8	322.9
		121-140	496.8	197.7
		141+	71.2	43.9
	6,931.8	Subtotal	6,791.4	3,364.0
SPM		0-20	-	-
		21 - 40	-	-
		41 - 60	-	-
		61 - 80	234.7	143.1
		81 - 100	1,821.6	990.8
		101 - 120	1,734.1	704.7
		121-140	305.1	169.8
		141+	22.2	-
	4,191.6	Subtotal	4,117.7	2,008.4
Stage of Management Subtotal		All clearcut forest units - no stages of management.		
Total All Forest Units	54,834.1		51,971.3	26,239.7

Data for 10-year available harvest area from Long-term Management Direction run: 27d_OLTMS.
Available Harvest Area data by forest unit matches area reported in Table FMP-7 prepared for the LTMD.

MANAGEMENT UNIT NAME: Whiskey Jack Forest

PLAN PERIOD: April 1, 2012 to March 31, 2022

☑ Phase I (Years 1-5)

☐ Phase II (Years 6-10)

FMP-12 PLANNED CLEARCUTS > 260 ha (5-Year)

Statistics		
	Number	Percent
Number of Planned Clearcuts <= 260 ha	108	76%
Number of Planned Clearcuts > 260 ha	34	24%
Total for all Planned Clearcuts	142	100%

Planned Clearcuts > 260 ha		
Location ID	Area of Planned Clearcut (ha)	Planned Harvest Area This Term (ha)
369	459	384
371	510	510
376	336	336
377	1,847	1,034
385	342	197
388	1,263	389
390	770	770
394	386	386
400	342	221
410	325	325
412	353	353
419	305	215
420	393	393
425	349	246
426	904	292
431	599	599
433	427	253
435	7,905	1,947
437	789	789
438	301	301
440	439	354
441	824	374
443	4,110	2,946
444	588	440
448	2,184	52
449	373	373
453	1,032	910
454	410	410
455	459	459
456	928	227
458	595	527
459	723	667
461	516	125
468	737	361

MANAGEMENT UNIT NAME: Whiskey Jack Forest

PLAN PERIOD: April 1, 2012 to March 31, 2022

☑ Phase I (Years 1-5)

☐ Phase II (Years 6-10)

FMP-13 PLANNED HARVEST VOLUME BY SPECIES (10-Year)

Total Planned Harvest Area from FMP-11: 51,971 ha.

Forest Unit	10-Year Available Harvest Volume (m^3)		10-Year Planned Harvest Volume (m^3)																
			Conifer									Hardwood						Total
	Conifer	Hardwood	Pw	Pr	Pj	Sb	Sw	Bf	Ce	La	Subtotal	Po	Bw	MH	UH	LH	Subtotal	
Net Merchantable:																		
BFM	128,524	28,040	-	-	11,512	47,750	29,065	33,018	2,233	-	123,577	12,686	13,822	-	-	-	26,508	150,085
CMX	590,692	258,118	-	644	116,076	280,968	40,258	85,738	36,504	-	560,188	162,708	86,819	-	-	1,601	251,128	811,315
HMX	411,613	679,872	-	2,479	43,530	158,496	59,477	88,754	10,151	-	362,888	434,085	209,923	-	-	11,930	655,937	1,018,825
OCL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PJD	318,237	9,218	-	-	238,285	54,940	741	371	-	-	294,337	13,111	640	-	-	-	13,752	308,088
PJM	436,093	31,957	-	2,442	252,710	170,887	955	6,283	-	-	433,277	29,539	7,869	-	-	-	37,407	470,684
POD	239,484	1,163,459	-	728	46,492	79,460	38,999	51,305	2,676	-	219,661	1,128,083	45,525	-	-	6,567	1,180,174	1,399,835
PRW	42,670	4,889	7,530	6,246	-	1,504	767	1,625	1,613	-	19,285	4,907	1,780	-	-	-	6,687	25,971
SBL	22,237	220	-	-	-	14,087	-	-	391	740	15,218	-	-	-	-	-	-	15,218
SPD	829,749	31,566	-	-	87,732	642,707	39,274	33,221	4,228	283	807,446	17,057	15,583	-	-	249	32,889	840,335
SPM	471,082	48,230	-	36	147,296	274,554	10,244	21,204	3,064	76	456,474	31,616	21,240	-	-	-	52,856	509,330
Sub-total	3,490,380	2,255,569	7,530	12,576	943,634	1,725,354	219,779	321,519	60,860	1,099	3,292,351	1,833,791	403,201	0	0	20,346	2,257,338	5,549,689
Defect (Branches, Twigs, Leaves, Bark):																		
BFM	25,042	6,626	-	-	1,150	9,464	4,615	8,734	135	-	24,098	2,764	3,547	-	-	-	6,311	30,409
CMX	90,748	58,693	-	25	11,598	55,690	6,392	22,679	2,211	-	98,594	35,454	22,276	-	-	96	57,826	156,420
HMX	73,304	153,847	-	96	4,349	31,415	9,443	23,477	615	-	69,395	94,587	53,862	-	-	712	149,161	218,557
OCL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PJD	34,154	2,009	-	-	23,809	10,890	118	98	-	-	34,914	2,857	164	-	-	-	3,021	37,935
PJM	52,649	7,133	-	94	25,250	33,871	152	1,662	-	-	61,029	6,436	2,019	-	-	-	8,455	69,484
POD	42,386	253,429	-	28	4,645	15,750	6,192	13,571	162	-	40,348	245,810	11,681	-	-	392	257,882	298,230
PRW	2,785	1,088	542	241	-	298	122	430	98	-	1,730	1,069	457	-	-	-	1,526	3,256
SBL	3,902	41	-	-	-	2,792	-	-	24	30	2,846	-	-	-	-	-	-	2,846
SPD	149,686	7,346	-	-	8,766	127,390	6,236	8,788	256	11	151,446	3,717	3,998	-	-	15	7,730	159,176
SPM	68,803	11,114	-	1	14,717	54,419	1,626	5,609	186	3	76,561	6,889	5,450	-	-	-	12,339	88,900
Sub-total	543,459	501,326	542	485	94,285	341,979	34,894	85,047	3,686	45	560,962	399,584	103,454			1,214	504,252	1,065,214
Undersize:																		
BFM	5,766	1,675	-	-	182	2,293	788	2,196	24	-	5,483	335	1,333	-	-	-	1,668	7,151
CMX	19,697	11,256	-	79	1,838	13,491	1,091	5,701	399	-	22,600	4,302	8,373	-	-	283	12,957	35,557
HMX	16,469	32,416	-	304	689	7,611	1,612	5,902	111	-	16,230	11,477	20,245	-	-	2,106	33,827	50,057
OCL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OTH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PJD	5,810	244	-	-	3,772	2,638	20	25	-	-	6,455	347	62	-	-	-	408	6,863
PJM	9,865	1,151	-	300	4,001	8,206	26	418	-	-	12,950	781	759	-	-	-	1,540	14,489
POD	9,371	35,143	-	89	736	3,815	1,057	3,412	29	-	9,139	29,825	4,390	-	-	1,159	35,375	44,514
PRW	2,952	171	42	767	-	72	21	108	18	-	1,028	130	172	-	-	-	301	1,329
SBL	1,398	12	-	-	-	676	-	-	4	174	854	-	-	-	-	-	-	854
SPD	34,707	1,681	-	-	1,389	30,861	1,065	2,209	46	66	35,636	451	1,503	-	-	44	1,998	37,634
SPM	14,516	2,369	-	4	2,332	13,183	278	1,410	34	18	17,259	836	2,048	-	-	-	2,884	20,143
Sub-total	120,550	86,118	42	1,544	14,938	82,847	5,958	21,380	666	258	127,633	48,484	38,884	0	0	3,591	90,959	218,593
TOTAL	4,154,389	2,843,013	8,114	14,605	1,052,857	2,150,180	260,632	427,946	65,211	1,402	3,980,947	2,281,858	545,539	0	0	25,151	2,852,549	6,833,496

Data for 10-Year available harvest volume from LTMD run 27d_OLTMS with regional calculations for defect and undersized volumes.
Data for 10-Year planned harvest volume from actual harvest allocations for the FMP with regional calculations for defect and undersized volumes.

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

☑ Phase I (Years 1-5)
☐ Phase II (Years 6-10)

FMP-14 PLANNED HARVEST VOLUME AND WOOD UTILIZATION (5-Year)

Total Planned Harvest Area from FMP-11: 26,240 ha.

Licensee or Grouping	Planned Harvest Area (ha)	Utilization	Volume Type	Product	Volume by Species (m3)															Total
					Conifer									Hardwood						
					Pw	Pr	Pj	Sb	Sw	Bf	Ce	La	Subtotal	Po	Bw	MH	UH	LH	Subtotal	
SFL	-		Net Merchantable	Fibre	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
			Undersize & Defect	All	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FRL Group	26,240		Net Merchantable	Fibre	2,854	3,980	467,814	869,289	109,163	152,569	31,783	913	1,638,363	983,637	207,437	-	-	9,840	1,200,914	2,839,278
			Undersize & Defect	All	221	642	54,148	214,041	20,291	50,502	2,273	251	342,370	240,341	73,230	-	-	2,324	315,895	658,265
Total:	26,240			**Total:**	3,075	4,622	521,962	1,083,330	129,454	203,071	34,055	1,164	1,980,733	1,223,978	280,667	-	-	12,164	1,516,809	3,497,542
		Utilized	Net Merchantable	Fibre	2,854	3,980	467,814	869,289	109,163	152,569	31,783	913	1,638,363	983,637	207,437	-	-	9,840	1,200,914	2,839,278
			Undersize & Defect	All	221	642	54,148	214,041	20,291	50,502	2,273	251	342,370	240,341	73,230	-	-	2,324	315,895	658,265
				Subtotal:	3,075	4,622	521,962	1,083,330	129,454	203,071	34,055	1,164	1,980,733	1,223,978	280,667	-	-	12,164	1,516,809	3,497,542
		Unutilized	Net Merchantable	Fibre									-						-	-
			Undersize & Defect	All									-						-	-
				Subtotal:	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
				Total:	3,075	4,622	521,962	1,083,330	129,454	203,071	34,055	1,164	1,980,733	1,223,978	280,667	-	-	12,164	1,516,809	3,497,542

NOTE: Net merchantable volumes calculated from planned harvest allocations for the 5-year term (Phase I) with regional calculations for defect and undersized volumes.

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

☒ Phase I (Years 1-5)
☐ Phase II (Years 6-10)

FMP-15 PLANNED WOOD UTILIZATION BY MILL (5-Year)

Mill	Commitment Type	Committed Volume (m3 per year)	Year	Product	Volume by Species (m3)														
					Conifer									Hardwood						Total
					Pw	Pr	Pj	Sb	Sw	Bf	Ce	La	Subtotal	Po	Bw	MH	UH	LH	Subtotal	
Weyerhaeuser - Kenora Timberstrand Engineered Lumber Facility	Ministerial Conditional Commitment - 2009 (1)	100,000 m3 Poplar (2) and up to 183,726 m3 Poplar (2)	All	Board	0	0	0	0	0	0	0	0	0	983,637	0	0	0	0	983,637	983,637
Prendiville Industries Ltd. - Kenora Forest Products Division	Ministerial Directive - 1994 (3)	133,000 m3 spruce, pine, fir	All	Sawlog	0	0	133,000	374,000	50,000	108,000	0	0	665,000	0	0	0	0	0	0	665,000
Prendiville Industries Ltd. - Kenora Forest Products Division	2007 Wood Supply Competitive Process Offer (4)	250,500 m3 spruce, pine, fir	All	Sawlog	0	0	309,814	448,289	57,163	36,069	0	0	851,334	0	0	0	0	0	0	851,334
Wincrief Forestry Products L.P.	2007 Wood Supply Competitive Process Offer (5)	9,000 m3 spruce, pine, fir	All	Sawlog	0	0	14,000	25,000	1,000	5,000	0	0	45,000	0	0	0	0	0	0	45,000
1358807 Ontario Ltd. (D. Riffel Harvesting)	2007 Wood Supply Competitive Process Offer (6)	7,500 m3 spruce, pine, fir	All	Sawlog	0	0	11,000	22,000	1,000	3,500	0	0	37,500	0	0	0	0	0	0	37,500
Open Market	Open Market		All	Fibre	2,854	3,980	0	0	0	0	31,783	913	39,529	0	207,437	0	0	9,840	217,278	256,807
Open Market	Open Market		All	Defect/ Undersize	221	642	54,148	214,041	20,291	50,502	2,273	251	342,370	240,341	73,230	0	0	2,324	315,895	658,265
				Total	3,075	4,622	521,962	1,083,330	129,454	203,071	34,055	1,164	1,980,733	1,223,978	280,667	0	0	12,164	1,516,809	3,497,542

NOTES:

(1) Ministerial Conditional Commitment - As per Minister Donna Cansfield letter dated July 14, 2009, commiting to a temporary replacement of volume.

(2) As per Minister Donna Cansfield letter dated July 14, 2009, commiting to a temporary replacement of volume of 100,000 m3 Poplar.

(3) Minsterial Directive (20 years) - As per Minister Hampton letter to Prendiville Industries Ltd (Kenora Forest Products) dated November 16, 1994 (expires on March 31, 2014).

(4) 2007 Wood Supply Competitive Process Offer - Additional conifer volume conditionally offered to KFP through the 2007 Kenora area Wood Supply Competitive Process. This conditional offer was reconfirmed by Minister Gravelle in a letter dated October 18, 2011 regarding KFP's 2010 Wood Supply Competitive Process conditional offers.

(5) 2007 Wood Supply Competitive Process Offer - Conifer volume conditionally offered to Wincrief Forestry Products LP through the 2007 Kenora area Wood Supply Competitive Process. A Wood Supply Agreement for this volume is pending on resolution of Whiskey Jack Forest related issues (i.e., Grassy Narrows First Nation and Keewatin Lands issues).

(6) 2007 Wood Supply Competitive Process Offer - Conifer volume conditionally offered to 1358807 Ontario Ltd (D. Riffel Harvesting) through the 2007 Kenora area Wood Supply Competitive Process. A Wood Supply Agreement for this volume is pending on resolution of Whiskey Jack Forest related issues (i.e., Grassy Narrows First Nation and Keewatin Lands issues).

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

☑ Phase I (Years 1-5)
☐ Phase II (Years 6-10)

FMP-16 CONTINGENCY HARVEST AREA AND VOLUME

Forest Unit	Age Class	Contingency Harvest Area (ha)	Contingency Harvest Volume (m^3)		
			Conifer	Hardwood	Total
BFM	1-20	0.0	0	0	0
	21 - 40	0.0	0	0	0
	41 - 60	0.0	0	0	0
	61 - 80	200.8	11,282	3,797	15,080
	81 - 100	0.0	0	0	0
	101 - 120	0.0	0	0	0
	121-140	0.0	0	0	0
	141+	0.0	0	0	0
	Subtotal	200.8	11,282	3,797	15,080
CMX	1-20	0.0	0	0	0
	21 - 40	0.0	0	0	0
	41 - 60	285.2	12,715	8,477	21,192
	61 - 80	697.3	43,808	22,146	65,954
	81 - 100	287.0	19,485	9,100	28,585
	101 - 120	184.0	12,751	5,154	17,905
	121-140	22.7	1,145	128	1,273
	141+	0.0	0	0	0
	Subtotal	1,476.2	89,905	45,004	134,909
HMX	1-20	0.0	0	0	0
	21 - 40	0.0	0	0	0
	41 - 60	609.5	18,201	30,269	48,470
	61 - 80	882.7	30,920	50,542	81,462
	81 - 100	188.1	8,092	9,398	17,490
	101 - 120	69.2	2,392	2,866	5,258
	121-140	0.0	0	0	0
	141+	0.0	0	0	0
	Subtotal	1,749.5	59,605	93,075	152,679
OCL	1-20	0.0	0	0	0
	21 - 40	0.0	0	0	0
	41 - 60	0.0	0	0	0
	61 - 80	0.0	0	0	0
	81 - 100	0.0	0	0	0
	101 - 120	0.0	0	0	0
	121-140	0.0	0	0	0
	141+	0.0	0	0	0
	Subtotal	0.0	0	0	0
OTH	1-20	0.0	0	0	0
	21 - 40	0.0	0	0	0
	41 - 60	0.0	0	0	0
	61 - 80	0.0	0	0	0
	81 - 100	0.0	0	0	0
	101 - 120	0.0	0	0	0
	121-140	0.0	0	0	0
	141+	0.0	0	0	0
	Subtotal	0.0	0	0	0
PJD	1-20	0.0	0	0	0
	21 - 40	0.0	0	0	0
	41 - 60	0.0	0	0	0
	61 - 80	189.4	20,997	1,619	22,616
	81 - 100	320.8	34,461	2,545	37,005
	101 - 120	31.2	2,840	316	3,156
	121-140	0.0	0	0	0
	141+	0.0	0	0	0
	Subtotal	541.4	58,298	4,479	62,777

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

☑ Phase I (Years 1-5)
☐ Phase II (Years 6-10)

FMP-16 CONTINGENCY HARVEST AREA AND VOLUME

Forest Unit	Age Class	Contingency Harvest Area (ha)	Contingency Harvest Volume (m^3)		
			Conifer	Hardwood	Total
PJM	1-20	0.0	0	0	0
	21 - 40	0.0	0	0	0
	41 - 60	0.0	0	0	0
	61 - 80	148.9	12,740	1,868	14,609
	81 - 100	540.4	41,956	5,921	47,878
	101 - 120	340.9	24,789	1,282	26,071
	121-140	0.0	0	0	0
	141+	0.0	0	0	0
	Subtotal	1,030.2	79,486	9,072	88,558
POD	1-20	0.0	0	0	0
	21 - 40	0.0	0	0	0
	41 - 60	533.8	9,461	43,898	53,359
	61 - 80	1,043.6	18,841	106,061	124,903
	81 - 100	372.9	10,820	34,903	45,724
	101 - 120	275.0	6,705	19,695	26,400
	121-140	0.0	0	0	0
	141+	0.0	0	0	0
	Subtotal	2,225.3	45,828	204,558	250,386
PRW	0-20	0.0	0	0	0
	21 - 40	0.0	0	0	0
	41 - 60	0.0	0	0	0
	61 - 80	0.0	0	0	0
	81 - 100	0.0	0	0	0
	101 - 120	0.0	0	0	0
	121-140	0.0	0	0	0
	141+	10.1	1,087	121	1,207
	Subtotal	10.1	1,087	121	1,207
SBL	0-20	0.0	0	0	0
	21 - 40	0.0	0	0	0
	41 - 60	0.0	0	0	0
	61 - 80	0.0	0	0	0
	81 - 100	19.1	766	328	1,095
	101 - 120	0.0	0	0	0
	121-140	9.1	730	0	730
	141+	25.4	1,164	0	1,164
	Subtotal	53.6	2,660	328	2,989
SPD	0-20	0.0	0	0	0
	21 - 40	0.0	0	0	0
	41 - 60	0.0	0	0	0
	61 - 80	745.4	84,206	1,314	85,520
	81 - 100	397.8	50,830	612	51,441
	101 - 120	123.0	16,328	169	16,497
	121-140	20.1	2,111	73	2,184
	141+	15.8	1,122	0	1,122
	Subtotal	1,302.1	154,597	2,168	156,765
SPM	0-20	0.0	0	0	0
	21 - 40	0.0	0	0	0
	41 - 60	0.0	0	0	0
	61 - 80	269.0	23,829	2,356	26,184
	81 - 100	250.6	27,816	5,005	32,821
	101 - 120	38.3	3,877	969	4,846
	121-140	0.0	0	0	0
	141+	0.0	0	0	0
	Subtotal	557.9	55,521	8,330	63,851
Total All Forest Units		9,147.1	558,269	370,931	929,200

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

☑ Phase I (Years 1-5)
☐ Phase II (Years 6-10)

FMP-17 PLANNED RENEWAL AND TENDING OPERATIONS

		Area (ha) Planned (10-Year)		Area (ha) Planned (5-Year)	
Renewal		**Harvest**	**Natural Disturbance**	**Harvest**	**Natural Disturbance**
Regeneration					
Natural					
Clearcut Silvicultural System (even-aged)					
	Block Cut	25,631		12,911	
	Strip Cut				
	Seed Tree Cut				
	HARP/HARO/CLAAG				
Shelterwood Silvicultural System (even-aged)					
	Uniform Shelterwood - Seed Cut				
	Strip Shelterwood - Strip Cut				
Selection Silvicultural System - Selection Harvest (uneven-aged					
Subtotal Natural		25,631	0	12,911	0
Artificial					
Planting		20,460		10,420	
Seeding		7,380		3,974	
Subtotal Artificial		27,839	0	14,394	0
Total Regeneration		53,470	0	27,306	0
Artificial - Retreatment					
Planting		0		0	
Seeding		0		0	
Total Retreatment					
Artificial - Supplemental					
Planting		0		0	
Seeding		0		0	
Total Supplemental					
Site Preparation					
Mechanical		27,839		14,394	
Chemical	Aerial				
	Ground				
Prescribed Burn	High Complexity				
	Slash Pile Burn	1,069		546	
Total Site Preparation		28,909		14,941	
Tending					
Cleaning					
Manual					
Mechanical		1,600		600	
Chemical	Aerial	4,726			
	Ground	1,600		600	
Prescribed Burn	High Complexity				
Spacing, pre-commercial thinning, improvement cutting					
Clearcut and Shelterwood Silvicultural Systems (even-aged)		139		84	
Selection Silvicultural System (uneven-aged)					
Other					
Cultivation					
Pruning					
Total Tending		8,065		1,284	

MANAGEMENT UNIT NAME: WHISKEY JACK FOREST
PLAN PERIOD: April 1, 2012 TO March 31, 2022

[X] Phase 1 (Years 1-5)
[ ] Phase 2 (Years 6-10)

FMP-18 Road Construction and Use Management

Road or Road Network Identifier	Plan Start Length (km)	Planned Construction 10 Year	Planned Construction This Term	Use Management					
				Maintenance	Monitoring	Access Control		Future Use Management	
						Type	Year	Transfer Year	Management Intent
A. Primary									
Aerobus	24.7			UMS-1	UMS-1				
April/Puzzle	33.1			UMS-1	UMS-1				
Bug Lake Road	6	10	10	UMS-1	UMS-1				
Conifer	63.6			UMS-1	UMS-1				
Deer Lake	72.3			UMS-1	UMS-1				
Fly	23.3			UMS-1	UMS-1				
Jones	46.7			UMS-1	UMS-1				
Little Clay	9.8			UMS-1	UMS-1				
Lobstick	13.2			UMS-1	UMS-1				
Longlegged	64.1			UMS-1	UMS-1				
Lount	17.3			UMS-1	UMS-1				
Maybrun	14.1			UMS-1	UMS-1				
McIntosh	5.9			UMS-1	UMS-1				
Scotty	27.5			UMS-1	UMS-1				
Segise	30.1			UMS-1	UMS-1				
South Pakwash	83.1			UMS-1	UMS-1				
Tide	12.8			UMS-2	UMS-2	PLA-sign			
Unexpected	17.8			UMS-2	UMS-2	PLA-sign			
Yellow Girl	0	8.2	8.2	UMS-1	UMS-1				
Windfall	47.5	6.6	0	UMS-1	UMS-1				
Witch Bay/Loon Lake Road	5.7	12	12	UMS-1	UMS-1				
Subtotal	593.9	36.8	30.2						

MANAGEMENT UNIT NAME: WHISKEY JACK FOREST
PLAN PERIOD: April 1, 2012 TO March 31, 2022

[X] Phase 1 (Years 1-5)
[ ] Phase 2 (Years 6-10)

FMP-18 Road Construction and Use Management

Road or Road Network Identifier	Plan Start Length (km)			Use Management					
		Planned Construction 10 Year	Planned Construction This Term	Maintenance	Monitoring	Access Control		Future Use Management	
						Type	Year	Transfer Year	Management Intent
B. Branch									
Aesthetic Road	17.3	9.9	9.9	UMS-2	UMS-2	PLA-sign			
April South Road	0	9.2	9.2	UMS-1	UMS-1				
April North Road	9.8			UMS-1	UMS-1				
Blindfold Road	6.7			UMS-1	UMS-1				
Burden Lake Road	18.9			UMS-1	UMS-1				
Butterfly Road	7			UMS-1	UMS-1				
Campfire Road	2.8			UMS-1	UMS-1				
Carter Road	6.2			UMS-1	UMS-1				
Cumby Road	2.6			UMS-1	UMS-1				
Ester Lake Road	2			UMS-1	UMS-1				
Evening Road	21.3			UMS-1	UMS-1				
Evening Road Branch 1	2.2			UMS-1	UMS-1				
Farewell Bay Road	9.1			UMS-1	UMS-1				
Farewell Bay Road Br. 1	1.2			UMS-1	UMS-1				
Glon Road	4.8			UMS-1	UMS-1				
Gould Road	9.4			UMS-1	UMS-1				
Hector Creek Road	3			UMS-1	UMS-1				
Jack Lake Road	7.5			UMS-1	UMS-1				
Jackpine Road	3.9			UMS-1	UMS-1				
Km 53 Road	6.1			UMS-1	UMS-1				
Km36 Road	5.3			UMS-1	UMS-1				
Lennan Road	17.3			UMS-2	UMS-2	PLA-sign			
Loon Lake Road	5.7			UMS-1	UMS-1				
Mac Lake Road	10			UMS-2	UMS-2	MTO Gate			
North Fleet Road	4.4			UMS-1	UMS-1				
Ord Lake Road	5.2			UMS-1	UMS-1				
Paul Road	3			UMS-1	UMS-1				
Placid Road	5.5			UMS-1	UMS-1				
Randy Road	4.2			UMS-1	UMS-1				
Red Bluff Br. Road	5			UMS-1	UMS-1				
Red Bluff Road	1.2			UMS-1	UMS-1				
Ryan Road	4.9			UMS-1	UMS-1				
Scotty Road Br. 1	3.6			UMS-1	UMS-1				
Scouter Road	4.6			UMS-1	UMS-1				
Slush Road	6.6			UMS-1	UMS-1				
Stag Road	9			UMS-1	UMS-1				
Stewart Road	14			UMS-1	UMS-1				
Sydney Lake Road	9.7			UMS-2	UMS-2	PLA-sign	2009		
Thadeus Road	8.4			UMS-1	UMS-1				
Turbo Road	1			UMS-1	UMS-1				
Wabigoon Road	3.6			UMS-1	UMS-1				
West Narrows Road	12.9			UMS-1	UMS-1				
White Tail Road	7.8			UMS-1	UMS-1				
Wilcox Road	4.8			UMS-1	UMS-1				
Subtotal	299.5	19.1	19.1						
Total		55.9	49.3						

MANAGEMENT UNIT NAME: WHISKEY JACK FOREST
PLAN PERIOD: April 1, 2012 TO March 31, 2022

[X] Phase 1 (Years 1-5)
[ ] Phase 2 (Years 6-10)

FMP-18 Road Construction and Use Management

Road or Road Network Identifier	Plan Start Length (km)			Use Management					
		Planned Construction 10 Year	Planned Construction This Term	Maintenance	Monitoring	Access Control		Future Use Management	
						Type	Year	Transfer Year	Management Intent
C. Operational									
ORB2			YES	UMS-1	UMS-1				
ORB4			YES	UMS-1	UMS-1				
ORB6			YES	UMS-1	UMS-1				
ORB8			YES	UMS-1	UMS-1				
ORB12			YES	UMS-1	UMS-1				
ORB14			YES	UMS-1	UMS-1				
ORB16			NO	UMS-1	UMS-1				
ORB18			YES	UMS-1	UMS-1				
ORB20			NO	UMS-1	UMS-1				
ORB22			NO	UMS-1	UMS-1				
ORB24			NO	UMS-1	UMS-1				
ORB26			NO	UMS-1	UMS-1				
ORB30			NO	UMS-1	UMS-1				
ORB32			NO	UMS-1	UMS-1				
ORB34			NO	UMS-1	UMS-1				
ORB36			NO	UMS-1	UMS-1				
ORB38			NO	UMS-1	UMS-1				
ORB40			YES	UMS-1	UMS-1				
ORB42			YES	UMS-1	UMS-1				
ORB44			YES	UMS-1	UMS-1				
ORB48			YES	UMS-1	UMS-1				
ORB52			YES	UMS-1	UMS-1				
ORB54			YES	UMS-1	UMS-1				
ORB56			YES	UMS-1	UMS-1				
ORB64			YES	UMS-1	UMS-1				
ORB66			YES	UMS-1	UMS-1				
ORB68			NO	UMS-1	UMS-1				
ORB70			NO	UMS-1	UMS-1				
ORB72			YES	UMS-1	UMS-1				
ORB74			NO	UMS-1	UMS-1				
ORB76			NO	UMS-1	UMS-1				
ORB78			NO	UMS-1	UMS-1				
ORB80			YES	UMS-1	UMS-1				
ORB82			YES	UMS-1	UMS-1				
ORB86			YES	UMS-1	UMS-1				
ORB88			YES	UMS-1	UMS-1				
ORB92			YES	UMS-1	UMS-1				
ORB98			YES	UMS-1	UMS-1				
ORB100			YES	UMS-1	UMS-1				
ORB102			YES	UMS-1	UMS-1				
ORB142			NO	UMS-1	UMS-1				
ORB136			YES	UMS-1	UMS-1				
ORB118			YES	UMS-1	UMS-1				
ORB202			YES	UMS-1	UMS-1				
ORB188			YES	UMS-1	UMS-1				
ORB200			NO	UMS-1	UMS-1				
ORB160			YES	UMS-1	UMS-1				
ORB166			NO	UMS-1	UMS-1				
ORB182			NO	UMS-1	UMS-1				
ORB180			NO	UMS-1	UMS-1				
ORB164			YES	UMS-1	UMS-1				
ORB126			NO	UMS-1	UMS-1				
ORB132			NO	UMS-1	UMS-1				
ORB112			NO	UMS-1	UMS-1				
ORB168			YES	UMS-3	UMS-3			2016	Decommission
ORB170			YES	UMS-3	UMS-3			2016	Decommission
ORB172			YES	UMS-3	UMS-3			2016	Decommission
ORB106			YES	UMS-1	UMS-1				
ORB204			YES	UMS-1	UMS-1				
ORB210			NO	UMS-1	UMS-1				
ORB212			YES	UMS-1	UMS-1				
ORB214			YES	UMS-1	UMS-1				
ORB216			YES	UMS-1	UMS-1				
ORB218			YES	UMS-1	UMS-1				
ORB222			YES	UMS-1	UMS-1				
ORB228			YES	UMS-1	UMS-1				
ORB230			YES	UMS-1	UMS-1				
ORB234			YES	UMS-1	UMS-1				
ORB236			YES	UMS-1	UMS-1				
ORB238			YES	UMS-1	UMS-1				
ORB240			YES	UMS-1	UMS-1				
ORB242			YES	UMS-1	UMS-1				

MANAGEMENT UNIT NAME: WHISKEY JACK FOREST
PLAN PERIOD: April 1, 2012 TO March 31, 2022

[X] Phase 1 (Years 1-5)
[ ] Phase 2 (Years 6-10)

FMP-18 Road Construction and Use Management

Road or Road Network Identifier	Plan Start Length (km)			Use Management					
		Planned Construction 10 Year	Planned Construction This Term	Maintenance	Monitoring	Access Control		Future Use Management	
						Type	Year	Transfer Year	Management Intent
ORB244			YES	UMS-1	UMS-1				
ORB248			YES	UMS-1	UMS-1				
ORB250			YES	UMS-1	UMS-1				
ORB254			YES	UMS-1	UMS-1				
ORB256			YES	UMS-1	UMS-1				
ORB262			YES	UMS-1	UMS-1				
ORB266			YES	UMS-1	UMS-1				
ORB268			YES	UMS-1	UMS-1				
ORB270			YES	UMS-1	UMS-1				
ORB272			NO	UMS-1	UMS-1				
ORB274			YES	UMS-1	UMS-1				
ORB276			YES	UMS-1	UMS-1				
ORB278			NO	UMS-1	UMS-1				
ORB282			YES	UMS-1	UMS-1				
ORB286			NO	UMS-1	UMS-1				
ORB288			YES	UMS-1	UMS-1				
ORB290			YES	UMS-1	UMS-1				
ORB292			YES	UMS-1	UMS-1				
ORB296			YES	UMS-1	UMS-1				
ORB298			YES	UMS-1	UMS-1				
ORB300			YES	UMS-1	UMS-1				
ORB304			YES	UMS-1	UMS-1				
ORB308			NO	UMS-1	UMS-1				
ORB312			YES	UMS-1	UMS-1				
ORB314			NO	UMS-1	UMS-1				
ORB316			NO	UMS-1	UMS-1				
ORB318			NO	UMS-1	UMS-1				
ORB320			YES	UMS-1	UMS-1				
ORB326			YES	UMS-1	UMS-1				
ORB332			YES	UMS-1	UMS-1				
ORB334			YES	UMS-1	UMS-1				
ORB336			YES	UMS-1	UMS-1				
ORB344			YES	UMS-1	UMS-1				
ORB346			YES	UMS-1	UMS-1				
ORB342			YES	UMS-1	UMS-1				
ORB348			YES	UMS-1	UMS-1				
ORB350			YES	UMS-1	UMS-1				
ORB352			YES	UMS-1	UMS-1				
ORB360			YES	UMS-1	UMS-1				
ORB364			YES	UMS-1	UMS-1				
ORB372			YES	UMS-1	UMS-1				
ORB374			YES	UMS-1	UMS-1				
ORB376			YES	UMS-1	UMS-1				
ORB378			YES	UMS-1	UMS-1				
ORB382			YES	UMS-1	UMS-1				
ORB386			YES	UMS-1	UMS-1				
ORB394			YES	UMS-1	UMS-1				
ORB396			YES	UMS-1	UMS-1				
ORB398			YES	UMS-1	UMS-1				
ORB400			YES	UMS-1	UMS-1				
ORB402			YES	UMS-1	UMS-1				
ORB404			YES	UMS-1	UMS-1				
ORB406			NO	UMS-1	UMS-1				
ORB410			NO	UMS-1	UMS-1				
ORB412			NO	UMS-1	UMS-1				
ORB414			NO	UMS-1	UMS-1				
ORB416			NO	UMS-1	UMS-1				
ORB418			YES	UMS-1	UMS-1				
ORB424			YES	UMS-1	UMS-1				
ORB426			YES	UMS-1	UMS-1				
ORB428			YES	UMS-1	UMS-1				
ORB448			YES	UMS-1	UMS-1				
ORB460			YES	UMS-1	UMS-1				
ORB462			YES	UMS-1	UMS-1				
ORB466			NO	UMS-1	UMS-1				
ORB500			NO	UMS-1	UMS-1				
ORB502			NO	UMS-1	UMS-1				
ORB504			NO	UMS-1	UMS-1				
ORB508			NO	UMS-1	UMS-1				
ORB512			NO	UMS-1	UMS-1				
ORB516			NO	UMS-1	UMS-1				
ORB520			NO	UMS-1	UMS-1				
ORB522			NO	UMS-1	UMS-1				

MANAGEMENT UNIT NAME: WHISKEY JACK FOREST
PLAN PERIOD: April 1, 2012 TO March 31, 2022

[X] Phase 1 (Years 1-5)
[ ] Phase 2 (Years 6-10)

FMP-18 Road Construction and Use Management

Road or Road Network Identifier	Plan Start Length (km)	Planned Construction 10 Year	Planned Construction This Term	Use Management					
				Maintenance	Monitoring	Access Control		Future Use Management	
						Type	Year	Transfer Year	Management Intent
ORB524			NO	UMS-1	UMS-1				
ORB526			NO	UMS-1	UMS-1				
ORB528			NO	UMS-1	UMS-1				
ORB530			NO	UMS-1	UMS-1				
ORB534			NO	UMS-1	UMS-1				
ORB540			NO	UMS-1	UMS-1				
ORB544			YES	UMS-1	UMS-1				
ORB546			NO	UMS-1	UMS-1				
ORB548			NO	UMS-1	UMS-1				
ORB550			NO	UMS-1	UMS-1				
ORB552			NO	UMS-1	UMS-1				
ORB554			NO	UMS-1	UMS-1				
ORB556			NO	UMS-1	UMS-1				
ORB560			NO	UMS-1	UMS-1				
ORB562			NO	UMS-1	UMS-1				
ORB564			NO	UMS-1	UMS-1				
ORB568			NO	UMS-1	UMS-1				
ORB582			NO	UMS-1	UMS-1				
ORB584			NO	UMS-1	UMS-1				
ORB586			NO	UMS-1	UMS-1				
ORB588			NO	UMS-1	UMS-1				
ORB592			NO	UMS-1	UMS-1				
ORB594			NO	UMS-1	UMS-1				
ORB596			YES	UMS-1	UMS-1				
ORB598			NO	UMS-1	UMS-1				
ORB600			NO	UMS-1	UMS-1				
ORB612			NO	UMS-1	UMS-1				
ORB622			NO	UMS-1	UMS-1				
ORB640			NO	UMS-1	UMS-1				
ORB644			YES	UMS-1	UMS-1				
ORB646			YES	UMS-1	UMS-1				
ORB648			YES	UMS-1	UMS-1				
ORB656			NO	UMS-1	UMS-1				
ORB658			NO	UMS-1	UMS-1				
ORB660			YES	UMS-1	UMS-1				
ORB662			YES	UMS-1	UMS-1				
ORB667			NO	UMS-1	UMS-1				
ORB666			NO	UMS-1	UMS-1				
ORB670			NO	UMS-1	UMS-1				
ORB672			NO	UMS-1	UMS-1				
ORB676			YES	UMS-1	UMS-1				
ORB678			YES	UMS-1	UMS-1				
ORB680			YES	UMS-1	UMS-1				
ORB684			NO	UMS-1	UMS-1				
ORB686			NO	UMS-1	UMS-1				
ORB688			YES	UMS-1	UMS-1				
ORB690			NO	UMS-1	UMS-1				
ORB692			NO	UMS-1	UMS-1				
ORB694			NO	UMS-1	UMS-1				
ORB696			NO	UMS-1	UMS-1				
ORB698			NO	UMS-1	UMS-1				
ORB700			NO	UMS-1	UMS-1				
ORB702			NO	UMS-1	UMS-1				
ORB704			NO	UMS-1	UMS-1				
ORB710			NO	UMS-1	UMS-1				
ORB712			NO	UMS-1	UMS-1				
ORB714			NO	UMS-1	UMS-1				
ORB716			NO	UMS-1	UMS-1				
ORB718			NO	UMS-1	UMS-1				
ORB720			NO	UMS-1	UMS-1				
ORB722			NO	UMS-1	UMS-1				
ORB724			NO	UMS-1	UMS-1				
ORB730			NO	UMS-1	UMS-1				
ORB734			NO	UMS-1	UMS-1				
ORB736			NO	UMS-1	UMS-1				
ORB738			NO	UMS-1	UMS-1				
ORB740			NO	UMS-1	UMS-1				
ORB742			NO	UMS-1	UMS-1				
ORB744			NO	UMS-1	UMS-1				
ORB746			NO	UMS-1	UMS-1				
ORB748			NO	UMS-1	UMS-1				
ORB750			NO	UMS-1	UMS-1				
ORB752			NO	UMS-1	UMS-1				

MANAGEMENT UNIT NAME: WHISKEY JACK FOREST
PLAN PERIOD: April 1, 2012 TO March 31, 2022

[X] Phase 1 (Years 1-5)
[ ] Phase 2 (Years 6-10)

FMP-18 Road Construction and Use Management

Road or Road Network Identifier	Plan Start Length (km)	Planned Construction 10 Year	Planned Construction This Term	Use Management					
				Maintenance	Monitoring	Access Control		Future Use Management	
						Type	Year	Transfer Year	Management Intent
ORB754			NO	UMS-1	UMS-1				
ORB756			YES	UMS-1	UMS-1				
ORB762			YES	UMS-1	UMS-1				
ORB766			NO	UMS-1	UMS-1				
ORB770			NO	UMS-1	UMS-1				
ORB774			NO	UMS-1	UMS-1				
ORB776			NO	UMS-1	UMS-1				
ORB778			NO	UMS-1	UMS-1				
ORB780			NO	UMS-1	UMS-1				
ORB782			NO	UMS-1	UMS-1				
ORB784			NO	UMS-1	UMS-1				
ORB786			NO	UMS-1	UMS-1				
ORB788			NO	UMS-1	UMS-1				
ORB794			YES	UMS-1	UMS-1				
ORB798			NO	UMS-1	UMS-1				
ORB808			NO	UMS-1	UMS-1				
ORB810			NO	UMS-1	UMS-1				
ORB390			YES	UMS-1	UMS-1				
ORB392			NO	UMS-1	UMS-1				
ORB388			NO	UMS-1	UMS-1				
ORB384			NO	UMS-1	UMS-1				
ORB533			NO	UMS-1	UMS-1				
ORB532			NO	UMS-1	UMS-1				
ORB510			NO	UMS-1	UMS-1				
ORB558			NO	UMS-1	UMS-1				
ORB536			NO	UMS-1	UMS-1				
ORB537			NO	UMS-1	UMS-1				
ORB206			NO	UMS-1	UMS-1				
ORB811			NO	UMS-1	UMS-1				
ORB812			NO	UMS-1	UMS-1				
ORB813			NO	UMS-1	UMS-1				
ORB814			NO	UMS-1	UMS-1				
ORB815			NO	UMS-1	UMS-1				
ORB816			NO	UMS-1	UMS-1				
ORB817			NO	UMS-1	UMS-1				
ORB819			NO	UMS-1	UMS-1				
ORB820			NO	UMS-1	UMS-1				
ORB821			NO	UMS-1	UMS-1				
ORB822			YES	UMS-1	UMS-1				
ORB823			NO	UMS-1	UMS-1				
ORB824			NO	UMS-1	UMS-1				
ORB825			YES	UMS-1	UMS-1				
ORB826			NO	UMS-1	UMS-1				
ORB827			NO	UMS-1	UMS-1				
ORB828			NO	UMS-1	UMS-1				
ORB830			NO	UMS-1	UMS-1				
ORB831			NO	UMS-1	UMS-1				
ORB832			YES	UMS-1	UMS-1				
ORB833			NO	UMS-1	UMS-1				
ORB176			YES	UMS-3	UMS-3			2016	Decommission
ORB280			YES	UMS-1	UMS-1				
ORB630			NO	UMS-1	UMS-1				
ORB320ER			YES	UMS-3	UMS-3			2022	decommission
ORB326ER			YES	UMS-3	UMS-3			2022	decommission
ORB332ER			YES	UMS-3	UMS-3			2022	decommission
ORB344ER			YES	UMS-3	UMS-3			2022	decommission
ORB622ER			NO	UMS-3	UMS-3			2022	decommission
ORB622ERa			NO	UMS-3	UMS-3			2022	decommission
ORB346ER			YES	UMS-3	UMS-3			2022	decommission
ORB448ER			YES	UMS-3	UMS-3			2022	decommission
ORB448ERa			YES	UMS-3	UMS-3			2022	decommission
ORB596ER			YES	UMS-3	UMS-3			2022	decommission
ORB600ER			NO	UMS-3	UMS-3			2022	decommission
ORB612ER			NO	UMS-3	UMS-3			2022	decommission
ORB660ER			YES	UMS-3	UMS-3			2022	decommission
ORB670ER			NO	UMS-3	UMS-3			2022	decommission
			YES	UMS-1	UMS-1				
Existing Roads - Not included in ORBs									
Subtotal									
Total	893.4								

MANAGEMENT UNIT NAME: WHISKEY JACK FOREST
PLAN PERIOD: April 1, 2012 TO March 31, 2022

[X] Phase 1 (Years 1-5)
[ ] Phase 2 (Years 6-10)

FMP-18 Road Construction and Use Management

Road or Road Network Identifier	Plan Start Length (km)	Planned Construction 10 Year	Planned Construction This Term	Use Management					
				Maintenance	Monitoring	Access Control		Future Use Management	
						Type	Year	Transfer Year	Management Intent

Summary of Use Management Strategies (UMS), as fully described in Supplementary Documentation G.

Road monitoring and maintenance will follow:

o Conditions for Water Crossings (Plan Text Section 4.7.4) and as documented in the AOC Supplementary Documentation G of this plan.

UMS-1

1. These roads and each associated right-of-way will receive maintenance, which will be carried out as required to maintain the road for forest management purposes (e.g. harvest, renewal, tending, transportation and hauling activities). These roads will be maintained to minimize risk to road users and minimize the potential for environmental damage. Routine maintenance operations may include any one or combination of the following: summer grading, ditching, drainage, brush clearing with mechanical or chemical methods (e.g. application of chemical herbicides for vegetation control along road shoulders), gravelling, re-shaping of road bed, dust control measures, signage, snow plowing, sanding/salting and clearing existing right-of-ways including the harvest of merchantable trees as required. Maintenance may also include non-emergency repairs of existing water crossings to clean culverts, remove blockages caused by beavers, and to apply material (e.g. gravel, riprap) to mitigate or enhance long-term erosion protection around water crossings.

1. (cont.) For safety/engineering concerns minor road re-alignment and bypass construction may also be required for existing roads during the implementation of the FMP. This is permitted within the existing right-of-way, subject to the confirmation of values and the application of all applicable AOCs to the proposed work area. If an appropriate AOC does not exist in the FMP note that it will need to be amended into the FMP and then applied. In cases where new and/or replacement water crossings are required during the implementation of the FMP, the replacement of culverts are permitted subject to the following conditions; the values must be reviewed and updated for each location to ensure up-to-date values are considered, the applicable AOC must be applied to address any value impacted at the location (if an appropriate AOC does not exist in the FMP note that it will need to be amended into the FMP and then applied), and the planned water crossing replacements are identified and approved (with all applicable conditions on the construction, including preventative and mitigative measures) in the AWS for the year of construction.
1. (cont.) Emergency maintenance is defined as “road maintenance that required immediate attention to restore access and reduce the chance of personal injury, damage to equipment, inconvenience to road users and further road damage” (2009 FMPM). Emergency maintenance will be necessary where public safety and/or environmental damage have occurred unexpectedly. Emergency repairs can proceed immediately without MNR approval provided the emergency works are limited in scope to only what is necessary to address essential public safety concerns and restrict further environmental damage. All emergency actions will be reported to MNR as soon as practical and any further actions (e.g. restoration, reconstruction, abandonment) will be subject to normal planning approvals. Where sediment has been released into a watercourse, the Ministry of the Environment is to be informed.

1. (cont.) Where water crossings have been adversely impacted by unplanned events, water crossings may not be restored in a timely manner and remedial work may be limited to only eliminating or reducing safety hazards and/or interim measures to stop environmental damage. Access to areas impacted by unplanned events could be disrupted at any time and there is no obligation on the Crown or the Forest Industry to undertake repair work to restore infrastructure and access. However, all actions must be consistent with the Use Management Strategy for the road/road network. Situations could also arise where it is determined that a damaged/deteriorating infrastructure is unsafe and continued use must be prohibited until a permanent solution is implemented.

2. While the road/road network is in use for forest management purposes (e.g. harvest, renewal, tending, transportation and hauling activities), it will be monitored on an ongoing basis for safety or environmental concerns. Bridges used for ‘heavy truck hauls’ inspected at least once a year by a competent person (following the inspection guidelines in Appendix E of the Crown Land Bridge Management Guidelines or by a professional engineer). When the road/road network is not in use for forest management purposes, monitoring will be based on a yearly schedule of specific roads to be inspected. This yearly schedule will be based upon a risk assessment approach with emphasis on the potential values which could be impacted (i.e. fish habitat) and the potential for public safety concerns and, at a minimum, these roads (including bridges open to public travel) will be inspected at least once every three years. Monitoring may occur as part of aerial assessments of reforestation (e.g. FTG surveys). In addition, all staff and contractors (harvest, renewal and tending contractors) are to report any existing or potential concerns regarding the road/road network and water crossings encountered while travelling on roads throughout the forest. Reports from the general public and other user groups will also contribute to the monitoring of the condition of the roads and water crossings. Additional monitoring will be considered based upon a risk assessment approach following severe weather conditions (e.g. heavy rainfall).

UMS-2

o Same as UMS-1 with some access controls identified above.

UMS-3

o Same as UMS-1 with decommissioning requirements. The conditions for roads that are to be decommissioned and regenerated can be found in Section 4.5.8 of the Plan text. This decommissioning may involve the physical destruction and re-vegetation of the roadbed and the removal of high risk water crossings. All water crossings will be examined using MNR’s criteria for removal of water crossings (*Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* page 143-144) to determine whether decommissioning activities are appropriate based upon biological, water quality, engineering and safety factors. Water crossings planned for decommissioning will be identified in the applicable AWS, reviewed with respect to the Fisheries Act, and approved with any resulting conditions.

MANAGEMENT UNIT NAME: Whiskey Jack Forest **[X] Phase 1 (Years 1-5)**
PLAN PERIOD: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Years 6-10)**

FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

List of AOCs in this table:

AOC ID	A. Primary/Branch Roads
A01	Existing roads
WS01	April South Road, Bug Lake Road, Yellow Girl Road, Aesthetic Road, Witch Bay Road
AOC ID	B. Operational Roads
A01	
D01	
D02	
D03	
D04	
D05	
M01	
N01	
N02	
N03	
N04	
ON01	
ON02	
ON03	
ON04	
BH01	
BH02	
BG01	
BS01	
BS02	
HO01	
HO02	
NO01	
NO02	
NO03	
NO04	
NO05	
NO06	
NO07	
NO08	
PL01	

MANAGEMENT UNIT NAME: Whiskey Jack Forest **[X] Phase 1 (Years 1-5)**
PLAN PERIOD: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Years 6-10)**

FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

RR01	
NG01	
HB01	
LS01	
TV01	
TVgl	
TVnsl	
TVw	
TVwl	
TVal	
TVer	
TVp	
WL01	
WL02	
WS01	
WS02	
WW01	
WW02	
FL01	
NE10	
AOC ID	C. Aggregate Pits
A01	
D01	
D02	
D03	
D04	
D05	
M01	
N01	
N02	
N03	
N04	
ON01	
ON02	
ON03	
ON04	

MANAGEMENT UNIT NAME: Whiskey Jack Forest **[X] Phase 1 (Years 1-5)**
PLAN PERIOD: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Years 6-10)**

FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

BH01	
BH02	
BG01	
BS01	
HO01	
HO02	
NO01	
NO02	
NO03	
NO04	
NO05	
NO06	
NO07	
NO08	
PGP01	
PL01	
RR01	
NG01	
HB01	
LS01	
TV01	
TVgl	
TVw	
TVwl	
TVal	
TVer	
TVp	
WL01	
WL02	
WS01	
WS02	
WW01	
WW02	
FL01	
NE10	

MANAGEMENT UNIT NAME: Whiskey Jack Forest **[X] Phase 1 (Years 1-5)**
PLAN PERIOD: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Years 6-10)**

FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

A. Primary Roads, Branch Roads and Landings

AOC Identifier	Road Identifier	Water Crossing	Planned or Existing		Acceptable Variations	
			Location	Conditions on Construction or Use	Location	Conditions on Construction or Use
A01				Existing Roads Use and maintenance of existing roads (i.e. previously disturbed right of ways) do not represent a new disturbance and therefore do not require archaeological assessment. Culvert replacement at an existing water crossing could result in a new disturbance as compared to the original culvert installation, in which case the significance of the disturbance must be assessed and an archaeological assessment may be required. Water crossing conditions found in AOC WS01, WS02 apply where applicable. If the protection measures for an area of archaeological potential are not complied with, operations must immediately cease within the area of concern and a Stage 2 archaeological assessment per Ministry of Culture's current standards and guidelines for consultant archaeologists shall occur. If a cultural heritage value is discovered during operations (e.g. an arrowhead, cemetery, or old logging camp) then operations must immediately stop and the district MNR staff will be contacted as per the Forest Information Manual. The value class of the discovery will determine who of the following will be contacted: Ministry of Culture staff, the local Aboriginal community, Registrar of Cemeteries, and/or the provincial cultural heritage specialist. When the class of cultural heritage value is established, the appropriate protection measure(s) will be applied and a plan amendment will be processed if required. When human remains are discovered, work at the site must be suspended and the police notified. It is also appropriate to notify the MNR district staff. The police will investigate the report to determine if the human remains are of forensic interest or represent a burial site as defined by the *Cemeteries Act*. All involved parties must act to safeguard the location until the police attend the site, and to limit media contact or display.		

MANAGEMENT UNIT NAME: Whiskey Jack Forest **[X] Phase 1 (Years 1-5)**
PLAN PERIOD: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Years 6-10)**

FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

A. Primary Roads, Branch Roads and Landings

AOC Identifier	Road Identifier	Water Crossing	Planned or Existing		Acceptable Variations	
			Location	Conditions on Construction or Use	Location	Conditions on Construction or Use
WS01	April South Road, Bug Lake, Yellow Girl, Aesthetic Road, Witch Bay Road	Yes	AP-01, AP-02, YE-01, YE-02, BU-01, BU-02, AE-01, AE-02, AE-03, AE-04, WB-01, WB-02, WB-03, WB-04, WB-05, WB-06, WB-06, WB-07, WB-08, WB-09	<u>Design and Location</u> The preliminary location and conditions outlined in this area of concern for a water crossing will be confirmed or changed in the AWS. If the conditions or locations are changed, the change must be consistent with the FMP. The culvert or bridge opening size shall be determined by hydrologic and hydraulic analyses, in accordance with design procedures developed for Ontario use. A water crossing structure with a single span greater than 3 m is considered a bridge; design of all bridges will comply with the requirements in the *Crown Land Bridge Management Guidelines*. Selection of the type of water crossings structure, its location and its capacity to pass water and allow for the movement of fish, will consider: i. Possible negative effects on the form and function of the undisturbed natural channel and its floodplain; ii. The fish species present and the impact of the crossing structure on them, as required by the *Fisheries Act*, and iii. Whether the water crossing is over navigable waters. Avoid crossing in areas which affect known critical fish habitat, such as fish spawning, feeding, over-wintering, or nursery areas. Avoid steep banks or sites where actively slumping banks are evident. <u>Installation and maintenance</u> Those responsible for installation and maintenance will monitor operations and select operating practices, materials, and mitigation techniques at each water crossing to prevent the harmful alteration, disruption or destruction of fish habitat or the impairment of water quality. Harmful alteration, disruption, or destruction of fish habitat is not permitted without DFO approval.	Any location within 100 m mapped corridor/AOC with the exception of identified restricted area.	

MANAGEMENT UNIT NAME: Whiskey Jack Forest **[X] Phase 1 (Years 1-5)**
PLAN PERIOD: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Years 6-10)**

FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

A. Primary Roads, Branch Roads and Landings

AOC Identifier	Road Identifier	Water Crossing	Planned or Existing		Acceptable Variations	
			Location	Conditions on Construction or Use	Location	Conditions on Construction or Use
				The installation of a water crossing will not result in the impediment of fish passage; mitigative techniques will be applied if the structure has the potential to impede or block fish migration or passage. Materials moved during construction, such as grubbed or earth fill material, will not be piled where they block drainage courses. At any time of year, the free movement of water and fish will not be blocked or otherwise impeded, except for brief periods during construction and as approved by MNR. The removal of stream boulders is generally not acceptable, except where necessary for installation of a crossing structure which retains a natural streambed (e.g., a bridge). Fill material required to build the road at the site of the crossing, below the high water level and within the floodplain of the water feature, will be erosion resistant and/or protected from erosion. Any exposed mineral soil between the height of land and the water crossing, or within 100 m of the water crossing, whichever is less, will be trimmed to a stable angle and be protected from erosion so sediment will not enter water. During construction and maintenance of a water crossing, contamination of a water feature by foreign materials such as lumber, nails, fuel, oil, or herbicides is not permitted (the crossing structure itself, including temporary crossings, can be in the water, if the approved design allows for this). Prevent sediment from entering the water features by using erosion and sediment control techniques. Blasting in or near water produces shock waves that can kill		

MANAGEMENT UNIT NAME: Whiskey Jack Forest **[X] Phase 1 (Years 1-5)**
PLAN PERIOD: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Years 6-10)**

FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

A. Primary Roads, Branch Roads and Landings

AOC Identifier	Road Identifier	Water Crossing	Planned or Existing		Acceptable Variations	
			Location	Conditions on Construction or Use	Location	Conditions on Construction or Use
				fish and will normally be avoided. Blasting with a potential impact on fish or fish habitat will only be done following approval from DFO. Upon completion of a water crossing, any temporary fill, culverts, refuse, etc. will be removed from the construction area and properly disposed of in a satisfactory manner. After construction, on-site inspections will be made by the proponent to confirm these standards are being met. If using temporary winter-only crossings, materials other than ice and snow will be removed from the stream prior to spring break-up. Upon installation, each new water crossing will be incorporated into the approved program for monitoring roads and water crossings. These standards are applicable to previously installed water crossings when they are replaced or upgraded due to sub-standard safety, environmental, or operational reasons. Use techniques and materials appropriate for the conditions encountered at each water crossing, to minimize disturbance of a water feature and significantly reduce the potential for erosion and sedimentation. Ensure logs and brush which may need to be removed or trimmed at the crossing site do not enter the water feature. Grubbing of low vegetative cover between the height of land and a water crossing, or within 100 m of a water crossing, whichever is less, will be limited to that required to address engineering issues and safety concerns, such as the removal of hazards. When diverting and/or removing water for dry installations, chase away or trap and relocate live fish before completely		

MANAGEMENT UNIT NAME: Whiskey Jack Forest **[X] Phase 1 (Years 1-5)**
PLAN PERIOD: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Years 6-10)**

FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

A. Primary Roads, Branch Roads and Landings

AOC Identifier	Road Identifier	Water Crossing	Planned or Existing		Acceptable Variations	
			Location	Conditions on Construction or Use	Location	Conditions on Construction or Use
				dewatering the area (note: permits may be required; consult the local MNR district office for further information). Apply mitigative techniques to provide for fish passage if there is potential to impede or block fish migration during installation of the crossing. Begin site stabilization and clean-up as soon as possible after the water crossing has been installed, including the removal of all diversions. Trim fill slopes to a stable angle, or use other mitigative stabilization techniques. A person should be able to walk up the slope without causing slumping and sliding of soil particles. When a temporary channel is no longer required, it should be stabilized to avoid long-term erosion. Construct and use fords during the driest time of the year but not during the restricted time of high risk to fish; ensure the ford does not restrict fish passage. Material used within the stream and on the banks to improve the crossing will be clean, non-erodable, and non-toxic to aquatic life. Install culverts on a straight section of stream. When installation of a culvert on a straight section of stream is not possible, minimize the change in stream morphology and impacts on fish habitat. <u>Conditions on Construction</u> No landings are permitted within the area of concern. Fill material placed to build the road below high water level within the floodplain of water body will be erosion resistant and/or protected from erosion. Materials moved during construction, such as grubbed or earth fill material, will not be piled where they block drainage courses.		

MANAGEMENT UNIT NAME: Whiskey Jack Forest **[X] Phase 1 (Years 1-5)**
PLAN PERIOD: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Years 6-10)**

FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

A. Primary Roads, Branch Roads and Landings

AOC Identifier	Road Identifier	Water Crossing	Planned or Existing		Acceptable Variations	
			Location	Conditions on Construction or Use	Location	Conditions on Construction or Use
				Grubbing or stripping within the 100 metre width or to the height of land (whichever comes first) of the location of the crossing on both sides of the waterway will be kept to an absolute minimum required for construction and where required must be stabilized to prevent erosion. Any exposed mineral soil between the height of land and a water crossing, or within 100 m of a water crossing, whichever is less, will be trimmed to a stable angle of repose and be protected from erosion so sediment will not enter the water after construction. New roads that traverse the AOC will be planned to avoid areas with a high potential to contain ephemeral streams, springs, seeps and other areas of groundwater discharge. Crossings of recognizable ephemeral streams, springs, seeps, and other areas of groundwater discharge will consider the design principles in this AOC to minimize the risk of sediment delivery and disruption of hydrological function. <u>Right-of-way (ROW)</u> The right-of-way for the stream crossing will be cleared to a minimum width needed for construction to a maximum width of 20 metres for a distance from the stream within the AOC as per FMP-10: <u>Slope AOC width</u> 0 to 15% 30 metres >15 to 30% 50 metres >30 to 45% 70 metres >45%+ 90 metres <u>Timing Restriction</u> Construction operations that may enter a water feature or that may cause sediment to enter a water feature are not to occur during periods of fish spawning, incubation, or fry emergence, unless approved by MNR. The timing restrictions for operations where the following local fish species are present		

MANAGEMENT UNIT NAME: Whiskey Jack Forest **[X] Phase 1 (Years 1-5)**
PLAN PERIOD: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Years 6-10)**

FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

A. Primary Roads, Branch Roads and Landings

AOC Identifier	Road Identifier	Water Crossing	Planned or Existing		Acceptable Variations	
			Location	Conditions on Construction or Use	Location	Conditions on Construction or Use
				are listed below: Walleye, Northern Pike, Lake Sturgeon: April 1st to June 15th. Muskellunge: May 1st to June 30th. Largemouth and Smallmouth Bass: May 15th to July 15th. Rainbow Trout or Unknown species: April 1st to July 15th. Lake Trout are present: Sept. 15th to May 15th. Brook Trout or Unknown species: Sept. 1st to June 15th. Lake Whitefish: Oct. 1st to May 15th. Lake Herring: Oct. 15th to May 15th. Some site conditions may require applying multiple timing restrictions. If warranted (i.e. late spring, no fish habitat) the MNR may vary timing dates based on local knowledge. The MNR will confirm at the AWS level all timing restriction conditions.		

MANAGEMENT UNIT NAME: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
PLAN PERIOD: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10**

FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

B. Operational Roads and Landings

AOC or AOC Group Identifier	Public Comment	Planned or Existing Conditions on Location, Construction or Use
A01		**Archaeological Potential Area:** Conditions on Location Operational roads are permitted in APAs with conditions below. Operational roads are to be minimized as much as possible in an APA. Conditions on Construction If there will be mineral soil disturbance within an APA then a Ministry of Culture's Stage 2 archaeological assessment is required and the report's recommendations followed. Regular operations can occur following the archaeological assessment where nothing has been found, the recommendation is that no further archaeological work is required, and the Ministry of Culture has reviewed the report. Use and maintenance of existing operational roads (i.e. previously disturbed right of ways) do not represent a new disturbance and therefore do not require archaeological assessment. Culvert replacement at an existing water crossing could result in a new disturbance as compared to the original culvert installation, in which case the significance of the disturbance must be assessed and an archaeological assessment may be required. An archaeological assessment is not required for operational roads that can be built with no mineral soil disturbance. Situations where operational roads can be constructed with no mineral soil disturbance might include: • Winter roads and landings constructed over packed snow and when the ground is frozen >20cm; • Water crossings constructed using snow, ice or a temporary bridge which do not require grubbing, filling or ditching, and only used while the ground is frozen >20cm • Minor alterations to the water course for culvert placement (e.g. removing a rock); and • Water crossings constructed using temporary bridges without in-ground footings. In winter, this provision applies to roads with approaches constructed using packed snow on frozen ground (>20cm). For other seasons, this provision applies to roads with approaches constructed using less than 2 metres of fill; the fill must be placed over geotextile, corduroy or brush mats; and there must be no grubbing or ditching. Water crossing conditions found in AOC WS01, WS02 apply where applicable. If the protection measures for an area of archaeological potential are not complied with, operations must immediately cease within the area of concern and a Stage 2 archaeological assessment per Ministry of Culture's current standards and guidelines for consultant archaeologists shall occur. If a cultural heritage value is discovered during operations (e.g. an arrowhead, cemetery, or old logging camp) then operations must immediately stop and the district MNR staff will be contacted as per the Forest Information Manual. The value class of the discovery will determine who of the following will be contacted: Ministry of Culture staff, the local Aboriginal community, Registrar of Cemeteries, and/or the provincial cultural heritage specialist. When the class of cultural heritage value is established, the appropriate protection measure(s) will be applied and a plan amendment will be processed if required. When human remains are discovered, work at the site must be suspended and the police notified. It is also appropriate to notify the MNR district staff. The police will investigate the report to determine if the human remains are of forensic interest or represent a burial site as defined by the *Cemeteries Act*. All involved parties must act to safeguard the location until the police attend the site, and to limit media contact or display.

MANAGEMENT UNIT NAME: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
PLAN PERIOD: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10**

FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

B. Operational Roads and Landings

AOC or AOC Group Identifier	Public Comment	Planned or Existing Conditions on Location, Construction or Use
D01		**Occupied Black Bear Den:** **Denning Period (October 15 to April 30):** • Road construction is not permitted within 100m of occupied dens. • Hauling and road maintenance operations are not permitted within 100 m of the den entrance, unless the road predates the den, is required for safety reasons or environmental protection.
D02		**Occupied Grey Fox Den:** **Denning Period (April 15 to September 15):** • Road construction is not permitted within100 m of the den entrance. • Hauling and road maintenance operations are not permitted within 50 m of the den unless the road predates the den, and is required for safety reasons or environmental protection. **Outside of the Denning Period (September 16 to April 14):** • No restrictions on road construction, maintenance or hauling operations.
D03		**Occupied Cougar Den:** **Denning Period:** • Road construction is not permitted within 200 m of the den entrance. • Hauling and road maintenance operations are not permitted within 100 m of the den unless the road predates the den, is required for safety reasons or environmental protection. **Note:** The*denning period* is potentially different for each occupied den encountered and is considered to extend for 8 weeks from the date an occupied den is located, or until a den is known to be no longer occupied. **Outside of the Denning Period:** • No restrictions on road construction, maintenance or hauling operations.
D04		**Wolf Den:** • New roads and landings are not permitted within the inner 100 m of the AOC. • Constructing of new roads and landings is not permitted within the outer 100m of the AOC unless it has been determined there is no other feasible alternative (e.g. terrain prevents road construction outside the AOC) in which case only one road is permitted and road will be built to the lowest standard necessary. • When roads are constructed within the AOC, temporary roads and/or water crossings will be used whenever practical and feasible to limit future access and disturbance (refer to AOC WS01 and WS02 for other conditions on water crossings that also apply). ***Denning Period* April 15 to July 15:**

MANAGEMENT UNIT NAME: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
PLAN PERIOD: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10**

FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

B. Operational Roads and Landings

AOC or AOC Group Identifier	Public Comment	Planned or Existing Conditions on Location, Construction or Use
		• Road construction is not permitted within 200 m of an occupied den during the *denning period*. • Hauling and road maintenance operations are not permitted within 100 m of an occupied den during the *denning period,* unless the road predates the den, is required for safety reasons or environmental protection.

D05		**Wolverine den:**
		• If a wolverine den is encountered all operations will stop within a 4km radius AOC and the Kenora District Office MNR will be immediately notified of the presence of a wolverine den in proximity to forest operations.
		• No further road/landing maintenance operations are permitted within the AOC.
		• Following the above the FMP may be amended by developing a new AOC, in consultation with MNR Biologists, with a den site management plan for a specific den site location that will include consideration of roads and landings in the AOC as follows:
		  • Denning generally occurs between February and May when snow depth is usually at its greatest;
		  • A Use Management Strategy for existing roads that will provide locally-appropriate measures to minimize road associated impacts on wolverines. This may include access controls while roads are in use and a decommissioning plan for roads following use.
		• Normally operational road construction will be prohibited in the AOC; however, some operations may be permitted to meet ecological, social or economic objectives. Where operations will be permitted the AOC will outline the extent and timing of any road/landing construction or maintenance operations.

M01		**Mineral licks:** • Operations associated with existing roads are permitted within the AOC. • New roads and landings are not permitted within the AOC.
N01		**Bald Eagle Primary Nest:** • New roads and landings are not permitted within 200 m of primary nests. • New roads and landings will not be constructed within 201-400 m of primary nests, unless no practical or feasible alternative locations exist (e.g. due to extremely rugged terrain in adjacent areas outside the AOC) in which case only one operational road or landing is permitted in the AOC. • When roads are constructed within the AOC, temporary roads and/or water crossings will be used whenever practical and feasible to limit future access and disturbance. See AOC WS01, WS02 for other conditions on water crossings that also apply when AOCs for aquatic features are crossed. • Operations associated with roads and landings are not permitted within 100-400 m of *occupied* nests during the *critical breeding period* (Feb. 15 – August 31) based on potential impact (see Table A, Table 19.1), unless required for safety reasons or environmental protection. • However, there is no timing restriction on hauling or low potential impact road maintenance operations (e.g., grading) if the road predates the nest. **Table A** **Potential Impacts** / **No operations within** High / 400 m Moderate / 200 m Low / 100 m

MANAGEMENT UNIT NAME: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
PLAN PERIOD: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10**

FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

B. Operational Roads and Landings

AOC or AOC Group Identifier	Public Comment	Planned or Existing Conditions on Location, Construction or Use
N02		**Bald Eagle Alternate Nest:** • New roads and landings are not permitted within 200 m of alternate nests. • No timing restriction on operations associated with roads and landings within the AOC.
N03		**Bald Eagle Inactive Nest:** • New roads and landings are not permitted within 100 m of inactive nests. • No timing restriction on operations associated with roads and landings within the AOC.
N04		**Bald Eagle Primary Nest Discovered During Operations But After Harvesting has Occurred within 200 metres of Nest:** • New roads and landings are not permitted within 200 m of primary nests. • New roads and landings will not be constructed within 201-400 m of primary nests, unless no practical or feasible alternative locations exist(e.g. due to extremely rugged terrain in adjacent areas outside the AOC) in which case only one operational road or landing is permitted in the AOC. • When roads are constructed within the AOC, temporary roads and/or water crossings will be used whenever practical and feasible to limit future access and disturbance. See AOC WS01, WS02 for other conditions on water crossings that also apply when AOCs for aquatic features are crossed. • Operations associated with roads and landings are not permitted within 100-400 m (see Table A, N01) of *occupied* nests during the *critical breeding period* (Feb. 15 – August 31) based on potential impact (see table FMP-19.1*),* unless required for safety reasons or environmental protection. • However, there is no timing restriction on hauling or low potential impact road maintenance operations (e.g., grading) if the road predates the nest.
ON01		**Osprey Primary Nest:** • New roads and landings are not permitted within 150 m of primary nests. • New roads and landings will not be constructed within 151-300 m of primary nests, unless no practical or feasible alternative locations exist(e.g. due to extremely rugged terrain in adjacent areas outside the AOC) in which case only one operational road or landing is permitted in the AOC. • When roads are constructed within the AOC, temporary roads and/or water crossings will be used whenever practical and feasible to limit future access and disturbance. See AOC WS01, WS02 for other conditions on water crossings that also apply when AOCs for aquatic features are crossed. • Operations associated with roads and landings are not permitted within 75-300 m of *occupied* nests during the *critical breeding period* (April 15 to August 31) based on potential impact (see Table A, Table 19.1), unless required for safety reasons or environmental protection. • However, there is no timing restriction on hauling or low potential impact road maintenance operations (e.g., grading) if the road predates the nest. **Table A** **Potential Impacts** / **No operations within** High / 300 m Moderate / 150 m Low / 75 m

MANAGEMENT UNIT NAME: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
PLAN PERIOD: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10**

FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

B. Operational Roads and Landings

AOC or AOC Group Identifier	Public Comment	Planned or Existing Conditions on Location, Construction or Use
ON02		**Osprey Alternate Nest:** • New roads and landings are not permitted within 150 m of alternate nests. • No timing restriction on operations associated with roads and landings within the AOC.
ON03		**Osprey Inactive Nest:** • New roads and landings are not permitted within 75 m of inactive nests. • No timing restriction on operations associated with roads and landings within the AOC.
ON04		**Primary Osprey Nest Discovered During Operations But After Harvesting has Occurred within 150 metres of Nest:** • New roads and landings are not permitted within 150 m of primary nests. • New roads and landings will not be constructed within 151-300 m of primary nests (see Table A, ON01), unless no practical or feasible alternative locations exist (i.e. due to extremely rugged terrain in adjacent areas outside the AOC in which case only one operational road or landing is permitted in the AOC). • When roads are constructed within the AOC, temporary roads and/or water crossings will be used whenever practical and feasible to limit future access and disturbance. See AOC WS01, WS02 for other conditions on water crossings that also apply when AOCs for aquatic features are crossed. • Operations associated with roads and landings are not permitted within 75-300 m of *occupied* nests during the *critical breeding period* (April 15 to August 31) based on potential impact (see table FMP-19.1) unless required for safety reasons or environmental protection. • However, there is no timing restriction on hauling or low potential impact road maintenance operations (e.g., grading) if the road predates the nest.
BH01		**Active Great Blue Heron Colonies:** • New roads and landings are not permitted within 150 m of colonies. • New roads and landings within 151-300 m of colonies (especially large colonies) are not permitted, unless no practical or feasible alternative locations exist (i.e. due to extremely rugged terrain in adjacent areas outside the AOC) in which case only one operational road or landing is permitted in the AOC. • When roads are constructed within the AOC, temporary roads and/or water crossings will be used whenever practical and feasible to limit future access and disturbance. See AOC WS01, WS02 for other conditions on water crossings that also apply when AOCs for aquatic features are crossed. Within residual forest, the width of the cleared corridor will be as narrow as practical and feasible, and will not exceed 20 m. • Operations associated with roads and landings are not permitted within 75-300 m of *occupied* nests (see Table A) within colonies during the *critical breeding period* (April 1 – Aug. 15) based on potential impact (see Table A, Table 19.1), unless required for safety reasons or environmental protection. • However, there is no timing restriction on hauling or low potential impact road maintenance operations (e.g., grading) if the road predates the colony. **Table A** **Potential Impacts** / **No operations within** High / 300 m Moderate / 150 m Low / 75 m

MANAGEMENT UNIT NAME: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
PLAN PERIOD: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10**

FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

B. Operational Roads and Landings

AOC or AOC Group Identifier	Public Comment	Planned or Existing Conditions on Location, Construction or Use
BH02		**Inactive Great Blue Heron Colonies:** • New landings are not permitted within the AOC. • New roads within the AOC are not permitted, unless no practical or feasible alternative locations exist (i.e. due to extremely rugged terrain in adjacent areas outside the AOC) in which case only one operational road is permitted in the AOC. • No timing restriction on operations associated with roads and landings within the AOC.
BG01		**Active colonies of Bonaparte's gull:** • New roads and landings are not permitted within 150 m of active colonies. • Operations associated with roads are not permitted within 40-150 m of *occupied* nests within colonies during the *critical breeding period* (May 1 to August 31)based on potential impact (see Table A, Table 19.1), unless required for safety reasons or environmental protection. • However, there is no timing restriction on hauling or low potential impact road maintenance operations (e.g., grading) if the road predates the colony. **Table A** **Potential Impacts** / **No operations within** High / 150 m Moderate / 75 m Low / 40 m
BS01		**Active large colonies of bank swallows (≥100 pairs)** • New roads and landings are not permitted within 50 m of active colonies. • Operations associated with roads and landings are not permitted within 10-50 m of occupied nests within colonies during the critical breeding period (May 1 – July 31)based on potential impact (see Table A, Table 19.1), unless required for safety reasons or environmental protection. • However, there is no timing restriction on hauling or low potential impact road maintenance operations (e.g., grading) if the road predates the colony. **Table A** **Potential Impacts** / **No operations within** High / 50 m Moderate / 25 m Low / 10 m
BS02		**Barn Swallow Nests** **The following is general guidance on protective prescriptions for barn swallow. Recognizing that unique situations and timing will arise and legislative conditions must be met, the Kenora District Biologist will be contacted upon the discovery of barn swallow nests on water crossing structures to ensure a nest management plan is in place. A FMP amendment will be required for any changes to the conditions for this AOC listed below.** The critical nesting period for Barn Swallow is May 1 – August 31.

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FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

B. Operational Roads and Landings

AOC or AOC Group Identifier	Public Comment	Planned or Existing Conditions on Location, Construction or Use
		If water crossing work is being completed during the critical nesting period (May 1 – August 31): If barn swallow nesting activity is identified: • Scheduled work will be suspended and a record of the activity will be made and passed to the District Biologist including details of: o The name, site and type of activity proposed to occur on the nesting habitat, o A description of the structure, o The number, location and description of barn swallow nests located on the structure and the amount of area suitable for nesting on the structure. • An exclusion plan will be developed with the District Biologist and will include nest removal and habitat replacement plans. • The habitat replacement plan will be developed with the District Biologist whereby: o 1 artificial nest (cup) for every destroyed nest will be installed on new nesting habitat (kiosk) no further than 1000 m from the original site and no further than 500 m from foraging space (water/wetland). o New nesting habitat must provide suitable nesting conditions by: ▪ Providing horizontal ledges or rough vertical surfaces with a sheltered overhang. ▪ Providing surface areas suitable for nest attachment at a height that minimizes disturbance or chance of predation. ▪ Allowing barn swallow to enter and exit freely. ▪ Providing suitable area to accommodate spacing between nests. ▪ Being structurally sound and capable of providing habitat for at least 5 breeding seasons. o This must occur before the beginning of the active barn swallow season. If, despite all measures in place, barn swallow enter the structure to establish nests any part of the activity that would harm or harass barn swallow while nesting must be suspended until the end of the barn swallow active season. Monitoring of the artificial nesting habitat will occur for 3 critical nesting period seasons. Reports detailing the number, description and location of new nests created by barn swallow and an estimate of the number of barn swallow using the structure will be given to the District Biologist. **If water crossing work is being completed outside of the critical nesting period (September 1 – April 30):** If barn swallow nesting activity is identified and the structure is being altered but will still be available for nesting after work is completed: • 1 artificial nest (cup) for every destroyed nest will be installed on the structure that was the object of the activity or in any structure that exists within 1 kilometer if it provides conditions that are suitable for barn swallow nesting. If barn swallow nesting activity is identified and the structure is being removed, demolished, destroyed or will otherwise no long be available for barn swallow nesting: • A habitat replacement plan will be developed with the District Biologist whereby: o 1 artificial nest (cup) for every destroyed nest will be installed on new nesting habitat no further than 1000 m from the original site and no further than 500 m from foraging space (water/wetland) ▪ On a structure previously existing that is deemed suitable for barn swallow nesting OR,

MANAGEMENT UNIT NAME: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
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FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

B. Operational Roads and Landings

AOC or AOC Group Identifier	Public Comment	Planned or Existing Conditions on Location, Construction or Use
		▪ On a structure that is constructed for the purpose of new nesting habitat. o Habitat replacement sites must provide suitable nesting conditions by: ▪ Providing horizontal ledges or rough vertical surfaces with a sheltered overhang. ▪ Providing surface areas suitable for nest attachment at a height that minimizes disturbance or chance of predation. ▪ Allowing barn swallow to enter and exit freely. ▪ Providing suitable area to accommodate spacing between nests. ▪ Being structurally sound and capable of providing habitat for at least 5 breeding seasons. o This must occur before the beginning of the critical nesting period (May 1 – August 31). Monitoring of the replacement nesting habitat will occur for 3 critical nesting period seasons. Reports detailing the number, description and location of new nests created by barn swallow and an estimate of the number of barn swallow using the structure will be given to the District Biologist.
HO01		**Primary Nests of great grey owl, northern goshawk, or red-shouldered hawk:** • New roads, landings, and aggregate pits are not permitted within 50 m of primary nests or within the 7 ha patch of suitable habitat retained within 200 m of primary nests of great grey owl, northern goshawk, or red-shouldered hawk. • Reasonable efforts will be made to avoid constructing new roads, landings and aggregate pits within 51-200m of primary nests unless no practical or feasible alternative locations exist (e.g. due to extremely rugged terrain in adjacent areas outside the AOC) in which case only one operational road or landing is permitted. If roads are constructed, temporary roads and/or water crossings will be used whenever practical and feasible to limit future access and disturbance and the width of the cleared corridor will be as narrow as practical and feasible, and will not exceed 20m. • Operations associated with roads and landings are not permitted within 50-200m of *occupied* nests during the *critical breeding period* (March 15 to July 15) based on potential impact (see Table 19.1), unless required for safety reasons or environmental protection. • However, there is no timing restriction on hauling or low potential impact road maintenance operations (e.g., grading) if the road predates the colony. **Table A** **Potential Impact** / **No operations within** High / 200 m Moderate / 100 m Low / 50 m
HO02		**Alternate nests of great grey owl, northern goshawk, or red-shouldered hawk:** • New roads and landings are not permitted within the AOC. • No timing restriction on operations associated with roads and landings within the AOC.

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FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

B. Operational Roads and Landings

AOC or AOC Group Identifier	Public Comment	Planned or Existing Conditions on Location, Construction or Use
NO01		**Stick nests occupied by barred owl, broad-winged hawk, common raven, Cooper's hawk, great horned owl, long-eared owl, merlin, red-tailed hawk, or sharp-shinned hawk**: • New roads and landings will not be constructed within 20 m of nests of the barred owl, Cooper's hawk, common raven, great horned owl, long-eared owl, and red-tailed hawk**.** • New roads and landings will not be constructed within 20 m of nests of the broad-winged hawk, merlin, and sharp-shinned hawk, unless no practical or feasible alternative locations exist (e.g. due to extremely rugged terrain in adjacent areas outside the AOC) in which case only one operational road or landing is permitted in the AOC. • Operations associated with roads and landings are not permitted within 10-200 m of *occupied* nests during the *critical breeding period* based on potential impact and species (see Table C for timing/distance restrictions and see Table FMP-19.1 for potential impact of activities) unless required for safety reasons or environmental protection. • However, there is no timing restriction on hauling or low potential impact road maintenance operations (e.g., grading) if the road predates the nest. **Table C**
NO02		**Nests/ communal roosts in cavities occupied by American kestrel, barred owl, boreal owl, eastern screech-owl, great horned owl, northern hawk owl, northern saw-whet owl or chimney swift:** • New roads and landings will not be constructed within 20 m of nests/communal roosts of the barred owl, great horned owl or chimney swift**.** • New roads and landings will not be constructed within 20 m of nests of the American kestrel, boreal owl, eastern screech-owl, northern hawk owl, or northern saw-whet owl, unless no practical or feasible alternative locations exist (e.g. due to extremely rugged terrain in adjacent areas outside the AOC) in which case only one operational road or landing is permitted in the AOC. • Operations associated with roads and landings are not permitted within 0-100 m of *occupied* nests during the *critical breeding/roosting period* based on potential impact and species(see Table C for timing/distance restrictions and see Table FMP-19.1 for potential impact of activities), unless required for safety reasons or environmental protection. • However, there is no timing restriction on hauling or low potential impact road maintenance operations (e.g., grading) if the road predates the nest/communal roost.

Species	Critical Breeding Period	High Impact Operations	Moderate Impact Operations	Low Impact Operations
(a) Barred owl	March 15 – July 15	200 m	100 m	50 m
(b) Broad-winged hawk	April 1 – July 31	100 m	50 m	25 m
(c) Cooper's hawk	April 1 – July 31	100 m	50 m	25 m
(d) Great horned owl	February 1 – May 31	100 m	50 m	25 m
(e) Long-eared owl	March 15 – July 15	100 m	50 m	25 m
(f) Red-tailed hawk	March 15 – July 15	100 m	50 m	25 m
(g) Common raven	February 15 – June 15	50 m	25 m	10 m
(h) Merlin	April 1 – July 31	50 m	25 m	10 m
(i) Sharp-shinned hawk	April 1 – July 31	50 m	25 m	10 m

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FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

B. Operational Roads and Landings

<table>
<tr><th rowspan="2">AOC or AOC Group Identifier</th><th rowspan="2">Public Comment</th><th>Planned or Existing</th></tr>
<tr><th>Conditions on Location, Construction or Use</th></tr>
<tr><td></td><td></td><td>
Table C
<table>
<tr><th>Species</th><th>Critical Breeding Period</th><th>High Impact Operations</th><th>Moderate Impact Operations</th><th>Low Impact Operations</th></tr>
<tr><td>(a) Barred owl</td><td>March 15 - July 15</td><td>100 m</td><td>50 m</td><td>25 m</td></tr>
<tr><td>(b) Great horned owl</td><td>February 1 – May 31</td><td>50 m</td><td>25 m</td><td>10 m</td></tr>
<tr><td>(c) Northern hawk owl</td><td>March 15 - July 15</td><td>50 m</td><td>25 m</td><td>10 m</td></tr>
<tr><td>(d) Chimney swift</td><td>May 1 – September 30</td><td>50 m</td><td>25 m</td><td>10 m</td></tr>
<tr><td>(e) American kestrel</td><td>April 1 – July 31</td><td>25 m</td><td>10 m</td><td>0 m</td></tr>
<tr><td>(f) Boreal owl</td><td>April 1 – July 31</td><td>25 m</td><td>10 m</td><td>0 m</td></tr>
<tr><td>(g) Eastern screech-owl</td><td>March 15 – July 15</td><td>25 m</td><td>10 m</td><td>0 m</td></tr>
<tr><td>(h) Northern saw-whet owl</td><td>March 15 – July 15</td><td>25 m</td><td>10 m</td><td>0 m</td></tr>
</table>
</td></tr>
<tr><td>NO03</td><td></td><td>
Ground nests occupied by northern harrier, short-eared owl, or turkey vulture

Operations associated with roads and landings are not permitted within 10-150 m of occupied nests during the critical breeding period based on potential impact and species (see Table B for timing and distance restrictions, see Table FMP 19.1 for potential impact of activities), unless required for safety reasons or environmental protection.
However, there is no timing restriction on hauling or low potential impact road maintenance operations (e.g., grading) if the road predates the nest.

Table B
<table>
<tr><th></th><th></th><th colspan="3">Distance from Nest (m) with Timing Restriction During Critical Breeding Period if Nest is Occupied</th></tr>
<tr><th>Species</th><th>Critical Breeding Period</th><th>High Impact Operations</th><th>Moderate Impact Operations</th><th>Low Impact Operations</th></tr>
<tr><td>(a) Turkey vulture</td><td>May 1 – August 31</td><td>150 m</td><td>75 m</td><td>40 m</td></tr>
<tr><td>(b) Short-eared owl</td><td>March 15 – July 15</td><td>100 m</td><td>50 m</td><td>25 m</td></tr>
<tr><td>(c) Northern harrier</td><td>April 1 – July 31</td><td>50 m</td><td>25 m</td><td>10 m</td></tr>
</table>
</td></tr>
<tr><td>NO04</td><td></td><td>
Whip-poor-will Nest Sites

When the habitat description under the ESA becomes available these conditions may be updated prior to plan approval if this is necessary to address the habitat description. If the habitat description becomes available after final plan approval, a plan amendment for this AOC may be submitted if necessary to address the habitat description.

Breeding Season (May 1 – August 14):
</td></tr>
</table>

MANAGEMENT UNIT NAME: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
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FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

B. Operational Roads and Landings

AOC or AOC Group Identifier	Public Comment	Planned or Existing Conditions on Location, Construction or Use
		• The construction of new operational roads is not permitted within the 200 m AOC. • Use of existing roads within the 200m AOC is permitted in the breeding season however night hauling should be avoided. ***Non-breeding Season*** **(August 15 – April 30th):** • The construction of new operational roads is not permitted within the 200 m AOC. • Use of existing operational roads within the 200m AOC is permitted in the non-breeding season.
NO05		**Common Nighthawk nest sites** When the habitat description under the ESA becomes available these conditions may be updated prior to plan approval if this is necessary to address the habitat description. If the habitat description becomes available after final plan approval, a plan amendment for this AOC may be submitted if necessary to address the habitat description. ***Breeding Season*** **(May 15 – August 15):** • The construction of new operational roads is not permitted within the 200 m AOC. • Use of existing roads within the 200m AOC is permitted in the breeding season however night hauling should be avoided. ***Non-breeding Season*** **(August 16 – May 14):** • The construction of new operational roads is not permitted within the 200 m AOC. • Use of existing operational roads within the 200m AOC is permitted in the non-breeding season.
NO06		**Olive-sided flycatcher nest sites** When the habitat description under the ESA becomes available these conditions may be updated prior to plan approval if this is necessary to address the habitat description. If the habitat description becomes available after final plan approval, a plan amendment for this AOC may be submitted if necessary to address the habitat description. • The construction of new operational roads is not permitted within the 100 m AOC. • Use of existing roads within the 100m AOC is permitted at anytime.
NO07		**Canada warbler nest sites** When the habitat description under the ESA becomes available these conditions may be updated prior to plan approval if this is necessary to address the habitat description. If the habitat description becomes available after final plan approval, a plan amendment for this AOC may be submitted if necessary to address the habitat description. • The construction of new operational roads is not permitted within the 100 m AOC.

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Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

B. Operational Roads and Landings

AOC or AOC Group Identifier	Public Comment	Planned or Existing Conditions on Location, Construction or Use
		• Use of existing roads within the 100m AOC is permitted at anytime.

NO08		**Bat Hibernacula** known to be suitable and to have been used at least once within the past 20 years by ≥ 50 **Little Brown Myotis** (Little Brown Bats) or ≥ 20 **Northern Myotis** (Northern long-eared bats)
		• 200m radius AOC centred on the entrance to the hibernaculum.
		  • No new roads and landing permitted within the inner 100m of the AOC.
		  • Reasonable efforts will be made to avoid constructing new roads, landings within 101-200m of the AOC. (ie. construct only of there is no other feasible/possible alternative due to excessive terrain outside the AOC or safety reasons).
		  • When roads are constructed within the AOC, temporary roads and/or water crossings will be used whenever practical and feasible to limit future access and disturbance.
		  • Road construction is not permitted within the AOC during the hibernation and associated entrance and emergence periods (September 1-May 30)
		  • No hauling and road maintenance operations permitted within the inner 100m of the AOC during the hibernation and associated entrance and emergence periods (September 1-May 30) unless the road predates the hibernaculum or is required for safety reasons or environmental protection.

PL01		**Patent Land:** • Roads and landings are allowed in AOC up to the established harvest boundary with a maximum right of way width of 20m. No roads are permitted between the harvest boundary and the patent land without the permission of the patent land owner and will require a plan amendment.
RR01		**Railway Right of Way:** • Roads and landings are allowed in AOC up to the railway right of way. • No slash piles or chipper debris piles are allowed to remain in landing for more than one year.
NG01		**Natural Gas Transmission Pipeline:** • Roads and landing are allowed in AOC; however a TransCanada Pipeline representative must be contacted before operations begin. **Contact Information:** TransCanada Pipelines Lakewood Area Pipeline Technician Lakewood Area Manager Office # 807-548-4241Office # 807- 548-6025 Cell # 807-466-7212Cell # 807-466-7330
HB01		**Highway Corridor Aesthetics:** • Operational road crossings are allowed with a maximum right-of-way width of 20 m.

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Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
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B. Operational Roads and Landings

AOC or AOC Group Identifier	Public Comment	Planned or Existing Conditions on Location, Construction or Use
LS01		**Tourism – Lac Seul Shoreline (Remoteness, aesthetics, fisheries, water quality, cultural heritage)** • No roads within 240 m of shoreline • Roads between 241m and 650 m of shoreline will be decommissioned. • All roads within 650 m of shoreline will be regenerated within 3 years of harvest operations.
TV01		**Tourism – Aesthetics Along Large High Volume Tourism Lakes, recognized canoe routes, recreational lakes:** • No roads permitted in AOC.
TVgl		**Tourism – Gibi Lake** • Operational road construction permitted between Labour Day and Victoria Day only. No construction on weekends (Friday 5 p.m. and Sunday 6 p.m.) between Labour Day and Thanksgiving Day.
TVw		**Tourism – timing restriction** • Operational road construction and hauling permitted between November 1st and April 30th.
TVwl		**Tourism – timing restriction** • Operational road construction and hauling permitted between November 1st and April 30th.
TVal		**Tourism – Aerobus Lake** • Operational road construction permitted between November 1st and May 1stonly.
TVer		**Tourism – English River Waterway Park** • Operational roads and water crossings within 500 m of the park boundary are to be made impassable following harvest operations through the removal of water crossing structures, trenching of roads and/or placement of slash on the road way. All roads within 500 m of the park boundary must be regenerated, within 3 years of harvest operations, to prevent access.
TVp		**Tourism - portage** • The maximum right of way width is 25 metres, unless a wider right of way is required to maintain a safe line of sight distance to a maximum of 35 metres. • Grubbing or stripping of material within 100 metres or to the height of land, whichever is least, on both sides of the portage will be kept to an absolute minimum required for construction.
WL01		**Large lakes, Medium lakes, Small lakes, Ponds - high or moderate potential sensitivity (HPS or MPS) to forest management operations:** • No landings are permitted in the AOC. • No new roads are permitted in the AOC.
WL02		**Ponds – low potential sensitivity (LPS) to forest management operations:** • New roads will not be constructed within 15 m of LPS ponds unless there is no practical or feasible alternative (i.e. excessive steep terrain prohibits road construction) and the mitigative measures outlined in Section 4.5.7 'General Conditions on Road Planning, Construction and Maintenance, Landings, Aggregate Pits' are taken to minimize the risk of sediment entering ponds and disruption of hydrological function. • Landings are not permitted within 15 m of LPS ponds.

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FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
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B. Operational Roads and Landings

AOC or AOC Group Identifier	Public Comment	Planned or Existing Conditions on Location, Construction or Use
WS01		**Rivers, Stream segments - high or moderate potential sensitivity (HPS or MPS) to forest management operations:** New roads that are not associated with an approved river/stream crossing are not permitted within the AOC unless no practical or feasible alternative exists, appropriate mitigative measures are taken to minimize the risk of sediment entering rivers or streams, and the road, including specific location, is identified and justified through the FMP AOC planning process. Refer to Part A for conditions that also apply to this AOC. Conditions on Decommissioning Decommissioning of water crossings will only occur if they are consistent with the approved road use management strategy and are scheduled for decommissioning in the current Annual Work Schedule. The schedules for water crossing and road decommissioning will be coordinated. Decommissioning of the water crossing will be consistent with the vehicular traffic expected by the use management strategy for the road. If continued vehicle passage can be considered after removal of the crossing structure, ensure the crossing site is safe and erosion resistant (e.g. a ford). All water crossings on that road system will be assessed by the MNR based on the criteria in the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales MNR 2010 in Section 5.1.2.3 Decommissioning and rehabilitation and will be decommissioned in an environmentally sound manner and approved by the MNR. The Annual Work Schedule will outline the necessary techniques required for decommissioning to prevent erosion and protect public safety based on the analysis of the above criteria. Techniques will be used appropriate for the conditions encountered at each crossing to minimize disturbance of the water feature and the potential for erosion and sedimentation during and after decommissioning. During decommissioning, workers will prevent contamination of a water feature by foreign materials such as lumber, nails, logs, brush, fuel or oil. Decommissioning and rehabilitation operations that may enter a water feature (i.e. in-water work) or that may potentially cause sediment to enter a water feature, are not to occur during periods of fish spawning, incubation or fry emergence (See Timing Restrictions in Part A above). The Proponent will monitor operations and mitigation techniques to prevent the harmful alteration, disruption, or destruction of fish habitat, the impairment of water quality, and problems related to fish passage. Fill material placed above the high water level within the floodplain of a water feature will be resistant and/or protected from erosion. Any exposed mineral soil between the height of land and the water crossing, or within 100 m of the water crossing, whichever is less, will be trimmed to a stable angle and be protected from erosion so sediment will not enter water. Upon completion of decommissioning, any temporary fill, culverts, refuse, etc. will be removed from the construction area and disposed of in a satisfactory manner. Following decommissioning, on-site inspections will be made by the Proponent to confirm the standards are being met. Problems are to be reported to MNR immediately. For decommissioned water crossings that have not been removed monitoring the water crossings will take place as per direction in Section 4.7.4.

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FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

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B. Operational Roads and Landings

AOC or AOC Group Identifier	Public Comment	Planned or Existing Conditions on Location, Construction or Use
WS02		**Stream segments - low potential sensitivity (LPS) to forest management operations:** New roads will not be located within 15 m of the active channel unless there is no feasible alternative and appropriate measures are taken to minimize and mitigate the risk of sediment entering streams and disruption of hydrological function. <u>Design and location of water crossings</u> The preliminary location and conditions outlined in this area of concern for a water crossing will be confirmed or changed in the AWS. If the conditions or locations are changed, the change must be consistent with the FMP. Avoid steep banks or sites where actively slumping banks are evident. <u>Installation and Maintenance</u> Those responsible for maintenance will monitor operations and select operating practices, materials, and mitigation techniques at each water crossing to prevent the harmful alteration, disruption or destruction of fish habitat or the impairment of water quality. Harmful alteration, disruption, or destruction of fish habitat is not permitted without DFO approval. The installation of a water crossing will not result in the impediment of fish passage; mitigative techniques will be applied if the structure has the potential to impede or block fish migration or passage. Materials moved during construction, such as grubbed or earth fill material, will not be piled where they block drainage courses. At any time of year, the free movement of water and fish will not be blocked or otherwise impeded, except for brief periods during construction and as approved by MNR. The removal of stream boulders is generally not acceptable, except where necessary for installation of a crossing structure which retains a natural streambed (e.g., a bridge). Fill material required to build the road at the site of the crossing, below the high water level and within the floodplain of the water feature, will be erosion resistant and/or protected from erosion. Any exposed mineral soil between the height of land and the water crossing, or within 100 m of the water crossing, whichever is less, will be trimmed to a stable angle and be protected from erosion so sediment will not enter water. During construction and maintenance of a water crossing, contamination of a water feature by foreign materials such as lumber, nails, fuel, oil, or herbicides is not permitted (the crossing structure itself, including temporary crossings, can be in the water, if the approved design allows for this). Prevent sediment from entering the water features by using erosion and sediment control techniques.

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B. Operational Roads and Landings

AOC or AOC Group Identifier	Public Comment	Planned or Existing Conditions on Location, Construction or Use
		Blasting in or near water produces shock waves that can kill fish and will normally be avoided. Blasting with a potential impact on fish or fish habitat will only be done following approval from DFO. Upon completion of a water crossing, any temporary fill, culverts, refuse, etc. will be removed from the construction area and properly disposed of in a satisfactory manner. If using temporary winter only crossings, materials other than ice & snow will be removed from the stream prior to spring break-up. After construction, on-site inspections will be made by the proponent to confirm these standards are being met. If using temporary winter-only crossings, materials other than ice and snow will be removed from the stream prior to spring break-up. Upon installation, each new water crossing will be incorporated into the approved program for monitoring roads and water crossings. These standards are applicable to previously installed water crossings when they are replaced or upgraded due to sub-standard safety, environmental, or operational reasons. Use techniques and materials appropriate for the conditions encountered at each water crossing, to minimize disturbance of a water feature and significantly reduce the potential for erosion and sedimentation. Ensure logs and brush which may need to be removed or trimmed at the crossing site do not enter the water feature. Grubbing of low vegetative cover between the height of land and a water crossing, or within 100 m of a water crossing, whichever is less, will be limited to that required to address engineering issues and safety concerns, such as the removal of hazards. When diverting and/or removing water for dry installations, chase away or trap and relocate live fish before completely dewatering the area (note: permits may be required; consult the local MNR district office for further information). Apply mitigative techniques to provide for fish passage if there is potential to impede or block fish migration during installation of the crossing. Begin site stabilization and clean-up as soon as possible after the water crossing has been installed, including the removal of all diversions. Trim fill slopes to a stable angle, or use other mitigative stabilization techniques. A person should be able to walk up the slope without causing slumping and sliding of soil particles. When a temporary channel is no longer required, it should be stabilized to avoid long-term erosion. Construct and use fords during the driest time of the year but not during the restricted time of high risk to fish; ensure the ford does not restrict fish passage. Material used within the stream and on the banks to improve the crossing will be clean, non-erodable, and non-toxic to aquatic life.

MANAGEMENT UNIT NAME: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
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FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

B. Operational Roads and Landings

AOC or AOC Group Identifier	Public Comment	Planned or Existing Conditions on Location, Construction or Use
		Install culverts on a straight section of stream. When installation of a culvert on a straight section of stream is not possible, minimize the change in stream morphology and impacts on fish habitat. <u>Conditions on Construction</u> No landings are permitted within the area of concern. Fill material placed to build the road below high water level within the floodplain of waterbody will be erosion resistant and/or protected from erosion. Materials moved during construction, such as grubbed or earth fill material, will not be piled where they block drainage courses. Grubbing or stripping within the 100 metre width or to the height of land (whichever comes first) of the location of the crossing on both sides of the waterway will be kept to an absolute minimum required for construction and where required must be stabilized to prevent erosion. Any exposed mineral soil between the height of land and a water crossing, or within 100 m of a water crossing, whichever is less, will be trimmed to a stable angle of repose and be protected from erosion so sediment will not enter the water after construction. <u>Right-of-way (ROW)</u> The right-of-way for the stream crossing will be cleared to a minimum width needed for construction or to a maximum width of 20 metres for a distance of 15 metres from the stream. <u>Timing Restriction</u> Construction operations that may enter a water feature or that may cause sediment to enter a water feature are not to occur during periods of fish spawning, incubation, or fry emergence, unless approved by MNR. If warranted (i.e. late spring, no fish habitat) the MNR may vary timing dates based on local knowledge. The timing restrictions for operations where the following local fish species are present are listed below: Baitfish and Suckers: April 1st to June 15th. The MNR will confirm at the AWS level all timing restriction conditions. <u>Water Crossing structure</u> Type of crossing structure will be determined and approved in the AWS. <u>Conditions on Decommissioning</u> Decommissioning of water crossings will only occur if they are consistent with the approved road use management strategy and are scheduled for decommissioning in the current Annual Work Schedule. The schedules for water crossing and road decommissioning will be coordinated. Decommissioning of the water crossing will be consistent with the vehicular traffic expected by the use management strategy for the road. If continued vehicle passage can be considered after removal of the crossing structure, ensure the crossing site is safe and erosion resistant (e.g. a ford).

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FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

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B. Operational Roads and Landings

AOC or AOC Group Identifier	Public Comment	Planned or Existing Conditions on Location, Construction or Use
		All water crossings on that road system will be assessed by the MNR based on the criteria in the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales MNR 2010 in Section 5.1.2.3 Decommissioning and rehabilitation and will be decommissioned in an environmentally sound manner and approved by the MNR. The Annual Work Schedule will outline the necessary techniques required for decommissioning to prevent erosion and protect public safety based on the analysis of the above criteria. Techniques will be used appropriate for the conditions encountered at each crossing to minimize disturbance of the water feature and the potential for erosion and sedimentation during and after decommissioning. During decommissioning, workers will prevent contamination of a water feature by foreign materials such as lumber, nails, logs, brush, fuel or oil. Decommissioning and rehabilitation operations that may enter a water feature (i.e. in-water work) or that may potentially cause sediment to enter a water feature, are not to occur during periods of fish spawning, incubation or fry emergence (See Timing Restrictions above). The Proponent will monitor operations and mitigation techniques to prevent the harmful alteration, disruption, or destruction of fish habitat, the impairment of water quality, and problems related to fish passage. Fill material placed above the high water level within the floodplain of a water feature will be resistant and/or protected from erosion. Any exposed mineral soil between the height of land and the water crossing, or within 100 m of the water crossing, whichever is less, will be trimmed to a stable angle and be protected from erosion so sediment will not enter water. Upon completion of decommissioning, any temporary fill, culverts, refuse, etc. will be removed from the construction area and disposed of in a satisfactory manner. Following decommissioning, on-site inspections will be made by the Proponent to confirm the standards are being met. Problems are to be reported to MNR immediately.
WW01		**Wetlands occupied in the last 20 years by breeding black terns, golden-winged warblers, least bitterns, or yellow rails:** • No new all-weather roads or landings are permitted. • New winter roads are not permitted within the AOC unless there is no practical or feasible alternative, reasonable efforts will be made to mitigate potential impact on occupied habitat, and the road, including specific location, is identified, justified and approved through an FMP amendment. • Water drawdowns or other activities that significantly alter hydrological regime are not permitted. • Reasonable efforts (i.e. Pre-harvest skid trail planning) will be made to avoid crossing wetlands with extraction trails during the frost-free period. • During all seasons crossings will be minimized and will follow the appropriate operating practices in FMP Section 4.2.2.2 Conditions on Regular Operations for 'Wetlands mapped permanent non-forested' to minimize potential site damage and effects on hydrological function.

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FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

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Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

B. Operational Roads and Landings

AOC or AOC Group Identifier	Public Comment	Planned or Existing Conditions on Location, Construction or Use
WW02		**Wetlands known to support flooded jellyskin:** • New roads and landings are not permitted within 30m of the high-water mark of woodland pools known to support flooded jellyskin. • Direction for woodland pools (FMP Section 4.5.7) will be applied to all other woodland pools with a surface area ≥200m2 (about a 15m diameter). • New all-weather roads are not permitted within the AOC unless there is no other feasible/possible alternative due to excessive terrain or for safety reasons.
FL01		**First Nation Reserve Land** • No new roads planned to be constructed. • Where road already exists through the AOC, road is open for travel except for forestry purposes unless approved with local First Nation in writing.
NE10		**Snapping Turtle Nesting Sites:** On identified snapping turtle nests and nesting habitat as encountered in the field. Applies only to areas scheduled for road decommissioning and does not impact regular maintenance on active roads: • No road decommissioning, including water crossing work, during the nesting period (June 1 to Sept 30). • No landings permitted within 200m of the nesting habitat area.
PGP01		<u>75m radius AOC measured from PGP centre, squared off such that the final AOC is 150m by 150m</u> • No landings permitted in the AOC • An operational road may be constructed in the area between the 75m radius measured from the PGP centre and the squared off (150m x 150m) AOC boundary • If an operational road is constructed within the AOC outside of the 75m radius from the plot centre yet within the squared off AOC boundary, adjust the AOC boundary to follow the edge of the road right-of-way (i.e. do not extend the AOC to include area on the opposite side of the road to the PGP centre) • Neither the road right-of-way nor the road can infringe on the75m radius from the PGP centre • No bulldozing of trees or road construction debris into the 75m radius from the PGP centre <u>75m radius AOC measured from PGP centre and rectangular plot AOC</u> • No landings permitted in the AOC No operational roads permitted in the AOC

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FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

C. Forestry Aggregate Pits

AOC or AOC Group Identifier	Planned or Existing Conditions on Location, Construction or Use
A01	**Archeological Potential Area** • No aggregate extraction is permitted. • No new aggregate pits are permitted.
D01	**Occupied Black Bear Den:** • Aggregate extraction is not permitted within the 100 m AOC during the denning period October 15 to April 30.
D02	**Occupied Grey Fox Den:** • Aggregate extraction is not permitted within the 100 m AOC during the denning period April 15 – September 15.
D03	**Occupied Cougar Den:** • Aggregate extraction is not permitted within the 200 m AOC during the denning period. Note: **The** *denning period* is potentially different for each occupied den encountered and is considered to extend for 8 weeks from the date an occupied den is located, or until a den is known to be no longer occupied.
D04	**Wolf Den:** • New aggregate pits are not permitted within the inner 100 m of the AOC. • New aggregate pits will not be constructed within the outer 100 m of the AOC unless it has been determined there is no other feasible alternative (e.g. terrain prevents aggregate pit establishment outside the AOC) ***Denning Period* April 15 to July 15:** • Aggregate extraction is not permitted within 200 m of an occupied den during the *denning period*.
D05	**Wolverine Den:** • If a wolverine den is encountered during operations all operations will stop within a 4km radius AOC and the Kenora District Office MNR will be immediately notified of the presence of a wolverine den in proximity to forest operations. • No further aggregate pits permitted within the AOC. • Following the above the FMP may be amended in consultation with MNR Biologists by developing a new AOC with a den site management plan for a specific den site location that will outline the extent and timing of any aggregate operations.
M01	**Mineral licks:** • Operations associated with existing aggregate pits are permitted within the AOC. • New aggregate pits are not permitted within the AOC.

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FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
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C. Forestry Aggregate Pits

AOC or AOC Group Identifier	Planned or Existing Conditions on Location, Construction or Use
N01	**Bald Eagle Primary Nest:** • New aggregate pits are not permitted within 200 m of primary nests. • New aggregate pits are not permitted within 201-400 m of primary nests, unless no practical or feasible alternative locations exist (e.g. due to extremely rugged terrain in adjacent areas outside the AOC) in which case only one pit is permitted in the AOC. • Operations associated with aggregate pits are not permitted within 100-400 m (Table A) of *occupied* nests during the *critical breeding period* (Feb. 15 – August 31). • See Table 19.1 for potential impacts **Table A** **Potential Impact** / **No operations within** High / 400 m Moderate / 200 m Low / 100 m
N02	**Bald Eagle Alternate Nest:** • New aggregate pits are not permitted within 200 m of alternate nests. • No timing restriction on operations associated with aggregate pits within the AOC.
N03	**Bald Eagle Inactive Nest:** • New aggregate pits are not permitted within 100 m of inactive nests. • No timing restriction on operations associated with aggregate pits within the AOC.
N04	**Bald Eagle Primary Nest Discovered During Operations after Harvest has Occurred within 200 m of nest:** • New aggregate pits are not permitted within 200 m of primary nests. • Operations associated with aggregate pits are not permitted within 100-400 m of *occupied* nests (see Table A, Table 19.1) during the *critical breeding period* (Feb. 15 – August 31) unless required for safety reasons or environmental protection. **Table A** **Potential Impact** / **No operations within** High / 400 m Moderate / 200 m Low / 100 m
ON01	**Osprey Primary Nest:** • New aggregate pits are not permitted within 150 m of primary nests. • New aggregate pits are not permitted within 151-300 m of primary nests, unless no practical or feasible alternative locations exist(e.g. due to extremely rugged terrain in adjacent areas outside the AOC) in which case only one pit is permitted in the AOC. • Operations associated with aggregate pits are not permitted within 75-300 m (Table A, see Table 19.1) of *occupied* nests during the *critical breeding period* (April 15 to August 31).

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FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

C. Forestry Aggregate Pits

AOC or AOC Group Identifier	Planned or Existing Conditions on Location, Construction or Use
	Table A **Potential Impact** / **No operations within** High / 300 m Moderate / 150 m Low / 75 m
ON02	**Osprey Alternate Nest:** • New aggregate pits are not permitted within 150 m of alternate nests. • No timing restriction on operations associated with aggregate pits within the AOC.
ON03	**Osprey Inactive Nest:** • New aggregate pits are not permitted within 75 m of inactive nests. • No timing restriction on operations associated with aggregate pits within the AOC.
ON04	**Primary Osprey Nest Discovered During Operations after Harvest has Occurred within 150 m. of Nest:** • New aggregate pits are not permitted within 150 m of primary nests. • Operations associated with aggregate pits are not permitted within 75-300 m of *occupied* nests (see Table A, Table 19.1) during the *critical breeding period* (April 15 – August 31) unless required for safety reasons or environmental protection. **Table A** **Potential Impact** / **No operations within** High / 300 m Moderate / 150 m Low / 75 m
BH01	**Active Great Blue Heron Colonies:** • New aggregate pits are not permitted within 150 m of colonies. • New aggregate pits are not permitted within 151-300 m of colonies (especially large colonies), unless no practical or feasible alternative locations exist (e.g. due to extremely rugged terrain in adjacent areas outside the AOC) in which case only one pit is permitted in the AOC. • Operations associated with aggregate pits are not permitted within 75-300 m (See Table A, Table 19.1) of *occupied* nests within colonies during the *critical breeding period* (April 1 – Aug. 15) unless required for safety reasons or environmental protection. **Table A** **Potential Impact** / **No operations within** High / 300 m Moderate / 150 m Low / 75 m

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FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

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C. Forestry Aggregate Pits

AOC or AOC Group Identifier	Planned or Existing Conditions on Location, Construction or Use
BH02	**Inactive Great Blue Heron Colonies:** • New aggregate pits are not permitted within the AOC. • No timing restriction on operations associated with aggregate pits within the AOC.
BG01	**Active colonies of Bonaparte's gull:** • New aggregate pits are not permitted within 150 m of active colonies. • Operations associated with aggregate pits are not permitted within 40-150 m (see Table A, Table 19.1) of *occupied* nests within colonies during the *critical breeding period* (May 1 to August 31) unless required for safety reasons or environmental protection. **Table A** **Potential Impact** / **No operations within** High / 150 m Moderate / 75 m Low / 40 m
BS01	**Active large colonies of bank swallows (≥100 pairs)** • Operations associated with aggregate pits are not permitted within 50 m of occupied nests within colonies during the critical breeding period (May 1 –July 31) unless required for safety reasons or environmental protection.
HO01	**Primary Nests of great grey owl, northern goshawk, or red-shouldered hawk:** • New aggregate pits are not permitted within 50 m of primary nests or within the 7 ha patch of suitable habitat retained within 200m of primary nests. • Reasonable efforts will be made to avoid constructing new aggregate pits within 51-200 m (see Table A, Table 19.1) of primary nests, unless no practical or feasible alternative locations exist (e.g. due to extremely rugged terrain in adjacent areas outside the AOC) in which case only one pit is permitted in the AOC. • Operations associated with aggregate pits are not permitted within 50-200 m of *occupied* nests during the *critical breeding period* (March 15 to July 15) unless required for safety reasons or environmental protection. **Table A** **Potential Impact** / **No operations within** High / 200 m Moderate / 100 m Low / 50 m
HO02	**Alternate nests of great grey owl, northern goshawk, or red-shouldered hawk:** • New aggregate pits are not permitted within the AOC. • No timing restriction on operations associated with aggregate pits within the AOC.

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FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

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C. Forestry Aggregate Pits

AOC or AOC Group Identifier	Planned or Existing Conditions on Location, Construction or Use

NO01

Stick nests occupied by barred owl, broad-winged hawk, common raven, Cooper's hawk, great horned owl, long-eared owl, merlin, red-tailed hawk, or sharp-shinned hawk:

- New aggregate pits will not be constructed within 20 m of nests of the barred owl, Cooper's hawk, common raven, great horned owl, long-eared owl, and red-tailed hawk**.**
- New aggregate pits will not be permitted within 20 m of nests of the broad-winged hawk, merlin, and sharp-shinned hawk, unless no practical or feasible alternative locations exist(e.g. due to extremely rugged terrain in adjacent areas outside the AOC) in which case only one pit is permitted in the AOC.
- Operations associated with aggregate pits are not permitted within 10-200 m of *occupied* nests during the *critical breeding period* unless required for safety reasons or environmental protection (see Table A, Table 19.1).

Table A

Species	Critical Breeding Period	High Impact Operations	Moderate Impact Operations	Low Impact Operations
(a) Barred owl	March 15 – July 15	200 m	100 m	50 m
(b) Broad-winged hawk	April 1 – July 31	100 m	50 m	25 m
(c) Cooper's hawk	April 1 – July 31	100 m	50 m	25 m
(d) Great horned owl	February 1 – May 31	100 m	50 m	25 m
(e) Long-eared owl	March 15 – July 15	100 m	50 m	25 m
(f) Red-tailed hawk	March 15 – July 15	100 m	50 m	25 m
(g) Common raven	February 15 – June 15	50 m	25 m	10 m
(h) Merlin	April 1 – July 31	50 m	25 m	10 m
(i) Sharp-shinned hawk	April 1 – July 31	50 m	25 m	10 m

NO02

Nests/ communal roosts in cavities occupied by American kestrel, barred owl, boreal owl, eastern screech-owl, great horned owl, northern hawk owl, northern saw-whet owl, or chimney swift:

- New aggregate pits will not be constructed within 20 m of nests/communal roosts of the barred owl, great horned owl, or chimney swift**.**
- New aggregate pits within 20 m of nests of the American kestrel, boreal owl, eastern screech-owl, northern hawk owl, or northern saw-whet owl, unless no practical or feasible alternative locations exist(e.g. due to extremely rugged terrain in adjacent areas outside the AOC) in which case only one pit is permitted in the AOC.
- Operations associated with aggregate pits are not permitted within 0-100 m of *occupied* nests during the *critical breeding/roosting period* (See Table A, Table 19.1) unless required for safety reasons or environmental protection.

Table A

Species	Critical Breeding Period	High Impact Operations	Moderate Impact Operations	Low Impact Operations
(a) Barred owl	March 15 - July 15	100 m	50 m	25 m
(b) Great horned owl	February 1 – May 31	50 m	25 m	10 m
(c) Northern hawk	March 15 - July 15	50 m	25 m	10 m

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FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

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C. Forestry Aggregate Pits

AOC or AOC Group Identifier	Planned or Existing Conditions on Location, Construction or Use

	owl				
	(d) Chimney swift	May 1 – September 30	50 m	25 m	10 m
	(e) American kestrel	April 1 – July 31	25 m	10 m	0 m
	(f) Boreal owl	April 1 – July 31	25 m	10 m	0 m
	(g) Eastern screech-owl	March 15 – July 15	25 m	10 m	0 m
	(h) Northern saw-whet owl	March 15 – July 15	25 m	10 m	0 m

NO03

Ground nests occupied by northern harrier, short-eared owl, or turkey vulture:

- The *critical breeding period* for all of Ontario is defined as March 15 to July 15 for short-eared owl, April 1 to July 31 for northern harrier, and May 1 to August 31 for turkey vulture.
- Operations associated with aggregate pits are not permitted within 10-150 m of *occupied* nests during the *critical breeding period* (see Table A, Table 19.1) unless required for safety reasons or environmental protection.

Table A

		Distance from Nest (m) with Timing Restriction During Critical Breeding Period if Nest is *Occupied*		
Species	**Critical Breeding Period**	**High Impact Operations**	**Moderate Impact Operations**	**Low Impact Operations**
(a) Turkey vulture	May 1 – August 31	150 m	75 m	40 m
(b) Short-eared owl	March 15 – July 15	100 m	50 m	25 m
(c) Northern harrier	April 1 – July 31	50 m	25 m	10 m

NO04

Whip-poor-will Nesting Sites

- No new forestry aggregate pits are permitted in the AOC (radius 200 metres from nest)
- Operations associated with aggregate pits are not permitted within 200 m of nests during the *critical breeding period* (May 1 – August 14) unless required for safety reasons or environmental protection.

NO05

Common Nighthawk Nesting Sites

- No new forestry aggregate pits are permitted in the AOC (radius 200 metres from nest)
- Operations associated with aggregate pits are not permitted within 200 m of nests during the *critical breeding period* (May 15 – August 15) unless required for safety reasons or environmental protection.

NO06

Olive-sided flycatcher nesting sites

- No new forestry aggregate pits are permitted in the AOC (radius 100 metres from nest)
- Operations associated with aggregate pits are not permitted within 100 m of nests during the *critical breeding period* (May 1 – August 31) unless required for safety reasons or environmental protection.

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C. Forestry Aggregate Pits

AOC or AOC Group Identifier	Planned or Existing Conditions on Location, Construction or Use
NO07	**Canada warbler nesting sites** • No new forestry aggregate pits are permitted in the AOC (radius 100 metres from nest) • Operations associated with aggregate pits are not permitted within 100 m of nests during the *critical breeding period* (May 15 – August 15) unless required for safety reasons or environmental protection.
NO08	**Bat Hibernacula** known to be suitable and to have been used at least once within the past 20 years by ≥ 50 **Little Brown Myotis** (Little Brown Bats) or ≥ 20 **Northern Myotis** (Northern long-eared bats) 200m radius AOC centred on the entrance to the hibernaculum. • No new aggregate pits permitted with the inner 100m of the AOC. • Reasonable efforts will be made to avoid constructing new aggregate pits within 101-200m of the AOC. (i.e. construct only of there is no other feasible/possible alternative due to excessive terrain outside the AOC or safety reasons). • Aggregate extraction is not permitted within the AOC during the hibernation and associated entrance and emergence periods (September 1-May 30)
PGP01	**FESC PGP Growth and Yield Trial Plot** • No new aggregate pits are permitted.
PL01	**Patent Land** • No new aggregate pits are permitted.
RR01	**Railroad Right of Way** • No new aggregate pits are permitted.
NG01	**Natural Gas Transmission Pipeline** • No new aggregate pits are permitted.
HB01	**Highway Corridor Aesthetics** • No new aggregate pits are permitted.
LS01	**Tourism – Lac Seul Shoreline (Remoteness, aesthetics, fisheries, water quality, cultural heritage)** • No aggregates permitted within 240 m of the shoreline.
TV01	**Tourism – Aesthetics Along Large High Volume Tourism Lakes, recognized canoe routes, recreational lakes:** • No aggregate pits are permitted in the AOC.
TVgl	**Tourism – Gibi Lake** • Aggregate extraction permitted between Labour Day and Victoria Day only. No aggregate extraction on weekends (Friday 5 p.m. and Sunday 6 p.m.) between Labour Day and Thanksgiving Day.

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C. Forestry Aggregate Pits

AOC or AOC Group Identifier	Planned or Existing Conditions on Location, Construction or Use
TVw	**Tourism – timing restriction** • Aggregate extraction permitted between November 1st and April 30th.
TVwl	**Tourism – timing restriction** • Aggregate extraction permitted between November 1st and April 30th.
TVal	**Tourism – Aerobus Lake** • No activity in aggregate pits between May 15th and August 31st.
TVer	**Tourism – English River Waterway Park** • No new aggregate pits are permitted within 500 m of the park boundary
TVp	**Tourism – Portage Trails** • No new aggregate pits are permitted.
WL01	**Large lakes, Medium lakes, Small lakes, Ponds - high or moderate potential sensitivity (HPS or MPS) to forest management operations:** • No aggregate pits are permitted in the AOC.
WL02	**Ponds – low potential sensitivity (LPS) to forest management operations:** • Aggregate pits are not permitted within 15 m of ponds.
WS01	**Rivers, Stream segments - high or moderate potential sensitivity (HPS or MPS) to forest management operations:** • Aggregate pits are not permitted in the AOC.
WS02	**Stream segments - low potential sensitivity (LPS) to forest management operations:** • Aggregate pits are not permitted within 15 m of the active channel.
WW01	**Wetlands occupied by breeding black terns, golden-winged warblers, least bitterns, or yellow rails:** • New aggregate pits are not permitted within the AOC.
WW02	**Woodland pools known to support flooded jellyskin** • New aggregate pits are not permitted within 30 m of the high-water mark of woodland pools known to support the flooded jellyskin. • Direction for woodland pools (FMP Section 4.5.7) will be applied to all other woodland pools with a surface area of ≥200m^2. • No new aggregate pits permitted within the AOC.

MANAGEMENT UNIT NAME: Whiskey Jack Forest **[X] Phase 1 (Year 1-5)**
PLAN PERIOD: April 1, 2012 to March 31, 2022 **[ ] Phase 2 (Year 6-10**

FMP-19 ROAD CROSSINGS, LANDINGS AND FORESTRY AGGREGATE PITS IN AREAS OF CONCERN

Note 1: Conditions on roads, landings and aggregate pits outside areas of concern are documented in FMP Text Section 4.5.7.
Note 2: Table FMP-19.1 Road Construction and Maintenance Activities and their Potential Impact are located at the end of Table FMP-19.

C. Forestry Aggregate Pits

AOC or AOC Group Identifier	Planned or Existing Conditions on Location, Construction or Use
FL01	**First Nation Reserve Land** • New aggregate pits and aggregate extraction in existing pits is not permitted in reserve area unless there is written consent from the First Nation.
NE10	**Snapping Turtle Nesting Site** • **No aggregate pits within 200m of known nesting sites.**

TABLE FMP-19.1 Road Construction, Use and Maintenance Activities and their Potential Impacts

Potential Impact:	High	Moderate	Low
Activities:	Road construction Aggregate extraction Work involving numerous pieces of heavy equipment, large numbers of people, or of extended duration e.g. water crossing replacement	Spot gravelling	Hauling Routine road maintenance (e.g., grading, dust control, application of herbicides for brush/vegetation control))

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

☑ Phase I (Years 1-5)
☐ Phase II (Years 6-10)

FMP-20 PLANNED EXPENDITURES (5-Year)

Expenditures		
Activity	**Forest Renewal Trust Fund (000s $)**	**Forestry Futures Trust Fund (000s $)**
Natural Regeneration	$ 540	$ -
Artificial Regeneration	$ 7,414	$ -
Site Preparation	$ 3,173	$ -
Tending *	$ 1,503	$ -
Renewal Support	$ -	$ -
Other Eligible Activities	$ -	$ -
Protection (Insect Pest Control) **		$ -
Total Expenditures	$ 12,630	$ -

* depends on approval of projects.

** The FFTF contributions to protection are on an "as needed" basis.

MANAGEMENT UNIT NAME: Whiskey Jack Forest
PLAN PERIOD: April 1, 2012 to March 31, 2022

FMP-21 Area Planned For Assessment of Regeneration Success (10-year)

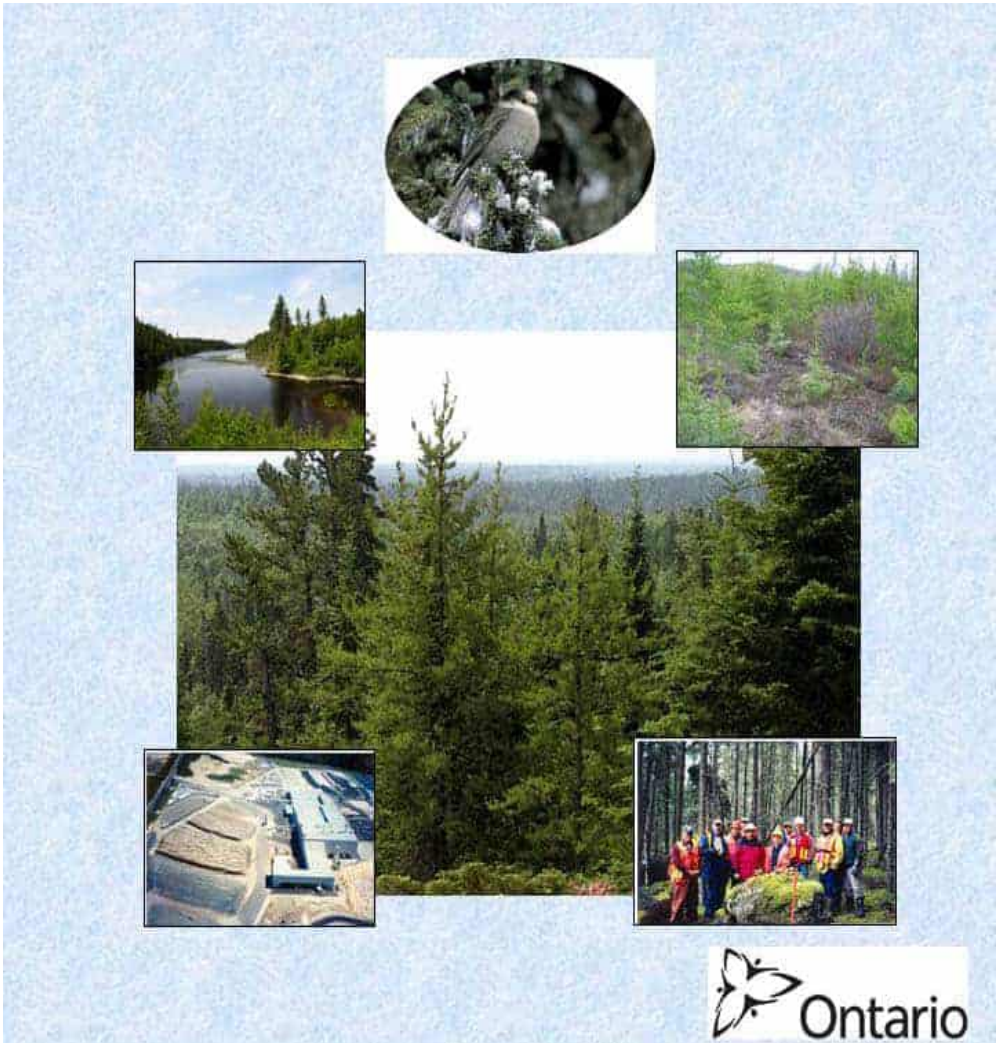
Forest Unit	Silvicultural Ground Rule	Projected Forest Unit	Area to be Assessed (ha)
Harvest			
BFM	BFM-BA1-PJM	PJM	6
	BFM-BA1-SPM	SPM	72
	BFM-EXT-BFM	BFM	210
BFM Total			289
CMX	CMX-BA1-PJM	PJM	339
	CMX-BA1-SPM	SPM	1,964
	CMX-EXT-CMX	CMX	390
CMX Total			2,694
HMX	HMX-BA1-PJM	PJM	15
	HMX-BA1-SPM	SPM	637
	HMX-EXT-HMX	HMX	105
	HMX-EXT-POD	POD	192
HMX Total			949
OTH	OTH-EXT-OTH	OTH	51
OTH Total			51
PJD	PJD-BA1-PJD	PJD	2,270
	PJD-BA1-PJM	PJM	91
	PJD-EXT-PJD	PJD	589
PJD Total			2,950
PJM	PJM-BA1-PJD	PJD	283
	PJM-BA1-PJM	PJM	120
	PJM-EXT-PJM	PJM	275
PJM Total			678
POD	POD-EXT-POD	POD	760
POD Total			760
PRW	PRW-BA1-PRW	PRW	14
	PRW-EXT-PRW	PRW	3
PRW Total			17
SBL	SBL-BA1-SBL	SBL	147
	SBL-EXT-SBL	SBL	431
SBL Total			578
SPD	SPD-BA1-PJM	PJM	15
	SPD-BA1-SPD	SPD	4,798
	SPD-EXT-SPM	SPM	929
SPD Total			5,742
SPM	SPM-BA1-PJM	PJM	36
	SPM-BA1-SPD	SPD	1,191
	SPM-EXT-SPM	SPM	289
SPM Total			1,516
Salvage Harvest			
		Forest Unit Subtotal	
		Harvest Subtotal	16,223
Natural Disturbance			
		Forest Unit Subtotal	
		Natural Disturbance Subtotal	
		Total	-

2012 - 2022
Forest Management Plan
for the
Whiskey Jack Forest

Supplementary Documentation

Supplementary Documentation

2012-2022 Whiskey Jack Forest
Forest Management Plan



List of Supplementary Documentation

A Analysis Package (separate file MU490_2012_FMP_P1_TXT_AnPack)

B Aboriginal Background Information Reports (retained at Kenora MNR District Office)

C Summary of Aboriginal Involvement (retained at Kenora MNR District Office)

D Social and Economic Description, including community demographic profiles.

E Monitoring Programs for Exceptions

F Monitoring Program for Regeneration Success

G Roads Planning Documentation

H Area of Concern (AOC) Planning Documentation

I Summary of Public Consultation, including:
(i) a summary of all comments received and the consideration of those comments;
(ii) a summary of issue resolution; and
(iii) a summary of each stage of consultation.

J Local Citizens Committee Report

K Final List of Required Alterations,
and a List of Major Changes from the Draft to Final Plans

L Planning Team Terms of Reference

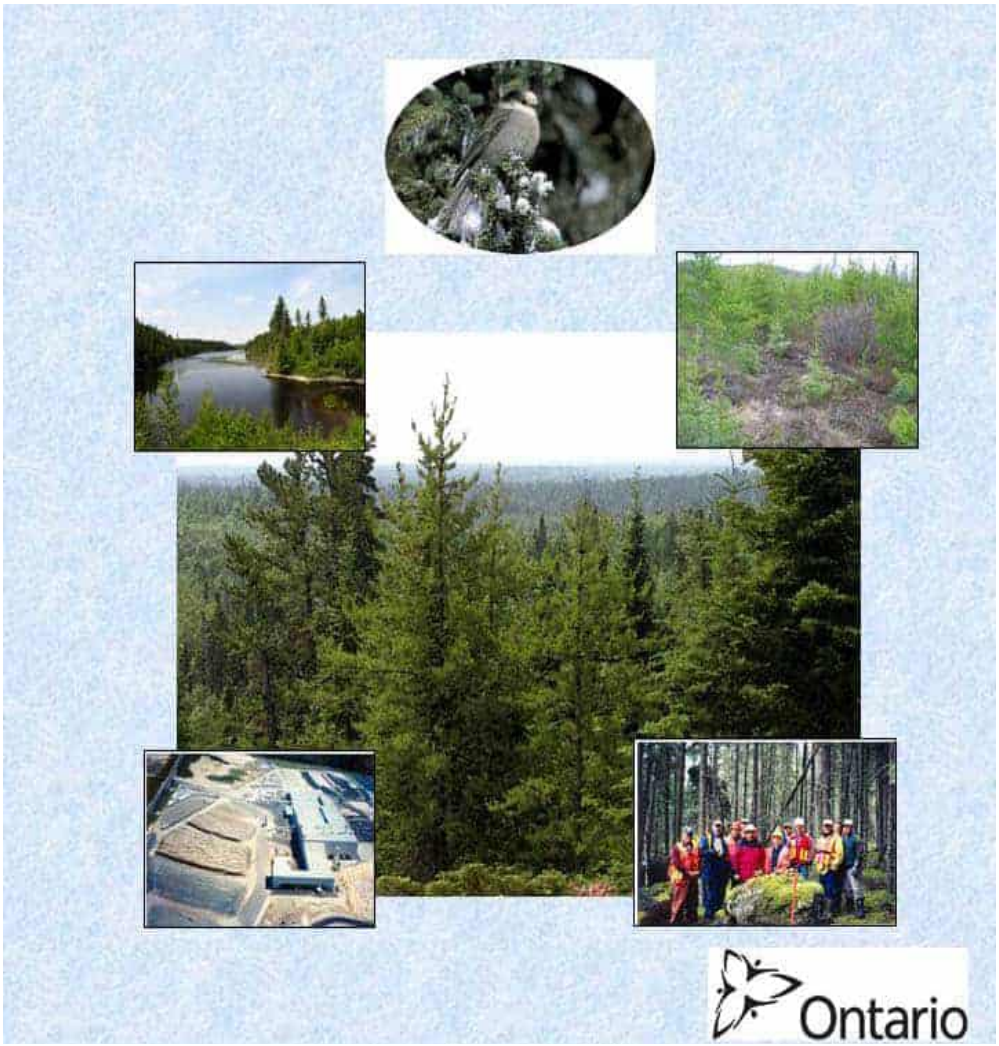
M Statement of Environmental Values (SEV)

N Spatial Analysis Reports, including:
- i) Caribou Habitat Analysis
- ii) Marten Habitat Analysis
- iii) Landscape Pattern (OLT and NDPE indicators)

Supplementary Documentation B

2012-2022 Whiskey Jack Forest Management Plan

Aboriginal Background Information Reports



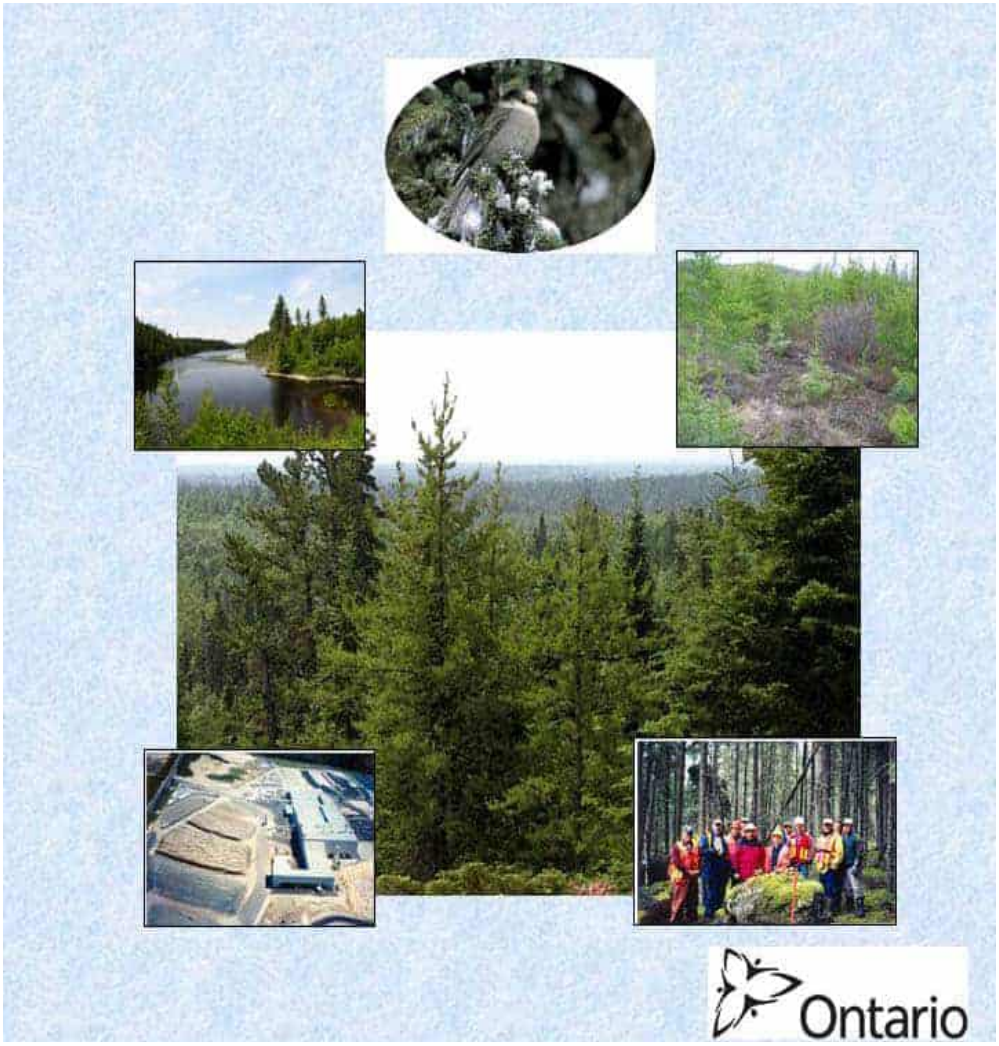
This report is retained at the

Ministry of Natural Resources District Office in Kenora.

Supplementary Documentation C

2012-2022 Whiskey Jack Forest Management Plan

Summary of Aboriginal Involvement



This report is retained at the

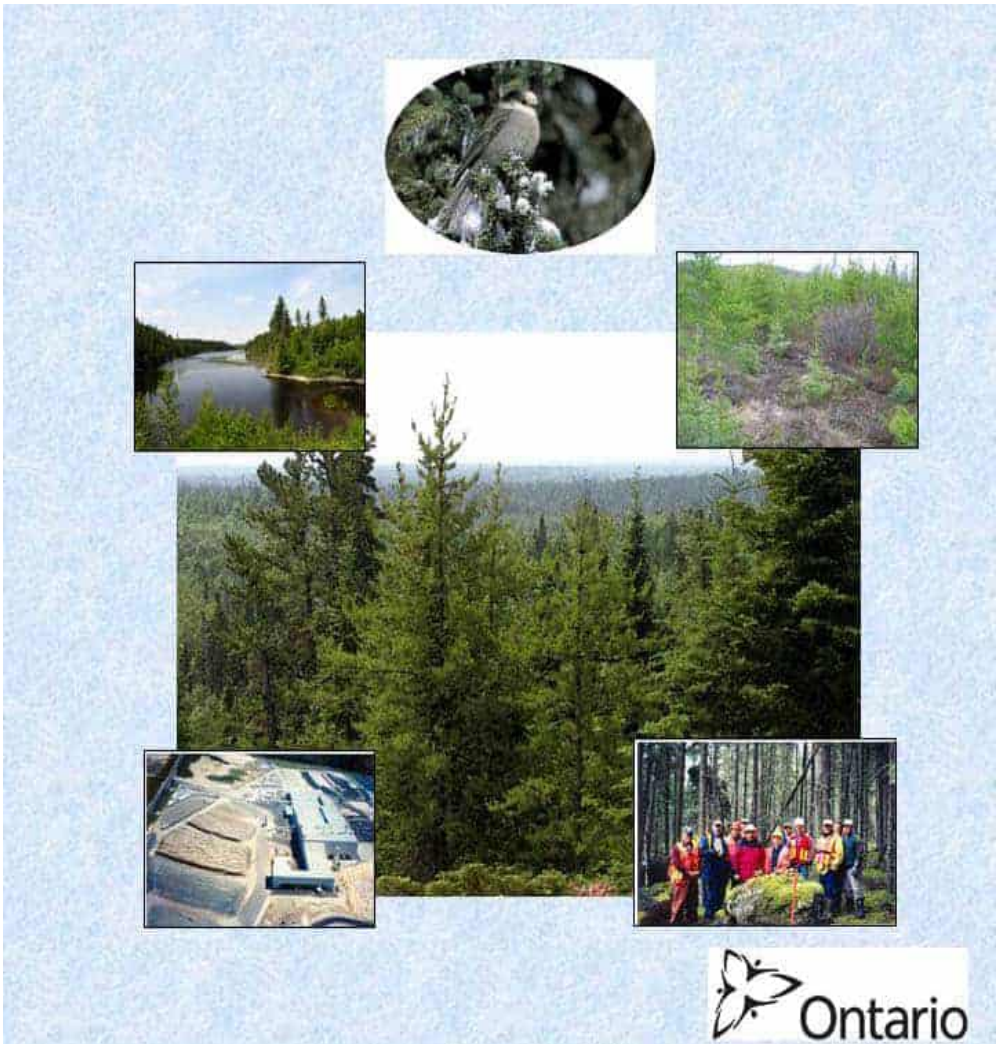
Ministry of Natural Resources District Office in Kenora.

Supplementary Documentation D

2012-2022 Whiskey Jack Forest Management Plan

Social and Economic Information

Includes:
(i) Social and Economic Description (SED);
(ii) Demographic Profiles; and
(iii) Social and Economic Assessment (SEA).



Supplementary Documentation D - Social and Economic Information

Social and economic information in this supplementary document is organized into the following sections:

Part A: Social and Economic Description
- (a) communities that receive substantial amounts of timber, chips or other forest resources from the management unit, and communities that have substantial employment related to the forest industry;
- (b) forest resource-processing facilities; and
- (c) the primary uses and users of the forest.

Part B: Demographic Profiles

Part C: Socio-economic Assessment

Parts A and B have been updated to include current information for this 2012-2022 forest management plan.

A component of forest sustainability is the provision for the needs of individuals who receive benefits from the Whiskey Jack Forest. The Ministry of Natural Resources recognizes that activities within the Whiskey Jack Forest have significant impacts on the local economy, as well as the regional and provincial economies.

Demographic profiles for Whiskey Jack Forest have been produced and are included in this Supplementary Documentation. The socio-economic profile includes a description of the communities that receive substantial amounts of timber, chips or other forest products from the management unit, and communities that have substantial employment related to the forest industry; forest resource-processing facilities; and the primary uses and users of the forest.

Part A: Social and Economic Description

Communities

The Whiskey Jack Forest is located in the Kenora census district as defined in the 2006 Canada Census. A demographic profile was also produced specifically based on wood flow from the Whiskey Jack Forest to communities that have dependent wood processing mills. Crown wood fibre from the Whiskey Jack Forest went to mills in the following census districts in:

a) Kenora
b) Fort Frances
c) Chapple
d) Dryden
e) Sioux Lookout

Demographic profiles are generated by the Ministry of Natural Resources for this management plan with data derived from the standard Canada census. A summary profile, called the Demographic Profile for Wood Flow from FMU-Whiskey Jack Forest, is also produced for the affected area as a whole. The detailed profiles are included in Part B of this Supplementary Documentation.

Demographics and Migration

The following is a summary of the information found in the demographic profiles. These profiles provide information on population, labour force and community dependency on uses of the forest and are discussed below.

Kenora Census District:

i) Kenora Organized:
The total population for the Kenora district, from the 2006 census is 15,177 persons of which 51.2% are female and 48.8.% are male. Average individual income for this district is $31,069 with the average household income of $59,325. The employment rate in Kenora is 91.5% with 52.2% of the labour force being male and 47.8% is female. The portion of the local labour force engaged in the forest industry is 7.4%. This area had a high dependency on the pulp, paper and paperboard mills (16.8) followed by logging (14.6). Employment in Kenora is largest in the sales sector (30.6%). Trades and finance sectors employ 17.5% and 13.1% of the labour force respectively. Employment in the manufacturing sector is tied up in a relatively few number of businesses.

ii) Kenora Unorganized:
This is a subdivision of Kenora Census District and includes the township of Ear Falls, with a total population of 7,041 of which 51% are male and 49% female. The township of Ear Falls has an average population of 1,153. Average individual income for this subdivision is $28,504 with the average household income of $57,921. The employment rate is 68.9% with 55% of the labour force being male and 45% is female. The portion of the labour force that is engaged in forestry activity is 14% with heavy reliance on timber tract operations (76.3%).

Fort Frances Census District:

The total population for the Fort Frances district, from the 2006 census, is 8,103 persons of which 47.9% are male and 52.1% female. The general population trend for this district has been decreasing since 1981 census. Average individual income for this district is $30,443 with the average household income of $55,017. The employment rate in Fort Frances is 93% with 52.3% of the labour force being male and 47.7% female. The portion of the local labour force engaged in the forest industry is 17%. This area has a high dependency on the pulp and paper sector (48%) followed by the veneer, plywood sector (19% indexed to province). Employment in Fort Frances is largest in the forestry sector (14%).

Chapple Census District:

The total population for the Chapple district, west of Fort Frances, from the 2006 census, is 856 persons of which 50.9% are male and 49.1% female. The general population trend for this district has been decreasing since 1981 census. Average individual income for this district is $23,247 with the average household income of $50,563. The employment rate in the Chapple district is 100% with 55% of the labour force being male and 45% female. The portion of the local labour force engaged in the forest industry is 12%. This area has a high dependency on the logging sector (34%) followed by the sawmills and wood preservation sector (19% indexed to province). Employment in the Chapple area is largest in the forestry sector (13%).

Dryden Census District:

The total population for the Dryden district, from the 2006 census, is 8,195 persons of which 49.1% are male and 50.9% female. The general population trend for this district has been decreasing since the 1981 census. Average individual income for this district is $32,568 with the average household income of $62,625. The employment rate in Dryden is 67.5% with 54.3 % of the labour force being male and 45.7% is female. The portion of the local labour force engaged in the forest industry is 19.7%. This area has a high dependency on the pulp and paper sector (64 indexed to province). Employment in Dryden is largest in the sales sector (28.1%).

Sioux Lookout Census District:

The total population for the Sioux Lookout district, from the 2006 census, is 5,183 persons of which 49% are male and 51% female. The general population trend for this district has been stable since 1981 census. Average individual income for this district is $38,971 with the average household income of $79,374. The employment rate in the Sioux Lookout district is 96% with 50% of the labour force being male and 50% female. The portion of the local labour force engaged in the forest industry is 12%. This area has a high dependency on the sawmills and wood preservation sector (67%) followed by the logging sector (23% indexed to province). Employment in the Sioux Lookout district is largest in the forestry sector (10%).

Aboriginal Communities

A number of Aboriginal communities will also be directly affected by forest operations within the Whiskey Jack Forest. These include:

1. Asubpeeschoseewagong Netum Anishnabek First Nation (Grassy Narrows)
2. Naotkamegwanning First Nation No. 32A *(*Whitefish Bay)
3. Wabaseemoong Independent Nations (Whitedog)
4. Wabauskang First Nation No.21
5. Ochiichagwe'babigo'inning First Nation (Dalles)
6. Kenora Métis Council

Please refer to the Aboriginal demographics for these communities within Part B of this supplementary Documentation, as well as the Aboriginal Background Information Report (retained on file in the Kenora District MNR office) for additional details regarding the First Nation communities.

Industrial and non-Industrial Uses of the Forest

There are many resource-based activities that occur on the Whiskey Jack Forest, including forestry, recreation and tourism, mining, aggregate and hydro generation, trapping and bait-harvesting. Together, these activities form the social and economic environment that is affected by decisions made through the forest management planning process.

Timber

Timber Licences

The Whiskey Jack Forest is a Crown unit managed by the Ministry of Natural Resources, Kenora District. Wood supply Commitments in the now expired SFL document will be used as objectives in the development of the 2012 Whiskey Jack Forest Management Plan.

Background information for this section was obtained from TREES and *"An Economic Impact Analysis of the Northwestern Ontario Forest Sector (2006)",* This report provided projections about future trends for the industry on the Whiskey Jack Forest. The forestry report was prepared by B. Moazzami, Ph.D.in association with the Northwestern Ontario Forest Council (NOFC) for the year 2006. This information, provided by NOFC has been included in this plan as supplementary documentation; however, it has not been verified for accuracy, quality or completeness by the planning team. Due to the extent of the study area comprising of most of Northwestern Ontario it was decided to use the Kenora subregion in this report. The full details of this report are found Appendix 2.

The forestry industry is the predominant employer for 350 communities in Canada. Approximately 285 communities in Ontario are somewhat forest dependent. Seventy of these are considered moderately to highly dependent since more than 50% of their employment directly or indirectly depend on the forestry industry. Of the 285 communities, 32% or about 90 communities are in Northwestern Ontario.

Northwestern Ontario's forestry industry directly employed about 12,935 people in 2001. Average annual wages and salaries ranged from $22,275 for forestry services to $42,508 in forestry and logging and $57,345 in pulp and paper industries. The overall average annual wages and salaries in the forestry industry equalled $48,244.38 in 2001 compared to the average earnings of $31,362 in Northwestern Ontario. In other words, the average earnings in the forestry industry are 54% higher than the overall average earnings in Northwestern Ontario. Note that these wages and salaries do not include fringe benefits. With fringe benefits, the average compensation and benefits in Northwestern Ontario's forestry industry equalled $62,143.58 in 2001 dollars.

Community dependency on forestry employment in Kenora sub-regions is 19.8% with the regional average being 27%. Community dependency on forestry income according to the report was 25.5% and the regional average being 35%.

Wood Supply Commitments

As there is no SFL in the Whiskey Jack Forest; commitments found in the old SFL document will be used to analyze wood supply in strategic modelling. This document describes two types of wood supply commitments found in Paragraph 3.0 and appendix E. The SFL wording of those commitments follows:

"3.0 WOOD SUPPLY COMMITMENTS AND OVERLAPPING LICENCES"

3.1 The forest resources harvested pursuant to this licence are to provide a supply of forest resources to the existing forest resource processing facility of the Company

located at Kenora and Fort Frances, Ontario and to the beneficiaries of forest resource supply commitments identified in Appendix "E" hereto.

3.2 Subject to complying with the wood supply commitments described in Appendix "E" and the conditions in Appendix F, the Company shall be entitled to harvest and utilize the full available harvest described in the Forest Management Plan for the Whiskey Jack Forest.

APPENDIX "E" WOOD SUPPLY COMMITMENTS

The Company shall comply with the following wood supply commitments on the Whiskey Jack Forest:

1) To make available, through long term memorandum of agreement, hardwood veneer quality fibre (poplar), annually, to Columbia Forest Products Inc. for use in their core veneer mill to be constructed in Northwestern Ontario. This supply of hardwood veneer quality fibre is subject to the fulfillment of conditions as described in a letter dated March 31, 1995 from the Minister of Natural Resources to Mr. Harry Demorest, President and Chief Executive Officer of Columbia Forest Products Inc. The Company must provide a copy of the memorandum of agreement negotiated as a result of this condition of the SFL to the Ministry upon request.

2) To make available annually, through a long term memorandum of agreement, all aspen poplar and white birch non-veneer roundwood to Weyerhaeuser Company Limited for use in their laminated strand lumber mill located at Kenora, Ontario. This wood supply is consistent with a letter dated June 16, 1999 from the Minister of Natural Resources to Mr. Thomas H. Denig, President and CEO, Trus Joist MacMillan (now Weyerhaeuser Company Limited). The Company must provide a copy of the memorandum of agreement negotiated as a result of this condition of the SFL to the Ministry upon request.

3) To make available annually, through a long term memorandum of agreement, 133,000 cubic metres of jack pine, spruce, and balsam fir coniferous fibre material, to Kenora Forest Products Ltd. For use in their sawmill at Kenora, Ontario. This supply of coniferous fibre material is consistent with a letter dated November 16, 1994 from the Minister of Natural Resources to Maureen Prendiville, President of Prendiville Industries. The Company must provide a copy of the memorandum of agreement negotiated as a result of this condition of the SFL to the Ministry upon request.

In addition to these commitments wood is made available through overlapping licences to people wishing to harvest fuelwood from the forest or for small quantities of building logs (e.g. trapper cabins). The Ministry of Natural Resources and Abitibi work cooperatively to provide these small quantities of wood.

Harvest and Wood Utilization

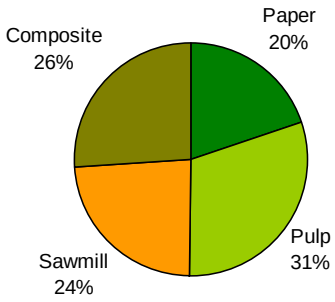
Information in this report was provided by the Ministry of Natural Resources scaling and billing system (TREES). TREES provides detailed information regarding harvest (e.g. species, volumes) and utilization (e.g. mill destination). The information covers the nine-year period from 2004/05 to 2012/13 inclusive.

This information will be useful in determining an appropriate target for wood supply in the 2012/22 FMP. With recent closures of mills, demand for wood supply will have to be re-evaluated. Analysis regarding future demand or utilization from the forest will consider the SFL commitments and the current industrial capacity.

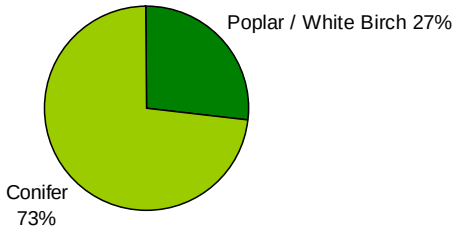
Over the nine year period, 2,391,486 cubic metres were harvested and utilized from the forest. The average annual volume harvested from the forest was 265,721 cubic metres of jack pine, spruce, poplar and white birch.

The majority of wood harvested was utilized at eighteen mills producing a variety of products including pulp, paper, lumber, composite boards, sawlogs and veneer.

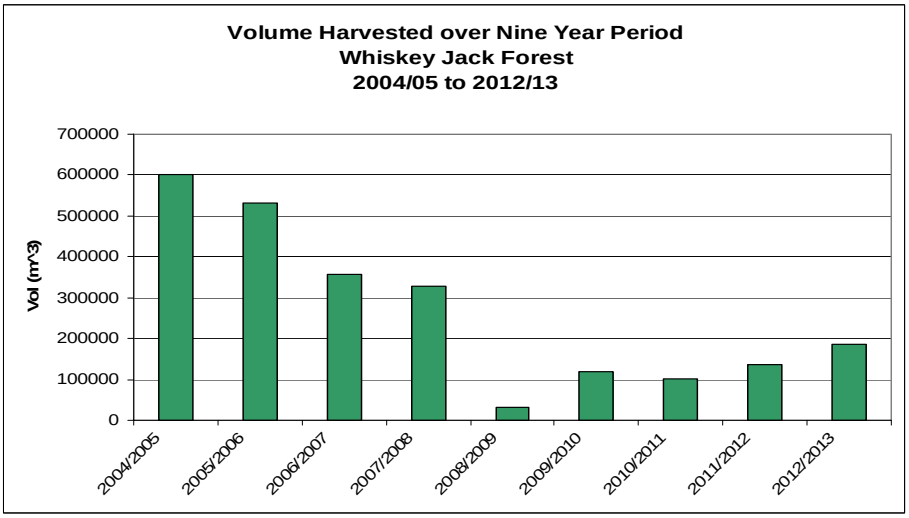
Products From Whiskey Jack Forest
Nine Year Totals
2004/05 to 2012/13



Species Groups Harvested
Whiskey Jack Forest
Nine Year Totals
2004/05 to 2012/13



Volume Harvested over Nine Year Period
Whiskey Jack Forest
2004/05 to 2012/13



Whiskey Jack Forest
Timber Use
2004/05 to 2012/13

Company Name	Mill Destination	Product	Species Sector	2004/2005	2005/2006	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011	2011/2012	2012/2013	Total	Share
Abitibi Consolidated	Kenora	Paper	Conifer	194,257	71,138								265,395	11%
Kenora Forest Products	Kenora	Sawmill	Conifer	154,721	155,265	131,192	80,766						521,944	22%
Weyerhaeuser	Kenora	Composite	Poplar / White Birch	152,768	204,695	120,908	100,110	19,071		5,334	4,060	18,175	625,120	26%
Abitibi Consolidated	Fort Frances	Pulp	Conifer	49,358	34,835	26,132	99,227	2,195					211,746	9%
Abitibi Consolidated	Fort Frances	Paper	Conifer	33,250	48,209	71,565	44,519	702					198,245	8%
Abitibi Consolidated	Thunder Bay	Paper	Conifer	0	60	0	0	0					60	0%
Ainsworth	Barwick	Composite	Poplar / White Birch	682		0	0	0	477				1,159	0%
McKenzie Forest Products	Hudson	Sawmill	Conifer	1,663	9,383	0	0	0					11,046	0%
Domtar	Dryden	Paper	Conifer	21	0	0	0	0					21	0%
Domtar	Dryden	Pulp	Conifer	32	0	0	0	0	116,201	95,887	130,942	167,375	510,437	21%
Devlin Timber	Kenora	Sawmill	Conifer	5,751	0	0	0	0					5,751	0%
Domtar	Ear Falls	Sawmill	Conifer	6,152	0	0	0	8,744					14,896	1%
Multiply	Nipigon	Composite	Poplar / White Birch	2,580	6,522	7,967	0	0					17,069	1%
Longlac Wood Industries	Longlac	Composite	Poplar / White Birch	-	-	-	1,748	0					1,748	0%
E&G Custom Sawing	Kenora	Sawmill	Conifer	0	0	0	0	288	252				540	0%
Wincrief Forestry Products	White Dog	Sawmill	Red Pine / White Pine									170	170	0%
1423 1358807 Ontario Ltd.	Perrault Falls	Sawmill	Conifer						1,959	335			2,294	0%
Misc.	Kenora	Building	Conifer	5	0	0	0	0					5	0%
Misc.	Kenora	Building	Poplar / White Birch	125	0	0	0	0					125	0%
Misc.	Kenora	Fuelwood	Poplar / White Birch	0	38			52					90	0%
Misc.	Kenora	Sawmill	Red Pine / White Pine Category 1	0	1,433	0	0	0					1,433	0%
Misc.	Kenora	Fuelwood	Conifer	0	26	454	634	78	1,000				2,192	0%
			Total	601,365	531,602	358,219	327,003	31,130	119,889	101,556	135,002	185,720	2,391,486	

Note: This red and white pine was originally identified as fuelwood in TREES but was utilized as sawlogs.
The data for this report includes both invoiced and undersize material which is consistent with the way volume is reported in the annual reports. The information is approximately equal to the annual report values. The Devlin sawmill closed in 2004. The Abitibi paper mill in Kenora closed in November 2005. One paper machine was closed at the Dryden mill in 2005.

Whiskey Jack Forest
Species Groups
2004/05 to 2012/13

Species Sector	Company Name	Mill Destination	Product	2004 2005	2005 2006	2006 2007	2007 2008	2008 2009	2009 2010	2010 2011	2011 2012	2012 2013	Total	Share
				Volume m3										
Conifer	Abitibi Consolidated	Kenora	Paper	194,257	71,138								265,395	11%
	Kenora Forest Products	Kenora	Sawmill	154,721	155,265	131,192	80,766						521,944	22%
	Abitibi Consolidated	Fort Frances	Pulp	49,358	34,835	26,132	99,227	2,195					211,746	9%
	Abitibi Consolidated	Fort Frances	Paper	33,250	48,209	71,565	44,519	702					198,245	8%
	Abitibi Consolidated	Thunder Bay	Paper	0	60	0	0	0					60	0%
	McKenzie Forest Products	Hudson	Sawmill	1,663	9,383	0	0	0					11,046	0%
	Domtar	Dryden	Paper	21	0	0	0	0					21	0%
	Domtar	Dryden	Pulp	32	0	0	0	0	116,201	95,887	130,942	167,375	510,437	21%
	Devlin Timber	Kenora	Sawmill	5,751	0	0	0	0					5,751	0%
	Domtar	Ear Falls	Sawmill	6,152	0	0	0	8,744					14,896	1%
	E&G Custom Sawing	Kenora	Sawmill	0	0	0	0	288	252				540	0%
	1358807 Ontario Ltd.	Perrault Falls	Sawmill	5	0	0	0	0	1,959	335			2,299	0%
	Misc.	Kenora	Fuelwood	0	26	454	634	78	1,000				2,192	0%
Subtotal				445,209	318,915	229,343	225,146	12,007	119,412	96,222	130,942	167,375	1,744,571	73%
Poplar / White Birch	Weyerhaeuser	Kenora	Composite	152,768	204,695	120,908	100,110	19,071		5,334	4,060	18,175	625,120	26%
	Ainsworth	Barwick	Composite	682		0	0	0	477				1,159	0%
	Multiply	Nipigon	Composite	2,580	6,522	7,967	0	0					17,069	1%
	Longlac Wood Industries	Longlac	Composite	-	-	-	1,748	0					1,748	0%
	Misc.	Kenora	Building	125	0	0	0	0					125	0%
	Misc.	Kenora	Fuelwood	0	38			52					90	0%
Subtotal				156,155	211,254	128,876	101,857	19,123	477	5,334	4,060	18,175	645,311	27%
Red Pine / White Pine	Wincrief Forestry Products L.P.	White Dog	Sawmill	0		0	0	0				170	170	0%
	Misc.	Kenora	Sawmill	0	1,433	0	0	0					1,433	0%
Subtotal				0	1,433	0	0	0	0	0	0	170	1,603	0%
	Grand total			601,365	531,602	358,219	327,003	31,130	119,889	101,556	135,002	185,720	2,391,486	

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Whiskey Jack Forest
Product
2004/05 to 2012/13

Production	Invoice Destination	Mill Destination	Species Sector	2004 2005	2005 2006	2006 2007	2007 2008	2008 2009	2009 2010	2010 2011	2011 2012	2012 2013	Grand Total	Share
				Volume m3										
Paper	Abitibi Consolidated	Kenora	Conifer	194,257	71,138								265,395	11%
	Abitibi Consolidated	Fort Frances	Conifer	33,250	48,209	71,565	44,519	702					198,245	8%
	Abitibi Consolidated	Thunder Bay	Conifer	0	60	0	0	0					60	0%
	Domtar	Dryden	Conifer	21	0	0	0	0					21	0%
Total				227,528	119,406	71,565	44,519	702	-	-	-	-	463,721	19%
Pulp	Abitibi Consolidated	Fort Frances	Conifer	49,358	34,835	26,132	99,227	2,195					211,746	9%
	Domtar	Dryden	Conifer	32	0	0	0	0	116,201	95,887	130,942	167,375	510,437	21%
Total				49,390	34,835	26,132	99,227	2,195	116,201	95,887	130,942	167,375	722,183	30%
Sawmill	Kenora Forest Products	Kenora	Conifer	154,721	155,265	131,192	80,766						521,944	22%
	McKenzie Forest Products	Hudson	Conifer	1,663	9,383	0	0	0					11,046	0%
	Devlin Timber	Kenora	Conifer	5,751	0	0	0	0					5,751	0%
	Domtar	Ear Falls	Conifer	6,152	0	0	0	8,744					14,896	1%
	E&G Custom Sawing	Kenora	Conifer	0	0	0	0	288	252				540	0%
	Wincrief Forestry Products L.P.	White Dog	Red Pine / White Pine									170	170	0%
	1423 1358807 Ontario Ltd.	Perrault Falls	Conifer						1958.7	335.11			2,294	0%
	Misc.	Kenora	Red Pine / White Pine	0	1,433	0	0	0					1,433	0%
Total				168,286	166,081	131,192	80,766	9,032	2,211	335	-	170	558,074	23%
Composite	Weyerhaeuser	Kenora	Poplar / White Birch	152,768	204,695	120,908	100,110	19,071	0	5334	4060	18175	625,120	26%
	Ainsworth	Barwick	Poplar / White Birch	682		0	0	0	477				1,159	0%
	Multiply	Nipigon	Poplar / White Birch	2,580	6,522	7,967	0	0					17,069	1%
	Longlac Wood Industries	Longlac	Poplar / White Birch	-	-	-	1,748	0					1,748	0%
Total				156,030	211,217	128,876	101,857	19,071	477	5,334	4,060	18,175	645,096	27%
Building	Misc.	Kenora	Conifer	5	0	0	0	0					5	0%
	Misc.	Kenora	Poplar / White Birch	125	0	0	0	0					125	0%
Total				130	-	-	-	-	-	-	-	-	130	0%
Fuelwood	Misc.	Kenora	Poplar / White Birch	0	38			52	1000				1,090	0%
	Misc.	Kenora	Conifer	0	26	454	634	78					1,192	0%
Total				-	63	454	634	130	1,000	-	-	-	2,281	0%
	Grand Total			601,365	531,602	358,219	327,003	31,130	119,889	101,556	135,002	185,720	2,391,485	

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Whiskey Jack Forest
Timber Use by Company
2004/05 to 2012/13

Company Name	Mill Destination	Product	Species Sector	2004 2005	2005 2006	2006 2007	2007 2008	2008 2009	2009 2010	2010 2011	2011 2012	2012 2013	Total	Share
				Volume m3										
Abitibi Consolidated	Kenora	Paper	Conifer	194,257	71,138								265,395	11%
	Fort Frances	Pulp	Conifer	49,358	34,835	26,132	99,227	2,195					211,746	9%
		Paper	Conifer	33,250	48,209	71,565	44,519	702					198,245	8%
	Thunder Bay	Paper	Conifer	0	60	0	0	0					60	0%
Total				276,865	154,241	97,697	143,746	2,897					675,446	28%
Kenora Forest Products	Kenora	Sawmill	Conifer	154,721	155,265	131,192	80,766						521,944	22%
Total				154,721	155,265	131,192	80,766	0					521,944	22%
Weyerhaeuser	Kenora	Composite	Poplar / White Birch	152,768	204,695	120,908	100,110	19,071	0	5334.1	4059.78	18174.78	625,120	26%
Total				152,768	204,695	120,908	100,110	19,071	0	5,334	4,060	18,175	625,120	26%
Domtar	Dryden	Paper	Conifer	21	0	0	0	0					21	0%
		Pulp	Conifer	32	0	0	0	0	116,201	95,887	130,942	167,375	510,437	21%
	Ear Falls	Sawmill	Conifer	6,152	0	0	0	8,744					14,896	1%
Total				6,206	0	0	0	8,744	116,201	95,887	130,942	167,375	525,354	22%
Ainsworth	Barwick	Composite	Poplar / White Birch	682		0	0	0	477				1,159	0%
McKenzie Forest Products	Hudson	Sawmill	Conifer	1,663	9,383	0	0	0					11,046	0%
Multiply Forest Products Inc.	Nipigon	Composite	Poplar / White Birch	2,580	6,522	7,967	0	0					17,069	1%
Devlin Timber	Kenora	Sawmill	Conifer	5,751	0	0	0	0					5,751	0%
E&G Custom Sawing	Kenora	Sawmill	Conifer	-	-	-	-	288	252				540	0%
Wincrief Forestry Products L.P.	White Dog	Sawmill	Red Pine/White Pine									170	170	0%
1358807 Ontario Ltd.	Perrault Falls	Sawmill	Conifer						1,959	335			2,294	0%
Longlac Wood Industries	Longlac	Composite	Poplar / White Birch	0	0	0	1,748	0					1,748	0%
Total				10,676	15,905	7,967	1,748	288	2,688	335	0	170	39,777	2%
Misc.	Kenora	Building	Conifer	5	-	-	-	-					5	0%
Misc.	Kenora	Building	Poplar / White Birch	125	-	-	-	-					125	0%
Misc.	Kenora	Fuelwood	Poplar / White Birch	-	38			52					90	0%
Misc. (see note)	Kenora	Sawmill	Red Pine / White Pine	-	1,433	-	-	-					1,433	0%
Misc.	Kenora	Fuelwood	Conifer	-	26	454	634	78	1,000				2,192	0%
Total				130	1,496	454	634	130	1,000	0	0	0	3,844	0%
Grand total				601,365	531,602	358,219	327,003	31,130	119,889	101,556	135,002	185,720	2,391,485	

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Chips

The Kenora Forest Products in Kenora and Domtar Inc. in Ear Falls sawmills produces chips, both jack pine and spruce. The Domtar Inc. paper mill in Dryden used those chips in their process.

Facilities Utilizing Wood from the Forest

There are three facilities named in the SFL as beneficiaries of wood from the forest:

1. Abitibi-Consolidated (Kenora)

Number of Employees: Mill N/A
Woodlands N/A
Contractors N/A
Products: N/A
Ownership: N/A
Upgrades: N/A
Downtime: Closed November 2005

2. Trus Joist Weyerhaeuser (Kenora)

Number of Employees: Mill 214
Woodlands 6
Contractors 150
Products: Laminated Strand Lumber (LSL) used for concrete edge forms, beams, headers, flange stock, rim board, shear panels and wall framing (premium lumber).
Ownership: Weyerhaeuser (since 2001)
Upgrades: Construction began in October 2000 and began operations in October 2002. Combustor upgrades
Downtime: Temporary shutdown in January 2007, laid off 100 workers with 41 other jobs permanently lost. Currently operating 3 shifts/week.

3. Resolute Forest Products (Abitibi-Consolidated (Fort Frances))

Number of Employees: Mill - 720 salaried and hourly
Woodlands - 30 salaried
Contractors - 65 harvesting
- 25 silviculture
- 10 road construction
- 18 road maintenance

Products: Uncoated groundwood specialty paper and northern bleached softwood pulp
Ownership: Abitibi-Consolidated Company of Canada has developed through a series of acquisitions, divestitures and mergers over time. The key developments associated with the Fort Frances Mill are summarized as follows:

Abitibi-Consolidated Inc. was formed by the merger of Abitibi-Price and Stone-Consolidated in May 1997. Stone-Consolidated's assets included eight pulp and paper mills, including the Fort Frances and Kenora operations. On April 18, 2000

Abitibi-Consolidated Inc. announced that it had acquired Donohue Inc. The combined Company operations in Canada became Abitibi-Consolidated Company of Canada. Resolute was formed as merger of Abitibi and Bowater Inc. in 2010.

Upgrades: No significant changes in production capacity, but a significant change has occurred in the grade mix, as a result of the peroxide bleaching addition at the Fort Frances mill in 2001. As a result, Fort Frances now produces a higher proportion of Very High Brite (VHB) grades (those 75 brite and higher). In February 2009, the biomass boiler was accepting hog fuel and operating at full steam.

Downtime: The last significant downtime for the Fort Frances mill was in 1998, when a five-month shutdown resulted from a labour dispute. Although there has not been any significant downtime at the Fort Frances mill since 2000, market related down time at the Boise mill in International Falls, MN has caused the Fort Frances kraft mill to slow down the production of kraft pulp on a periodic basis. In 2013, Resolute laid off 240 staff due to curtailment of the kraft mill and one paper machine.

4. <u>Kenora Forest Products (Kenora) (currently closed)</u>

Number of Employees: Mill 109
Woodlands

Products: 2x4 and 2x6 kiln dried studs in 48'' to 104'' lengths for building purposes
1x4 rough green solid wood products in 48'' to 104'' lengths
Planer shavings, sawdust and bark used in Dryden, Wisconsin and Atikokan

Ownership: Prendiville (since 1994)

Upgrades: Production and recovery improvements

Downtime: Idled Indefinitely

5. <u>Devlin Timber (Kenora)</u>

The Devlin Timber sawmill ceased operations in 2004 due to a series of production, economic, and operational problems. In April of 2005 the assets of the mill were sold at a public auction. The mill is no longer in operation.

<u>A number of other facilities received wood from the forest during the 2004/2012 period. Significant users are listed below.</u>

6. <u>Mackenzie Forest Products (Hudson)</u>

Number of Employees: Mill 350
Woodlands 325

Products: Primarily 2x4 studs and some additional products such as 1x4 and 2x3 lumber.

Ownership: Buchanan Forest Group

Upgrades: Last major upgrade 1998 $20 million capital for a new DDM line (small diameter wood)

Downtime: Mill shutdown in September 2008.

7. Domtar Inc. (Dryden)

Number of Employees: Mill, woodlands, and contractors employ approximately 1,125 people
Products: Hardwood pulp and majority of softwood pulp used internally as feed stock for fine paper machine (720/fine paper). Mill complex contains two fine paper machines as well as converting facilities that convert paper rolls into cut sheets.
A sawmill operated on the site until 2004. Chips from the sawmill were used to supplement the roundwood in the Kraft papermaking process.
Ownership: Domtar Inc. has owned and operated Dryden pulp & paper mill since 2007.
Upgrades: Recent upgrades include construction of a new recovery boiler primarily to reduce emissions and odours. Project completed early in 2004 at a cost in excess of $250 million.
Downtime: No major downtime over past few years. Some idle time on paper machines due to soft markets.
In 2004 the sawmill was closed and operations were shifted to Ear Falls.
In 2005 one paper machine was closed. In November 2008, Domtar permanently shut down a paper machine affecting 195 employees.

8. EACOM Sawmill (Ear Falls) (currently **closed)**

Number of Employees:	Mill	189
	Woodlands	6
	Contractors	

Products: Stud Lumber Production
Ownership: EACOM has operated the facility since taking over from Domtar in 2010
Upgrades: Recent upgrades include new plant/equipment worth $1.6 million
Downtime: Idled since December 2009

9. Multiply/Levesque Plywood Limited (Nipigon) (operating as Columbia Forest Products) **MILL BURNT DOWN 2006, NOT REBUILT.**

10. Ainsworth Engineered Corp. (formerly Voyageur Panel Ltd.) (Barwick)

Number of Employees: Mill - 152
Products: Variety of value-added OSB products, including premium floor underlayment, rimboard and webstock, in addition to commodity structural sheathing panels.
Ownership: Ainsworth Engineered Corp. - mill purchased from Voyageur Panel Limited in May of 2004
Upgrades: None under new ownership.
Downtime: None under new ownership.

Volume and Value Report
Whiskey Jack Forest

Year	Species Sector	Volume m3	Undersize m3	Total Volume m3	Stumpage $	Residual $	Total Crown Charges	Renewal $	Future $	FRI$	Total $	Average Stumpage per m3
2004 2005	Conifer	433,218	11,991	445,209	$ 1,559,586	$ 446,584	$ 2,006,170	$2,599,310	$207,945		$ 4,813,425	$ 4.51
	Hemlock / Cedar	100	-	100	$ 361	$ 291	$ 652	$ 301	$ 48		$ 1,001	$ 6.49
	Poplar / White Birch	145,228	10,927	156,155	$ 522,819	$ 611,230	$ 1,134,049	$ 145,229	$ 69,710		$ 1,348,987	$ 7.26
	Annual Total	**578,546**	**22,918**	**601,464**	**$ 2,082,767**	**$ 1,058,104**	**$ 3,140,871**	**$2,744,841**	**$277,702**		**$ 6,163,414**	$ 5.22
											$ -	
2005 2006	Conifer	309,601	9,407	319,008	$ 1,104,379	$ 5,287	$ 1,109,665	$1,769,763	$148,706		$ 3,028,134	$ 3.48
	Hemlock / Cedar	0	-	0	$ 1	$ -	$ 1	$ 629	$ 101		$ 730	$ 3.72
	Poplar / White Birch	198,700	12,554	211,254	$ 659,814	$ 133,687	$ 793,502	$ 84,626	$ 81,240		$ 959,368	$ 3.76
	Red Pine / White Pine Category 1	1,252	-	1,252	$ 4,658	$ -	$ 4,658	$ 7,513	$ 601		$ 12,772	$ 3.72
	Red Pine / White Pine Category 2	181	-	181	$ 107	$ -	$ 107	$ 1,087	$ 87		$ 1,281	$ 0.59
	Annual Total	**509,735**	**21,961**	**531,696**	**$ 1,768,959**	**$ 138,974**	**$ 1,907,933**	**$1,863,618**	**$230,735**		**$ 4,002,286**	$ 3.59
											$ -	
2006 2007	Conifer	224,400	4,943	229,343	$ 699,836	$ -	$ 699,836	$1,018,565	$117,223		$ 1,835,624	$ 3.05
	Poplar / White Birch	123,039	5,837	128,876	$ 397,102	$ -	$ 397,102	$ 111,273	$106,821		$ 615,196	$ 3.08
	Annual Total	**347,439**	**10,780**	**358,219**	**$ 1,096,938**	**$ -**	**$ 1,096,938**	**$1,129,838**	**$224,044**		**$ 2,450,820**	$ 3.06
											$ -	
2007 2008	Conifer	218,699	6,447	225,146	$ 618,229	$ -	$ 618,229	$1,052,375	$104,168		$ 1,774,772	$ 2.75
	Poplar / White Birch	96,840	5,017	101,857	$ 278,063	$ -	$ 278,063	$ 134,559	$ 46,416		$ 459,038	$ 2.73
	Annual Total	**315,539**	**11,464**	**327,003**	**$ 896,291**	**$ -**	**$ 896,291**	**$1,186,935**	**$150,584**		**$ 2,233,810**	$ 2.74
											$ -	
2008 2009	Conifer	11,813	194	12,007	$ 34,023	$ -	$ 34,023	$ 35,441	$ 5,670		$ 75,134	$ 2.83
	Poplar / White Birch	18,398	725	19,123	$ 3	$ -	$ 3	$ 18,398	$ 8,754		$ 27,155	$ 0.00
	Annual Total	**30,211**	**918**	**31,130**	**$ 34,026**	**$ -**	**$ 34,026**	**$ 53,839**	**$ 14,424**		**$ 102,289**	$ 1.09
2009 2010	Conifer	48,062	6,035	12,007	$ 118,929		$ 118,929	$ 264,341	$ 23,070	$ 76,685	$ 483,025	$ 9.90
	Poplar / White Birch	3,186	168	19,123			$ -	$ 2,389	$ 1,529	$ 1,880	$ 3,918	$ -
	Annual Total	**51,248**	**6,203**	**31,130**	**$ 118,929**	**$ -**	**$ 118,929**	**$ 266,730**	**$ 24,599**	**$ 78,565**	**$ 410,258**	$ 3.82
2010 2011	Conifer	33,945	3,667	12,007	$ 97,222		$ 97,222	$ 186,699	$ 16,294	$ 38,559	$ 338,773	$ 8.10
	Poplar / White Birch	9,041	762	19,123	$ 5,334		$ 5,334	$ 6,781	$ 4,340		$ 16,454	$ 0.28
	Annual Total	**42,986**	**4,428**	**31,130**	**$ 102,556**	**$ -**	**$ 102,556**	**$ 460,210**	**$ 45,232**	**$117,124**	**$ 607,998**	$ 3.29
2011 2012	Conifer	56,982	6,527	12,007	$ 130,942		$ 130,942	$ 341,891	$ 27,351	$103,827	$ 500,184	$ 10.91
	Poplar / White Birch	8,658	1,040	19,123	$ 4,067		$ 4,067	$ 6,493	$ 4,156	$ 1,041	$ 15,757	$ 0.21
	Annual Total	**65,639**	**7,566**	**31,130**	**$ 135,009**	**$ -**	**$ 135,009**	**$ 348,384**	**$ 31,507**	**$104,868**	**$ 514,900**	$ 4.34
2012 2013	Conifer	39,290	4,304	12,007	$ 167,375	$ -	$ 167,375	$ 225,917	$ 18,859		$ 412,152	$ 13.94
	Poplar / White Birch	32,010	3,835	19,123	$ 18,175	$ -	$ 18,175	$ 18,353	$ 15,365	$ 533	$ 51,892	$ 0.95
	Red Pine / White Pine Category 1	39	-		$ 165			$ 155	$ 19			
	Red Pine / White Pine Category 2	10	-		$ 6			$ 39	$ 5			
	Annual Total	**71,300**	**8,139**	**31,130**	**$ 185,550**	**$ -**	**$ 185,550**	**$ 244,270**	**$ 34,224**	**$ 533**	**$ 464,044**	$ 5.96
Nine Years	Conifer	1,342,065	49,847	1,266,734	$ 4,433,297	$ 451,871	$ 4,885,168	$7,307,603	$652,993	$180,513	$ 12,922,450	$ 3.86
	Hemlock / Cedar	101	-	101	$ 363	$ 291	$ 653	$ 930	$ 149	$ -	$ 1,732	$ 10.22
	Poplar / White Birch	635,099	40,865	693,756	$ 1,885,377	$ 744,917	$ 2,630,294	$ 528,102	$338,329	$ 3,454	$ 3,497,766	$ 3.79
	Red Pine / White Pine Category 1	1,262	-	1,252	$ 4,664	$ -	$ 4,658	$ 7,552	$ 606	$ -	$ 12,772	$ 3.72
	Red Pine / White Pine Category 2	191	-	181	$ 113	$ -	$ 107	$ 1,126	$ 92	$ -	$ 1,281	$ 0.59
	Grand Total	**1,978,718**	**90,712**	**1,962,024**	**$ 6,323,814**	**$ 1,197,078**	**$ 7,520,881**	**$7,845,313**	**$992,168**	**$ 3,454**	**$ 16,436,001**	**$ 3.83**

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Notes for the volume and value table:

- Volume m3 is the invoiced volume.
- Undersize is the additional volume below the scaling manual minimum size.
- Undersize was free of Crown charges.
- Stumpage is the minimum Crown charge.
- Residual value fluctuates based on market conditions and the value of the product.
- Both are combined for the total stumpage charge.
- Renewal refers to contributions to the Forest Renewal Trust (FRT) account for the Whiskey Jack Forest.
- Future refers to the contribution to the Forest Futures Trust (FFT) account.

During the nine-year period, there were 115 licenses issued to individuals to collect fuel wood and an additional 5 licenses to harvest wood for other purposes (e.g trapping cabins).

Summary of Personal Use from the Whiskey Jack Forest
Nine Year period: 2004/05 to 2012/13

Personal Use	Volume m3	Undersize m3	Total Volume M3	Stumpage $	Residual $	Total Crown Charges	Renewal $	Future $	Total $
Fuelwood	2,093	0	2,093	$4,621	$0	$4,621	$231	$31	$4,883
Other	960	0	960	$3,619	$0	$3,619			$3,619
Total	3,053	0	3,053	$8,240	$0	$8,240	$231	$31	$8,502

Recreation and Tourism

Resource-based Tourism Industry

The tourism industry has been an important component in the Kenora area for a long time. Lodges and cottages were in operation by 1905. At that time the activities were based on hunting, fishing and canoeing opportunities. The Whiskey Jack Forest has attracted recreation-based tourism since the late 19th Century due to its variety of natural values. The area continues to be a desired recreational destination for canoeing, boating, fishing, hunting, hiking, snowmobiling, camping and cottaging for the following reasons:

- There are more interconnected lakes, rivers and portages.
- The rugged topography including cliffs, low wetlands, viewpoints and island-dotted lakes provide excellent scenery for summer and winter travelers.
- The area is traversed by numerous trails providing winter recreation opportunities by snowmobile, cross-country ski, or dog sled. In the summer, canoeist and hikers can access remote locations.
- There are numerous cultural heritage values including very old aboriginal heritage sites
- And more recent logging and mining heritage sites.

Background information for this section was obtained from the Crown Land Atlas and survey information was supplemented with data gathered from a number of other sources, specifically; MNR fishing and hunting licence files, tourist operator websites, the "*The Economic Impact of Tourism in Sunset Country, Ontario – Final Report (2003*) and the Lake of the Woods Economic Impact Study – Final Report (2003)". These last two reports provided projections about future trends for the industry on the Whiskey Jack Forest. The tourism report was prepared by Paul Kerr Forster in association with the Canadian Tourism Research Institute for the Northwestern Ontario Tourist Association (NOWATA) for the year 2001, expenditure or user days or travel distance for most of these activities. This information, provided by NOWATA has been included in this plan as supplementary documentation; however, it has not been verified for accuracy, quality or completeness by the planning team. Due to the extent of the study area comprising of most of Northwestern Ontario and Northern United States, it was decided to use the Kenora subregion in this report. The full details of this report are found Appendix 1.

There are 362 tourist operators in Kenora District and of that, of which 143 are associated with the Whiskey Jack Forest. There are 1,852 units available in the Whiskey Jack Forest. A "unit" is defined as any of the following: serviced hotel or motel room, serviced resort rooms, serviced cottages, serviced cabins, serviced outpost camps, housekeeping room, housekeeping suites, housekeeping cottages, housekeeping cabins, housekeeping outpost camps. The impact study reports that 54% of the operators have >= 10 units, 29% have between 11-19 units and 18% > 20 units. In 2001, the average revenue generated by each unit was $40,000. Of this, Retail and Guest services generated 25% of the revenue with Food and Beverage operations generated 11% of the total revenue. It is estimated that 500,000 people visited Kenora district in 2001 which was made up of travellers from Ontario (20%), other Canadian provinces (25%), United States (55%) and Others (1%).

The planning team sent out questionnaires to all the tourist operators registered within Kenora district as shown in Appendix 2. About 20% of the mail outs responded to the questionnaire which is considered a success. Of the respondents, 65% identified an average of 5 outpost camps, 20 beds, 25 employees and a minimum client volume of 200 people (mostly clients from the U.S.A. (75-100%)). The expectation is almost 90% will increase or like to increase the capacity of their lodges in the next 5 years.

The Sunset economic study reports that in 2001, 443 operators provided employment to 3,785 persons of which 1,221 were located in the Whiskey Jack Forest. The operator survey also indicated that there were 758 First Nations employed in Sunset Country of which 80% were seasonal or part time employees. Accommodation providers in Sunset Country employed 498 or 40% which were between 25-44 years old. The large variety of lakes and rivers, some of which are remote (17% boat access and 13% fly-in) while others are easily road accessible (62%), provide a wide range of angling opportunities. Whiskey Jack Forest has excellent natural lake trout lakes and walleye fishing is also popular in hundreds of small lakes along with larger lakes such as Lake of the Woods, Dryberry and Sydney Lakes.

The tourism expenditures in Kenora District, down into categories for both the amount spent and the amount retained in the District. This is useful in determining the retention rate of the tourism economic impact in the Study Region. According to the Ministry of Tourism & Recreation, overall, tourism in the Kenora Census Districts contributed just over $181 million in Gross Domestic Product in 2001, $109 million or 60% of which was retained in the District. It is estimated that tourism alone generated almost $80 million in taxes distributed to federal, provincial and municipal governments. Tourism creates almost 3,000 direct jobs in the Districts distributing close to $49 Million in direct wages and salaries. The total number of jobs created by tourism including direct, indirect and induced was 5,263 in 2001, with payroll earnings of just over $114 Million.

The Whiskey Jack Forest is comprised of five Wildlife Management Units (WMU); zones 3, 5, 6, 7B and 8. This represents a significant portion of these wildlife units that are utilized extensively for hunting and fishing. Hunting continues to be an important recreational activity in the Whiskey Jack Forest area. Big game is the primary activity although ruffed grouse, black bear, migratory waterfowl and snowshoe hare are also hunted. Hunting is either carried out adjacent to access roads created by the forest industry, by use of water based transportation to remote roadless areas, or by fly-in outfitters to backcountry locations. A large proportion of big game hunters are non-resident hunters who contribute to the local economy depending on how many local services they utilize. More than 90% of the bear hunters are non-residents. There are a wide variety of trails in the Whiskey Jack Forest that are used (depending on the nature of the activity and the Land Use designation) by hikers, cross country skiers, dog sledders, snowmobilers, and ATV operators. In addition to prepared trails, there are opportunities to travel on ungroomed areas such as snowshoeing along lakes and portages or snowmobiling along ungroomed lakes or unploughed roads.

Rushing River Provincial Park, and a few other private campgrounds along Highway 17 and Highway 71 corridor, provides camping opportunities. Approximately 65,000 people visit or use the many canoe routes around the park. Canoe trippers and anglers that are flown into backcountry sites use most of the remote sites. Many cottages were established after the railroad arrived in 1888 and made access to the Whiskey Jack Forest area easier. There are abundant cottages on Lake of the Woods are primarily located on the many islands on the lake, since shoreline development is limited. The building of what is now known as Hwy 17 made it easier to access additional lakes in the area.

The list of lodges on the Whiskey Jack Forest follows:

Lodge Name	Type		Grand Total
	Main Base Lodge	Outpost	
1037779 Ontario Ltd.		3	3
1091253 Ontario Limited	1		1
1507677 Ontario Inc.	1		1
1561250 Ontario Inc. *	1	1	2
Andy Lake Resort	1		1
Anishinabi Lodge Inc. *	1	1	2
Ashambie Outpost Limited		1	1
Berry Lake Camp	1		1
Big Canon Lake Lodge	1		1
Blyth's Canyon Lake Lodge	1		1
Breezy Point Resort	1		1
Camp Waterfall	1		1
Canada Outfitters Ltd.		3	3
Canadian Vacations	1		1
Canadian Wilderness Camps & Outfitters	1		1
Casey's Canadian Resort	1		1
Cedar Lake Lodge	1		1
Cedar Point Resort	1		1
Clark's Camp	2		2
Conifer Lake Outpost		1	1
Crest Resort	1		1
Crow Rock Camp		1	1
Delaney Lake Lodge Limited	1		1
Dogtooth Resort (Kenora) Ltd.	1		1
Don Wright's Camp	1		1
Dryberry Falls Lodge	2		2
Eagle Nest Camp	1		1
Echo Lake Lodge	1	1	2
Excellent Adventure Outposts & Air Service	2		2
Excellent Adventures Outposts & Air Service Ltd. *	2	1	3
Fisherman's Cove Camp *	1		1
Fletcher Lake Lodge *	1	3	4
Forest Lake Lodge	2		2
French Narrows Camp	1		1
Gawley's Little Beaver Lodge and Outposts Ltd. *	1		1
Gold Arrow Camp *	1		1
Goose Bay Camp *	1		1
Grassy Narrows First Nation		6	6
Gustafson's Resort	1		1
Halley's Camps Incorporated *		5	5
Hawk Lake Lodge	1		1
Hideaway Cabins	1		1
Hideaway Resort	1		1
Highwind Lake Camp	1		1
Hilbert's Hideaway Camp	1		1
Indian Lake Lodge	1		1
Jerry and Ellies Cedar Lake Camp	1		1
Jim's Caviar Camp	1		1
JR's Portage Bay Camp	1		1
Keewache-Ete-Min Corporation	2		2
Kenora Air Service Limited *		2	2
Keystone Lodge *	1	1	2
Kingfisher Resort Inc.	1		1
Lac Seul Airways Ltd. *	1		1
Lac Seul Golden Eagle Resort	1		1
Lac Seul Lodge *	1		1
Lake of the Woods Houseboats Limited	1		1
Laughing Water Lodge	1		1
Lebron's Long Bay Camp	1		1
Little Canada Camp	1		1
Long Bay Lodge	1		1
Longbow Lake Camp and Trailer Park	1		1
Longlegged Lake Resort Inc.	1		1
Lost Bay Resort	1		1

Lodge Name	Type		Grand Total
Luther Village	1		1
MacKenzie Lodge	1		1
Manitou Falls Camp	1	1	2
Manotak Lodge *	2		2
Maynard Lake Lodge and Outpost	1	1	2
McIntosh Lodge	1		1
Moore Bay Lodge	1		1
Naughty Pines Fishing Camp	1		1
Naughty Pines Fishing Camp *		1	1
North Country Lodge	1		1
North Star Camps Limited *	1	1	2
Oak Lake Lodge	1		1
Ojibwe Aking Marina	1		1
Onaway Lodge	1		1
Ontario North Outpost Limited *		1	1
Pakuni Lodge	3		3
Parkview Camp Ltd.	1		1
Peffley's Canadian Wilderness Camp	1		1
Perrault Lake Camp	1		1
Pickerel Creek Camp	1		1
Pickerel Lake Outfitters		3	3
Pipestone Point Resort	1		1
Pleasant Point Lodge	1		1
Portage Lodge	1		1
Primmer's Court	1		1
Race's Log Cabins	1		1
Rainbow Point Lodge *	1		1
Redden's Camp	1	1	2
Richard Lake Cottages and Outfitters	1		1
Rocky Shore Lodge	1		1
Rod and Reel	1		1
Scout Lake Camp *	1		1
Separation Lake Camps Ltd.	1		1
Sharp's Cliff Lake Lodge	1		1
Showalter's Fly-In Camps Ltd. *		1	1
Silver Lake Lodge	1		1
Sioux Narrows Lodge	1		1
Skyline Lodge	1		1
Sleepy Dog Cabins	1		1
Smith Camps	1		1
Stork Lake Lodge	1		1
Sydney Lake Lodge	1		1
Tall Pines Camp	1		1
The Outpost Company		1	1
Timber Point Camp	1		1
Totem Lodge	1		1
Tuesday's Resort (do not send)	1		1
Twilight Outpost Lodge	1		1
Tyc's Blindfold Lake Resort	1		1
Walsten Outposts		3	3
White Birch Lodge	1		1
White Moose Resort and Golf Course	1		1
Whitewing Resort and Floating Lodges *	1		1
Wilderness Air (Vermilion Bay) 1982 Limited *		2	2
Wilderness Air Ltd.		6	6
Wildeyes Wilderness Lodge Inc.	1		1
Wilson's Rocky Lake Camps Limited	2		2
Wine Lake Camp *	1	2	3
Witch Bay Canadian Camps Limited	1		1
Wogenstahl's Can. Resort and Trailer Park Ltd.	1		1
Yellowbird Lodge	1		1
Arnold Wolf	1		1
Marcell Paquin	1		1
Norman Johnson	1		1
Rocky & Angie Thompson	1		1
Grand Total	**123**	**54**	**177**

1

Mining, Aggregates and Hydro Generation

Mining

DESCRIPTION OF THE WHISKEY JACK FOREST MANAGEMENT UNIT

Overview of the Management Unit

The Whiskey Jack Forest Management Unit is located on the Precambrian Shield in northwestern Ontario. The Management Unit is underlain by rocks of the Superior Province contained within the Precambrian Shield. Rocks of the Superior Province are represented predominantly by granitic bedrock with substantial amounts of metavolcanic and meta-sedimentary rocks, generally termed greenstone.

The management unit's glacial geology was developed by advances of the Wisconsinan Sheet which started over 100,000 years ago and the subsequent glacial retreats which ended approximately 7,000 years ago.

Geology

There are geological features associated with two major eras of earth history visible within the management unit. The older is represented by the bedrock geology and the younger is expressed by surficial geological features. The bedrock in the area is a result of continent building processes which were active between approximately 2.7 and 1.1 billion years ago. Bedrock represents the solid foundation upon which the current landscape is set. The surficial geology is a result of erosion processes active since the continent-building activity. The last two million years saw glacial advances and retreats, which ended approximately 7,000 years ago. The glacial activity produced landforms by deposition and erosion of surface materials. The topography and landforms observed within the management unit are a result of the presence of both bedrock and surficial geological features and their interaction with environmental surface processes.

Bedrock Geology

The management unit is underlain by a diverse assemblage of rocks contained within the extensive Superior province. Within the boundaries of the management unit the Superior Province is further divided into the Wabigoon and Winnipeg River subprovinces. The Wabigoon subprovince is an east-trending belt made up of volcanic and sedimentary rocks that have been altered through exposure to heat and pressure, and subsequently intruded and surrounded by large bodies of granitic rocks. The volcanic rocks are prospective for base metal deposits; the volcanic and associated sedimentary rocks are prospective for gold deposits. The Winnipeg River subprovince makes up the northern portion of the management unit and is dominantly granitoid rocks with areas of highly metamorphosed and deformed volcanic and sedimentary rocks (OGS, 1991).

Surficial Geology

The Whiskey Jack Forest Management Unit consists of bedrock-controlled uplands, where the surficial sediment cover is commonly thin and consists of stony, sandy till. In the low-lying areas, there are significant areas of glaciolacustrine deposits related to Glacial Lake Agassiz interbedded with several layers of till of northeastern and northwestern provenance. Surficial deposits of granular resources occur primarily in the Rainy Lake-Lake of the Woods moraine and as buried ice-contact and subaqueous fan deposits (Bajc 2001).

Mining and Mineral Exploration

Historically, mining and mineral exploration have been an important activity in this management unit and historically gold, silver and copper were the predominant commodities mined. Currently there are four granite producers in operation which have been and continue to be a significant contributor to the economy of the area. The value of total granite production was not available at the time of writing. Historical metal production occurred within the management unit between 1893 and 1951 and totaled 68,513 ounces gold, 14,762 ounces silver and 1.89 million pounds of copper valued at $49.73 million CDN at current metal prices.

In addition to historical and current mineral production there are significant concentrations of gold, nickel, copper, silver and uranium contained within documented mineral deposits throughout the management unit. The total estimated value of metals contained within these deposits at current commodity prices is in excess of $158 million CDN.

There are an estimated 1,605 active mining claim units recorded throughout this management unit, as indicated on MNDM's CLAIMaps website (MNDM, 2006). These claims represent an investment in the management unit of approximately $400,000 CDN for claim staking, which directly relates to its mineral potential. In addition there is an estimated dollar expenditure of nearly $650,000 CDN per year related to mineral exploration work required to keep the claims in good standing. Current claim staking targets areas with potential for uranium, rare-metals, zinc and gold. Historically, several areas within the management unit have seen extensive staking and mineral exploration.

Aggregates

There are 12 aggregate sites located in the Whiskey Jack Forest, all operated by MNR.

Hydro

A number of hydro-electric facilities are located within or adjacent to the forest. These facilities are on the English River between Lac Seul and the Manitoba border and on the Winnipeg River between Lake of the Woods and the English River.

Two sites owned by Ontario Power Generation are located within the district:

1. Ear Falls

There are four power generating units at Ear Falls located on the English River at the outlet of Lac Seul. The first unit began operating in 1930.

Additional generating capacity is being developed at the Ear Falls GS by adding a new 12.5 MW generating unit capable of generating approximately 52 million kilowatt hours of hydroelectricity per year.

2. Manitou Falls

This facility is located on the English River where it enters Barnston Lake downstream of Ear Falls. There are five operating units located at this facility. Construction on this facility began in 1953.

Four additional sites are located within Kenora district and supply power to the area. Two of these are also owned by Ontario Power Generation and the other two (both in Kenora) are owned by Abitibi Consolidated.

3. Caribou Falls

Caribou Falls consist of three power generating units built in 1958 on the English River at the outlet of Umfreville Lake. The Caribou station was the third plant built along the English River which represented just a fraction of the widespread program undertaken to meet the challenge of expansion in mining and also pulp and paper industries.

4. Whitedog Falls

This facility consists of three power generating units built in 1958 on the Winnipeg River at Whitedog Falls.

5. Kenora Power House and Norman Dam

These generating stations are owned by Abitibi Consolidated. The Kenora Power House is located on the on the Winnipeg River in Kenora at the outlet of Lake of the Woods. The Norman Dam generating station is located on the Winnipeg River in Kenora.

Parks and Protected Areas

There are seven provincial parks or protected areas adjacent to or surrounded by the Whiskey Jack Forest. Parks in the management unit include the West English River, Eagle-Dogtooth, Tide Lake and the Maynard Lake Parks. The Pakwash Provincial Park is located adjacent to the northeast corner of the unit, Rushing River Provincial Park is located in the southern portion of the forest, and Woodland Caribou Provincial Park (and addition) is located in the northwest portion of the unit. All of these parks have either an Interim Management Statement or a park management plan that provides direction.

Parks and protected areas include Crown lands that are not available for forest management purposes. These areas include Provincial Parks and Conservation Reserves regulated under the *Provincial Parks and Conservation Reserves Act*. The Crown land areas where forest management cannot occur that lie in on or adjacent to the Forest are listed in Table 1. Some of the areas listed in this table lie entirely within the Whiskey Jack Forest, others are adjacent to, but outside of the forest (e.g., Pakwash and the pre-Ontario's Living Legacy portion of Woodland Caribou provincial parks), and portions of others lie both within and outside the boundaries of the forest (e.g., Eagle-Dogtooth).

Parks and protected areas lying within the boundaries of the Whiskey Jack Forest encompass a total of approximately 88,811hectares, of which 47,743 hectares is forested. This represents about 5% of the productive Crown land area of the forest.

For wildlife management purposes, park and conservation reserve areas on the Whiskey Jack Forest can be used in the establishment of core areas for marten habitat. Similarly, these areas can contribute to meeting 'old growth' targets but are not included in the determination of the available harvest area.

Provincial parks (and conservation reserves) provide places where people can enhance their health and well-being through enjoyment and recreational use of the outdoors, while developing a greater appreciation for Ontario's natural diversity. The following are important benefits and help to demonstrate how parks support our quality of life:

- Protection and contribution to ecological functions (air quality, water quality, flood control, soil stabilization),
- Biodiversity contributions (genetic material, protection of species at risk),
- Protection of resource integrity (some of the last green spaces left in the province),
- Health effects from use of parks (mental, physical, spiritual benefits),
- Worker productivity (healthy and happy workers tend to be more productive - a visit to a provincial park can contribute),

- Educational benefits (young and old learning about our environment),
- Scientific benefits (research in provincial parks),
- International responsibilities to protect natural settings, features and wildlife,
- Business location decisions (quality of life/business) and community cohesion.

Ontario Parks reports on the following indicators of economic impact:

- Value Added
- Provincial Gross Sales (or Provincial Gross Output)
- Wages & Salaries
- Provincial Person Years of Employment

Economic impacts are based on expenditures such as those made by the park on operations and capital improvements, as well as average visitor trip expenditures (camper and day visitor).

As well, the public and municipal officials should be aware that provincial parks help to make their communities attractive for business as well as for tourists and retirees. The retirement community brings in pension income, which is often indexed to inflation and is recession proof. Communities with attractive waterfronts, low crime, recreational activities and healthy environments are sought out by the retirement community. The park budget (operating and capital) represents a grant or transfer payment from the government to their community. Not all communities have this transfer. The community may also receive grants in lieu of taxes.

Following Table 1 is a description of the benefits that each provincial park provides. Conservation Reserves are included in Table 2.

Table 1 Parks and Protected Areas on (or adjacent to) the Whiskey Jack Forest

Name	CLUPA Reference ID*	Classification (Category)	Area (ha)**
West English River	P2345	Provincial Park (Waterway)	22,923
Tide Lake	P2614	Provincial Park (Nature Reserve)	51
Maynard Lake	P2698	Provincial Park (Nature Reserve)	25
Eagle-Dogtooth	P2363	Provincial Park (Waterway)	41,128
Rushing River	P2615	Provincial Park (Recreation)	340
Pakwash	P2528	Provincial Park (Recreation)	3,993
Woodland Caribou (existing)	P2370e	Provincial Park (Wilderness)	450,000
Woodland Caribou additions	P2370	Provincial Park (Wilderness)	30,442

* - MNR's Crown Land Use Planning Atlas (CLUPA) reference identification number
** - areas according to MNR's Crown Land Use Planning Atlas (CLUPA)

Woodland Caribou (P2370e), an operating wilderness class park of 450,000 hectares, was regulated in 1983. It protects representative earth and life science features of Site District 4S-1, such as the Eagle-Finlayson Moraine, prairie-boreal vegetation and habitat for Woodland Caribou, a threatened species. The park provides opportunities for backcountry canoeing, camping and outpost camp and main base lodge fishing. The park had 4799 camper-nights and 4799 days-use visitors in 2007. For 2005/06, the economic impact of Woodland Caribou Provincial Park was: Initial expenditure: $503,938; Value Added: $709,902; Wages and Salaries: $505,559; Person-years employment: 28. Only a portion of the Whiskey Jack Forest abuts Woodland Caribou, so the entire economic impact of the park does not affect the Forest.

Woodland Caribou recommended park additions (P2370) were established during Ontario's Living Legacy – Land Use Strategy. There are four additions to the existing park (Douglas Lake, Peisk Lake, Anchor Lake and Sydney Lake areas) although only Sydney Lake is within the FMU. The Sydney Lake addition includes a significant white elm site. A primary forest access road crossing between Rowdy and Sydney Lakes will be permitted as determined through previous forest management planning processes. This addition is in the most popular backcountry canoeing area of the park. It is unknown how much of the economic impact of Woodland Caribou Provincial Park (see above) can be assigned to the Sydney Lake recommended park addition.

Maynard Lake (P2698), a non-operating nature reserve class park of 25 hectares, was regulated in 1997. It consists of a peninsula with deep soils on the east shore of Maynard Lake. It provides representation/protection of an atypical old growth white pine stand (age class + 160 years) at the northern limit of the species range. It is surrounded by West English River Provincial Park on three sides. Camping, day-use, hunting and most other recreational activities are prohibited because of the classification of the park. The actual amount of use is unknown.

Tide Lake (P2614), a non-operating nature reserve class park of 51 hectares, was regulated in 1997. It consists of the peninsula between Ball and Tide lakes. The park provides representation/protection of an atypical old growth white pine stand (age class + 160 years) at the northern limit of the species' range. It is surrounded by West English River Provincial Park on three sides. Camping, day-use, hunting and most other recreational activities are prohibited because of the classification of the park. The actual amount of use is unknown.

West English River (P2345), a non-operating waterway class park of 22,923 hectares, was regulated in 2003. The area includes that portion of the English River from Barnston Lake to Tide Lake. The waterway contains old growth red and white pine at the northern extent of its range, wilderness environments and tourism attributes, and is an historic travel corridor. Two provincial nature reserves, Maynard Lake and Tide Lake, abut the park. Motor boating, canoeing, sport fishing, hunting and camping are popular activities, although the actual use is unknown.

Eagle-Dogtooth (P2363), a non-operating waterway class park of 41,128 hectares, was regulated in 2003. It provides a waterway linkage between Eagle Lake and nearby protected areas (e.g., Rushing River, Winnange). It is an important recreational waterway. The site contains regionally significant moraines, wetlands, pine forest ecosystems, eagles, waterfowl and is an important recreation and tourism area. Motor boating, canoeing, sport fishing, hunting and camping are popular activities, although the actual use is unknown.

Pakwash (P2528) is a staffed natural environment class provincial park of 3,993 hectares. The park was established in 1967 and was regulated in 1989 as a natural environment class Provincial Park. The park provides representation/protection of Site District 4S-2, specifically

the Hartman Moraine. Pakwash provides opportunities for car-camping and day-use. The park is operated through a partnership with Ear Falls 2000 Inc. The park had 8,523 camper-nights and 476 days-use visitors in 2007. For 2005/06, the economic impact of Pakwash Provincial Park was: Initial expenditure: $178,746; Value Added: $205,386; Wages and Salaries: $124,866; Person-years employment: 3.2. Only a portion of the Whiskey Jack Forest abuts Pakwash, so the entire economic impact of the park does not affect the Forest.

Rushing River (P2615), a staffed recreation class provincial park of 340 hectares was established in September 1958. Natural features include jack pine uplands, wetlands and a lush river valley. The park has a popular campground, day-use area and interpretive facilities/trails. The park had 47,804 camper-nights and 14,960 days-use visitors in 2007. For 2005/06, the economic impact of Rushing River Provincial Park was: Initial expenditure: $3,896,802; Value Added: $4,815,843; Wages and Salaries: $3,771,395; Person-years employment: 118.3. Only a portion of the Whiskey Jack Forest abuts Rushing River, so the entire economic impact of the park does not affect the Forest.

Table 2 Conservation Reserves on (or adjacent to) the Whiskey Jack Forest

Report Run On : 11/25/08 9:19 AM

Area Representation - Area Overlay

Protected Area									Area Profile				
ID Code	Protected Area Name	Type	Class	Administrative Zone	Initiative	Operating	Regulation Status	Current Size (ha)	Area Type	Area Name	Area Code	Area Size (ha)	Relationship
C2368	Campfire River	Conservation Reserve		Northwest	Ontario's Living Legacy	N	Regulated	4180.00	Forest Management Unit (FMU)	Whiskey Jack Forest	490	4158.97	Overlay
C2594	Clay Lake	Conservation Reserve		Northwest	Original System	N	Regulated	80.00	Forest Management Unit (FMU)	Whiskey Jack Forest	490	84.01	Overlay
C2357	Dryberry Lake	Conservation Reserve		Northwest	Ontario's Living Legacy	N	Regulated	21850.00	Forest Management Unit (FMU)	Whiskey Jack Forest	490	21721.78	Overlay
C2317	Lac Seul Islands	Conservation Reserve		Northwest	Ontario's Living Legacy	N	Regulated	14723.00	Forest Management Unit (FMU)	Whiskey Jack Forest	490	69.16	Overlay
C2366	Lake of the Woods CR	Conservation Reserve		Northwest	Ontario's Living Legacy	N	Regulated	45960.00	Forest Management Unit (FMU)	Whiskey Jack Forest	490	2848.51	Overlay
C2365	Scenic Lake	Conservation Reserve		Northwest	Ontario's Living Legacy	N	Regulated	1890.00	Forest Management Unit (FMU)	Whiskey Jack Forest	490	1880.40	Overlay
C2361e	Scotty Lake	Conservation Reserve		Northwest	Original System	N	Regulated	775.00	Forest Management Unit (FMU)	Whiskey Jack Forest	490	770.04	Overlay
C2362	Solitary Lake	Conservation Reserve		Northwest	Ontario's Living Legacy	N	Regulated	257.00	Forest Management Unit (FMU)	Whiskey Jack Forest	490	256.48	Overlay
C2430	Twilight Lake	Conservation Reserve		Northwest	Ontario's Living Legacy	N	Regulated	396.00	Forest Management Unit (FMU)	Whiskey Jack Forest	490	394.24	Overlay
	Total Records : 9							**90,111.00**					

Disclaimer : This report provides background information on each protected area. The Area Profile section provides land use context and is built using thematic data, some of which is derived using GIS analysis. This report is based on the best available information at the time of report generation.

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Other

Local residents use the forest for fuelwood cutting; primarily white birch and aspen.

Forest management activities can affect other forest resources in a variety of ways. Obvious affects include the loss of terrestrial habitat through road construction and forest removal. There may be short or long-term changes in ecosystem processes that may alter the regenerative course of the landscape and there may be adverse aesthetic impacts on people. There are also beneficial impacts, which include restoration of early successional habitat and improved access for hunters, trappers, anglers, naturalists and baitfish operators.

Summary of First Nation's Use of Other Resources

First Nation community members actively use portions of the Whiskey Jack Forest for many resource-based activities.

i) Fishing

Several First Nation communities hold commercial fishing licenses on Lake of the Woods and inland lakes. Lake of the Woods and surrounding lakes are used for subsistence fishing by community members.

Surrounding tourist lodges provide some employment opportunities for First Nation residents as guides in the sport fishery.

ii) Trapping

First Nation community individuals hold registered trap lines located all or partially within Kenora District.

iii) Wild rice

Wild rice is harvested annually be community members for personal use and re-sale from various lakes throughout the area.

iv) Cultural and Social, other Wildlife

Special sites within the forest are used for traditional cultural purposes such as fasting, vision quests and offerings. The specific location of these sites are known to community members, and the community is encouraged to participate in the forest management planning process to ensure these values are considered in proposed forest management activities.

Certain wildlife species, such as the bald eagle, have a cultural and social significance to First Nation people. The protection and management of these species and their habitats is important.

While the subsistence hunting, fishing, and gathering of resources from within the forest are an integral part of community existence, there are no accurate records of the level of such harvest. The harvest of deer, moose, waterfowl, rabbits and grouse provides an important source of food to community members.

Identified First Nation values for the Whiskey Jack Forest are confidential values and are retained on values maps on file in the Kenora District office.

Trapping

Trapping provides seasonal employment for 89 registered traplines in the Whiskey Jack Forest. Additionally, there are approximately 17 First Nation Community traplines located with the Whiskey Jack Forest. The expected average resources value per trapline is estimated at $2,440. Since all the trappers work out of their home it would not be appropriate to identify their names in this document The major fur bearing animals that are of economic importance are beaver, fox, muskrat, lynx, otter, mink, fisher, and marten. Registered trap lines cover the entire Whiskey Jack Forest as seen on the Values Map 4.4.

Baitfish

In 2009-2010, the Whiskey Jack Forest had licensed baitfish individuals of which all are camp operators operating in 95 harvest areas. Baitfish is consumed locally by the angling industry. Since the majority of baitfish operators' work as individuals out of their home, it would not be appropriate to identify their name in this document. The baitfish industry provides supplemental income to these people and complements the local angling industry.

Commercial Bear Management

There are approximately 124 commercial bear management areas on the forest operated by 76 tourist operators. All of these areas are accessible from the existing road network on the unit. The bear management areas are distributed throughout the unit except for the areas close to populated centres. Registered bear management areas cover all of the Whiskey Jack Forest as seen on the 2012 Values Map 4.4.

MNR Administration

Responsibility for forest management planning and day to day administration of the Whiskey Jack Forest (licencing, approvals etc.) lies with Kenora District. There are five staff positions in Kenora involved on a day to day basis with the Whiskey Jack Forest.

Whiskey Jack Forest

Demographic Profiles

Communities

CSDcode	CSDname	community
3560027	Dryden	Dryden
3560032	Ear Falls	Ear Falls
3560058	English River 21	Asubpeeschoseewagong Netum Anishnabek First Nation
3559012	Fort Frances	Fort Frances
3560010	Kenora	Kenora
3560042	Red Lake	Red Lake
3560034	Sioux Lookout	Sioux Lookout
3560061	Wabaseemoong	Wabaseemoong Independent First Nations *(Whitedog)*
3560084	Wabauskang 21	Wabauskang First Nation No.21
3560004	Whitefish Bay 32A	Naotkamegwanning First Nation No. 32A
n/a	n/a	Kenora Métis Council

indicates Aboriginal community

2006 Whiskey Jack Forest

816

Ontario

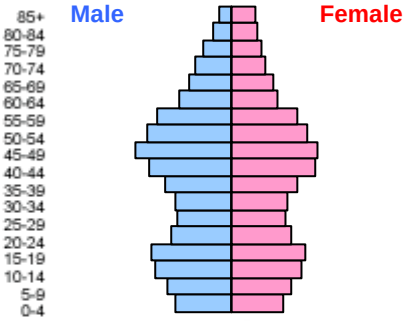
Population 52,360

Male	25,812	49.3%	1.011
Female	26,548	50.7%	0.990

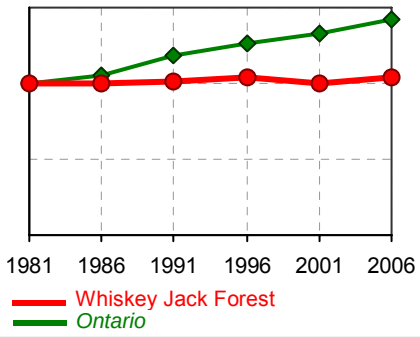
change in past 5 years **2.94%**

Avg Income:	**$35,489**	0.931
Avg Male Income:	**$43,392**	0.924
Avg Female Income:	**$27,792**	0.935

Distribution



Trend



Households 20,795

Avg Income:	**$69,528**	0.892
rate of Low Income	**4.0%**	0.342
avg persons/ household:	**2.8**	1.077

Household Income

$000's			
over 100	21.8%	0.549
80 to 100	13.5%	1.320
60 to 80	15.4%	1.191
40 to 60	18.2%	1.196
20 to 40	18.2%	1.230
under 20	12.9%	1.800

Household Size

1	26.0%	1.072
2	35.5%	1.114
3	15.4%	0.927
4-5	20.7%	0.869
6+	2.5%	0.706

Dwellings 20,805

Avg Value:	**$162,027**	0.545
Avg Monthly Rent:	**$626**	0.751
Housing Affordability Index:	**2.33**	0.611

Tenure

owned	75.1%	1.058
rented	22.5%	0.782
band housing	2.3%	14.677

When constructed

pre 1960	35.7%	1.190
1960's	14.0%	0.992
1970's	18.1%	1.064
1980's	15.9%	0.968
1990's	12.7%	0.955
2000's	12.7%	0.955

Community Diversity

Migration

1 year:	non-movers	88.2%	1.018
	movers	11.8%	0.884
from where	other country	2.2%	0.260
	other province	11.2%	3.131
	within province	24.6%	0.863
	locally	62.1%	1.040
5 year:	non-movers	66.5%	1.133
	movers	33.5%	0.811
from where	other country	2.3%	0.194
	other province	14.0%	3.545
	within province	23.8%	0.799
	locally	59.8%	1.104

Canadian Born	**93.7%**	1.312
Foreign Born	**6.3%**	0.219

When immigrated

pre 1960	36.4%	2.796
1960's	15.9%	1.337
1970's	15.8%	1.121
1980's	13.0%	0.792
1990's	12.4%	0.450
2000's	6.5%	0.381

Place of Birth

United States	26.4%	8.425
Caribbean	0.6%	0.104
Central America	2.1%	1.213
South America	1.1%	0.244
Northern Europe	19.3%	1.854
Western Europe	22.8%	4.348
Southern Europe	9.9%	0.711
Eastern Europe	9.7%	1.084
Africa	2.1%	0.434
Middle East	1.6%	0.257
Eastern Asia	1.0%	0.079
Southeast Asia	1.3%	0.163
Southern Asia	0.8%	0.058
Oceania	1.3%	2.929

Cdn citizen	**98.2%**	1.061
Aboriginal	**18.7%**	9.287

Education

Highest Level		
University:	**15.2%**	0.553
College:	**12.6%**	1.409
Trade:	**12.6%**	1.409
Secondary:	**30.1%**	1.007
Primary:	**29.6%**	1.193

Official Language

English:	**92.8%**	1.080
French:	**0.0%**	0.047
Both:	**7.0%**	0.611
Neither:	**0.2%**	0.074

Labour Force 28,405

Labour Force:

Male:	**51.4%**	0.985
Female:	**48.6%**	1.017
Participation Rate:	**67.9%**	1.012
Employment Rate:	**93.2%**	0.996
Wage and Salary:	**90.8%**	1.028
Self-Employed:	**9.0%**	0.791
Unpaid:	**0.2%**	0.728

Occupation

management	9.1%	0.833
finance	15.0%	0.765
natural	5.5%	0.752
health	7.3%	1.319
social	1.2%	0.366
culture	1.2%	0.366
sales	30.0%	1.207
trades	19.7%	1.326
primary	5.7%	2.102
processing	5.2%	0.691

indexed to Ontario

source: Statistics Canada Census of Population

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Ontario

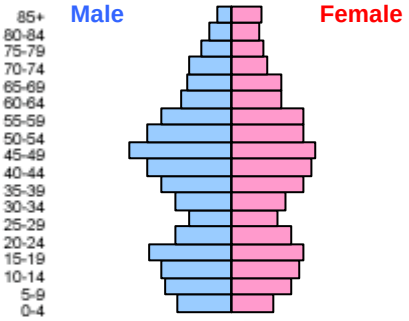
Population 8,195

Male	3,955	48.3%	0.990
Female	4,240	51.7%	1.010

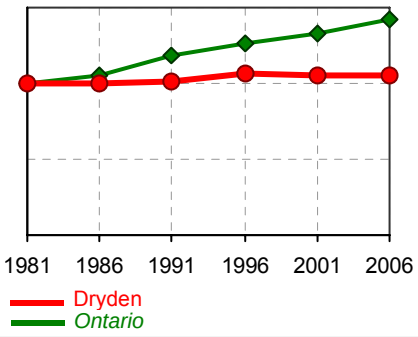
change in past 5 years -0.04%

Avg Income:	$37,246	0.978
Avg Male Income:	$48,407	1.031
Avg Female Income:	$27,181	0.915

Distribution



Trend



Households 3,285

Avg Income:	$72,443	0.929
rate of Low Income	6.3%	0.538
avg persons/ household:	2.4	0.923

Household Income

$000's			
over 100	41.8%	1.053
80 to 100	10.6%	1.031
60 to 80	13.4%	1.036
40 to 60	17.5%	1.153
20 to 40	12.9%	0.871
under 20	3.9%	0.538

Household Size

1	26.2%	1.081
2	34.9%	1.096
3	15.2%	0.919
4-5	22.1%	0.930
6+	1.5%	0.431

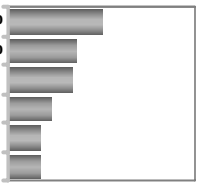
Dwellings 3,285

Avg Value:	$171,993	0.578
Avg Monthly Rent:	$653	0.783
Housing Affordability Index:	2.37	0.622

Tenure

owned	76.6%	1.078
rented	23.4%	0.814
band housing	0.0%	0.000

When constructed



pre 1960	30.1%	1.003
1960's	22.1%	1.569
1970's	20.5%	1.205
1980's	14.3%	0.870
1990's	10.4%	0.781
2000's	10.4%	0.781

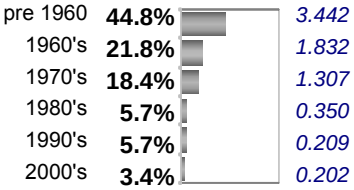
Community Diversity

Migration

1 year:	**non-movers**	**85.4%**	0.987
	movers	**14.6%**	1.087
from where	other country	2.6%	0.309
	other province	10.6%	2.983
	within province	23.8%	0.838
	locally	63.0%	1.054
5 year:	**non-movers**	**64.1%**	1.092
	movers	**35.9%**	0.869
from where	other country	3.2%	0.268
	other province	12.4%	3.130
	within province	19.9%	0.669
	locally	64.5%	1.190

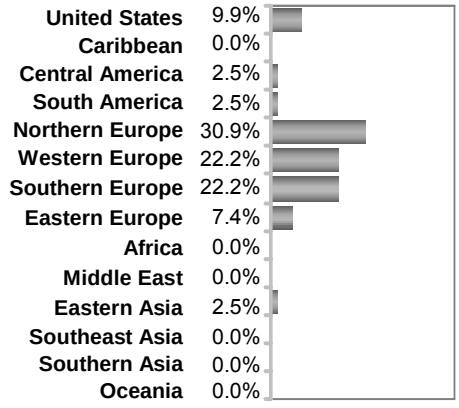
Canadian Born	94.6%	1.324
Foreign Born	5.4%	0.188

When immigrated



pre 1960	44.8%	3.442
1960's	21.8%	1.832
1970's	18.4%	1.307
1980's	5.7%	0.350
1990's	5.7%	0.209
2000's	3.4%	0.202

Place of Birth



United States	9.9%	3.155
Caribbean	0.0%	0.000
Central America	2.5%	1.424
South America	2.5%	0.532
Northern Europe	30.9%	2.972
Western Europe	22.2%	4.235
Southern Europe	22.2%	1.600
Eastern Europe	7.4%	0.827
Africa	0.0%	0.000
Middle East	0.0%	0.000
Eastern Asia	2.5%	0.201
Southeast Asia	0.0%	0.000
Southern Asia	0.0%	0.000
Oceania	0.0%	0.000

Cdn citizen	98.3%	1.063
Aboriginal	9.7%	4.792

Education

Highest Level		
University:	15.0%	0.545
College:	11.9%	1.331
Trade:	11.9%	1.331
Secondary:	33.9%	1.134
Primary:	27.4%	1.105

Official Language

English:	92.9%	1.081
French:	0.0%	0.000
Both:	6.9%	0.605
Neither:	0.2%	0.084

Labour Force 4,290

Labour Force:

Male:	49.7%	0.951
Female:	50.3%	1.053
Participation Rate:	64.7%	0.964
Employment Rate:	94.2%	1.006
Wage and Salary:	92.7%	1.049
Self-Employed:	7.1%	0.624
Unpaid:	0.2%	0.804

Occupation

management	10.5%	0.967
finance	16.2%	0.825
natural	6.1%	0.825
health	6.5%	1.163
social	0.8%	0.232
culture	0.8%	0.232
sales	30.9%	1.245
trades	19.0%	1.279
primary	3.0%	1.129
processing	6.2%	0.821

indexed to Ontario

source: Statistics Canada Census of Population

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Ontario

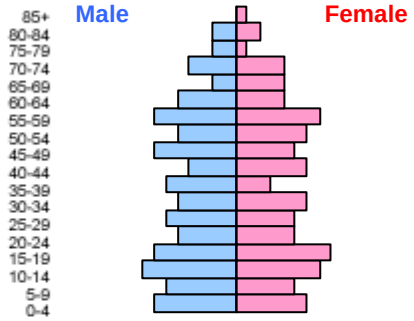
Population 856

Male	436	50.9%	1.043
Female	420	49.1%	0.959

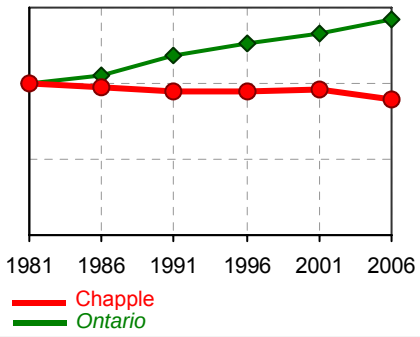
change in past 5 years -5.93%

Avg Income:	$23,247	0.610
Avg Male Income:	$29,020	0.618
Avg Female Income:	$17,283	0.582

Distribution



Trend



Households 300

Avg Income:	$50,563	0.649
rate of Low Income	13.3%	1.137
avg persons/ household:	2.8	1.077

Household Income

$000's			
over 100	15.6%	0.394
80 to 100	12.5%	1.219
60 to 80	12.5%	0.966
40 to 60	21.9%	1.439
20 to 40	25.0%	1.690
under 20	12.5%	1.740

Household Size

1	20.0%	0.824
2	36.7%	1.152
3	15.0%	0.905
4-5	20.0%	0.841
6+	8.3%	2.354

Dwellings 300

Avg Value:	$118,385	0.398
Avg Monthly Rent:	$394	0.472
Housing Affordability Index:	2.34	0.614

Tenure

owned	89.8%	1.265
rented	10.2%	0.353
band housing	0.0%	0.000

When constructed

pre 1960	38.3%	1.276
1960's	3.3%	0.237
1970's	18.3%	1.075
1980's	15.0%	0.913
1990's	21.7%	1.635
2000's	21.7%	1.635

Community Diversity

Migration

1 year:	non-movers	94.6%	1.093
	movers	5.4%	0.402
from where	other country	0.0%	0.000
	other province	0.0%	0.000
	within province	100.0%	3.515
	locally	0.0%	0.000
5 year:	non-movers	89.6%	1.528
	movers	10.4%	0.251
from where	other country	0.0%	0.000
	other province	0.0%	0.000
	within province	64.7%	2.172
	locally	35.3%	0.652

Canadian Born	88.2%	1.235
Foreign Born	11.8%	0.412

When immigrated

pre 1960	20.0%	1.535
1960's	10.0%	0.839
1970's	20.0%	1.421
1980's	10.0%	0.609
1990's	40.0%	1.456
2000's	0.0%	0.000

Place of Birth

United States	36.4%	11.615
Caribbean	0.0%	0.000
Central America	9.1%	5.242
South America	0.0%	0.000
Northern Europe	0.0%	0.000
Western Europe	54.5%	10.395
Southern Europe	0.0%	0.000
Eastern Europe	0.0%	0.000
Africa	0.0%	0.000
Middle East	0.0%	0.000
Eastern Asia	0.0%	0.000
Southeast Asia	0.0%	0.000
Southern Asia	0.0%	0.000
Oceania	0.0%	0.000

Cdn citizen	95.9%	1.036
Aboriginal	9.9%	4.932

Education

Highest Level		
University:	6.0%	0.219
College:	13.5%	1.517
Trade:	13.5%	1.517
Secondary:	20.3%	0.680
Primary:	46.6%	1.879

Official Language

English:	97.1%	1.130
French:	0.0%	0.000
Both:	2.9%	0.257
Neither:	0.0%	0.000

Labour Force 420

Labour Force:

Male:	54.8%	1.049
Female:	45.2%	0.946
Participation Rate:	61.8%	0.921
Employment Rate:	100.0%	1.069
Wage and Salary:	67.9%	0.768
Self-Employed:	29.8%	2.622
Unpaid:	2.4%	8.108

Occupation

management	6.3%	0.575
finance	5.0%	0.254
natural	2.5%	0.339
health	7.5%	1.349
social	0.0%	0.000
culture	0.0%	0.000
sales	13.8%	0.553
trades	26.3%	1.765
primary	32.5%	12.065
processing	6.3%	0.826

indexed to Ontario

source: Statistics Canada Census of Population

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Ontario

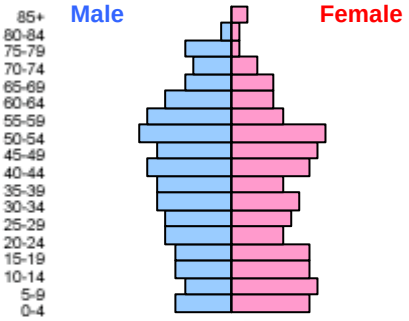
Population 1,153

Male	556	48.3%	0.990
Female	597	51.7%	1.010

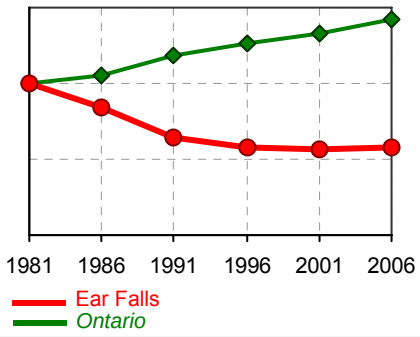
change in past 5 years 0.35%

Avg Income:	$39,521	1.037
Avg Male Income:	$49,790	1.060
Avg Female Income:	$28,639	0.964

Distribution



Trend



Households 465

Avg Income:	$77,387	0.993
rate of Low Income	4.1%	0.350
avg persons/ household:	2.5	0.962

Household Income

$000's			
over 100	44.4%	1.121
80 to 100	14.3%	1.393
60 to 80	14.3%	1.104
40 to 60	17.5%	1.149
20 to 40	6.3%	0.429
under 20	3.2%	0.442

Household Size

# of persons		
1	21.5%	0.886
2	40.9%	1.283
3	16.1%	0.973
4-5	20.4%	0.859
6+	1.1%	0.304

Dwellings 470

Avg Value:	$95,281	0.320
Avg Monthly Rent:	$707	0.848
Housing Affordability Index:	1.23	0.323

Tenure

owned	77.7%	1.093
rented	22.3%	0.775
band housing	0.0%	0.000

When constructed

pre 1960	14.9%	0.496
1960's	22.3%	1.588
1970's	40.4%	2.371
1980's	9.6%	0.582
1990's	9.6%	0.722
2000's	9.6%	0.722

Community Diversity

Migration

1 year:	non-movers	89.6%	1.034
	movers	10.4%	0.779
from where	other country	0.0%	0.000
	other province	36.0%	10.095
	within province	12.0%	0.422
	locally	52.0%	0.871
5 year:	non-movers	65.9%	1.124
	movers	34.1%	0.825
from where	other country	0.0%	0.000
	other province	21.6%	5.463
	within province	41.9%	1.406
	locally	36.5%	0.674

Canadian Born	94.3%	1.320
Foreign Born	5.7%	0.199

When immigrated

pre 1960	50.0%	3.839
1960's	16.7%	1.398
1970's	16.7%	1.184
1980's	0.0%	0.000
1990's	16.7%	0.607
2000's	0.0%	0.000

Place of Birth

United States	15.4%	4.914
Caribbean	0.0%	0.000
Central America	0.0%	0.000
South America	0.0%	0.000
Northern Europe	15.4%	1.482
Western Europe	53.8%	10.261
Southern Europe	15.4%	1.107
Eastern Europe	0.0%	0.000
Africa	0.0%	0.000
Middle East	0.0%	0.000
Eastern Asia	0.0%	0.000
Southeast Asia	0.0%	0.000
Southern Asia	0.0%	0.000
Oceania	0.0%	0.000

Cdn citizen	99.1%	1.071
Aboriginal	10.0%	4.961

Education

Highest Level		
University:	8.9%	0.323
College:	15.4%	1.724
Trade:	15.4%	1.724
Secondary:	36.7%	1.228
Primary:	23.7%	0.954

Official Language

English:	93.1%	1.084
French:	0.9%	2.107
Both:	6.0%	0.527
Neither:	0.0%	0.000

Labour Force 715

Labour Force:

Male:	50.3%	0.965
Female:	49.7%	1.038
Participation Rate:	75.7%	1.128
Employment Rate:	96.5%	1.032
Wage and Salary:	83.9%	0.950
Self-Employed:	16.1%	1.417
Unpaid:	0.0%	0.000

Occupation

management	8.8%	0.805
finance	14.6%	0.743
natural	4.4%	0.594
health	3.6%	0.657
social	1.5%	0.445
culture	1.5%	0.445
sales	24.1%	0.969
trades	16.8%	1.129
primary	13.1%	4.877
processing	11.7%	1.544

indexed to Ontario

source: Statistics Canada Census of Population

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2006 English River 21

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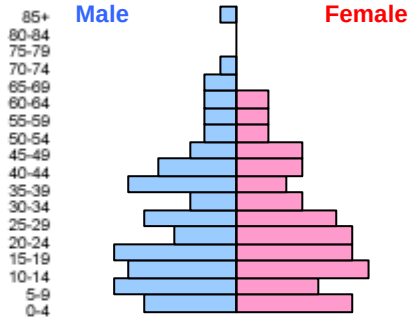
Ontario

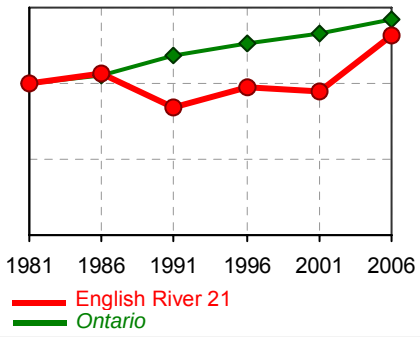
Population 633

Male	326	51.6%	1.057
Female	307	48.4%	0.946
change in past 5 years		39.43%	
Avg Income:		$11,599	0.304
Avg Male Income:		$9,863	0.210
Avg Female Income:		$13,630	0.459

Distribution



Trend



Households 185

Avg Income:	$25,580	0.328
rate of Low Income	0.0%	0.000
avg persons/ household:	3.4	1.308

Household Income

$000's			
over 100	0.0%	0.000
80 to 100	9.5%	0.929
60 to 80	9.5%	0.736
40 to 60	9.5%	0.626
20 to 40	19.0%	1.288
under 20	52.4%	7.292

Household Size

# of persons			
1	19.4%	0.801
2	19.4%	0.611
3	19.4%	1.173
4-5	27.8%	1.168
6+	13.9%	3.923

Dwellings 185

Avg Value:	$0	0.000
Avg Monthly Rent:	$0	0.000
Housing Affordability Index:	0.00	0.000

Tenure

owned	7.9%	0.111
rented	5.3%	0.183
band housing	86.8%	546.365

When constructed

pre 1960	5.6%	0.185
1960's	0.0%	0.000
1970's	25.0%	1.466
1980's	27.8%	1.690
1990's	36.1%	2.725
2000's	36.1%	2.725

Community Diversity

Migration

1 year:	non-movers	90.2%	1.042
	movers	9.8%	0.728
from where	other country	0.0%	0.000
	other province	0.0%	0.000
	within province	40.0%	1.406
	locally	60.0%	1.005
5 year:	non-movers	74.3%	1.267
	movers	25.7%	0.621
from where	other country	0.0%	0.000
	other province	10.3%	2.614
	within province	17.2%	0.579
	locally	72.4%	1.337

Canadian Born	0.0%	0.000
Foreign Born	0.0%	0.000

When immigrated

pre 1960	0.0%	0.000
1960's	0.0%	0.000
1970's	0.0%	0.000
1980's	0.0%	0.000
1990's	0.0%	0.000
2000's	0.0%	0.000

Place of Birth

United States	0.0%	0.000
Caribbean	0.0%	0.000
Central America	0.0%	0.000
South America	0.0%	0.000
Northern Europe	0.0%	0.000
Western Europe	0.0%	0.000
Southern Europe	0.0%	0.000
Eastern Europe	0.0%	0.000
Africa	0.0%	0.000
Middle East	0.0%	0.000
Eastern Asia	0.0%	0.000
Southeast Asia	0.0%	0.000
Southern Asia	0.0%	0.000
Oceania	0.0%	0.000

Cdn citizen	0.0%	0.000
Aboriginal	98.4%	48.818

Education

Highest Level			
University:	3.3%	0.119
College:	14.1%	1.584
Trade:	14.1%	1.584
Secondary:	8.7%	0.291
Primary:	59.8%	2.409

Official Language

English:	100.0%	1.164
French:	0.0%	0.000
Both:	0.0%	0.000
Neither:	0.0%	0.000

Labour Force 235

Labour Force:

Male:	53.2%	1.019
Female:	46.8%	0.979
Participation Rate:	54.7%	0.815
Employment Rate:	66.0%	0.705
Wage and Salary:	100.0%	1.132
Self-Employed:	0.0%	0.000
Unpaid:	0.0%	0.000

Occupation

management	11.1%	1.022
finance	11.1%	0.565
natural	0.0%	0.000
health	0.0%	0.000
social	0.0%	0.000
culture	0.0%	0.000
sales	51.9%	2.087
trades	18.5%	1.245
primary	7.4%	2.750
processing	0.0%	0.000

indexed to Ontario

source: Statistics Canada Census of Population

694
000673

2006 Fort Frances

3559012

Ontario

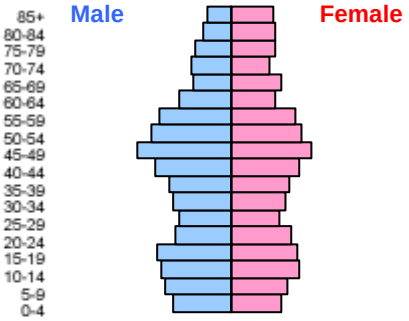
Population 8,103

Male	3,861	47.7%	0.977
Female	4,242	52.3%	1.022

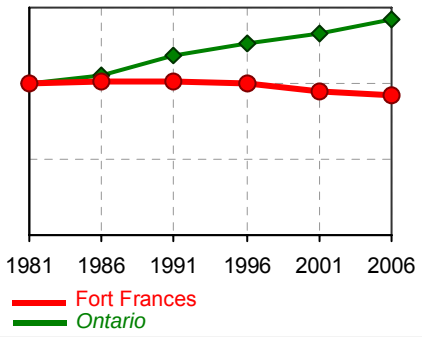
change in past 5 years -2.53%

Avg Income:	$35,087	0.921
Avg Male Income:	$42,167	0.898
Avg Female Income:	$28,613	0.963

Distribution



Trend



Households 3,445

Avg Income:	$63,556	0.815
rate of Low Income	7.0%	0.598
avg persons/ household:	2.3	0.885

Household Income

$000's			
over 100	35.0%	0.884
80 to 100	13.6%	1.330
60 to 80	12.0%	0.930
40 to 60	15.2%	1.003
20 to 40	16.8%	1.139
under 20	7.2%	1.005

Household Size

# of persons			
1	32.4%	1.334
2	33.8%	1.062
3	14.5%	0.875
4-5	17.7%	0.745
6+	1.6%	0.451

Dwellings 3,445

Avg Value:	$138,127	0.464
Avg Monthly Rent:	$618	0.741
Housing Affordability Index:	2.17	0.570

Tenure

owned	71.0%	1.000
rented	29.0%	1.005
band housing	0.0%	0.000

When constructed

pre 1960	46.7%	1.554
1960's	13.8%	0.982
1970's	18.3%	1.074
1980's	10.8%	0.654
1990's	8.3%	0.625
2000's	8.3%	0.625

Community Diversity

Migration

1 year:	non-movers	86.8%	1.003
	movers	13.2%	0.982
from where	other country	2.0%	0.236
	other province	6.3%	1.778
	within province	29.8%	1.046
	locally	62.0%	1.037
5 year:	non-movers	67.7%	1.155
	movers	32.3%	0.780
from where	other country	1.7%	0.137
	other province	7.3%	1.835
	within province	20.1%	0.675
	locally	71.0%	1.310

Canadian Born	93.4%	1.307
Foreign Born	6.6%	0.230

When immigrated

pre 1960	32.4%	2.484
1960's	18.6%	1.563
1970's	15.7%	1.115
1980's	20.6%	1.254
1990's	8.8%	0.321
2000's	3.9%	0.230

Place of Birth

United States	46.2%	14.742
Caribbean	1.9%	0.309
Central America	3.8%	2.218
South America	0.0%	0.000
Northern Europe	22.1%	2.130
Western Europe	6.7%	1.283
Southern Europe	5.8%	0.415
Eastern Europe	7.7%	0.859
Africa	1.9%	0.397
Middle East	0.0%	0.000
Eastern Asia	0.0%	0.000
Southeast Asia	1.9%	0.241
Southern Asia	0.0%	0.000
Oceania	1.9%	4.352

Cdn citizen	97.7%	1.055
Aboriginal	16.8%	8.336

Education

Highest Level			
	University:	16.4%	0.597
	College:	11.6%	1.300
	Trade:	11.6%	1.300
	Secondary:	34.5%	1.153
	Primary:	26.0%	1.046

Official Language

English:	94.2%	1.096
French:	0.0%	0.000
Both:	5.8%	0.508
Neither:	0.0%	0.000

Labour Force 4,165

Labour Force:

Male:	50.5%	0.967
Female:	49.5%	1.036
Participation Rate:	64.5%	0.962
Employment Rate:	92.8%	0.992
Wage and Salary:	92.9%	1.052
Self-Employed:	7.1%	0.623
Unpaid:	0.0%	0.000

Occupation

management	9.8%	0.898
finance	16.8%	0.856
natural	3.8%	0.515
health	9.0%	1.611
social	1.5%	0.455
culture	1.5%	0.455
sales	31.2%	1.256
trades	16.4%	1.104
primary	1.9%	0.705
processing	8.1%	1.076

indexed to Ontario

source: Statistics Canada Census of Population

695
000674

2006 Kenora

3560010

Ontario

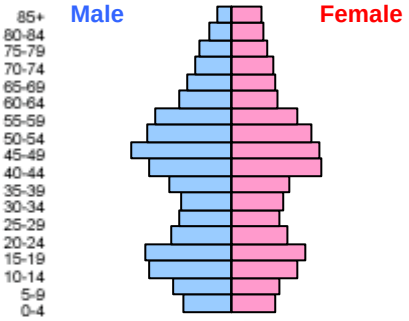
Population 15,177

Male	7,409	48.8%	1.001
Female	7,768	51.2%	0.999

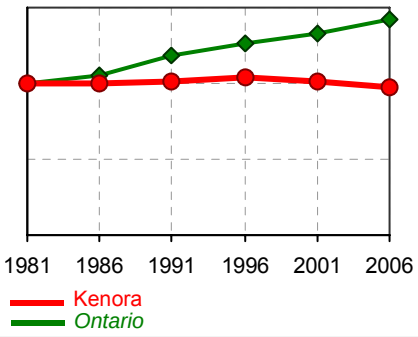
change in past 5 years -4.17%

Avg Income:	$35,252	0.925
Avg Male Income:	$42,474	0.904
Avg Female Income:	$28,395	0.956

Distribution



Trend



Households 6,250

Avg Income:	$67,773	0.869
rate of Low Income	6.4%	0.547
avg persons/ household:	2.4	0.923

Household Income

$000's			
over 100	34.4%	0.867
80 to 100	12.4%	1.206
60 to 80	14.5%	1.124
40 to 60	18.5%	1.215
20 to 40	15.8%	1.066
under 20	4.5%	0.624

Household Size

1	28.5%	1.176
2	35.3%	1.107
3	14.4%	0.868
4-5	20.1%	0.847
6+	1.7%	0.474

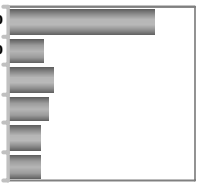
Dwellings 6,250

Avg Value:	$172,060	0.578
Avg Monthly Rent:	$633	0.759
Housing Affordability Index:	2.54	0.665

Tenure

owned	77.3%	1.088
rented	22.7%	0.789
band housing	0.0%	0.000

When constructed



pre 1960	47.1%	1.568
1960's	11.5%	0.820
1970's	14.6%	0.855
1980's	12.9%	0.784
1990's	10.5%	0.791
2000's	10.5%	0.791

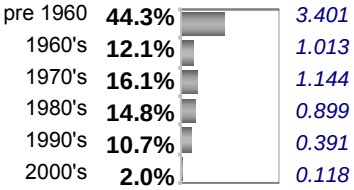
Community Diversity

Migration

1 year:	non-movers	90.2%	1.042
	movers	9.8%	0.728
from where	other country	1.0%	0.126
	other province	9.4%	2.629
	within province	14.2%	0.500
	locally	75.3%	1.262
5 year:	non-movers	67.6%	1.152
	movers	32.4%	0.784
from where	other country	1.1%	0.089
	other province	12.3%	3.114
	within province	16.6%	0.558
	locally	70.0%	1.292

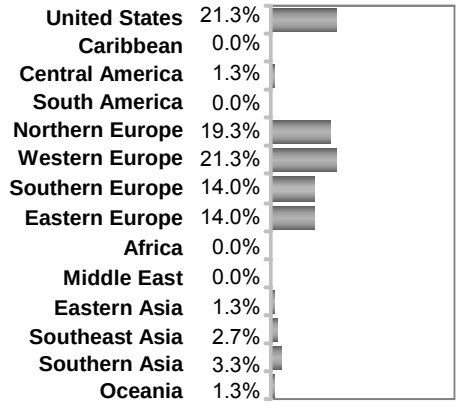
Canadian Born	95.0%	1.329
Foreign Born	5.0%	0.175

When immigrated



pre 1960	44.3%	3.401
1960's	12.1%	1.013
1970's	16.1%	1.144
1980's	14.8%	0.899
1990's	10.7%	0.391
2000's	2.0%	0.118

Place of Birth



United States	21.3%	6.814
Caribbean	0.0%	0.000
Central America	1.3%	0.769
South America	0.0%	0.000
Northern Europe	19.3%	1.862
Western Europe	21.3%	4.065
Southern Europe	14.0%	1.008
Eastern Europe	14.0%	1.563
Africa	0.0%	0.000
Middle East	0.0%	0.000
Eastern Asia	1.3%	0.108
Southeast Asia	2.7%	0.335
Southern Asia	3.3%	0.239
Oceania	1.3%	3.017

Cdn citizen	99.2%	1.072
Aboriginal	15.8%	7.845

Education

Highest Level			
	University:	15.8%	0.573
	College:	12.9%	1.444
	Trade:	12.9%	1.444
	Secondary:	29.6%	0.990
	Primary:	28.9%	1.164

Official Language

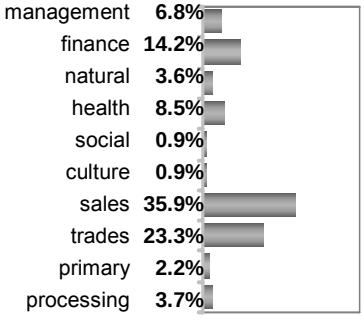
English:	91.9%	1.069
French:	0.0%	0.000
Both:	7.9%	0.686
Neither:	0.3%	0.121

Labour Force 8,225

Labour Force:

Male:	50.3%	0.965
Female:	49.7%	1.039
Participation Rate:	66.5%	0.991
Employment Rate:	92.8%	0.992
Wage and Salary:	92.9%	1.051
Self-Employed:	6.9%	0.611
Unpaid:	0.2%	0.627

Occupation



management	6.8%	0.628
finance	14.2%	0.723
natural	3.6%	0.486
health	8.5%	1.521
social	0.9%	0.289
culture	0.9%	0.289
sales	35.9%	1.443
trades	23.3%	1.565
primary	2.2%	0.829
processing	3.7%	0.483

indexed to Ontario

source: Statistics Canada Census of Population

696
000675

2006 Kenora, Unorganized

3560090

Ontario

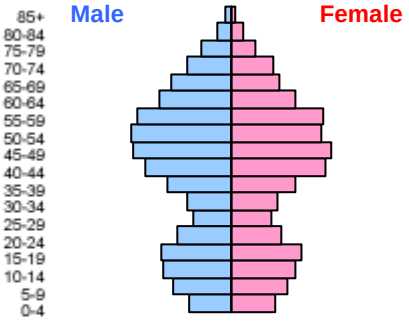
Population 7,041

Male	3,626	51.5%	1.056
Female	3,415	48.5%	0.947

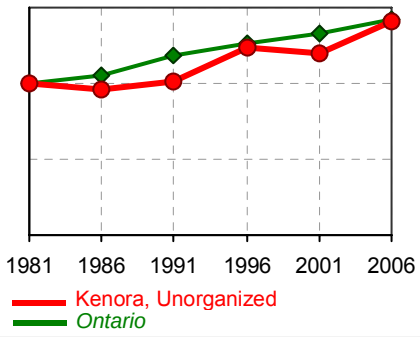
change in past 5 years **18.28%**

Avg Income:	**$35,173**	0.923
Avg Male Income:	**$44,104**	0.939
Avg Female Income:	**$25,494**	0.858

Distribution



Trend



Households 2,795

Avg Income:	**$71,560**	0.918
rate of Low Income	**3.4%**	0.291
avg persons/ household:	**2.5**	0.962

Household Income

$000's			
over 100	35.3%	0.890
80 to 100	11.8%	1.148
60 to 80	13.9%	1.077
40 to 60	17.0%	1.120
20 to 40	17.0%	1.151
under 20	5.0%	0.690

Household Size

# of persons			
1	19.5%	0.802
2	43.0%	1.352
3	16.1%	0.969
4-5	19.3%	0.811
6+	2.1%	0.605

Dwellings 2,800

Avg Value:	**$199,226**	0.670
Avg Monthly Rent:	**$596**	0.715
Housing Affordability Index:	**2.78**	0.730

Tenure

owned	89.6%	1.262
rented	10.4%	0.360
band housing	0.0%	0.000

When constructed

pre 1960	17.9%	0.596
1960's	12.7%	0.903
1970's	23.6%	1.385
1980's	24.7%	1.502
1990's	16.3%	1.228
2000's	16.3%	1.228

Community Diversity

Migration

1 year:	non-movers	90.3%	1.043
	movers	9.7%	0.723
from where	other country	5.9%	0.712
	other province	14.7%	4.124
	within province	32.4%	1.137
	locally	47.1%	0.788
5 year:	non-movers	76.4%	1.302
	movers	23.6%	0.571
from where	other country	3.1%	0.260
	other province	24.5%	6.197
	within province	32.1%	1.076
	locally	40.3%	0.743

Canadian Born	92.3%	1.291
Foreign Born	7.7%	0.270

When immigrated

pre 1960	28.7%	2.204
1960's	15.7%	1.320
1970's	18.5%	1.316
1980's	13.0%	0.789
1990's	13.0%	0.472
2000's	11.1%	0.650

Place of Birth

United States	38.9%	12.422
Caribbean	0.0%	0.000
Central America	0.0%	0.000
South America	0.0%	0.000
Northern Europe	20.4%	1.962
Western Europe	25.9%	4.941
Southern Europe	4.6%	0.333
Eastern Europe	4.6%	0.517
Africa	0.0%	0.000
Middle East	1.9%	0.294
Eastern Asia	0.0%	0.000
Southeast Asia	0.0%	0.000
Southern Asia	0.0%	0.000
Oceania	3.7%	8.381

Cdn citizen	97.6%	1.055
Aboriginal	12.9%	6.408

Education

Highest Level			
	University:	15.5%	0.565
	College:	13.0%	1.456
	Trade:	13.0%	1.456
	Secondary:	31.4%	1.052
	Primary:	27.1%	1.091

Official Language

English:	92.5%	1.077
French:	0.0%	0.000
Both:	7.5%	0.651
Neither:	0.0%	0.000

Labour Force 3,895

Labour Force:

Male:	**54.0%**	1.034
Female:	**46.0%**	0.963
Participation Rate:	**65.8%**	0.981
Employment Rate:	**92.7%**	0.990
Wage and Salary:	**83.3%**	0.943
Self-Employed:	**16.0%**	1.411
Unpaid:	**0.6%**	2.200

Occupation

management	12.5%	1.148
finance	13.9%	0.706
natural	5.0%	0.685
health	5.2%	0.933
social	1.3%	0.385
culture	1.3%	0.385
sales	24.4%	0.982
trades	23.4%	1.575
primary	7.3%	2.707
processing	5.8%	0.760

indexed to Ontario

source: Statistics Canada Census of Population

2006 Red Lake

3560042

Ontario

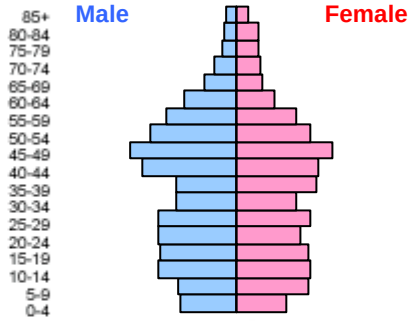
Population 4,526

Male	2,338	51.7%	1.059
Female	2,188	48.3%	0.944

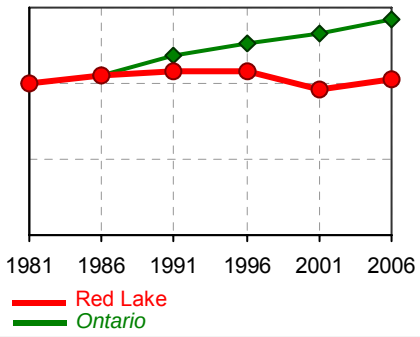
change in past 5 years 6.92%

Avg Income:	$42,216	1.108
Avg Male Income:	$53,597	1.141
Avg Female Income:	$29,740	1.001

Distribution



Trend



Households 1,750

Avg Income:	$83,025	1.065
rate of Low Income	5.1%	0.436
avg persons/ household:	2.5	0.962

Household Income

$000's			
over 100	42.2%	1.065
80 to 100	16.9%	1.647
60 to 80	11.1%	0.859
40 to 60	16.9%	1.111
20 to 40	9.3%	0.631
under 20	3.6%	0.495

Household Size

# of persons		
1	25.1%	1.036
2	33.7%	1.059
3	17.4%	1.051
4-5	21.4%	0.901
6+	2.3%	0.646

Dwellings 1,750

Avg Value:	$148,976	0.501
Avg Monthly Rent:	$720	0.863
Housing Affordability Index:	1.79	0.470

Tenure

owned	72.4%	1.019
rented	27.6%	0.959
band housing	0.0%	0.000

When constructed

pre 1960	32.8%	1.091
1960's	18.7%	1.328
1970's	18.1%	1.062
1980's	19.3%	1.171
1990's	8.9%	0.672
2000's	8.9%	0.672

Community Diversity

Migration

1 year:	non-movers	86.6%	1.000
	movers	13.4%	1.001
from where	other country	4.3%	0.517
	other province	20.5%	5.752
	within province	19.7%	0.691
	locally	55.6%	0.930
5 year:	non-movers	57.7%	0.983
	movers	42.3%	1.024
from where	other country	4.7%	0.392
	other province	26.2%	6.616
	within province	34.5%	1.159
	locally	34.5%	0.638

Canadian Born	93.2%	1.304
Foreign Born	6.8%	0.238

When immigrated

pre 1960	48.3%	3.711
1960's	13.3%	1.118
1970's	13.3%	0.947
1980's	15.0%	0.913
1990's	5.0%	0.182
2000's	5.0%	0.293

Place of Birth

United States	14.5%	4.637
Caribbean	0.0%	0.000
Central America	4.8%	2.790
South America	3.2%	0.695
Northern Europe	8.1%	0.777
Western Europe	33.9%	6.455
Southern Europe	8.1%	0.581
Eastern Europe	24.2%	2.700
Africa	0.0%	0.000
Middle East	3.2%	0.512
Eastern Asia	0.0%	0.000
Southeast Asia	0.0%	0.000
Southern Asia	0.0%	0.000
Oceania	0.0%	0.000

Cdn citizen	97.4%	1.053
Aboriginal	12.7%	6.311

Education

Highest Level			
	University:	15.7%	0.571
	College:	14.8%	1.659
	Trade:	14.8%	1.659
	Secondary:	26.1%	0.875
	Primary:	28.6%	1.152

Official Language

English:	89.9%	1.046
French:	0.0%	0.000
Both:	9.9%	0.867
Neither:	0.2%	0.101

Labour Force 2,740

Labour Force:

Male:	55.8%	1.070
Female:	44.2%	0.924
Participation Rate:	75.6%	1.127
Employment Rate:	94.7%	1.012
Wage and Salary:	91.0%	1.030
Self-Employed:	9.0%	0.793
Unpaid:	0.0%	0.000

Occupation

management	8.0%	0.734
finance	13.8%	0.701
natural	13.0%	1.759
health	4.4%	0.790
social	1.2%	0.365
culture	1.2%	0.365
sales	22.8%	0.916
trades	14.2%	0.953
primary	19.0%	7.039
processing	2.6%	0.343

indexed to Ontario

source: Statistics Canada Census of Population

2006 Sioux Lookout

3560034

Ontario

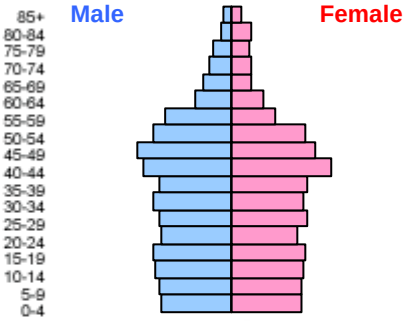
Population 5,183

Male	2,554	49.3%	1.010
Female	2,629	50.7%	0.990

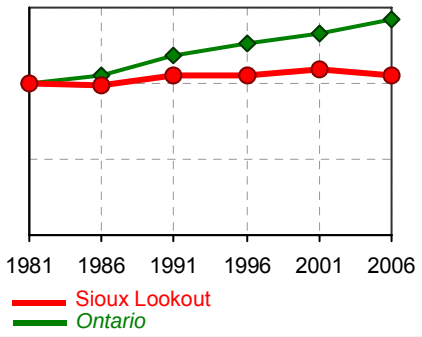
change in past 5 years -2.85%

Avg Income:	$38,971	1.023
Avg Male Income:	$44,263	0.943
Avg Female Income:	$33,942	1.142

Distribution



Trend



Households 1,925

Avg Income:	$79,374	1.018
rate of Low Income	6.1%	0.521
avg persons/ household:	2.7	1.038

Household Income

$000's

over 100	48.5%	1.224
80 to 100	14.0%	1.370
60 to 80	14.5%	1.118
40 to 60	11.5%	0.756
20 to 40	10.6%	0.719
under 20	0.9%	0.118

Household Size

of persons

1	21.6%	0.888
2	34.0%	1.069
3	16.9%	1.018
4-5	23.6%	0.994
6+	3.9%	1.100

Dwellings 1,925

Avg Value:	$184,898	0.622
Avg Monthly Rent:	$743	0.891
Housing Affordability Index:	2.33	0.611

Tenure

owned	71.6%	1.008
rented	28.4%	0.985
band housing	0.0%	0.000

When constructed

pre 1960	32.4%	1.078
1960's	8.5%	0.608
1970's	13.2%	0.775
1980's	18.1%	1.103
1990's	23.1%	1.740
2000's	23.1%	1.740

Community Diversity

Migration

1 year:	non-movers	83.7%	0.966
	movers	16.3%	1.218
from where	other country	0.0%	0.000
	other province	9.1%	2.549
	within province	29.7%	1.044
	locally	61.2%	1.025
5 year:	non-movers	52.8%	0.899
	movers	47.2%	1.143
from where	other country	3.1%	0.257
	other province	10.0%	2.515
	within province	28.8%	0.965
	locally	58.2%	1.074

Canadian Born	92.3%	1.292
Foreign Born	7.7%	0.269

When immigrated

pre 1960	20.8%	1.595
1960's	16.9%	1.416
1970's	9.1%	0.646
1980's	9.1%	0.553
1990's	24.7%	0.898
2000's	19.5%	1.140

Place of Birth

United States	17.9%	5.733
Caribbean	2.6%	0.412
Central America	0.0%	0.000
South America	3.8%	0.829
Northern Europe	16.7%	1.605
Western Europe	20.5%	3.909
Southern Europe	5.1%	0.369
Eastern Europe	6.4%	0.715
Africa	14.1%	2.909
Middle East	7.7%	1.222
Eastern Asia	2.6%	0.208
Southeast Asia	2.6%	0.322
Southern Asia	0.0%	0.000
Oceania	0.0%	0.000

Cdn citizen	97.8%	1.056
Aboriginal	28.1%	13.946

Education

Highest Level

University:	18.3%	0.667
College:	11.3%	1.265
Trade:	11.3%	1.265
Secondary:	26.8%	0.897
Primary:	32.3%	1.302

Official Language

English:	93.1%	1.084
French:	0.0%	0.000
Both:	6.7%	0.585
Neither:	0.2%	0.088

Labour Force 3,190

Labour Force:

Male:	50.2%	0.961
Female:	49.8%	1.042
Participation Rate:	78.5%	1.170
Employment Rate:	95.8%	1.024
Wage and Salary:	92.4%	1.046
Self-Employed:	7.6%	0.670
Unpaid:	0.0%	0.000

Occupation

management	9.1%	0.836
finance	18.0%	0.916
natural	8.0%	1.085
health	10.7%	1.930
social	2.0%	0.610
culture	2.0%	0.610
sales	26.7%	1.076
trades	15.3%	1.027
primary	3.5%	1.282
processing	4.7%	0.625

indexed to Ontario

source: Statistics Canada Census of Population

2006 Wabaseemoong

3560061

Ontario

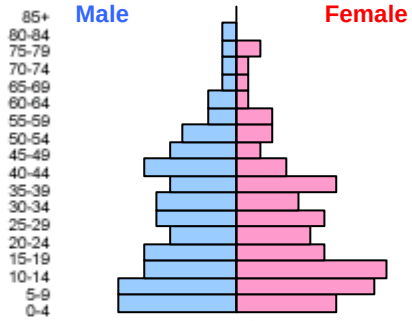
Population 786

Male	396	50.3%	1.032
Female	390	49.7%	0.970

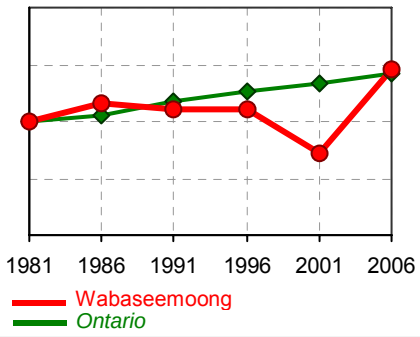
change in past 5 years **102.58%**

Avg Income:	**$14,516**	0.381
Avg Male Income:	**$13,890**	0.296
Avg Female Income:	**$15,178**	0.511

Distribution



Trend



Households 200

Avg Income:	**$32,984**	0.423
rate of Low Income	**0.0%**	0.000
avg persons/ household:	**3.9**	1.500

Household Income

$000's			
over 100	0.0%	0.000
80 to 100	0.0%	0.000
60 to 80	9.1%	0.703
40 to 60	22.7%	1.495
20 to 40	27.3%	1.844
under 20	40.9%	5.695

Household Size

# of persons		
1	14.6%	0.603
2	19.5%	0.613
3	12.2%	0.736
4-5	31.7%	1.333
6+	22.0%	6.200

Dwellings 200

Avg Value:	**$0**	0.000
Avg Monthly Rent:	**$0**	0.000
Housing Affordability Index:	**0.00**	0.000

Tenure

owned	5.0%	0.070
rented	7.5%	0.260
band housing	87.5%	550.504

When constructed

pre 1960	0.0%	0.000
1960's	4.8%	0.339
1970's	4.8%	0.279
1980's	38.1%	2.318
1990's	38.1%	2.874
2000's	38.1%	2.874

Community Diversity

Migration

1 year:	**non-movers**	**92.8%**	1.071
	movers	**7.2%**	0.540
from where	other country	**0.0%**	0.000
	other province	**18.2%**	5.099
	within province	**36.4%**	1.278
	locally	**45.5%**	0.761
5 year:	**non-movers**	**77.3%**	1.318
	movers	**22.7%**	0.549
from where	other country	**0.0%**	0.000
	other province	**21.9%**	5.527
	within province	**21.9%**	0.734
	locally	**56.3%**	1.038

Canadian Born	**0.0%**	0.000
Foreign Born	**0.0%**	0.000

When immigrated

pre 1960	0.0%	0.000
1960's	0.0%	0.000
1970's	0.0%	0.000
1980's	0.0%	0.000
1990's	0.0%	0.000
2000's	0.0%	0.000

Place of Birth

United States	0.0%	0.000
Caribbean	0.0%	0.000
Central America	0.0%	0.000
South America	0.0%	0.000
Northern Europe	0.0%	0.000
Western Europe	0.0%	0.000
Southern Europe	0.0%	0.000
Eastern Europe	0.0%	0.000
Africa	0.0%	0.000
Middle East	0.0%	0.000
Eastern Asia	0.0%	0.000
Southeast Asia	0.0%	0.000
Southern Asia	0.0%	0.000
Oceania	0.0%	0.000

Cdn citizen	**0.0%**	0.000
Aboriginal	**97.5%**	48.342

Education

Highest Level	**University:**	**6.7%**	0.245
	College:	**7.7%**	0.862
	Trade:	**7.7%**	0.862
	Secondary:	**10.6%**	0.354
	Primary:	**67.3%**	2.712

Official Language

English:	**96.9%**	1.127
French:	**0.0%**	0.000
Both:	**1.9%**	0.165
Neither:	**1.3%**	0.567

Labour Force 265

Labour Force:

Male:	**52.7%**	1.010
Female:	**47.3%**	0.989
Participation Rate:	**52.5%**	0.782
Employment Rate:	**77.4%**	0.827
Wage and Salary:	**92.2%**	1.043
Self-Employed:	**7.8%**	0.691
Unpaid:	**0.0%**	0.000

Occupation

management	9.4%	0.862
finance	12.5%	0.636
natural	0.0%	0.000
health	0.0%	0.000
social	0.0%	0.000
culture	0.0%	0.000
sales	40.6%	1.635
trades	28.1%	1.891
primary	9.4%	3.480
processing	0.0%	0.000

indexed to Ontario

source: Statistics Canada Census of Population

700
000679

2006 Wabauskang 21

3560084

Ontario

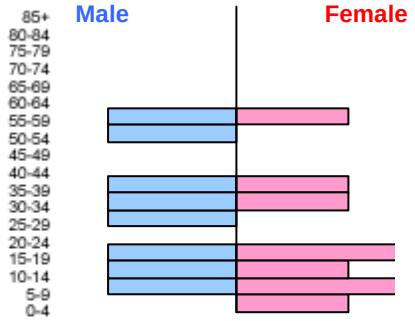
Population 85

Male	40	47.1%	0.965
Female	45	52.9%	1.033

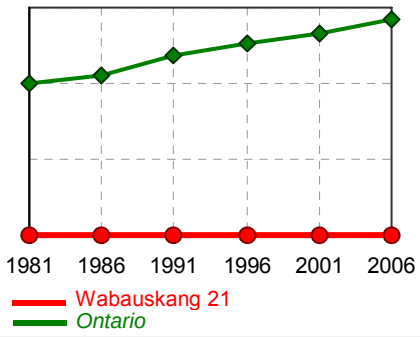
change in past 5 years 66.67%

Avg Income:	$0	0.000
Avg Male Income:	$0	0.000
Avg Female Income:	$0	0.000

Distribution



Trend



Households 30

Avg Income:	$0	0.000
rate of Low Income	0.0%	0.000
avg persons/ household:	2.8	1.077

Household Income

$000's			
over 100	0.0%	0.000
80 to 100	0.0%	0.000
60 to 80	0.0%	0.000
40 to 60	0.0%	0.000
20 to 40	0.0%	0.000
under 20	0.0%	0.000

Household Size

# of persons			
1	33.3%	1.374
2	16.7%	0.523
3	16.7%	1.005
4-5	16.7%	0.701
6+	16.7%	4.707

Dwellings 30

Avg Value:	$0	0.000
Avg Monthly Rent:	$0	0.000
Housing Affordability Index:	0.00	0.000

Tenure

owned	0.0%	0.000
rented	0.0%	0.000
band housing	100.0%	629.148

When constructed

pre 1960	0.0%	0.000
1960's	0.0%	0.000
1970's	0.0%	0.000
1980's	0.0%	0.000
1990's	50.0%	3.773
2000's	50.0%	3.773

Community Diversity

Migration

1 year:	non-movers	88.9%	1.026
	movers	11.1%	0.829
from where	other country	0.0%	0.000
	other province	0.0%	0.000
	within province	0.0%	0.000
	locally	0.0%	0.000
5 year:	non-movers	46.7%	0.796
	movers	53.3%	1.290
from where	other country	0.0%	0.000
	other province	0.0%	0.000
	within province	50.0%	1.678
	locally	50.0%	0.923

Canadian Born	0.0%	0.000
Foreign Born	0.0%	0.000

When immigrated

pre 1960	0.0%	0.000
1960's	0.0%	0.000
1970's	0.0%	0.000
1980's	0.0%	0.000
1990's	0.0%	0.000
2000's	0.0%	0.000

Place of Birth

United States	0.0%	0.000
Caribbean	0.0%	0.000
Central America	0.0%	0.000
South America	0.0%	0.000
Northern Europe	0.0%	0.000
Western Europe	0.0%	0.000
Southern Europe	0.0%	0.000
Eastern Europe	0.0%	0.000
Africa	0.0%	0.000
Middle East	0.0%	0.000
Eastern Asia	0.0%	0.000
Southeast Asia	0.0%	0.000
Southern Asia	0.0%	0.000
Oceania	0.0%	0.000

Cdn citizen	0.0%	0.000
Aboriginal	00.0%	49.606

Education

Highest Level			
	University:	0.0%	0.000
	College:	13.3%	1.494
	Trade:	13.3%	1.494
	Secondary:	13.3%	0.446
	Primary:	60.0%	2.418

Official Language

English:	100.0%	1.164
French:	0.0%	0.000
Both:	0.0%	0.000
Neither:	0.0%	0.000

Labour Force 30

Labour Force:

Male:	33.3%	0.639
Female:	66.7%	1.394
Participation Rate:	46.2%	0.688
Employment Rate:	75.0%	0.802
Wage and Salary:	100.0%	1.132
Self-Employed:	0.0%	0.000
Unpaid:	0.0%	0.000

Occupation

management	0.0%	0.000
finance	16.7%	0.848
natural	0.0%	0.000
health	16.7%	2.998
social	16.7%	5.082
culture	16.7%	5.082
sales	0.0%	0.000
trades	16.7%	1.121
primary	0.0%	0.000
processing	16.7%	2.203

indexed to Ontario

source: Statistics Canada Census of Population

2006 Whitefish Bay 32A

3560004

Ontario

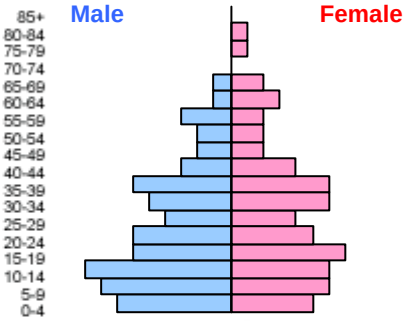
Population 622

Male	316	50.8%	1.042
Female	306	49.2%	0.960

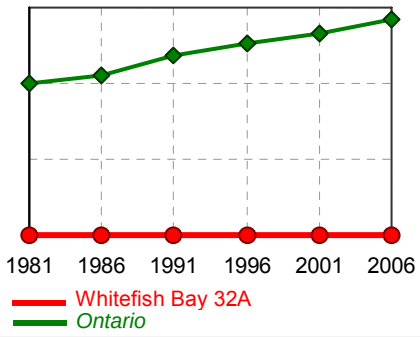
change in past 5 years 0.00%

Avg Income:	$14,061	0.369
Avg Male Income:	$12,378	0.264
Avg Female Income:	$15,764	0.531

Distribution



Trend



Households 165

Avg Income:	$28,812	0.370
rate of Low Income	0.0%	0.000
avg persons/ household:	3.9	1.500

Household Income

$000's			
	over 100	0.0%	0.000
	80 to 100	0.0%	0.000
	60 to 80	11.1%	0.859
	40 to 60	11.1%	0.731
	20 to 40	38.9%	2.629
	under 20	38.9%	5.414

Household Size

# of persons			
1	9.4%	0.386
2	18.8%	0.589
3	18.8%	1.131
4-5	34.4%	1.446
6+	18.8%	5.296

Dwellings 165

Avg Value:	$0	0.000
Avg Monthly Rent:	$0	0.000
Housing Affordability Index:	0.00	0.000

Tenure

owned	15.2%	0.213
rented	12.1%	0.421
band housing	72.7%	457.562

When constructed

pre 1960	0.0%	0.000
1960's	6.1%	0.431
1970's	15.2%	0.889
1980's	39.4%	2.397
1990's	18.2%	1.372
2000's	18.2%	1.372

Community Diversity

Migration

1 year:	non-movers	94.3%	1.089
	movers	5.7%	0.428
from where	other country	0.0%	0.000
	other province	0.0%	0.000
	within province	28.6%	1.004
	locally	71.4%	1.196
5 year:	non-movers	70.5%	1.202
	movers	29.5%	0.713
from where	other country	0.0%	0.000
	other province	0.0%	0.000
	within province	21.9%	0.734
	locally	78.1%	1.442

Canadian Born	0.0%	0.000
Foreign Born	0.0%	0.000

When immigrated

pre 1960	0.0%	0.000
1960's	0.0%	0.000
1970's	0.0%	0.000
1980's	0.0%	0.000
1990's	0.0%	0.000
2000's	0.0%	0.000

Cdn citizen	0.0%	0.000
Aboriginal	00.0%	49.606

Place of Birth

United States	0.0%	0.000
Caribbean	0.0%	0.000
Central America	0.0%	0.000
South America	0.0%	0.000
Northern Europe	0.0%	0.000
Western Europe	0.0%	0.000
Southern Europe	0.0%	0.000
Eastern Europe	0.0%	0.000
Africa	0.0%	0.000
Middle East	0.0%	0.000
Eastern Asia	0.0%	0.000
Southeast Asia	0.0%	0.000
Southern Asia	0.0%	0.000
Oceania	0.0%	0.000

Education

Highest Level	University:	4.7%	0.171
	College:	11.8%	1.319
	Trade:	11.8%	1.319
	Secondary:	22.4%	0.748
	Primary:	49.4%	1.991

Official Language

English:	100.0%	1.164
French:	0.0%	0.000
Both:	0.0%	0.000
Neither:	0.0%	0.000

Labour Force 235

Labour Force:

Male:	53.2%	1.019
Female:	46.8%	0.979
Participation Rate:	57.3%	0.854
Employment Rate:	83.3%	0.891
Wage and Salary:	100.0%	1.132
Self-Employed:	0.0%	0.000
Unpaid:	0.0%	0.000

Occupation

management	10.0%	0.919
finance	10.0%	0.509
natural	0.0%	0.000
health	0.0%	0.000
social	0.0%	0.000
culture	0.0%	0.000
sales	53.3%	2.146
trades	20.0%	1.345
primary	6.7%	2.475
processing	0.0%	0.000

indexed to Ontario

source: Statistics Canada Census of Population

Whiskey Jack Forest

Aboriginal Profiles

Communities

CSDcode	CSDname	community
3560027	Dryden	Dryden
3560032	Ear Falls	Ear Falls
3560058	English River 21	Asubpeeschoseewagong Netum Anishnabek First Nation
3559012	Fort Frances	Fort Frances
3560010	Kenora	Kenora
3560042	Red Lake	Red Lake
3560034	Sioux Lookout	Sioux Lookout
3560061	Wabaseemoong	Wabaseemoong Independent First Nations *(Whitedog)*
3560084	Wabauskang 21	Wabauskang First Nation No.21
3560004	Whitefish Bay 32A	Naotkamegwanning First Nation No. 32A
n/a	n/a	Kenora Métis Council

indicates Aboriginal community

Aboriginal Population estimates

	INAC	StatCan
Wabaseemoong	829	766
Wabauskang	113	85
English River 21	825	623
Whitefish Bay 32A	656	622
	as of Sept, 2008	*as of June, 2006*

2006
816
Forest Management Unit Woodflow

Whiskey Jack Forest
Aboriginal Population

Ontario

Population

Non- Aboriginal Population	42,557	81.3%	0.8295
Aboriginal Population	9,803	18.7%	9.2873

Male	48.1%	0.992
Female	51.9%	1.008

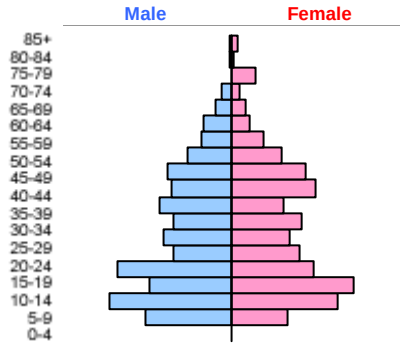
Registered	10.4%	10.096
Non Registered	89.6%	0.906

Aboriginal Origin

North American	63.2%	0.9675
Metis	34.7%	1.1445
Inuit	0.3%	0.3680
Multiple	0.7%	0.9171
Other	1.0%	0.3816

Households 665

Age Distribution



Migration

within previous 1 year: 19.8% 1.098

moved from...

other country	0.0%	0.000
other province	3.3%	1.461
within province	16.0%	0.984
locally	30.7%	0.990

within previous 5 years: 50.8% 1.110

moved from...

other country	0.0%	0.000
other province	3.3%	1.113
within province	12.9%	0.733
locally	33.8%	1.169

Education

highest level attained

Primary	38.5%	1.023
Secondary	27.6%	1.140
Trade	8.2%	0.813
College	18.2%	0.968
University	7.5%	0.812

Language

Aboriginal	14.7%	1.232
English only	81.4%	1.114
French only	0.0%	0.000
English + French only	3.3%	0.248
Other Languages	0.6%	0.441

Has knowledge of Aboriginal language	3.1%	0.574
Aboriginal Language spoken at home	14.8%	1.231
Aboriginal Language as first learned	11.3%	1.151

Income

Individual Average Income	$29,468	1.059
Male Average Income	$32,250	1.001
Female Average Income	$26,536	1.131

Income Source:

Wages	82.83%	1.073
Government	13.35%	0.804
Other	3.80%	0.613

Labour

Labour Force 2,920

Male	48.4%	0.9660
Female	51.6%	1.0341
Participation rate	72.7%	1.1258

Employed Labour Force 649

Male	46.9%	0.9440
Female	53.1%	1.0553
Employment rate	65.4%	1.1526

Occupation...

Management	5.0%	0.731
Finance	12.1%	0.809
Natural Science	3.3%	0.879
Health	2.4%	0.526
Social	14.4%	1.514
Culture	2.2%	1.036
Sales	33.6%	1.174
Trades	19.2%	1.012
Primary	1.9%	0.513
Processing	6.0%	0.852

Industry Sector ...

Agriculture and resource-based industries	0.921
Construction industries	0.426
Manufacturing industries	1.053
Wholesale trade	0.637
Retail trade	1.206
Finance and real estate	0.832
Health care and social services	1.697
Educational services	0.880
Business services	0.871
Other services	0.928

indexed to Ontario

source: Statistics Canada Census of Population

2006
3560027
Census SubDivisions

Dryden
Aboriginal Population

Ontario

Population

Non- Aboriginal Population	7,403	90.3%	0.9220
Aboriginal Population	792	9.7%	4.7916

Male	48.4%	0.998
Female	51.6%	1.002

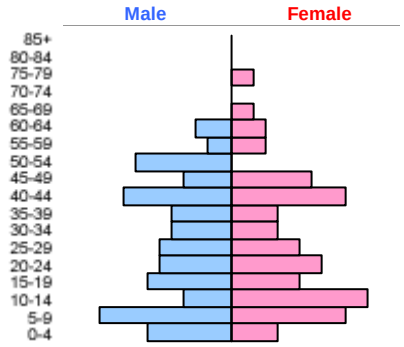
Registered	3.2%	3.072
Non Registered	96.8%	0.978

Aboriginal Origin

North American	25.0%	0.3827
Metis	70.5%	2.3229
Inuit	0.0%	0.0000
Multiple	0.0%	0.0000
Other	4.5%	1.6637

Households 395

Age Distribution



Migration

within previous 1 year: 26.8% 1.486

moved from...

other country	0.0%	0.000
other province	6.0%	2.614
within province	20.2%	1.248
locally	23.8%	0.768

within previous 5 years: 58.6% 1.280

moved from...

other country	0.0%	0.000
other province	7.6%	2.553
within province	7.1%	0.403
locally	35.3%	1.220

Education

highest level attained

Primary	32.4%	0.863
Secondary	28.8%	1.191
Trade	14.4%	1.423
College	18.0%	0.957
University	6.3%	0.682

Language

Aboriginal	9.6%	0.798
English only	84.7%	1.160
French only	0.0%	0.000
English + French only	5.7%	0.429
Other Languages	0.0%	0.000

Has knowledge of Aboriginal language	1.9%	0.352
Aboriginal Language spoken at home	9.6%	0.800
Aboriginal Language as first learned	5.8%	0.592

Income

Individual Average Income	$30,640	1.101
Male Average Income	$42,528	1.321
Female Average Income	$18,574	0.791

Income Source:

Wages	84.90%	1.100
Government	12.90%	0.777
Other	2.10%	0.339

Labour

Labour Force 415

Male	51.8%	1.0344
Female	48.2%	0.9655
Participation rate	75.5%	1.1687

Employed Labour Force 390

Male	48.1%	0.9670
Female	51.9%	1.0326
Employment rate	70.9%	1.2504

Occupation...

Management	9.8%	1.435
Finance	11.0%	0.731
Natural Science	3.7%	0.989
Health	0.0%	0.000
Social	8.5%	0.901
Culture	2.4%	1.139
Sales	29.3%	1.024
Trades	25.6%	1.351
Primary	2.4%	0.645
Processing	7.3%	1.037

Industry Sector ...

Agriculture and resource-based industries	1.459
Construction industries	0.484
Manufacturing industries	1.333
Wholesale trade	1.383
Retail trade	1.520
Finance and real estate	0.767
Health care and social services	0.744
Educational services	0.656
Business services	0.937
Other services	0.941

indexed to Ontario

source: Statistics Canada Census of Population

2006
3559024
Census SubDivisions

Chapple
Aboriginal Population

Ontario

Population

Non- Aboriginal Population	771	90.1%	0.9191
Aboriginal Population	85	9.9%	4.9316

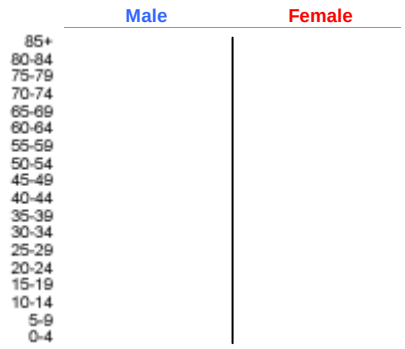
Male	0.0%	0.000	Registered	0.0% 0.000
Female	0.0%	0.000	Non Registered	0.0% 0.000

Aboriginal Origin

North American	76.5%	1.1707
Metis	23.5%	0.7751
Inuit	0.0%	0.0000
Multiple	0.0%	0.0000
Other	0.0%	0.0000

Households 0

Age Distribution



Migration

within previous 1 year: 0.0% 0.000

moved from...

other country	0.0%	0.000
other province	0.0%	0.000
within province	0.0%	0.000
locally	0.0%	0.000

within previous 5 years: 0.0% 0.000

moved from...

other country	0.0%	0.000
other province	0.0%	0.000
within province	0.0%	0.000
locally	0.0%	0.000

Education

highest level attained

Primary	0.0%	0.000
Secondary	0.0%	0.000
Trade	0.0%	0.000
College	0.0%	0.000
University	0.0%	0.000

Language

Aboriginal	0.0%	0.000
English only	0.0%	0.000
French only	0.0%	0.000
English + French only	0.0%	0.000
Other Languages	0.0%	0.000

Has knowledge of Aboriginal language	0.0%	0.000
Aboriginal Language spoken at home	0.0%	0.000
Aboriginal Language as first learned	0.0%	0.000

Income

Individual Average Income	$0	0.000
Male Average Income	$0	0.000
Female Average Income	$0	0.000

Income Source:

Wages	0.00%	0.000
Government	0.00%	0.000
Other	0.00%	0.000

Labour

Labour Force 0

Male	0.0%	0.0000
Female	0.0%	0.0000
Participation rate	0.0%	0.0000

Employed Labour Force 0

Male	0.0%	0.0000
Female	0.0%	0.0000
Employment rate	0.0%	0.0000

Occupation...

Management	0.0%	0.000
Finance	0.0%	0.000
Natural Science	0.0%	0.000
Health	0.0%	0.000
Social	0.0%	0.000
Culture	0.0%	0.000
Sales	0.0%	0.000
Trades	0.0%	0.000
Primary	0.0%	0.000
Processing	0.0%	0.000

Industry Sector ...

Agriculture and resource-based industries	0.000
Construction industries	0.000
Manufacturing industries	0.000
Wholesale trade	0.000
Retail trade	0.000
Finance and real estate	0.000
Health care and social services	0.000
Educational services	0.000
Business services	0.000
Other services	0.000

indexed to Ontario

source: Statistics Canada Census of Population

2006
3560032
Census SubDivisions

Ear Falls
Aboriginal Population

Ontario

Population

Non- Aboriginal Population	1,038	90.0%	*0.9185*
Aboriginal Population	115	10.0%	*4.9606*

Male
Female

Registered
Non Registered

Aboriginal Origin

North American	60.9%	*0.9318*
Metis	39.1%	*1.2891*
Inuit	0.0%	*0.0000*
Multiple	0.0%	*0.0000*
Other	0.0%	*0.0000*

Households

Age Distribution

Male Female

85+
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
5-9
0-4

Migration

within previous 1 year:
moved from...
other country
other province
within province
locally

within previous 5 years:
moved from...
other country
other province
within province
locally

Education

highest level attained
Primary
Secondary
Trade
College
University

Language

Aboriginal
English only
French only
English + French only
Other Languages

Has knowledge of Aboriginal language
Aboriginal Language spoken at home
Aboriginal Language as first learned

Income

Individual Average Income
Male Average Income
Female Average Income

Income Source:
Wages
Government
Other

Labour

Labour Force

Male
Female
Participation rate

Employed Labour Force

Male
Female
Employment rate

Occupation...
Management
Finance
Natural Science
Health
Social
Culture
Sales
Trades
Primary
Processing

Industry Sector ...
Agriculture and resource-based industries
Construction industries
Manufacturing industries
Wholesale trade
Retail trade
Finance and real estate
Health care and social services
Educational services
Business services
Other services

indexed to Ontario

source: Statistics Canada Census of Population

2006
3560058
Census SubDivisions

English River 21
Aboriginal Population

Ontario

Population

Non- Aboriginal Population	10	1.6%	*0.0162*
Aboriginal Population	623	98.4%	*48.8183*

Male
Female

Registered
Non Registered

Aboriginal Origin

North American	100.0%	*1.5309*
Metis	0.0%	*0.0000*
Inuit	0.0%	*0.0000*
Multiple	0.0%	*0.0000*
Other	0.0%	*0.0000*

Households

Age Distribution

Male Female

85+
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
5-9
0-4

Migration

within previous 1 year:
moved from...
other country
other province
within province
locally

within previous 5 years:
moved from...
other country
other province
within province
locally

Education

highest level attained
Primary
Secondary
Trade
College
University

Language

Aboriginal
English only
French only
English + French only
Other Languages

Has knowledge of Aboriginal language
Aboriginal Language spoken at home
Aboriginal Language as first learned

Income

Individual Average Income
Male Average Income
Female Average Income

Income Source:
Wages
Government
Other

Labour

Labour Force

Male
Female
Participation rate

Employed Labour Force

Male
Female
Employment rate

Occupation...

Management
Finance
Natural Science
Health
Social
Culture
Sales
Trades
Primary
Processing

Industry Sector ...

Agriculture and resource-based industries
Construction industries
Manufacturing industries
Wholesale trade
Retail trade
Finance and real estate
Health care and social services
Educational services
Business services
Other services

indexed to Ontario

source: Statistics Canada Census of Population

2006
3559012
Census SubDivisions

Fort Frances
Aboriginal Population

Ontario

Population

Non- Aboriginal Population	6,741	83.2%	0.8491
Aboriginal Population	1,362	16.8%	8.3355

Male	47.4%	0.977
Female	52.6%	1.022

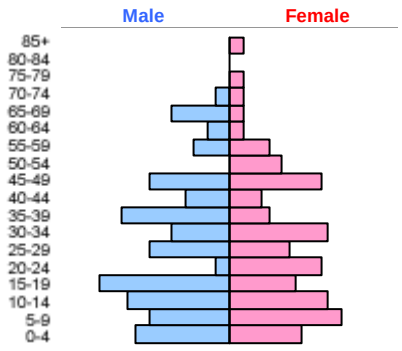
Registered	8.3%	8.049
Non Registered	91.7%	0.927

Aboriginal Origin

North American	49.2%	0.7539
Metis	48.9%	1.6100
Inuit	0.0%	0.0000
Multiple	1.1%	1.4356
Other	0.8%	0.2788

Households 635

Age Distribution



Migration

within previous 1 year: 23.0% 1.277

moved from...

other country	0.0%	0.000
other province	0.0%	0.000
within province	26.7%	1.645
locally	23.3%	0.752

within previous 5 years: 46.7% 1.019

moved from...

other country	0.0%	0.000
other province	0.0%	0.000
within province	15.0%	0.858
locally	35.0%	1.208

Education

highest level attained

Primary	33.2%	0.882
Secondary	31.5%	1.303
Trade	7.1%	0.697
College	19.0%	1.010
University	9.2%	0.999

Language

Aboriginal	5.7%	0.473
English only	90.9%	1.245
French only	0.0%	0.000
English + French only	2.3%	0.169
Other Languages	1.1%	0.890

Has knowledge of Aboriginal language	0.8%	0.148
Aboriginal Language spoken at home	5.6%	0.467
Aboriginal Language as first learned	4.1%	0.418

Income

Individual Average Income	$28,980	1.042
Male Average Income	$26,491	0.823
Female Average Income	$31,361	1.336

Income Source:

Wages	77.50%	1.004
Government	16.60%	1.000
Other	5.90%	0.952

Labour

Labour Force 625

Male	46.8%	0.9349
Female	53.2%	1.0653
Participation rate	67.6%	1.0464

Employed Labour Force 550

Male	47.7%	0.9601
Female	52.3%	1.0394
Employment rate	59.5%	1.0494

Occupation...

Management	1.6%	0.241
Finance	11.5%	0.764
Natural Science	2.5%	0.665
Health	3.3%	0.729
Social	18.9%	1.989
Culture	1.6%	0.766
Sales	36.9%	1.290
Trades	18.0%	0.951
Primary	1.6%	0.434
Processing	4.1%	0.581

Industry Sector ...

Agriculture and resource-based industries		1.329
Construction industries		0.630
Manufacturing industries		1.156
Wholesale trade		0.000
Retail trade		0.684
Finance and real estate		1.246
Health care and social services		1.659
Educational services		0.854
Business services		0.508
Other services		1.224

indexed to Ontario

source: Statistics Canada Census of Population

2006
3560090
Census SubDivisions

Kenora, Unorganized
Aboriginal Population

Ontario

Population

Non- Aboriginal Population	6,132	87.1%	0.8887
Aboriginal Population	909	12.9%	6.4076

Male
Female

Registered
Non Registered

Aboriginal Origin

North American	39.9%	0.6107
Metis	57.4%	1.8902
Inuit	1.1%	1.3022
Multiple	1.6%	2.0867
Other	0.0%	0.0000

Households

Age Distribution

Male Female

85+
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
5-9
0-4

Migration

within previous 1 year:
moved from...
other country
other province
within province
locally

within previous 5 years:
moved from...
other country
other province
within province
locally

Education

highest level attained
Primary
Secondary
Trade
College
University

Language

Aboriginal
English only
French only
English + French only
Other Languages

Has knowledge of Aboriginal language
Aboriginal Language spoken at home
Aboriginal Language as first learned

Income

Individual Average Income
Male Average Income
Female Average Income

Income Source:
Wages
Government
Other

Labour

Labour Force

Male
Female
Participation rate

Employed Labour Force

Male
Female
Employment rate

Occupation...

Management
Finance
Natural Science
Health
Social
Culture
Sales
Trades
Primary
Processing

Industry Sector ...

Agriculture and resource-based industries
Construction industries
Manufacturing industries
Wholesale trade
Retail trade
Finance and real estate
Health care and social services
Educational services
Business services
Other services

indexed to Ontario

source: Statistics Canada Census of Population

2006
3560010
Census SubDivisions

Kenora
Aboriginal Population

Ontario

Population

Non- Aboriginal Population	12,777	84.2%	0.8592
Aboriginal Population	2,400	15.8%	7.8447

Male	52.4%	1.081
Female	47.6%	0.923

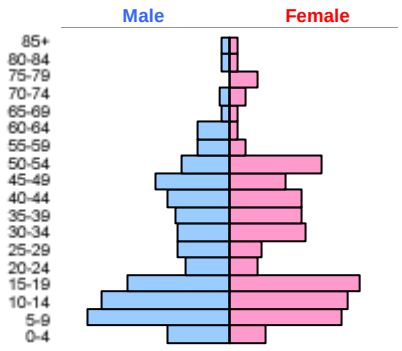
Registered	7.7%	7.487
Non Registered	92.3%	0.933

Aboriginal Origin

North American	48.5%	0.7428
Metis	49.6%	1.6333
Inuit	0.4%	0.5028
Multiple	0.6%	0.8056
Other	0.8%	0.3129

Households 1,065

Age Distribution



Migration

within previous 1 year: 12.0% 0.666

moved from...

other country	0.0%	0.000
other province	5.4%	2.352
within province	8.9%	0.551
locally	35.7%	1.151

within previous 5 years: 43.6% 0.952

moved from...

other country	0.0%	0.000
other province	3.6%	1.198
within province	10.8%	0.614
locally	35.6%	1.232

Education

highest level attained

Primary	41.3%	1.098
Secondary	25.7%	1.063
Trade	5.4%	0.533
College	19.7%	1.046
University	7.9%	0.858

Language

Aboriginal	9.3%	0.776
English only	86.1%	1.179
French only	0.0%	0.000
English + French only	4.2%	0.316
Other Languages	0.4%	0.332

Has knowledge of Aboriginal language	1.7%	0.315
Aboriginal Language spoken at home	9.3%	0.775
Aboriginal Language as first learned	7.2%	0.735

Income

Individual Average Income	$28,885	1.038
Male Average Income	$30,798	0.956
Female Average Income	$26,698	1.138

Income Source:

Wages	81.40%	1.054
Government	14.10%	0.849
Other	4.50%	0.726

Labour

Labour Force 1,115

Male	50.5%	1.0073
Female	49.5%	0.9927
Participation rate	70.1%	1.0851

Employed Labour Force 960

Male	49.7%	1.0010
Female	50.3%	0.9991
Employment rate	60.4%	1.0653

Occupation...

Management	2.3%	0.339
Finance	9.7%	0.644
Natural Science	4.1%	1.122
Health	2.8%	0.615
Social	12.9%	1.361
Culture	0.0%	0.000
Sales	34.6%	1.209
Trades	23.5%	1.240
Primary	2.3%	0.610
Processing	7.8%	1.111

Industry Sector ...

Agriculture and resource-based industries	0.427
Construction industries	0.590
Manufacturing industries	0.893
Wholesale trade	0.673
Retail trade	1.623
Finance and real estate	0.700
Health care and social services	1.437
Educational services	0.959
Business services	0.998
Other services	0.894

indexed to Ontario

source: Statistics Canada Census of Population

2006
3560042
Census SubDivisions

Red Lake
Aboriginal Population

Ontario

Population

Non- Aboriginal Population	3,950	87.3%	0.8907
Aboriginal Population	576	12.7%	6.3114

Male
Female

Registered
Non Registered

Aboriginal Origin

North American	64.3%	0.9851
Metis	31.3%	1.0313
Inuit	0.0%	0.0000
Multiple	2.6%	3.3205
Other	1.7%	0.6448

Households

Age Distribution

Male Female

85+
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
5-9
0-4

Migration

within previous 1 year:
moved from...
other country
other province
within province
locally

within previous 5 years:
moved from...
other country
other province
within province
locally

Education

highest level attained
Primary
Secondary
Trade
College
University

Language

Aboriginal
English only
French only
English + French only
Other Languages

Has knowledge of Aboriginal language
Aboriginal Language spoken at home
Aboriginal Language as first learned

Income

Individual Average Income
Male Average Income
Female Average Income

Income Source:
Wages
Government
Other

Labour

Labour Force

Male
Female
Participation rate

Employed Labour Force

Male
Female
Employment rate

Occupation...
Management
Finance
Natural Science
Health
Social
Culture
Sales
Trades
Primary
Processing

Industry Sector ...
Agriculture and resource-based industries
Construction industries
Manufacturing industries
Wholesale trade
Retail trade
Finance and real estate
Health care and social services
Educational services
Business services
Other services

indexed to Ontario

source: Statistics Canada Census of Population

2006
3560034
Census SubDivisions

Sioux Lookout
Aboriginal Population

Ontario

Population

Non- Aboriginal Population	3,726	71.9%	0.7337
Aboriginal Population	1,457	28.1%	13.9456

Male	44.1%	0.910
Female	55.9%	1.085

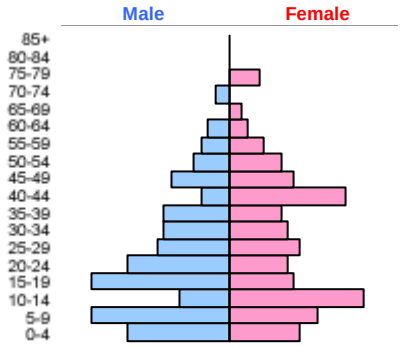
Registered	22.4%	21.775
Non Registered	77.6%	0.784

Aboriginal Origin

North American	82.4%	1.2616
Metis	15.2%	0.4998
Inuit	0.7%	0.8218
Multiple	0.7%	0.8778
Other	1.0%	0.3835

Households 565

Age Distribution



Migration

within previous 1 year: 17.4% 0.964

moved from...

other country	0.0%	0.000
other province	2.0%	0.878
within province	8.0%	0.494
locally	40.0%	1.290

within previous 5 years: 54.4% 1.187

moved from...

other country	0.0%	0.000
other province	2.1%	0.700
within province	18.5%	1.057
locally	29.4%	1.015

Education

highest level attained

Primary	47.0%	1.249
Secondary	24.2%	1.002
Trade	6.1%	0.598
College	16.2%	0.859
University	6.6%	0.710

Language

Aboriginal	34.5%	2.881
English only	63.8%	0.874
French only	0.0%	0.000
English + French only	1.0%	0.077
Other Languages	0.7%	0.542

Has knowledge of Aboriginal language	8.0%	1.481
Aboriginal Language spoken at home	34.6%	2.883
Aboriginal Language as first learned	28.0%	2.857

Income

Individual Average Income	$29,365	1.056
Male Average Income	$29,183	0.906
Female Average Income	$29,510	1.257

Income Source:

Wages	87.50%	1.133
Government	9.80%	0.590
Other	2.70%	0.435

Labour

Labour Force 765

Male	44.4%	0.8874
Female	55.6%	1.1130
Participation rate	77.7%	1.2028

Employed Labour Force 695

Male	42.1%	0.8481
Female	57.9%	1.1500
Employment rate	70.6%	1.2451

Occupation...

Management	6.2%	0.907
Finance	16.4%	1.095
Natural Science	2.7%	0.741
Health	3.4%	0.761
Social	17.1%	1.807
Culture	4.8%	2.239
Sales	33.6%	1.174
Trades	9.6%	0.506
Primary	1.4%	0.363
Processing	4.8%	0.680

Industry Sector ...

Agriculture and resource-based industries	0.467
Construction industries	0.000
Manufacturing industries	0.829
Wholesale trade	0.492
Retail trade	0.998
Finance and real estate	0.613
Health care and social services	2.948
Educational services	1.050
Business services	1.041
Other services	0.652

indexed to Ontario

source: Statistics Canada Census of Population

2006
3560061
Census SubDivisions

Wabaseemoong
Aboriginal Population

Ontario

Population

Non- Aboriginal Population	20	2.5%	*0.0260*
Aboriginal Population	766	97.5%	*48.3419*

Male
Female

Registered
Non Registered

Aboriginal Origin

North American	98.7%	*1.5110*
Metis	1.3%	*0.0428*
Inuit	0.0%	*0.0000*
Multiple	0.0%	*0.0000*
Other	0.0%	*0.0000*

Households

Age Distribution

Male Female

85+
80-84
75-79
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
5-9
0-4

Migration

within previous 1 year:
moved from...
other country
other province
within province
locally

within previous 5 years:
moved from...
other country
other province
within province
locally

Education

highest level attained
Primary
Secondary
Trade
College
University

Language

Aboriginal
English only
French only
English + French only
Other Languages

Has knowledge of Aboriginal language
Aboriginal Language spoken at home
Aboriginal Language as first learned

Income

Individual Average Income
Male Average Income
Female Average Income

Income Source:
Wages
Government
Other

Labour

Labour Force

Male
Female
Participation rate

Employed Labour Force

Male
Female
Employment rate

Occupation...

Management
Finance
Natural Science
Health
Social
Culture
Sales
Trades
Primary
Processing

Industry Sector ...

Agriculture and resource-based industries
Construction industries
Manufacturing industries
Wholesale trade
Retail trade
Finance and real estate
Health care and social services
Educational services
Business services
Other services

indexed to Ontario

source: Statistics Canada Census of Population

2006
3560084
Census SubDivisions

Wabauskang 21
Aboriginal Population

Ontario

Population

Non- Aboriginal Population	0	0.0%	*0.0000*
Aboriginal Population	85	100.0%	*49.6057*

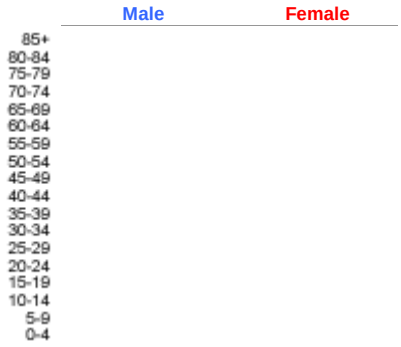
Male
Female

Registered
Non Registered

Aboriginal Origin			
North American	100.0%		*1.5309*
Metis	0.0%		*0.0000*
Inuit	0.0%		*0.0000*
Multiple	0.0%		*0.0000*
Other	0.0%		*0.0000*

Households

Age Distribution



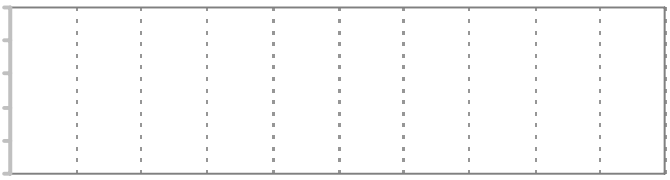
Migration

within previous 1 year:
moved from...
other country
other province
within province
locally

within previous 5 years:
moved from...
other country
other province
within province
locally

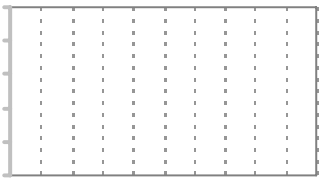
Education

highest level attained
Primary
Secondary
Trade
College
University



Language

Aboriginal
English only
French only
English + French only
Other Languages



Has knowledge of Aboriginal language
Aboriginal Language spoken at home
Aboriginal Language as first learned

Income

Individual Average Income
Male Average Income
Female Average Income

Income Source:
Wages
Government
Other

Labour

Labour Force

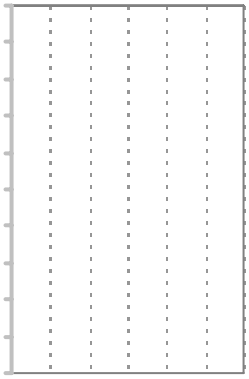
Male
Female
Participation rate

Employed Labour Force

Male
Female
Employment rate

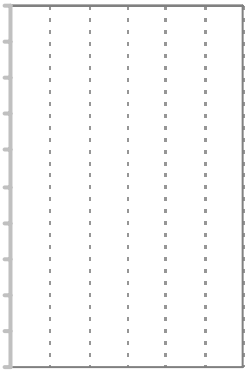
Occupation...

Management
Finance
Natural Science
Health
Social
Culture
Sales
Trades
Primary
Processing



Industry Sector ...

Agriculture and resource-based industries
Construction industries
Manufacturing industries
Wholesale trade
Retail trade
Finance and real estate
Health care and social services
Educational services
Business services
Other services



indexed to Ontario

source: Statistics Canada Census of Population

2006
3560004
Census SubDivisions

Whitefish Bay 32A
Aboriginal Population

Ontario

Population

Non- Aboriginal Population	0	0.0%	*0.0000*
Aboriginal Population	622	100.0%	*49.6057*

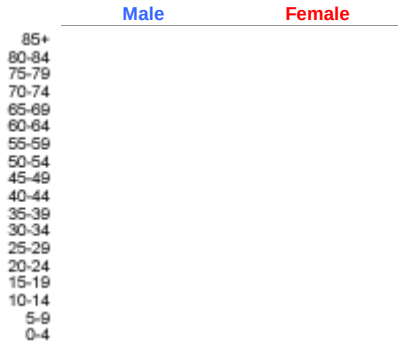
Male
Female

Registered
Non Registered

Aboriginal Origin			
North American	98.4%		*1.5064*
Metis	0.0%		*0.0000*
Inuit	0.0%		*0.0000*
Multiple	0.0%		*0.0000*
Other	1.6%		*0.5932*

Households

Age Distribution



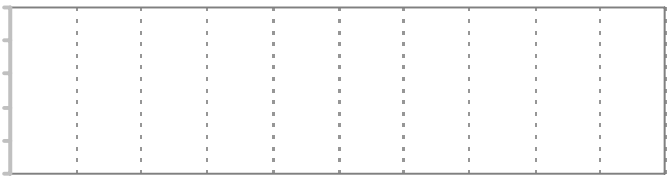
Migration

within previous 1 year:
moved from...
other country
other province
within province
locally

within previous 5 years:
moved from...
other country
other province
within province
locally

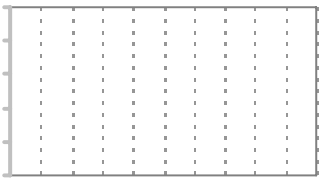
Education

highest level attained
Primary
Secondary
Trade
College
University



Language

Aboriginal
English only
French only
English + French only
Other Languages



Has knowledge of Aboriginal language
Aboriginal Language spoken at home
Aboriginal Language as first learned

Income

Individual Average Income
Male Average Income
Female Average Income

Income Source:
Wages
Government
Other

Labour

Labour Force

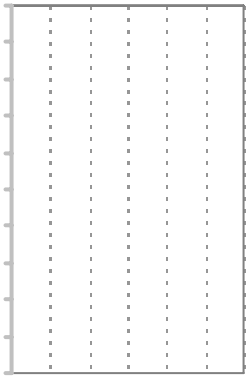
Male
Female
Participation rate

Employed Labour Force

Male
Female
Employment rate

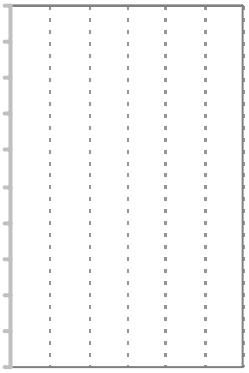
Occupation...

Management
Finance
Natural Science
Health
Social
Culture
Sales
Trades
Primary
Processing



Industry Sector ...

Agriculture and resource-based industries
Construction industries
Manufacturing industries
Wholesale trade
Retail trade
Finance and real estate
Health care and social services
Educational services
Business services
Other services



indexed to Ontario

source: Statistics Canada Census of Population

Whiskey Jack Forest

Local Economy Profiles

Communities

CSDcode	CSDname	community
3560027	Dryden	Dryden
3560032	Ear Falls	Ear Falls
3560058	English River 21	Asubpeeschoseewagong Netum Anishnabek First Nation
3559012	Fort Frances	Fort Frances
3560010	Kenora	Kenora
3560042	Red Lake	Red Lake
3560034	Sioux Lookout	Sioux Lookout
3560061	Wabaseemoong	Wabaseemoong Independent First Nations *(Whitedog)*
3560084	Wabauskang 21	Wabauskang First Nation No.21
3560004	Whitefish Bay 32A	Naotkamegwanning First Nation No. 32A
n/a	n/a	Kenora Métis Council

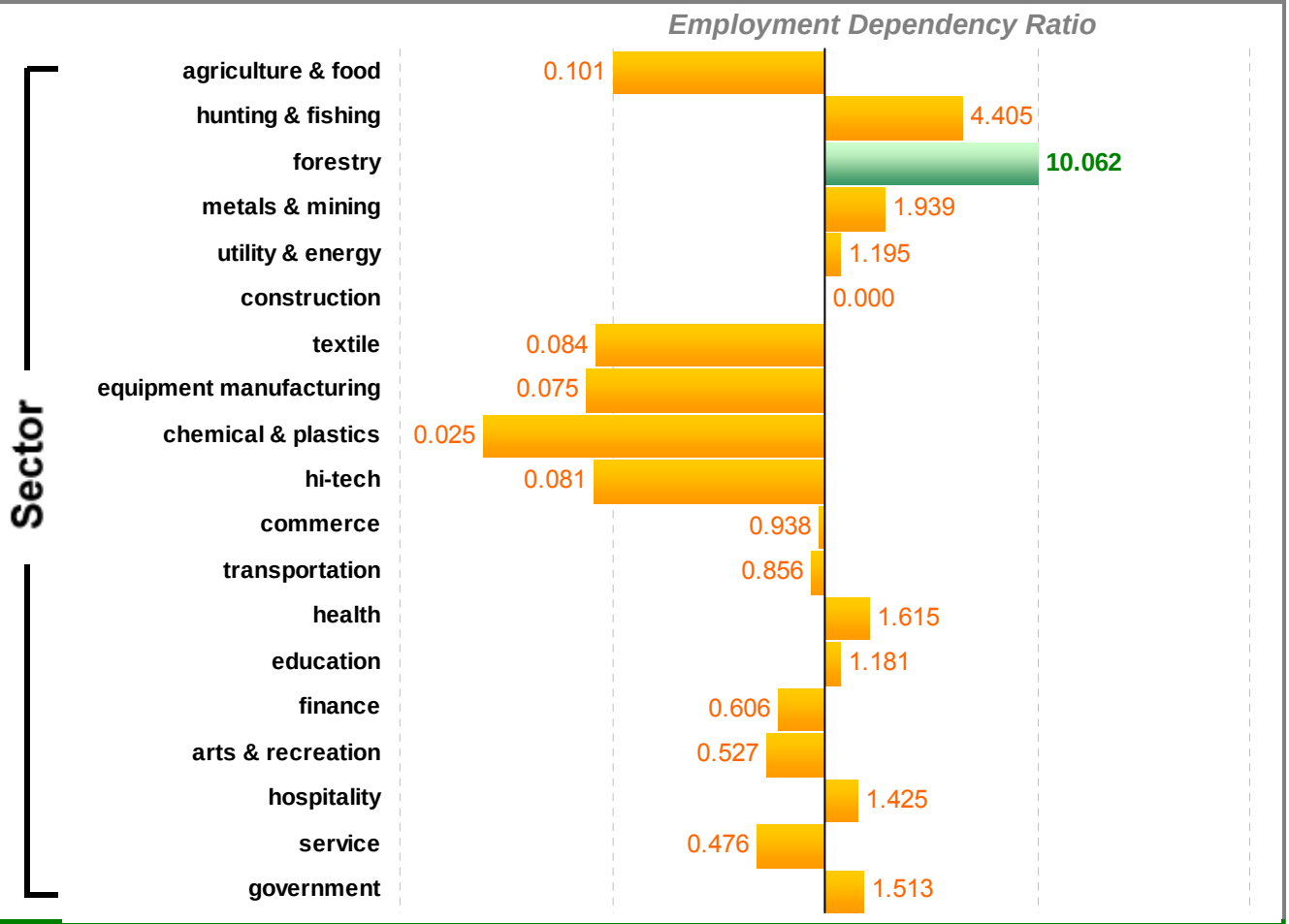
indicates Aboriginal community

2006
816
Forest Management Unit Woodflow

Whiskey Jack Forest

Ontario

Local Economy

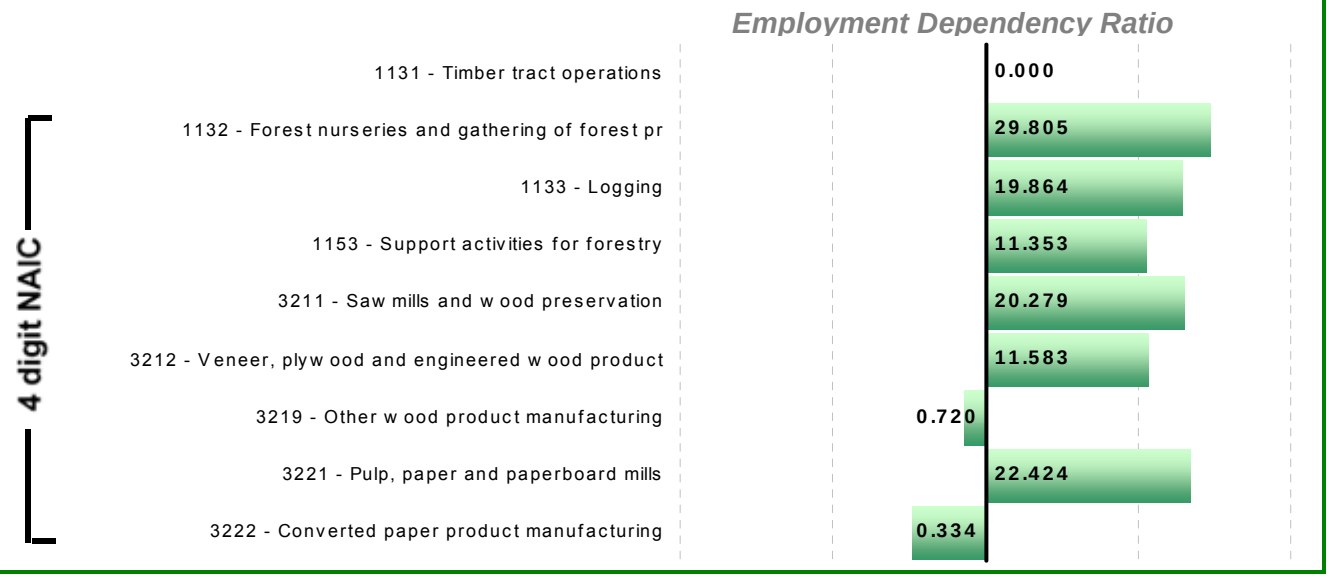


Forest Industry

10.9% of Total Labour Force

Employment: 2,440 *index:* *10.062* 93.7% Employment Ratio

Average Income: $58,005 *index:* *1.260*



indexed to Ontario

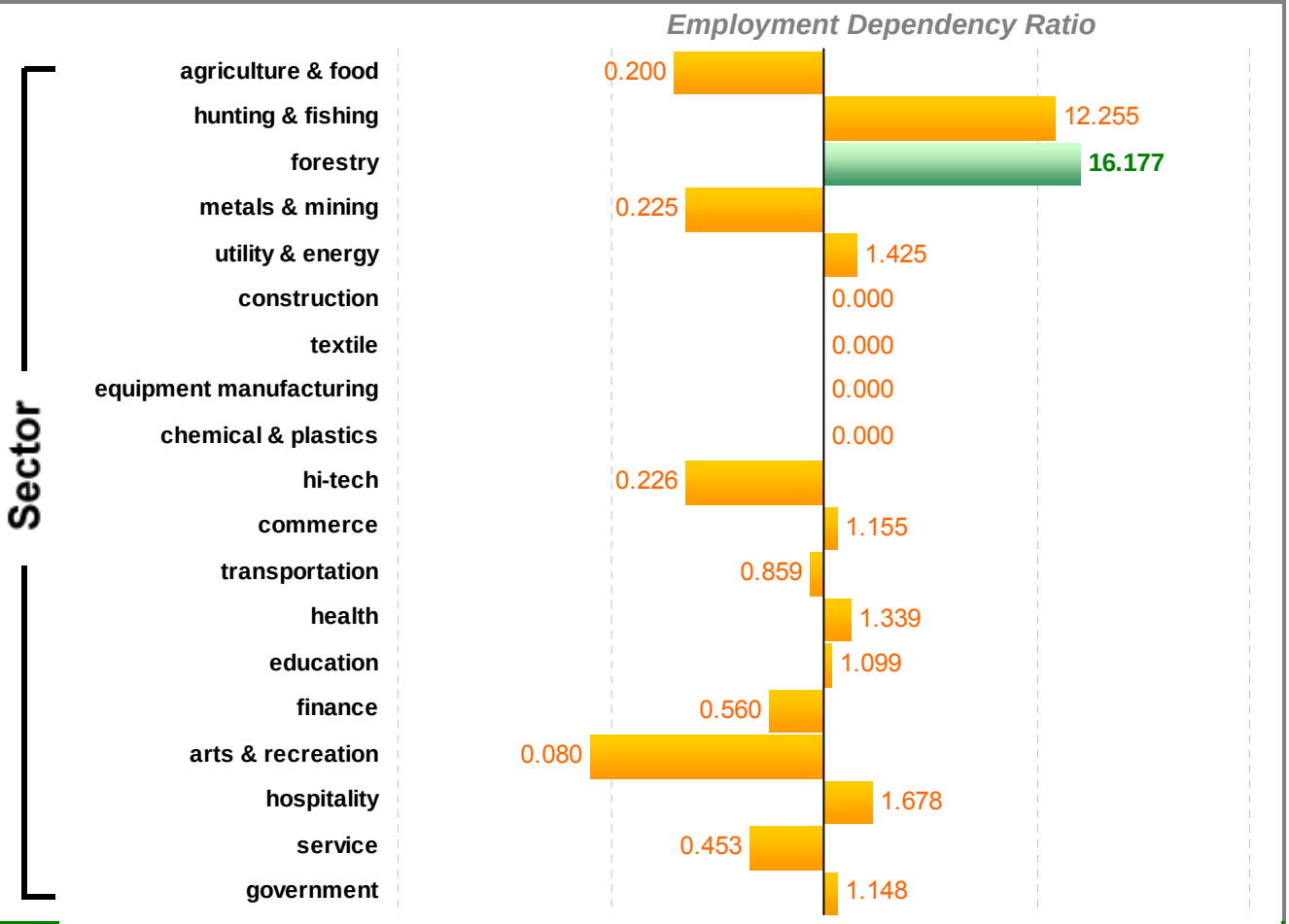
source: Statistics Canada 2006 Census of Population

2006
3560027
CDN

Dryden

Ontario

Local Economy

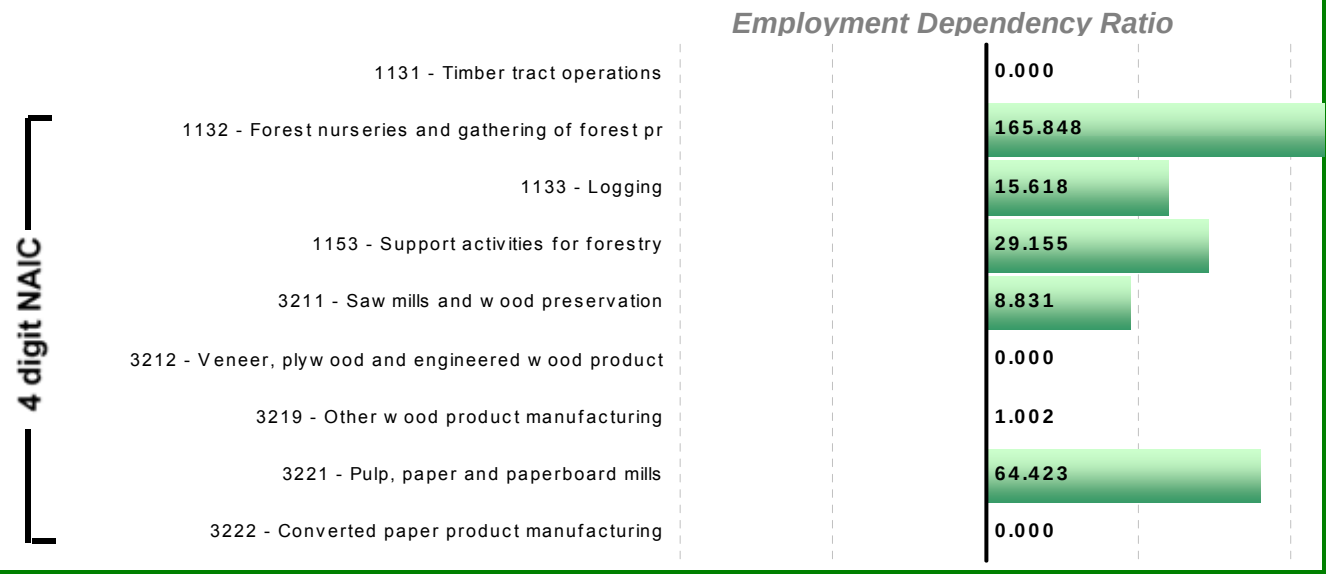


Forest Industry

16.9% of Total Labour Force

Employment: **705** *index:* *16.177* 97.9% Employment Ratio

Average Income: **$69,645** *index:* *1.513*



indexed to Ontario

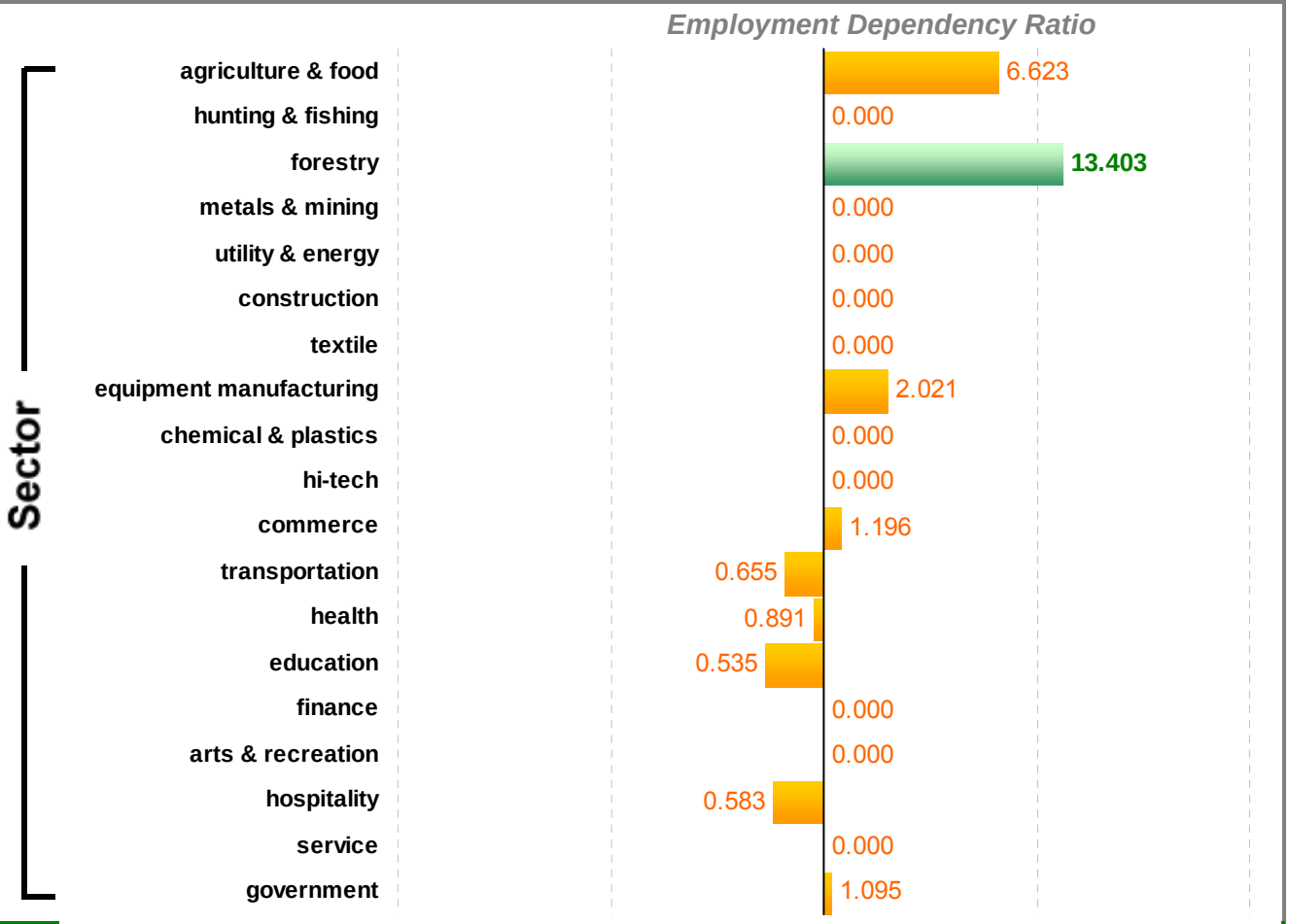
source: Statistics Canada 2006 Census of Population

2006
3559024
CDN

Chapple

Ontario

Local Economy

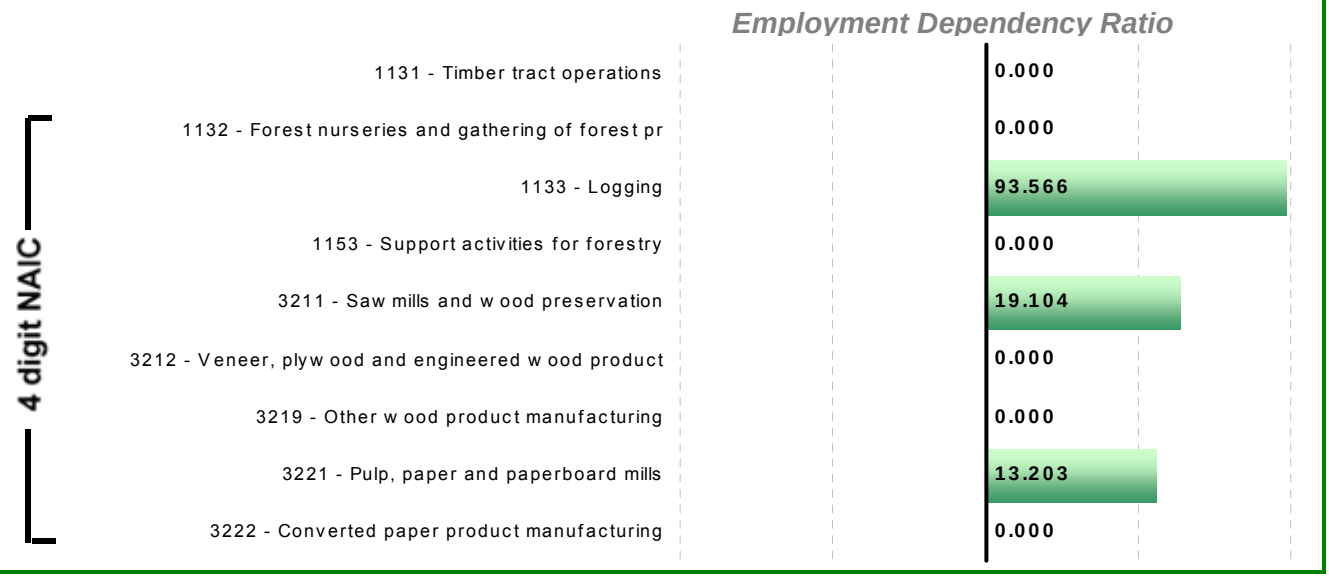


Forest Industry

11.9% of Total Labour Force

Employment: **60** *index:* *13.403* 100.0% Employment Ratio

Average Income: **$15,988** *index:* *0.347*



indexed to Ontario

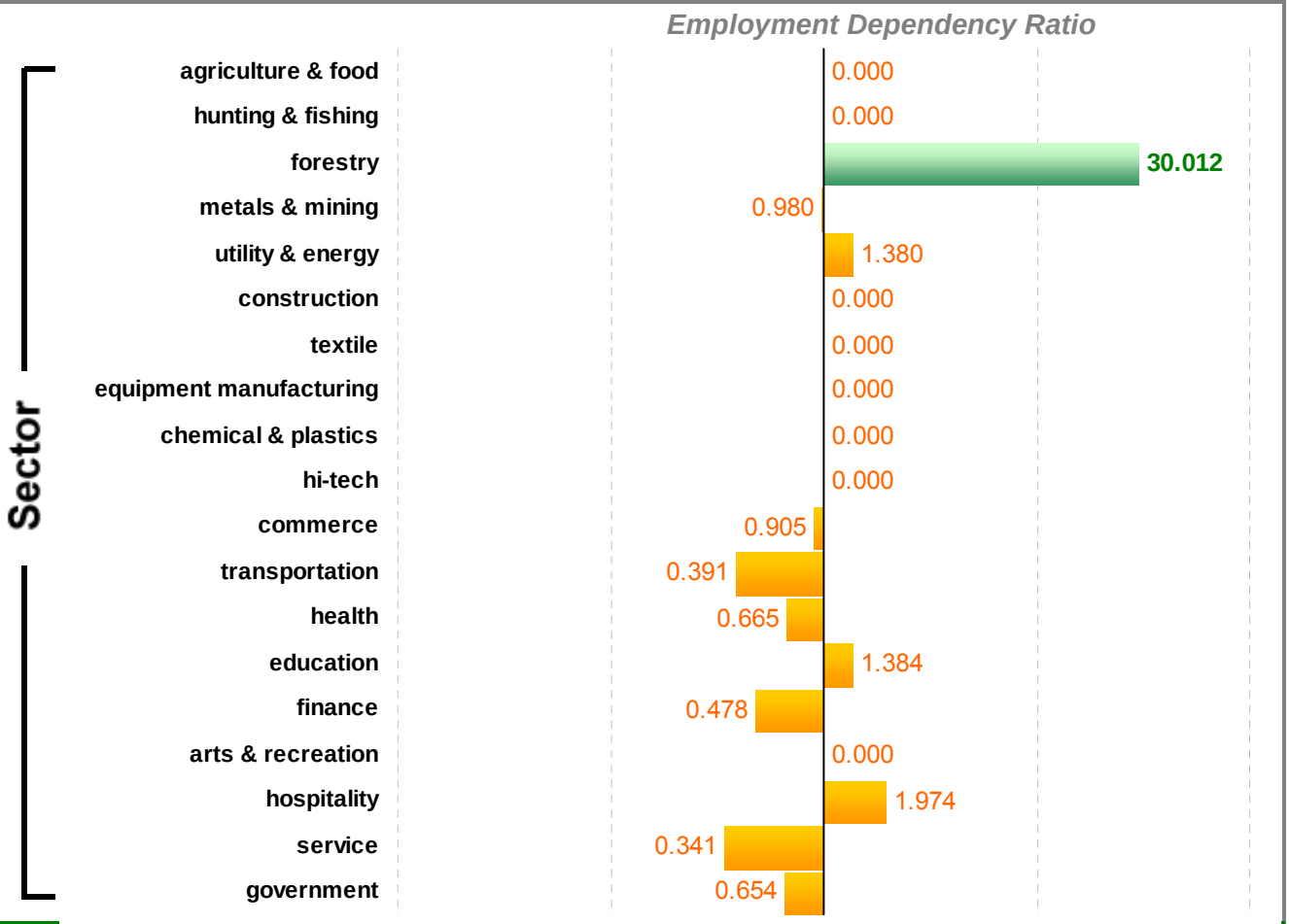
source: Statistics Canada 2006 Census of Population

2006
3560032
CDN

Ear Falls

Ontario

Local Economy

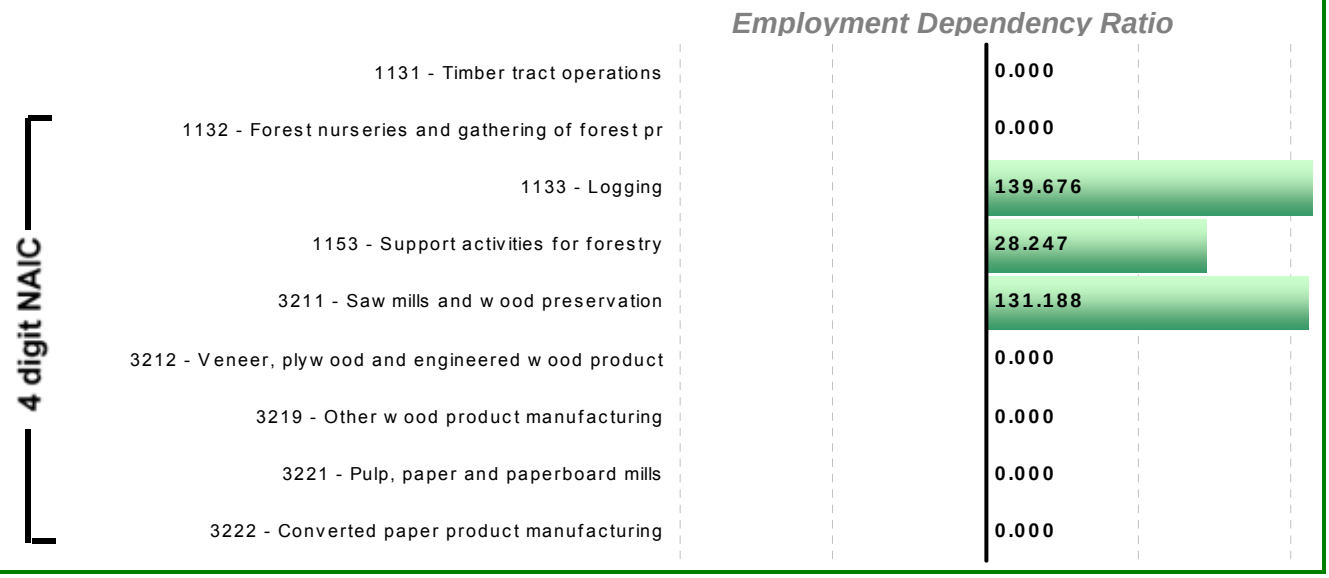


Forest Industry

32.2% of Total Labour Force

Employment: **225** *index:* *30.012* 95.7% Employment Ratio

Average Income: **$53,750** *index:* *1.168*



indexed to Ontario

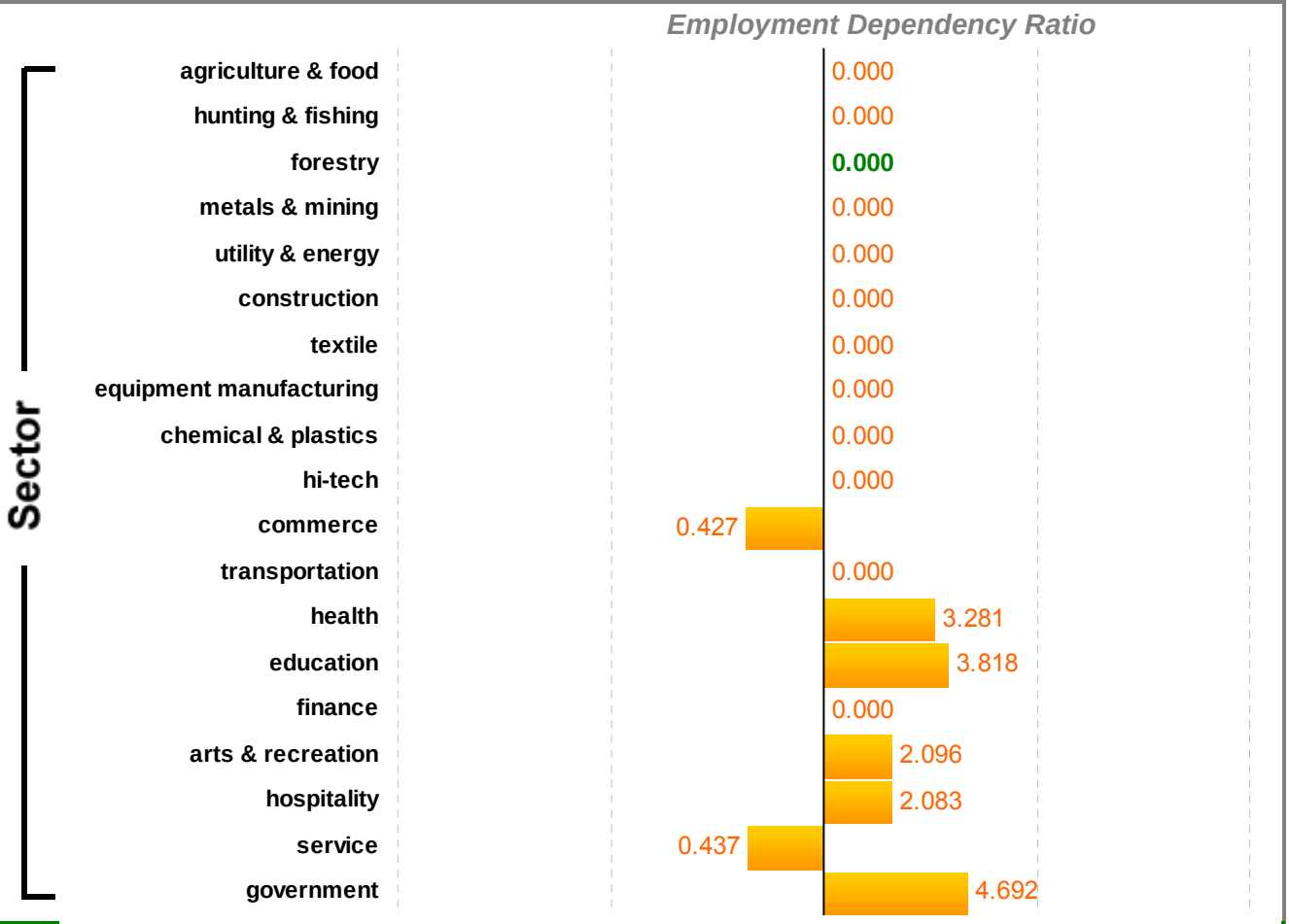
source: Statistics Canada 2006 Census of Population

2006
3560058
Census SubDivisions

English River 21

Ontario

Local Economy

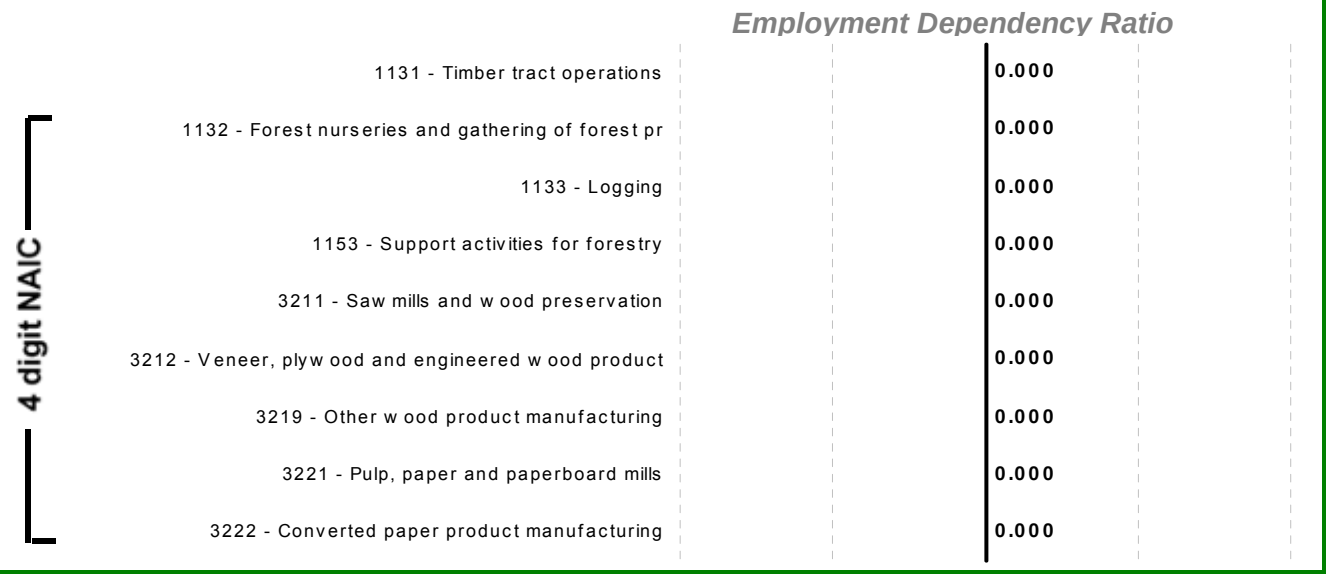


Forest Industry

9.8% of Total Labour Force

Employment: 0 *index:* *0.000* 0.0% Employment Ratio

Average Income: $0 *index:* *0.000*



indexed to Ontario

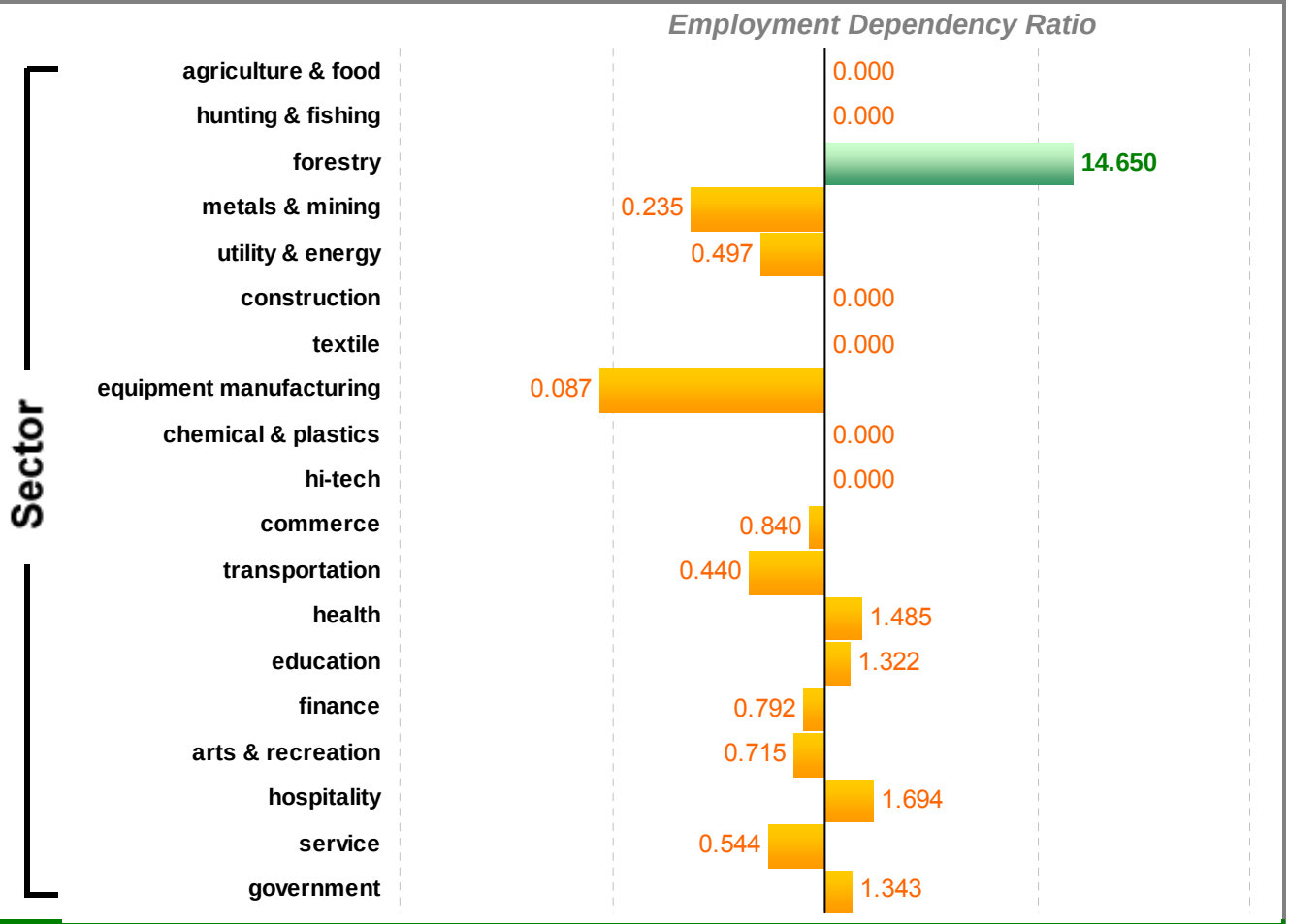
source: Statistics Canada 2006 Census of Population

2006
3559012
CDN

Fort Frances

Ontario

Local Economy

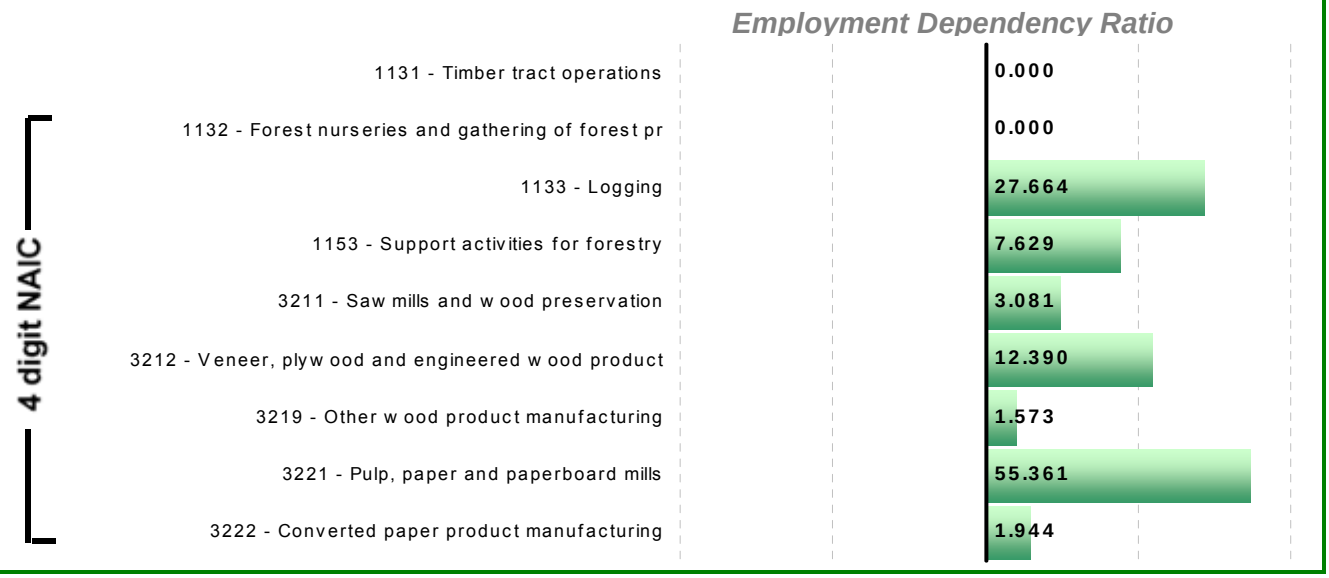


Forest Industry

16.5% of Total Labour Force

Employment: **610** *index:* *14.650* 91.0% Employment Ratio

Average Income: **$56,379** *index:* *1.225*



indexed to Ontario

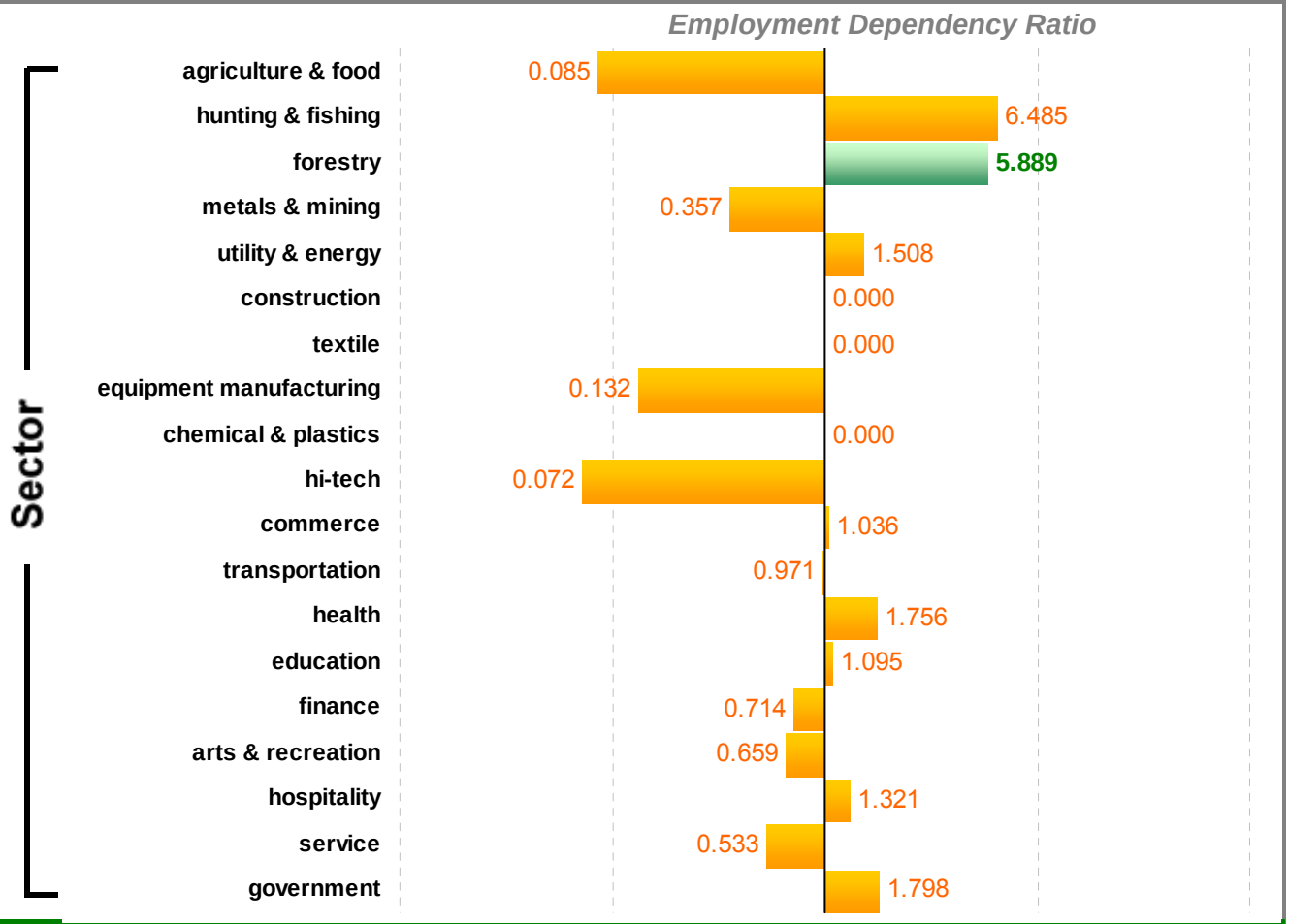
source: Statistics Canada 2006 Census of Population

2006
3560010
CDN

Kenora

Ontario

Local Economy

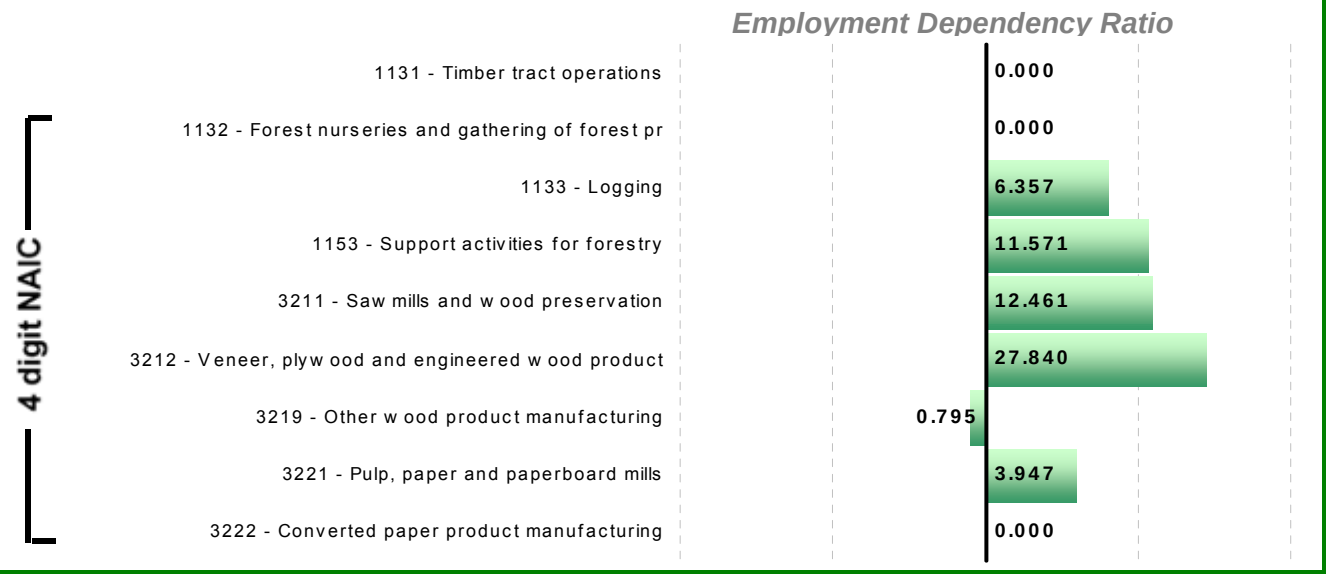


Forest Industry

6.6% of Total Labour Force

Employment: 485 *index:* 5.889 87.4% Employment Ratio

Average Income: $53,756 *index:* 1.168



indexed to Ontario

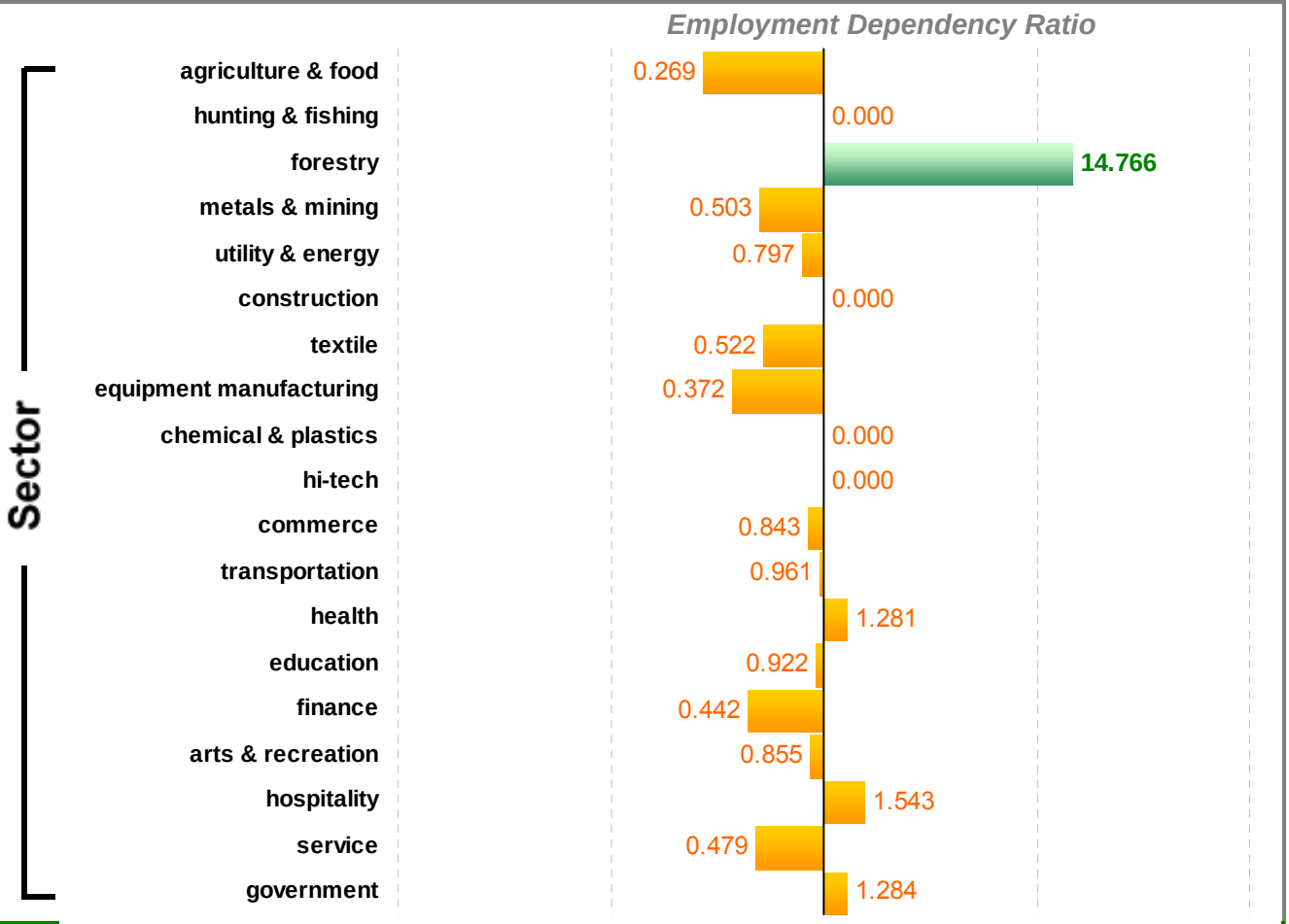
source: Statistics Canada 2006 Census of Population

2006
3560090
CDN

Kenora, Unorganized

Ontario

Local Economy

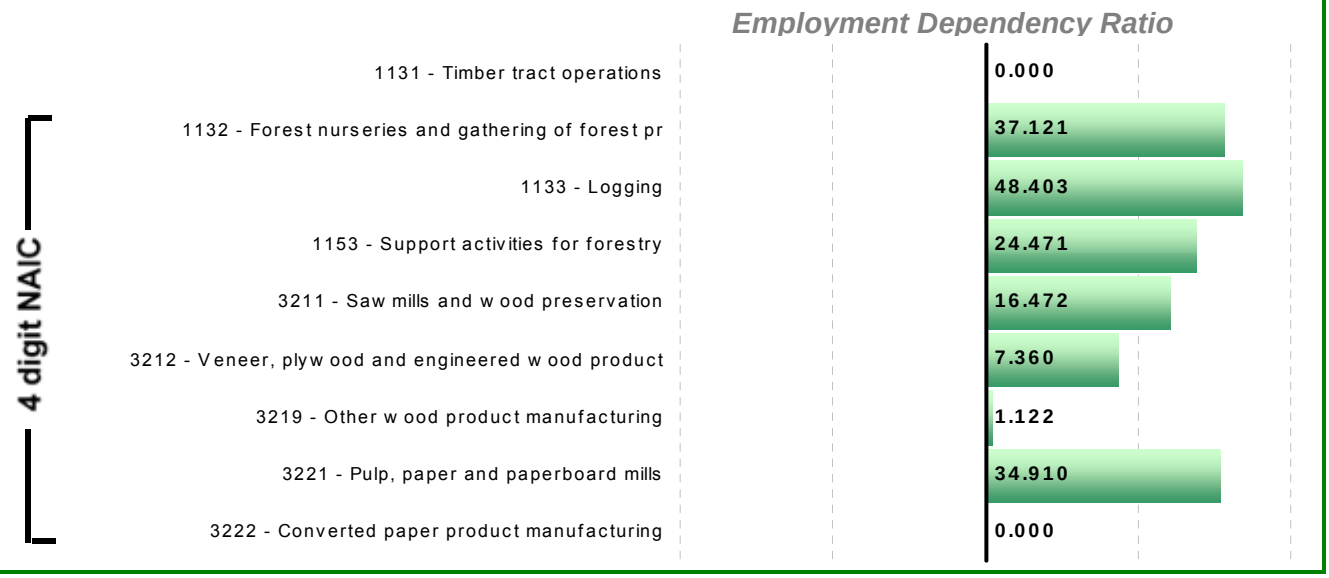


Forest Industry

15.9% of Total Labour Force

Employment: **575** *index:* *14.766* 96.6% Employment Ratio

Average Income: **$58,505** *index:* *1.271*



indexed to Ontario

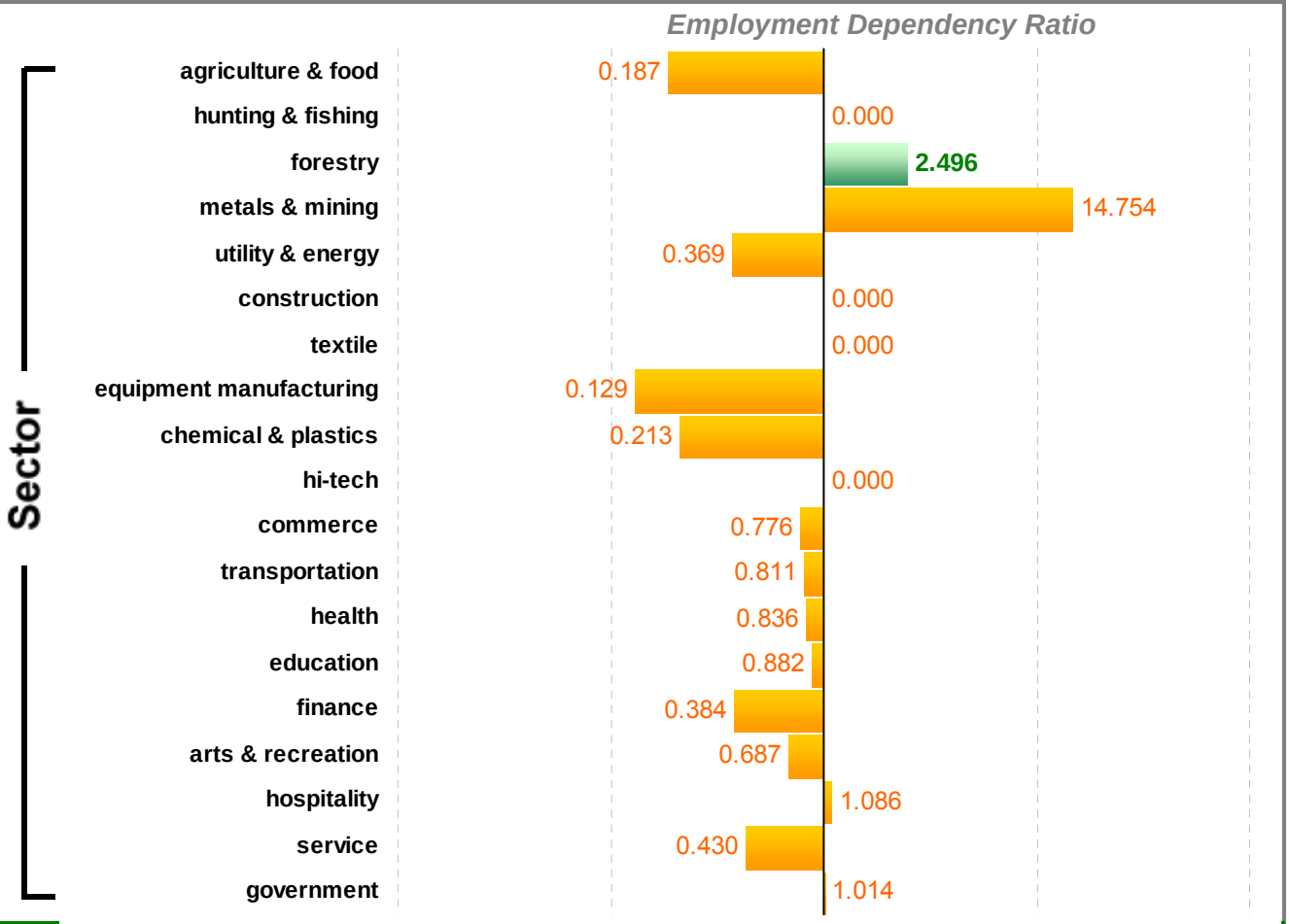
source: Statistics Canada 2006 Census of Population

2006
3560042
CDN

Red Lake

Ontario

Local Economy

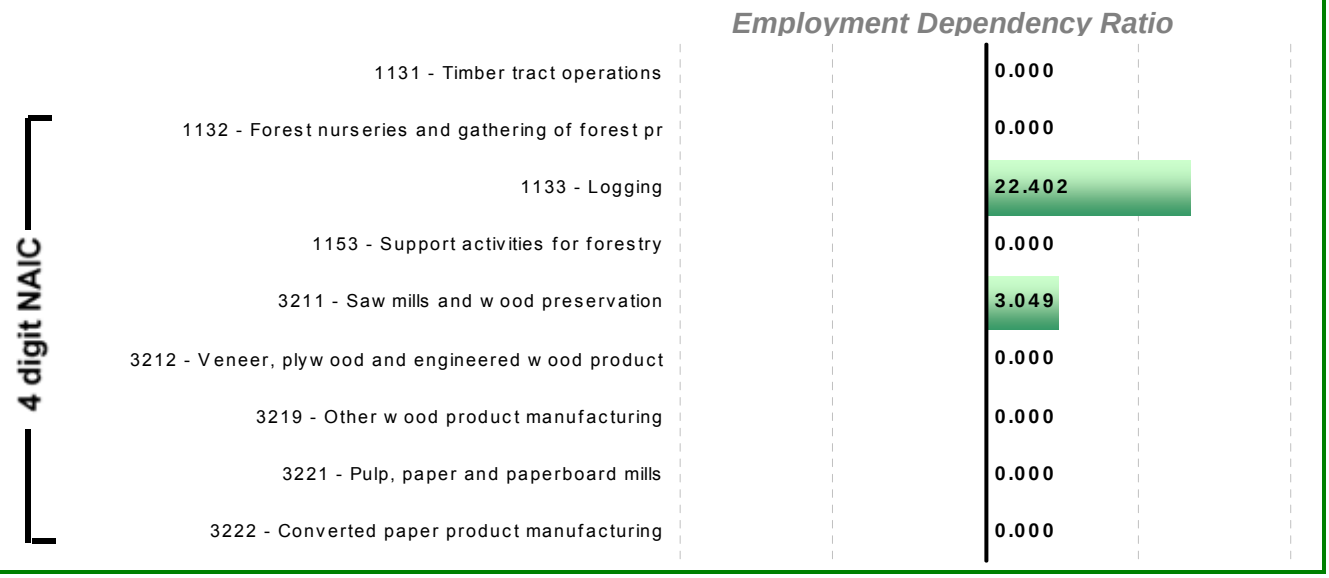


Forest Industry

2.6% of Total Labour Force

Employment: 70 *index:* 2.496 100.0% Employment Ratio

Average Income: $54,761 *index:* 1.190



indexed to Ontario

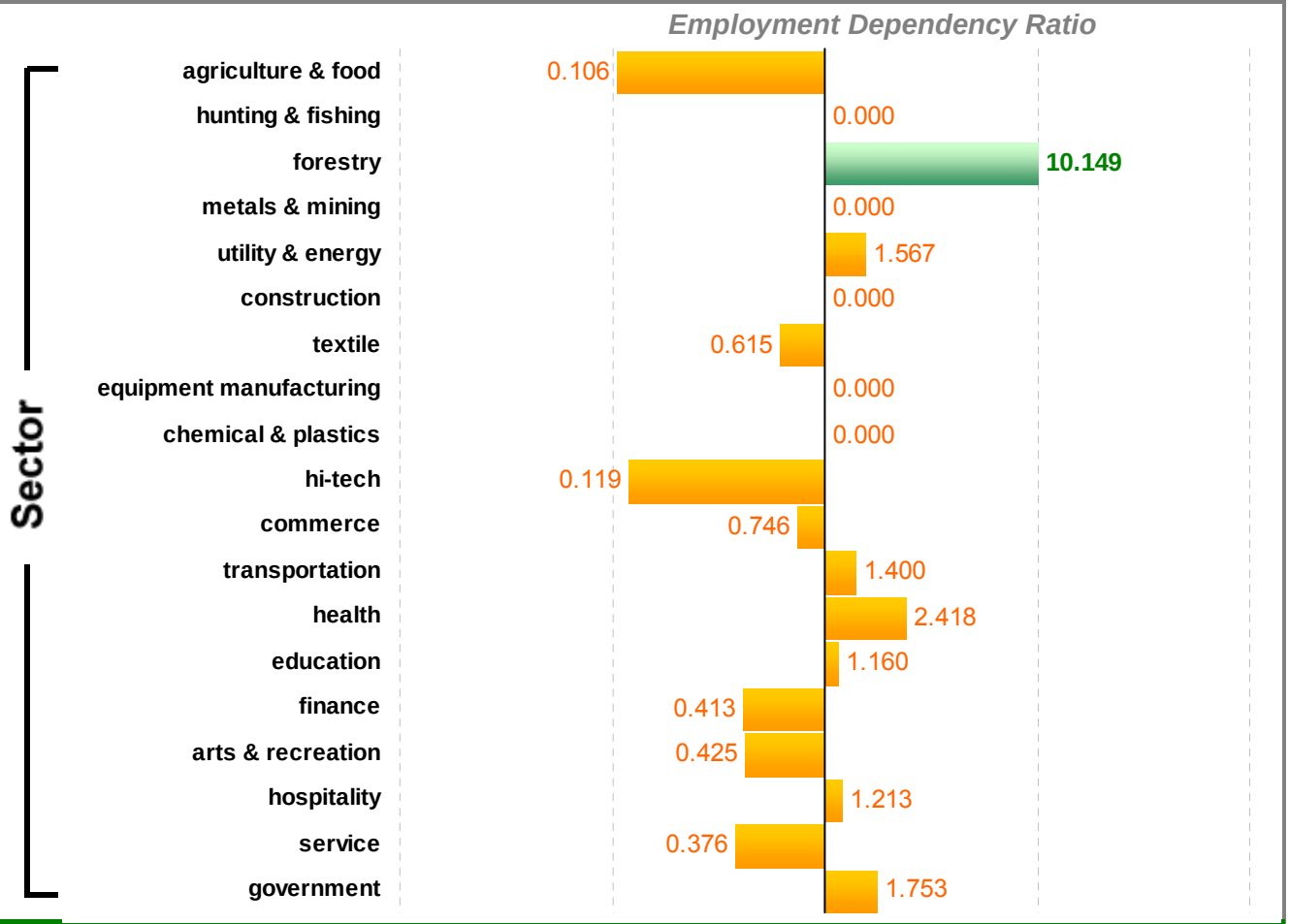
source: Statistics Canada 2006 Census of Population

2006
3560034
CDN

Sioux Lookout

Ontario

Local Economy

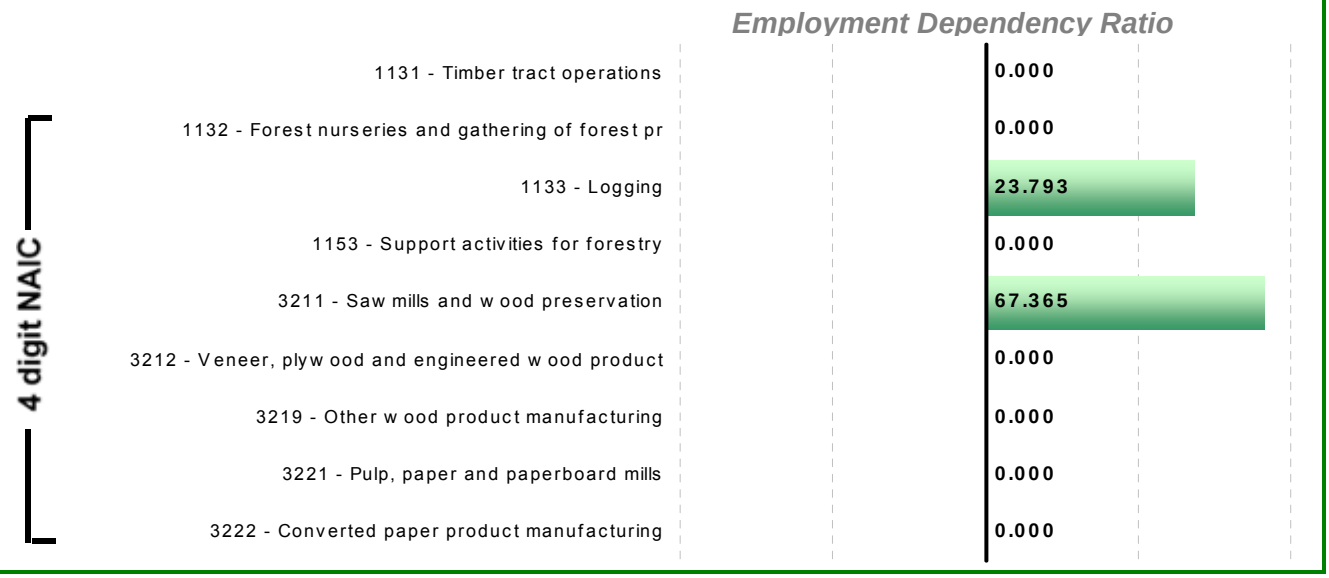


Forest Industry

10.9% of Total Labour Force

Employment: 335 *index:* *10.149* 97.1% Employment Ratio

Average Income: $47,889 *index:* *1.041*



indexed to Ontario

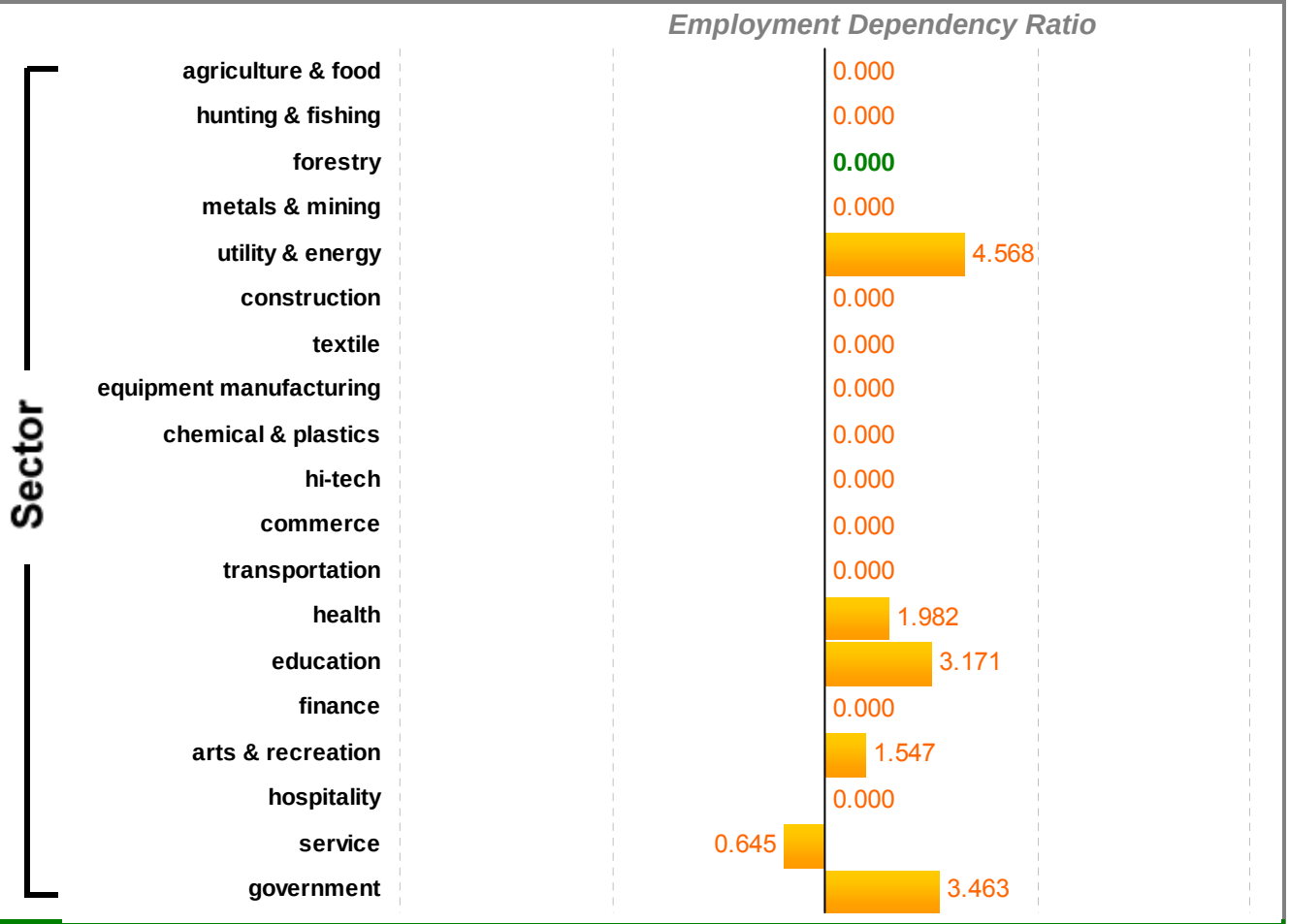
source: Statistics Canada 2006 Census of Population

2006
3560061
Census SubDivisions

Wabaseemoong

Ontario

Local Economy

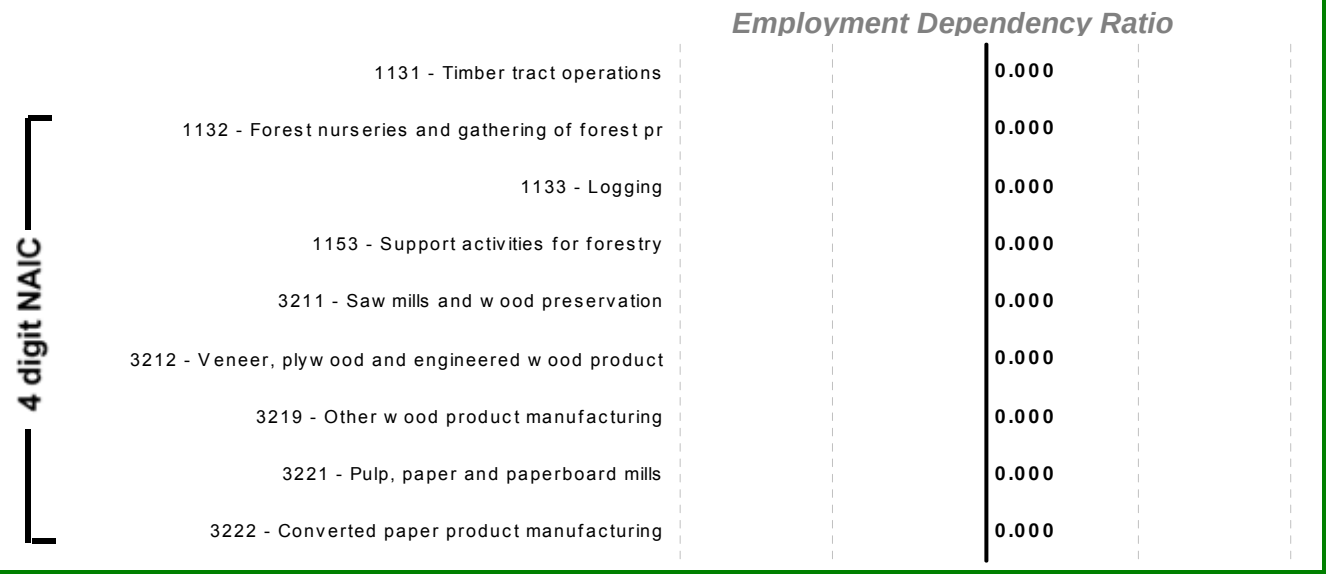


Forest Industry

0.0% of Total Labour Force

Employment: 0 *index:* *0.000* 0.0% Employment Ratio

Average Income: $0 *index:* *0.000*



indexed to Ontario

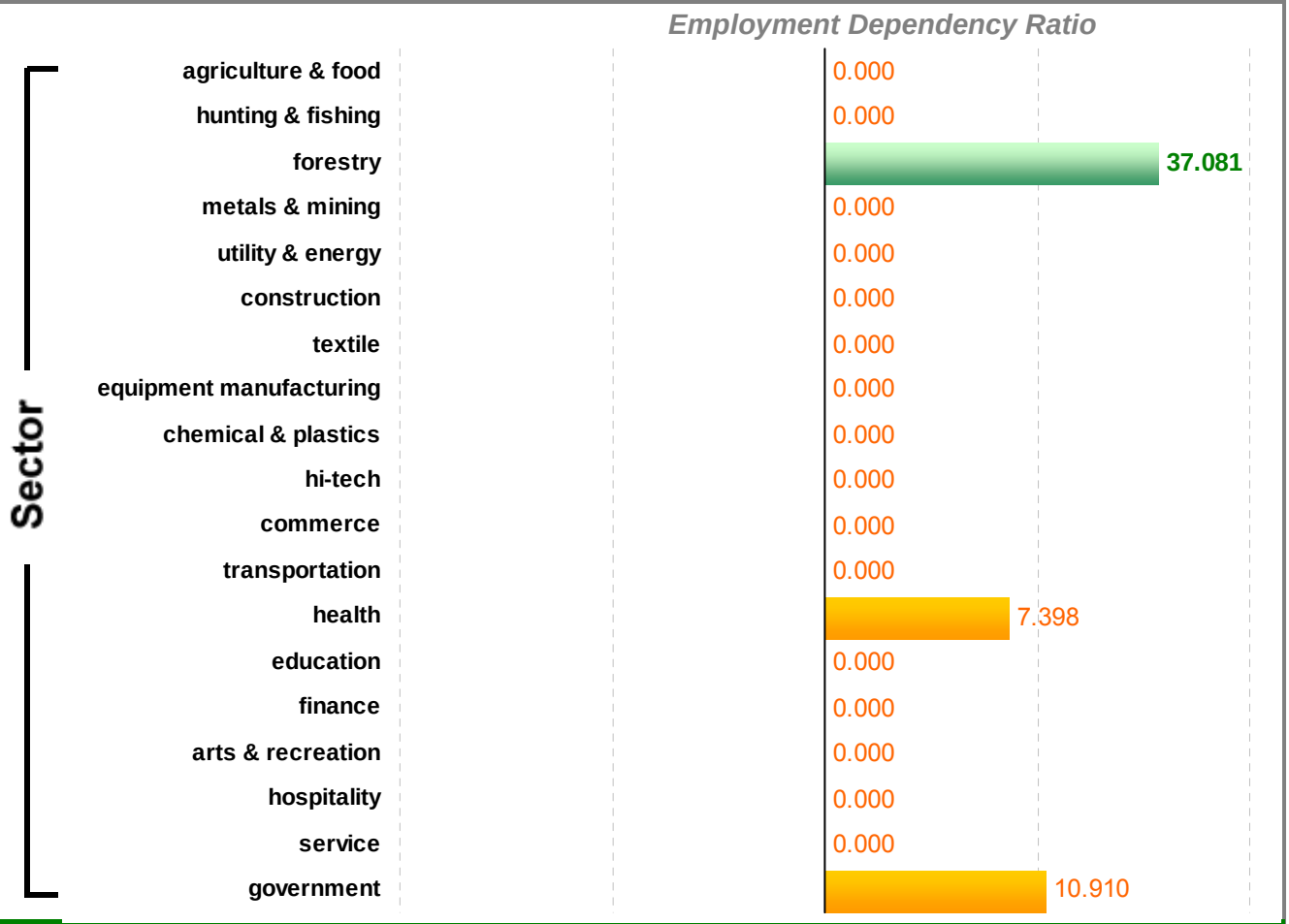
source: Statistics Canada 2006 Census of Population

2006
3560084
CDN

Wabauskang 21

Ontario

Local Economy

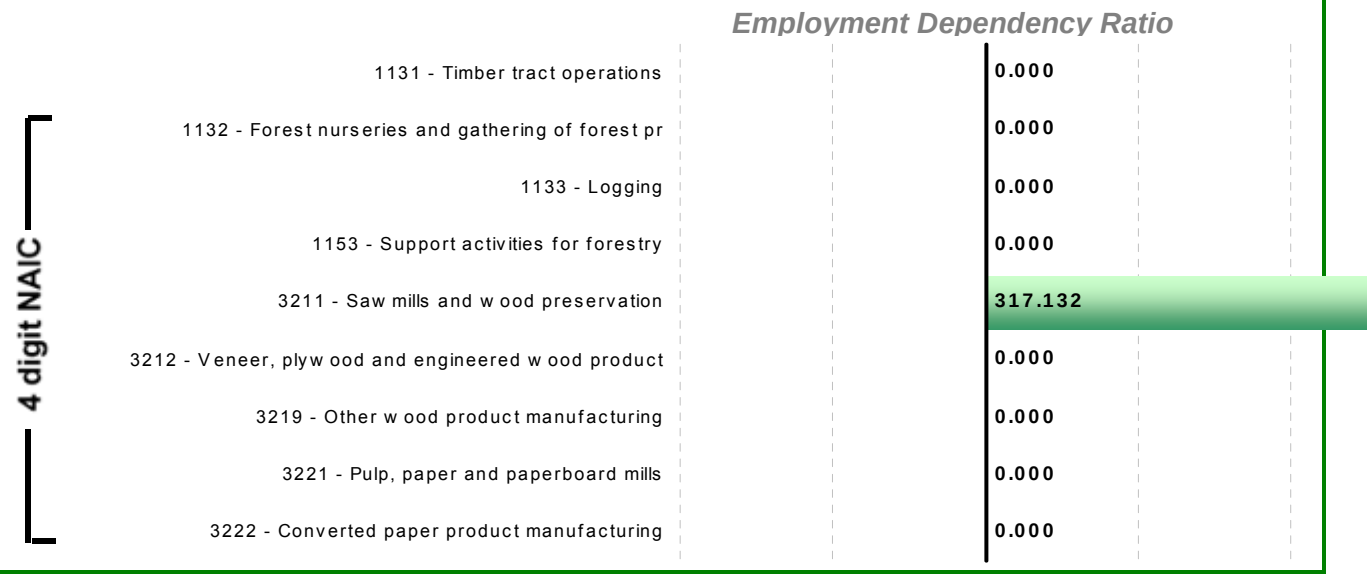


Forest Industry

0.0% of Total Labour Force

Employment: **10** *index:* *37.081* 100.0% Employment Ratio

Average Income: **$0** *index:* *0.000*



indexed to Ontario

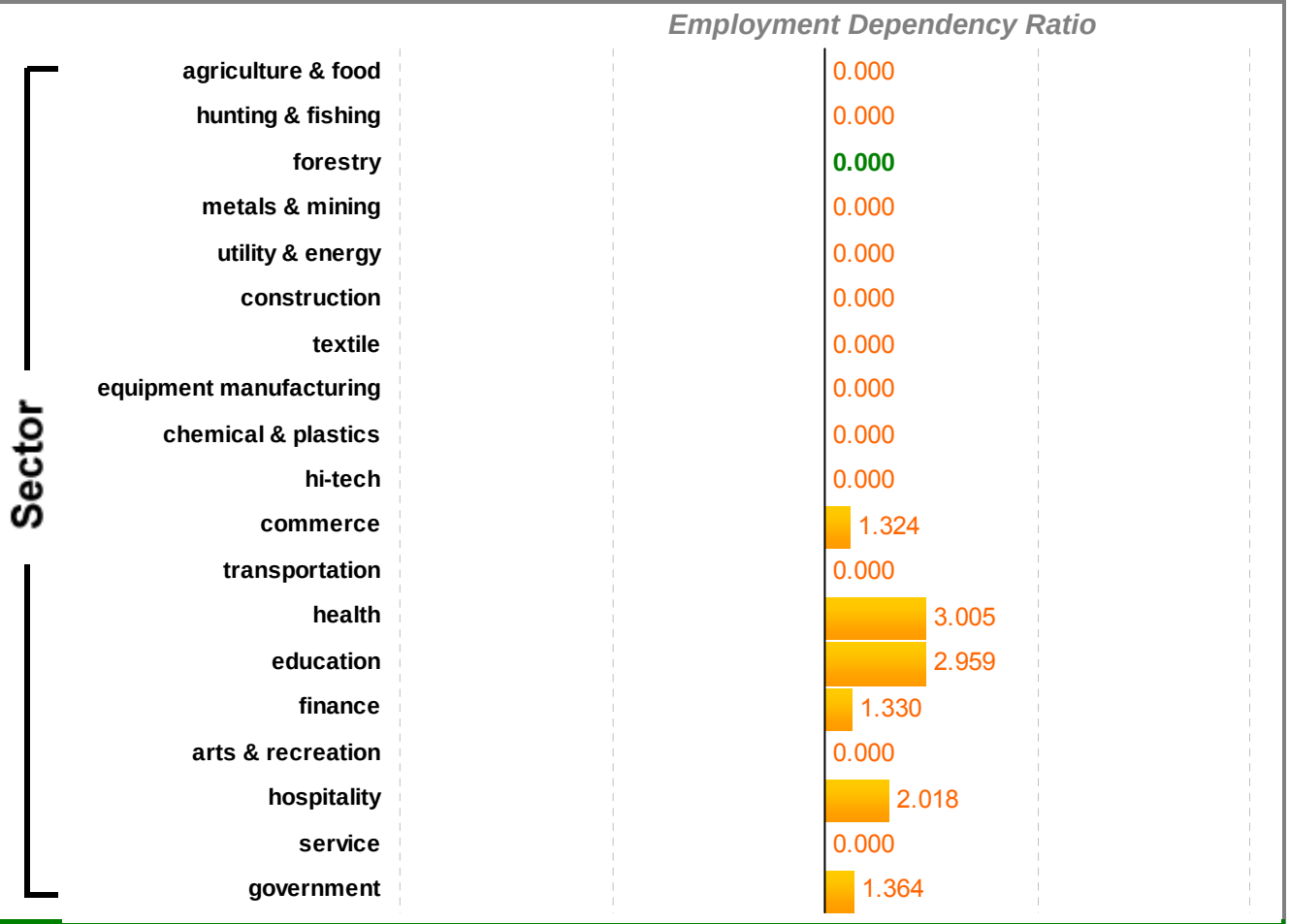
source: Statistics Canada 2006 Census of Population

2006
3560004
Census SubDivisions

Whitefish Bay 32A

Ontario

Local Economy

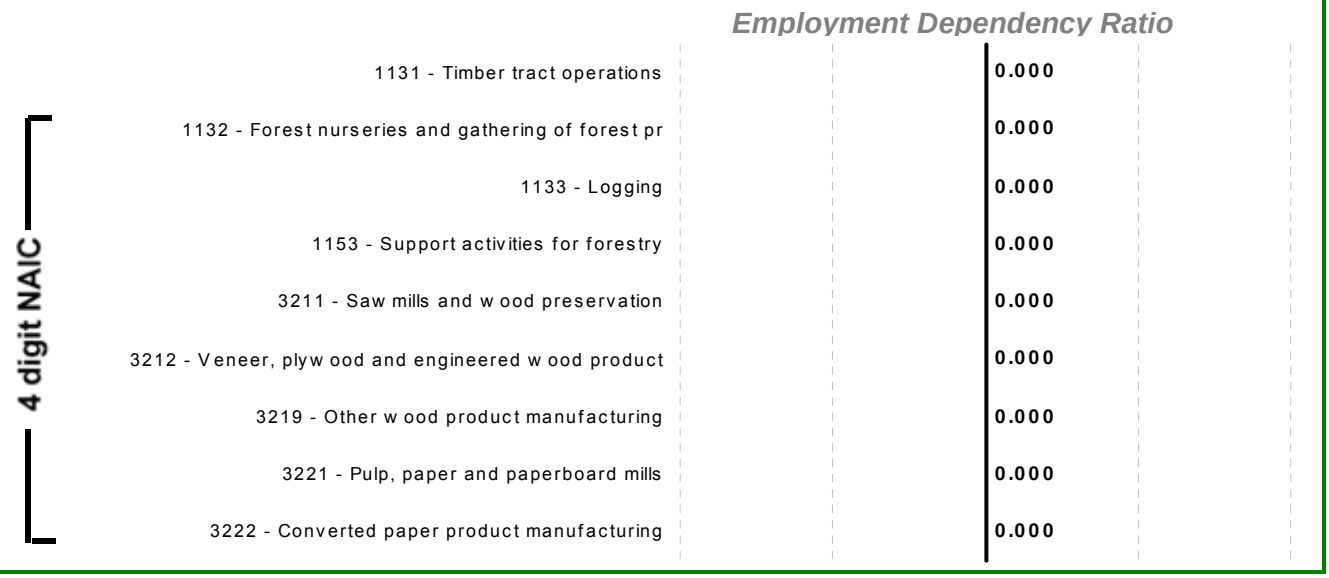


Forest Industry

0.0% of Total Labour Force

Employment: 0 *index:* *0.000* 0.0% Employment Ratio

Average Income: $0 *index:* *0.000*



indexed to Ontario

source: Statistics Canada 2006 Census of Population

PART C: Social and Economic Assessment (SEA)

A component of forest sustainability is provision for the needs of the people who receive benefits from the forest. Decisions in a forest management plan have significant impacts on the local economy, as well as the regional and provincial economies. Therefore it is important to be knowledge about the social and economic impacts, which can result from decisions that are made in forest management plans.

The forest management planning process formally requires a socioeconomic impact assessment be prepared for the proposed management strategy. Socioeconomic impacts relate changes in production levels, and their associated expenditures patterns, to parameters of social concern. The most common socioeconomic indicators have been employment, wages, population and the like. But production activity also impacts other societal concerns: namely pollution, wealth effects and lifestyle issues.

As a result of achieving the forecasted timber volume (average planned volume in the Long-term management Direction) of 574,595 m^3 per year, which is within the -5% threshold of the last approved plan, a non-modeling analysis (NMA) was undertaken. The assumption is that this difference would not be large enough to significantly affect the stability of the dependent communities, forest mills or other stakeholders associated with the forest management unit (FMU).

Estimates of the annual harvest potential are derived by the Strategic Forest Management Model (SFMM) and are based upon a number of factors which define the management strategy. These are described and discussed elsewhere in the plan. Determining their impact depends on an assessment of the resulting production pattern in terms of product and location.

A number of events has occurred to reduce both the annual employment and estimated employment income since the 2004 FMP. The Abitibi Consolidated paper mill in Kenora in 2005 and the destruction by fire of the Multiply Plywood mill in Nipigon were the major ones reductions in processing capabilities. Implications were also felt in the reduction of wood deliveries to receiving facilities as per the Crown Roundwood Records. Assuming all other things being constant, the implementation of the Long-term Management Direction in the 2012 Whiskey Jack FMP will potentially maintain or increase the current job and net employment income. These gains represent direct social and economic impacts in the primary wood manufacturing facilities and will occur in communities that receive fiber from the Whiskey Jack Forest.

Recreation and Tourism

Non-Industrial Uses of the Forest –

a) Summary of First Nation Use of Other Resources

First Nation community members actively use portions of the Whiskey Jack Forest for many resource-based activities.

i) Fishing

Several First Nation communities hold commercial fishing licenses on Lake of the Woods and inland lakes. Lake of the Woods and surrounding lakes are used for subsistence fishing by community members.

Surrounding tourist lodges provide some employment opportunities for First Nation residents as guides in the sport fishery.

ii) Trapping

First Nation community individual hold registered trap lines located all or partially within Kenora District.

iii) Wild rice

Wild rice is harvested annually be community members for personal use and re-sale from various lakes throughout the area.

iv) Cultural and Social, other Wildlife

Special sites within the forest are used for traditional cultural purposes such as fasting, vision quests and offerings. The specific location of these sites are known to community members, and the community is encouraged to participate in the forest management planning process to ensure these values are considered in proposed forest management activities.

Certain wildlife species, such as the bald eagle, have a cultural and social significance to First Nation people. The protection and management of these species and their habitats is important.

While the subsistence hunting, fishing, and gathering of resources from within the forest are an integral part of community existence, there are no accurate records of the level of such harvest. The harvest of deer, moose, waterfowl, rabbits and grouse provides an important source of food to community members.

Identified First Nation values for the Whiskey Jack Forest are confidential values and are retained on values maps on file in the Kenora District office.

b) Resource Based Tourism Industry

The tourism industry has been an important component in the Kenora area for a long time. Lodges and cottages were in operation by 1905. At that time the activities were based on hunting, fishing and canoeing opportunities. The Whiskey Jack Forest has attracted recreation-based tourism since the late 19th Century due to its variety of natural values. The area continues to be a desired recreational destination for canoeing, boating, fishing, hunting, hiking, snowmobiling, camping and cottaging for the following reasons:

- There are more interconnected lakes, rivers and portages.
- The rugged topography including cliffs, low wetlands, viewpoints and island-dotted lakes provide excellent scenery for summer and winter travelers.
- The area is traversed by numerous trails providing winter recreation opportunities by snowmobile, cross-country ski, or dog sled. In the summer, canoeist and hikers can access remote locations.
- There are numerous cultural heritage values including very old aboriginal

heritage sites
- And more recent logging and mining heritage sites.

Background information for this section was obtained from the Crown Land Atlas and survey information was supplemented with data gathered from a number of other sources, specifically; MNR fishing and hunting licence files, tourist operator websites, the "*The Economic Impact of Tourism in Sunset Country, Ontario – Final Report (2003*) and the Lake of the Woods Economic Impact Study – Final Report (2003)". These last two reports provided projections about future trends for the industry on the Whiskey Jack Forest. The tourism report was prepared by Paul Kerr Forster in association with the Canadian Tourism Research Institute for the Northwestern Ontario Tourist Association (NOWATA) for the year 2001, expenditure or user days or travel distance for most of these activities. This information, provided by NOWATA has been included in this plan as supplementary documentation; however, it has not been verified for accuracy, quality or completeness by the planning team. Due to the extent of the study area comprising of most of Northwestern Ontario and Northern United States, it was decided to use the Kenora subregion in this report. The full details of this report is found in Appendix 1.

There are 362 tourist operators in Kenora District and of that, of which 143 are associated with the Whiskey Jack Forest. There are 1,852 units available in the Whiskey Jack Forest. A "unit" is defined as any of the following: serviced hotel or motel room, serviced resort rooms, serviced cottages, serviced cabins, serviced outpost camps, housekeeping room, housekeeping suites, housekeeping cottages, housekeeping cabins, housekeeping outpost camps. The impact study reports that 54% of the operators have >= 10 units, 29% have between 11-19 units and 18% > 20 units. In 2001, the average revenue generated by each unit was $40,000. Of this, Retail and Guest services generated 25% of the revenue with Food and Beverage operations generated 11% of the total revenue. It is estimated that 500,000 people visited Kenora district in 2001 which was made up of travellers from Ontario (20%), other Canadian provinces (25%), United States (55%) and Others (1%).

The planning team sent out questionnaires to all the tourist operators registered within Kenora district as shown in Appendix 2. About 20% of the mail outs responded to the questionnaire which is considered a success. Of the respondents, 65% identified an average of 5 outpost camps, 20 beds, 25 employees and a minimum client volume of 200 people (mostly clients from the U.S.A. (75-100%)). The expectation is almost 90% will increase or like to increase the capacity of their lodges in the next 5 years.

The Sunset economic study reports that in 2001, 443 operators provided employment to 3,785 persons of which 1,221 where located in the Whiskey Jack Forest. The operator survey also indicated that there were 758 First Nations employed in Sunset Country of which 80% were seasonal or part time employees. Accommodation providers in Sunset Country employed 498 or 40% which were between 25-44 years old. The large variety of lakes and rivers, some of which are remote (17% boat access and 13% flay in) while others are easily road accessible (62%), provide a wide range of angling opportunities. Whiskey Jack Forest has excellent natural lake trout lakes and walleye fishing is also popular in hundreds of small lakes along with larger lakes such as Lake of the Woods. Dryberry and Sydney Lakes.

The tourism expenditures in Kenora District, down into categories for both the amount spent and the amount retained in the District. This is useful in determining the retention

rate of the tourism economic impact in the Study Region. According to the Ministry of Tourism & Recreation, overall, tourism in the Kenora Census Districts contributed just over $181 million in Gross Domestic Product in 2001, $109 million or 60% of which was retained in the District. It is estimated that tourism alone generated almost $80 million in taxes distributed to federal, provincial and municipal governments. Tourism creates almost 3,000 direct jobs in the Districts distributing close to $49 Million in direct wages and salaries. The total number of jobs created by tourism including direct, indirect and induced was 5,263 in 2001, with payroll earnings of just over $114 Million.

The Whiskey Jack Forest is comprised of 5 Wildlife Management Units (WMU); zones 3, 5, 6, 7B and 8. This represents a significant portion of these wildlife units that are utilized extensively for hunting and fishing. Hunting continues to be an important recreational activity in the Whiskey Jack Forest area. Big game is the primary activity although ruffed grouse, black bear, migratory waterfowl and snowshoe hare are also hunted. Hunting is either carried out adjacent to access roads created by the forest industry, by use of water based transportation to remote roadless areas, or by fly-in outfitters to backcountry locations. A large proportion of big game hunters are non-resident hunters who contribute to the local economy depending on how many local services they utilize. More than 90% of the bear hunters are nonresidents. There are a wide variety of trails in the Whiskey Jack Forest that are used (depending on the nature of the activity and the Land Use designation) by hikers, cross country skiers, dog sledders, snowmobilers, and ATV operators. In addition to prepared trails, there are opportunities to travel on ungroomed areas such as snowshoeing along lakes and portages or snowmobiling along ungroomed lakes or unploughed roads.

Rushing River Provincial Park, and a few other private campgrounds along Hwy 17 and 71 corridors, provides camping opportunities. Approximately 65,000 people visit or use the many canoe routes around the park. Canoe trippers and anglers that are flown into backcountry sites use most of the remote sites. Many cottages were established after the railroad arrived in 1888 and made access to the Whiskey Jack Forest area easier. There are abundant cottages on Lake of the Woods are primarily located on the many islands on the lake, since shoreline development is limited. The building of what is now known as Hwy 17 made it easier to access additional lakes in the area.

When additional road access is proposed, road-based tourism could be enhanced, but at a cost to remote-based tourism. In contrast, when road closures are made, this could be beneficial to remote-based tourism, but a bane to road-based tourism.

In situations where road-based tourism occurs most often on a FMU, harvesting activities would probably have a positive impact, if they enhance road network for road-based tourism. Harvesting activities however, would have a negative impact to aesthetic beauty of the forests

One could argue that the opportunity cost of pursuing road-based tourism would be the foregone benefit of remote-based tourism, and aesthetic beauty of the forests.

If one values biodiversity the most in comparison to remote-based tourism and aesthetics beauty of the forests, then biodiversity would be the next best alternative (to road-based tourism). Along this line of reasoning, one can then say that the opportunity cost of establishing road-based tourism is the foregone benefit (or value if you may) of maintaining biodiversity.

Mining, Aggregates and Hydro Generation

Mining

Historically, mining and mineral exploration have been an important activity in this management unit and historically gold, silver and copper were the predominant commodities mined. Currently there are four granite producers in operation which have been and continue to be a significant contributor to the economy of the area. The value of total granite production was not available at the time of writing. Historical metal production occurred within the management unit between 1893 and 1951 and totalled 68,513 ounces gold, 14,762 ounces silver and 1.89 million pounds of copper valued at $49.73 million CDN at current metal prices.

In addition to historical and current mineral production there are significant concentrations of gold, nickel, copper, silver and uranium contained within documented mineral deposits throughout the management unit. The total estimated value of metals contained within these deposits at current commodity prices is in excess of $158 million CDN.

There are an estimated 1,605 active mining claim units recorded throughout this management unit, as indicated on MNDM's CLAIMaps website (MNDM, 2006). These claims represent an investment in the management unit of approximately $400,000 CDN for claim staking, which directly relates to its mineral potential. In addition there is an estimated dollar expenditure of nearly $650, 000 CDN per year related to mineral exploration work required to keep the claims in good standing. Current claim staking targets areas with potential for uranium, rare-metals, zinc and gold. Historically, several areas within the management unit have seen extensive staking and mineral exploration. There are no active mines located in the Whiskey Jack Forest.

When additional roads are built to increase access for mining exploration, a positive effect may result in increasing the profitability of mining companies. But this could have some deleterious effects on habitat protection.

With more roads, increased access for timber harvesting can clear areas for mining sampling and mapping, but potentially it would increase the chance or removing mining survey lines, and destruction of claim posts could occur. Timber harvesting however, would be beneficial to forest companies, but at the expense of reducing habitat protection.

Aggregates

There are 54 aggregate sites located in the Whiskey Jack Forest. Of these, Abitibi-Bowater Inc. operates 21 of those for forestry purposes.

Nelson Granite operates 7 sites in the production of bulk granite which is shipped to various processing facilities around the world. Granite production is approximately 16,000 metric tones annually. Full time employment is three.

The remaining 26 sites produce approximately 15,000 metric tonnes of sand and gravel annually. Employment is estimated at five.

Forest operations, such as timber harvesting, build forest roads that increase the chance of finding aggregates. More road network ultimately increases access to aggregates.

On the flip side, opening-up areas through additional road construction could have deleterious effect on remote-based non-timber activities and forest protection measures.

Hydro

A number of hydro electric facilities are located within or adjacent to the forest. These facilities are on the English River between Lac Seul and the Manitoba border and on the Winnipeg River between Lake of the Woods and the English River.

Two sites owned by Ontario Power Generation are located within the forest:

1. Ear Falls
There are four power generating units at Ear Falls located on the English River at the outlet of Lac Seul. The first unit began operating in 1930. Additional generating capacity is being developed at the Ear Falls GS by adding a new 12.5 MW generating unit capable of generating approximately 52 million kilowatt hours of hydroelectricity per year. It will create enough energy to service up to 4,000 homes and will create up to 20 new jobs.

2. Manitou Falls
This facility is located on the English River where it enters Barnston Lake downstream of Ear Falls. There are five operating units located at this facility. Construction on this facility began in 1953.

Four additional sites are located within Kenora district and supply power to the area. Two of these are also owned by Ontario Power Generation and the other two (both in Kenora) are owned by Abitibi Consolidated.

3. Caribou Falls
Caribou Falls consist of three power generating units built in 1958 on the English River at the outlet of Umfreville Lake. The Caribou station was the third plant built along the English River which represented just a fraction of the widespread program undertaken to meet the challenge of expansion in mining and also pulp and paper industries.

4. Whitedog Falls
This facility consists of three power generating units built in 1958 on the Winnipeg River at Whitedog Falls.

5. Kenora Power House and Norman Dam
These generating stations are owned by Abitibi Consolidated. The Kenora Power House is located on the on the Winnipeg River in Kenora at the outlet of Lake of the Woods. The Norman Dam generating station is located on the Winnipeg River in Kenora.

Some of the objectives of an FMU may specifically indicate whether hydro generation will be allowed in the area. Forest operations will usually allow for this kind of activity. Timber harvesting for example, will increase access for hydro generation, but will negatively impact the maintenance of habitat.

Other Uses:

Local residents use the forest for fuelwood cutting; primarily white birch and aspen.

Forest management activities can affect other forest resources in a variety of ways. Obvious affects include the loss of terrestrial habitat through road construction and forest removal. There may be short or long-term changes in eco system processes that may alter the regenerative course of the landscape and there may be adverse aesthetic impacts on people. There are also beneficial impacts, which include restoration of early successional habitat and improved access for hunters, trappers, anglers, naturalists and baitfish operators.

a) Fur Harvesting
Trapping provides seasonal employment for 89 registered traplines. Additionally, there are approximately 17 First Nation Community traplines located with the Whiskey Jack Forest. The expected average resources value per is trapline is estimated at $2,440. Since all the trappers work out of their home it would not be appropriate to identify their names in this document The major fur bearing animals that are of economic importance are beaver, fox, muskrat, lynx, otter, mink , fisher, and marten. Registered trap lines cover the entire Whiskey Jack Forest as seen on the Values Map 4.4.

b) Commercial Bear Management:
There are approximately 124 commercial bear management areas on the forest operated by 76 tourist operators. All of these areas are accessible from the existing road network on the unit. The bear management areas are distributed throughout the unit except for the areas close to populated centres. Registered bear management areas cover all of the Whiskey Jack Forest as seen on Values Map 4.4

c) Baitfish Operations
In 2009-2010, the Whiskey Jack Forest had licensed baitfish individuals of which all are camp operators operating in 95 harvest areas. Baitfish is consumed locally by the angling industry. Since the majority of baitfish operators' work as individuals out of their home, it would not be appropriate to identify their name in this document. The baitfish industry provides supplemental income to these people and complements the local angling industry.
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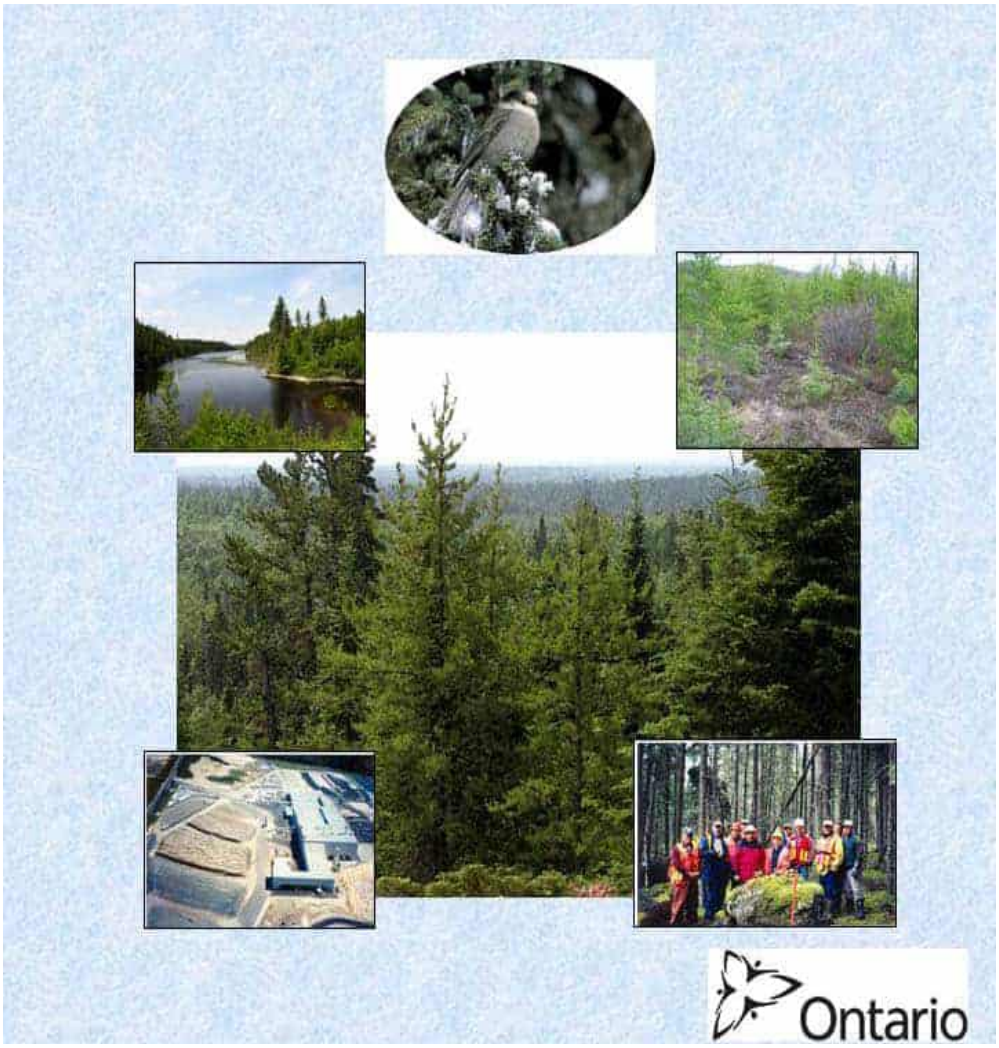
<u>MNR Administration</u>

Responsibility for forest management planning and day to day administration of the forest (licensing, approvals etc.) lies with Kenora District. There are five staff positions in Kenora involved on a day to day basis with the Whiskey Jack Forest.

Supplementary Documentation E

2012-2022 Whiskey Jack Forest Management Plan

Monitoring Program for Exceptions



FULL TREE HARVESTING OF ECOSITES 11 AND 12 IN NORTHWESTERN ONTARIO:

MONITORING PROCEDURES AND BEST MANAGEMENT PRACTICES

April 1, 2001

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EXECUTIVE SUMMARY

In the silviculture guide for the Boreal Forest, full tree logging is listed as a 'not recommended' practice on shallow sites (ecosites 11 and 12) in Northwestern Ontario. The practice was designated as 'not recommended' because there is a lack of information to confirm whether or not the additional nutrient removal and soil disturbance associated with full tree harvesting would have a detrimental impact on the long term sustainability of forest management on these nutrient poor sites.

Many companies in Northwestern Ontario are using full tree logging equipment and are cautious about investing large amounts of capital into other logging systems (eg. tree length or shortwood logging systems). Therefore, to continue full tree harvest operations on these shallow sites, an approved monitoring program to assess the impact of this treatment is mandatory, in accordance with the 'exceptions' process of the Forest Management Planning Manual. A working group, comprised of Industry and OMNR stakeholders, in consultation with OMNR Boreal Science section, was formed to devise an appropriate monitoring procedure.

The proposed procedure includes two series of permanent sample plots. 'Level I' involves four case study sites that incorporate intensive monitoring procedures developed by CNFER's Stand Ecology Program to investigate long-term site productivity issues. These case study sites will be distributed across the Region to sample key soil textures and parent materials, and climatic conditions and patterns. Each case study site will have two blocks (high and low productivity areas within the ecosite), and three treatments (tree length and full tree logging and a no-cut control). Detailed sampling occurs prior to harvest, immediately post-harvest and five and ten years post-harvest for each of the treatments. An initial report is scheduled for year 5 post-harvest. A cost estimate has been prepared for the first three years of the program. As part of the cost of implementation, a Project Manager is required to coordinate site selection, plot establishment and data management for the initial three year period. The cooperators have proposed a cost sharing formula to reduce their individual implementation costs.

A second series of permanent sample plots (referred to as 'Level II' plots) will be established to address the variation of ES 11 and 12 sites across the Region, and to confirm that the results from Level I case studies are consistent with the range of normal operations. These plots follow a less intensive sampling methodology that is implemented by each SFL holder after harvest. The responsibility and cost for their establishment will be born by the respective SFL holder. An allocation matrix will be used to guide the location of these plots regionwide and ensure that the range of variability (ie. sites, operations) has been sampled. The aforementioned Project Manager will assist with site selection and data management. The implementation schedule proposes a maximum of 30 monitoring sites region wide for each of three years.

This document also outlines procedures for Companies to follow to identify shallow soil sites (maps and stand listings) in Annual Work Schedules and FMP's and track operations on these sites. A commitment is made to provide training to staff and contractors in identifying ecosites 11 and 12. 'Best management practices" to reduce both ground disturbance and nutrient loss are listed for use in developing Silvicultural Ground Rules and Forest Operation Prescriptions for shallow soil sites. Winter harvest remains the preferred option to reduce ground disturbance and nutrient losses on these sites.

1.0 INTRODUCTION

As the underpinning to all Forest Management Plans (FMP) prepared and approved in Ontario, the overall goal for Ontario's forests is: *... to ensure the long-term health of our forest ecosystems for the benefit of the local and global environments, while enabling present and future generations to meet their material and social needs* (OMNR 1995). Although a universal definition of "forest health" appears to be somewhat elusive, most definitions imply that forest health is a condition of the forest ecosystem which sustains complexity or diversity while still providing for human needs (Morris 1997). In turn, it has been recognized that forest management activities influence stand structure and function largely through the silvicultural treatments prescribed in the silvicultural ground rules and forest operation prescriptions (OMNR 1997a). These treatment packages refer to the range of acceptable treatments (*i.e.*, harvest, renewal, tending) for the appropriate forest unit (typically derived using FEC ecosites) which can be undertaken at various intervals throughout the life of a forest stand to achieve a desired future forest condition (OMNR 1996).

Many companies in Northwest Ontario are not presently equipped for tree-length or cut-to-length / shortwood logging (the recommended practices on ES11 and ES12s) and are cautious about investing large amounts of capital into such equipment. As such, there is a desire within the companies to harvest these shallow soil sites, utilizing full-tree harvesting equipment. To do so, and go against the recommended treatment package, companies must go through the "exception process" as detailed in the Forest Management Planning Manual. Part of the exceptions is to develop and implement an MNR acceptable monitoring program to assess a) the level of disturbance on and b) the recovery process of, the sites being harvested

The potential site hazards identified for harvesting and renewal activities on these ecosites include 1) susceptibility to nutrient loss (especially with soils < 5cm), 2) seasonal drought/desiccation, 3) erosion, and 4) rutting on the SS9 inclusions (OMNR 1997b). Based on these potential site hazards, the logging method of choice (*i.e.*, full-tree harvesting) on these ecosites prescribed in the proposed Silvicultural Treatment Packages for the ES11 and ES12 forest units in these upcoming management plans, is Not Recommended (NR) where total soil depth is less than 20cm and only conditionally recommended (CR) where soil depth exceeds 20cm provided that best practices are employed to minimize disturbance of the organic layer (OMNR 1997b). Linked to this recommendation, Archibald *et al*. (1997) suggested that forest units that have been identified as being sensitive to nutrient loss should be monitored to assess the "effectiveness" of the prescribed treatments. It should be emphasized that when approval is given to a practice in any FMP which has the NR designation in the silvicultural guide, monitoring is mandatory (A-133 of the FMP manual). In the case of monitoring soil quality, the physical site guideline (Archibald *et al*. 1997) falls short by not providing any quantitative measurements that could be used to monitor post-harvest recovery of these sites as indicators of potential impacts to soil quality and, ultimately, site productivity. In fact, this type of proposed monitoring program, and the associated sampling protocols, is rare across much of North America (Powers *et al*. 1998).

Soil quality is considered to be the ability of a specific kind of soil to function within its surroundings, support plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation. Within this context, soil quality indicators are physical, chemical, and biological properties, processes, and characteristics that can be measured to monitor changes in the soil. In turn, soil quality standards are stated quantitative or qualitative threshold values for soil properties and conditions established to maintain or improve the suitability or productive potential of a soil. These threshold values, along with disturbed areal

extent limits are indicators of significant reduction in soil productivity. There are six key indicators/standards that should be monitored for the es11 or es12 ecosites: 1) soil compaction, 2) soil rutting and puddling, 3) soil displacement, 4) soil erosion, 5) soil organic matter retention and 6) soil nutrient reserves.

It should be recognized that these six standards apply to the cumulative effects of management practices over time. Overall, a large percentage of the activity area must be left in a condition of acceptable potential soil productivity following forest management activities (the U.S. standards suggest 85 %). If there are major site/slope differences within an activity area these can be evaluated separately. An activity area does not, however, include areas with dedicated uses such as permanent roads or dedicated trails.

As noted above, although some of these indicators are manifested at the time of harvest, others include parameters that are expected to change over time. Repeated measurements of these indicators must be done on appropriate time scales to provide a meaningful assessment of the potential impacts to soil quality.

The intent of the monitoring processes are either to confirm or change the "not recommended" status of full-tree harvesting on ES11/12 sites, as well as define acceptable threshold levels for the various soil quality indicators. This will be done by, utilizing a scientific approach on four case study sites (Level I monitoring) in conjunction with less intense monitoring on a subset of harvested ES12 sites from across the region (Level II). It is the combination of the Level I and Level II monitoring, in conjunction with the AWS documentation, which constitutes the whole monitoring program designed to fulfill the requirements of a regionally-based evaluation of the silvicultural recommendations.

2.0 LEVEL I SAMPLING

2.1 Site Selection

The ES12 (Black Spruce-Jack Pine: Very Shallow Soil), and ES11 (Red Pine-White Pine-Jack Pine: Very Shallow Soil) ecosites, are primarily located in the westerly portion of the region (*e.g.*, Fort Frances, Kenora). The soils on these ecosites, by their shallow nature (<20 cm), are highly variable in terms of depth and include the SS1 (Discontinuous Organic Mat on Bedrock) to the SS5 (Shallow-Moderately Deep / Sandy) soil types, with some inclusions of the SS9 (Shallow-Moderately Deep / Organic-Peaty Phase) soil type. The mineral soil is commonly overtopped by relatively thin fibrimor humus. The potential site hazards identified for harvesting and renewal activities on these ecosites include 1) susceptibility to nutrient loss (especially with soils <5cm, 2) seasonal drought/desiccation, 3) erosion, and 4) rutting on the SS9 inclusions (OMNR 1997b). These concerns are reinforced, with particular emphasis on the nutrient loss issue, in OMNR's Forest Management Guidelines for the Protection of the Physical Environment (Archibald *et al*. 1997).

The Northwest Ontario region covers a wide area of land from the Manitoba border in the west to Geraldton in the East. There are regional differences in the function of ecosystems due to factors such as general topography, soil texture and parent material, and climatic conditions and patterns. There are also differences in productivity within an ecosite beyond that of regional differences. These differences are a result of nutrient availability and rates of nutrient cycling of a particular site.

In order to address the regional and productivity differences of the ES12 sites in Northwest Ontario, four case study sites will be chosen for intensive study. Each of the four case study areas within the Northwest Region will be represented by two stands (ie. blocks) of different productivity levels. The following is a summary of the recommended structure of the Level I Monitoring Program.

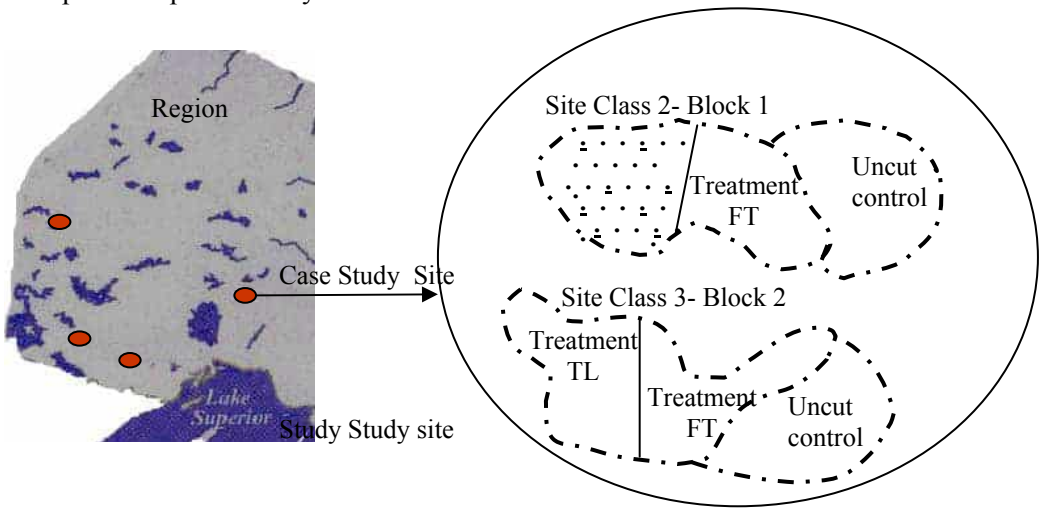
Case study sites:
1. Coarse textured tills on bedrock (North of Kenora)
2. Coarse to medium textured tills over greenstone
3. Fine soils on bedrock (Fort Frances)
4. Calcareous soils (Long Lac)

Blocks: Two blocks per case study = Eight blocks in total
1. high productivity
2. low productivity

Each block should be approximately 25 hectares in size to keep the treatments as operationally typical as possible.

Treatments: Each block is divided into three logging treatments, which will be completed during the snow-free period.
1. Tree length (R) approximately 10 ha
2. Full tree (NR) approximately 10 ha
3. Uncut (controls) approximately 5 ha

Plots: Thirty-six plots in each harvest treatment and 18 plots on the uncut (control) treatment are to be placed in systematically random location**s.** Twelve of the thirty six-plots (evenly distributed over the treatment) will be intensive plots where soil and vegetative nutrient concentrations will be collected. Each plot is marked with a GPS unit indicating its UTM position and elevation. The twelve intensive plots are permanently marked.



2.2 Pre-harvest Sampling:

The systematic layout (grid pattern) across each treatment provides a format where the site could be examined by layer. Modeling the stand in a 3-dimensional format, indicating nutrient pool quantities pre- and post-harvest will aid in assessing the effect of various treatments on the sites nutrient capital. Also, this format allows for a greater refinement of the variation

found on the ES12 sites. For example, the difference in nutrient capital between rock knobs and small deep soil inclusions could be shown.

Much of the concern with full-tree harvesting on these shallow sites deals with nutrient removals. Therefore, a full accounting of the nutrient capital and the compartments where those nutrients are found shall be done. Other indicators of possible soil degradation (compaction, rutting and erosion) must also be assessed in the monitoring system. The following important physical, chemical and biological properties of the sites shall be monitored on all 36 plots in a treatment unless otherwise indicated.

Physical

- Soil depth*, by horizon (include LFH layers if present)
- Field textures
- Bulk density*, particle density, total porosity, by horizon, recording the depth sample was taken (the 12 intensive plots only)
- Soil strength (by horizon, record depth) (the 12 intensive plots only)
- Coarse Fragment (cf) content (% by volume of horizon)*

* Essential for the determination of soil nutrient reserves.

Chemical

- Soil pH (distilled , Ca Cl_2)
- Soil sample retained for chemical determination (the 12 intensive plots only)
- Soil nutrient by horizon = concentration * soil volume *bulk density * (cf/100) (the 12 intensive plots only)

Biological

- Vegetation sampling
  - Tree
    - 7.5 meter radius plots
    - dbh and species on all free standing trees (live and dead)
    - status of tree (live or dead)
    - basal and dbh cores taken on 3 trees per species found in each of the 12 intensive plots
    - heights on cored trees
    - biomass samples of tree components for nutrient concentration analysis (N, P ,K, Ca, Mg) (two major species on the 12 intensive plots)
    - utilize existing regression equations (dbh to biomass by component)
    - use cores for proper age determination and calculating tree productivity.
  - Shrub
    - 2m x 2m-shrub plot taking percent cover
    - located within the tree plot
    - utilize an existing regression, % cover to biomass
    - existing nutrient data to determine nutrient capital
  - Herb
    - 1m x 1m herb plot within the shrub plot (percent cover)
    - utilize an existing regression equation , % cover to biomass
    - existing nutrient data to determine nutrient capital

- Moss
  - Percent cover: included in the herb plot
  - In addition, for each moss species encountered, a 225cm^2 - biomass plot (15cmX15cm) will be collected. These plots must have 100 percent cover of that particular moss species. (the 12 intensive plots only)
  - Moss biomass samples will be analyzed for nutrient concentrations (N, P ,K, Ca, Mg) (on the moss biomass samples described above)

- Coarse Woody Material
  - 3 Systematically random transects (2m X 7.5m) per treatment
  - All CWD greater than 2cm diameter is measured for:
    - distance along the transect
    - top, bottom and intersecting diameter
    - length of CWD
    - decay class (6 classes)
    - position (buried, partially buried, on surface, aerial)
    - samples of decay class and position combination taken for density determination and nutrient analysis (N, P ,K, Ca, Mg)

- Site Photographs (at each intensive plot)
  - Locate a tree of average diameter for that particular plot.
  - stretch a measuring tape 5 metres away from the tree and mark this as the camera position.
  - spray paint the stump of the tree with tree marking paint, tag the stump (very close to the base) with an aluminum tag facing the camera position
  - lean a metal meter stick, upright, against the tree facing the camera position
  - take two photos, one portrait and one landscape with the camera set a 28mm and the tree near the centre of the photo.

2.3 Harvest Treatments

Each case study site has two 25-hectare blocks where harvesting will take place. Three logging treatments will be employed on each block; 'full-tree' on 10 hectares, 'tree length' on 10 hectares and 'uncut' on the remaining 5 hectares of the block. Harvesting will be completed during the snow-free period. The time of year and soil condition should be noted at the time of harvest. The Project manager should be present for the actual harvest and should be on site for the change over of logging method (e.g. fulltree to tree-length).

Logging should be as operationally "normal" as possible. It is realized that equipment for tree-length harvesting under normal conditions may not be available so some simulation with roadside delimbers brought into the block and a careful redistribution of slash may be necessary. This will be done in consultation with the Project Manager, OMNR (Centre for Northern Forest Research (CNFER)), and company and contractor representatives.

2.4 Post-harvest Sampling

A temporal sampling schedule (0, 5 and 10 years post-harvest) will be adopted to estimate changes to the physical, chemical and biological properties measured as part of the pre-harvest measurements that result from the different harvest treatments.

Re-visitations to the pre-harvest plots shall be done on four separate occasions,
1) immediately after harvest (tØ),
2) after site preparation, if applicable,
3) five years post-harvest and
4) 10 years post harvest.

At each sampling period, the physical and chemical properties measured in the pre-harvest stand will be repeated. Sampling will be done within a three-meter radius of the pre-harvest plot locations.

In addition, an assessment of the six key indicators will be conducted in the following manner for all 36 plots in each treatment unless otherwise indicated**.**

- Soil Compaction
  - Measured as an increase of bulk density on the 12 intensive plots

- Soil Rutting and Puddling
  - Percent of plot area rutted and severity of rutting.

- Soil Displacement
  - Percent of plot area where soil displacement as a result of harvest occurred.

- Soil Erosion
  - Measure of slope, soil texture and exposed mineral soil within the plot.

- Soil Organic Matter Retention
  - Measure of soil organic matter depths and bulk density.

- Soil Nutrient Reserves
  - Residual biomass assessment (year 0) Slash
    - Similar to CWD plots without the diameter limits.
    - Count all slash intersecting a line transect to develop a relationship of slash count to mass.
    - Slash mass in a 2mx2m plot is weighed in the field
    - Samples collected and fresh weights, oven-dry weights and nutrient concentration determined.
  - Soil nutrient reserves (all four sampling periods)
    - As sampled in pre-harvest
  - Vegetation (after site prep, year 5 and year 10)
    - Assessment of vegetative recovery
      - → Seedling assessments, density, growth rates, foliar clipping for nutrient content
      - → Shrub, herb, moss percent covers.

In addition, at each sampling period, site photographs are to be taken at each pre-harvest photo site. Follow the same protocol as described in the pre-harvest section.

2.5 <u>Data Management and Associated Laboratory Work</u>

In both the pre- and post-harvest sampling times, there is a requirement to conduct laboratory work. This work involves preparing samples for nutrient analysis, properly handling samples for bulk density determination and data entry. Furthermore, the proper set up of a database is required to relate all pre- and post-harvest activities to the analytical results.

2.6 Cost Estimates

The cost estimate presented in the following table is for the establishment, monitoring, managing and analysis associated with one Level I case study site for the first 3 years of the program.

2.6.1 Costs per Case Study Site

Activity	Expenses	Cost $k
Site selection	1 wk travel for project manager	0.5
Site selection Total		**0.5**
Pre-harvest Sampling	Crew of 4 X 3 wks (650x4x3)	7.8
	Accommodations	3.0
	Field supplies	0.5
	Vehicle	0.6
Pre-harv Total		**11.9**
Associated Lab Work	2 people x 3 weeks	3.9
	Lab supplies	0.5
	Analytical chemistry - soils 150 samples x $30 = 4.5k - Veg 200 samples x $10 = 2.0 k	6.5
Pre-harv Lab Total		**10.9**
Harvest	Possible extra cost due to TL treatment	
Harvest Total		?
Post-Harvest (tØ field)	2 people x 2 wks (650 x 2 x 2)	2.6
	Accommodations	1.0
	Field supplies	0.2
	Vehicle	0.3
Post-Harvest field (tØ)		**4.1**
Post Harvest (tØ) lab	2 people x 1 wk	1.8
	Analytical chemistry (soil 150, veg 200)	6.6
Post-Harv. Lab (tØ)		**8.3**
Summary		
Total Establishment		**23.3**
Post-harvest (tØ)		**12.4**
Bottom Line per case study site		**35.7**

2.6.2 Project Coordination and Costs for Subsequent Assessments

In addition to the costs estimated in the preceding table, there will be a requirement for a **Project Manager at 40.0 k per year for 3 years**. This position would be responsible for, 1) site selection, 2) monitoring harvesting, 3) supervising Level I establishment, 4) post-harvest assessment, and 5) data management and synthesis of Level I & Level II projects.

Also not including in the above estimate is Year 5 and Year 10 sampling. Sampling at these periods is **estimated to be approximately 15.0K each sampling period per case study site**.

2.6.3 Cost Sharing Formula for Level I Monitoring

a) Seventy-five percent (75%) of the total cost for Level I monitoring will be split equally among the following cooperators:
- Bowater Pulp and Paper Canada Inc.
- Abitibi Consolidated Inc.
- Weyerhaeuser Canada Ltd.
- Domtar Forest Products
- Kimberly Clark Inc.
- Ontario Ministry of Natural Resources

b) Each cooperator's contribution to the remaining twenty-five percent (25%) of the total cost of Level I monitoring will be based on the amount of ecosite 11/12 scheduled for harvest in their current forest management plan, expressed as a percentage of the total amount of ecosite 11/12 scheduled for harvest in the current plans for all the Cooperators.

3.0 LEVEL II SAMPLING

Level II sampling is to provide an operational verification of the range of variability in full-tree harvest effects on specific parameters on ES11 and 12 sites. The data collected from this sampling procedure will tie into the Level I case study sites.

The design for Level II sampling will be modeled after the Field Manual for the Establishment of Forest Monitoring Permanent Sample Plots (Sumac Forest Information Services Ltd. draft version April, 2000). This design was chosen to provide the best utility of a sampling procedure, since the Level II PSP's may become Forest Growth and Yield Monitoring PSP's in future sampling periods. Appendix I includes the detailed procedures for Level II sampling.

Level II PSP's are proposed for a sub-sample of the ES 11/12 stands that are full tree logged. There is no requirement to sample tree-length logged areas.

The sampling intensity suggested is 30 clusters across the region in the planning year 2001/2002, with no more than 30 clusters in the 2 years following. At the time of submitting the annual work schedule, each S.F.L. will identify the areas of ES12 that are identified for harvest. A distribution of clusters will be determined based on an allocation matrix. At the completion of the first year of data collection, the Project Manager will synthesize the data to review how well the regional differences in ES11 and 12 were covered and evaluate the sample intensity for future periods. These differences should include the geographic range of shallow soils in the region, operational differences between SFL's, the frequency of ES 11/12 on a licenced area and the season of harvest.

4.0 LINKING LEVEL I and LEVEL II MONITORING

The sampling procedures conducted on the Level II sites are directly linked to the Level I experimental sites. The Level I experimental sites provide an opportunity to assess key site/soil types within the broad ES12 matrix. The Level II procedures allow a wider range of sites to be sampled to ensure or validate that the case study sites:

1) bridge the regional site variability of ES12 site types, and,
2) are within the range of normal operations.

The post-harvest /post-site preparation sampling for both levels are similar. The Level I sampling provides a greater detailed assessment of a particular site and is used to develop relationships (i.e. the relationship between slash intersects on transects to slash mass) where simpler and more efficient measurements can be made on the Level II sites.

It is the combination of the Level I and Level II monitoring, in conjunction with the AWS documentation (Section 5.0), which constitutes the entire program required to address the regional silviculture recommendation.

5.0 ANNUAL WORK SCHEDULE DOCUMENTATION

All ES 11 and ES 12 sites that are scheduled for operations in the Annual Work Schedule (AWS) will be handled as follows:

a) These sites will be clearly identified in the AWS (maps and stand listings). In the absence of an ecosite classification, surrogate information (e.g. stands designated as PFR) should be used to identify these sites in the inventory. Identification of these sites may require verification of the FRI designation through aerial photograph interpretation, aerial reconnaissance or field inspections prior to harvest. Mistyped stands (minimum size of 8 ha.) will be assigned to the correct ecosite and managed accordingly.

b) Operations on ES 11 and 12 will be in accordance with Best Management Practices (BMP's) as described in Section 6.0 of this document. Best Management Practices should be used for developing the Silviculture Ground Rules for shallow soil ecosites in the Forest Management Plan. They provide direction for formulating site-specific treatments when developing Forest Operation Prescriptions (FOP) during preparation of the Annual Work Schedule. When developing a FOP, actual site conditions are verified and the silviculture treatment to be used on that site is selected. At this point, additional details regarding the treatment packages (e.g. the application of BMP's) may be added (Archibald et al, 1997). Where feasible, best management practices will also be employed on inclusions of shallow soil conditions within stands typed to other ecosite types. The intent of these practices will be to minimize organic matter and soil disturbance, and reduce potential nutrient losses to the site.

c) Silviculture practices and assessments on ES 11 and ES 12 sites will be documented in accordance with the Silviculture Effectiveness Monitoring system, such that the results and effectiveness of treatments on these sites may be reported as required.

d) Companies that are cooperating with this comprehensive monitoring procedure may include the following statement in their AWS and, with slight wording adjustments, may amend the following statement to their Forest Management plans:

"Full tree logging on NWO ecosites 11 and 12, where total organic matter plus soil depth is less than 20 cm., is designated as a 'not recommended' practice in the silviculture guide for northwestern Ontario. This company is contributing to a comprehensive, region-wide initiative to monitor the impact of this treatment on these site conditions, as outlined in our forest management plan. As part of this monitoring program, these shallow soil sites have been identified in this Annual Work Schedule *(or Forest Management Plan)* and operations will be conducted in accordance with the best management practices approved for these site conditions."

6.0 BEST MANAGEMENT PRACTICES FOR ES 11/12 SHALLOW SOIL SITES

In addition to the Level I and II monitoring, Best Management Practices must be employed when harvesting stands that have been identified as Ecosite 11 or 12. "Best Management Practices are practices that are not considered part of normal operating procedures and are conducted specifically to prevent or minimize damage to the physical environment." (Archibald et al, 1997). The Best Management Practices included in the "Forest Management Guidelines for the Protection of the Physical Environment" (Archibald et al, 1997) are not considered the only management practices that may be "used to prevent, minimize or mitigate site damage." (Archibald et al, 1997). As a result, expanded lists of Best Management Practices are included in this section for consideration when planning or implementing operations on shallow soil sites.

All Ecosite 11 or 12 areas greater than 8 ha. must be identified in the Annual Work Schedule. It is recognized that significant shallow soil areas occur in stands typed to other ecosites. The sites which are most at risk (i.e. very shallow soils) are relatively easily identified. It is more difficult, however, to define the line where sites are marginally at risk, especially due to the variation in site conditions within each ecosite type. A 'conservative and adaptive approach' (Archibald et al, 1997) should be taken to managing these sites. The Best Management Practices selected for these sites must include practices that minimize the amount of site damage (i.e. ground disturbance and nutrient loss) occurring throughout the stand as a result of harvest and site preparation treatments.

The identification of these sites will be an important consideration during operator training, so that the best management practices may also be implemented on the small patches (< 8 ha.) of Ecosites 11 or 12 that have not been captured in the inventory. In order to minimize the potential for nutrient depletion from full-tree logging, the Best Management Practices listed in sections 6.1 and 6.2 are also recommended for these smaller shallow soil areas. Operational constraints will influence the extent to which these best management practices may be implemented on these smaller areas, but the overall goal will be to utilize practices that reduce ground disturbance and nutrient loss from the sites.

These Best Management Practices are to be considered in both planning and field implementation. The Silvicultural Ground Rules in the Forest Management Plan should address how these sites will be managed to prevent or minimize damage due to soil disturbance and nutrient loss. It may be appropriate to separate these sensitive sites into separate forest units for management purposes. (Archibald et al, 1997). The lists of Best Management Practices (Section 6.1 and 6.2) also provide direction for formulating site-specific treatments when developing Forest Operation Prescriptions (FOP) during preparation of the Annual Work Schedule. Operational design of activities (i.e. on-site planning), conducted at the field level, provides the

best opportunity for effectively implementing Best Management Practices. The level of detail associated with this planning level varies with the complexity of the forest conditions, and the type of forest operation being conducted (Archibald et al, 1997). Operator and field supervisor training are key to successful on-site implementation of Best Management Practices.

As mentioned, training will be a significant consideration for the implementation of these best management practices. Training, which will be carried out with MNR and forest industry staff, will focus on the identification of these sites and the proper application of best management practices. During the first year of the monitoring program (2001-2), each forest company will conduct a formal training session regarding best management practices for employees, contract staff and equipment operators involved with operations on ES 11 and ES 12 sites, and other shallow soil conditions. As required, each company will reinforce the implementation of best management practices on these sites through on-going discussions, annual reviews of practices, refresher training sessions, and regular inspections and reporting.

6.1 Minimize Ground Disturbance During Harvest and Renewal Activities:

Site disturbance associated with harvest and renewal activities should be minimized on shallow soil sites. All operations will be performed on shallow soil sites in such a manner and timing as to avoid widespread, continuous ground disturbance. Proper planning and timing of operations are key to avoiding extensive ground disturbance. These practices include:

- *Winter harvesting* of shallow soil sites is recommended, within operational constraints. Winter harvesting will conserve slightly more nutrients on site, and will help to reduce site damage such as erosion, compaction, or rutting. The use of winter harvesting does not preclude the use of other best management practices. Although winter harvesting is recommended, avoidance of excessive disturbance, and the implementation of other best management practices will minimize the impacts of summer logging on shallow soil sites.

- *Use high floatation (low impact) equipment* to maintain the integrity of the surface organic layer, and prevent rutting or compaction in the deeper soil inclusions. This is especially important during wet weather conditions when the organic layer or soil is saturated.

- *Minimize skid trails*, *landings* and roads on shallow soil sites, with an emphasis on creating the least amount of disturbance to the organic layer, and the protection of advanced regeneration. Whenever possible, non-productive areas such as rock outcrops shall be selected for landings or skid trails. Re-use skidways, rather than build extra landings. Avoid or minimize the amount of bulldozing required to create landings ***and roads*** on shallow soil sites. (e.g. backhoes may be used to build roads, avoiding the removal of soil from large areas).

- *Avoid harvesting and skidding on steep slopes* with shallow soils, since they will be susceptible to erosion (i.e. areas with only a discontinuous layer of organic material over bedrock). Clearcut practices may be modified to retain some trees adjacent to inoperable slopes. Modify skidding patterns on shallow soil slopes to reduce the risk of erosion (i.e. along the contour to the extent possible).

- *Silvicultural treatments that minimize ground disturbances should be favoured.* Natural regeneration, Careful Logging Around Advanced Growth (CLAAG), and artificial renewal treatments (i.e. aerial seeding, planting) that do not require mechanical site

preparation should be used, where appropriate. For example, planting without site preparation, through the thin LFH layer, or boot-screefing may be an alternative to mechanical site preparation. Planting with mini-plugs, or aerial seeding are viable renewal options for these sites, which tend to have low competition levels.

- *Mechanical site preparation should provide the minimum amount of mineral soil exposure* that is acceptable to meet silvicultural objectives *(e.g. if required for aerial seeding)*. Heavy mechanical site preparation (i.e. blading, heavy drags) will not be used on these sites. If mechanical site preparation is required, 'patch' type scarification is preferred. It is recognized that summer full-tree logging may result in adequate disturbance of the site for renewal purposes, thus eliminating the need for mechanical site preparation.

6.2 Avoid Practices That May Encourage Nutrient Loss from These Sites:

The following best management practices are recommended to prevent nutrient loss after full tree logging, with the emphasis on maintaining the nutrient capital stored on the sites:

- *Winter harvesting is recommended* to reduce nutrient loss from these sites. The use of winter harvesting does not preclude the use of other best management practices.

- *Careful Logging Around Advance Growth (CLAAG)* may be used as an operational harvest practice to improve the cycling and capture of nutrient capital.

- *Residual trees or snag trees should be left on site,* according to existing guidelines. Green hardwood trees should be favoured (particularly poplar), to improve nutrient cycling and the capture of nutrient capital. Residual trees should be left on areas susceptible to erosion.

- *Post-harvest prescriptions and renewal efforts* should be carried out as quickly as possible on shallow soil sites to encourage full site occupancy. This should also help to prevent problems with erosion and loss of nutrients.

- *Lower nutrient demanding species such as jack pine* should be matched to nutrient poor sites. The use of fast growing species is advisable to ensure rapid reforestation and reduce the erosion risk.

- *Chemical aerial tending* must be carefully assessed on shallow soil sites prone to nutrient depletion, since many of the competitive species on site act as nutrient sinks. This will maintain a diversity of tree and plant species on the site. Species such as alder, for example, are capable of fixing nitrogen in the soil, and should be retained. However, on some shallow sites, especially those with finer textured soils, aerial tending may be required to facilitate crop tree establishment, survival and growth.

- *Chemical site preparation* is generally not required, as these sites tend to be shrub and herb poor (i.e. low competition sites). However, on some shallow sites, especially those with finer textured soils, chemical site preparation may be required to facilitate crop tree establishment, survival and growth.

- *Prescribed Fire is* conditionally *recommended* due to potential loss of organic matter and nutrients. Low severity fires which remove less than 20% of the surface organic material are permissible**.**

7.0 REPORTING

7.1 Level I Monitoring:

The Project Manager is responsible for maintaining all files pertaining to the Level I permanent sample plots and developing the format for data management. All data and files will be kept at the Centre for Northern Forest Research (CNFER) within the Stand Ecology Program.
Establishment reports will be prepared for each of the Level I plots following the pre-harvest assessments and nutrient analyses. The report will include the following information:

- Locator maps and maps of plot layout
- The results of the physical, chemical and biological assessments, as outlined in section 2.2 of this document.
- Site photographs

At each of the **follow-up assessment periods** (i.e. "immediately**"** post-harvest, and "5 and 10 years" post-harvest), progress reports will be prepared which will include:

- Updated Site Photographs
- A summary of results of the current physical, chemical and biological assessments, as outlined in section 2.2 of this document.
- An assessment of the 'Six Key Indicators' (Section 1.0).

The Stand Ecology Program Leader at CNFER (or other suitably qualified individual) will complete the assessment of change in the six key indicators: Soil compaction, Soil Rutting and Puddling, Soil Displacement, Soil Erosion, Soil Organic Matter Retention, and Soil Nutrient Reserves.
In addition, at the year 5 and 10 assessments, the results of the Level II assessments will be compared to the Level I results, particularly with respect to the range of : post-harvest site disturbance (i.e. degree of rutting, MSE and soil displacement), amount of woody material on site post-harvest (i.e. residuals and snags, down woody material), and soil textures and fertility.

7.2 Level II Monitoring

SFL holders are responsible for the establishment and field assessment of Level II plots. Level II plots are key components of the Region wide monitoring proposal and are required to assess the relevance of Level I results. Therefore it is critical that the results of the Level II assessments be available in the centralized CNFER database.

When the Level II post-harvest assessment is complete, SFL holders will complete a computerized report in a standardized format (to be developed by the Project Manager using the outline in Appendix I of this document) and a copy will be sent to the Project Manager. The Project Manager will confirm the assignment of each plot to the allocation matrix and will be responsible for coordinating the analysis of nutrient samples.

If Post Site Preparation Sampling is required on the plot, the SFL holders will complete the field assessments and forward the information (see Section 3.0 of Appendix 1) to the Project Manager in a standardized format (to be developed).

7.3 Annual Work Schedules (AWS), Forest Management Plans (FMP), Annual Reports (AR) and Best Management Practices: Documentation

In order to be able to evaluate the extent to which these best management practices have been implemented over time, each SFL holder will be required to report on the implementation of Best

Management Practices in the text of their Annual Reports. The following information on ES 11/12 stands will be available to the Ministry of Natural Resources as supporting documentation:

- List of Stands and area harvested.
- Season of harvest.
- Details of the Forest Operation Prescription that was implemented for each stand.
- A summary of the renewal and tending treatments that have occurred on these sites (regeneration treatments, site preparation, and tending) and assessment results.

Each SFL holder is responsible for reporting the information outlined in Section 5.0 and Section 6.0 of this document. As indicated in these sections, the information pertaining to ES 11 and 12 stands will be reported in accordance with AWS, FMP and AR procedures outlined in the Forest Management Planning Manual.

8.0 OTHER OPPORTUNITIES: FURTHER INVESTIGATIONS AND ADDITIONAL FUNDING SUPPORT

Opportunities to link this monitoring program to further investigations of soil processes should be investigated. Soil quality monitoring is on the forefront of many North American jurisdictions, yet there has been very little work toward a comprehensive soil monitoring program. Opportunities may exist to establish partnerships with other jurisdictions to develop standards for measuring site degradation indicators.

The monitoring proposal outlined in this document involves static sampling of physical, chemical, and biological components of the ES11/12 sites. There are opportunities to investigate the processes that regulate the cycling of nutrients on these sites. More information on processes such as nutrient input through precipitation and weathering, decomposition rates, nitrogen mineralization rates, net forest water and litterfall aid in our understanding of how these systems function and ultimately recover from a specific disturbance.

Presently, the Centre for Northern Forest Ecosystem Research Stand Ecology Program (CNFER) is establishing a comprehensive plot network, using a chronosequence approach (stands of different ages developing on similar site/soil conditions). The intent here is to develop both wildfire and harvest chronosequences for different ecosites, including ES12, and compare stand development and important ecosystem processes to look for differences between these two modes of stand initiation/renewal. Further more, the data collected from these chronosequence sites will be used to calibrate and create ecological models. These models will be designed to look at the potential impacts of alternative silvicultural options on soil quality and ecosystem recovery.

The static samplings and process-oriented studies may generate interest in organizations involved in Criteria / Indicators, carbon sequestering or climate change work. These organizations may be able to provide some levels of funding. If these linkages are made, caution must be exercised to ensure that the integrity of the current monitoring system is not jeopardized.

9.0 REFERENCES

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Appendix I

ES11 and ES12 Soil Monitoring:
Detailed Procedures for Level II Sampling
(From: Field Manual for the Establishment of Forest Monitoring Permanent Sample Plots
(Sumac Forest Information Services Ltd.; draft April 2000))

Procedures:
The selected stands (greater than 8 ha) will have a cluster of three PSP's. Each PSP must be at least 70 m from the others in a cluster (center to center). Sampling will occur within the first year post-harvest and before site preparation.

1.0 PSP Location

Materials:
Candidate PSP pkg. (aerial photo, FRI data, main PSP info. form).
Unit road map. Locators map (blank).
Grease pencil. Ru ler.
Navigational protractor. Compass.
Hip chain.
Spray paint (orange and blue).
Flagging.

1.1 Locating The Tie Point:

Using the maps and candidate PSP package provided, locate a roadside tie point. The tie point should be a permanent and prominent feature i.e. road forks, bedrock outcrops.

1.2 Locating The PSP:

Managing body: PSP
PSP No._____
PSP Center Post

Upon completion of the PSP record the azimuth and distance (straight line) to the PSP from the roadside tie point. The tie point will be marked with a witness tree. A flag line is to be hung from the PSP to the witness tree. Ensure the witness tree is off the road right of way to avoid damage or removal during road maintenance.

Orange and blue bands painted at eye level identify the witness tree. The witness tree shall also bare the PSP number painted with tube paint below the coloured bands.

The Locator Map:

Map and describe the route to the PSP from a major permanent feature i.e. highway junction. Record the distance between each prominent feature (road junctions, bridges, and water crossings) that marks the route. Provide a distance beyond the PSP to a visible feature to indicate that the tie point has been passed.

This map need not be drawn to scale but should reflect the general direction of travel and have enough detail that person unfamiliar with the area can relocate the PSP with ease.

2.0 Main PSP Information Form

Location Information:

PSP No. – Record the PSP number.

The PSP is numbered as follows: Working circle – Year – Block number and Plot number i.e. 78-2000-606-1.

Working circles	Management Unit	Managing Body
4	English River Forest	Bowater
78	Black Sturgeon Forest	Bowater
12	Caribou Forest	Bowater
3	Brightsand Forest	Bowater
56	Dog River Matawin Forest	Bowater

Add in other Mgmt Units and interest groups

Ownership – Record *Managing Body*

Azimuth to PSP – Record azimuth to PSP from the witness tree.

Distance to PSP – Record distance to PSP from the witness tree.

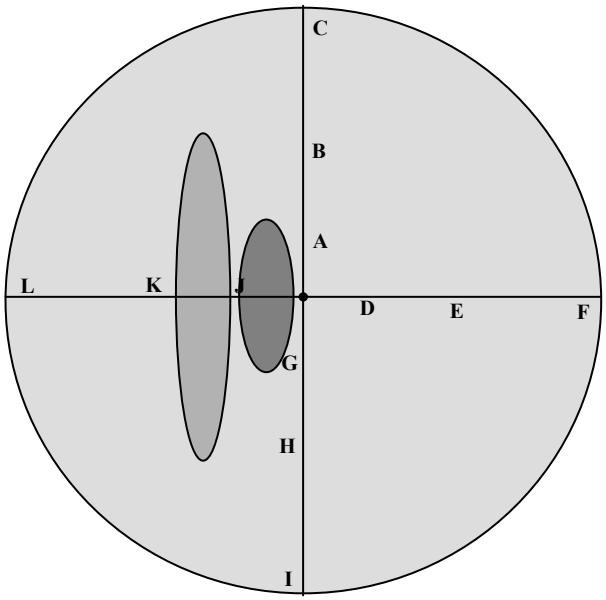
Declination – Record declination used.

Photo No. – Record aerial photo number.
Year - Flight Line - Roll – Photo Number.

Basemap / OBM No. – Record Basemap / OBM number.

Establishment Date – Record date of PSP establishment.
Year/ Month/ Day.

Crew 1 – Record the last name of tally person.
Crew 2 – Record last name of second crew person.



Plot Radius – Record 11.28 meters with four transects originating from the centre of the plot. The first transect bearing should be randomly selected and the other three at approximately 90^{o} intervals around the plot. Points are established along each transect at 2.82 m and at 5.64 m. These points will be labeled as A through L as per the accompanying diagram
To record general site conditions, take a **photo** along each transect line.

***Stand Information*:**

FRI Year – Record the FRI year.

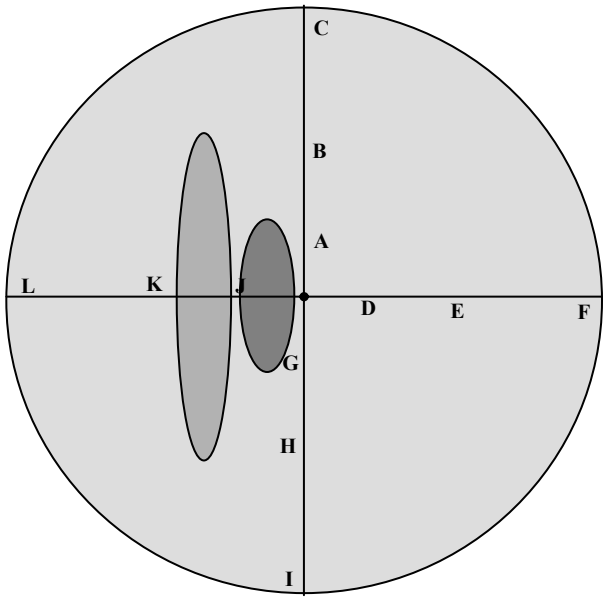
FRI Stand No. – Record FRI stand number. Include stand suffix if applicable.
If unknown leave blank, until information is obtained. Note this occurrence on the Plot Package Checklist.

Stand Area ***– Record the stand area from FRI map or aerial photography provided***

Stand Disturbance – Record the stand disturbance code.
Harvest
Year:
Season:

**** Degree of Rutting:**
Heavy
Moderate
Light
Not evident
Definitions still required

Azimuths of transects
Azimuth A→C:
Azimuth D→F:
Azimuth G→I:
Azimuth J→K:



Station	Depth of Duff
A	
B	
C	
D	
E	
F	
G	
H	
I	
J	
K	
L	

**** Map Exposed Bedrock**
Estimate pre-harvest condition

**** In the area without exposed bedrock**:
** Provide an ocular estimate of **MSE** (% of the area minus pre-harvest exposed bedrock)
** **Soil Displacement** as a result of harvest/SIP activities (% of area minus pre-harvest exposed bedrock)

(Note: items marked '' are re-assessed if a post Site Prep. Assessment is required)**

Main PSP information Form
Soils Information:
A soil pit is to be established at plot centre. The following information is to be collected.

A profile identifying the textural classes, depth to textural changes and depth to mottling is to be done for the primary site condition within the PSP. If there are other site conditions then location of the plot at this point should be reconsidered.

Sampling is required to Bedrock. Use a divot to determine the depths of the individual layers of the duff.

Scratch pits are allowable for the determination of bedrock. They are also helpful for the determination of mottling due to a fluctuating water table.

If the pore pattern remains the same throughout the profile a sample from the deepest section of the profile is to be bagged. Ensure a minimum of a fist size sample is collected. If there are multiple pore patterns present within the profile, samples of each are to be collected and properly labeled, PSP No., depth, and texture and sample number.

Depth From – Record the beginning depth of a textural change to the nearest cm.

Depth To – Record the ending depth of a textural change to the nearest cm.
All profiles are to end at bedrock.

Tex. / Tax. / Dec. – Record the texture class for each mineral horizon encountered. Record the proper taxonomic identifiers for each layer that makes up the duff layer.

Texture class is the nomenclature used in the Canadian System of Soils classification to describe the relationship between the base components of the soil, sand, silt and clay.

C – Clay	Si – Silt	vfS – Very Fine Sand
SC – Sandy Clay	SiS – Silty Sand	fS – Fine Sand
SCL – Sandy Clay Loam	SiL – Silt Loam	mS – Medium Sand
CL – Clay Loam	SiC – Silty Clay	cS – Coarse Sand
SiCL	– Silty Clay Loam	vcS – Very Coarse Sand
	L – Loam	
	SL – Sandy Loam (specify sand fraction)	
	LS – Loamy Sand (specify sand fraction)	

CF – Record the coarse fragments code.
1- <10% 2- 10-35% 3- >35%

Pore Pattern - Record the pore pattern for each mineral soil horizon and any bedrock horizon.
Pore patterns maybe found in the chart:

Depth to Mottles - Record the depth at which mottles begin. If none are found record 999.
Do not record a depth for hesitation or root mottles. Only mottles due to a fluctuating water table are to be recorded. Hesitation and roots mottles should be noted in the notes section.

Depth to Gley – Record the depth at which gley begins. If none is found record 999.

Bulk Density- Samples are taken from each horizon (including both organic and mineral) for Bulk Density determination.

Depth to Bedrock – Record the depth at which bedrock begins. If not encountered record 999.

Parent Material- Record the bedrock type, e.g. granitic, greenstone, calcareous …

Landform – Record the landform code.

1-	Outwash Plain	6-	End Moraine	11-	Rock Ridge	16-	Boulder Pavement
2-	Kame	7-	Lake Plain	12-	Spillway	17-	Other
3-	Esker	8-	Dune	13-	Drumlin		
4-	Terrace	9-	Delta	14-	Organic		
5-	Ground Moraine	10-	Beach	15-	Bedrock		

Mode – Record mode of deposition.

B-	Basal Till	G-	Glaciofluvial	O-	Organic
C-	Colluvial	L-	Lacustrine	R-	Rock
D-	Eolian	M-	Morainal		
F-	Fluvial	N-	Marine		

Slope Position – Record the slope position code.

1-	Crest	3-	Middle Slope	5-	Toe	7-	Level
2-	Upper slope	4-	Lower slope	6-	Depression	8-	Rolling/ Complex

Slope % – Record the average percent slope for the area of the PSP.

Aspect – **Record the azimuth for the direction the PSP is facing. If the site is complex record 999.**

Humus Form – Record the humus form code.

1-	Compact Mull	6-	Typical Moder		11-	Humimor
2-	Fine Mull	7-	Raw Moder		12-	Humic Peatymor
3-	Medium Mull	8-	Fibrimor	13	-	Mesic Peatymor
4-	Coarse Mull	9-	Humifibrimor		14-	Fibric Peatymor
5-	Mull like Moder	10-	Fibrihumimor		15-	Anmor (muck)

Effective Texture – Record the effective texture.
If soil is stratified (more than 1 pore pattern) determine effective texture. If one pore pattern is present record the texture of the dominant texture.

Moisture Regime – Record moisture regime. For Theta enter D.
In stratified mineral soils the moisture regime is to be calculated using the effective texture. Use the dominant texture for profiles with <60 cm mineral soil.

Do not use depth to hesitation mottles when calculating moisture regime. Following this determination, there is an allowance for moisture regime to be moved up one class, if warranted with the presence of hesitation mottles.

D-	Dry	3-	Very Fresh		7-	Moderately Wet
0-	Moderately Dry	4-	Moderately Moist		8-	Wet
1-	Moderately Fresh	5-	Moist	9	-	Very Wet
2-	Fresh	6 -	Very Moist			

Drainage Class – Record the drainage class code.
Use the effective texture.

Do not use depth to hesitation mottles when determining drainage class. Following this determination, there are allowances for drainage class to be moved up one class, if warranted with the presence of hesitation mottles.

1-	Very Rapid	4-	Moderately Well	7-	Very Poor
2-	Rapid	5-	Imperfect		
3-	Well	6-	Poor		

Texture Range – Record the texture range.
This is the broad grouping that is used to segregate out a range of textural classes. For example Coarse Loamy, Clayey, Sandy, etc.

Sandy – vcS, cS, mS, fS, vfS, LvcS, LcS, LmS, LfS
Coarse Loamy – LvfS, All SiS, SL, L
Silty – SiL, Si
Fine Loamy – SCL, CL, SiCL
Clayey – SC, SiC, C

S-Type – Record S-Type.
Use the C horizon of the soil auger for this purpose.

Nutrient Samples
At the end points of the four transects, soil cores are to be taken. For each organic and mineral horizon encountered, bag a sample of soil for nutrient analysis. These samples should be labeled as PSP number, ownership, horizon and point number (C, F, I or L)

Stump/residual and snag Inventory
Record the species and diameter at a height of 10cm of each stump, residual tree and snag in the PSP. Three dominant stumps should be aged to confirm the pre-harvest stand age. The diameter limit is 2cm minimum. The tally shall indicate whether it was a stump/ snag or residual tree.

Down Woody Material (4 transects)
Down Woody Material (DWD) is any woody material that is laying on the ground.

Measure the top, bottom and intersecting diameter, and the length of each piece of DWD that crosses the transects. Assign a decay class to each piece of DWD along the line. Minimum diameter = 2 cm. Determine species if possible, otherwise distinguish between hardwood and conifer.
Each transect is to have a 5m length assessed for DWD

Decay Class (Duval and Grigal, 1999)

0	Fresh Slash
1	Bark on, wood sound and round
2	Bark partially off, wood partially decayed but round
3	Bark mostly off, wood decayed and exterior friable, round to partially oval
4	No bark, wood very decayed and highly friable throughout, oval
5	No bark, wood sound and bleached

Fine Slash Count; (for each transect)
Record the count (by species) of each piece of DWD smaller than 2cm in diameter and belonging to decay class 0, that intersects the transect.

3.0 Post Site Preparation Sampling

Level II plots are to be established post-harvest, but prior to site preparation. If site preparation does occur, some parameters must be re-assessed to enable the impacts of full tree harvest and site preparation to be separated.

The following is the procedure to be used:
Re-locate the centre of each plot. Using the bedrock exposure map produced from the post-harvest sampling, provide an updated ocular estimate of 1) rutting severity, 2) mineral soil exposure and 3) mineral soil displacement using the same procedures followed in the first sampling.
In addition, record the following information and add it to the file for the site: 1) Year and Month of Site Prep., and 2) Type of Site Prep. equipment.

APPENDIX II

WORKING GROUP MEMBERS

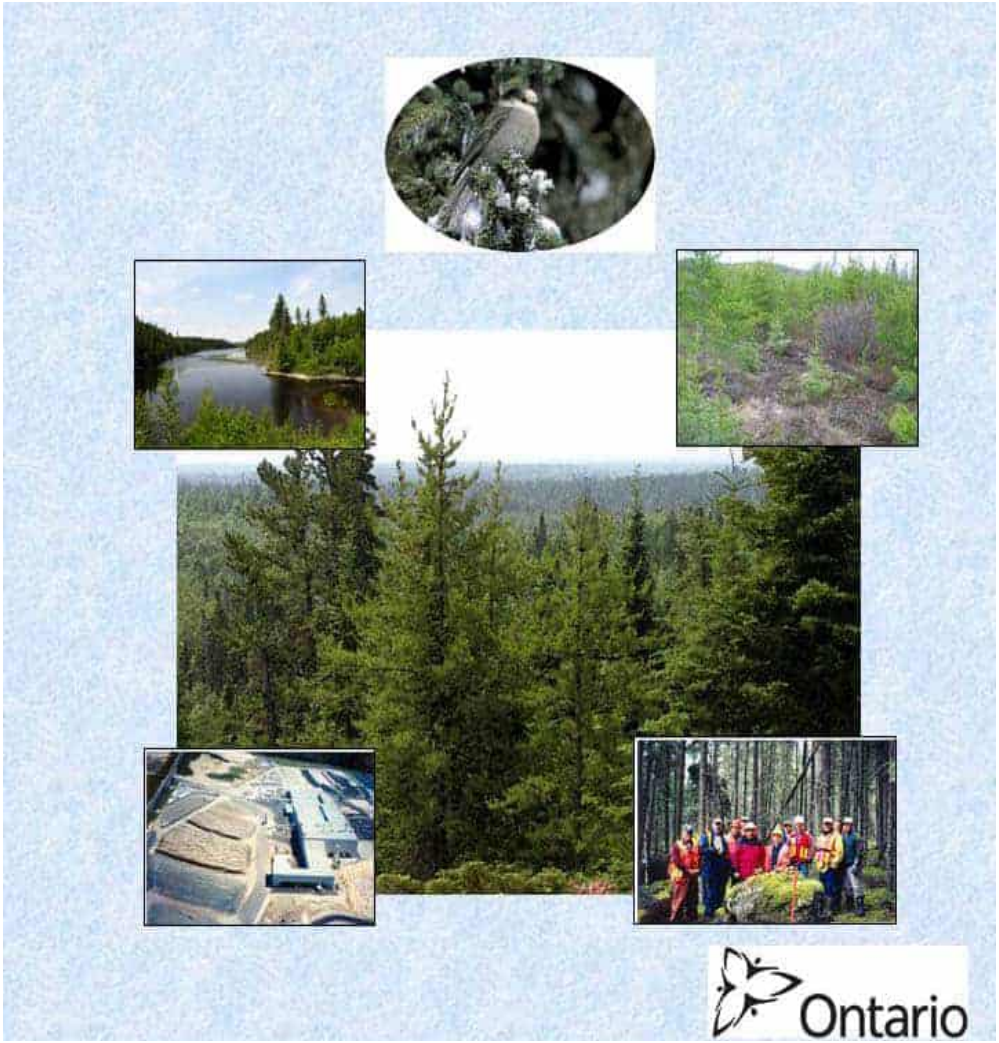
The following are the Industry and OMNR representatives assigned to the working group responsible for the development of this procedure:

- **Dave Archibald – Bowater Pulp and Paper Canada Inc.**
- **Steve Watson – Abitibi Consolidated Inc.**
- **David Salter – Weyerhaeuser Canada Ltd.**
- **Brian Campbell/Harry Pearce – Domtar Forest Products**
- **Ken Lennon – Kimberly Clark Inc.**
- **Richard Cameron – Red Lake Forest Management Company**
- **Dave Morris – OMNR, Centre for Northern Forest Research**
- **Dan Duckert – OMNR, Centre for Northern Forest Research**
- **Mike Dawe – OMNR, Kenora District**
- **Bob White – OMNR, Northwest Science and Technology**
- **Neil Stocker – OMNR, Provincial Silviculturist**
- **Ron Waito – OMNR, Northwest Regional Planning**

Supplementary Documentation F

2012-2022 Whiskey Jack Forest Management Plan

Monitoring Program for Regeneration Success



Pre-Free Growing Survey Methodology

Pre-free growing surveys are intended to determine the regeneration success of a given forest area and to identify any areas where regeneration is not adequate. Data collected can be used to determine the stocking of the area, species composition, and the extent of competing vegetation. This information provides a measure of how the stand is progressing towards its set objectives.

These surveys should be completed 2-5 years after harvesting or renewal treatments have been completed. This scheduling is designed to allow time for any remedial treatments to be completed and for their effects on the block to be seen before free to grow assessment. This timing should also allow seedlings to become established in the stand. Trees which were unsuccessful due to factors such as poor microsites would also be showing signs of stress by this point, allowing surveyors to easily identify seedlings unlikely to survive.

Plot Allocation

Plots 4m² in size, with a plot radius of 1.13 will be used to complete pre-free to grow surveys. This plot size will provide an adequate description of the survey area as the block being assessed contains smaller trees, meaning more trees can be captured in the plot. However, a plot density of **three** plots per hectare is needed in areas of higher variability in order to account for between plot variations and to provide an accurate description of the block. Blocks that are pure hardwood receive a plot density of one plot per hectare if they are uniform.

After the minimum plot number is established, plot locations should be determined systematically and mapped, with the grid size and pattern depending on the number of plots required. Plot spacing and line spacing should generally be kept similar in order to approximate a square layout pattern. The distance between survey lines and between the sample plots along the survey lines can be calculated using the following formula.

$$\text{Plot spacing (m)} \times \text{Line spacing (m)} = \frac{\text{Strata area (ha)} \times 10{,}000}{\text{Required min. number of plots}}$$

Once the desired survey line spacing is selected, calculate the required plot spacing (for the minimum number of plots) by substituting “line spacing”, “strata area (ha)”, and “required minimum number of plots” in the above formula and solving for “plot spacing”.

Mapping

The minimum number of plots required should be established on a map prior to going out to the field. Survey line locations should be tied into recognizable features on the ground, and distance and bearing information should also be included to facilitate mapping and navigation.

Data Collection

Before going into the field, a block header sheet should be filled out (Appendix 1). This provides the surveyor with background information for the block. The header sheet gives treatment types and dates, as well as the targets and standards for the block and should include the number of plots and plot spacing established in the previous step.

Plot Location

Follow the mapped survey lines and establish plots at the predetermined locations. The plot center should be flagged and GPS'd to aid in locating the plot in the future if necessary. If a plot lands in an area where a feature such as permanent water, or exposed bedrock composes over half of the plot, or if it lands in an un-harvested area, the plot should be moved and these features noted. Plots should be moved to a location halfway between two plots as near to the initial plot location as possible.

If a plot lands on a site where conditions resulting from forestry activities exist, such as equipment trails, puddle ruts, slash piles or wind throw, assess the plot normally and provide comments regarding site conditions on the tally sheet.

Tree Tally

After the plot is located, all trees in the plot are tallied by species and height class, and recorded in the Pre-free to grow tally sheet (Appendix 2).

Pre-free to grow surveys are completed after only 2 to 5 growing seasons, as a result there are no minimum heights required in order for a tree to be tallied during this survey. This time period does allow trees to become established in the stand. However, during seedling establishment, growth is not focused on the above ground portion of the tree, so heights will be lower resulting in several trees not being included in the tally because they do not meet height requirements when in reality they will grow and contribute to the stand given more time. Requiring trees to be a minimum height could result in a stratum not meeting stocking requirements or a fill plant being recommended when in reality there are several seedlings not captured in the surveys that will naturally fill in the spaces.

Dominant ground cover should also be recorded in the competing species column of the tally sheet (Appendix 2). Dominant ground cover is considered to be non-commercial vegetation such as shrubs and grasses which is competing with the seedlings. Dominant ground cover is recorded as the percentage of the plot that the species is covering, as well as the average height. This information will provide an indication of whether vegetation management is required in order to reduce competition and ensure the success of the crop species. Not all vegetation will compete with the seedlings to the same degree and therefore not all species of non-commercial vegetation will need to be treated.

Any health concerns or signs of stress such as drought or browsing should be noted during the survey. Dead seedlings or those not expected to recover from some stress should also be noted, but should not be included in the plot tally.

Determining Stocking

The percent stocking of a block is determined using survey results and the following formula. In order to be considered stocked, a plot must contain at least one crop tree. If a plot contains trees, but the species are not listed as desired or acceptable under the SGR for that stratum, the plot is considered to be not-stocked even though trees are present.

Stocking Formula

$$\frac{\text{\# of stocked plots}}{\text{total \# of plots}}$$

For example, if 72 "stocked" plots were recorded in a 30ha stratum which had 90 plots sampled, the stocking % would be as follows.

$$\frac{72}{90} = 80\% \text{ stocked}$$

In order for a plot to be measured it must be located on a site that is capable of supporting a tree. Areas that are flooded, located on bedrock or occur within an unmapped residual stand will not count towards the "total" number of plots. However, areas that are temporarily not capable of supporting trees, i.e. slash piles, operational roads, landings that do not occur on areas "permanently" incapable of supporting trees will be included in the total number of plots.

Determining Regeneration Status

The regeneration status of a stratum is determined as either Satisfactorily Regenerated (SR) or Not Satisfactorily Regenerated (NSR). This status is determined by comparing survey results with minimum standards determined by the silvicultural ground rule associated with the stratum. Determining whether a plot is satisfactorily regenerated or not satisfactorily regenerated is a function of plot size and the required minimum stocking level of the block.

The proportion of a hectare the plot composes determines the stocking factor of the plot.

1ha= 10,000m²
10,000 m²/ 4 m² = 2,500 meaning a 4 m² plot composes 1/2500 of a hectare.

For plots 4m² in size, the minimum stocking for each treatment (extensive, basic and intensive) as found in the SGRs (FMP-4) to be declared SR will depend on whether the stratum underwent extensive, basic or intensive treatments.

Treatment	Minimum Stocking Requirements
Extensive	70%
Basic	80%
Intensive	80%

The minimum number of stocked plots required in order to meet stocking standards can be found by multiplying the minimum average number of crop trees per plot by the total number of plots required in the stratum.

For Example, in a 30 hectare stratum, 90 plots are normally required in order to get a plot density of three plots per hectare (30ha x 3 plots/ha). The following are the minimum numbers of stocked plots required to meet stocking requirements under each silviculture intensity treatment.

Extensive 90 x 70% stocking= 63 stocked plots per block
Basic 90 x 80% stocking = 72 stocked plots per block
Intensive 90 x 80% stocking = 72 stocked plots per block

Survey Summary

After the survey is completed, a Pre-Free to Grow summary sheet should be completed based on the survey results (Appendix 3). This includes a summary of the total number of trees tallied by species and height class, which is then used to determine the current species composition and regeneration status of the stratum.

Based on these results, it can then be determined if the stratum is on its way to becoming a regeneration and silvicultural success. A stratum is considered a regeneration success when it meets stocking standards as found in its assigned SGR. A stratum is considered a silviculture success when it meets the species composition and desired forest unit found in its assigned SGR. The results of this survey will naturally alter by the time the stratum is assessed for Free Growing. However, this survey will determine if the desired species are present at the desired density in the stratum. If it is found that desired species are not present, or are in a low concentration in the stratum, a fill plant or other remedial actions can be completed to help the stand move towards the desired future forest condition.

Appendix 1

Pre-Free Growing Regeneration Survey Header Sheet

Pre- free-growing Regeneration Survey Header Sheet

Surveyors: _____ Date: _____

Administrative Data:

District: _____ Project #: _____ Area (ha) _____

SFL: _____ Block #: _____ FRI Photo #: _____

Township: _____ Stratum #: _____ Licensee: _____

Mapsheet : _____

Pre-Harvest Site Description:

Pre-harvest FRI Description: _____

Ecosite: _____ Veg. Type: _____ Soil Type: _____

Silvicultural Treatment Package:

Year of Harvest: _____ Harvest Method: _____

Year of SIP: _____ SIP Method: _____

Year of Veg. Mgt.: _____ Type of Veg. Mgt.: _____

Regeneration Methods: _____

Prescription:

Target FU: _____ Regeneration Standard: _____
all species (# free-growing, well-spaced stems/ ha)

Target Species: _____

Acceptable Species: _____

Field Layout:

Minimum # of Plots: _____ Distance Between Lines: _____ m Distance Between Plots: _____ m

Appendix 2

Pre-Free to Grow Survey Tally Sheets

Pre-Free to Grow Survey Tally Sheet

Surveyors: _____ Date: _____

Page #: _____ of Total # : _____

Project No: _____ Block No: _____ Licensee: _____

Target FU: _____ Stratum No: _____

Line/ Bearing	Plot No.	Spp.	Total Number of stems Height Class 1	2	3	Stocked	Competition Spp	Ht	%	Comments
		Sb								
		Sw								
		Pj								
		Bf								
		Po								
		Bw								
		Sb								
		Sw								
		Pj								
		Bf								
		Po								
		Bw								
		Sb								
		Sw								
		Pj								
		Bf								
		Po								
		Bw								
		Sb								
		Sw								
		Pj								
		Bf								
		Po								
		Bw								

Species	1	2	3
Sb, Sw, Bf,Ce	0 to 0.3	0.3 to 0.79	0.8 to 2.0
Pj, Pr, Pw, L	0 to 0.3	0.3 to 0.9	1.0 to 2.0
Hardwoods	0 to 0.3	0.3 to 1.9	2.0 to 2.9

Note: Height classes may differ from the examples given depending on the minimum crop tree heights listed in the silvicultural ground rules associated with this stratum.

Stocking Formula = # stocked plots/ total # of plots

Appendix 3

Pre-Free Growing Regeneration Survey Summary Sheet

Pre- Free-growing Regeneration Survey
Summary Sheet

Block #_____ Stratum #_____ Survey year _____

Stratum Area = _____ ha	% Occupied Plots (≥1 crop tree in plot) = _____ %	
Number of plots= _____		
Mean # Crop Trees	Mean =_____ / #plots	x 2,500 = _____/ ha
Regeneration Standard (trees/ ha- all species)		
Target Species		
Acceptable Species		
Ecosite		

Spp.	Height Class 1	Height Class 2	Height Class 3	
Pj				
Pr				
Pw				
Sb				
Sw				
Po				
Bw				
La				
Bf				
Ce				

Treatment	
→	
Species Composition	
Comments:	
Satisfactorily Regenerated	Not Satisfactorily Regenerated
Silviculture Success	Not a Silviculture Success

* Height Classes

Species	1	2	3
Sb, Sw, Ce, Bf	0 -0.3	0.3- 0.79	0.8 -2.0
Po, Pr, PW, L	0 -0.3	0.3-0.9	1.0 -2.0
Hardwoods	0 -0.3	0.3 -0.9	2.0 -2.9

Ocular Estimate Survey

Ocular estimate surveys will generally be conducted from the air via helicopter, with associated ground trothing for quality control. Some areas may be surveyed on the ground (e.g. not aerially assessed) depending on helicopter availability and road access.

This survey methodology is intended for use in stands where accurate estimates of stand conditions can be obtained through an ocular assessment, such as found in relatively pure species forest conditions like naturally regenerated poplar. This survey methodology is designed for strata that have undergone extensive or basic silviculture intensity treatments, where density regulation is not desired.

These surveys will be conducted by experienced forestry workers who will complete an ocular assessment of species composition, average height, stocking, and determination of free-to-grow status. Annual ground calibration surveys are conducted to ensure accuracy of observations. Previous on-the ground assessments following the pre-free to grow methodology found in Supplementary Documentation F will be used to determine suitability for ocular estimate strata and as a guide for species composition and stocking during the ocular estimate survey.

Silvicultural treatment polygons (based on silviculture records) are the initial survey polygons. These polygons may be stratified further based on differences in future forest unit, species distribution, site type, stocking, density or height.

Stocking is determined from the air for those areas where density regulation is not a criterion of regeneration standards. The ocular assessment will determine if the minimum stocking as identified in the Silvicultural Ground Rules (Table FMP-4) for extensively or basically treated areas is achieved across the harvested area. Determination of stocking will consider both the target and acceptable species. Stocking will provide a measure of the percent of the area within a harvest area occupied by target plus acceptable tree species to the acceptable limits identified in the SGRs. Balsam fir will only be used in determining stocking up to the limit specified in the appropriate SGR.

Site occupancy is also determined from the air for those areas where density regulation is not a criterion of regeneration standards. Site occupancy is assessed for density regulated stands using the Well-Spaced Free Growing Survey method (see Supplementary Documentation F). Site occupancy is assessed against a larger assessment area as compared to the stocking assessment area described above. The site occupancy assessment area includes all harvested areas, landings, slash and chip debris piles and roads that are to be renewed, excluding only those areas that did not originally support production forest (e.g. rock outcrops, natural wet areas) or elements such as residual wildlife trees or retained roads. Assessment areas with more than 20% gaps (16 m2 circular plot areas without a single target or acceptable tree species over 30 cm in height) would not be identified as free-to-grow.

Where stocking or site occupancy is not relatively uniform across an assessment area, the assessment area will be stratified to identify areas that are clearly above or below regeneration standards. Results will not be averaged over the whole assessment areas where results vary significantly within the assessment area. Portions of assessment areas that are clearly not adequately regenerated will either receive further renewal treatment to enhance stocking levels or will be monitored for natural ingress of target and acceptable species on those sites where ingress of desirable species is expected. Portions of assessment areas that are delineated as meeting regeneration standards will not require further regeneration treatment and will be declared free-to-grow.

Methodology for Large Scale Photography and Photo Interpretation

Schedule A

A1. BACKGROUND INFORMATION RELATING TO THE SERVICES

The Whiskey Jack Forest has approximately 22,000 hectares of backlog silviculture blocks that have not been declared Free Growing. These areas need to be assessed and declared Free to Grow so that they may be brought back into the working Forest Resources Inventory for the forest. As a result the MNR is contracting KBM Forestry to undertake Large Scale Digital 3-D Photography to be utilized in the interpretation and in determining a Free Growing status on approximately 2200 hectares of the backlog areas.

A2 Description of Services

1. MNR and KBM will work together during this process on the refinement and standardization of the photo interpretation methodology.
2. MNR will supply all shapefiles, depletion, acceptable species and silviculture information of the areas to be assessed.
3. The Contractor will utilize the supplied information to determine flight paths for large scale photography.
4. Large Scale Photography will be taken during leaf off conditions.
5. The resolution of the photography will be of sufficient size to determine species and height within a 16m2 plot.
6. The digital imagery will be processed and brought into the 3-D environment.
7. Calibration for photo interpretation – if available MNR will supply previous years Free Growing (FTG) survey results and shapefiles to Supplier. The Supplier will utilize this information to calibrate photo interpreters on stand characteristics. Calibration will be done prior to starting the remainder of the supply silviculture blocks.
8. Further ground sampling of the target stands may be require to provide interpreters with benchmark data.
9. Interpreters will use the imagery as well as available background information (e.g. pre-disturbance forest condition, depletion and silviculture records, ground data) to stratify the blocks into homogeneous polygons using the same stratification rules as the current forest resources inventories. Minimum strata size is 8 hectares for productive forest areas –and 2 hectares for unproductive or unique polygons. The entire depleted will be stratified in the assessment - roads, landings and harvested area. Areas related to non-productive land or elements such as residual wildlife stands, bypass or retained roads will not be included.
10. The Supplier will supply all digital imagery and will supply FTG information as per Forest Information Manual and Technical Specifications.

Interpretation Specifications

A random start grid pattern will be used to establish virtual plots. Intensity of plots will be two per hectare (square grid of just over 70 meters). At each intersection of the grid a virtual plot with a fixed size of 16m2 will be established. Using the elevation tool the 16m2 plot will be adjusted to ground level before interpreting each plot.

Minimum Free to Grow Heights

Unless otherwise stated in an SGR. The following FTG height standards will be utilized

Species	Height Class (m)
Sb, Sw, BF, Ce	>=0.8
Pj, Pr, Pw, La	>=1.0
Hardwoods	>=2.0

Plot Information

At the individual 16 m² plot the following information will be recorded:

Plot information - UTM location, stratum,

Total Trees – All trees species that meet the Minimum Free to Grow Heights will be recorded. Total trees will be used in to determine the effective density of the stand.

Effective density – a tally of all acceptable species (minimum free to grow height) and average height of each species is recorded.

Target or Acceptable Species– tally of target or acceptable species - 1 meter apart to a max of 4 trees or one per quadrate

Stocking - will be determined by dividing the total recorded stems of Target or Acceptable Species by 2500 stems per hectare. (Maximum number of stems based on 4 trees per plot in a 16m2 plot system).

Site Occupancy - This plot will also be used to assess site occupancy. The plots will be recorded as:

Productive - containing at least 1 target of acceptable tree as per minimum free to grow heights,
Void – previously productive area with no trees, including slash piles, roads and landings.
Naturally Unproductive – prior to disturbance. e.g. rock, natural wet areas, alder etc.

This data will be utilized to produce stand level information. ie. Species composition, stocking, total and acceptable tree density of trees meeting minimum height requirements, age (not interpreted), average height.

Data Entry

The individual plot data is recorded in a spreadsheet. The stratum data is summarized and the interpreted information is then entered into a geodatabase ensuring linkage to the polygons.

Quality control - a sub-sample of interpreter work is internally audited by the contractor to ensure consistent high quality results from image interpretation.

Delivery – include the geodatabase, rectified digital images of all project areas, stratification, digitized individual plot locations, and Tally Sheets for field verification. Geodatabase will also include all necessary fields required for a Forest Information Manual compliant Annual Report submission.

Determining Species Composition

Example of Survey Results:

a) Area of stratum: 20 hectare
b) Stand age: 10 years
c) Number of plots surveyed: 40 plots
d) Effective density for each species (that is, the total tally of stems (for each species) greater than or equal to the minimum heights, divided by the total number of productive plots x the expansion factor (625) = avg. stems/ hectare).

   Jack pine: 278 stems per hectare
   Black spruce: 1736 stems per hectare
   White Birch: 278 stems per hectare
   Aspen: 200 stems per hectare

e) Number of plots in which each species occurs;
   Jack pine: in 15 (of 40) plots
   Black spruce: in 30 plots
   White Birch: in 15 plots
   Aspen: in 10 plots

e) Number of voids: there were 4 plots with no measurable stems.

f) Number of Naturally Unproductive: 0

g) Total Productive Plots: Total plots – Naturally Unproductive – Voids = Productive Plots
   40 – 0 – 4 = 36 productive plots

H) Calculation:

Species	Effective Density (all stems per ha.)	Occurrence (% of occupied plots in which this species occurs)	Weighted Values	% Species Comp. based on weighted values
Jack pine	280	.42 (15/36)	118	7%
B. spruce	1700	.83 (30/36)	1411	84%
White Birch	280	.42 (15/36)	118	7%
Aspen	200	.27 (10/36)	54	2% (negligible)
Total	**2460**		**1701**	

Therefore, **interim species composition label for this stratum** is (after rounding): **Sb8PJ1BW1**

Site occupancy = 36/40 x 100 = 90 %
Site Density – 2460 stems per ha
Stocking: 1701 trees per hectare / 2500 = 68%

Regular Free to Grow Survey

This survey methodology is designed for strata that have undergone Extensive or Basic Silviculture Intensity treatments, where density regulation is not desired. It is used to measure the species composition, average height of desired species, stocking and to assess freedom from competition. The free to grow determination is based on stand structure and species competition at the time of assessment, but incorporates criteria designed to improve predictions that the trees remain free to grow over time.

This survey methodology is an adaptation from the Well-spaced Free-growing Regeneration Assessment Procedure for Ontario (White et al. 2005). The full reference is as follows: White, R.G., C.L. Bowling, W.J. Parton and W.D. Towill. 2005. Well-spaced free-growing regeneration assessment procedure for Ontario. Ont. Min. Natur. Resour. Northwest Sci. and Info., NWSI Tech. Manual TM-007. 38pp + appendices.

Plot Allocation

Free to grow surveys will be completed using plots sizes of 16m², with a plot radius of 2.26m. This plot size accounts for more within plot variation, which is important in heterogeneous blocks, and blocks where stocking is borderline. A plot density of **one** plot per hectare should provide sufficient coverage of an area, and account for any between plot variations.

After the minimum plot number is established, plot locations should be determined systematically and mapped, with the grid size and pattern depending on the number of plots required. Plot spacing and line spacing should generally be kept similar in order to approximate a square layout pattern. The distance between survey lines and between the sample plots along the survey lines can be calculated using the following formula.

$$\text{Plot spacing (m) x Line spacing (m) Required} = \frac{\text{Strata area (ha)} \times 10{,}000}{\text{min. number of plots}}$$

Once the desired survey line spacing is selected, calculate the required plot spacing (for the minimum number of plots) by substituting “line spacing”, “strata area (ha)”, and “required minimum number of plots” in the above formula and solving for “plot spacing”.

Mapping

The minimum number of plots required should be established on a map prior to going out to the field. Survey line locations should be tied into recognizable features on the ground, distance and bearing information should also be included to facilitate mapping and navigation.

Before going out into the field, a Survey Header Sheet (Appendix 1) should be filled out for each block. This document will include background information such as year of harvest, regeneration and vegetation management methods, as well as stocking standards for the block.

Data Collection

Plot Location

Follow the mapped survey lines and establish plots at predetermined locations. The plot should be flagged and GPS'd to aid in locating the plot in the future if necessary. If a plot lands in an area where a feature such as permanent water, or exposed bedrock composes over half of the plot, or if it lands in a bypass or un-harvested area, the plot should be moved and these features noted. Plots should be moved to a location halfway between two plots as near to the initial plot location as possible.

If a plot lands on a site where conditions resulting from forestry activities exist, such as equipment trails, puddle ruts, or slash piles, assess the plot normally and provide comments regarding site conditions on the tally sheet (Appendix 2).

Tree Tally

Tally all trees over 30cm tall by species and height class, both crop tree (desired and acceptable species) and non-crop tree species should be included. Trees below 30cm in height are not included in this tally as they generally do not contribute to the canopy of the future stand.

Identify a dominant crop tree (desired or acceptable species) as a starting point. A minimum inter tree distance of 2m is required to provide the trees with adequate growing space. The dominant crop trees selected are referred to as 'stocked' trees. The number of stocked trees in each plot should be recorded in the Regular Free to grow tally sheet (Appendix 2). Should tree distribution be clumped, the most dominant crop tree should be selected as the 'stocked' tree. At least one tree within the clump will survive to canopy closure, with the tree that is currently dominant having the best chances of out-competing the smaller crop trees. Disregard the other crop species within the clump as competition. These dominant or 'stocked' trees will be assessed for free to grow status.

When selecting a 'stocked' tree it is important to assess tree health and form as well as dominance. Trees that are suffering from temporary defects, such as an insect attack, but are otherwise healthy may be selected as a stocked tree. Trees which appear to be diseased or chlorotic should not be selected as these trees are unlikely to survive to maturity. Trees displaying poor stem form resulting from poor planting technique or smothering from grass or snow press should also not be selected. MNR free to grow criteria will be applied to the 'stocked' trees in each plot.

Free to Grow Evaluation

Stocked trees will be evaluated for free to grow status based on tree health, form, and non-crop tree competition. The flowchart included in Appendix 3 lists all of the criteria for a 'stocked' tree to be declared free to grow. The assessment aid is designed for use in the field and aims to aid surveyors in applying free to grow criteria to 'stocked' trees.

The free to grow assessment is carried out within a 1.2m radius around each 'stocked' tree. Competitor stems must be rooted within the cylinder or have a main stem growing vertically within the cylinder to be considered as competition (e.g. coppice birch stems). Competitor branches encroaching into the cylinder from outside are not assessed as competitors unless the 'stocked' tree is overtopped.

Any 'stocked' tree found under a closed canopy or being overtopped (i.e. a competitor's branch extends over the terminal of the 'stocked' tree) is not free to grow (Figure 1). Overtopping identifies potential for leader whipping, or growth loss due to excessive shading. This category does not apply to overstory trees left intentionally as part of the shelterwood silvicultural system or other retention guidelines.

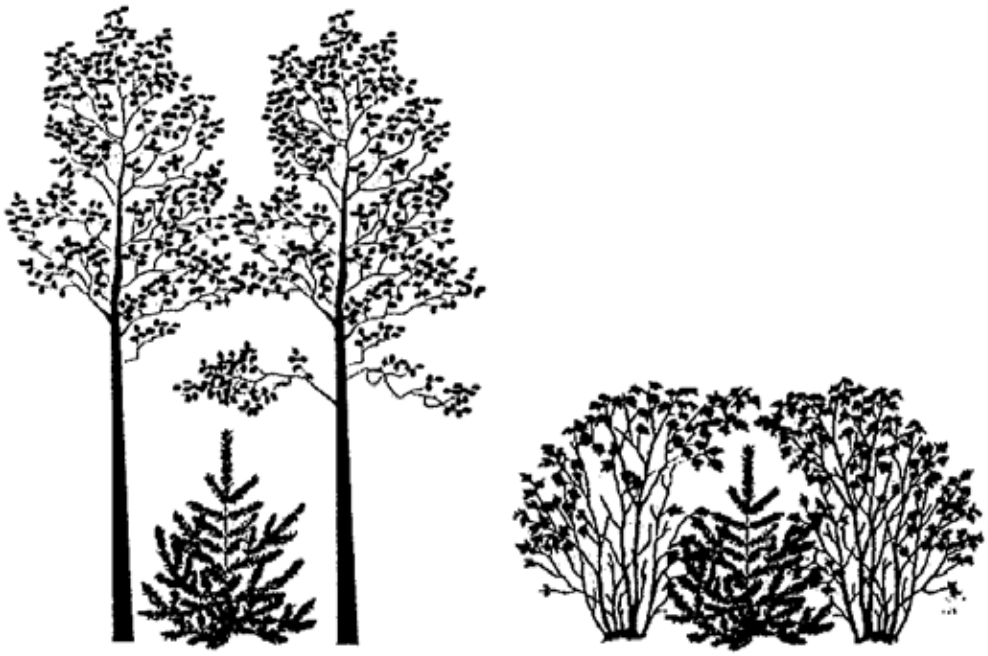


Figure 1: A 'stocked' tree underneath a closed canopy or overtopped cannot be considered free to grow

The competition relevant to the free to grow criteria is divided into brush and non-crop tree competition. At this stage of stand development, herbs, grasses, sedges, fireweed (*Epilobium angustifolium*), low-growing ericaceous shrubs [e.g. blueberries (*Vaccinium* spp.), Labrador tea (*Ledum Groenlandicum*), Laurels (*Kalmia* spp.), and bracken fern (*Pteridium aquilinum*)] are not considered competitors that would have an impact on the success of the selected crop trees. The species of brush and non-crop trees which are

considered competition for crop trees at this stage of development are found below (Table 1). Other species may be added to this table based on local conditions and knowledge.

Table 1: This table lists the species included as brush and tree competition for this free to grow assessment.

Shrub Competition	Tree Competition
Alders (*Alnus* spp.)	Poplar (*Populus* spp.)
Beaked Hazel (*Corylus cornuta*)	Birch (*Betula* spp.)
Cherries (*Prunus* spp.)	Red maple (*Acer rubrum*)
Dogwoods (*Cornus* spp.)	Sugar maple (*Acer saccharum*)
Elderberries (*Sambucus* spp.)	Ash (*Fraxinus* spp.)
Mountain Ash (*Sorbus* spp.)	Jack pine (*Pinus banksiana*)
Mountain Maple (*Acer spicatum*)	Larch (*Larix laricina*)
Raspberry/ Thimbleberry (*Rubus* spp.)	Eastern white cedar (*Thuja occidentalis*)
Serviceberry (*Amilanchier* spp.)	Balsam fir (*Abies blasamea*)
Striped maple (*Acer pensylvanicum*)	
Squashberry/ Highbush cranberry (*Viburnum* spp.)	
Willows (*Salix* spp.)	

Brush Competition

If the 'stocked' tree is greater than or equal to 1.5 times taller than the brush height, the tree is free to grow. For example, if the brush is 0.8m tall, the tree must be at least 1.5 x 0.8m = 1.2m tall to be considered free to grow (Figure 2). Table2 shows the minimum heights for crop trees to be declared free to grow when competing species with different heights are present.

Trees greater than 2.5m tall do not need to be evaluated for brush competition. Trees of this size are already well established in the stand and will not be significantly influenced by competition from brush species. Also, as long as the brush species is less than 1.7m in height, trees this size would be more than 1.5 times the size of the brush. Few of the brush species listed as competition in table 1 will exceed a height of 1.7m.

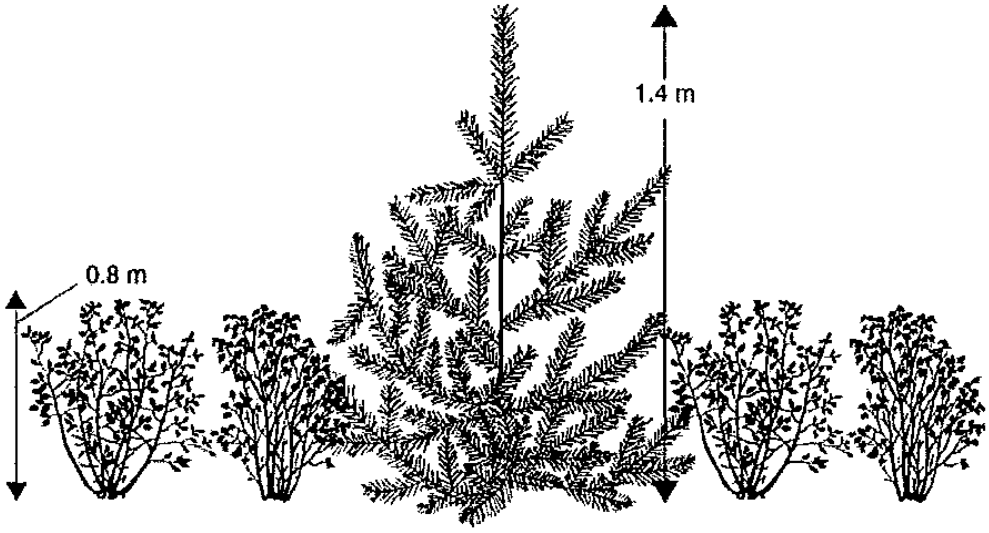


Figure 2: The free to grow tree is more than 1.5 times the height of the brush competition.

Table 2: Threshold height values for brush and tree competition (rounded up to the nearest 10cm). Brush and non-crop trees shorter than the heights listed are not considered competitors for determining free to grow status.

Height of Crop Tree (m)	Threshold Height of Competition	
	Brush (m)	Non-Crop Trees (m)
0.5	0.3	0.3
0.6	0.4	0.3
0.7	0.5	0.4
0.8	0.5	0.4
0.9	0.6	0.5
1.0	0.7	0.5
1.1	0.7	0.6
1.2	0.8	0.6
1.3	0.9	0.7
1.4	0.9	0.7
1.5	1.0	0.8
1.6	1.1	0.8
1.7	1.1	0.9
1.8	1.2	0.9
1.9	1.3	1.0
2.0	1.3	1.0
2.1	1.4	1.1
2.2	1.5	1.1
2.3	1.5	1.2
2.4	1.6	1.2
2.5	1.7	1.3

To quickly determine if the crop tree is free to grow from brush competition while in the field, measure the height of the brush stem and divide by 2 (round up the result to the nearest 10cm). Add this result (half the height of the brush stem) to the measured height of the brush stem. If this total is less than the height of the crop tree, then the crop tree is free to grow.

> **-e.g.** If a brush stem is 1.0m high, the crop tree must be at least 1.0 / 2 + 1.0 = 1.5m tall to be considered free to grow.

If the 'stocked' tree is less than 2.5m high and is not 1.5 times the brush height, the tree can still be declared free to grow if at least two quadrants within a1.2m radius of the tree are completely free of all brush and tree competition (Figure 3). When evaluating a plot for competition, there is no pre-determined direction for quadrant layout. They may be aligned in whichever way is most beneficial, and should be aligned so as to maximize the number of free to grow trees in a plot. For example, if quadrants can be aligned so competition is confined to one or two quadrants, allowing a 'stocked' tree to be declared free to grow, that is how the plot should be evaluated.

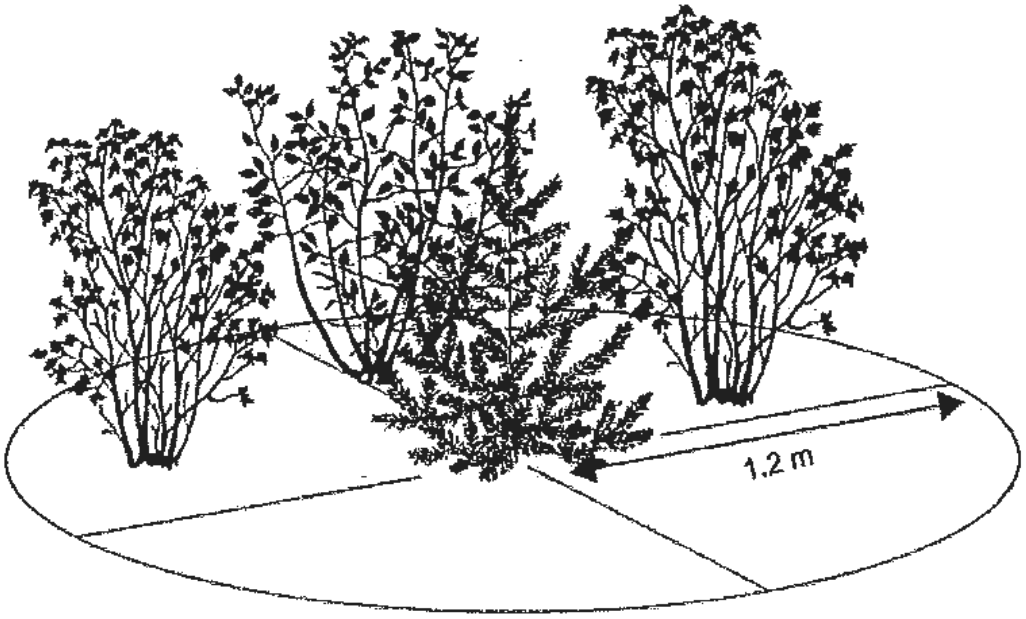


Figure 3: Although the tree is less than 1.5 times the brush height, the tree is free to grow since two quadrants are free of all competition exceeding the height criteria.

Tree Competition

Non-crop tree species considered to be competition for crop trees at this stage of stand development are found in Table 2. The criteria for determining if a 'stocked' tree is free to grow from non-crop tree competition are similar to the criteria used for brush competition. If a 'stocked' tree is not located underneath a closed canopy or overtopped

(i.e. a competitor's branch does not extend over the terminal of a 'stocked' tree) and competing tree stems are less than one-half the height of the 'stocked' tree then the 'stocked' tree is free to grow (Figure 4).

If the crop tree has growth rates equal to or faster than the competitor tree species (e.g. aspen or spruce crop trees with balsam fir competitors), it can be declared free to grow if the competing tree stems are less than or equal to the height of the 'stocked' trees, and all competition occurs in a maximum of two quadrants (Figure 5).

Figure 4: The free to grow tree is more than twice the height of the tree competition.

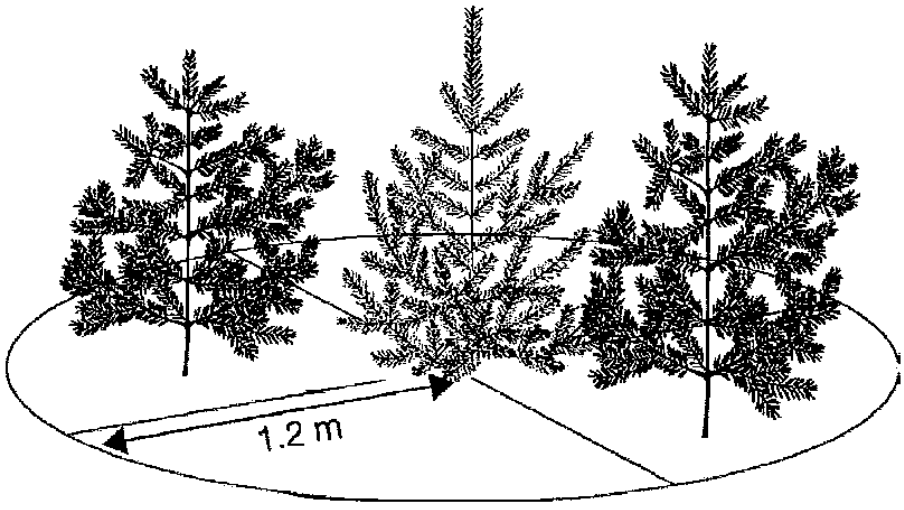


Figure 5: Crop trees with faster or similar growth rates than tree competitors are free to grow if the competing stems are less than or equal to the height of the 'stocked' tree and occur in a maximum of 2 quadrants.

When there are competing tree stems within a plot which are greater than one half the height of the 'stocked' tree, align the quadrants so the competition is confined to as few quadrants as possible. If all competition can be confined to only one quadrant the 'stocked' tree may still be declared free to grow (Figure 6).

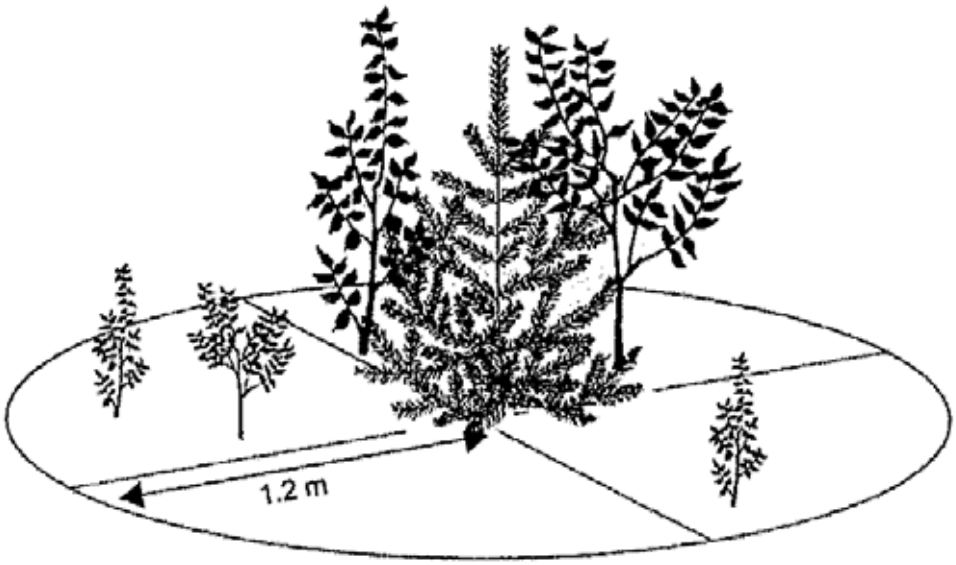


Figure 6: Although the tree competition is greater than one half the crop tree height, the crop tree is free to grow since the competition is confined to only one quadrant surrounding the tree.

Data Recording

The total number of trees over 30cm in height are recorded on the Regular Free to Grow Tally sheet by species and height class (Appendix 2).

In the "Number of Stocked Stems" column of the Regular Free to Grow tally sheet (Appendix 2), record the number of dominant trees of a crop species which have an inter-tree distance of 2m. As the trees found in these columns will be evaluated for free to grow status, the number in these columns may not be lower than the number found in the "Number of FG Stems" column.

In the competing species column of the tally sheet, record the average height and percent cover of each species of interest.

In the comments section, record forest health (insect and disease concerns). Record the plot as a VOID when no trees over 30cm tall are found in the plot. When a VOID is recorded, estimate the size of the opening by recording the approximate number of 16m² plots that would fit in the opening (e.g.: VOID – 2 plots). If the plot is recorded as a void, the number of stocked and free to grow trees is recorded as zero for use in calculations.

The mean canopy height of the plot should also be estimated and recorded. The height class tally gives an indication of the vertical stratification of the area; however, it only

gives a range of heights. Having an average canopy height will provide a more accurate representation of the stand.

Determining Regeneration Status

The regeneration status of a stratum is determined as either Satisfactorily Regenerated (SR) or Not Satisfactorily Regenerated (NSR). This status is determined by comparing survey results with minimum standard from the silvicultural ground rule associated with the stratum. Determining whether a plot is satisfactorily regenerated (SR) or not satisfactorily regenerated (NSR) is a function of plot size and the required minimum stocking for the block.

The proportion of a hectare the plot composes determines the stocking factor of the plot.

1ha= 10,000m²
10,000 m²/ 16 m² = 625 meaning a 16 m² plot composes 1/625 of a hectare.

The minimum stocking for each treatment (extensive, basic and intensive) as found in the SGRs determine the minimum number of free to grow trees to be found in each plot in order to meet stocking standards.

For plots 16m² in size, the minimum number of trees per plot required for the plot to be declared SR will depend on whether the stratum underwent extensive, basic or intensive treatments. The minimum number of trees per plot required to meet stocking requirements can be found by dividing the minimum stocking for each treatment by the stocking factor of 625 (Table 3)

.

Table 3: This table illustrates the minimum average number of free to grow trees per plot required to meet the stocking standards of each silviculture intensity treatment.

Treatment	Minimum Stocking Requirement (sph)	Minimum Average FG Trees per Plot
Extensive	1,750	2.8
Basic	1,850	3.0
Intensive	2,000	3.2

Assuming a plot density of one plot per hectare, the minimum number of stocked trees required in a stratum in order to meet stocking standards can be found by multiplying the minimum average number of free to grow trees per plot by the stratum area.

For Example for a 30 hectare stratum, the following are the minimum numbers of 'stocked' trees required for the stratum to meet stocking requirements.

Extensive 30 x 2.8 = 70 Free Growing trees
Basic 30 x 3.0 = 90 Free Growing trees
Intensive 30 x 3.2 = 96 Free Growing trees

Determining Stocking

The percent stocking of a stratum can be determined using survey results and the following formula.

Stocking Formula:

$$\frac{\text{Total \# of "stocked" trees}}{\text{4 x plots (ha)}} = \text{Stocking \%}$$

For example, if 84 "stocked" trees were recorded in a 30ha stratum which had 30 plots sampled, the stocking % would be as follows.

$$\frac{84}{4 \times 30} = 0.7 = 70\% \text{ stocked}$$

In order for a plot to be measured it must be located on a site that is capable of supporting a tree. Areas that are flooded, located on bedrock or occur within an unmapped residual stand will not count towards the "total" number of plots. However, areas that are temporarily not capable of supporting trees, i.e. slash piles, operational roads, landings that do not occur on areas "permanently" incapable of supporting trees will be included in the total number of plots.

Survey Summary

After the survey is completed, a Free to Grow Summary sheet should be completed based on survey results (Appendix 4).

This document includes a summary of the total number of trees tallied by species and height class, as well as the number of free to grow stems of each species, which is then used to determine the current species composition and regeneration status of the stratum.

Species composition should be determined using information from height classes 2 and 3. Selecting these trees will provide an accurate description of the current stand composition, as these trees are currently dominant in the stand. It will also provide an indication of what the stand will look like in the future, as trees currently dominant in the stratum are most likely to contribute to the canopy in the future. Trees in height class one will likely survive, however, most trees in this height class will be out competed by the larger trees before canopy closure.

Based on the survey summary, it should be decided if the stratum is a Regeneration Success and/or a Silvicultural success. A stratum is considered a regeneration success when it meets minimum stocking requirements as found in its assigned SGR. A stratum is declared a silvicultural success when it meets the desired species composition or forest unit based on the assigned SGR.

Appendix 1

Free to Grow Survey Header Sheet

Free to Grow Survey Header Sheet

Surveyors: _____ Date: _____

Administrative Data:

District: _____ Project #: _____ Stratum Area (ha) _____

SFL: _____ Block #: _____ FRI Photo #: _____

Township : _____ Stratum #: _____ Licensee: _____
Mapsheet : _____

Pre-Harvest Site Description:

Pre-harvest FRI Description: _____

Ecosite: _____ Veg. Type: _____ Soil Type: _____

Silvicultural Treatment Package:

Year of Harvest: _____ Harvest Method: _____

Year of SIP: _____ SIP Method: _____

Year of Veg. Mgt.: _____ Type of Veg. Mgt.: _____

Regeneration Methods: _____

Prescription:

Target FU: _____ Regeneration Standard: _____
all species (# free to grow, 'stocked' stems/ ha)

Target Species						
Minimum Heights						

Acceptable Species						
Minimum Heights						

Field Layout:

Minimum # of Plots: _____ Distance Between Lines : _____ m Distance Between Plots : _____ m

Appendix 2

Regular Free to Grow Tally sheet

Free to Grow Regeneration Assessment Tally Sheet

Surveyors: _____ Date: _____
Page #: of Total #

Project No: Block No: Stratum No:
Target FU: Mean Canopy Ht (m): Licensee:

Line/ Bearing	Plot No.	Spp.	Total Number of Stems* Height Class 1	2	3	Number of Stocked Stems	Number of FG Stems	Competing Species (avg. ht., % cover)	Comments (on forest health, site conditions, etc.)
		Sb							
		Sw							
		Pj							
		Bf							
		Po (Pt)							
		Bw							
		Sb							
		Sw							
		Pj							
		Bf							
		Po (Pt)							
		Bw							
		Sb							
		Sw							
		Pj							
		Bf							
		Po (Pt)							
		Bw							
		Sb							
		Sw							
		Pj							
		Bf							
		Po (Pt)							
		Bw							

Species	Height Class (m) 1	2	3
Sb, Sw, Bf, Ce, L	0.3 to 0.79	0.8 to 2.0	> 2.0
Pj, Pr, Pw	0.3 to 0.9	1.0 to 2.0	> 2.0
Po, Bw, Ab	0.3 to 1.9	2.0 to 2.9	> 3.0

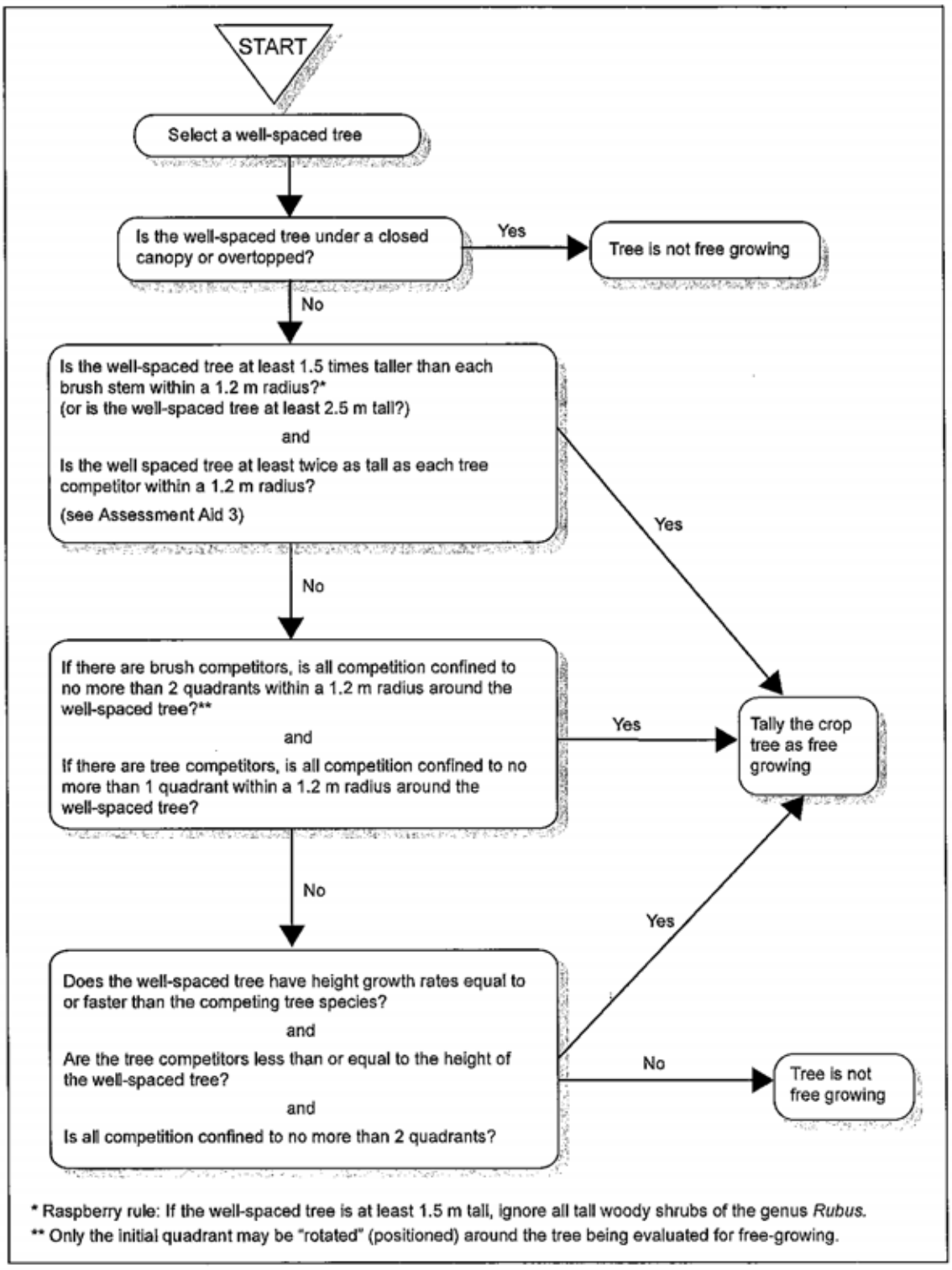
Note: Height classes may differ from the examples given depending on the minimum crop tree heights listed in the silvicultural ground rules associated with this stratum.

* If there are no trees taller than 30cm in the plot, mark VOID and estimate the size of the opening in this column and record zero for the number of FG stems.

Stocking Formula: total # of "stocked" trees/ 4x # plots(ha) = stocking %

Appendix 3

Assessment Aid for Determining if a 'Stocked' Tree is Free to Grow



Note: Substitute the word "Well-Spaced" with "Stocked".

Appendix 4

Free to Grow Survey Summary Sheet

Free to Grow Survey Summary Sheet

Block #:_____ Stratum #: _____ Survey year: _____

Stratum Area =___ha	% Occupied Plots: (free to grow stems in plot) :_____%	
Number of plots: _____		
Mean # of Trees above minimum height	Mean = _____ / #plots	_____ x 625 = _____ ha
Mean # Stocked Free to grow Trees	Mean =_____ / #plots	_____ x 625 =_____ha
Regeneration Standard (trees/ha- all species)		
Target Species		
Acceptable Species		
Ecosite		

Spp.	Height Class 1	Height Class 2	Height Class 3	Free to grow
Pj				
Pr				
Pw				
Sb				
Sw				
Po				
Bw				
La				
Bf				
Ce				

Treatment	
→	
Species Composition	
Free to Grow Species Composition	
% of trees above minimum height target	
Comments:	
Satisfactorily Regenerated	Not Satisfactorily Regenerated
Silviculture Success	Not a Silviculture Success

* Height Classes

Species	1	2	3
Sb, Sw, Ce, Bf	0.3- 0.79	0.8 -2.0	>2.0
Po, Pr, PW, L	0.3-0.9	1.0 -2.0	>2.0
Hardwoods	0.3 -0.9	2.0 -2.9	>3.0

Well Spaced Free to Grow Survey

This survey methodology is designed for strata which have undergone Intensive Silviculture Intensity treatments, where density regulation is desired. It is used to measure the species composition, average height of desired species, stocking, stand density, and assess freedom from competition.

This survey will be completed with a systematic plot allocation method using 16m² plots with a density of one plot per hectare. Trees selected as well spaced and assessed for free to grow status will be chosen based on the MNR criteria.

This survey methodology is an adaptation from the Well-spaced Free-growing Regeneration Assessment Procedure for Ontario (White et al. 2005). The full reference is as follows: White, R.G., C.L. Bowling, W.J. Parton and W.D. Towill. 2005. Well-spaced free-growing regeneration assessment procedure for Ontario. Ont. Min. Natur. Resour. Northwest Sci. and Info., NWSI Tech. Manual TM-007. 38pp + appendices.

Plot Allocation

Surveys will be completed using plots sizes of 16m², with a plot radius of 2.26m. This plot size accounts for more within plot variation, which is important in heterogeneous blocks, and blocks where stocking is borderline. A plot density of one plot per hectare should provide sufficient coverage of an area, and account for any between plot variations.

After the minimum plot number is established, plot locations should be determined systematically and mapped, with the grid size and pattern depending on the number of plots required. Plot spacing and line spacing should generally be kept similar in order to approximate a square layout pattern. The distance between survey lines and between the sample plots along the survey lines can be calculated using the following formula.

$$\text{Plot spacing (m) Required} \times \text{Line spacing (m)} = \frac{\text{Strata area (ha)} \times 10{,}000}{\text{min. number of plots}}$$

Once the desired survey line spacing is selected, calculate the required plot spacing (for the minimum number of plots) by substituting “line spacing”, “strata area (ha)”, and “required minimum number of plots” in the above formula and solving for “plot spacing”.

Before going out into the field, a Survey Header Sheet (Appendix 1) should be filled out for each block. This document will include background information such as year of harvest, regeneration and vegetation management methods, as well as stocking standards for the block.

Mapping

The minimum number of plots required should be established on a map prior to going out to the field. Survey line locations should be tied into recognizable features on the ground, and distance and bearing information should also be included to facilitate mapping and navigation.

Data Collection

Plot Location

Follow the mapped survey lines and establish plots at predetermined locations. The plot should be flagged and GPS'ed to aid in locating the plot in the future if necessary. If a plot lands in an area where a feature such as permanent water, or exposed bedrock composes over half of the plot, or if it lands in a bypass or un-harvested area, the plot should be moved and these features noted. Plots should be moved to a location halfway between two plots, as near to the initial plot location as possible.

If a plot lands on a site where conditions resulting from forestry activities exist, such as equipment trails, puddle ruts, or slash piles, assess the plot normally and provide comments regarding site conditions on the tally sheet.

Tree Tally

Tally all trees over 30cm tall by species and height class, both crop tree (desired and acceptable species) and non-crop tree species should be included. Trees below 30cm in height are not included in this tally as they generally do not contribute to the canopy of the future stand.

Well Spaced Evaluation

The well spaced criteria are applied consecutively to crop trees (target and acceptable species) within the plot. A maximum of four well spaced crop trees can be tallied for each plot using this evaluation procedure. The flowchart included in Appendix 2 lists all of the criteria for a well spaced tree to be declared free to grow. The assessment aid is designed for use in the field and aims to aid surveyors in applying free to grow criteria to well spaced trees.

Procedure

Select and mark a prominent crop tree within the 16m² plot as the starting tree. A prominent tree is selected as a starting and ending point to avoid double counting trees. Prominent trees will be evaluated for well spaced status based on health, and crop-tree competition.

Tree Health

Careful attention must be paid to tree health and vigor when selecting well spaced trees. Trees that are suffering temporary defects (e.g. insect attack) but are otherwise healthy may be selected as well spaced trees. Trees with extensive chlorosis, trees that appear to be infected with disease, and trees that appear to be dying should not be selected as well spaced as it is unlikely they will survive to maturity. Trees displaying poor stem form resulting from poor planting technique or smothering from grass or snow press should also not be selected as a well spaced tree as trees with poor form are commercially undesirable.

Crop Tree Competition

An inter-tree distance of 1.8m is required in order for trees to be declared well spaced. If the tree under consideration has no other crop trees closer than 1.8m either inside or outside the plot, it is counted as a well spaced tree (i.e. all adjacent crop trees are at least 1.8m away)

If there is a crop tree (or trees) less than 1.2m away from the tree being considered, choose the most vigorous tree and continue well- spaced evaluation. With trees growing this close together, it is likely that one tree will out compete the others to become part of the future canopy, with the tree that is currently dominant having the best chance of out competing the smaller crop trees. The other trees within the 1.2m radius may be ignored entirely when continuing to assess the number of well spaced trees in the plot.

If there is another crop tree between 1.2m and 1.8m away from the crop tree being considered, tally the tree as well spaced if two quadrants within a 1.8m radius around the selected tree contain no crop trees more than half the height of the selected tree (Figure1). If a crop tree is less than half the height of the potential well spaced tree, it is not considered competition.

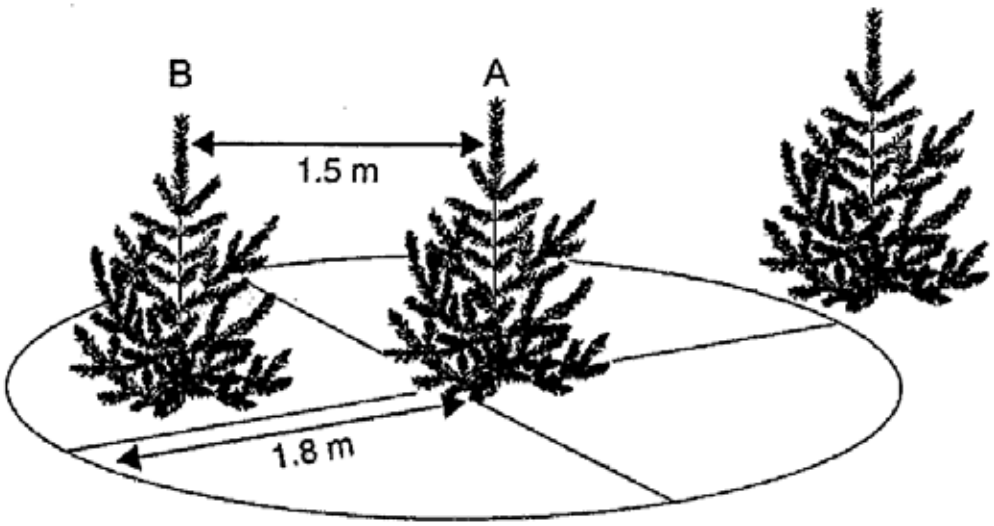


Figure 1: Tree A is well spaced even though tree B is less than 1.8m away because tree A still has at least two quadrants free of other crop trees.

Proceed systematically around the plot and select the next crop tree for evaluation. Record the total number of well spaced trees by species on the Well Spaced Free to Grow Tally Sheet (Appendix 2). A maximum of four well spaced trees may be tallied in each plot, in attempts to ensure each tree has adequate growing space.

Free to grow Evaluation

Well spaced trees will be evaluated for free to grow status based on tree health, form, and non-crop tree competition. A tree must be well spaced in order to be evaluated for free to grow status. The flowchart included in Appendix 4 lists all of the criteria for a well spaced tree to be declared free to grow. The assessment aid is designed for use in the field and aims to aid surveyors in correctly applying free to grow criteria to well spaced trees.

The free to grow assessment is carried out within a 1.2m radius around each well spaced tree. Competitor stems must be rooted within the cylinder or have a main stem growing vertically within the cylinder to be considered as competition (e.g. coppice birch stems). Competitor branches encroaching into the cylinder from outside are not assessed as competitors unless the well spaced tree is overtopped.

Any well spaced tree found under a closed canopy or being overtopped (i.e. a competitor's branch extends over the terminal of the well spaced tree) is not free to grow (Figure 2). Overtopping identifies potential for leader whipping, or growth loss due to excessive shading. This category does not apply to overstory trees left intentionally as part of the shelterwood silvicultural system or other retention guidelines.

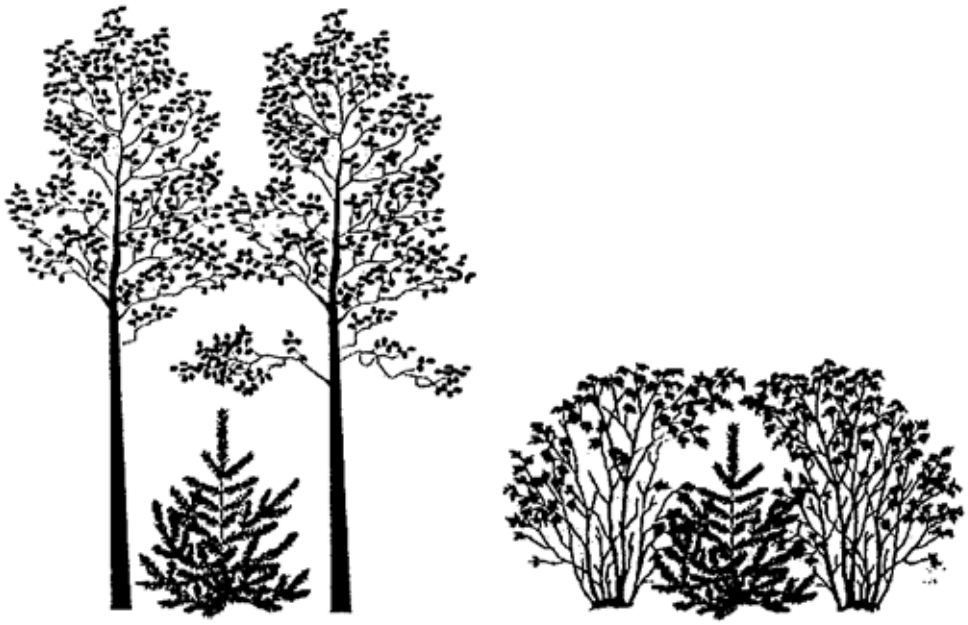


Figure 2: A well spaced tree underneath a closed canopy or overtopped cannot be considered free to grow

The competition relevant to the free to grow criteria is divided into brush and non-crop tree competition. At this stage of stand development, herbs, grasses, sedges, fireweed (*Epilobium angustifolium*), low-growing ericaceous shrubs [e.g. blueberries (*Vaccinium* spp.), Labrador tea (*Ledum Groenlandicum*), Laurels (*Kalmia* spp.), and bracken fern (*Pteridium aquilinum*)] are not considered competitors that would have an impact on the success of the selected crop trees. The species of brush and non-crop trees which are considered competition for crop trees at this stage of stand development are found below (Table 1). Other species may be added to this table based on local conditions and knowledge.

Table 1: This table lists the species included as brush and tree competition for this free to grow assessment.

Shrub Competition	Tree Competition
Alders (*Alnus* spp.)	Poplar (*Populus* spp.)
Beaked Hazel (*Corylus cornuta*)	Birch (*Betula* spp.)
Cherries (*Prunus* spp.)	Red maple (*Acer rubrum*)
Dogwoods (*Cornus* spp.)	Sugar maple (*Acer saccharum*)
Elderberries (*Sambucus* spp.)	Ash (*Fraxinus* spp.)
Mountain Ash (*Sorbus* spp.)	Jack pine (*Pinus banksiana*)
Mountain Maple (*Acer spicatum*)	Larch (*Larix laricina*)
Raspberry/ Thimbleberry (*Rubus* spp.)	Eastern white cedar (*Thuja occidentalis*)
Serviceberry (*Amilanchier* spp.)	Balsam fir (*Abies blasamea*)
Striped maple (*Acer pensylvanicum*)	
Squashberry/ Highbush cranberry (*Viburnum* spp.)	
Willows (*Salix* spp.)	

Brush Competition

If the well spaced tree is greater than or equal to 1.5 times the brush height, the tree is free to grow. For example, if the brush is 0.8m tall, the tree must be at least 1.5 x 0.8 = 1.2m tall to be considered free to grow (Figure 3).

Trees greater than 2.5m tall do not need to be evaluated for brush competition. Trees of this size are already well established in the stand and will not be greatly influenced by competition from brush species. Also, as long as the brush species is less than 1.7m in height, trees this size would be more than 1.5 times the size of the brush. Few of the brush species listed as competition in Table 1 will exceed a height of 1.7m. Table 2 shows the minimum heights for crop trees to be declared free to grow when competing species are present at different heights. For each crop-tree height listed, any brush or non-crop tree species below the heights listed are not considered competition. For example, for a 50cm crop tree, brush and non-crop tree species shorter than 30cms are not considered to be competition for the crop tree.

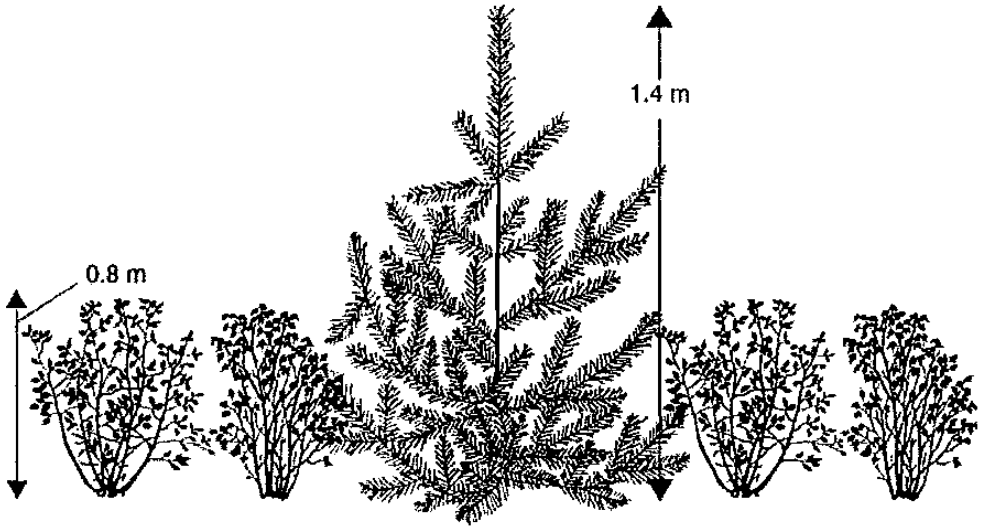


Figure 3: The free to grow tree is more than 1.5 times the height of the brush competition.

Table 2: Threshold height values for brush and tree competition (rounded up to the nearest 10cm). Brush and non-crop trees shorter than the heights listed are not considered competitors for determining free to grow status.

Height of Crop Tree (m)	Threshold Height of Competition	
	Brush (m)	Non-Crop Trees (m)
0.5	0.3	0.3
0.6	0.4	0.3
0.7	0.5	0.4
0.8	0.5	0.4
0.9	0.6	0.5
1.0	0.7	0.5
1.1	0.7	0.6
1.2	0.8	0.6
1.3	0.9	0.7
1.4	0.9	0.7
1.5	1.0	0.8
1.6	1.1	0.8
1.7	1.1	0.9
1.8	1.2	0.9
1.9	1.3	1.0
2.0	1.3	1.0
2.1	1.4	1.1
2.2	1.5	1.1
2.3	1.5	1.2
2.4	1.6	1.2
2.5	1.7	1.3

To quickly determine if a crop tree is free to grow from brush competition, measure the height of the brush stem and divide it by 2 (round up the result to the nearest 10cm). Add this result (half the height of the brush stem) to the measured height of the brush stem. If this total is less than the height of the crop tree, then the crop tree is free to grow.

> **- e.g.** If a brush stem is 1.0m high, the well spaced crop tree must be at least 1.0 / 2 + 1.0 = 1.5m tall to be considered free to grow.

If the well spaced tree is less than 2.5m high and is not 1.5 times the brush height, the tree can still be declared free to grow if at least two quadrants within a1.2m radius of the tree are completely free of all brush and tree competition (Figure 4). When evaluating a plot for competition, there is no pre-determined direction for the quadrants. They may be aligned in whichever way is most beneficial, which would be to maximize the number of free to grow trees in a plot. For example, if quadrants can be aligned so competition is confined to one or two quadrants, allowing a well spaced tree to be declared free to grow, that is how the plot should be evaluated.

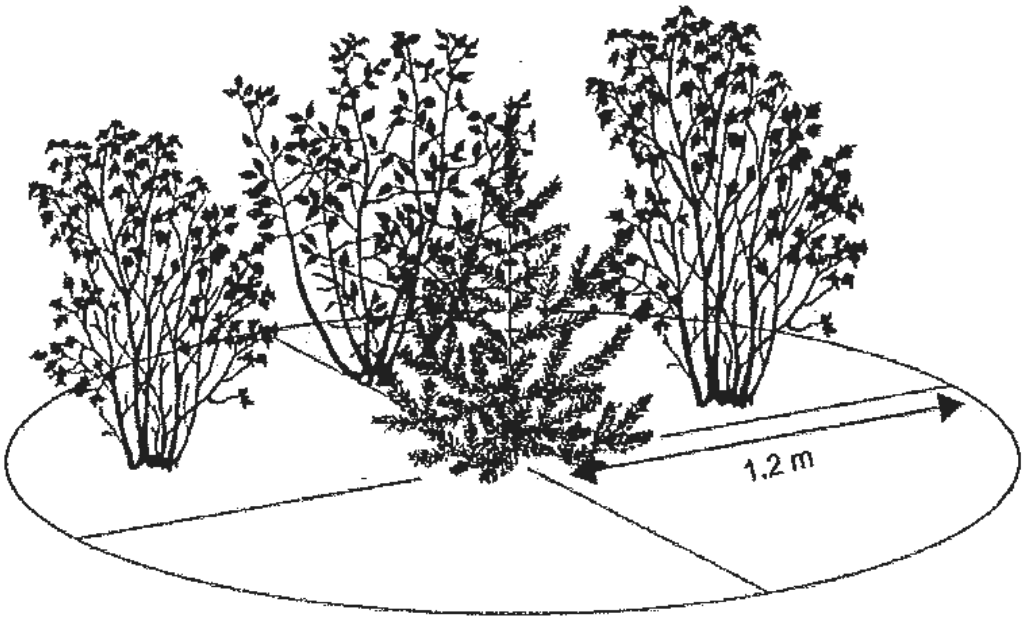


Figure 4: Although the tree is less than 1.5 times the brush height, the tree is free to grow since two quadrants are free of all competition exceeding the height criteria.

Tree Competition

Non-crop tree species considered to be competition at this stage of stand development are found in table 2. The criteria for determining if a well spaced tree is free to grow from non-crop tree competition are similar to the criteria used for brush competition. If a well spaced tree is not located underneath a closed canopy or overtopped (i.e. a competitor's branch does not extend over the terminal of a well spaced tree) and competing tree stems are less than one-half the height of the well spaced tree then the well spaced tree is free to grow (Figure 5).

If the crop tree has growth rates equal to or faster than the competitor tree species (e.g. aspen or spruce crop trees with balsam fir competitors), it can be declared free to grow if the competing tree stems are less than or equal to the height of the well spaced trees, and all competition occurs in a maximum of two quadrants (Figure 6).

Figure 5: The well spaced tree is more than twice the height of the tree competition and can be declared free to grow.

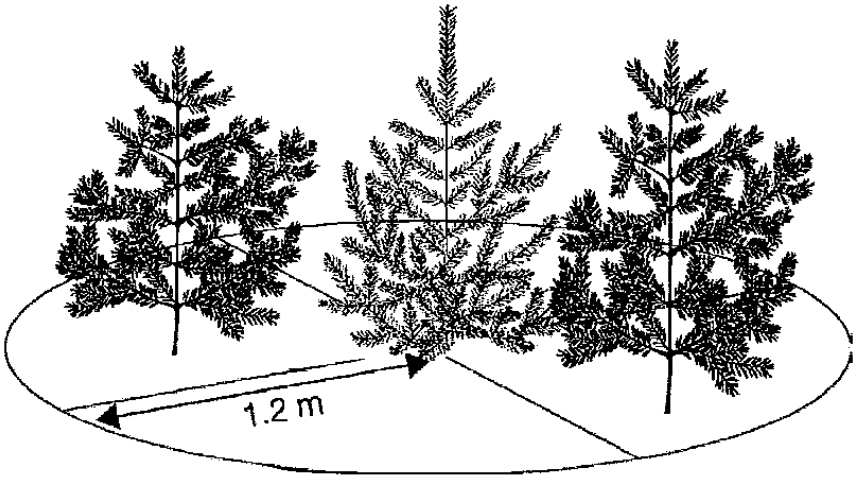


Figure 6: Crop trees with faster or similar growth rates than tree competitors are free to grow if the competing stems are less than or equal to the height of the well spaced tree and occur in a maximum of 2 quadrants.

When there are competing tree stems within a plot which are greater than one half the height of the well spaced tree, align the quadrants so the competition is confined to as few quadrants as possible. If all competition can be confined to only one quadrant the well spaced tree may be declared free to grow (Figure 7).

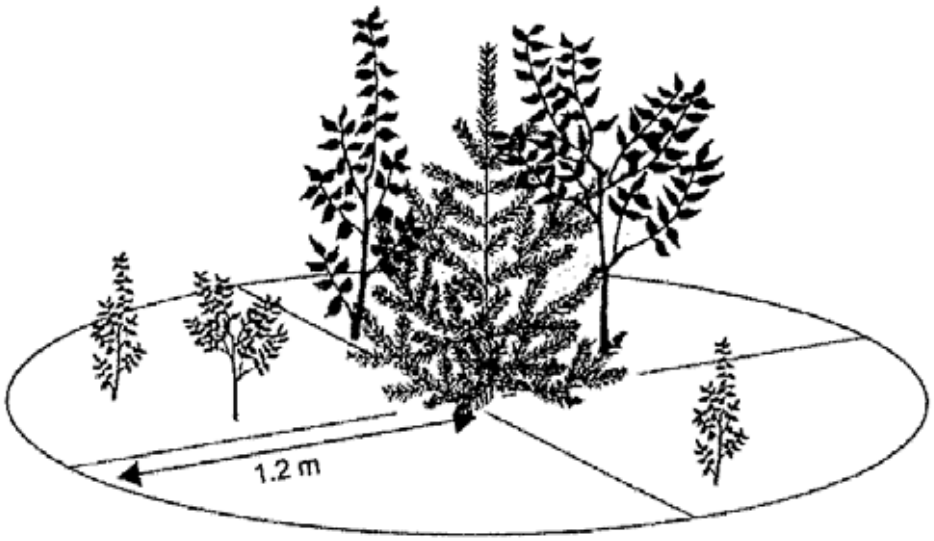


Figure 7: Although the crop tree is less than twice the height of the tree competition (i.e. the tree competition is greater than one half the tree height), the crop tree is free to grow since the competition is confined to only one quadrant surrounding the tree.

Data Recording

The total number of trees over 30cm in height are recorded on the Regular Free to Grow Tally sheet by species and height class Appendix 3).

In the "Number of WS Stems" column of the Well Spaced Free to Grow tally sheet (Appendix 3), record the number of stems which meet MNR well spaced criteria, up to a maximum of four trees per plot. As the trees found in these columns will be evaluated for free to grow status, the number in these columns may not be lower than the number found in the "Number of FG Stems" column.

In the competing species column of the tally sheet, record the average height and percent cover of each species of interest.

In the comments section, record forest health (insect and disease concerns). Record the plot as a VOID when no trees over 30cm tall are found in the plot. When a VOID is recorded, estimate the size of the opening by recording the approximate number of 16m² plots that would fit in the opening (e.g.: VOID – 2 plots). If the plot is recorded as a void, the number of well spaced and free to grow trees is recorded as zero for use in calculations.

The mean canopy height of the plot should also be estimated and recorded. The height class tally gives an indication of the vertical stratification of the area; however, it only gives a range of heights. Having an average canopy height will provide a more accurate representation of the stand.

Determining Regeneration Status

The regeneration status of a stratum is determined as either Satisfactorily Regenerated (SR) or Not Satisfactorily Regenerated (NSR). This status is determined by comparing survey results with minimum standard from the silvicultural ground rule associated with the stratum. Determining whether a plot is satisfactorily regenerated (SR) or not satisfactorily regenerated (NSR) is a function of plot size and the required minimum stocking for the block.

The proportion of a hectare the plot composes determines the stocking factor of the plot.

1ha= 10,000m²
10,000 m²/ 16 m² = 625 meaning a 16 m² plot composes 1/625 of a hectare.

The minimum stocking for each treatment (extensive, basic and intensive) as found in the SGRs determine the minimum number of free to grow trees to be found in each plot in order to meet stocking standards.

For plots 16m² in size, the minimum number of trees per plot required for the plot to be declared SR will depend on whether the stratum underwent extensive, basic or intensive treatments. The minimum number of trees per plot required to meet stocking requirements can be found by dividing the minimum stocking for each treatment by the stocking factor of 625 (Table 3).

Table 3: This table shoes the minimum average number of free to grow trees per plot required to meet the stocking standards of each silviculture intensity treatment.

Treatment	Minimum Stocking Requirement (sph)	Minimum Average FG Trees per Plot
Extensive	1,750	2.8
Basic	1,850	3.0
Intensive	2,000	3.2

Assuming a plot density of one plot per hectare, the minimum number of well spaced trees required in a stratum in order to meet stocking standards can be determined by multiplying the minimum average number of free to grow trees per plot by the stratum area.

For Example for a 30 hectare stratum, the following are the minimum numbers of trees required for the stratum to meet stocking requirements.

Extensive 30 x 2.8 = 84 trees
Basic 30 x 3.0 = 90 trees
Intensive 30 x 3.2 = 96 trees

Determining Stocking

The percent stocking of a stratum can be determined using survey results and the following formula.

Stocking Formula:

$$\frac{\text{Total \# of well spaced trees}}{\text{4 x plots (ha)}} = \text{Stocking \%}$$

For example, if 84 well spaced trees were recorded in a 30ha stratum which had 30 plots sampled, the stocking % would be as follows.

$$\frac{84}{4 \times 30} = 0.7 = 70\% \text{ stocked}$$

In order for a plot to be measured it must be located on a site that is capable of supporting a tree. Areas that are flooded, located on bedrock or occur within an unmapped residual stand will not count towards the "total" number of plots. However, areas that are temporarily not capable of supporting trees, i.e. slash piles, operational roads, landings that do not occur on areas "permanently" incapable of supporting trees will be included in the total number of plots.

Survey Summary

After the survey is completed, a Free to Grow Summary sheet should be filled out based on survey results (Appendix 5). This document includes a summary of the total number of trees tallied by species and height class, as well as the number of free to grow stems of each species, which is then used to determine the current species composition and regeneration status of the stratum.

Species composition should be determined using information from height classes 2 and 3. Selecting these trees will provide an accurate description of the current stand composition, as these trees are currently dominant in the stand. It will also provide an indication of what the stand will look like in the future, as trees currently dominant in the stratum are most likely to contribute to the canopy in the future. Trees in height class one will likely survive, however, most trees in this height class will be out competed by the larger trees before canopy closure.

Based on the survey summary, it should be decided if the stratum is a Regeneration Success and/or a Silvicultural success. A stratum is considered a regeneration success when it meets minimum stocking requirements as found in its assigned SGR. A stratum is declared a silvicultural success when it meets the desired species composition or forest unit based on the assigned SGR.

Appendix 1

Well Spaced Free to Grow Survey Header Sheet

Well Spaced Free to Grow Survey Header Sheet

Surveyors: _____ Date: _____

Administrative Data:

District: _____ Project #: _____ Stratum Area (ha) _____

SFL: _____ Block #: _____ FRI Photo #: _____

Township : _____ Stratum #: _____ Licensee: _____
Mapsheet : _____

Pre-Harvest Site Description:

Pre-harvest FRI Description: _____

Ecosite: _____ Veg. Type: _____ Soil Type: _____

Silvicultural Treatment Package:

Year of Harvest: _____ Harvest Method: _____

Year of SIP: _____ SIP Method: _____

Year of Veg. Mgt.: _____ Type of Veg. Mgt.: _____

Regeneration Methods: _____

Prescription:

Target FU: _____ Regeneration Standard: _____
all species (# free to grow, well spaced stems/ ha)

Target Species						
Minimum Heights						

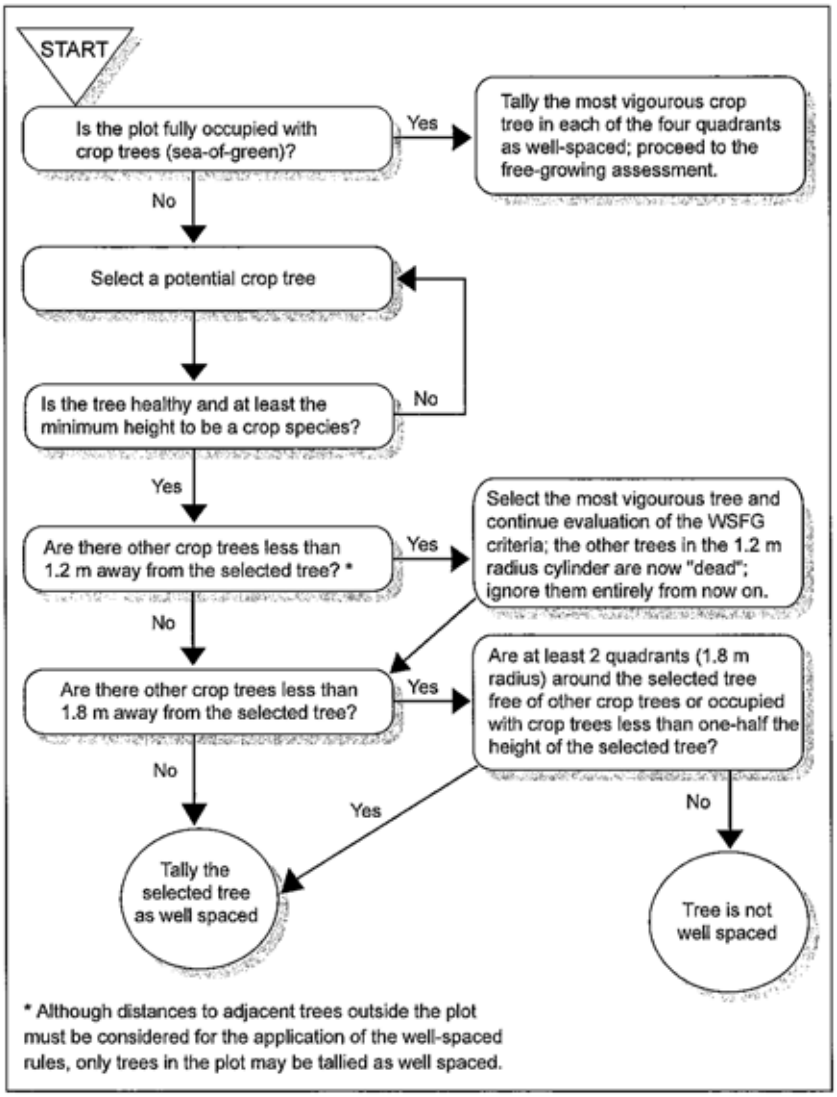
Acceptable Species						
Minimum Heights						

Field Layout:

Minimum # of Plots: _____ Distance Between Lines : _____ m Distance Between Plots : _____ m

Appendix 2

Assessment Aid for Evaluating Whether a Crop Tree Meets the Well spaced Criteria



Note:

- The *initial* quadrant (only) may be "rotated" (positioned) anywhere about the tree being assessed to maximize the number of unoccupied quadrants.
- Remember that a crop tree is defined as "a healthy, vigourous tree of either a target or acceptable species that meets a minimum height standard as defined in the silvicultural ground rule."
- All inter-tree distances are measured pith to pith (at tree base if in doubt).

Appendix 3

Well Spaced Free to Grow Tally Sheet

Well Spaced Free to grow Regeneration Assessment Tally Sheet

Surveyors: _____ Date: _____

Page #: of Total #

Project No: Block No: Stratum No:

Target FU: Mean Canopy Ht (m): Licensee:

Line/ Bearing	Plot No.	Spp.	Total Number of Stems* Height Class 1	2	3	Number of WS Stems	Number of FG Stems	Competing Species (avg. ht., % cover)	Comments (on forest health, site conditions, etc.)
		Sb							
		Sw							
		Pj							
		Bf							
		Po (Pt)							
		Bw							
		Sb							
		Sw							
		Pj							
		Bf							
		Po (Pt)							
		Bw							
		Sb							
		Sw							
		Pj							
		Bf							
		Po (Pt)							
		Bw							
		Sb							
		Sw							
		Pj							
		Bf							
		Po (Pt)							
		Bw							

Species	Height Class (m) 1	2	3
Sb, Sw, Bf, Ce, L	0.3 to 0.79	0.8 to 2.0	> 2.0
Pj, Pr, Pw	0.3 to 0.9	1.0 to 2.0	> 2.0
Po, Bw, Ab	0.3 to 1.9	2.0 to 2.9	> 3.0

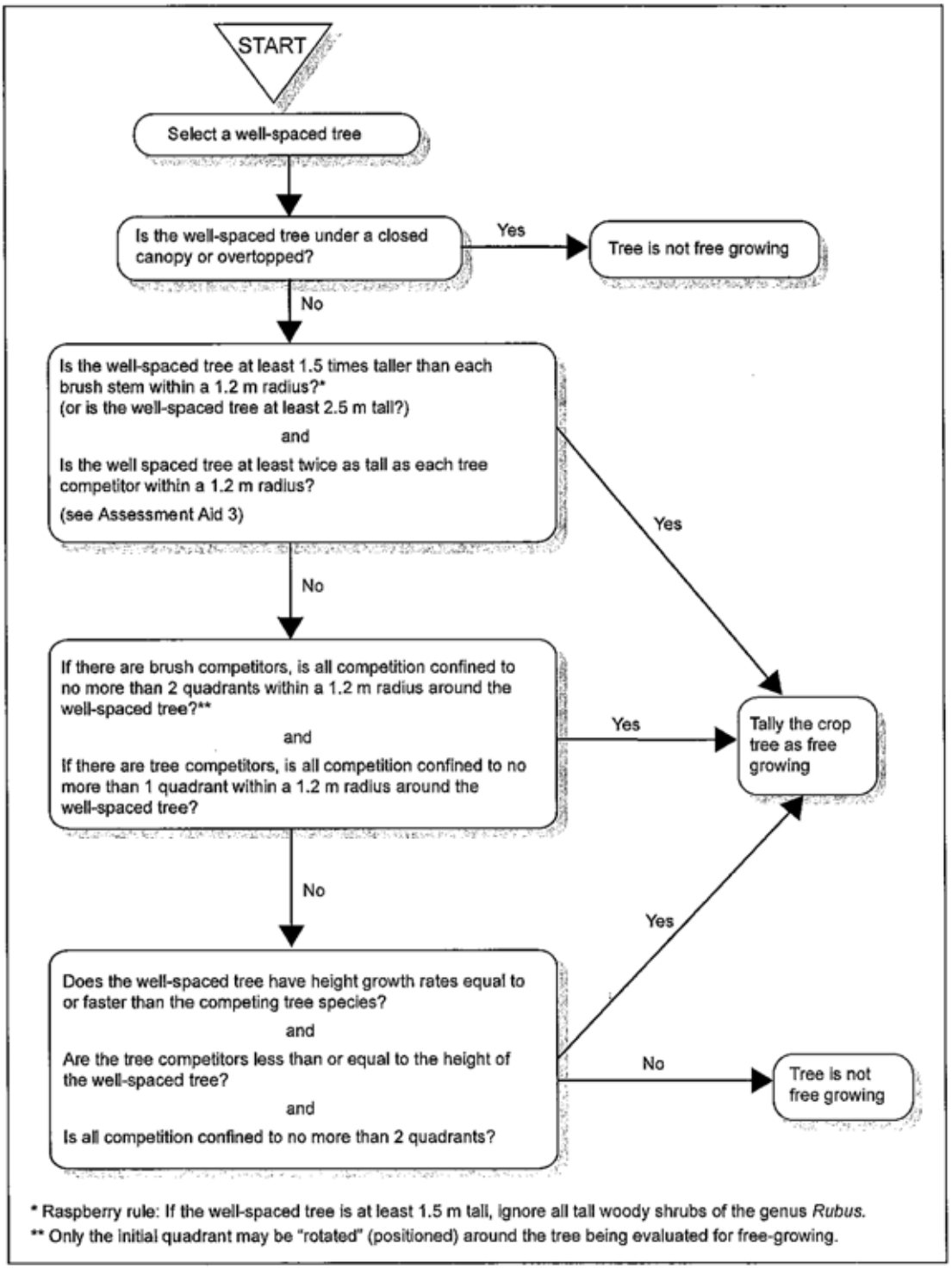
Note: Height classes may differ from the examples given depending on the minimum crop tree heights listed in the silvicultural ground rules associated with this stratum.

* If there are no trees taller than 30cm in the plot, mark VOID and estimate the size of the opening in this column and record zero for the number of FG stems.

Stocking Formula: total # of well spaced trees/ 4x # plots(ha) = stocking %.

Appendix 4

Assessment Aid for Determining if a Well Spaced Tree is Free to Grow


START
Select a well-spaced tree
Is the well-spaced tree under a closed canopy or overtopped?
Yes
Tree is not free growing
No
Is the well-spaced tree at least 1.5 times taller than each brush stem within a 1.2 m radius?*
(or is the well-spaced tree at least 2.5 m tall?)
and
Is the well spaced tree at least twice as tall as each tree competitor within a 1.2 m radius?
(see Assessment Aid 3)
Yes
No
If there are brush competitors, is all competition confined to no more than 2 quadrants within a 1.2 m radius around the well-spaced tree?**
and
If there are tree competitors, is all competition confined to no more than 1 quadrant within a 1.2 m radius around the well-spaced tree?
Yes
Tally the crop tree as free growing
No
Yes
Does the well-spaced tree have height growth rates equal to or faster than the competing tree species?
and
Are the tree competitors less than or equal to the height of the well-spaced tree?
and
Is all competition confined to no more than 2 quadrants?
No
Tree is not free growing
* Raspberry rule: If the well-spaced tree is at least 1.5 m tall, ignore all tall woody shrubs of the genus Rubus.
** Only the initial quadrant may be "rotated" (positioned) around the tree being evaluated for free-growing.

Appendix 5

Well Spaced Free to Grow Survey Summary Sheet

Well Spaced Free to Grow Survey Summary Sheet

Block #:_____ Stratum #: _____ Survey year: _____

Stratum Area =___ha	% Occupied Plots: (free to grow stems in plot) :_____%	
Number of plots: _____		
Mean # of Trees above minimum height	Mean = _____ / #plots	_____ x 625 = _____ ha
Mean # Well Spaced Free to grow Trees	Mean =_____ / #plots	_____ x 625 =_____ha
Regeneration Standard (trees/ha- all species)		
Target Species		
Acceptable Species		
Ecosite		

Spp.	Height Class 1	Height Class 2	Height Class 3	Free to grow
Pj				
Pr				
Pw				
Sb				
Sw				
Po				
Bw				
La				
Bf				
Ce				

Treatment	
→	
Species Composition	
Free to Grow Species Composition	
% of trees above minimum height target	
Comments:	
Satisfactorily Regenerated	Not Satisfactorily Regenerated
Silviculture Success	Not a Silviculture Success

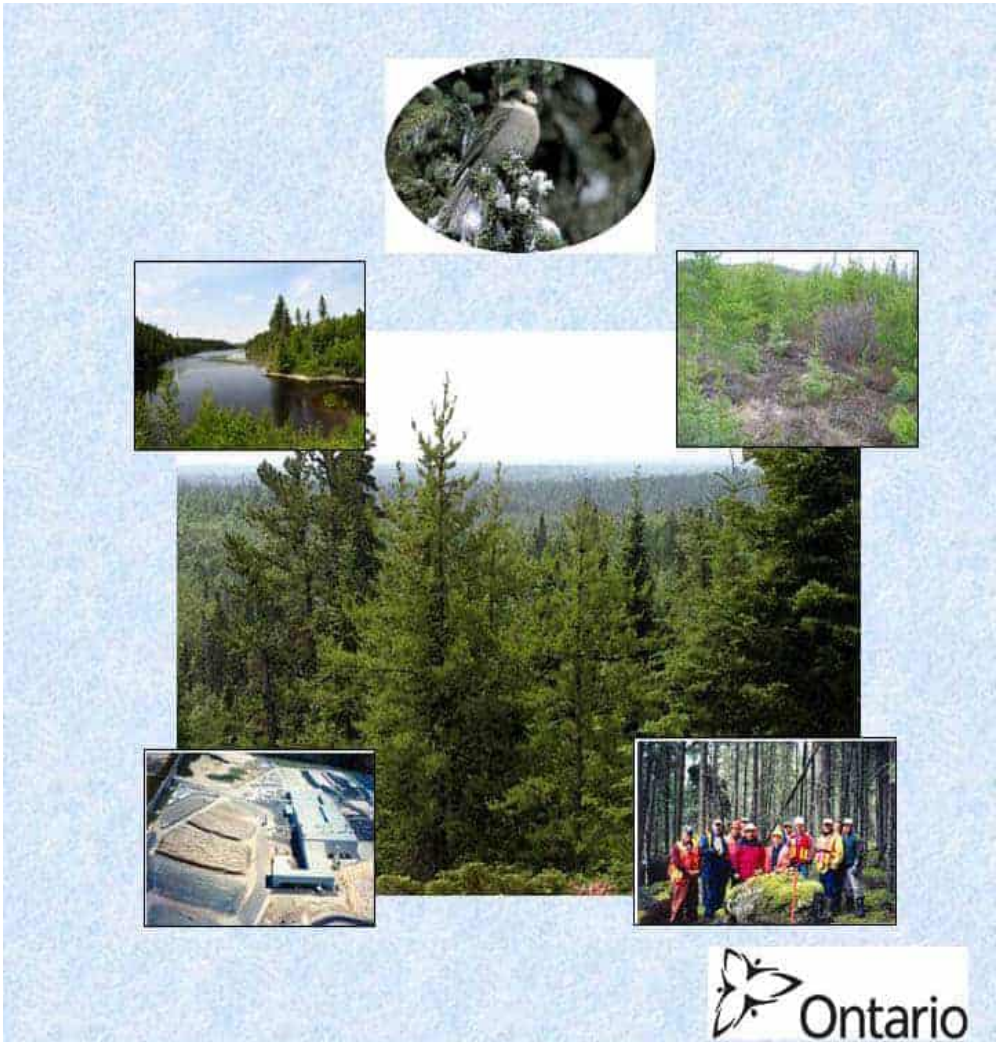
* Height Classes

Species	1	2	3
Sb, Sw, Ce, Bf	0.3- 0.79	0.8 -2.0	>2.0
Po, Pr, PW, L	0.3-0.9	1.0 -2.0	>2.0
Hardwoods	0.3 -0.9	2.0 -2.9	>3.0

Supplementary Documentation G

2012-2022 Whiskey Jack Forest Management Plan

Roads Planning Documentation



ROADS SUPPLEMENTARY DOCUMENTATION FORM

ROAD NAME: Yellow Girl Bay Road (New Primary Road)

The Yellow Girl Bay Road is a new primary road, approximately 38 kilometers south of highway 17 junction with highway 71. This new road has a total road length of 8.2 km of which the first 3.2 km is reconstruction and the remaining length is new construction. This road provides access to a section of the southern part of the unit for forestry activities in the 2012-2014 as well as future plans. The road commences westerly off of the highway and proceeds near the Yellow Girl Bay Reserve 32B (Naotkamegwanning). (Basemaps 41548, 42548)

1. Alternative Corridors

In identifying a reasonable range of alternative corridors for analysis, the following was considered:

(a) Physical conditions, specific non-timber values and significant engineering or safety factors that may affect planning of the road corridor and the cost of construction of the road,

(b) Any other planning initiatives that deal with access in the area (e.g. Ontario's Crown Land Use Policy Atlas, management statement of conservation interest, park management plans, lake management plans, resource stewardship agreements), and

(c) Issues arising from public consultation regarding this primary road proposal.

Only one route is proposed due to the following:

- Corridor utilizes an existing road bed which will be reconstructed
- Provides for the most direct route in accessing future wood supplies and silviculture activities
- Location of lakes, topography and existing roads
- Provides for strategic access to southern portion of the management unit

2. Environmental Analysis of Alternative Corridors

a) Alternative Corridor (number) and Description: Yellow Girl Bay Road – Alternative 1(See Areas Selected for Operations Maps)

This proposed all weather primary road, approximately 8.15 km in length, commencing off of highway 71 approximately 38 km south of highway 17 and proceeds westerly near the Yellow Girl Bay Reserve 32B.

b) Environmental Analysis

i. Access to Areas Eligible for harvest, renewal and tending operations

Advantages

- Utilizes 3.2 km of existing operational roadbed for reconstruction to primary
- Observed to be the best location to build the road due to access limitations from lakes and waterways.
- Proposed road strategically develops future wood supply areas including a 60 year marten core deferral (Core # 23), as well as subsequent renewal and tending treatments.

Disadvantages

- None

Potential Effects on Non-Timber Values

Advantages

- Enhanced access for other forest users
- Provides for access to unoccupied Naotkamegwanning First Nations land for socioeconomic opportunities.

Disadvantages

- The proposed road requires two water crossings
- The proposed road will increase the amount of other users adjacent to the Reserve 32B.

Providing access to any remote Aboriginal communities which were previously inaccessible by road

- This corridor will not provide access to any remote Aboriginal communities that were not previously accessible by road.

ii) Use Management Strategy

(a) Maintenance provisions:

These roads and each associated right-of-way will receive maintenance, which will be carried out as required to maintain the road for forest management purposes (e.g. harvest, renewal, tending, transportation and hauling activities). These roads will be maintained to minimize risk to road users and minimize the potential for environmental damage. Routine maintenance operations may include any one or combination of the following: summer grading, ditching, drainage, brush clearing with mechanical or chemical methods (e.g. application of chemical herbicides for vegetation control along road shoulders), gravelling, re-shaping of road bed, dust control measures, signage, snow plowing, sanding/salting and clearing existing right-of-ways including the harvest of merchantable trees as required. Maintenance may also include non-emergency repairs of existing water crossings to clean culverts, remove blockages caused by beavers, and to apply material (e.g. gravel, riprap) to mitigate or enhance long-term erosion protection around water crossings.

For safety/engineering concerns minor road re-alignment and bypass construction may also be required during the implementation of the FMP. This is permitted within the existing right-of-way, subject to the confirmation of values and the application of all applicable AOCs to the proposed work area. If an appropriate AOC does not exist in the FMP note that it will need to be amended into the FMP and then applied. In cases where new and/or replacement water crossings are required during the implementation of the FMP, the replacement of culverts are permitted subject to the following conditions; the values must be reviewed and updated for each location to ensure up-to-date values are considered, the applicable AOC must be applied to address any value impacted at the location (if an appropriate AOC does not exist in the FMP note that it will need to be amended into the FMP and then applied), and the planned water crossing replacements are identified and approved (with all applicable conditions on the construction, including preventative and mitigative measures) in the AWS for the year of construction company.

Emergency maintenance is defined as “road maintenance that required immediate attention to restore access and reduce the chance of personal injury, damage to equipment, inconvenience to road users and further road damage” (2009 FMPM). Emergency maintenance will be necessary where public safety and/or environmental damage have occurred unexpectedly. Emergency repairs can proceed immediately without MNR approval provided the emergency works are limited in scope to only what is necessary to address essential public safety concerns and restrict further environmental damage. All emergency actions will be reported to MNR as soon as practical and any further actions (e.g. restoration, reconstruction, abandonment) will be subject to normal planning approvals. Where sediment has been released into a watercourse, the Ministry of the Environment is to be informed.

Where water crossings have been adversely impacted by unplanned events, water crossings may not be restored in a timely manner and remedial work may be limited to only eliminating or reducing safety hazards and/or interim measures to stop environmental damage. Access to areas impacted by unplanned events could be disrupted at any time and there is no obligation on the Crown or the Forest Industry to undertake repair work to restore infrastructure and access. However, all actions must be consistent with the Use Management Strategy for the road/road network. Situations could also arise where it is determined that a damaged/deteriorating infrastructure is unsafe and continued use must be prohibited until a permanent solution is implemented.

(b) Monitoring Provisions

While the road/road network is in use for forest management purposes (e.g. harvest, renewal, tending, transportation and hauling activities), it will be monitored on an ongoing basis for safety or environmental concerns. Bridges used for ‘heavy truck hauls’ inspected at least once a year by a competent person (following the inspection guidelines in Appendix E of the Crown Land Bridge Management Guidelines or by a professional engineer). When the road/road network is not in use for forest management purposes, monitoring will be based on a yearly schedule of specific roads to be inspected. This yearly schedule will be based upon a risk assessment approach with emphasis on the potential values which could be impacted (i.e. fish habitat) and the potential for public safety concerns and, at a minimum, these roads (including bridges open to public travel) will be inspected at least once every three years. Monitoring may occur as part of aerial assessments of reforestation (e.g. FTG surveys). In addition, all staff and contractors (harvest, renewal and tending contractors) are to report any existing or potential concerns regarding the road/road network and water crossings encountered while travelling on roads throughout the forest. Reports from the general public and other user groups will also contribute to the monitoring of the condition of the roads and water crossings. Additional monitoring will be considered based upon a risk assessment approach following severe weather conditions (e.g. heavy rainfall).

c) Access provisions or restrictions which apply to the public and commercial resource users with the rationale for the restrictions:
- none

d) a statement if the intent of the sustainable forest licence is to transfer the responsibility for the road or road network to MNR in the next 20 years, and the operating year or
5-year term in which the transfer is intended to occur:
- There is no intent to transfer at this time.

e) where the sustainable forest licensee has indicated an intent to transfer responsibility, MNR will provide a preliminary indication of the management intent for the road or road network:

- There is no intent to transfer at this time.

f) where the sustainable forest licensee has indicated an intent to transfer responsibility during the five-year term and MNR's management intent is to not maintain the road for public use, the activities required prior to transfer, including potential removal of water crossings will be documented (e.g. decommissioning, signs):

- There is no intent to transfer at this time.

iii) Estimated Cost of Construction and Use Management

- Construction: $30,000 - $35,000 /km; plus two minor AOC WS01 water crossings at around $6,000 /per crossing; plus 20' bridge estimated to cost $20,000.
- Maintenance: $8,000 – $10,000 /km/yr

3. Summary of Public Comments:

- None received to-date.

4. Proposed Corridor:

a) Description: See Alternative 1

b) Rationale: Alternative 1 utilizes a segment of an existing road, develops future harvest and renewal activities, provides access to First Nations lands and is the most economical given the local terrain limitations.

c) Use Management Strategy: See Alternative 1

5. Summary of Public Comments:

None

6. Selected Corridor: See Proposed Corridor (Part 4)

7. Changes to a Confirmed Primary Road Corridor Road Use Management Strategy

Use Management Strategy:
No change to UMS

Summary of Public Comments:
Refer to Part 3

Use Management Strategy
See Alternative 1

ROADS SUPPLEMENTARY DOCUMENTATION FORM

ROAD NAME: Bug Lake Road

The Bug Lake Road is a primary road, approximately 25 kilometers south of highway 17 junction with highway 71. This new road has a total road length of 10 km of which all is reconstruction. This road provides access to a section of the southern part of the unit for forestry activities in the 2012-2022 FMP as well as future plans. The road commences westerly off of the highway and proceeds along the east shore of Bug Lake. (Basemaps 41548, 41549, 42549)

1. Alternative Corridors

In identifying a reasonable range of alternative corridors for analysis, the following was considered:

(a) Physical conditions, specific non-timber values and significant engineering or safety factors that may affect planning of the road corridor and the cost of construction of the road,

(b) Any other planning initiatives that deal with access in the area (e.g. Ontario's Crown Land Use Policy Atlas, management statement of conservation interest, park management plans, lake management plans, resource stewardship agreements), and

(c) Issues arising from public consultation regarding this primary road proposal.

Only one route is proposed due to the following:

- Corridor utilizes an existing road bed which will be reconstructed
- Provides for the most direct route in accessing future wood supplies and silviculture activities
- Location of lakes, topography and existing roads
- Provides for strategic access to southern portion of the management unit

2. Environmental Analysis of Alternative Corridors

a) Alternative Corridor (number) and Description: Bug Lake Road – Alternative 1(See Areas Selected for Operations Maps)

This proposed all weather primary road, approximately 10 km in length, commencing off of highway 71 approximately 25 km south of highway 17 and proceeds westerly along the east shore of Bug Lake.

b) Environmental Analysis

i. Access to Areas Eligible for harvest, renewal and tending operations

Advantages

- Utilizes 6 km of existing branch roadbed for reconstruction to primary
- Observed to be the best location to build the road due to access limitations from lakes and waterways.
- Proposed road strategically develops future wood supply areas including a 20 year marten core deferral (Core # 23), as well as subsequent renewal and tending treatments.

Disadvantages
- None

Potential Effects on Non-Timber Values

Advantages
- Enhanced access for other forest users

Disadvantages
- The proposed road requires one water crossing
- The proposed road will increase the amount of other users within the area.

Providing access to any remote Aboriginal communities which were previously inaccessible by road
- This corridor will not provide access to any remote Aboriginal communities that were not previously accessible by road.

ii) Use Management Strategy

(a) Maintenance provisions:

These roads and each associated right-of-way will receive maintenance, which will be carried out as required to maintain the road for forest management purposes (e.g. harvest, renewal, tending, transportation and hauling activities). These roads will be maintained to minimize risk to road users and minimize the potential for environmental damage. Routine maintenance operations may include any one or combination of the following: summer grading, ditching, drainage, brush clearing with mechanical or chemical methods (e.g. application of chemical herbicides for vegetation control along road shoulders), gravelling, re-shaping of road bed, dust control measures, signage, snow plowing, sanding/salting and clearing existing right-of-ways including the harvest of merchantable trees as required. Maintenance may also include non-emergency repairs of existing water crossings to clean culverts, remove blockages caused by beavers, and to apply material (e.g. gravel, riprap) to mitigate or enhance long-term erosion protection around water crossings.

For safety/engineering concerns minor road re-alignment and bypass construction may also be required during the implementation of the FMP. This is permitted within the existing right-of-way, subject to the confirmation of values and the application of all applicable AOCs to the proposed work area. If an appropriate AOC does not exist in the FMP note that it will need to be amended into the FMP and then applied. In cases where new and/or replacement water crossings are required during the implementation of the FMP, the replacement of culverts are permitted subject to the following conditions; the values must be reviewed and updated for each location to ensure up-to-date values are considered, the applicable AOC must be applied to address any value impacted at the location (if an appropriate AOC does not exist in the FMP note that it will need to be amended into the FMP and then applied), and the planned water crossing replacements are identified and approved (with all applicable conditions on the construction, including preventative and mitigative measures) in the AWS for the year of construction company.

Emergency maintenance is defined as “road maintenance that required immediate attention to restore access and reduce the chance of personal injury, damage to equipment, inconvenience to road users and further road damage” (2009 FMPM). Emergency maintenance will be necessary where public safety and/or environmental damage have occurred unexpectedly. Emergency

repairs can proceed immediately without MNR approval provided the emergency works are limited in scope to only what is necessary to address essential public safety concerns and restrict further environmental damage. All emergency actions will be reported to MNR as soon as practical and any further actions (e.g. restoration, reconstruction, abandonment) will be subject to normal planning approvals. Where sediment has been released into a watercourse, the Ministry of the Environment is to be informed.

Where water crossings have been adversely impacted by unplanned events, water crossings may not be restored in a timely manner and remedial work may be limited to only eliminating or reducing safety hazards and/or interim measures to stop environmental damage. Access to areas impacted by unplanned events could be disrupted at any time and there is no obligation on the Crown or the Forest Industry to undertake repair work to restore infrastructure and access. However, all actions must be consistent with the Use Management Strategy for the road/road network. Situations could also arise where it is determined that a damaged/deteriorating infrastructure is unsafe and continued use must be prohibited until a permanent solution is implemented.

(b) Monitoring Provisions

While the road/road network is in use for forest management purposes (e.g. harvest, renewal, tending, transportation and hauling activities), it will be monitored on an ongoing basis for safety or environmental concerns. Bridges used for 'heavy truck hauls' inspected at least once a year by a competent person (following the inspection guidelines in Appendix E of the Crown Land Bridge Management Guidelines or by a professional engineer). When the road/road network is not in use for forest management purposes, monitoring will be based on a yearly schedule of specific roads to be inspected. This yearly schedule will be based upon a risk assessment approach with emphasis on the potential values which could be impacted (i.e. fish habitat) and the potential for public safety concerns and, at a minimum, these roads (including bridges open to public travel) will be inspected at least once every three years. Monitoring may occur as part of aerial assessments of reforestation (e.g. FTG surveys). In addition, all staff and contractors (harvest, renewal and tending contractors) are to report any existing or potential concerns regarding the road/road network and water crossings encountered while travelling on roads throughout the forest. Reports from the general public and other user groups will also contribute to the monitoring of the condition of the roads and water crossings. Additional monitoring will be considered based upon a risk assessment approach following severe weather conditions (e.g. heavy rainfall).

c) Access provisions or restrictions which apply to the public and commercial resource users with the rationale for the restrictions:

- none

d) a statement if the intent of the sustainable forest licence is to transfer the responsibility for the road or road network to MNR in the next 20 years, and the operating year or
5-year term in which the transfer is intended to occur:

- There is no intent to transfer at this time.

e) where the sustainable forest licensee has indicated an intent to transfer responsibility, MNR will provide a preliminary indication of the management intent for the road or road network:

- There is no intent to transfer at this time.

f) where the sustainable forest licensee has indicated an intent to transfer responsibility during the five-year term and MNR's management intent is to not maintain the road for public use, the activities required prior to transfer, including potential removal of water crossings will be documented (e.g. decommissioning, signs):

- There is no intent to transfer at this time.

iii) Estimated Cost of Construction and Use Management

- Construction: $30,000 - $35,000 /km plus two minor AOC water crossings at around $6,000 /per
- Maintenance: $8,000 – $10,000 /km/yr

3. Summary of Public Comments:

- None received to-date.

4. Proposed Corridor:

a) Description: See Alternative 1

b) Rationale: Alternative 1 utilizes a segment of an existing road, develops future harvest and renewal activities and is the most economical given the local terrain limitations.

c) Use Management Strategy: See Alternative 1

5. Summary of Public Comments:

None

6. Selected Corridor: See Proposed Corridor (Part 4)

7. Changes to a Confirmed Primary Road Corridor Road Use Management Strategy

Use Management Strategy:

No change to UMS

Summary of Public Comments:

Refer to Part 3

Use Management Strategy

See Alternative 1

ROADS SUPPLEMENTARY DOCUMENTATION FORM

ROAD NAME: Witch Bay/ Loon Lake Road (New Primary Road)

The Witch Bay/Loon Lake Road is a primary road, approximately 12 kilometers south of highway 17 junction with highway 71. This new road has a total road length of 12 km of which all is reconstruction. This road provides access to a section of the southern part of the unit for forestry activities in the 2012-2022 FMP as well as future plans. The road commences westerly off of the highway and proceeds south following the power line and turns west towards Jadakin Lake. (Basemaps 41549, 41550)

1. Alternative Corridors

In identifying a reasonable range of alternative corridors for analysis, the following was considered:

(a) Physical conditions, specific non-timber values and significant engineering or safety factors that may affect planning of the road corridor and the cost of construction of the road,

(b) Any other planning initiatives that deal with access in the area (e.g. Ontario's Crown Land Use Policy Atlas, management statement of conservation interest, park management plans, lake management plans, resource stewardship agreements), and

(c) Issues arising from public consultation regarding this primary road proposal.

Only one route is proposed due to the following:

- Corridor utilizes an existing road bed which will be reconstructed
- Provides for the most direct route in accessing future wood supplies and silviculture activities
- Location of lakes, topography and existing roads
- Provides for strategic access to southern portion of the management unit

2. Environmental Analysis of Alternative Corridors

a) Alternative Corridor (number) and Description: Witch Bay/ Loon Lake Road – Alternative 1(See Areas Selected for Operations Maps)

This proposed all weather primary road, approximately 12 km in length, commencing off of highway 71 approximately 12 km south of highway 17 and proceeds southerly along the power line turning west towards Jadakin Lake.

b) Environmental Analysis

i. Access to Areas Eligible for harvest, renewal and tending operations

Advantages

- Utilizes 12 km of existing branch and operational roadbed for reconstruction to primary
- Observed to be the best location to build the road due to access limitations from lakes and waterways.
- Proposed road strategically develops future wood supply areas as well as subsequent renewal and tending treatments.

Disadvantages

- None

Potential Effects on Non-Timber Values

Advantages

- Enhanced access for other forest users

Disadvantages

- The proposed road requires one water crossing
- The proposed road will increase the amount of other users within the area.

Providing access to any remote Aboriginal communities which were previously inaccessible by road

- This corridor will not provide access to any remote Aboriginal communities that were not previously accessible by road.

ii) Use Management Strategy

(a) Maintenance provisions:

These roads and each associated right-of-way will receive maintenance, which will be carried out as required to maintain the road for forest management purposes (e.g. harvest, renewal, tending, transportation and hauling activities). These roads will be maintained to minimize risk to road users and minimize the potential for environmental damage. Routine maintenance operations may include any one or combination of the following: summer grading, ditching, drainage, brush clearing with mechanical or chemical methods (e.g. application of chemical herbicides for vegetation control along road shoulders), gravelling, re-shaping of road bed, dust control measures, signage, snow plowing, sanding/salting and clearing existing right-of-ways including the harvest of merchantable trees as required. Maintenance may also include non-emergency repairs of existing water crossings to clean culverts, remove blockages caused by beavers, and to apply material (e.g. gravel, riprap) to mitigate or enhance long-term erosion protection around water crossings.

For safety/engineering concerns minor road re-alignment and bypass construction may also be required during the implementation of the FMP. This is permitted within the existing right-of-way, subject to the confirmation of values and the application of all applicable AOCs to the proposed work area. If an appropriate AOC does not exist in the FMP note that it will need to be amended into the FMP and then applied. In cases where new and/or replacement water crossings are required during the implementation of the FMP, the replacement of culverts are permitted subject to the following conditions; the values must be reviewed and updated for each location to ensure up-to-date values are considered, the applicable AOC must be applied to address any value impacted at the location (if an appropriate AOC does not exist in the FMP note that it will need to be amended into the FMP and then applied), and the planned water crossing replacements are identified and approved (with all applicable conditions on the construction, including preventative and mitigative measures) in the AWS for the year of construction company.

Emergency maintenance is defined as “road maintenance that required immediate attention to restore access and reduce the chance of personal injury, damage to equipment, inconvenience to road users and further road damage” (2009 FMPM). Emergency maintenance will be necessary where public safety and/or environmental damage have occurred unexpectedly. Emergency

repairs can proceed immediately without MNR approval provided the emergency works are limited in scope to only what is necessary to address essential public safety concerns and restrict further environmental damage. All emergency actions will be reported to MNR as soon as practical and any further actions (e.g. restoration, reconstruction, abandonment) will be subject to normal planning approvals. Where sediment has been released into a watercourse, the Ministry of the Environment is to be informed.

Where water crossings have been adversely impacted by unplanned events, water crossings may not be restored in a timely manner and remedial work may be limited to only eliminating or reducing safety hazards and/or interim measures to stop environmental damage. Access to areas impacted by unplanned events could be disrupted at any time and there is no obligation on the Crown or the Forest Industry to undertake repair work to restore infrastructure and access. However, all actions must be consistent with the Use Management Strategy for the road/road network. Situations could also arise where it is determined that a damaged/deteriorating infrastructure is unsafe and continued use must be prohibited until a permanent solution is implemented.

(b) Monitoring Provisions

While the road/road network is in use for forest management purposes (e.g. harvest, renewal, tending, transportation and hauling activities), it will be monitored on an ongoing basis for safety or environmental concerns. Bridges used for 'heavy truck hauls' inspected at least once a year by a competent person (following the inspection guidelines in Appendix E of the Crown Land Bridge Management Guidelines or by a professional engineer). When the road/road network is not in use for forest management purposes, monitoring will be based on a yearly schedule of specific roads to be inspected. This yearly schedule will be based upon a risk assessment approach with emphasis on the potential values which could be impacted (i.e. fish habitat) and the potential for public safety concerns and, at a minimum, these roads (including bridges open to public travel) will be inspected at least once every three years. Monitoring may occur as part of aerial assessments of reforestation (e.g. FTG surveys). In addition, all staff and contractors (harvest, renewal and tending contractors) are to report any existing or potential concerns regarding the road/road network and water crossings encountered while travelling on roads throughout the forest. Reports from the general public and other user groups will also contribute to the monitoring of the condition of the roads and water crossings. Additional monitoring will be considered based upon a risk assessment approach following severe weather conditions (e.g. heavy rainfall).

c) Access provisions or restrictions which apply to the public and commercial resource users with the rationale for the restrictions:

- none

d) a statement if the intent of the sustainable forest licence is to transfer the responsibility for the road or road network to MNR in the next 20 years, and the operating year or
5-year term in which the transfer is intended to occur:

- There is no intent to transfer at this time.

e) where the sustainable forest licensee has indicated an intent to transfer responsibility, MNR will provide a preliminary indication of the management intent for the road or road network:

- There is no intent to transfer at this time.

f) where the sustainable forest licensee has indicated an intent to transfer responsibility during the five-year term and MNR's management intent is to not maintain the road for public use, the activities required prior to transfer, including potential removal of water crossings will be documented (e.g. decommissioning, signs):

- There is no intent to transfer at this time.

iii) Estimated Cost of Construction and Use Management

- Construction: $30,000 - $35,000 /km plus two minor AOC water crossings at around $6,000 /per
- Maintenance: $8,000 – $10,000 /km/yr

3. Summary of Public Comments:

- None received to-date.

4. Proposed Corridor:

a) Description: See Alternative 1

b) Rationale: Alternative 1 utilizes a segment of an existing road, develops future harvest and renewal activities and is the most economical given the local terrain limitations.

c) Use Management Strategy: See Alternative 1

5. Summary of Public Comments:

None

6. Selected Corridor: See Proposed Corridor (Part 4)

7. Changes to a Confirmed Primary Road Corridor Road Use Management Strategy

Use Management Strategy:

No change to UMS

Summary of Public Comments:

Refer to Part 3

Use Management Strategy

See Alternative 1

ROADS SUPPLEMENTARY DOCUMENTATION FORM

B: Branch Road Corridors

ROAD NAME: April South and Aesthetic Branch Extension Roads (Branch Road)

1. Proposed Corridor

(a) April South (mapsheet 49555) and Aesthetic Branch Extension (mapsheets 40556, 41556) Roads (see Areas Selected for Operations Map)

These proposed road corridors are identified on the Index map and Areas Selected for Operations Maps. The April South road is located off the Ord road in the North east portion of the Whiskey Jack forest. The Aesthetic Branch Extension road is located off Highway 71 in the South west portion of the Whiskey Jack Forest. April South Road is an existing road that require reconstruction. The Aesthetic Branch Extension is new road construction off of the existing Aesthetic Road. The length of the roads can be found in table FMP-18.

(b) Rationale: The corridor was identified based on consideration of the following:

I. The degree to which the physical conditions, non-timber values (i.e. natural resource features, land uses and values, as identified on the values map for the MU) and significant engineering or safety factors in the area, act as constraints or provide opportunities, including possibilities for development of other resources.
II. Any Other Planning Initiatives that Deal with Access in the Area (i.e. Ontario's Crown Land Use Policy Atlas, management statement of conservation interest, park management plans, lake management plans, resource stewardship agreements)
III. Results of Consultation with Interested and Affected Persons and or Organizations.

Only one route is proposed due to the following:

- Corridors utilize an existing road beds
- Provides for the most direct route in accessing future harvest allocations and silviculture activities
- Location of lakes, topography and existing roads
- The roads currently exist and require minimal reconstruction efforts for hauling and safety requirements.

(c) Use Management Strategy

Proposed corridors share the following Use Management Strategy:

(a) Maintenance provisions:

These roads and each associated right-of-way will receive maintenance, which will be carried out as required to maintain the road for forest management purposes (e.g. harvest, renewal, tending, transportation and hauling activities). These roads will be maintained to minimize risk to road users and minimize the potential for environmental damage. Routine maintenance operations may include any one or combination of the following: summer grading, ditching, drainage, brush

clearing with mechanical or chemical methods (e.g. application of chemical herbicides for vegetation control along road shoulders), gravelling, re-shaping of road bed, dust control measures, signage, snow plowing, sanding/salting and clearing existing right-of-ways including the harvest of merchantable trees as required. Maintenance may also include non-emergency repairs of existing water crossings to clean culverts, remove blockages caused by beavers, and to apply material (e.g. gravel, riprap) to mitigate or enhance long-term erosion protection around water crossings.

For safety/engineering concerns minor road re-alignment and bypass construction may also be required during the implementation of the CP. This is permitted within the existing right-of-way, subject to the confirmation of values and the application of all applicable AOCs to the proposed work area. If an appropriate AOC does not exist in the CP note that it will need to be amended into the CP and then applied. In cases where new and/or replacement water crossings are required during the implementation of the CP, the replacement of culverts are permitted subject to the following conditions; the values must be reviewed and updated for each location to ensure up-to-date values are considered, the applicable AOC must be applied to address any value impacted at the location (if an appropriate AOC does not exist in the CP note that it will need to be amended into the CP and then applied), and the planned water crossing replacements are identified and approved (with all applicable conditions on the construction, including preventative and mitigative measures) in the AWS for the year of construction company.

Emergency maintenance is defined as “road maintenance that required immediate attention to restore access and reduce the chance of personal injury, damage to equipment, inconvenience to road users and further road damage” (2009 FMPM). Emergency maintenance will be necessary where public safety and/or environmental damage have occurred unexpectedly. Emergency repairs can proceed immediately without MNR approval provided the emergency works are limited in scope to only what is necessary to address essential public safety concerns and restrict further environmental damage. All emergency actions will be reported to MNR as soon as practical and any further actions (e.g. restoration, reconstruction, abandonment) will be subject to normal planning approvals. Where sediment has been released into a watercourse, the Ministry of the Environment is to be informed.

Where water crossings have been adversely impacted by unplanned events, water crossings may not be restored in a timely manner and remedial work may be limited to only eliminating or reducing safety hazards and/or interim measures to stop environmental damage. Access to areas impacted by unplanned events could be disrupted at any time and there is no obligation on the Crown or the Forest Industry to undertake repair work to restore infrastructure and access. However, all actions must be consistent with the Use Management Strategy for the road/road network. Situations could also arise where it is determined that a damaged/deteriorating infrastructure is unsafe and continued use must be prohibited until a permanent solution is implemented.

(b) Monitoring Provisions

While the road/road network is in use for forest management purposes (e.g. harvest, renewal, tending, transportation and hauling activities), it will be monitored on an ongoing basis for safety or environmental concerns. Bridges used for ‘heavy truck hauls’ inspected at least once a year by a competent person (following the inspection guidelines in Appendix E of the Crown Land Bridge Management Guidelines or by a professional engineer). When the road/road network is not in use for forest management purposes, monitoring will be based on a yearly schedule of specific roads to be inspected. This yearly schedule will be based upon a risk assessment

approach with emphasis on the potential values which could be impacted (i.e. fish habitat) and the potential for public safety concerns and, at a minimum, these roads (including bridges open to public travel) will be inspected at least once every three years. Monitoring may occur as part of aerial assessments of reforestation (e.g. FTG surveys). In addition, all staff and contractors (harvest, renewal and tending contractors) are to report any existing or potential concerns regarding the road/road network and water crossings encountered while travelling on roads throughout the forest. Reports from the general public and other user groups will also contribute to the monitoring of the condition of the roads and water crossings. Additional monitoring will be considered based upon a risk assessment approach following severe weather conditions (e.g. heavy rainfall).

c) Access provisions or restrictions which apply to the public and commercial resource users with the rationale for the restrictions:

- none

d) a statement if the intent of the sustainable forest licence is to transfer the responsibility for the road or road network to MNR in the next 20 years, and the operating year or
5-year term in which the transfer is intended to occur:

- There is no intent to transfer at this time.

e) where the sustainable forest licensee has indicated an intent to transfer responsibility, MNR will provide a preliminary indication of the management intent for the road or road network:

- There is no intent to transfer at this time.

f) where the sustainable forest licensee has indicated an intent to transfer responsibility during the five-year term and MNR's management intent is to not maintain the road for public use, the activities required prior to transfer, including potential removal of water crossings will be documented (e.g. decommissioning, signs):

- There is no intent to transfer at this time.

2. Summary of Public Comments:

- None received to-date.

3. Selected Corridor: See Proposed Corridor

ROADS SUPPLEMENTARY DOCUMENTATION FORM

C. Operational Roads

OPERATIONAL ROAD BOUNDARY IDENTIFIER: ORBs listed in table FMP-18 with UMS-1:

ORB2, ORB4, ORB6, ORB8, ORB12, ORB14, ORB16, ORB18, ORB20, ORB22, ORB24, ORB26, ORB30, ORB32, ORB34, ORB36, ORB38, ORB40, ORB42, ORB44, ORB48, ORB52, ORB54, ORB56, ORB64, ORB66, ORB68, ORB70, ORB72, ORB74, ORB76, ORB78, ORB80, ORB82, ORB86, ORB88, ORB92, ORB98, ORB100, ORB102, ORB142, ORB136, ORB118, ORB202, ORB188, ORB200, ORB160, ORB166, ORB182, ORB180, ORB164, ORB126, ORB132, ORB112, ORB168, ORB106, ORB204, ORB210, ORB212, ORB214, ORB216, ORB218, ORB222, ORB228, ORB230, ORB234, ORB236, ORB238, ORB240, ORB242, ORB244, ORB248, ORB250, ORB254, ORB256, ORB262, ORB266, ORB268, ORB270, ORB272, ORB274, ORB276, ORB278, ORB282, ORB286, ORB288, ORB290, ORB292, ORB296, ORB298, ORB300, ORB304, ORB308, ORB312, ORB314, ORB316, ORB318, ORB332, ORB334, ORB336, ORB342, ORB348, ORB350, ORB352, ORB360, ORB364, ORB372, ORB374, ORB376, ORB378, ORB382, ORB386, ORB394, ORB396, ORB398, ORB400, ORB402, ORB404, ORB406, ORB410, ORB412, ORB414, ORB416, ORB418, ORB424, ORB426, ORB428, ORB460, ORB462, ORB466, ORB500, ORB502, ORB504, ORB508, ORB512, ORB516, ORB520, ORB522, ORB524, ORB526, ORB528, ORB530, ORB534, ORB540, ORB544, ORB546, ORB548, ORB550, ORB552, ORB554, ORB556, ORB560, ORB562, ORB564, ORB568, ORB582, ORB584, ORB586, ORB588, ORB592, ORB594, ORB598, ORB622, ORB640, ORB644, ORB646, ORB648, ORB656, ORB658, ORB662, ORB667, ORB666, ORB672, ORB676, ORB678, ORB680, ORB684, ORB686, ORB688, ORB690, ORB692, ORB694, ORB696, ORB698, ORB700, ORB702, ORB704, ORB710, ORB712, ORB714, ORB716, ORB718, ORB720, ORB722, ORB724, ORB730, ORB734, ORB736, ORB738, ORB740, ORB742, ORB744, ORB746, ORB748, ORB750, ORB752, ORB754, ORB756, ORB762, ORB766, ORB770, ORB774, ORB776, ORB778, ORB780, ORB782, ORB784, ORB786, ORB788, ORB794, ORB798, ORB808, ORB810, ORB390, ORB392, ORB388, ORB384, ORB533, ORB532, ORB510, ORB558, ORB536, ORB537, ORB206, ORB811, ORB812, ORB813, ORB814, ORB815, ORB816, ORB817, ORB819, ORB820, ORB821, ORB822, ORB823, ORB824, ORB825, ORB826, ORB827, ORB828, ORB830, ORB831, ORB832, ORB833, ORB176, ORB630

These operational road boundaries for which this road supplementary documentation applies are listed in table FMP -18 and are illustrated on the Areas Selected for Operations Maps.

1. Proposed Use Management Strategy for new Operational Roads / Networks

a) Maintenance Provisions

These roads and each associated right-of-way will receive maintenance, which will be carried out as required to maintain the road for forest management purposes (e.g. harvest, renewal, tending, transportation and hauling activities). These roads will be maintained to minimize risk to road users and minimize the potential for environmental damage. Routine maintenance operations may include any one or combination of the following: summer grading, ditching, drainage, brush clearing with mechanical or chemical methods (e.g. application of chemical herbicides for vegetation control along road shoulders), gravelling, re-shaping of road bed, dust control measures, signage, snow plowing, sanding/salting and clearing existing right-of-ways including the harvest of merchantable trees as required. Maintenance may also include non-emergency

repairs of existing water crossings to clean culverts, remove blockages caused by beavers, and to apply material (e.g. gravel, riprap) to mitigate or enhance long-term erosion protection around water crossings.

For safety/engineering concerns minor road re-alignment and bypass construction may also be required for existing roads during the implementation of the FMP. This is permitted within the existing right-of-way, subject to the confirmation of values and the application of all applicable AOCs to the proposed work area. If an appropriate AOC does not exist in the FMP note that it will need to be amended into the FMP and then applied. In cases where new and/or replacement water crossings are required during the implementation of the FMP, the replacement of culverts are permitted subject to the following conditions; the values must be reviewed and updated for each location to ensure up-to-date values are considered, the applicable AOC must be applied to address any value impacted at the location (if an appropriate AOC does not exist in the FMP note that it will need to be amended into the FMP and then applied), and the planned water crossing replacements are identified and approved (with all applicable conditions on the construction, including preventative and mitigative measures) in the AWS for the year of construction.

Emergency maintenance is defined as “road maintenance that requires immediate attention to restore access and reduce the chance of personal injury, damage to equipment, inconvenience to road users and further road damage” (2009 FMPM). Emergency maintenance will be necessary where public safety and/or environmental damage have occurred unexpectedly. Emergency repairs can proceed immediately without MNR approval provided the emergency works are limited in scope to only what is necessary to address essential public safety concerns and restrict further environmental damage. All emergency actions will be reported to MNR as soon as practical and any further actions (e.g. restoration, reconstruction, abandonment) will be subject to normal planning approvals. Where sediment has been released into a watercourse, the Ministry of the Environment is to be informed.

Where water crossings have been adversely impacted by unplanned events, water crossings may not be restored in a timely manner and remedial work may be limited to only eliminating or reducing safety hazards and/or interim measures to stop environmental damage. Access to areas impacted by unplanned events could be disrupted at any time and there is no obligation on the Crown or the Forest Industry to undertake repair work to restore infrastructure and access. However, all actions must be consistent with the Use Management Strategy for the road/road network. Situations could also arise where it is determined that a damaged/deteriorating infrastructure is unsafe and continued use must be prohibited until a permanent solution is implemented. However, all actions must be consistent with the UMS for the road / road network. Situations could also arise where it is determined that damaged/deteriorating infrastructure is unsafe and continued use must be prohibited until a permanent solution is implemented.

Note that maintenance activities may be minimal as these operational roads are not intended for long term use. There is no expressed or implied commitment to maintain the entire existing road network for continuous general public access. There is no obligation on the Crown or the forest industry to undertake repair work to restore infrastructure and access beyond the requirements of forest management operations and/or terms of the use management strategy for the road.

b) Monitoring Provisions

While the road/road network is in use for forest management purposes (e.g. harvest, renewal, tending, transportation and hauling activities), it will be monitored on an ongoing basis for safety or environmental concerns. Bridges used for ‘heavy truck hauls’ inspected at least once a year by

a competent person (following the inspection guidelines in Appendix E of the Crown Land Bridge Management Guidelines or by a professional engineer). When the road/road network is not in use for forest management purposes, monitoring will be based on a yearly schedule of specific roads to be inspected. This yearly schedule will be based upon a risk assessment approach with emphasis on the potential values which could be impacted (i.e. fish habitat) and the potential for public safety concerns and, at a minimum, these roads (including bridges open to public travel) will be inspected at least once every three years. Monitoring may occur as part of aerial assessments of reforestation (e.g. FTG surveys). In addition, all staff and contractors (harvest, renewal and tending contractors) are to report any existing or potential concerns regarding the road/road network and water crossings encountered while travelling on roads throughout the forest. Reports from the general public and other user groups will also contribute to the monitoring of the condition of the roads and water crossings. Additional monitoring will be considered based upon a risk assessment approach following severe weather conditions (e.g. heavy rainfall).

c) Access provisions or restrictions which apply to the public and commercial resource users with the rationale for the restrictions:

- N/A

d) a statement if the intent of the sustainable forest licence is to transfer the responsibility for the road or road network to MNR in the next 20 years, and the operating year or 5-year term in which the transfer is intended to occur:

- N/A

e) where the sustainable forest licensee has indicated an intent to transfer responsibility, MNR will provide a preliminary indication of the management intent for the road or road network:

- N/A

f) where the sustainable forest licensee has indicated an intent to transfer responsibility during the five-year term and MNR's management intent is to not maintain the road for public use, the activities required prior to transfer, including potential removal of water crossings will be documented (e.g. decommissioning, signs):

- N/A

2. Summary of Public Comments:

- None received

ROADS SUPPLEMENTARY DOCUMENTATION FORM

C. Operational Roads

OPERATIONAL ROAD BOUNDARY IDENTIFIER: ORBs listed in table FMP-18 with UMS-3:

ORB170, ORB172, ORB176, ORB168, ORB232, ORB764, ORB 320ER, ORB326ER, ORB332ER, ORB344ER, ORB622ER, ORB622ERa, ORB346ER, ORB448ER, ORB448ERa, ORB596ER, ORB600ER, ORB612ER, ORB660ER, ORB670ER

These operational road boundaries for which this road supplementary documentation applies are listed in table FMP -18 and are illustrated on the Areas Selected for Operations Maps.

1. Proposed Use Management Strategy for new Operational Roads / Networks

a) Maintenance Provisions

These roads and each associated right-of-way will receive maintenance, which will be carried out as required to maintain the road for forest management purposes (e.g. harvest, renewal, tending, transportation and hauling activities). These roads will be maintained to minimize risk to road users and minimize the potential for environmental damage. Routine maintenance operations may include any one or combination of the following: summer grading, ditching, drainage, brush clearing with mechanical or chemical methods (e.g. application of chemical herbicides for vegetation control along road shoulders), gravelling, re-shaping of road bed, dust control measures, signage, snow plowing, sanding/salting and clearing existing right-of-ways including the harvest of merchantable trees as required. Maintenance may also include non-emergency repairs of existing water crossings to clean culverts, remove blockages caused by beavers, and to apply material (e.g. gravel, riprap) to mitigate or enhance long-term erosion protection around water crossings.

For safety/engineering concerns minor road re-alignment and bypass construction may also be required for existing roads during the implementation of the FMP. This is permitted within the existing right-of-way, subject to the confirmation of values and the application of all applicable AOCs to the proposed work area. If an appropriate AOC does not exist in the FMP note that it will need to be amended into the FMP and then applied. In cases where new and/or replacement water crossings are required during the implementation of the FMP, the replacement of culverts are permitted subject to the following conditions; the values must be reviewed and updated for each location to ensure up-to-date values are considered, the applicable AOC must be applied to address any value impacted at the location (if an appropriate AOC does not exist in the FMP note that it will need to be amended into the FMP and then applied), and the planned water crossing replacements are identified and approved (with all applicable conditions on the construction, including preventative and mitigative measures) in the AWS for the year of construction.

Emergency maintenance is defined as “road maintenance that requires immediate attention to restore access and reduce the chance of personal injury, damage to equipment, inconvenience to road users and further road damage” (2009 FMPM). Emergency maintenance will be necessary where public safety and/or environmental damage have occurred unexpectedly. Emergency repairs can proceed immediately without MNR approval provided the emergency works are limited in scope to only what is necessary to address essential public safety concerns and restrict

further environmental damage. All emergency actions will be reported to MNR as soon as practical and any further actions (e.g. restoration, reconstruction, abandonment) will be subject to normal planning approvals. Where sediment has been released into a watercourse, the Ministry of the Environment is to be informed.

Where water crossings have been adversely impacted by unplanned events, water crossings may not be restored in a timely manner and remedial work may be limited to only eliminating or reducing safety hazards and/or interim measures to stop environmental damage. Access to areas impacted by unplanned events could be disrupted at any time and there is no obligation on the Crown or the Forest Industry to undertake repair work to restore infrastructure and access. However, all actions must be consistent with the Use Management Strategy for the road/road network. Situations could also arise where it is determined that a damaged/deteriorating infrastructure is unsafe and continued use must be prohibited until a permanent solution is implemented. However, all actions must be consistent with the UMS for the road / road network. Situations could also arise where it is determined that damaged/deteriorating infrastructure is unsafe and continued use must be prohibited until a permanent solution is implemented.

Note that maintenance activities may be minimal as these operational roads are not intended for long term use. There is no expressed or implied commitment to maintain the entire existing road network for continuous general public access. There is no obligation on the Crown or the forest industry to undertake repair work to restore infrastructure and access beyond the requirements of forest management operations and/or terms of the use management strategy for the road.

b) Monitoring Provisions

While the road/road network is in use for forest management purposes (e.g. harvest, renewal, tending, transportation and hauling activities), it will be monitored on an ongoing basis for safety or environmental concerns. Bridges used for 'heavy truck hauls' inspected at least once a year by a competent person (following the inspection guidelines in Appendix E of the Crown Land Bridge Management Guidelines or by a professional engineer). When the road/road network is not in use for forest management purposes, monitoring will be based on a yearly schedule of specific roads to be inspected. This yearly schedule will be based upon a risk assessment approach with emphasis on the potential values which could be impacted (i.e. fish habitat) and the potential for public safety concerns and, at a minimum, these roads (including bridges open to public travel) will be inspected at least once every three years. Monitoring may occur as part of aerial assessments of reforestation (e.g. FTG surveys). In addition, all staff and contractors (harvest, renewal and tending contractors) are to report any existing or potential concerns regarding the road/road network and water crossings encountered while travelling on roads throughout the forest. Reports from the general public and other user groups will also contribute to the monitoring of the condition of the roads and water crossings. Additional monitoring will be considered based upon a risk assessment approach following severe weather conditions (e.g. heavy rainfall).

c) Access provisions or restrictions which apply to the public and commercial resource users with the rationale for the restrictions:

- N/A

d) a statement if the intent of the sustainable forest licence is to transfer the responsibility for the road or road network to MNR in the next 20 years, and the operating year or 5-year term in which the transfer is intended to occur:

Between 2016 and 2022, these nineteen new road systems will be no longer required for forest management purposes (e.g. harvest, renewal, tending, transportation and hauling activities) and therefore they are scheduled for transfer in the plan period. All water crossings on this road are scheduled for removal unless an interested third party is willing to become responsible for the road system.

e) where the sustainable forest licensee has indicated an intent to transfer responsibility, MNR will provide a preliminary indication of the management intent for the road or road network:

MNR's preliminary management intent is to not maintain the road for public use and to decommission the road (to make it impassable to vehicular traffic, enhance public safety and reduce environmental damage).

f) where the sustainable forest licensee has indicated an intent to transfer responsibility during the five-year term and MNR's management intent is to not maintain the road for public use, the activities required prior to transfer, including potential removal of water crossings will be documented (e.g. decommissioning, signs):

The conditions for roads that are to be decommissioned and regenerated can be found in Section 4.5.8 of the Plan text. This decommissioning may involve the physical destruction and re-vegetation of the roadbed and the removal of high risk water crossings. All water crossings will be examined using MNR's criteria for removal of water crossings (Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales guidelines page 143-144) to determine whether decommissioning activities are appropriate based upon biological, water quality, engineering and safety factors. Water crossings planned for decommissioning will be identified in the applicable AWS, reviewed with respect to the Fisheries Act, and approved with any resulting conditions.

2. Summary of Public Comments:

- None received

ROADS SUPPLEMENTARY DOCUMENTATION FORM

D. Existing Roads or Road Networks

ROAD OR ROAD NETWORK NAME/IDENTIFIER: Existing primary and branch road roads, or operational road networks following UMS-1 and have No Access Restrictions:

Primary and Branch Roads

Aerobus
April North Road
April/Puzzle
Blindfold Road
Burden Lake Road
Butterfly Road
Campfire Road
Carter Road
Conifer
Cumby Road
Ester Lake Road
Evening Road
Evening Road Branch 1
Farewell Bay Road
Farewell Bay Road Br. 1
Fly
Glon Road
Gould Road
Hector Creek Road
Jack Lake Road
Jackpine Road
Km36 Road
KM 53 Road
Little Clay
Lobstick
Longlegged
Loon Lake Road
Lount
Maybrun (up to km 14.5)
McIntosh
North Fleet Road
Ord Lake Road
Paul Road
Placid Road
Randy Road
Red Bluff Br. Road
Red Bluff Road
Ryan Road
Scotty
Scotty Road Br. 1
Scouter Road
Slush Road
South Pakwash
Stag Road
Stewart Road
Thadeus Road
Turbo Road
Wabigoon Road
West Narrows Road
White Tail Road
Wilcox Road
Windfall Raod

The roads and road networks for which this road supplementary documentation applies are listed in table FMP -18 and are illustrated on the Areas Selected for Operations Maps and the Existing Road Inventory geospatial data MU490_12ERU00.E00 - Existing Road Use Management Strategy.

1. Proposed Use Management Strategy

(a) Maintenance provisions:

These roads and each associated right-of-way will receive maintenance, which will be carried out as required to maintain the road for forest management purposes (e.g. harvest, renewal, tending, transportation and hauling activities). These roads will be maintained to minimize risk to road users and minimize the potential for environmental damage. Routine maintenance operations may include any one or combination of the following: summer grading, ditching, drainage, brush clearing with mechanical or chemical methods (e.g. application of chemical herbicides for vegetation control along road shoulders), gravelling, re-shaping of road bed, dust control measures, signage, snow plowing, sanding/salting and clearing existing right-of-ways including

the harvest of merchantable trees as required. Maintenance may also include non-emergency repairs of existing water crossings to clean culverts, remove blockages caused by beavers, and to apply material (e.g. gravel, riprap) to mitigate or enhance long-term erosion protection around water crossings.

For safety/engineering concerns minor road re-alignment and bypass construction may also be required during the implementation of the FMP. This is permitted within the existing right-of-way, subject to the confirmation of values and the application of all applicable AOCs to the proposed work area. If an appropriate AOC does not exist in the FMP note that it will need to be amended into the FMP and then applied. In cases where new and/or replacement water crossings are required during the implementation of the FMP, the replacement of culverts are permitted subject to the following conditions; the values must be reviewed and updated for each location to ensure up-to-date values are considered, the applicable AOC must be applied to address any value impacted at the location (if an appropriate AOC does not exist in the FMP note that it will need to be amended into the FMP and then applied), and the planned water crossing replacements are identified and approved (with all applicable conditions on the construction, including preventative and mitigative measures) in the AWS for the year of construction company.

Emergency maintenance is defined as “road maintenance that required immediate attention to restore access and reduce the chance of personal injury, damage to equipment, inconvenience to road users and further road damage” (2009 FMPM). Emergency maintenance will be necessary where public safety and/or environmental damage have occurred unexpectedly. Emergency repairs can proceed immediately without MNR approval provided the emergency works are limited in scope to only what is necessary to address essential public safety concerns and restrict further environmental damage. All emergency actions will be reported to MNR as soon as practical and any further actions (e.g. restoration, reconstruction, abandonment) will be subject to normal planning approvals. Where sediment has been released into a watercourse, the Ministry of the Environment is to be informed.

Where water crossings have been adversely impacted by unplanned events, water crossings may not be restored in a timely manner and remedial work may be limited to only eliminating or reducing safety hazards and/or interim measures to stop environmental damage. Access to areas impacted by unplanned events could be disrupted at any time and there is no obligation on the Crown or the Forest Industry to undertake repair work to restore infrastructure and access. However, all actions must be consistent with the Use Management Strategy for the road/road network. Situations could also arise where it is determined that a damaged/deteriorating infrastructure is unsafe and continued use must be prohibited until a permanent solution is implemented.

(b) Monitoring Provisions

While the road/road network is in use for forest management purposes (e.g. harvest, renewal, tending, transportation and hauling activities), it will be monitored on an ongoing basis for safety or environmental concerns. Bridges used for ‘heavy truck hauls’ inspected at least once a year by a competent person (following the inspection guidelines in Appendix E of the Crown Land Bridge Management Guidelines or by a professional engineer). When the road/road network is not in use for forest management purposes, monitoring will be based on a yearly schedule of specific roads to be inspected. This yearly schedule will be based upon a risk assessment approach with emphasis on the potential values which could be impacted (i.e. fish habitat) and the potential for public safety concerns and, at a minimum, these roads (including bridges open to public travel) will be inspected at least once every three years. Monitoring may occur as part of

aerial assessments of reforestation (e.g. FTG surveys). In addition, all staff and contractors (harvest, renewal and tending contractors) are to report any existing or potential concerns regarding the road/road network and water crossings encountered while travelling on roads throughout the forest. Reports from the general public and other user groups will also contribute to the monitoring of the condition of the roads and water crossings. Additional monitoring will be considered based upon a risk assessment approach following severe weather conditions (e.g. heavy rainfall).

c) Access provisions or restrictions which apply to the public and commercial resource users with the rationale for the restrictions:

- none

d) a statement if the intent of the sustainable forest licence is to transfer the responsibility for the road or road network to MNR in the next 20 years, and the operating year or 5-year term in which the transfer is intended to occur:

- There is no intent to transfer at this time.

e) where the sustainable forest licensee has indicated an intent to transfer responsibility, MNR will provide a preliminary indication of the management intent for the road or road network:

- There is no intent to transfer at this time.

f) where the sustainable forest licensee has indicated an intent to transfer responsibility during the five-year term and MNR's management intent is to not maintain the road for public use, the activities required prior to transfer, including potential removal of water crossings will be documented (e.g. decommissioning, signs):

- There is no intent to transfer at this time.

2. Summary of Public Comments:

- None received to-date.

3. Use Management Strategy:

- Refer to Part 1.

ROADS SUPPLEMENTARY DOCUMENTATION FORM

D. Existing Roads or Road Networks

ROAD OR ROAD NETWORK NAME/IDENTIFIER: Existing primary and branch road roads, or operational road networks following UMS-2 with existing access restrictions:

Primary and Branch Roads
Aesthetic Road
Lennan Road
Mac Lake Road
Sydney Lake Road
Tide Road
Unexpected Road

The roads and road networks for which this road supplementary documentation applies are listed in table FMP -18 along with the access control type and are illustrated on the Areas Selected for Operations Maps.

1. Proposed Use Management Strategy

a) Maintenance Provisions

These roads and each associated right-of-way will receive maintenance, which will be carried out as required to maintain the road for forest management purposes (e.g. harvest, renewal, tending, transportation and hauling activities). These roads will be maintained to minimize risk to road users and minimize the potential for environmental damage. Routine maintenance operations may include any one or combination of the following: summer grading, ditching, drainage, brush clearing with mechanical or chemical methods (e.g. application of chemical herbicides for vegetation control along road shoulders), gravelling, re-shaping of road bed, dust control measures, signage, snow plowing, sanding/salting and clearing existing right-of-ways including the harvest of merchantable trees as required. Maintenance may also include non-emergency repairs of existing water crossings to clean culverts, remove blockages caused by beavers, and to apply material (e.g. gravel, riprap) to mitigate or enhance long-term erosion protection around water crossings.

For safety/engineering concerns minor road re-alignment and bypass construction may also be required for existing roads during the implementation of the FMP. This is permitted within the existing right-of-way, subject to the confirmation of values and the application of all applicable AOCs to the proposed work area. If an appropriate AOC does not exist in the FMP note that it will need to be amended into the FMP and then applied. In cases where new and/or replacement water crossings are required during the implementation of the FMP, the replacement of culverts are permitted subject to the following conditions; the values must be reviewed and updated for each location to ensure up-to-date values are considered, the applicable AOC must be applied to address any value impacted at the location (if an appropriate AOC does not exist in the FMP note that it will need to be amended into the FMP and then applied), and the planned water crossing replacements are identified and approved (with all applicable conditions on the construction, including preventative and mitigative measures) in the AWS for the year of construction.

Emergency maintenance is defined as “road maintenance that requires immediate attention to restore access and reduce the chance of personal injury, damage to equipment, inconvenience to road users and further road damage” (2009 FMPM). Emergency maintenance will be necessary

where public safety and/or environmental damage have occurred unexpectedly. Emergency repairs can proceed immediately without MNR approval provided the emergency works are limited in scope to only what is necessary to address essential public safety concerns and restrict further environmental damage. All emergency actions will be reported to MNR as soon as practical and any further actions (e.g. restoration, reconstruction, abandonment) will be subject to normal planning approvals. Where sediment has been released into a watercourse, the Ministry of the Environment is to be informed.

Where water crossings have been adversely impacted by unplanned events, water crossings may not be restored in a timely manner and remedial work may be limited to only eliminating or reducing safety hazards and/or interim measures to stop environmental damage. Access to areas impacted by unplanned events could be disrupted at any time and there is no obligation on the Crown or the Forest Industry to undertake repair work to restore infrastructure and access. However, all actions must be consistent with the Use Management Strategy for the road/road network. Situations could also arise where it is determined that a damaged/deteriorating infrastructure is unsafe and continued use must be prohibited until a permanent solution is implemented. However, all actions must be consistent with the UMS for the road / road network. Situations could also arise where it is determined that damaged/deteriorating infrastructure is unsafe and continued use must be prohibited until a permanent solution is implemented.

Note that maintenance activities may be minimal as these operational roads are not intended for long term use. There is no expressed or implied commitment to maintain the entire existing road network for continuous general public access. There is no obligation on the Crown or the forest industry to undertake repair work to restore infrastructure and access beyond the requirements of forest management operations and/or terms of the use management strategy for the road.

b) Monitoring Provisions

While the road/road network is in use for forest management purposes (e.g. harvest, renewal, tending, transportation and hauling activities), it will be monitored on an ongoing basis for safety or environmental concerns. Bridges used for ‘heavy truck hauls’ inspected at least once a year by a competent person (following the inspection guidelines in Appendix E of the Crown Land Bridge Management Guidelines or by a professional engineer). When the road/road network is not in use for forest management purposes, monitoring will be based on a yearly schedule of specific roads to be inspected. This yearly schedule will be based upon a risk assessment approach with emphasis on the potential values which could be impacted (i.e. fish habitat) and the potential for public safety concerns and, at a minimum, these roads (including bridges open to public travel) will be inspected at least once every three years. Monitoring may occur as part of aerial assessments of reforestation (e.g. FTG surveys). In addition, all staff and contractors (harvest, renewal and tending contractors) are to report any existing or potential concerns regarding the road/road network and water crossings encountered while travelling on roads throughout the forest. Reports from the general public and other user groups will also contribute to the monitoring of the condition of the roads and water crossings. Additional monitoring will be considered based upon a risk assessment approach following severe weather conditions (e.g. heavy rainfall).

c) Access provisions or restrictions which apply to the public and commercial resource users with the rationale for the restrictions:

The following is an overview of the use management strategies for the Aesthetic, Lennan, Mac Lake, Sydney Lake, Tide and Unexpected Roads, and associated operational road networks:

- All roads will continue to be managed as closed or restricted travel roads under the *Public Lands Act* (Section 52).
- The road closure will be year round closures.
- Guidelines for issuing travel permits have been prepared for each road and will be administered by the Kenora District office.
- First Nations use of the above closed road systems will be a permitted activity and has been included in the above guidelines for issuing travel permits.

These road systems, as well as the branch and operational roads coming off of them, have restricted travel conditions to protect remote tourism and lake trout values. The travel restrictions for these roads have been in place for several FMP's:

Aesthetic Road: PLA sign
Lennan Road: PLA sign
Sydney Lake Road: PLA sign
Tide Road: PLA sign
Unexpected: PLA sign

The Mac Lake Road is travel restricted due to an MTO gate.

d) a statement if the intent of the sustainable forest licence is to transfer the responsibility for the road or road network to MNR in the next 20 years, and the operating year or 5-year term in which the transfer is intended to occur:

- N/A

e) where the sustainable forest licensee has indicated an intent to transfer responsibility, MNR will provide a preliminary indication of the management intent for the road or road network:

- N/A

f) where the sustainable forest licensee has indicated an intent to transfer responsibility during the five-year term and MNR's management intent is to not maintain the road for public use, the activities required prior to transfer, including potential removal of water crossings will be documented (e.g. decommissioning, signs):

- N/A

2. Summary of Public Comments:

- None received to-date.

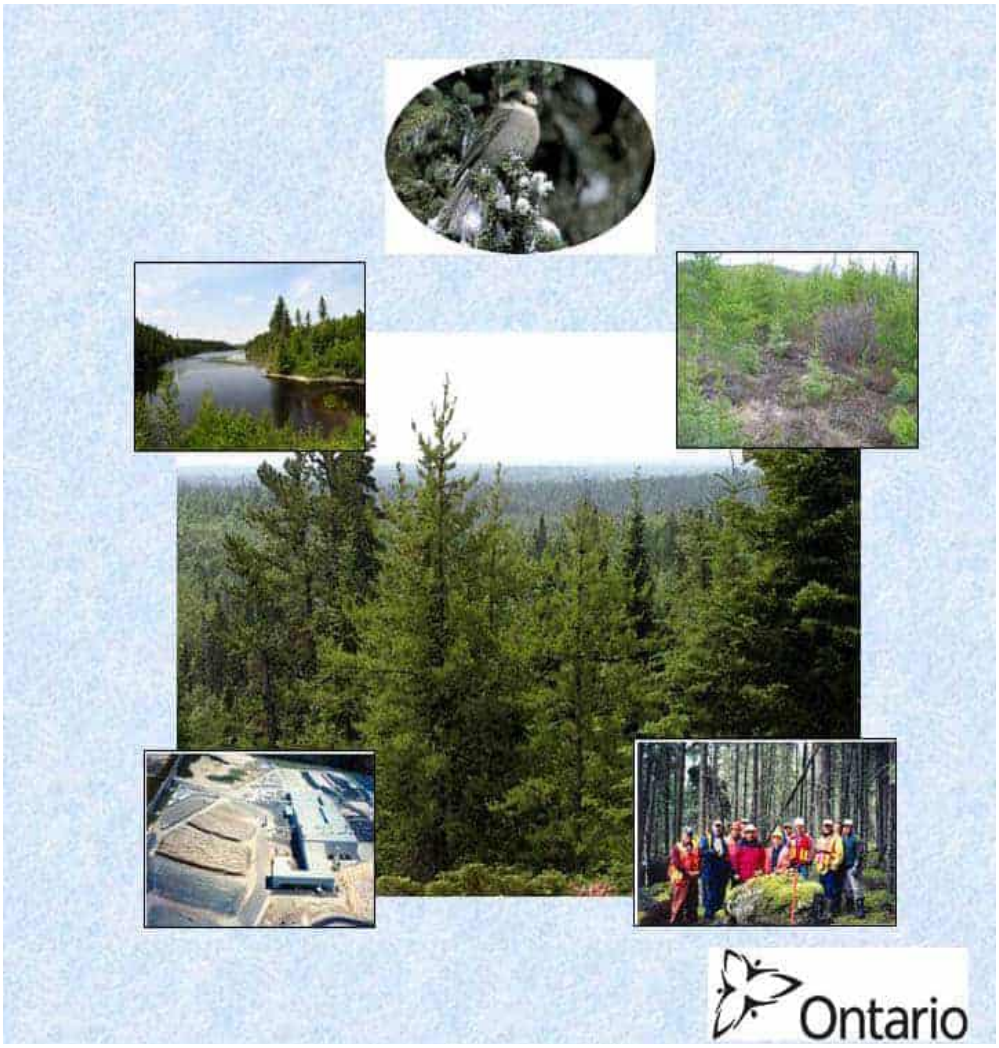
3. Use Management Strategy:

- Refer to Part 1.

Supplementary Documentation H

2012-2022 Whiskey Jack Forest Management Plan

Area of Concern (AOC) Planning Documentation



Management Unit Name: Whiskey Jack Forest
Plan Period: April 1, 2012 to March 31, 2022

Listing of Codes for Areas of Concern

(not all AOCs require supplementary documentation)

A01	Archaeological Potential Area
D01	Occupied black bear dens
D02	Occupied grey fox dens
D03	Occupied cougar dens
D04	Wolf dens
D05	Wolverine dens
M01	Mineral licks
N01	Bald eagle - primary nests - Identified Prior to Operations
N02	Bald eagle - alternate nests
N03	Bald eagle - inactive nests
N04	Bald Eagle Primary Nest - Discovered During Operations
ON01	Osprey - primary nests - Identified Prior to Operations
ON02	Osprey - alternate nests
ON03	Osprey - inactive nests
ON04	Primary Osprey Nest - Discovered During Operations
BH01	Active Great Blue Heron colonies
BH02	Inactive Great Blue Heron colonies
BG01	Active colonies of Bonaparte's gull
BS01	Active large colonies of bank swallows (≥100 pairs)
BS02	Barn Swallow Nests
HO01	Primary nests of great grey owl, northern goshawk, or red-shouldered hawk
HO02	Alternate nests of great grey owl, northern goshawk, or red-shouldered hawk
NO01	Stick nests occupied by barred owl, broad-winged hawk, common raven, Cooper's hawk, great horned owl, long-eared owl, merlin, red-tailed hawk, or sharp-shinned hawk.
NO02	Nests/ communal roosts in cavities occupied by American kestrel, barred owl, boreal owl, eastern screech-owl, great horned owl, northern hawk owl, northern saw-whet owl or chimney swift.
NO03	Ground nests occupied by northern harrier, short-eared owl, or turkey vulture
NO04	Whip-poor-will nest sites
NO05	Common nighthawk nest sites
NO06	Olive-sided flycatcher nest sites
NO07	Canada warbler nest sites
NO08	**Bat Hibernacula** known to be suitable and to have been used at least once within the past 20 years by ≥ 50 **Little Brown Myotis** (Little Brown Bats) or ≥ 20 **Northern Myotis** (Northern long-eared bats)
PGP01	FESC PGP G&Y Trial Plot
PL01	Patent Land
RR01	Railroad Right of Way
NG01	Natural Gas Transmission Pipeline
HB01	Highway Corridor Aesthetics
LS01	Tourism – Lac Seul Shoreline (Remoteness, aesthetics, fisheries, water quality, cultural heritage)
TV01	Tourism – Aesthetics Along Large High Volume Tourism Lakes, recognized canoe routes, recreational lakes
TVgl	Tourism- Gibi Lake
TVnsl	Tourism- North Star Lodge
TVw	Tourism – timing restriction
TVwl	Tourism – Wine Lake
TVal	Tourism – Aerobus Lake
TVer	Tourism – English River Waterway Park
TVp	Tourism - portage
TVc	Tourism - campsite
WL01	Large lakes, Medium lakes, Small lakes, Ponds - high or moderate potential sensitivity (HPS or MPS) to forest management operations
WL02	Ponds – low potential sensitivity (LPS) to forest management operations
WS01	Rivers, Stream segments -high or moderate potential sensitivity (HPS or MPS) to forest management operations
WS02	Stream segments -low potential sensitivity (LPS) to forest management operations
WW01	Wetlands occupied by breeding black terns, golden-winged warblers, least bitterns, or yellow rails
WW02	Woodland pools known to support flooded jellyskin
FL01	First Nation Reserve Land
NE9	Trumpeter Swan Nesting Site
NE10	Snapping Turtle Nesting Site

This supplementary documentation is organized into five parts for each individual or group Area of Concern:

A: Area of Concern Description
B: Operational Prescription
C: Conditions on Operational Roads
D: Primary and Branch Road Crossings
E: Monitoring Program

A: Area of Concern Description

1. Area of Concern (AOC) Identifier: D05

2. Description of Natural Resource Feature, Land Use or Value:

(a) Description of natural resource feature (s), land use(s) or value(s)
- Wolverine Den.

(b) Dimensions of area of concern:
- 4 km radius AOC centered on the den entrance.

B: Operational Prescription

1. Environmental Analysis of Alternative Operational Prescriptions

(a) **Alternative identifier/number: 1**

(b) Description of proposed operational prescription:

- 4 km radius AOC centered on the den entrance.
- No harvest, renewal and tending operations permitted within the AOC.
- If a wolverine den is encountered during operations all operations will stop within a 4km radius AOC and the Kenora District Office MNR will be immediately notified of the presence of a wolverine den in proximity to forest operations.
- No further harvest, renewal or tending activities are permitted within the AOC.
- The FMP may be amended following the above by developing a new AOC in consultation with MNR biologists that includes a den site management plan for the specific location and in consideration of the following:
  - The specific dimensions of the wolverine den AOC;
  - Normally harvest, renewal and tending operations will be prohibited in the AOC, however, some operations may be permitted to meet ecological, social or economic objectives. Where operations will be permitted the AOC will outline the extent and timing of any harvest, renewal and tending operations;
  - Denning generally occurs between February and May when snow depth is usually at its greatest.
- Reasonable efforts will be made to incorporate the AOC into a large block of unharvested and unroaded forest (ie. marten core or caribou block).

(c) Environmental Analysis:

(i) Potential effects: This prescription provides protection for wolverine dens by utilizing a reserve area and prohibiting continued forestry operations near the den.

(ii) Advantages/disadvantages: The prescription protects wolverine dens while permitting some level of forest operations on the forest management unit. There are no known disadvantages to den sites by applying this prescription.

2. Proposed Operational Prescription

(a) Description: **Same as Alternative 1.**

(b) Rationale: Only 1 alternative has been proposed in order to follow *the Forest Management Guide for Conserving Biodiversity at the Stand and Site Guide Scales* while documenting the option to amend the plan at a further date if a specific wolverine den site is located.

Wolverines have low reproductive potential and are sensitive to human disturbance, especially with respect to den site selection. Natal and maternal dens are selected, in part, to avoid humans and predators during the denning and kit-rearing periods. Human contact may cause females to abandon den sites; dens are typically located a considerable distance from roads and human infrastructure. The operational prescription for this AOC is based on all of these premises.

(c) Exception: No

3. Summary of Public Comments

None.

4. Selected Prescription

See Alternative 1.

C: Conditions on Operational Roads

No operational roads allowed in AOC. AOC supplementary documentation is not required for Conditions on Operational Roads.

D: Primary or Branch Road Crossing

No primary or branch roads proposed.

E: Monitoring Program

Not applicable.

This supplementary documentation is organized into five parts for each individual or group Area of Concern:

A: Area of Concern Description
B: Operational Prescription
C: Conditions on Operational Roads
D: Primary and Branch Road Crossings
E: Monitoring Program

A: Area of Concern Description

1. Area of Concern (AOC) Identifier: NO04

2. Description of Natural Resource Feature, Land Use or Value:

(a) Description of natural resource feature (s), land use(s) or value(s)
- Whip-poor-will nesting site.

(b) Dimensions of area of concern:
- 200 m radius AOC centered on nesting site. The critical breeding period for whip-poor-will is May 1st to August 14th.

B: Operational Prescription

1. Environmental Analysis of Alternative Operational Prescriptions

(a) Alternative identifier/number: 1

(b) Description of proposed operational prescription:

When the habitat description under the ESA becomes available these conditions may be updated prior to plan approval if this is necessary to address the habitat description. If the habitat description becomes available after final plan approval, a plan amendment for this AOC may be submitted if necessary to address the habitat description.

• 200 m radius AOC centred on nesting sites identified in NRVIS or encountered by field operations. Upon discovery of a whip-poor-will nesting site, the local MNR biologist will be notified so that they can confirm the species using the nesting site.
• The critical breeding period for Whip-poor-will is May 1st to August 14th.
• The following operational prescription will be followed:
  - No forest harvest operations permitted within 200 m from the nesting site.
  - Site preparation, renewal and tending operations of previously harvested areas within the AOC are only permitted outside of the critical breeding period (August 15th to April 30th).
  - Residual pattern, wildlife trees and downed woody material will be retained as prescribed in the FMP text Section 4.2.2.2.

(c) Environmental Analysis:

i) Potential effects: There is the potential to impact the nesting site through operations occurring in the area, prior to the discovery of the nesting site.
ii) Advantages of the alternative operational prescription: The prescription provides protection for known nesting sites, as well as nesting sites discovered during operations.
iii) Disadvantages of the alternative operational prescription: There are no disadvantages to applying this prescription.

2. Proposed Operational Prescription

(a) Description: Same as Alternative 1.

(b) Rationale: Whip-poor-will is designated as a threatened species under the Endangered Species Act (ESA). This prescription was developed to address habitat protection for this species as there is currently

no guideline or habitat description available for Whip-poor-will. The prescription was developed through consultation with the MNR Species at Risk (SAR) biologist based on the best available knowledge at this time. Whip-poor-will is a territorial bird that exhibits high site fidelity. While they are known to forage up to 500 metres from a nesting territory, their typical home range is confined to 400 metres and within this area they defended a smaller territory from 3 to 11 hectares (average 5). They require a landscape that provides both forest canopy for nesting and open areas for feeding. In a managed forest setting harvest is required to maintain long term habitat supply. One study found that densities of Whip-poor-will were twice as high in areas where open clear-cut habitats were immediately available in the landscape as compared to mature forest only and further that Whip-poor-will rarely ranged more than 200 metres from adjacent forest edge. Given these habitat requirements, the MNR SAR biologist has recommended that a 200 metre AOC be considered in forest management until such time that a habitat description in support of the ESA is available. Whip-poor-will does not create a nest as it lays its eggs on leaf matter. The male whip-poor-will investigates intruders near-by "hovering in place with its body nearly vertical and its tail spread wide to show off the broad white tips of the tail feathers". This makes finding the nesting site very difficult. As a result, the prescription has added the statement that the local MNR biologist or SAR biologist will be notified so that they can confirm the location of the nesting site and species using the nesting site. When the habitat description under the ESA becomes available this prescription may be updated via a plan amendment if necessary to address the ESA habitat description. The critical breeding period for whip-poor-will is May 1st to August 14th, therefore existing forestry related land use activities adjacent to the nesting area is restricted at this time. These include conditions on aggregate extraction and road use.

(c) Exception: No.

3. Summary of Public Comments

None.

4. Selected Prescription

Alternative 1.

C: Conditions on Operational Roads

AOC supplementary documentation is not required for Conditions on Operational Roads.
Refer to AOC NO04 in Table FMP-19.

D: Primary or Branch Road Crossing

No primary or branch roads proposed.

E: Monitoring Program

Not applicable.

This supplementary documentation is organized into five parts for each individual or group Area of Concern:

A: Area of Concern Description
B: Operational Prescription
C: Conditions on Operational Roads
D: Primary and Branch Road Crossings
E: Monitoring Program

A: Area of Concern Description

1. Area of Concern (AOC) Identifier: NO05

2. Description of Natural Resource Feature, Land Use or Value:

(a) Description of natural resource feature (s), land use(s) or value(s)
- Common Nighthawk nesting site.

(b) Dimensions of area of concern:

- 200 m radius AOC centered on nesting site.

B: Operational Prescription

1. Environmental Analysis of Alternative Operational Prescriptions

(a) Alternative identifier/number: 1

(b) Description of proposed operational prescription:

When the habitat description under the ESA becomes available these conditions may be updated prior to plan approval if this is necessary to address the habitat description. If the habitat description becomes available after final plan approval, a plan amendment for this AOC may be submitted if necessary to address the habitat description.

• 200 m radius AOC centered on nesting sites identified in NRVIS or encountered by field operations. Upon discovery of a common nighthawk nesting site, the local MNR biologist will be notified so that they can confirm the species using the nesting site.
• The critical breeding period for Common Nighthawk is May 15th to August 15th.
• The following operational prescription will be followed:
  - No forest harvest operations permitted within 200 m from the nesting site.
  - Site preparation, renewal and tending operations of previously harvested areas within the AOC are only permitted outside of the critical breeding period (August 16th to May 14th).
  - Residual pattern, wildlife trees and downed woody material will be retained as prescribed in the FMP text Section 4.2.2.2.

(c) Environmental Analysis:

i) Potential effects: There is the potential to impact the nesting site through operations occurring in the area, prior to the discovery of the nesting site.
ii) Advantages of the alternative operational prescription: The prescription provides protection for known nesting sites, as well as nesting sites discovered during operations.
iii) Disadvantages of the alternative operational prescription: There are no disadvantages to applying this prescription.

2. Proposed Operational Prescription

(a) Description: Same as Alternative 1.

(b) Rationale: Common Nighthawk is designated as a special concern species under the Endangered Species Act (ESA). This prescription was developed to address habitat protection for this species as

there is currently no guideline or habitat description available for Common Nighthawk. The prescription was developed through consultation with the MNR Species at Risk (SAR) biologist based on the best available knowledge at this time. Finding common nighthawk nesting sites can be difficult. As a result, the prescription has added the statement that the local MNR biologist or SAR biologist will be notified so that they can confirm the location of the nesting site and species using the nesting site. When the habitat description under the ESA becomes available this prescription may be updated via a plan amendment if necessary to address the ESA habitat description. The critical breeding period for common nighthawk is May 15th to August 15th, therefore existing forestry related land use activities adjacent to the nesting area is restricted at this time. These include conditions on aggregate extraction and road use.

(c) Exception: No.

3. Summary of Public Comments

None.

4. Selected Prescription

Alternative 1.

C: Conditions on Operational Roads

AOC supplementary documentation is not required for Conditions on Operational Roads.
Refer to AOC NO05 in Table FMP-19.

D: Primary or Branch Road Crossing

No primary or branch roads proposed.

E: Monitoring Program

Not applicable.

This supplementary documentation is organized into five parts for each individual or group Area of Concern:

A: Area of Concern Description
B: Operational Prescription
C: Conditions on Operational Roads
D: Primary and Branch Road Crossings
E: Monitoring Program

A: Area of Concern Description

1. Area of Concern (AOC) Identifier: NO06

2. Description of Natural Resource Feature, Land Use or Value:

(a) Description of natural resource feature (s), land use(s) or value(s)
- Olive-sided flycatcher nesting site.

(b) Dimensions of area of concern:

- 100 m radius AOC centered on nesting site.

B: Operational Prescription

1. Environmental Analysis of Alternative Operational Prescriptions

(a) Alternative identifier/number: 1

(b) Description of proposed operational prescription:

When the habitat description under the ESA becomes available these conditions may be updated prior to plan approval if this is necessary to address the habitat description. If the habitat description becomes available after final plan approval, a plan amendment for this AOC may be submitted if necessary to address the habitat description.

• 100 m radius AOC centered on nesting sites identified in NRVIS or encountered by field operations. Upon discovery of an olive-sided flycatcher nesting site, the local MNR biologist will be notified so that they can confirm the species using the nesting site.
• The critical breeding period for olive-sided flycatcher is May 1st to August 31st.
• The following operational prescription will be followed:
  - No forest harvest operations permitted within 100 m from the nesting site.
  - Site preparation, renewal and tending operations of previously harvested areas within the AOC are only permitted outside of the critical breeding period (September 1st to April 30th).
  - Residual pattern, wildlife trees and downed woody material will be retained as prescribed in the FMP text Section 4.2.2.2.

(c) Environmental Analysis:

i) Potential effects: There is the potential to impact the nesting site through operations occurring in the area, prior to the discovery of the nesting site.
ii) Advantages of the alternative operational prescription: The prescription provides protection for known nesting sites, as well as nesting sites discovered during operations.
iii) Disadvantages of the alternative operational prescription: There are no disadvantages to applying this prescription.

2. Proposed Operational Prescription

(a) Description: Same as Alternative 1.

(b) Rationale: Olive-sided flycatcher is designated as a special concern species under the Endangered Species Act (ESA) and threatened under the Species At Risk Act (SARA). This prescription was developed to address habitat protection for this species as there is currently no guideline or habitat description available for Olive-sided flycatcher. The prescription was developed through consultation with the MNR Species at Risk (SAR) biologist based on the best available knowledge at this time. Finding olive-sided flycatcher nesting sites can be difficult. As a result, the prescription has added the statement that the local MNR biologist or SAR biologist will be notified so that they can confirm the location of the nesting site and species using the nesting site. When the habitat description under the ESA becomes available this prescription may be updated via a plan amendment if necessary to address the ESA habitat description. The critical breeding period for olive sided flycatcher is May 1st to August 31st, therefore existing forestry related land use activities adjacent to the nesting area is restricted at this time. These include conditions on aggregate extraction and road use.

(c) Exception: No.

3. Summary of Public Comments

None.

4. Selected Prescription

Alternative 1.

C: Conditions on Operational Roads

AOC supplementary documentation is not required for Conditions on Operational Roads.
Refer to AOC NO06 in Table FMP-19.

D: Primary or Branch Road Crossing

No primary or branch roads proposed.

E: Monitoring Program

Not applicable.

This supplementary documentation is organized into five parts for each individual or group Area of Concern:

A: Area of Concern Description
B: Operational Prescription
C: Conditions on Operational Roads
D: Primary and Branch Road Crossings
E: Monitoring Program

A: Area of Concern Description

1. Area of Concern (AOC) Identifier: NO07

2. Description of Natural Resource Feature, Land Use or Value:

(a) Description of natural resource feature (s), land use(s) or value(s)
- Canada warbler nesting site.

(b) Dimensions of area of concern:

- 100 m radius AOC centered on nesting site.

B: Operational Prescription

1. Environmental Analysis of Alternative Operational Prescriptions

(a) Alternative identifier/number: 1

(b) Description of proposed operational prescription:

When the habitat description under the ESA becomes available these conditions may be updated prior to plan approval if this is necessary to address the habitat description. If the habitat description becomes available after final plan approval, a plan amendment for this AOC may be submitted if necessary to address the habitat description.

• 100 m radius AOC centered on nesting sites identified in NRVIS or encountered by field operations. Upon discovery of a Canada warbler nesting site, the local MNR biologist will be notified so that they can confirm the species using the nesting site.
• The critical breeding period for Canada warbler is May 15th to August 15th.
• The following operational prescription will be followed:
  - No forest harvest operations permitted within 100 m from the nesting site.
  - Site preparation, renewal and tending operations of previously harvested areas within the AOC are only permitted outside of the critical breeding period (August 16th to May 14th).
  - Residual pattern, wildlife trees and downed woody material will be retained as prescribed in the FMP text Section 4.2.2.2.

(c) Environmental Analysis:

i) Potential effects: There is the potential to impact the nesting site through operations occurring in the area, prior to the discovery of the nesting site.
ii) Advantages of the alternative operational prescription: The prescription provides protection for known nesting sites, as well as nesting sites discovered during operations.
iii) Disadvantages of the alternative operational prescription: There are no disadvantages to applying this prescription.

2. Proposed Operational Prescription

(a) Description: Same as Alternative 1.

(b) Rationale: Canada warbler is designated as a special concern species under the Endangered Species Act (ESA). This prescription was developed to address habitat protection for this species as there is currently no guideline or habitat description available for Canada warbler. The prescription was developed through consultation with the MNR Species at Risk (SAR) biologist based on the best available knowledge at this time. Finding Canada warbler nesting sites can be difficult. As a result, the prescription has added the statement that the local MNR biologist or SAR biologist will be notified so that they can confirm the location of the nesting site and species using the nesting site. When the habitat description under the ESA becomes available this prescription may be updated via a plan amendment if necessary to address the ESA habitat description. As Canada warbler are some of the last song birds to arrive in the spring and first to leave in late summer, the critical breeding period for Canada warbler has been defined as May 15th to August 15th. Existing forestry related land use activities adjacent to the nesting area is restricted at this time. These include conditions on aggregate extraction and road use.

(c) Exception: No.

3. Summary of Public Comments

None.

4. Selected Prescription

Alternative 1.

C: Conditions on Operational Roads

AOC supplementary documentation is not required for Conditions on Operational Roads.
Refer to AOC NO07 in Table FMP-19.

D: Primary or Branch Road Crossing

No primary or branch roads proposed.

E: Monitoring Program

Not applicable.

This supplementary documentation is organized into five parts for each individual or group Area of Concern:

A: Area of Concern Description
B: Operational Prescription
C: Conditions on Operational Roads
D: Primary and Branch Road Crossings
E: Monitoring Program

A: Area of Concern Description

1. Area of Concern (AOC) Identifier: PGP01

2. Description of Natural Resource Feature, Land Use or Value:

(a) Description of natural resource feature (s), land use(s) or value(s)
Provincial Forest Growth & Yield Research Plots: Permanent Growth Plot (PGP)

A PGP is a 400m2 circular plot, 11.28m in radius.

Historic PGPs (i.e. Beckwith & Roebellen, Andison) may be rectangular in nature.

(b) Dimensions of area of concern:
Circular plot:
75m radius measured from the PGP centre, squared off such that the final AOC is 150m by 150m

OR

75m radius measured from the PGP centre

Rectangular plot:
65m measured from each boundary (side) of the PGP

B: Operational Prescription

1. Environmental Analysis of Alternative Operational Prescriptions

(a) **Alternative identifier/number: 1**

(b) Description of proposed operational prescription:

Circular plot:

No harvest, renewal or tending within a 75m radius measured from the PGP centre, squared off such that the final reserve is 150m by 150m (2.25ha). As required of FMP-19 adjust the AOC boundary to follow the edge of the road right-of-way if a road is permitted outside of the 75m radius from the plot centre yet within the squared off AOC boundary (i.e. do not extend the AOC to include area on the opposite side of the road to the PGP centre).

OR

No harvest, renewal or tending within a 75m radius measured from the PGP centre (1.77ha)

Rectangular plot:

No harvest, renewal or tending 65m from each boundary (side) of the PGP.

A separate AOC must be developed and approved for any harvest, renewal or tending activities within a PGP AOC.

- The Growth & Yield Program may permit some forest management activities within a PGP AOC, such as partial harvest, renewal or tending operations, in order to monitor the impact of these activities. Discussions with the MNR Regional Growth & Yield Specialist will determine where and when this may occur. Permission to carry out such activities must be documented in writing by the Regional Growth & Yield Specialist and will be used for a separate AOC prescription to be developed and approved.
- If the following forest management activities are planned in the area adjacent to a PGP AOC, contact the MNR Regional Growth & Yield Specialist for consideration of these activities in a PGP AOC:
  1) selection or shelterwood harvest,
  2) commercial thinning harvest, or
  3) tending activities (e.g. herbicide application, pre-commercial thinning).
- Forest Ecosystem Science Co-operative (Forest Co-op) PGPs may also be considered for clearcut harvest if three measurements have been conducted on a plot. Discussions with the Forest Co-op and MNR Regional Growth & Yield Specialists will determine the status of a Forest Co-op PGP and any clearcut harvest treatment. Permission to clearcut harvest a Forest Co-op PGP must be documented in writing by the Regional Growth & Yield Specialist and will be used for a separate AOC prescription to be developed and approved.

(c) Environmental Analysis:

(i) identification of the potential environmental effects of specific forest management operations on the natural resource feature(s), land use(s) or value(s) in the area of concern:

Growth and yield is an empirical (i.e. based on data) branch of forest science that attempts to understand and predict the growth, composition and productivity of forest stands through time. This objective is accomplished through a consistent and continuous cycle of data collection, analysis and interpretation, and is most efficiently implemented through the use of long-term monitoring plots. An accurate and efficient method of determining growth and yield is with Permanent Sample Plots (PSPs) and Permanent Growth Plots (PGPs).

The Ontario Forest Growth and Yield Program establishes and monitors a network of PSPs and PGPs in managed and natural forests across the province. These plots have a broad ecosystem focus and serve as a benchmark network for provincial level information needs. Permanent plots serve a vital role in forest monitoring and modeling forests, as growth (including stand dynamics) can be estimated directly from repeated measurements of various ecosystem elements. To ensure the integrity of the permanent growth and yield plot network, the Forest Growth & Yield Program protects PGPs from vandalism, trespassing, logging and other types of human-caused damage.

(ii) assessment of the advantages and disadvantages of the alternative operational prescription in preventing, minimizing or mitigating those potential effects:

A harvest, renewal and tending reserve on the PGP will ensure that the existing structure and integrity of the plot at the stand and tree level is maintained. Maintaining the forested conditions around the plot provides a forest buffer that minimizes the potential effects of adjacent harvest, renewal or tending operations on the Permanent Growth Plot. Also, by providing an adequate buffer around the plot, blow down of trees in the buffer zone adjacent to the harvest area will have a minimal impact on the plot.

2. Proposed Operational Prescription

(a) Description: **Same as Alternative 1.**

(b) Rationale: The proposed operational prescription has been developed with input from the MNR Provincial Growth & Yield Program and the Forest Ecosystem Science

Co-operative Growth & Yield Science Unit. This AOC prescription utilizes the direction provided in the *OMNR Growth and Yield PSP and PGP Reference Manual 2009*, the *Forest Co-op Field Manual for the Location & Measurement of Permanent Growth Plots 2009*, and is recommended by the MNR Regional Growth and Yield Specialists. The proposed operational prescription will protect the investment of the MNR and Forest Co-op in the establishment and monitoring of provincial growth and yield permanent growth plots.

(c) Exception: N/A

C: Conditions on Operational Roads

AOC supplementary documentation is not required for Conditions on Operational Roads.
Refer to AOC PGP01 in Table FMP-19.

D: Primary or Branch Road Crossing

No primary or branch roads proposed.

E: Monitoring Program

Not applicable.

This supplementary documentation is organized into five parts for each individual or group Area of Concern:

A: Area of Concern Description
B: Operational Prescription
C: Conditions on Operational Roads
D: Primary and Branch Road Crossings
E: Monitoring Program

A: Area of Concern Description

1. Area of Concern (AOC) Identifier: PL01

2. Description of Natural Resource Feature, Land Use or Value:

(a) Description of natural resource feature (s), land use(s) or value(s)
- Patent land.

(b) Dimensions of area of concern:
- 30 m from the boundary of mapped patent/federal land adjacent to allocated harvest blocks.

B: Operational Prescription

1. Environmental Analysis of Alternative Operational Prescriptions

(a) **Alternative identifier/number: 1**

(b) Description of proposed operational prescription:

- AOC width is 30 metres from the boundary of mapped patent land adjacent to allocated harvest blocks.

  Harvest operations are permitted subject to the procedure below being implemented in the following order:

  1) If the property boundary had been previously established by a licenced surveyor and the boundary markers and monuments can be located then the harvest boundary will be established along the boundary markers and monuments. Regular harvest, renewal and tending operations are permitted in allocated blocks.
  2) If there is an agreement with the neighbouring landowner regarding the placement of the limit of forest operations then the harvest boundary will be placed according to the agreement. Regular harvest, renewal and tending operations are permitted in allocated blocks subject to this agreement.
  3) If neither 1) or 2) above apply, the harvest boundary will be established so that a buffer is put in between the mapped boundary and the harvest block. The size of the buffer will be no more than 30 metres wide, will be marked and will be determined by the forest operator's level of uncertainty regarding the true location of the property boundary. Regular harvest, renewal and tending operations are permitted outside of the marked reserve buffer.

(c) Environmental Analysis:

(iii) Potential effects: The prescription will protect the boundary of the private land by providing a buffer between the cutover and the property line, to ensure that no trespasses onto private land occur. The prescription will protect the value while also optimizing fibre extraction.

(iv) Advantages/disadvantages: Protects the property boundary. Provides a margin for error, and a moderate aesthetic buffer. Adjacent landowner may see some cutover areas behind the buffer.

2. Proposed Operational Prescription

(a) Description: **Same as Alternative 1.**

(b) Rationale: This prescription provides a reasonable buffer to ensure that no trespasses onto private land occur, while minimizing fibre loss to the forest industry.

(c) Exception: No

3. Summary of Public Comments

There were a no public comments received.

4. Selected Prescription

See Alternative 1.

C: Conditions on Operational Roads

AOC supplementary documentation is not required for Conditions on Operational Roads.
Refer to AOC PL01 in Table FMP-19.

D: Primary or Branch Road Crossing

No primary or branch roads proposed.

E: Monitoring Program

Not applicable.

This supplementary documentation is organized into five parts for each individual or group Area of Concern:

A: Area of Concern Description
B: Operational Prescription
C: Conditions on Operational Roads
D: Primary and Branch Road Crossings
E: Monitoring Program

A: Area of Concern Description

1. Area of Concern (AOC) Identifier: FL01

2. Description of Natural Resource Feature, Land Use or Value:

(a) Description of natural resource feature (s), land use(s) or value(s)
- First Nation Reserve (federal) land.

(b) Dimensions of area of concern:
- 30 m from the boundary of mapped First Nation Reserve land adjacent to allocated harvest blocks.

B: Operational Prescription

1. Environmental Analysis of Alternative Operational Prescriptions

(a) **Alternative identifier/number: 1**

(b) Description of proposed operational prescription:

- AOC width is 30 metres from the boundary of mapped First Nation Reserve land adjacent to allocated harvest blocks.

  Harvest operations are permitted subject to the procedure below being implemented in the following order:

  1) If the property boundary had been previously established by a licenced surveyor and the boundary markers and monuments can be located then the harvest boundary will be established along the boundary markers and monuments. Regular harvest, renewal and tending operations are permitted in allocated blocks.
  2) If there is an agreement with the First Nation Community regarding the placement of the limit of forest operations then the harvest boundary will be placed according to the agreement. Regular harvest, renewal and tending operations are permitted in allocated blocks subject to this agreement.
  3) If neither 1) or 2) above apply, the harvest boundary will be established so that a buffer is put in between the mapped boundary and the harvest block. The First Nation Reserve boundary will be checked against information provided by both MNR and INAC. The more restrictive of the two boundaries will be used if agreement cannot be reached as to the proper boundary location. The size of the buffer will be no more than 30 metres wide. Regular harvest, renewal and tending operations are permitted outside of the marked reserve buffer.

(c) Environmental Analysis:

(i) Potential effects: The prescription will protect the boundary of the federal land by providing a buffer between the cutover and the property line, to ensure that no trespasses onto federal land occur. The prescription will protect the value while also optimizing fibre extraction.

(ii) Advantages/disadvantages: Protects the property boundary. Provides a margin for error, and a moderate aesthetic buffer.

2. Proposed Operational Prescription

(a) Description: **Same as Alternative 1.**

(b) Rationale: This prescription provides a reasonable buffer to ensure that no trespasses onto federal land occur, while minimizing fibre loss to the forest industry.

(c) Exception: No

3. Summary of Public Comments

None received.

4. Selected Prescription

See Alternative 1.

C: Conditions on Operational Roads

AOC supplementary documentation is not required for Conditions on Operational Roads.
Refer to AOC FL01 in Table FMP-19.

D: Primary or Branch Road Crossing

No primary or branch roads proposed.

E: Monitoring Program

Not applicable.

This supplementary documentation is organized into five parts for each individual or group Area of Concern:

A: Area of Concern Description
B: Operational Prescription
C: Conditions on Operational Roads
D: Primary and Branch Road Crossings
E: Monitoring Program

A: Area of Concern Description

1. Area of Concern (AOC) Identifier: RR01

2. Description of Natural Resource Feature, Land Use or Value:

(a) Description of natural resource feature (s), land use(s) or value(s)
- Railroad Right of Way

(b) Dimensions of area of concern:
- AOC width is 50 metres from the railroad right of way.

B: Operational Prescription

1. Environmental Analysis of Alternative Operational Prescriptions

(a) Alternative identifier/number: 1

(b) Description of proposed operational prescription:

- Clear cut harvest to railway right of way within AOC, while leaving the 50 m AOC as a slash free zone. All forest management activities permitted; however slash piles or chipper debris piles are to be removed. No slash piles or chipper debris piles are allowed to remain in landing for more than one year.

(c) Environmental Analysis:

i) Potential effects: Reduction in fire hazard along railway right of ways.

ii) Advantages/disadvantages: Ensuring there is no slash within 50m of the railway right of way and allowing the area to regenerate to hardwoods will reduce potential fire hazard.

(a) Alternative identifier/number: 2

(b) Description of proposed operational prescription:

50 metre reserve from railway right of way.

(c) Environmental Analysis:
i) Potential effects: Increased fire hazard along railway from trees in reserve as they mature, die and fall over.
ii) Advantages/disadvantages: Reserved trees will reduce blowing and drifting snow on the railway in the winter. Retained trees will provide habitat that may cause more animals to browse and travel along the railway, leading to increased animal mortality through collisions with trains.

2. Proposed Operational Prescription

(a) Description: Same as Alternative 1.

(b) Rationale: The proposed prescription provides for the full recovery of merchantable timber and provides for a level of protection from railway caused fires.

(c) Exception: No.

3. Summary of Public Comments

None.

4. Selected Prescription

See Alternative 1.

C: Conditions on Operational Roads

AOC supplementary documentation is not required for Conditions on Operational Roads.
Refer to AOC RR01 in Table FMP-19.

Summary of Public Comments:

No comments received.

D: Primary or Branch Road Crossing

No primary or branch roads proposed.

E: Monitoring Program

Not applicable.

This supplementary documentation is organized into five parts for each individual or group Area of Concern:

A: Area of Concern Description
B: Operational Prescription
C: Conditions on Operational Roads
D: Primary and Branch Road Crossings
E: Monitoring Program

A: Area of Concern Description

1. Area of Concern (AOC) Identifier: NG01

2. Description of Natural Resource Feature, Land Use or Value:

(a) Description of natural resource feature (s), land use(s) or value(s)
- Natural Gas Transmission Pipeline

(b) Dimensions of area of concern:
- AOC width is 30 metres from the pipeline right-of-way.

B: Operational Prescription

1. Environmental Analysis of Alternative Operational Prescriptions

(a) **Alternative identifier/number: 1**

(b) Description of proposed operational prescription: 30 metre AOC from natural gas transmission pipeline right-of-way. All forest management activities are permitted; however a representative from TransCanada pipelines is required to be notified before operations begin. TransCanada Pipelines will mark the pipeline outside edge of right-of-way to ensure that the proper location is identified.

Contact Information:
TransCanada Pipelines:
Lakewood Area Pipeline Technician, Lakewood Area Manager
Office # 807-548-4241Office # 807- 548-6025
Cell # 807-466-7212Cell # 807-466-7330

(c) Environmental Analysis:

i) Potential effects: A reduction of the potential of unauthorized travel within the pipeline right-of-way.

ii) Advantages/disadvantages: Ensuring the pipeline right-of-way is properly marked will reduce the likelihood of damage or explosion of the pipeline due to forestry operations.

(a) **Alternative identifier/number: 2**

(b) Description of proposed operational prescription: 30 metre reserve from natural gas pipeline right of way.

(c) Environmental Analysis:

i) Potential effects: Increased fire hazard along right of way from trees in reserve as they mature, die and fall over.

ii) Advantages/disadvantages: Loss of merchantable timber.

2. **Proposed Operational Prescription**

(a) Description: **Same as Alternative 1.**

(b) Rationale: The proposed prescription provides for the full recovery of merchantable timber and provides for a level of protection from unauthorized travel within the pipeline right of way.

(c) Exception: No

3. Summary of Public Comments
None.

4. Selected Prescription
See Alternative 1.

C: Conditions on Operational Roads

AOC supplementary documentation is not required for Conditions on Operational Roads.
Refer to AOC NG01 in Table FMP-19.

Summary of Public Comments:
No comments received.

D: Primary or Branch Road Crossing

No primary or branch roads proposed.

E: Monitoring Program

Not applicable.

This supplementary documentation is organized into five parts for each individual or group Area of Concern:

A: Area of Concern Description
B: Operational Prescription
C: Conditions on Operational Roads
D: Primary and Branch Road Crossings
E: Monitoring Program

A: Area of Concern Description

1. Area of Concern (AOC) Identifier: HB01

2. Description of Natural Resource Feature, Land Use or Value:

(a) Description of natural resource feature (s), land use(s) or value(s)
- Highway corridor aesthetics.

(b) Dimensions of area of concern:
iii. 60 metre AOC from highway right-of way (as mapped).

B: Operational Prescription

1. Environmental Analysis of Alternative Operational Prescriptions

(a) **Alternative identifier/number: 1**

(b) Description of proposed operational prescription:

- Harvest operations are permitted in the AOC only when adjacent forest/cutover is a minimum of 2 metres tall.
- Regular renewal and tending operations as per SGRs are permitted.

(c) Environmental Analysis:

(i) Potential effects: Protection of viewscape as seen from the highway and prevention of blowing and drifting snow.

(ii) Advantages/disadvantages: Harvesting of timber using the methods described above permits recovery of the merchantable timber while retaining the aesthetics and functional aspects of the AOC buffer.

(a) **Alternative identifier/number: 2**

(b) Description of proposed operational prescription:
Clearcut harvest of 60-metre AOC to highway right of way.

(c) Environmental Analysis:

(i) Potential effects: Aesthetics from the highway will be less pleasing to the traveling public.

(ii) Advantages/disadvantages: Harvesting to the highway edge allows capture of all merchantable timber however no protection is provided for the viewscape or from blowing or drifting snow.

2. Proposed Operational Prescription

(a) Description: **Same as Alternative 1.**

(b) Rationale: The proposed prescription provides the best balance between recovery of merchantable timber and the long term protection of highway viewscape and the prevention of blowing and drifting snow on the highway.

(c) Exception: No

3. Summary of Public Comments
None received.

4. Selected Prescription
See Alternative 1.

C: Conditions on Operational Roads

AOC supplementary documentation is not required for Conditions on Operational Roads.
Refer to AOC HB01 in Table FMP-19.

Summary of Public Comments
No comments received.

D: Primary or Branch Road Crossing

No primary or branch roads proposed.

E: Monitoring Program

Not applicable.

This supplementary documentation is organized into five parts for each individual or group Area of Concern:

A: Area of Concern Description
B: Operational Prescription
C: Conditions on Operational Roads
D: Primary and Branch Road Crossings
E: Monitoring Program

A: Area of Concern Description

1. Area of Concern (AOC) Identifier: TV01

2. Description of Natural Resource Feature, Land Use or Value:

(a) Description of natural resource feature (s), land use(s) or value(s)
- Tourism aesthetics along large, high volume tourism lakes, recognized canoe routes, recreational lakes.

(b) Dimensions of area of concern:
- 90 metre AOC.

B: Operational Prescription

1. Environmental Analysis of Alternative Operational Prescriptions

(a) **Alternative identifier/number: 1**

(b) Description of proposed operational prescription:

For *large lakes, medium lakes, small lakes, HPS* ponds, *rivers* and *HPS* streams associated with identified canoe routes, 30 to 90 m AOC based on slope as follows measured from the edge of standing timber along the shoreline:

Slope (%)	Slope Angle (degrees)	Width of AOC
0 – 15	0 - 8.5	30 m
>15 - 30	8.6 – 16.7	50 m
>30 - 45	16.8 – 24.2	70 m
> 45	> 24.2	90 m

No harvest, renewal and tending operations are permitted within the AOC.

(c) Environmental Analysis:

(iii) Potential effects: increased visual buffer from water.

(iv) Advantages/disadvantages: As the AOC is measured from the standing timber it will protect lakes, pond, river, and stream values and maintain aesthetically pleasing shoreline vistas for the public.

(a) **Alternative identifier/number: 2**

(b) Description of proposed operational prescription:

- Apply a 90-metre AOC measured from the edge of the standing timber along the shoreline.
- No harvest, renewal and tending operations are permitted within the AOC.

(c) Environmental Analysis:

(i) Potential effects: Large reserve of standing timber reduces visibility of harvested areas and provides protection for lakes, pond, river, and stream values.

(ii) Advantages/disadvantages: A reserve wider than that proposed in alternative 1 will exceed that required to protect the water bodies however will reduce the visibility of areas that would otherwise be seen in alternative 1. Potentially an over protection of aesthetics, lakes, pond, river, and stream values as it is not a slope dependent AOC and the entire AOC is reserve. Does not provide environmental benefits of young forest adjacent to shoreline. May result in decreasing aesthetic value in future as trees get old and fall down, as opposed to having young healthy forest adjacent to shoreline.

2. Proposed Operational Prescription

(a) Description: **Same as Alternative 2.**

(b) Rationale: Ensuring that the AOC is measured from the standing timber will maintain aesthetically pleasing shoreline vistas for the public. Prescription meets or exceeds requirements for protection of lakes, rivers, ponds, and stream values as required of the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales, 2010*.

(c) Exception: No

3. Summary of Public Comments

General support of the additional harvest reserves.

4. Selected Prescription

See Alternative 2.

C: Conditions on Operational Roads

AOC supplementary documentation is not required for Conditions on Operational Roads. Refer to AOC TV01 in Table FMP-19.

Summary of Public Comments

No comments received.

D: Primary or Branch Road Crossing

No primary or branch roads proposed.

E: Monitoring Program

Not applicable.

This supplementary documentation is organized into five parts for each individual or group Area of Concern:

A: Area of Concern Description
B: Operational Prescription
C: Conditions on Operational Roads
D: Primary and Branch Road Crossings
E: Monitoring Program

A: Area of Concern Description

1. Area of Concern (AOC) Identifier: TVw

2. Description of Natural Resource Feature, Land Use or Value:

(a) Description of natural resource feature (s), land use(s) or value(s)
- Tourism-timing restriction.

(b) Dimensions of area of concern:
- As mapped, boundaries of blocks 12.130, 12.131, 12.181, 12.498, 12.503, 12.513, 12.339, 12.333, 12.884, 12.162, 12.158, 12.160

B: Operational Prescription

1. Environmental Analysis of Alternative Operational Prescriptions

(a) **Alternative identifier/number: 1**

(b) Description of proposed operational prescription:

Seasonal restriction on harvest, and mechanical site preparation operations between May 1 and October 31. No restrictions of timing of low-noise renewal activities. All operations are permitted between November 1 and April 30th.

(c) Environmental Analysis:

(i) Potential effects: Will maintain sense of remoteness.

(ii) Advantages/disadvantages: This prescription maintains the sense of remoteness. No disadvantage to the identified values however, the prescription limits the flexibility of harvest operations.

2. Proposed Operational Prescription

(a) Description: **Same as Alternative 1.**

(b) Rationale: Seasonal harvest restriction was the only prescription that addressed the identified values therefore only one option was developed. The prescription allows for timber extraction while ensuring that the sense of remoteness is maintained.

(c) Exception: No

3. Summary of Public Comments

Comments were supportive of the seasonal harvest restriction. Comments were received from mainly tourist establishments expressing concern with summer harvesting and its effect on their business.

4. Selected Prescription

See Alternative 1.

C: Conditions on Operational Roads

Refer to AOC TVw in Table FMP-19.

Summary of Public Comments

None received.

D: Primary or Branch Road Crossing

No primary or branch roads proposed.

E: Monitoring Program

Not applicable.

This supplementary documentation is organized into five parts for each individual or group Area of Concern:

A: Area of Concern Description
B: Operational Prescription
C: Conditions on Operational Roads
D: Primary and Branch Road Crossings
E: Monitoring Program

A: Area of Concern Description

1. Area of Concern (AOC) Identifier: TVwl

2. Description of Natural Resource Feature, Land Use or Value:

(a) Description of natural resource feature (s), land use(s) or value(s)
- Tourism – Wine Lake

(b) Dimensions of area of concern:
- As mapped, boundaries of blocks 12.354

B: Operational Prescription

1. Environmental Analysis of Alternative Operational Prescriptions

(a) **Alternative identifier/number: 1**

(b) Description of proposed operational prescription:
No harvest or mechanical site preparation operations between May 1 and October 31. No restrictions on timing of low-noise renewal activities. All operations are permitted between November 1 and April 30th. A 200 m no-harvest reserve as mapped along top end of Wabauskang Lake and river leading into Wine Lake. Wine Lake Camp owners are to be notified prior to harvest.

(c) Environmental Analysis:

(iii) Potential effects: Will maintain sense of remoteness.

(iv) Advantages/disadvantages: This prescription maintains the sense of remoteness. No disadvantage to the identified values however, the prescription limits the flexibility of harvest operations.

2. Proposed Operational Prescription

(a) Description: **Same as Alternative 1.**

(b) Rationale: Seasonal harvest restriction and 200 m no harvest reserve was the only prescription that addressed the tourism sense of remoteness therefore only one option was developed. Prescription developed with affected tourism operator. The prescription allows for timber extraction while ensuring that the sense of remoteness is maintained.

(c) Exception: No

3. Summary of Public Comments

Prescription developed with affected tourism operation.

4. Selected Prescription
See Alternative 1.

C: Conditions on Operational Roads

Refer to AOC TVwl in Table FMP-19.

Summary of Public Comments

None Received

D: Primary or Branch Road Crossing

No primary or branch roads proposed.

E: Monitoring Program

Not applicable.

This supplementary documentation is organized into five parts for each individual or group Area of Concern:

A: Area of Concern Description
B: Operational Prescription
C: Conditions on Operational Roads
D: Primary and Branch Road Crossings
E: Monitoring Program

A: Area of Concern Description

1. Area of Concern (AOC) Identifier: TVgl

2. Description of Natural Resource Feature, Land Use or Value:

(a) Description of natural resource feature (s), land use(s) or value(s)
- Tourism – Gibi Lake

(b) Dimensions of area of concern:
- As mapped, boundaries of blocks 12.168 and 12.170.

B: Operational Prescription

1. Environmental Analysis of Alternative Operational Prescriptions

(a) **Alternative identifier/number: 1**

(b) Description of proposed operational prescription:

60 meters no-harvest reserve from Witch Bay road. No harvest and mechanical site preparation operations are permitted between Victoria Day and Labour Day holidays. No restrictions of timing of low-noise renewal activities. All operations are permitted between Labour Day (September) and Victoria Day (May) with the exception of no weekend operations permitted between Labour Day and Thanksgiving (Friday 5 p.m. to Sunday 6 p.m.).

(c) Environmental Analysis:

(v) Potential effects: Will maintain sense of remoteness.

(vi) Advantages/disadvantages: This prescription maintains the sense of remoteness. No disadvantage to the identified values however, the prescription limits the flexibility of harvest operations.

2. Proposed Operational Prescription

(a) Description: **Same as Alternative 1.**

(b) Rationale: Seasonal harvest restriction was the only prescription that addressed the identified values therefore only one option was developed. Prescription developed with affected stakeholders. The prescription allows for timber extraction while ensuring that the sense of remoteness is maintained.

(c) Exception: No

3. Summary of Public Comments
None received

4. Selected Prescription
See Alternative 1.

C: Conditions on Operational Roads

Refer to AOC TVgl in Table FMP-19.

Summary of Public Comments
None received

D: Primary or Branch Road Crossing

No primary or branch roads proposed.

E: Monitoring Program

Not applicable.

This supplementary documentation is organized into five parts for each individual or group Area of Concern:

A: Area of Concern Description
B: Operational Prescription
C: Conditions on Operational Roads
D: Primary and Branch Road Crossings
E: Monitoring Program

A: Area of Concern Description

1. Area of Concern (AOC) Identifier: TVer

2. Description of Natural Resource Feature, Land Use or Value:

(a) Description of natural resource feature (s), land use(s) or value(s)
- Tourism – English River Waterway Park

(b) Dimensions of area of concern:
- As mapped, 500 m from park boundary.

B: Operational Prescription

1. Environmental Analysis of Alternative Operational Prescriptions

(a) **Alternative identifier/number: 1**

(b) Description of proposed operational prescription:

Within 500 m of the park boundary, no harvest will occur between April 1 and September 30.

(c) Environmental Analysis:

(i) Potential effects: Will maintain sense of remoteness.

(ii) Advantages/disadvantages: This prescription maintains the sense of remoteness. No disadvantage to the identified values however, the prescription limits the flexibility of harvest operations.

2. Proposed Operational Prescription

(a) Description: **Same as Alternative 1.**

(b) Rationale: The prescription allows for timber extraction while ensuring that the sense of remoteness is maintained. Prescription developed with Park Ontario.

(c) Exception: No

3. Summary of Public Comments
None received.

4. Selected Prescription
See Alternative 1.

C: Conditions on Operational Roads

Refer to AOC TVer in Table FMP-19.

Summary of Public Comments
None Recieved

D: Primary or Branch Road Crossing

No primary or branch roads proposed.

E: Monitoring Program

Not applicable.

This supplementary documentation is organized into five parts for each individual or group Area of Concern:

A: Area of Concern Description
B: Operational Prescription
C: Conditions on Operational Roads
D: Primary and Branch Road Crossings
E: Monitoring Program

A: Area of Concern Description

1. Area of Concern (AOC) Identifier: **TVal**

2. Description of Natural Resource Feature, Land Use or Value:

(a) Description of natural resource feature (s), land use(s) or value(s)
- Tourism – Aerobus Lake

(b) Dimensions of area of concern:
- As mapped, boundaries of blocks 04.389.

B: Operational Prescription

1. Environmental Analysis of Alternative Operational Prescriptions

(a) **Alternative identifier/number: 1**

(b) Description of proposed operational prescription:

No harvest or mechanical site preparation operations between May 1 and October 31. No restrictions of timing of low-noise renewal activities. All operations are permitted between November 1 and April 30th.

(c) Environmental Analysis:

(iii) Potential effects: Will maintain sense of remoteness.

(iv) Advantages/disadvantages: This prescription maintains the sense of remoteness. No disadvantage to the identified values however, the prescription limits the flexibility of harvest operations.

2. Proposed Operational Prescription

(a) Description: **Same as Alternative 1.**

(b) Rationale: Seasonal harvest restriction was the only prescription that addressed the identified values therefore only one option was developed. The prescription allows for timber extraction while ensuring that the sense of remoteness is maintained. This prescription is consistent with a previous Resource Stewardship Agreement in place prior to the Whiskey Jack Forest reverting to a Crown management unit.

(c) Exception: No

3. Summary of Public Comments
None received

4. Selected Prescription
See Alternative 1.

C: Conditions on Operational Roads

Refer to AOC TVal in Table FMP-19.

Summary of Public Comments

None received

D: Primary or Branch Road Crossing

No primary or branch roads proposed.

E: Monitoring Program

Not applicable.

This supplementary documentation is organized into five parts for each individual or group Area of Concern:

A: Area of Concern Description
B: Operational Prescription
C: Conditions on Operational Roads
D: Primary and Branch Road Crossings
E: Monitoring Program

A: Area of Concern Description

1. Area of Concern (AOC) Identifier: TVp

2. Description of Natural Resource Feature, Land Use or Value:

(a) Description of natural resource feature (s), land use(s) or value(s)
- Tourism – identified portage trails

(b) Dimensions of area of concern:
- As mapped.

B: Operational Prescription

1. Environmental Analysis of Alternative Operational Prescriptions

(a) **Alternative identifier/number: 1**

(b) Description of proposed operational prescription:

No harvest, renewal or tending permitted in the AOC.

Measured from the edge of the identified portage as mapped, 30 to 90 m AOC based on slope as follows:

Slope (%)	Slope Angle (degrees)	Width of AOC
0 - 15	0 - 8.5	30 m
>15 - 30	8.6 – 16.7	50 m
>30 - 45	16.8 – 24.2	70 m
> 45	> 24.2	90 m

(c) Environmental Analysis:

(i) Potential effects: Will maintain sense of remoteness. Operations crossing trails may damage the portage trail and create conflicts with other forest users.

(ii) Advantages/disadvantages: This prescription maintains the sense of remoteness and protection of the value. No disadvantage to the identified value.

2. Proposed Operational Prescription

(a) Description: **Same as Alternative 1.**

(b) Rationale: This prescription provides protection for the identified value and acknowledges the importance of trails on the forest to other forest users.

(c) Exception: No

3. Summary of Public Comments
None.

4. Selected Prescription
See Alternative 1.

C: Conditions on Operational Roads

Refer to AOC TVp in Table FMP-19.

Summary of Public Comments
None.

D: Primary or Branch Road Crossing

No primary or branch roads proposed.

E: Monitoring Program

Not applicable.

This supplementary documentation is organized into five parts for each individual or group Area of Concern:

A: Area of Concern Description
B: Operational Prescription
C: Conditions on Operational Roads
D: Primary and Branch Road Crossings
E: Monitoring Program

A: Area of Concern Description

1. Area of Concern (AOC) Identifier: TVc

2. Description of Natural Resource Feature, Land Use or Value:

(a) Description of natural resource feature (s), land use(s) or value(s)
- Tourism – campsites

(b) Dimensions of area of concern:
- As mapped.

B: Operational Prescription

1. Environmental Analysis of Alternative Operational Prescriptions

(a) **Alternative identifier/number: 1**

(b) Description of proposed operational prescription:

- 70 metre reserve from campsite centre.
- No harvest, renewal or tending operations permitted.

(c) Environmental Analysis:

(i) Potential effects: Operations near campsites may create damage and create conflicts with other forest users. Implementation of prescription will maintain sense of remoteness.

(ii) Advantages/disadvantages: This prescription will prevent damage to campsites and conflicts with other forest users, and will maintain a sense of remoteness. No disadvantage to the identified values.

2. Proposed Operational Prescription

(a) Description: **Same as Alternative 1.**

(b) Rationale: This prescription provides protection for the identified value and acknowledges the importance of campsites on the forest to other forest users.

(c) Exception: No

3. Summary of Public Comments
None.

4. Selected Prescription
See Alternative 1.

C: Conditions on Operational Roads

No operational roads proposed.

D: Primary or Branch Road Crossing

No primary or branch roads proposed.

E: Monitoring Program

Not applicable.

This supplementary documentation is organized into five parts for each individual or group Area of Concern:

A: Area of Concern Description
B: Operational Prescription
C: Conditions on Operational Roads
D: Primary and Branch Road Crossings
E: Monitoring Program

A: Area of Concern Description

1. Area of Concern (AOC) Identifier: NE9

2. Description of Natural Resource Feature, Land Use or Value:

a) Description:
Trumpeter Swan Nesting Site

Secondary Values
Fish habitat
Water Quality

b) Dimensions of AOC:
120 metres.

B. Operational Prescription:

1. Environmental Analysis of Alternative Operational Prescriptions:

a) Alternative identifier/number: 1

b) Description of proposed operational prescription:

Reserve Zone

Measured from the edge of the standing timber as mapped, 30 to 90 m AOC based on slope as follows:

Slope (%)	Slope Angle (degrees)	Width of AOC
0 - 15	0 - 8.5	30 m
>15 - 30	8.6 – 16.7	50 m
>30 - 45	16.8 – 24.2	70 m
> 45	> 24.2	90 m

No forest management operations are permitted within the reserve.

Modified Zone
Outside of the slope-based reserve, a 120 metre modified operations zone, measured from the high water mark, where the following restrictions apply;

i. Harvesting, mechanical site preparation, and aerial spray operations are permittted between August 15th and April 15th,
ii. Tree planting is permitted but limited to one (1) crew of four (4) planters and ATV use is to be kept to a minimum. Tree caches are to be located as far from the nest as possible.

c) Environmental analysis:
This prescription will protect the nesting site and ensure the birds are not disturbed during the nesting period.

2. Proposed Operational Prescription:

a) Description:
See alternative # 1 above

b) Rationale:

- There is no forest management guide for trumpeter swan nesting sites. Prescription meets or exceeds requirements for protection of lakes, rivers, ponds, and stream values as required of the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales, 2010*.
- Harvest, mechanical site preparation and aerial herbicide spray operations within the modified operations zone will be conducted outside of the nesting season as to avoid disturbing the nest. The maintenance of a minimum 30 metre reserve around the nesting site and maintaining residual trees in the modified operations zone will contribute towards mitigation of changes to the landscape created by clearcut harvesting by reducing the visual impact of the cutover area as seen from the nest. Conditions on the number of tree planters will minimize disturbance to the nesting birds and contribute towards mitigation of changes to the landscape created by clearcut harvesting.

Only one alternative was documented for this AOC because:

- The prescription is based on a similar prescription used in previous Forest Management Plans. There was no known negative effect on the swans.

c) Exception:
No

3. Summary of Public Comments:
No comments received

4. Selected Prescription:
See alternative # 1 above.

C. Conditions on Operational Roads

Not applicable – none permitted.

D: Primary or Branch Road Crossing

Not applicable – none proposed in AOC.

E. Monitoring Program

Not applicable.

This supplementary documentation is organized into five parts for each individual or group Area of Concern:

A: Area of Concern Description
B: Operational Prescription
C: Conditions on Operational Roads
D: Primary and Branch Road Crossings
E: Monitoring Program

A: Area of Concern Description

1. Area of Concern (AOC) Identifier: LS01

2. Description of Natural Resource Feature, Land Use or Value:

(a) Description of natural resource feature (s), land use(s) or value(s)

- Lac Seul Shoreline (Remoteness, aesthetics, fisheries, water quality, cultural heritage)

(b) Dimensions of area of concern:

- 650m from the shoreline of Lac Seul

B: Operational Prescription

a) Description:
No timber harvested within 120 meters of the shoreline of Lac Seul. No conditions on harvest, renewal or tending between 121 – 650 m from the shoreline; conditions on roads only, refer to table FMP-19.

b) Rationale:
A General Use Area has been identified around Lac Seul. The prescription matches the policy direction from the Lac Seul Lake Management Plan (Section 5.0, Page 11).

c) Exception:
No

3. Summary of public comments:

No public comments have been received to date.

C: Conditions on Operational Roads
Refer to FMP-19.

Summary of Public Comments
No public comments have been received to date.

D: Primary or Branch Road Crossing

Not applicable – none proposed

E: Monitoring Program

Not Applicable

This supplementary documentation is organized into five parts for each individual or group Area of Concern:

A: Area of Concern Description
B: Operational Prescription
C: Conditions on Operational Roads
D: Primary and Branch Road Crossings
E: Monitoring Program

A: Area of Concern Description

1. Area of Concern (AOC) Identifier: WS01

2. Description of Natural Resource Feature, Land Use or Value:

(a) Description of natural resource feature (s), land use(s) or value(s)

- Rivers, stream segments – high or moderate potential sensitivity (HPS or MPS) to forest management operations identified prior to plan approval.

(b) Dimensions of area of concern:

- For *rivers* and *HPS* streams, 30 to 90 m AOC based on slope as follows:

Slope (%)	Slope Angle (degrees)	Width of AOC
0 - 15	0 - 8.5	30 m
>15 - 30	8.6 – 16.7	50 m
>30 - 45	16.8 – 24.2	70 m
> 45	> 24.2	90 m

For *MPS streams*, 30 m AOC as mapped.

B: Operational Prescription

AOC supplementary documentation is not required for the operational prescription.
Refer to AOC WS01 in Table FMP-10.

C: Conditions on Operational Roads

AOC supplementary documentation is not required for Conditions on Operational Roads.
Refer to AOC WS01 in Table FMP-19.

D: Primary or Branch Road Crossing

ROAD NAME IDENTIFIER:

April South Road – AP-01

1. Proposed Crossing Location

(a) Identification of the 100m metre wide location (i.e. individual AOC identifier) for the road

AP-01 is an existing crossing that may need to be re-built in this plan. For each crossing, the 100 m location is shown on the Areas Selected for Operations Maps. There is no variation from the proposed crossing.

A complete listing of the road name, water crossing numbers and the conditions on the construction or use is presented in table FMP-19 under WSO1.

(b) Rationale for the crossing location

The April South Road is located to utilize an existing road, however the water crossing location may need upgrading. In addition to utilizing the existing road location, lakes and other impeding factors within or adjacent to the road corridor make this AOC crossing unavoidable. There are no other known values impacted by these crossings. No interested or affected persons or organizations have provided comments on these AOC crossings.

Refer to FMP-19 for preventative and mitigative measures appropriate for the aforementioned AOC crossings.

2. Summary of Public Comments

None.

3. Selected Crossing Location

See Proposed Crossing Location

D: Primary or Branch Road Crossing

ROAD NAME IDENTIFIER:

April South Road – AP-02

1. Proposed Crossing Location

(a) Identification of the 100m metre wide location (i.e. individual AOC identifier) for the road

AP-02 is an existing crossing that may need to be re-built in this plan. For each crossing, the 100 m location is shown on the Areas Selected for Operations Maps. There is no variation from the proposed crossing.

A complete listing of the road name, water crossing numbers and the conditions on the construction or use is presented in table FMP-19 under WSO1.

(b) Rationale for the crossing location

The April South Road is located to utilize an existing road, however the water crossing location may need to be upgraded. In addition to utilizing the existing road location, lakes and other impeding factors within or adjacent to the road corridor make this AOC crossing unavoidable. There are no other known values impacted by these crossings. No interested or affected persons or organizations have provided comments on these AOC crossings.

Refer to FMP-19 for preventative and mitigative measures appropriate for the aforementioned AOC crossings.

2. Summary of Public Comments

None.

3. Selected Crossing Location

See Proposed Crossing Location

D: Primary or Branch Road Crossing

ROAD NAME IDENTIFIER:

Yellow Girl Road – YE-01

1. Proposed Crossing Location

(a) Identification of the 100m metre wide location (i.e. individual AOC identifier) for the road

YE-01 is a new crossing proposed as part of the construction of the new primary road listed above. For each crossing, the 100 m location is shown on the Areas Selected for Operations Maps. There is no variation from the proposed crossing.

A complete listing of the road name, water crossing numbers and the conditions on the construction or use is presented in table FMP-19 under WSO1.

(b) Rationale for the crossing location

The crossing is located on a flat section with approximately 1% grade and good cobble located in the area to minimize erosion of the site. This location represents the best alternative available within the corridor as other locations will require more than one crossing or to be located across swamp or flood plain areas. There are no other known values impacted by these crossings. No interested or affected persons or organizations have provided comments on these AOC crossings.

Refer to FMP-19 for preventative and mitigative measures appropriate for the aforementioned AOC crossings.

2. Summary of Public Comments

None.

3. Selected Crossing Location

See Proposed Crossing Location

D: Primary or Branch Road Crossing

ROAD NAME IDENTIFIER:

Yellow Girl Road – YE-02

1. Proposed Crossing Location

(a) Identification of the 100m metre wide location (i.e. individual AOC identifier) for the road

YE-02 is a new crossing proposed as part of the construction of the new primary road listed above. For each crossing, the 100 m location is shown on the Areas Selected for Operations Maps. There is no variation from the proposed crossing.

A complete listing of the road name, water crossing numbers and the conditions on the construction or use is presented in table FMP-19 under WSO1.

(b) Rationale for the crossing location

The crossing is located in a narrow section of a swampy area that has a relatively defined channel in comparison to many areas around this location. This location represents the best alternative available within the corridor. There are no other known values impacted by these crossings. No interested or affected persons or organizations have provided comments on these AOC crossings.

Refer to FMP-19 for preventative and mitigative measures appropriate for the aforementioned AOC crossings.

2. Summary of Public Comments

None.

3. Selected Crossing Location

See Proposed Crossing Location

D: Primary or Branch Road Crossing

ROAD NAME IDENTIFIER:

Bug Lake Road – BU-01

1. Proposed Crossing Location

(a) Identification of the 100m metre wide location (i.e. individual AOC identifier) for the road

BU-01 is an existing crossing that will need to be re-built in this plan. For each crossing, the 100 m location is shown on the Areas Selected for Operations Maps. There is no variation from the proposed crossing.

A complete listing of the road name, water crossing numbers and the conditions on the construction or use is presented in table FMP-19 under WSO1.

(b) Rationale for the crossing location

The water crossing location is on the existing road location. The re-use of this location will minimize disruption of other areas along the stream. There are no other known values impacted by this crossing although it is in an area of high potential cultural heritage, by re-using the existing location there is no opportunity to damage any potential cultural heritage. No interested or affected persons or organizations have provided comments on these AOC crossings.

Refer to FMP-19 for preventative and mitigative measures appropriate for the aforementioned AOC crossings.

2. Summary of Public Comments

None.

3. Selected Crossing Location

See Proposed Crossing Location

D: Primary or Branch Road Crossing

ROAD NAME IDENTIFIER:

Bug Lake Road – BU-02

1. Proposed Crossing Location

(a) Identification of the 100m metre wide location (i.e. individual AOC identifier) for the road

BU-02 is an existing crossing that will need to be re-built in this plan. For each crossing, the 100 m location is shown on the Areas Selected for Operations Maps. There is no variation from the proposed crossing

A complete listing of the road name, water crossing numbers and the conditions on the construction or use is presented in table FMP-19 under WSO1.

(b) Rationale for the crossing location

The water crossing location is on the existing road location. The re-use of this location will minimize disruption of other areas along the stream. There are no other known values impacted by this crossing. No interested or affected persons or organizations have provided comments on these AOC crossings.

Refer to FMP-19 for preventative and mitigative measures appropriate for the aforementioned AOC crossings.

2. Summary of Public Comments

None.

3. Selected Crossing Location

See Proposed Crossing Location

D: Primary or Branch Road Crossing

ROAD NAME IDENTIFIER:

Aesthetic Road – AE-01

1. Proposed Crossing Location

(a) Identification of the 100m metre wide location (i.e. individual AOC identifier) for the road

AE-01 is an existing crossing that will need to be re-built in this plan. For each crossing, the 100 m location is shown on the Areas Selected for Operations Maps. There is no variation from the proposed crossing.

A complete listing of the road name, water crossing numbers and the conditions on the construction or use is presented in table FMP-19 under WSO1.

(b) Rationale for the crossing location

The water crossing location is on the existing road location. The re-use of this location will minimize disruption of other areas along the stream. There are no other known values impacted by this crossing although it is in an area of high potential cultural heritage, by re-using the existing location there is no opportunity to damage any potential cultural heritage. No interested or affected persons or organizations have provided comments on these AOC crossings.

Refer to FMP-19 for preventative and mitigative measures appropriate for the aforementioned AOC crossings.

2. Summary of Public Comments

None.

3. Selected Crossing Location

See Proposed Crossing Location

D: Primary or Branch Road Crossing

ROAD NAME IDENTIFIER:

Aesthetic Road – AE-02

1. Proposed Crossing Location

(a) Identification of the 100m metre wide location (i.e. individual AOC identifier) for the road

AE-02 is an existing crossing that will need to be re-built in this plan. For each crossing, the 100 m location is shown on the Areas Selected for Operations Maps. There is no variation from the proposed crossing.

A complete listing of the road name, water crossing numbers and the conditions on the construction or use is presented in table FMP-19 under WSO1.

(b) Rationale for the crossing location

The water crossing location is on the existing road location. The re-use of this location will minimize disruption of other areas along the stream. There are no other known values impacted by this crossing although it is in an area of high potential cultural heritage, by re-using the existing location there is no opportunity to damage any potential cultural heritage. No interested or affected persons or organizations have provided comments on these AOC crossings.

Refer to FMP-19 for preventative and mitigative measures appropriate for the aforementioned AOC crossings.

2. Summary of Public Comments

None.

3. Selected Crossing Location

See Proposed Crossing Location

D: Primary or Branch Road Crossing

ROAD NAME IDENTIFIER:

Aesthetic Road – AE-03

1. Proposed Crossing Location

(a) Identification of the 100m metre wide location (i.e. individual AOC identifier) for the road

AE-03 is an existing crossing that will need to be re-built in this plan. For each crossing, the 100 m location is shown on the Areas Selected for Operations Maps. There is no variation from the proposed crossing.

A complete listing of the road name, water crossing numbers and the conditions on the construction or use is presented in table FMP-19 under WSO1.

(b) Rationale for the crossing location

The water crossing location is on the existing road location. The re-use of this location will minimize disruption of other areas along the stream. There are no other known values impacted by this crossing although it is in an area of high potential cultural heritage, by re-using the existing location there is no opportunity to damage any potential cultural heritage. No interested or affected persons or organizations have provided comments on these AOC crossings.

Refer to FMP-19 for preventative and mitigative measures appropriate for the aforementioned AOC crossings.

2. Summary of Public Comments

None.

3. Selected Crossing Location

See Proposed Crossing Location

D: Primary or Branch Road Crossing

ROAD NAME IDENTIFIER:

Aesthetic Road – AE-04

1. Proposed Crossing Location

(a) Identification of the 100m metre wide location (i.e. individual AOC identifier) for the road

AE-04 is an existing crossing that will need to be re-built in this plan. For each crossing, the 100 m location is shown on the Areas Selected for Operations Maps. There is no variation from the proposed crossing.

A complete listing of the road name, water crossing numbers and the conditions on the construction or use is presented in table FMP-19 under WSO1.

(b) Rationale for the crossing location

The water crossing location is on the existing road location. The re-use of this location will minimize disruption of other areas along the stream. There are no other known values impacted by this crossing although it is in an area of high potential cultural heritage, by re-using the existing location there is no opportunity to damage any potential cultural heritage. No interested or affected persons or organizations have provided comments on these AOC crossings.

Refer to FMP-19 for preventative and mitigative measures appropriate for the aforementioned AOC crossings.

2. Summary of Public Comments

None.

3. Selected Crossing Location

See Proposed Crossing Location

D: Primary or Branch Road Crossing

ROAD NAME IDENTIFIER:

Witch Bay Road – WB-01

1. Proposed Crossing Location

(a) Identification of the 100m metre wide location (i.e. individual AOC identifier) for the road

WB-01 is an existing crossing that may need to be re-built in this plan. For each crossing, the 100 m location is shown on the Areas Selected for Operations Maps. There is no variation from the proposed crossing.

A complete listing of the road name, water crossing numbers and the conditions on the construction or use is presented in table FMP-19 under WSO1.

(b) Rationale for the crossing location

The water crossing location is on the existing road location. The re-use of this location will minimize disruption of other areas along the stream. There are no other known values impacted by this crossing although it is in an area of high potential cultural heritage, by re-using the existing location there is no opportunity to damage any potential cultural heritage. No interested or affected persons or organizations have provided comments on these AOC crossings.

Refer to FMP-19 for preventative and mitigative measures appropriate for the aforementioned AOC crossings.

2. Summary of Public Comments

None.

3. Selected Crossing Location

See Proposed Crossing Location

D: Primary or Branch Road Crossing

ROAD NAME IDENTIFIER:

Witch Bay Road – WB-02

1. Proposed Crossing Location

(a) Identification of the 100m metre wide location (i.e. individual AOC identifier) for the road

WB-02 is an existing crossing that may need to be re-built in this plan. For each crossing, the 100 m location is shown on the Areas Selected for Operations Maps. There is no variation from the proposed crossing.

A complete listing of the road name, water crossing numbers and the conditions on the construction or use is presented in table FMP-19 under WSO1.

(b) Rationale for the crossing location

The water crossing location is on the existing road location. The re-use of this location will minimize disruption of other areas along the stream. There are no other known values impacted by this crossing although it is in an area of high potential cultural heritage, by re-using the existing location there is no opportunity to damage any potential cultural heritage. No interested or affected persons or organizations have provided comments on these AOC crossings.

Refer to FMP-19 for preventative and mitigative measures appropriate for the aforementioned AOC crossings.

2. Summary of Public Comments

None.

3. Selected Crossing Location

See Proposed Crossing Location

D: Primary or Branch Road Crossing

ROAD NAME IDENTIFIER:

Witch Bay Road – WB-03

1. Proposed Crossing Location

(a) Identification of the 100m metre wide location (i.e. individual AOC identifier) for the road

WB-03 is an existing crossing that may need to be re-built in this plan. For each crossing, the 100 m location is shown on the Areas Selected for Operations Maps. There is no variation from the proposed crossing.

A complete listing of the road name, water crossing numbers and the conditions on the construction or use is presented in table FMP-19 under WSO1.

(b) Rationale for the crossing location

The water crossing location is on the existing road location. The re-use of this location will minimize disruption of other areas along the stream. There are no other known values impacted by this crossing although it is in an area of high potential cultural heritage, by re-using the existing location there is no opportunity to damage any potential cultural heritage. No interested or affected persons or organizations have provided comments on these AOC crossings.

Refer to FMP-19 for preventative and mitigative measures appropriate for the aforementioned AOC crossings.

2. Summary of Public Comments

None.

3. Selected Crossing Location

See Proposed Crossing Location

D: Primary or Branch Road Crossing

ROAD NAME IDENTIFIER:

Witch Bay Road – WB-04

1. Proposed Crossing Location

(a) Identification of the 100m metre wide location (i.e. individual AOC identifier) for the road

WB-04 is an existing crossing that may need to be re-built in this plan. For each crossing, the 100 m location is shown on the Areas Selected for Operations Maps. There is no variation from the proposed crossing.

A complete listing of the road name, water crossing numbers and the conditions on the construction or use is presented in table FMP-19 under WSO1.

(b) Rationale for the crossing location

The water crossing location is on the existing road location. The re-use of this location will minimize disruption of other areas along the stream. There are no other known values impacted by this crossing although it is in an area of high potential cultural heritage, by re-using the existing location there is no opportunity to damage any potential cultural heritage. No interested or affected persons or organizations have provided comments on these AOC crossings.

Refer to FMP-19 for preventative and mitigative measures appropriate for the aforementioned AOC crossings.

2. Summary of Public Comments

None.

3. Selected Crossing Location

See Proposed Crossing Location

D: Primary or Branch Road Crossing

ROAD NAME IDENTIFIER:

Witch Bay Road – WB-05

1. Proposed Crossing Location

(a) Identification of the 100m metre wide location (i.e. individual AOC identifier) for the road

WB-05 is an existing crossing that may need to be re-built in this plan. For each crossing, the 100 m location is shown on the Areas Selected for Operations Maps. There is no variation from the proposed crossing.

A complete listing of the road name, water crossing numbers and the conditions on the construction or use is presented in table FMP-19 under WSO1.

(b) Rationale for the crossing location

The water crossing location is on the existing road location. The re-use of this location will minimize disruption of other areas along the stream. There are no other known values impacted by this crossing although it is in an area of high potential cultural heritage, by re-using the existing location there is no opportunity to damage any potential cultural heritage. No interested or affected persons or organizations have provided comments on these AOC crossings.

Refer to FMP-19 for preventative and mitigative measures appropriate for the aforementioned AOC crossings.

2. Summary of Public Comments

None.

3. Selected Crossing Location

See Proposed Crossing Location

D: Primary or Branch Road Crossing

ROAD NAME IDENTIFIER:

Witch Bay Road – WB-06

1. Proposed Crossing Location

(a) Identification of the 100m metre wide location (i.e. individual AOC identifier) for the road

WB-06 is an existing crossing that may need to be re-built in this plan. For each crossing, the 100 m location is shown on the Areas Selected for Operations Maps. There is no variation from the proposed crossing.

A complete listing of the road name, water crossing numbers and the conditions on the construction or use is presented in table FMP-19 under WSO1.

(b) Rationale for the crossing location

The water crossing location is on the existing road location. The re-use of this location will minimize disruption of other areas along the stream. There are no other known values impacted by this crossing although it is in an area of high potential cultural heritage, by re-using the existing location there is no opportunity to damage any potential cultural heritage. No interested or affected persons or organizations have provided comments on these AOC crossings.

Refer to FMP-19 for preventative and mitigative measures appropriate for the aforementioned AOC crossings.

2. Summary of Public Comments

None.

3. Selected Crossing Location

See Proposed Crossing Location

D: Primary or Branch Road Crossing

ROAD NAME IDENTIFIER:

Witch Bay Road – WB-07

1. Proposed Crossing Location

(a) Identification of the 100m metre wide location (i.e. individual AOC identifier) for the road

WB-07 is an existing crossing that may need to be re-built in this plan. For each crossing, the 100 m location is shown on the Areas Selected for Operations Maps. There is no variation from the proposed crossing.

A complete listing of the road name, water crossing numbers and the conditions on the construction or use is presented in table FMP-19 under WSO1.

(b) Rationale for the crossing location

The water crossing location is on the existing road location. The re-use of this location will minimize disruption of other areas along the stream. There are no other known values impacted by this crossing although it is in an area of high potential cultural heritage, by re-using the existing location there is no opportunity to damage any potential cultural heritage. No interested or affected persons or organizations have provided comments on these AOC crossings.

Refer to FMP-19 for preventative and mitigative measures appropriate for the aforementioned AOC crossings.

2. Summary of Public Comments

None.

3. Selected Crossing Location

See Proposed Crossing Location

D: Primary or Branch Road Crossing

ROAD NAME IDENTIFIER:

Witch Bay Road – WB-08

1. Proposed Crossing Location

(a) Identification of the 100m metre wide location (i.e. individual AOC identifier) for the road

WB-08 is an existing crossing that may need to be re-built in this plan. For each crossing, the 100 m location is shown on the Areas Selected for Operations Maps. There is no variation from the proposed crossing.

A complete listing of the road name, water crossing numbers and the conditions on the construction or use is presented in table FMP-19 under WSO1.

(b) Rationale for the crossing location

The water crossing location is on the existing road location. The re-use of this location will minimize disruption of other areas along the stream. There are no other known values impacted by this crossing although it is in an area of high potential cultural heritage, by re-using the existing location there is no opportunity to damage any potential cultural heritage. No interested or affected persons or organizations have provided comments on these AOC crossings.

Refer to FMP-19 for preventative and mitigative measures appropriate for the aforementioned AOC crossings.

2. Summary of Public Comments

None.

3. Selected Crossing Location

See Proposed Crossing Location

D: Primary or Branch Road Crossing

ROAD NAME IDENTIFIER:

Witch Bay Road – WB-09

1. Proposed Crossing Location

(a) Identification of the 100m metre wide location (i.e. individual AOC identifier) for the road

WB-09 is an existing crossing that may need to be re-built in this plan. For each crossing, the 100 m location is shown on the Areas Selected for Operations Maps. There is no variation from the proposed crossing.

A complete listing of the road name, water crossing numbers and the conditions on the construction or use is presented in table FMP-19 under WSO1.

(b) Rationale for the crossing location

The water crossing location is on the existing road location. The re-use of this location will minimize disruption of other areas along the stream. There are no other known values impacted by this crossing although it is in an area of high potential cultural heritage, by re-using the existing location there is no opportunity to damage any potential cultural heritage. No interested or affected persons or organizations have provided comments on these AOC crossings.

Refer to FMP-19 for preventative and mitigative measures appropriate for the aforementioned AOC crossings.

2. Summary of Public Comments

None.

3. Selected Crossing Location

See Proposed Crossing Location

E: Monitoring Program

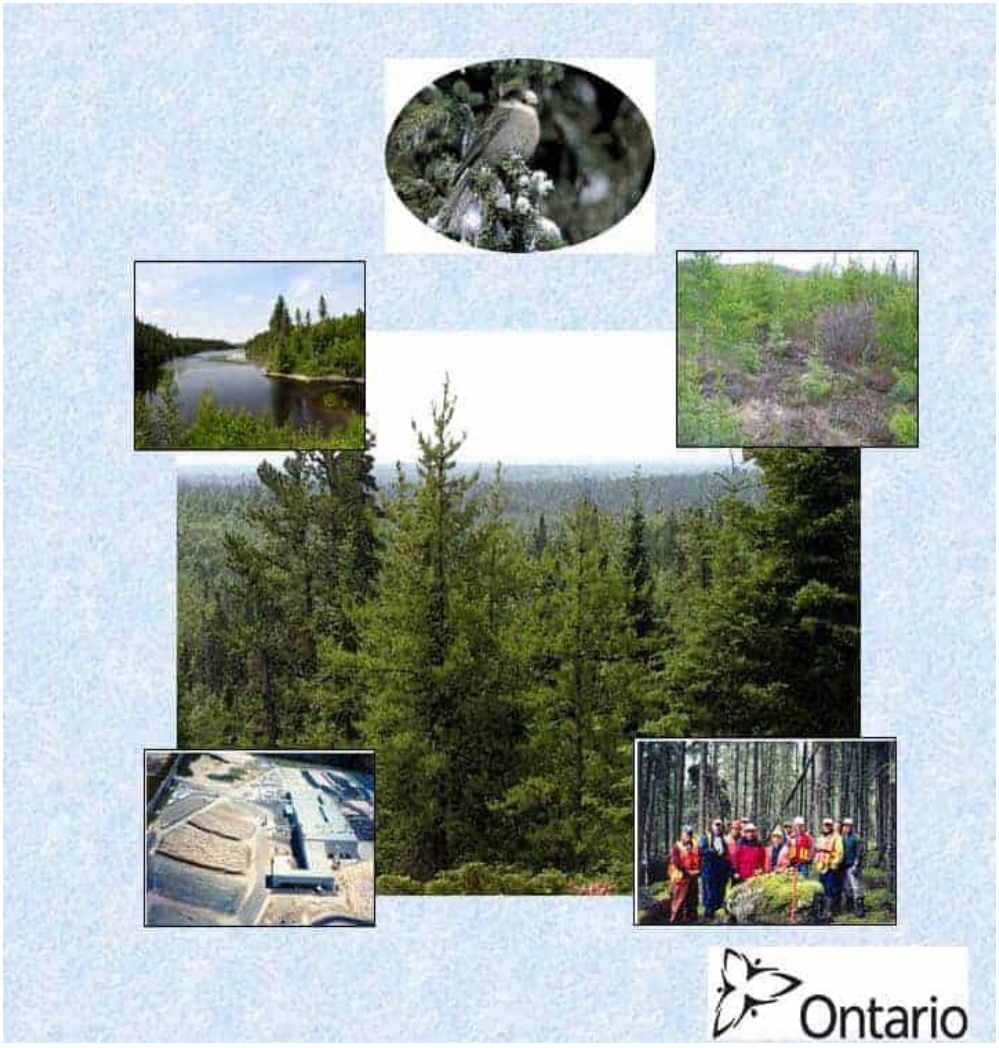
Not applicable.

Supplementary Documentation I

2012-2022 Whiskey Jack Forest Management Plan

Summary of Public Consultation

Includes:
(i) a summary of each stage of consultation.
(ii) a summary of all comments received and the consideration of those comments; and
(iii) a summary of issue resolution.



Summary of Public Consultation for the Whiskey Jack Forest 2012-22 FMP

Mail Out

Invitation to Participate

A letter to affiliations including approximately 800 stakeholders and 545 property owners was sent on January 29, 2010. This letter advised the stakeholders that planning for the 2012-2022 Whiskey Jack Forest Management Plan was about to begin. It invited stakeholders to provide input and views on desired benefits and contributions to background information and values.

LTMD

A letter to affiliations including approximately 800 stakeholders and 545 property owners was sent out on December 14, 2011 to all known stakeholders advising of LTMD

(See Contingency Plan Consultation for communications during hiatus between 2010-2013)

Stage 3

A letter to affiliations including approximately 800 stakeholders and 545 property owners was sent on January 31, 2013. This letter invited stakeholders to the 'Proposed Operations' Information Centre for the 2012-2022 Whiskey Jack Forest Management Plan to be held March 4 to 7th in Kenora, Sioux Narrows, Red Lake and Ear Falls.

Draft Plan

A letter to affiliations including approximately 800 stakeholders and 545 property owners was sent on July 30, 2013. This letter invited stakeholders to Information Centres for the 2012-2022 Whiskey Jack Forest Draft Management Plan to be held September 3 to 6th in Kenora, Sioux Narrows, Red Lake and Ear Falls.

Communication

Invitation to Participate

Newspapers advertisements were placed in the following editions with the dates provided:

Kenora Daily Miner and News	February 2, 2010
Sioux Lookout Wawatay News	February 18, 2010
Lake of the Woods Enterprise	February 6, 2010
Dryden Observer	February 10, 2010
Red Lake Northern Sun News	February 3, 2010

(See Contingency Plan Consultation for communications during hiatus between 2010-13)

LTMD

EBR Posting Approved November 22, 2011 (Withdrawn)
EBR Posting Approved December 24, 2011

Notices were published in local newspapers

Kenora Daily Miner and News	December 14, 2011
Lake of the Woods Enterprise	December 17, 2011
Dryden Observer	December 21, 2011
Sioux Lookout Wawatay News	December 22, 2011

Stage 3

Newspaper advertisments were placed in the following editions:

Kenora Daily Miner and News	January 29, 2013
Kenora Lake of the Woods Enterprise	January 28, 2013
Northern Sun News	February 2, 2013
Dryden Observer	February 2, 2013
Sioux Lookout Wawatay News	February 14, 2013

Draft Plan

Newspaper Advertisements were placed in the following informing of dates of the Information Centres.

Kenora Daily Miner and News	August 2, 2013
Kenora Lake of the Woods Enterprise	August 1, 2013
Northern Sun News	August 7, 2013
Dryden Observer	August 7, 2013
Sioux Lookout Wawatay News	August 1, 2013

And follow advertisements sponsored by the Kenora Local Citizens Committee were placed in the Kenora Daily Miner and News, August 30, 2013 and in the Lake of the Woods Enterprise on August 29, 2013.

EBR posting was in place by July 30, 2013.

Information Centres were held as follows:

Sioux Narrows – September 4, 2013 – 0 members of public attended
Red Lake - September 4, 2013- 6 members of public attended
Ear Falls – September 5, 2013 – 10 members of public attended
Kenora – September 6, 2013 – 4 members of public attended.

First Nations Communications
Invitation to Participate
Letters were sent from the District Manager to the current chief of each First Nations Community in both the Whiskey Jack and the Kenora Forest Management Units as an Invitation to Participate in the 2012-2022 Plans. The letter mentions the possibility of combining forest units as well as the need for an Aboriginal Task Team.

Only one response was received through the Minister's Office. A response from the Ministers Office was sent out June 22, 2010

LTMD
Registered Letter was sent to communities and Metis Council on December 14, 2011 inviting review and comment on the Long Term Management Direction for the Whiskey Jack Forest. One community requested a open house in early 2012.

(See Contingency Plan Consultation for communications during hiatus)

Stage 3
Letters were sent January 14, 2013 from the District Manager to the Resource Mangers of First Nations Communities to inform that Planning is starting for the WJFFMP 2012-2022. Please advise if council would like a session brought to their community.

On January 31, 2013, a follow up letter was sent from the District Manager to Chiefs within the WJF and the Metis Council announcing the MNR et al intentions to hold public information centres on the progress to date in the preparation of the FMP for the WJF.

Draft Plan

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On July 30, 2013, a detailed information package and letter was sent to Chiefs within the WJF and to the Kenora Metis Council regarding the upcoming information centres for the Draft Plan.

Summary of remaining responses:

Invitation to Participate

Environmental Agency	2 requests to be added to mailing list
Miscellaneous	Public member questioned Biodiversity, Historic forest condition Marten and Old Growth and WJF Independent Audit
Private Land Owners	7 responses, 4 of which requested additions/changes to mailing list.
Utilities/Pipelines	1 response concerning work around pipelines
Tourist Operators	4 responses from initial mail out

LTMD

Municipalities	one municipality questioned whether there would be activity within their municipal boundary.
Rec/Special Interest Group	series of communications regarding canoe routes and AOC's between one group.
LCC	email sent to LCC members on December 14, 2011. Met via Con Call with Red Lake LCC on January 11, 2012.
Forestry	Three forest industries sent letters of support to the Minister regarding the LTMD for the WJF.
Cottager/Private Land	two cottagers or their representatives requested information on this stage.
Environmental	One representative from an environmental group has maintained communications throughout the planning process.

Stage 3

Trapper	requested map of trapline area
Cottager/Private Land	Notice sent to Lake of the Woods Area News
Special Interest Group	referred to confusion of dates on EBR. Noted that AOC's are Now added to canoe routes.
LCC	Presentation made to Red Lake LCC on Feb 5/13. Also Kenora LCC member requested copies of OP maps.
Tourist Operator	Two operators responding (also several during contingency plan). Wanted maps and information on operations.

Draft Plan

Correspondence received to date during the Draft Plan stage are as follows.

First Nations	– follow up emails to communities regarding hosting information centres.
Cottager/Private Land	– one detailed submission requesting further information and stressing concerns.
Environmental Groups	– two large email campaigns, one consists of 680 emails to Premier and cc'd to forester regarding harvesting in Grassy Narrows area and one consisting of 1048 emails from Amnesty International focusing on 'Free Prior and Informed Consent' to forester and cc'd to Premier.
Tourist Operator	– one tourist operator requested maps and will be identifying Bear Bait areas.

Resource Based Tourism Mailout

Invitation to Participate

A follow-up to the initial invitation was sent out to tourist outfitters with interests within the Whiskey Jack Forest. A standardized set of questions were asked. Out of 163 tourist outfitters contacted, there were 8 responses.

Summary of Consultation
Whiskey Jack Forest 2012-2022 FMP

Invitation to Participate	Date	Comment	Response
Notices sent to Mail List.			
Notice sent to Media List			
Newspaper clippings			
attached organizational maillist			
attached private land and requests to be included list			
Shoal Lake Watershed list			
Registered Letters to FN communities.			
Wilderness Lodge	05-May-09	had concerns with CP and wanted to review maps.	explained that review period had expired but that the AWS would be coming up soon and once completed he would be notified through the regular channels.
Big North Lodge and Outposts	02-Mar-10	Re: remote tourism values. Recommends a formula for determining value.	Steve Duda discussed at LCC
Crowrock Lodge and outposts	23-Mar-10	wants to be kept informed on activities near Rowdy lake and boat cache lakes.	Spoke with lodge owner. Company noted that RSA was sent to him as well.
BMA holder	30-Apr-10	called J. Superovich/B. Ranta re concern over bear dens being destroyed during fmp operations	staff discussed concerns with BMA holder.
Wine Lake Camps	25-May-10	camp owner provided maps and reports of wildlife and fisheries values near his camp	Management Forester to provide response
Pickerel Creek Camp and Outpost	09-Dec-10	concerns with Aerobus an Deer Lake Roads.	Management Forester assured lodge owner that he would keep him informed of any work that is planned on these two road systems. Also suggested setting up a meeting.
Wine Lake Camps	08-Feb-11	in response to email from K.P., lodge owner voices concerns over portages between Wabaskang Lake and Anishishabi River. Wants to retain solitude for guests	Management Forester responded that they have a talk to discuss concerns.
Crowrock Lodge and outposts	11-Feb-11	Interested in areas around Rowdy Lake and the Western Penninsula	KMU Forester emailed a response and forwarded the email to Kurt Pochailo for WJF information.
Anishinabi Lodge	15-Feb-11	concerned that the Windfall and Deer Lake Roads were going to be connected.	Management Forester assured lodge owner that there is no current plan to join these two roads.
Nestor Fall Fly-In Outpost	18-Mar-11	operater concerned with values in area around Lount Lake, including timing and roads.	Management Forester promised to draft an AOC prescription that would take his concerns into account and send it to him to look over.
Big North Lodge and Outposts	08-Feb-11	1.Wondered if the RTV formula that was proposed and accepted last winter is now incorporated into the FMP. 3. Understood that RTV was to be incorporated, not to be pulled out for discussion as need arose. 5. Operator responded that this should be discussed again in March 2011.	2.MNR responded 'no' as there has been no discussion as yet with individual operators. 4. correct that it was accepted in principle. Discussed on April 23 that it may be inappropriate to carte blanche apply this formula to all tourism facilities…

Invitation to Participate	Date	Comment	Response
Letter sent regarding both forests (Kenora and WJF) Feb.3/2010	Feb. 3/2010		
Wabaseemoong Independent Nations			
Naotkamegwanning First Nations (WBFN)			
Wabauskang First Nation			
Northwest Angle No. 37 FN			
Kenora Metis Council			
Kenora Chiefs Advisory			
Grassy Narrows First Nations		Letter to Minister Jeffrey	no response filed as yet
Grand Council Treaty 3			
Dalles First Nation			
Bimose Tribal Council			
AKRC			
		wanted maps as per offered on mailout	sent Fisheries and Wildlife and Forestry maps.
		requested being removed from maillist	removed
		wanted to be added to mail list	added to mail list
		contacted LCC rep and requested values maps	sent values map via LCC rep.
		LCC rep had question from Minaki Cottager and requested info on harvesting	Steve Duda provided info.
		MNR forester sent map showing 10 yr allocations. Area near Gibi lake dropped. Road safety and condition will be considered.	
		wanted to be added to stakeholder list	name added to mail list
		notice that EBR posting has been made	
		wanted to be added to stakeholder list	name added to mail list
		Several questions regarding biodiversity, historic forest condition, marten and old growth and WJ IFAudit	Letter addressing concerns raised.

TransCanada Pipeline, C/O Lehman and Associates		Letter regarding TCPL's potential concerns with FM operations.	from Ian Pyke and also sent to Company.
Long Term Management Direction	Date	Comment	Response
EBR Posting Approved November 22, 2011			
No. MNR450BN-21010-1491			
(Withdrawn)			
EBR Posting Approved December 14, 2011			
EBR No. MNR450BN-2010-1491			
Mailout - Mailed December 14, 2011 to all known stakeholders.			
Media - Notices published in local newspapers		Published Wawatay, December 22, 2011	
		wanted to know if MNR could provide some timing projections as to when harvesting may take place on WJF	DM responded that earliest would be July of 2012 on some operations on the forest
LTMD		letter to Minister supporting the WJF plan.	
LTMD		letter to Minister supporting the WJF plan.	
LTMD		letter to Minister supporting the WJF plan.	
Township of Ear Falls	19-Dec-11	wants to be advised of any harvesting within the municipal boundary	
		April 6, 2012 - request for extensive amount of information (historical and proposed) on harvesting in WJF	Directed towards link as well as dvd provided with information requested.
		April 10, 2012, asked if MNR receives FPIC from GNFN before authorized logging takes place on their traditional territory.	
		December 19, maps picked up by Grassy Narrows member and another concerned person.	LTMD for WJF has been left at counter for pickup.
		March 8, 2012 Letter to respondent regarding questions on letter sent January 31, 2012.	
	15-Dec-11	addressed concerns regarding canoe routes and portages.	Glad that he is getting involved at early stages. Easier to develop prescriptions at the planning stage and want to work with him to ensure portage values that are identified are protected.
Wine Lake Camps	09-Jan-12	operater wanted info on Windfall Road. Concerned with 1 km wide corridor	response regarding road and attached Road Supp Doc.
Gold Arrow Camps	04-Jan-12	wanted info on Aerobus and April Road area.	Overview map sent, and respondent indicated which maps they were interested in. A CD was sent.
Gold Arrow Camps	29-Jan-12	Thanked for CD. TO indicated specific areas where they had concerns and may affect their economics.	
Gold Arrow Camps	27-Feb-12		letter to tourist operator offering to meet with them to discuss and review maps in order to address their interests. .
Contingency Plan 2012-2014	Date	Method	
	31-May-12	Letter to stakeholders	
	31-May-12	EBR Posting	
	25-Sep-12	Letter to stakeholders	
	25-Sep-12	EBR Posting	
	25-Sep-12	Kenora Daily Miner and News	
	31-May-12	Lake of the Woods Enterprise	
	31-May-12	Wawatay	
	15-Jun-12	CKDR Radio ads	
Email to representative	28-May-10	List of Anishinaabe Communities and Councils listed in Whiskey Jack Forest Terms of Reference	
Pickerel Creek Camp and Outpost	03-May-12	email to operator explaining delays in the plan and the development of this contingency plan.	
Gold Arrow Camps	3-May-12	email to operator explaining delays in the plan and the development of this contingency plan.	
Perrault Lake Camp	03-May-12	email to operator explaining delays in the plan and the development of this contingency plan.	
Gold Arrow Camps	08-May-12	met with operator to discuss CP and harvest areas. No concerns were raised at this time. Operator will	
Dalles First Nation	21-Dec-11	minutes of a meeting held with Chief	
Naotkamegwanning First Nations (WBFN)	02-May-12	Community representative requested map (of the WJF CP 2012-14).	May 2, 2012. Map of proposed harvest blocks provided to representative of Whitefish Bay FN.
Dalles First Nation	31-May-12	MNR sent by Registered mail the notice of CP 2012-14 and Q&A	Signed for June 1, 2012

Grassy Narrows First Nations	31-May-12	MNR sent by Registered mail the notice of CP 2012-14 and Q&A	Signed for June 6, 2012
Naotkamegwanning First Nations (WBFN)	31-May-12	MNR sent by Registered mail the notice of CP 2012-14 and Q&A	Signed for June 1, 2012
Wabaseemoong Independent First Nations	31-May-12	MNR sent by Registered mail the notice of CP 2012-14 and Q&A	Signed for June 4, 2012
Wabauskang First Nation No. 21	31-May-12	MNR sent by Registered mail the notice of CP 2012-14 and Q&A	Signed for June 6, 2012
Kenora Metis Council	31-May-12	MNR sent by Registered mail the notice of CP 2012-14 and Q&A	Signed for June 4, 2012
Grand Council Treaty #3	31-May-12	MNR sent by Registered mail the notice of CP 2012-14 and Q&A	Signed for June 6, 2012
	26-May-12	note sent to Miisun regarding the values identified by elders.	
Grassy Narrows First Nations	08-Jun-12	Wanted to thank planning team for excellent overview. Wanted to confirm date of planning team meeting	Responded with date and time for meeting.
Naotkamegwanning First Nations (WBFN)	11-Jun-12	informed representative that open house is in SN on the 19th. Electronic version is being sent by email. Asked if any interest in info session being held in the community.	
Naotkamegwanning First Nations (WBFN)	12-Jun-12	indicated that Naotkamegwanning wants to have session with planning group and elders and other concerned members of the community. Dates suggested.	
Grassy Narrows First Nations	11-Jun-12	MNR following up to see if any further direction had been received from Chief and council regarding WJF.	Sent CD up to community.
Kenora Metis Council	11-Jun-12	MNR questioned whether they would like a map of proposed areas for the WJF CP2012-14.	
Naotkamegwanning First Nations (WBFN)	15-Jun-12	As per emails, MNR mailed CD of plan text and map to band office.	
Grassy Narrows First Nations	19-Jun-12	respondent picked up a wildlife and forestry values map from MNR office.	
Naotkamegwanning First Nations (WBFN)	18-Jun-12	MNR responded that planning tean unable to make proposed dates. Asked if there are any dates available in first two weeks of July.	
Grassy Narrows First Nations	13-Jun-12	Letter from Chief and council requesting electronic copy of proposed plan and maps as well as a list of detailed requests regarding the CP.	
Grassy Narrows First Nations	13-Jul-12	email asking if there is more information to share regarding the Whiskey Jack forest other than just maps. Is there a power point presentation? Tables and supplementary documentation?	
Wabauskang First Nation No. 21	17-Jul-12	email with letter from Chief attached	Email response stating that offer is still out there to hold a meeting with the community. Spoke with Band manager to arrange a date. July 25 email asking if there had been direction/input from chief regarding a meeting date.
Naotkamegwanning First Nations (WBFN)	17-Jul-12	Gave notice that he is resigning from his position on planning team due to conflicts with his present position and named a replacement for the future meetings.	
Naotkamegwanning First Nations (WBFN)	17-Jul-12	rough notes taken at a meeting held with Whitefish Bay community on July 17, 2012	
		email thanking rep for coordinating the meeting at WFBFN. Acknowledges that there are a list of action items and a field visit to implement.	
Grassy Narrows First Nations	18-Jul-12	email with attached comments regarding the Contingency plan from ANA.	
Waubaskang First Nations	17-Jul-12	letter from Chief requesting a meeting as soon as possible to discuss Ontario's plans for the Whiskey Jack Forest.	Email response stating that offer is still out there to hold a meeting with the community. Spoke with Band manager to arrange a date.
Grassy Narrows First Nations	19-Jul-12	email apologizing for stating that there had been no response from the MNR to concerns raised with CP. The response had just been received that morning with confirmation that information was being gathered to answer their questions.	
Naotkamegwanning First Nations (WBFN)	17-Jul-12	Email stating that the elders would like to say thank you to the team and look forward to many more sessions in the future.	
Grassy Narrows First Nations	01-Aug-12	series of emails between District Manager and Councillor trying to firm up a date to meet to discuss the Contingency Plan. Date suggested is August 3.	

Grassy Narrows First Nations	07-Aug-12	email from DM to ANA project manager thanking her for sharing the fact she had not seen the 15 page submission. DM also provided map as attachment.	
		met with Jim McNulty, didn't receive notice of plan.	checked files, notice sent to previous trapline owner. Ownership now updated and respondent added to mail list.
		email to cottager in regard to the delay in planning process and the development of Contingency plan. Would like to meet and discuss harvest areas in the Witch Bay Road area.	
	15-Jun-12	email from MNR to respondent regarding June 7th comment on CP and bring the CP closer to the 80:20 ration. Wanted to inform that planners were successful in bringing the landscape measurement close to this ration	June 15, 2012. respondent was glad to hear that this was achieved.
	03-May-12	email to operator explaining delays in the plan and the development of this contingency plan.	
	3-May-12	email to operator explaining delays in the plan and the development of this contingency plan.	
	03-May-12	email to operator explaining delays in the plan and the development of this contingency plan.	
	08-May-12	met with operator to discuss CP and harvest areas. No concerns were raised at this time. Operator will GPS bear baits.	
		email to cottager in regard to the delay in planning process and the development of Contingency plan. Would like to meet and discuss harvest areas in the Witch Bay Road area.	
		met with Jim McNulty, didn't receive notice of plan.	checked files, notice sent to previous trapline owner. Ownership now updated and respondent added to mail list.
AWS 2012-13			
Notice sent to Stakeholders	17-Oct-12		
Notice in Newspapers	17-Oct-12	Kenora Daily Miner and News	
	18-Oct-12	Wawatay	
	19-Oct-12	Kenora Daily Miner and News	
Stage 3 - Review of Proposed Operations			
Whiskey Jack Forest 2012-2022 FMP Review of Proposed Operations			
Mailout sent January 31, 2013			
KDM&N February 1, 2013			
Lake of the Woods Enterprise Thursday, January 31, 2013			
EBR Posting January 31, 2013			
Stage 3		LCC member had requested that this trapper wanted copy of map.	January 3/13 letter sent to trapper with map showing area being harvested on this trapline, and informing of open house date in Ear Falls.
Whiskey Jack Forest Management Plan - Review of Proposed Operations		request for maps	response from MNR with maps sent.
Stage 3			sent notice to be put in their magazine and website (cottagers).
Stage 3			Road near harvest block used by family to get in and out during ice in/out season. Road would improve access.
Stage 3		letter returned. NSA. Emailed and got address correction	sent announcement by email
Whiskey Jack Forest Management Plan - Review of Proposed Operations		comment sheet from open house	requested copies of maps. Maps picked up March 12, 2013.
Whiskey Jack Forest Management Plan - Review of Proposed Operations		comment sheet from open house	requested removal of several blocks. Response from MNR June 16, 2013 indicating which blocks were being removed from harvest.
Whiskey Jack Forest Management Plan - Review of Proposed Operations		comment sheet from open house	wants block in trapline uncut for at least 5 years. Has had 8 marten boxes missing from block 12.190
		Jan. 31, 2013. referred to confusion on dates on EBR.	Feb. 1, 2013. said that error on posting dates are now rectified. Also noted that AOC's have been added to known canoe routes. Asked that if there are other routes that require AOC please advise.
		Mar. 5, 2013. comment sheet at open house regarding NWOSTA trails.	
		comment sheet from open house submitted by mining representative on LCC	requested copy of specific maps. Maps picked up at info center.

	04-Feb-13	will be coming into town and want to pick up maps of Roger Lake area. Second email asking if maps have been sent yet?	responded with small version of map attached and offer to print out larger scale if required.
	22-Feb-13	Wants to know if logging in Highwind area still a go. Is there a way to look on line.	Will send CD with info. Harvest area still in plan for next winter.
	28-Feb-13	Comment Sheet: refers to block 12.908. Would like to see removed as it would provide access into Roger Lake and impact two remote outpost camps.	
AWS 2013-14	Date	Comment	Response
Whiskey Jack Forest Annual Work Schedule 2013_2014			
mailout sent to stakeholders March 14, 2013			
Lake of the Woods Enterprise, March 14, 2013			
Review of Draft FMP -WJF 2012-22	Date	Comment	Response
Notice sent to stakeholders	30-Jul-13		
Notice in Newspapers	01-Aug-13	Wawatay News	
	01-Aug-13	Lake of the Woods Enterprise	
	30-Jul-13	Kenora Daily Miner and News	
Notice in Newspapers from Kenora LCC	30-Aug-13	Kenora Daily Miner and News	
	29-Aug-13	Lake of the Woods Enterprise	
EBR posting	30-Jul-13		
Information Centres	03-Sep-13	Sioux Narrows	0 members of public
	04-Sep-13	Red Lake	6 members of public
	05-Sep-13	Ear Falls	10 members of public
	06-Sep-13	Kenora	4 members of public
		letter dated October 28, 2013 with several items to be addressed.	November 6, 2013, planning forester emailed with direction of how to find information requested on enclosed dvd.
		June 25, 2013 - email regarding the listed organizations position on the Whiskey Jack Forest.	
		letter with DVD as requested by another Earthroots member to be sent to you.	
		letter to forester regarding EBR posting. They attached a letter to Premier Wynne with this letter	
		680 emails with a generic message regarding harvesting in Grassy Narrows area sent to Premier Wynne and cc'd to forester.	email campain from Freegrassy.net
		1048 emails with content being for the most part 'Free Prior and Informed consent' cc'd to Premier Wynne	email campain from Amnesty International site.
	07-Sep-13	comment sheet from open house requesting maps and will send gps coordinates of bear baits later.	

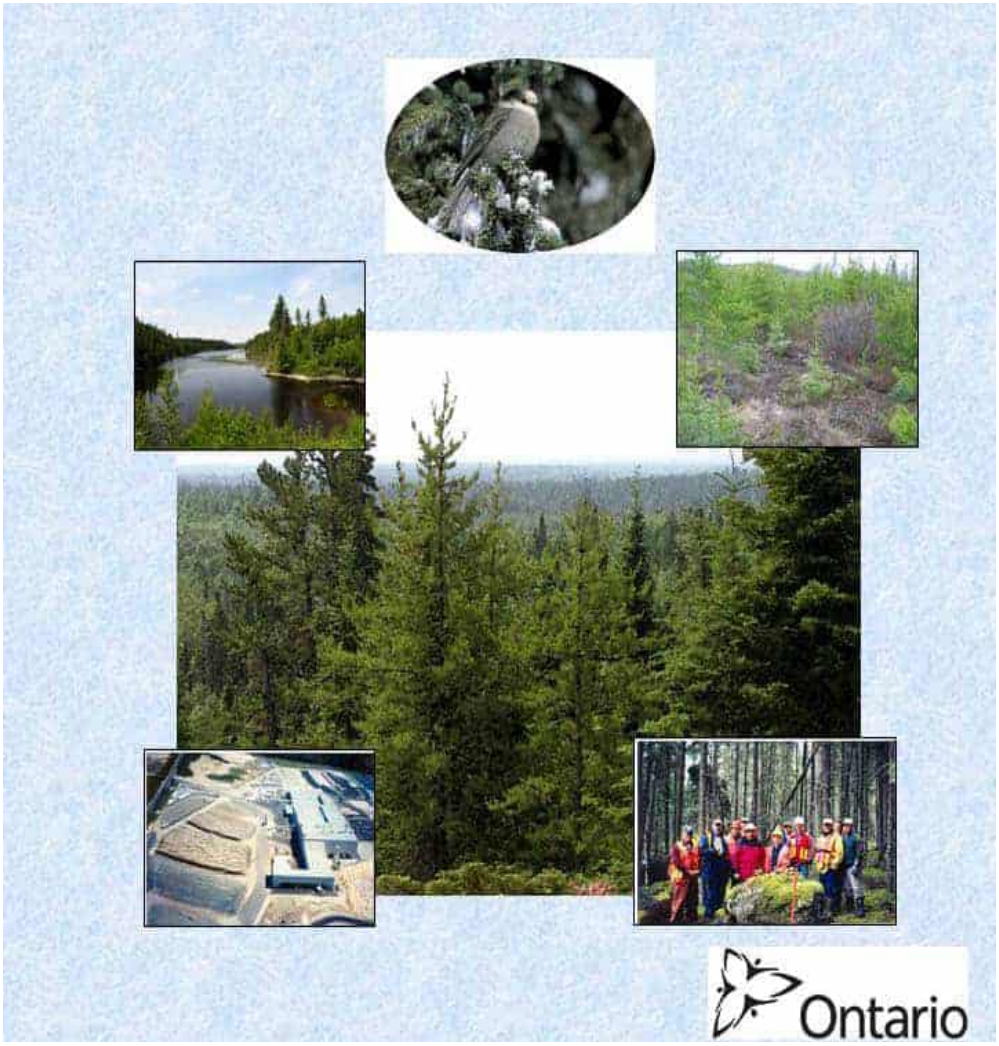
SUMMARY OF ISSUE RESOLUTION

Issue resolution was not initiated for this forest management plan, therefore no summary is required.

Supplementary Documentation J

2012-2022 Whiskey Jack Forest Management Plan

Local Citizens Committee Report



Kenora Local Citizens Committee
Activity Report

for the

Whiskey Jack Forest

2012-2022
Forest Management Plan

April 2009 – November 2013

KLCC ACTIVITY REPORT for the WHISKEY JACK FOREST 2012-2014 FMP

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Report of the Kenora Local Citizen's Committee (KLCC)
Whiskey Jack Forest 2012-2022 Forest Management Plan
April 2009 – September 2012

INTRODUCTION

This report is prepared in accordance with the Forest Management Planning Manual for Ontario's Crown Forests (2009). The intent of the report is to summarize the activities of this committee and to document key issues and interests.

The Kenora Local Citizens Committee (KLCC) is an advisory committee to the District Manager of the Kenora District Ministry of Natural Resources. The committee consists of individuals from the surrounding communities with diverse interests and backgrounds. The current membership includes:

Member	Affiliation
Clarke Anderson – Chair	Kenora Trapper's Council
David Anderson	Independent
Wayne Bruce	LOWDPOA
Dave Canfield	City of Kenora
Karen Cederwall	Independent
Henry Dribnenky	LOWDPOA (Alternate)
Rod McKay	Forest Industry
Alasdair Mowat	Mineral Exploration
Dale Munro	Forest Industry (Alternate)
Alex Rheault	Tourism
Pat Rheault	Tourism (Alternate)
Mark Scott	Independent Loggers
Sandra Triskle	Kenora Métis Council
Floyd Triskle	Kenora Métis Council (Alternate)

The area covered by this local citizens committee is the Kenora District, which includes all of the Kenora Forest and the majority of the Whiskey Jack Forest. The remainder of the Whiskey Jack Forest lies within the Red Lake District and as a result, the Red Lake Resource Management Committee also plays an advisory role.

The Kenora Forest and the Whiskey Jack Forest are both on the 2012-2022 planning schedule and, in order to increase efficiencies, the KLCC serves as the Local Citizens Committee for both forests. Throughout the period covered by this report, many KLCC meetings included discussion and information about both the Kenora and Whiskey Jack Forests. When the Kenora Forest 2012-2022 Forest Management Plan (FMP) was completed, planning continued on the Whiskey Jack 2012-2022 Forest Management Plan. This KLCC Activity Report has been prepared for the 2012-2022 Whiskey Jack FMP, but may include some discussions on forest management planning in general, and the Kenora Forest 2012-2022 FMP.

At monthly KLCC meetings, members reviewed the Whiskey Jack Forest components as presented, and received FMP updates and status reports regularly from the Planning Team. The KLCC has participated in several Forest Management Planning activities.

ACTIVITIES

- KLCC representatives: W. Bruce was nominated as KLCC representative on the Planning Teams for the Whiskey Jack and Kenora Forests.

- The KLCC representative participated in almost all of the Planning Team meetings for the Whiskey Jack Forest FMP.

- There were 43 total KLCC meetings from April 2009 to June 2013..

May 26, 2009	*October 12, 2010*	*January 24, 2012*
July 7, 2009	*November 4, 2010*	*February 8, 2012*
August 5, 2009	*December 7, 2010*	*March 27, 2012*
September 14, 2009	*December 21, 2010*	*May 1, 2012*
December 1, 2009	*January 25, 2011*	*May 24, 2012*
January 19, 2010	*February 28, 2011*	*June 14, 2012*
February 2, 2010	*April 12, 2011*	*August 14, 2012*
March 2, 2010	*May 10, 2011*	*October 30, 2012*
March 30, 2010	*June 21, 2011*	*January 9, 2013*
April 27, 2010	*July 19, 2011*	*February 28, 2013*
May 18, 2010	*August 23, 2011*	*May 9, 2013*
June 23, 2010	*September 20, 2011*	*June 3, 2013*
August 30, 2010	*November 7, 2011*	*August 28, 2013*
September, 20, 2010	*December 6, 2011*	*October 9, 2013*
		November 12, 2013

- At monthly KLCC meetings, members reviewed both the Kenora Forest FMP and Whiskey Jack FMP components as presented and received planning updates from Planning Team members.

- KLCC members reviewed and made recommendations on amendments.

TRAINING

2009 *April* - Forest Management Training in Kenora
K. Cederwall in attendance.

November - Long Term Management Direction Training in Kenora
H. Dribnenky, D. Anderson, and R. McKay in attendance.

2010 *September* - Operational Planning/Changes
H. Dribnenky in attendance.

2011 *April* – LCC Training Modules – option for all KLCC members to complete online.

ACKNOWLEDGEMENTS

The KLCC would like to acknowledge all of the effort that both Henry Dribnenky and Stephen Duda put into this current FMP, as well as forest management planning in Kenora District in general, and thank them for all of their hard work.

KLCC MEETING DISCUSSIONS AND INFORMATION SHARING

This section includes a summary of the topics and issues raised and discussed at KLCC meetings during the time period covered by this report. Some topics are specific to the Whiskey Jack Forest, while others are pertinent to both the Whiskey Jack and Kenora Forests.

Inventories

Independent Forest Audit

The Whiskey Jack 2009 independent forest audit was discussed by the KLCC at several meetings (5+). The committee requested and received presentations from the auditors and was provided a short text version of the audit, as well as copies of the final report on two separate occasions. Early on, the KLCC noted that silviculture was of particular interest and expressed skepticism that audit findings would have any beneficial influence in the current FMP process. Some KLCC members were of the impression that audit findings would be watered down before being finalized and in essence, MNR and Industry would 'pull the wool over the public's eyes'. Other concerns include questions about who has liability for silviculture shortfalls, roads abandonment, and slash pile maintenance associated with the previous Sustainable Forest Licence. The KLCC is also concerned about whether the public received value for money invested in respect of silviculture and if funding would be available to address audit findings associated with silviculture shortfalls. The KLCC documented these concerns in a November 9, 2010 letter to the District Manager and the MNR formally responded to these concerns in a letter to the KLCC dated March 16, 2011. Additionally, the MNR provided information to the KLCC on how two of the audit recommendations have been addressed in the silviculture strategy for the 2012-2022 Whiskey Jack Forest FMP.

SFMM (Strategic Forest Management Model), Volume Discrepancies

SFMM and the discrepancies between planned and actual harvest volumes has been a long standing concern for the KLCC. Much discussion has occurred at KLCC meetings throughout the time period covered by this report and many concerns have been expressed about SFMM. It is the impression of many committee members that plan authors can, and do, change the numbers that are entered into the SFMM program until SFMM provides them with the desired answer. Additionally, many on the KLCC cannot understand why forest managers plan to harvest at one level when they know that traditionally the actual harvest is only a fraction of this level (e.g. plan to harvest 5,000ha/yr vs. actual harvest is 1,200ha/yr). At several KLCC meetings, representatives from MNR and Industry made presentations with the intent to explain the SFMM program and the planning rationale for annual harvest allocations; however these topics continue to be unclear and are still concerning to the KLCC.

Age Class Substitution

The KLCC has expressed concerns about age class substitution during the planning process and how it affects the long term sustainability of the forest. A committee member noted that age class substitution has been a problem in the past and is concerned about the trend to continue this practice. MNR provided the rationale for age class substitution on the Whiskey Jack Forest and explained it was an accepted planning tool within the FMP manual.

Climate Change

Climate change was discussed and the MNR explained that all management plans must include text referencing climate change. The KLCC expressed its concern with how climate change will affect the local forest and suggested that a climate change adaptation option should be included in the upcoming plans.

Internal KLCC Workings

Recruitment

The lack of First Nation representation on the KLCC has been discussed at several meetings (Grassy Narrows specifically and all First Nations in general). Early during the period covered by this report (spring/summer of 2009) a general letter of invitation was sent from the MNR to many area stakeholders and communities including First Nations and Métis. The Kenora Métis Council responded and is now represented on the KLCC but no response was received from First Nation communities. Later in the process (Feb 28, 2011) an additional letter was sent from the KLCC to all First Nation communities. One community indicated interest as a result of this letter, however they did not follow-up with attendance at a meeting. The KLCC continues to have no First Nation representation and this is a concern for several members.

Communication

The KLCC has expressed concerns on numerous occasions that MNR is not communicating all information to them that they should. On one occasion, a committee member noted that any issues that MNR discusses with industry should also be brought forward to the KLCC for information purposes. In another meeting, the KLCC expressed their opinion that historically they had been well informed about amendments to FMP's, but that recently they had the perception that they were not always being consulted. The forest managers for both the Kenora and Whiskey Jack Forests explained that although one amendment had not been presented to the committee (apologies provided), and two others had been presented after being classified as administrative, all other amendments had been presented to the committee. It was speculated by the MNR that the KLCC may have had the perception that they were not being informed of amendments because there had been an extended period of time without amendments (one full year). The KLCC also expressed concerns that the MNR is not providing a summary of compliance activities consistently. The MNR responded to this at the following meeting by providing a summary of the previous year's compliance activity for both forests while noting that there was minimal compliance activity because there had been minimal forest management activity.

Other Users

Grassy Narrows Mediation

The KLCC expressed on many occasions their extreme frustration with Justice Iacobucci's mediation talks with Grassy Narrows. The talks themselves were not of concern but the process in general was. The KLCC was extremely frustrated with the lack of communication about how the talks were proceeding and asked on many occasions for the MNR to arrange a meeting/conference call with Justice Iacobucci. The MNR was not able to schedule this meeting and has explained that this was due to Justice Iacobucci's busy schedule and the confidentiality of the talks themselves. Of equal concern for the KLCC was the length of time that the mediation talks took as well as the perceived extravagance of the meeting locations. On many occasions committee members questioned why the talks were occurring in Toronto and Winnipeg and not in Kenora or Grassy Narrows.

Resource Based Tourism

Early in the planning process a committee member provided the MNR with a tourism valuation formula to recognize resource based tourism values within an FMP. This formula was accepted in principle by the KLCC pending MNR review. The MNR explained to the committee that they believe the formula can be a tool to provide to resource based tourism outfitters for their use in developing Resource Stewardship Agreements.

Forest Management

Optimum Use of Wood Harvested

Several of the committee members have expressed concerns about the optimum end use of the wood being harvested. Committee members have heard that in some cases harvested wood was being used by mills to burn for energy (hog fuel) instead of for conventional purposes (sawlogs/pulp). In the opinion of the KLCC, this is not the proper end-use of forest resources. It has also been the concern of the KLCC that harvesting of conifer continues on the Whiskey Jack Forest while there are no local mills to utilize the wood (e.g. Kenora Forest Products). Instead this conifer is being utilized by the pulp mill in Dryden. It's the opinion of some KLCC that this conifer should not be harvested until local mills reopen; however other members did not agree and were happy that the wood was being utilized and providing employment. Some members of the KLCC are also concerned that prime, sawlog grade conifer stands are being harvested and utilized to produce pulp. In the KLCC's opinion these stands should not be targeted until the local mill reopens and in the interim mixed species stands should be harvested.

Pure Species Management

The KLCC has concerns about forest management direction to convert many mixed species stands to pure species stands. Foresters from both forests explained that it is the current opinion that forest stands prior to European settlement were pure species, and it is the desire to return to this condition. The committee expressed skepticism that this was true and inquired what effect conversion to pure conifer would have on wildlife such as moose and deer. One member expressed his

opinion that mixed species stands were part of the landscape in his childhood and in his opinion, are part of the natural condition.

Harvesting to Shoreline

Forest managers have described to the KLCC the forest management option to harvest to the shoreline in certain cases. They have explained the rationale and reiterated that it would only be considered in non-contentious and environmentally safe situations. However, the KLCC continues to have concerns about how harvesting to shoreline will affect fisheries, shoreline erosion, waterbodies, and their plant and wildlife communities.

Roads

Density of Roads

A member of the KLCC has expressed concerns about the number of roads that 'crisscross the forest' thereby detracting from the remote tourism value. The MNR, SFL and another member of the KLCC all explained that the forest industry needs to build a certain amount of roads to access harvest areas. Sometimes it is necessary to go around swamps, creeks, rock, etc. Roads must also be built to accommodate the weight of loaded pulp trucks, allow them to pass each other and turn around in certain spots. Due to the costs associated with road building and gravel hauling, the forest industry does not build more road than is actually needed.

PERSONAL OBSERVATIONS OF INDIVIDUAL KLCC MEMBERS

This section includes issues and opinions expressed by individual committee members. The individual comments may, or may not, reflect the collective opinion of the committee; however, all comments have been included in this report with full committee support.

Inventory

Inventory and Allowable Harvest Calculations

- There is concern that the inventory used for computer modeling does not represent the inventory on the ground. More ground-truthing is necessary. When harvesting, the estimated yield should be compared to the actual yield. The forest inventory should then be adjusted to the actual results. There is no measure of the accuracy of the inventory. This does not give a comfort level for those on the KLCC that doubt the accuracy.

- The KLCC has also heard how changes in the silvicultural ground rules and the assessment of silvicultural success will be modified in the 2012 plan, partly in response to auditor concerns. One outstanding concern that was raised by the auditor and the KLCC has to do with the inventory used in the 2012 plan. The auditor was concerned about how regeneration surveys and surveys of natural disturbances have been reflected in the inventory. The auditor questions the accuracy of some 112,000 ha of barren and scatter/regeneration surveys. The audit recommendation is that the results of those surveys must be reviewed to ensure that the inventory reflects the current forest condition. Errors in an area that size, roughly 15% of the productive land base, could have significant impact on descriptions of the current forest and consequently, the future forest and all plan objectives that project changes in forest condition.

Independent Forest Audit

- The Whiskey Jack FMP must incorporate the 2009 audit findings and recommendations.

- The committee has asked for details from the MNR in response to the 2009 Whiskey Jack audit. The LCC sent a letter to the MNR with a number of questions. The letter was sent on November 6, 2010 and it took MNR until March 16, 2011 to respond.
- The MNR prepares audit action plans based on audit report recommendations. These action plans are not made available to the LCC on a timely basis.

Sustainability and Accountability

- Sustainability should be determined prior to an audit. As illustrated by the Whiskey Jack audit in which the silviculture was badly mismanaged and the damage was not detected until the audit. By then corrective action in some cases is too late. There is no accountability or evident consequences if the forest is mismanaged. Again the Whiskey Jack Forest is an example of this allegation. Sustainability should be determined through Annual Reports, past Forest Operations Reports, etc. (from past experience). Using the Whiskey Jack Forest as an example, sustainability was only determined as a result of an audit which occurs many years later. The test for sustainability needs to be more transparent.

- In spite of indications of problems, there have been no meaningful discussions regarding forest inventory, miles of abandoned roads, & major disturbances within cut blocks. It appears that it is "business as usual", in spite of many indications that current practices are unsustainable.

SFMM

- The inputs and assumptions that are put into the SFMM model are suspect and are not transparent to the KLCC. The concern is that the inventory should represent the inventory on the ground. Inputs and assumptions are tweaked until the objectives are met for the LTMD. The model is run multiple times until the objectives and the targets are achievable or there is an explanation why not. The process must be more transparent.

- When the management plan has an objective, it seems to me the SFMM, age classes and inventories are tweaked and stretched to meet an unrealistic target.

- The short term impacts of age class substitution relative to the age class structure resulting from the strategic model must be explained.

- Members of the LCC have expressed concerns about the strategic models. I share those concerns. We've heard that the models are complex, not easily interpreted for non-users, and there is uncertainty about inputs and inventory, etc.

  Independent Forest Audits have reported that there is a trend toward forest conversion from conifer to hardwood or various types of hardwood/conifer mixed wood. This trend is evident in any analysis of past and present forest inventories. There is no question in my mind that forest management, namely logging, has caused changes in forest conditions that cannot be reversed through management as we see it in the current management plans. As it is, with government scientists predicting a progressively warmer and drier environment through time I think it is highly likely we will see more, not less, forest conversion to hardwood/mixed woods.

  The FMP doesn't consider climate change and for this and other reasons I think it doesn't really reflect past and likely future changes in forest cover.

  I would like to see a different approach to development of the strategic model. Move away from the unsustainable objective to produce wood and focus on the ecology of the forest, the historic logging pattern, and trends in changes in forest cover. Projections of silvicultural success have been adjusted to reflect results of recent regeneration surveys but I don't think that goes far enough. At a minimum, the model should include estimations of most likely changes in forest cover under climate conditions predicted in the climate change model. I think it's reasonable to think that long term forest composition and structure forecasts are still too optimistic in a forest that has already been significantly modified from the natural condition.

  The Racey/Towill report discusses a number of issues related to warmer/drier climate conditions that could be used to explore potential changes in forest cover.
  - longer and more severe fire seasons
  - earlier increased damage from windstorms
  - increases in insect infestation
  - encroachment by non-native plant species
  - lower productivity from typical silvicultural practices

Climate Change

- Forest Management Planning should include recommended methods to adapt our forest for climate change and mitigate our losses. Thus far FMPs are totally silent on the issues and the potential long term impact of climate change. An available computer model should be used to measure the carbon sink now and compare the net carbon sink after the Proposed Management Strategy is chosen.

- The KLCC has raised the question of climate change and why it isn't considered as an influencing factor in terms of the future forest condition in the development of current and past management plans. In the June 2005 KLCC Report, the KLCC said that computer modeling is necessary to predict 'what if' scenarios and the impacts of climate change on the sustainability of the forest.[1]

  Six years later, and we have yet to hear how forest managers are adapting plans in the event that predictions about climate change are right. Climate change is important to the Province of Ontario[2] and in fact the Province has developed the models that could be used to describe changes in forest condition resulting from various climate change scenarios.[3] The MNR Science Unit in Northwestern Ontario developed models specific to the Northwest Region that show changes in species distribution resulting from various climate change scenarios.[4] In that report, they show that in the worst case scenario, black spruce will no longer be a 'native' species by 2071 when climate change is taken into consideration. Similar changes are predicted for jack pine.

Recommendation: To consider the likely outcomes resulting from climate change, at a minimum the plan should:

a) Include a comprehensive assessment of the most likely climate change scenarios, using MNR science as the base.
b) Include measures to adapt to the predicted changes through silviculture.
c) Develop a future forest condition reflective of the changes predicted through climate change.
d) Adjust plan objectives and planned operations to be more reflective of the changes predicted as a result of climate change.

- In my opinion climate change is the most significant threat facing the global environment and lack of discussion about climate change in the plan is, in my opinion, a disappointing oversight. Climate changes predicted by MNR scientists will affect future forest conditions regardless of efforts of planners to manage the forest. Rather than focus on wood supply the plan should focus on adaptation and mitigation strategies as described in the Province of Ontario climate change policy. I think the record shows that the planning team spent part of one meeting two years ago on the climate change issue but decided to ignore it. At a minimum the planning team might have assigned someone to investigate the work done by Government of Ontario scientists to provide some perspective to the team (and the LCC) to be included in the FMP(s). The planning manual lists climate change as one of the topics that may be considered in development of the LTMD.

  I accept the conclusions of government scientists predicting changes in climate and forest cover. According to the science, we will see climate changes in time frames of less than 60-70 years, well within the 160 year planning horizon. The FMP predicts changes in forest conditions between 2012 and 2172 based on current climate conditions. I don't think the management strategy in the FMP is particularly reliable under those circumstances and I can't agree with a management strategy that disregards the scientific conclusions around climate change.

  The following is a list of some of the climate change sites available from the Province of Ontario that cover a wide range of climate change issues. The Province has a number of websites dedicated to reports on science and policy across all Ministries. The Ministry of Natural Resources has websites more specifically directed at forests and climate change as well as a 'tool' that allows the user to visual changes in climate over the next 100 years or so.

- http://www.ene.gov.on.ca/environment/en/category/climate_change/
- http://www.ene.gov.on.ca/environment/en/resources/STDPROD_081662.html
- http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/stdprod_085423.pdf
- http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/stdprod_085424.pdf
- http://www.mnr.gov.on.ca/en/Business/ClimateChange/2ColumnSubPage/STDPROD_090050.html
- http://www.mnr.gov.on.ca/stdprodconsume/groups/lr/@mnr/@climatechange/documents/document/stdprod_090231.pdf

[1] Report of the Local Citizen's Committee (LCC) June 2005
[2] http://www.ene.gov.on.ca/environment/en/category/climate_change/index.htm
[3] http://www.web2.mnr.gov.on.ca/mnr/ccmapbrowser/climate.html
[4] Climate Change and Forest Management, Towill *et. al.* 2005

- http://www.mnr.gov.on.ca/en/Business/ClimateChange/2ColumnSubPage/STDPROD_090063.html
- http://www.mnr.gov.on.ca/en/Business/ClimateChange/Publication/STEL01_132689.html
- http://www.mnr.gov.on.ca/en/Business/ClimateChange/2ColumnSubPage/STDPROD_090054.html

Clearly, the Province of Ontario has no reservations concerning the reality of climate change and the impacts climate change will have on our environment, including forests and forest management. Climate change is real, it is happening and there will be significant changes in our forests, particularly the Boreal forest, as the climate warms and becomes drier.

Internal KLCC Workings

Recruitment

- We have always had a problem attracting regular First Nation representation despite the repeated efforts and invitations from the MNR and sitting KLCC members.

- Most of us have trouble finding an alternate or a replacement if we want to retire. One reason often given to me is the KLCC advice and input is not given serious consideration. I have sometimes felt that the DM and the regional director ignore us as 'pesky gnats'.

Communication

- Members, from time to time, request things from the MNR (maps, copies, etc) to be brought to a meeting without bringing the request up for a vote as an action item.

- MNR personnel often have to take flack over things that are beyond their control.

- There is no communication between the Ontario Government's MNR and MNDM departments. Regarding our local Kenora MNR District office, copies of all meeting reports and maps should be forwarded to the regional MNDM's regional office in Thunder Bay. After processing, the pertinent information should be distributed to other stakeholders with concerns in the Kenora area.

Other Users

Aboriginal

- The issue between Grassy Narrows and the MNR continues and will continue to raise questions about the effectiveness of this entire process.

- After years of paying an extremely high priced facilitator and providing honorariums and cost-free trips (to several big cities) for dozens of 'negotiators', the blockade at Grassy Narrows remains in place and there are no near-by forest operations. Thousands of cords of harvested timber were stranded to rot in the forests beyond the blockade. The Segise Bridge has been washed out and, until harvesting is resumed, there are no resources available to repair the bridge on this logging road. Until it is once again passable, there is no short-cut for the community members to reach the Red Lake Road. I know that the local MNR office has little power to alter what is going on but I just had to vent my frustration over what I have heard is a constantly changing list of demands(?) and the seemingly insincere desire to come to an agreement. It seems to me, and to a lot of people I've talked to, that this situation has become a 'cash cow' for people involved.

- The LCC has been interested in the progress of the Grassy Narrows negotiations and the development of the Whiskey Jack LTMD. The LTMD is well advanced but the negotiations are on going. It isn't clear what aspects of the negotiations or the process agreement were considered in the development of the LTMD.

Forest Management

Wood Supply, Utilization

- There should be clarification of the wood supply objectives including volumes, species, products and destinations.

- The KLCC has asked about wood supply and how wood is being utilized in the current plan and where harvested wood will go in the upcoming FMP. The information available says that the wood supply targets for the Whiskey Jack plan are based on supply commitments from previous plans. In my opinion, these wood commitments are out of date and do not reflect the reality of the current forest industry. With the exception of the hardwood commitments to Weyerhaeuser there is no current local demand for any fibre from these forests, yet the target volumes are higher than ever, even when there were paper mill and sawmill operations.

  When I asked the question about wood supply commitments, I was told simply that allocations would be 'as per the FMPM'. In my opinion the MNR has no idea what the true wood supply is and where it might go.

  The problem with this approach is that these 'commitments' become the target in the arithmetic model. The target drives everything that follows, namely achievement of non-timber objectives. In my opinion, that isn't 'forest management' so much as it is 'supply management'.

  We hear others talking about Bill 151 and their belief that new legislation will open up Ontario's forests to export. We hear about the emerging use of forest resources for biofibre/biofuel.

  With these issues in mind and with the substantial volumes still forecast from the Whiskey Jack Forest, the KLCC has reason to be concerned about transparency in the planning process, especially regarding planned wood utilization.

  Recommendation: MNR should clarify wood utilization and provide realistic estimates of mill volumes and provide rationale for planned utilization considering volume estimates much higher than historic harvest levels.

- The MNR has approved a facility licence for a new facility in Kenora that plans to produce utility poles. The facility has been granted a wood supply (9,000 cubic metres) from the Kenora Forest through a Ministerial Directive. A similar volume has been directed from the Whiskey Jack Forest for a total of 18,000 cubic metres.

  Utility poles can be manufactured from jack pine or red pine; however red pine is clearly preferred. Red pine is also relatively scarce in the forest as a result of decades of harvesting and for the most part is found as scattered individuals, on islands or locked up in riparian reserves. The KLCC asked if a wood supply analysis was done before the license was issued and was told that confirmation of the wood supply was the responsibility of the proponent.

  It isn't clear if the Whiskey Jack FMP has considered a strategy to provide material for this new facility. In my opinion, from a social and economic perspective, it doesn't make a lot of sense to encourage investment in a facility reliant upon a reasonably specialized wood supply without confirming there is a long term sustainable supply.

  Recommendation: A wood supply study is required.

Pure Species Management, Protection of Local Interests

- Nearby pure, young conifer stands are made available in the plan when KFP is not in operation. To harvest conifer in mixed stands and turn them into the desired pure conifer stands is one thing, but I feel nearby pure conifer blocks should be preserved for now.

- It must be taken into account that there are very few large blocks of harvestable timber available and a few of them should be managed for future local needs.

- More conifer is targeted in the FMP than can be used locally at present.

- The KLCC heard presentations about the planning process from both planning teams about the planning process and how forest management will lead to a desired forest condition sometime in the future. The KLCC was told that the strategic plan is based on an understanding of the natural forest condition and that forest management is supposed to lead from

the current forest condition to a point where the forest resembles whatever is defined as the natural forest. The KLCC has heard that logging certain forest types and implementing strategic silvicultural strategies will over time lead to a forest that resembles the natural forest. All the arithmetic presented by the planning team seeks to demonstrate how that will be achieved.

I'm not convinced that proposed operations are consistent with that outcome. The KLCC hears from some that the current situation, heavily weighted to mixedwoods and hardwoods, may be the natural forest but we also hear that the natural forest would be more pure conifer and less hardwood. We also see that silvicultural strategies seem to be leaning toward low cost investments, which will not promote the pure conifer conditions.

This is confusing and leads to inconsistencies in planning. If the goal is to maintain the current forest condition then it may be completely acceptable to keep silviculture investments low and promote hardwood/mixedwood conditions. If the goal is to move toward purer conifer conditions, then there has to be a commitment to higher cost silvicultural strategies, which doesn't seem to be the case.

Independent audits for the Dryden and Whiskey Jack forest management units also indicate that harvesting has led to an increase in forest conversion from conifer (the type of tree that dominates the Boreal Forest landscape) to hardwoods such as aspen. This is very problematic from both a forest industry perspective as well as a wildlife habitat perspective, as many Boreal species are dependent on habitat that is made up primarily of conifer forests.[5]

Silviculture, Silviculture Ground Rules

- Current (5-10 year) harvest areas/volumes are calculated largely on the theory that silviculture today (harvest, renewal, tending and protection) will create a certain forest condition with specific species and harvest yields. Essentially the theory says that volume and species composition improves over time through silviculture and therefore more area can be cut today.

  The problem with the theory is that if the silviculture fails, if assumptions are overly optimistic or if in fact there is insufficient investment, then the theory collapses. The future forest does not materialize and forecast/current harvest levels are too high. As we learned from the audits, the current track in both the Kenora and Whiskey Jack Forest is toward more mixedwoods and less conifer. That forest condition will not produce the forecast yields and therefore current harvest levels, based on future returns, are too high.

  If we factor in the predicted changes in forest cover from climate change, the forecasts of future yields, forest condition and forest composition become unrealistic.

- The Whiskey Jack Forest long term silvicultural strategy talks about increasing pure species conditions, especially conifer, consistent with the natural forest condition. The KLCC has asked for information regarding silvicultural ground rules, but to date we haven't had an opportunity to discuss strategic silvicultural planning. The KLCC doesn't have the tools or knowledge to understand how the ground rules and their implementation during the plan term will contribute to the desired forest condition. The high proportion of natural regeneration in the Whiskey Jack suggests to me that silvicultural investments are not high enough to move toward the desired forest in a timely manner.

  These concerns have been discussed in previous independent forest audits.

  We concluded that the investment in conifer renewal is being jeopardized by a lack of adequate monitoring and tending on these ecosites. While the sites will eventually become mixedwood forest units (with a component of conifer), the objective of maintaining higher conifer stocking levels within these stands will not likely be achieved without further silvicultural interventions (i.e. infill planting, seeding, tending, etc.).[6]

  Silviculture practices, including a lack of tending of artificially regenerated areas, are leading to reduced stocking of conifer and an increased component of hardwood on the Forest. This trend does not support the management intention of maintaining a conifer dominated forest, as set out in the 2004-2024 Whiskey Jack Forest FMP.[7]

[5] http://www.greenpeace.org/canada/en/recent/Greenpeace-report-fails-McGuinty-on-forest-management/
[6] Kenora Independent Forest Audit 2003/08 pg 41
[7] Whiskey Jack Independent Forest Audit 2004/09 pg iii

Recommendation: The MNR should assess and report on the ground rules and provide rationale describing how the ground rules as presented will provide the results required to achieve the future forest condition.

Roads

Density

- Word games are sometimes used to disguise what is really meant, for example new all-weather roads are not being accurately described as such.

- There are too many roads that crisscross the forest.

Decommissioning and Liability

- The MNR is too committed to decommissioning of roads and trails in Ontario because of the liability concerns. Question: "How many successful liability suits have been filed against the government; particularly, the MNR"? If the MNR and government are that concerned, they should put warning labels on all issued licenses; example, timber harvesting, minnow trapping, trapping, hunting, fishing, boating, camping, prospecting; et cetera. The "Warning Label" should read: "To enter Ontario Forests and water ways by means of water craft, foot or other means is at your own risk". The Government has already established legal precedence by labeling tobacco and alcohol products. The roads and trails have been paid for directly and indirectly by the Ontario tax payer, at great expense, both in construction and decommissioning and in several cases the same roads have been reconstructed with future decommissioning.

Mining and Agriculture

- The Provincial Government's MNR does not think outside the box! The roads and trails are constructed for timber purposes and timber purposes only. Any other resource activity is an annoyance. These road systems offer other opportunities in opening up resource development of mining and agriculture.

- Agriculture has been overlooked! Without going into a lengthy discussion on increasing food costs with dimensioning food supply with increasing food demand, the government has to look at agricultural development within the non-productive forest areas; examples are Quebec, Manitoba. Road access through these areas creates economic opportunities for First Nations. Included in this agriculture package are road /trail access to small lakes/ponds suitable for hydroponics development-floating rafts. In both cases, these land and water areas will provide vegetable and berry production for domestic consumption and financial income. The floating hydroponic platforms will provide shade for fish, which will increase fish harvesting production.

Whiskey Jack Forest – Red Lake Resource Management Committee participation

- March 2, 2009 meeting of the Red Lake Resource Management Committee (RLRMC): Committee approved a motion to endorse the Whiskey Jack Forest Contingency Plan.
- June 1, 2009 meeting of the RLRMC: Trevor Park provided an update on the Whiskey Jack Forest Contingency Plan/AWS.
- October 5, 2009 meeting of the RLRMC: Dave New and Laurent Tetreault provided an update on the IFA for the Whiskey Jack Forest, which took place in September 2009.
- February 1, 2010 meeting of the RLRMC: Conference call and PowerPoint presentations by Steve Duda and Abby Anderson on "Desired Forest and Benefits" for Whiskey Jack and Kenora Forests and a Desired Forest and Benefits Questionnaire.

  Rod Seabrook of KBM (phone-in and PowerPoint Presentation) provided a discussion on the findings of the IFA on the Whiskey Jack Forest that was conducted in September 2009.
- April 12, 2010 meeting of the RLRMC: Gregg Lloyd, Red lake MNR representative to the Whiskey Jack FMP planning team, provided an update and a handout regarding a major amendment proposal to the current Whiskey Jack Forest FMP.

  Trevor invited any RLRMC members to attend the Planning Team meeting on May 17, 2010.

  Discussion took place surrounding Desired Forest and Benefits to the Whitefeather Forest; some ideas transferable to the Whiskey Jack Forest.
- May 3, 2010 meeting of the RLRMC: Committee informed about Whiskey Jack Information Center for Major Amendment (Red Lake Rec. Centre: Wed. May 5 from 4-8 p.m. and Ear Falls Legion: May 6 from 4-8 p.m.).
- May 17, 2010 meeting of Whiskey Jack Planning Team: Laurent Tetreault attended as RLRMC rep.
- May 18, 2010 Desired Forest and Benefits meeting of KLCC: Laurent Tetreault attended as RLRMC rep.
- October 4, 2010 meeting of the RLRMC: Steve Duda, project manager for the Whiskey Jack FMP attended meeting and provided a presentation on Long Term Management Direction.
- November 4, 2010 meeting of RLRMC: Laurent Tetreault updated the group on intended harvest areas.
- December 6, 2010 meeting of RLRMC: Laurent Tetreault indicated that the next meeting of the Whiskey Jack FMP Planning team would be held on December 7, 2010 in Kenora.
- January 10, 2011 meeting of RLRMC: Laurent Tetreault provided an update, focusing on recent activities concerning bridge installation at Caribou Falls.
- February 7, 2011 meeting of the RLRMC: Steve Duda reviewed the Whiskey Jack LTMD and asked the RLRMC if they had any problems or issues with the current round of forest management planning. He also asked the RLRMC to consider what kind of protocol they feel should be put in place to coordinate the RLRMC and the KLCC.
- January 9, 2012 meeting of RLRMC: Steve Duda, via teleconference, gave the group an update on the stage of planning and anticipated next steps for the Whiskey Jack Forest.
- February 4, 2013 meeting of RLRMC: Hassan Mohamed, via teleconference, gave the group an update on Stage 3 of planning and the associated Information Centres.
- October 7, 2013 meeting of RLRMC: Shawn Stevenson, via teleconference, gave the group an update on Stage 4 of planning and the associated Information Centres.

Problems and Issues

There were no problems or issues identified that were specific to the Whiskey Jack Forest 2012-2022 FMP.

KLCC Effectiveness – WHISKEY JACK FOREST

As part of the Local Citizens Committee report for the draft plan phase of the Whiskey Jack Forest 2012-2022 Forest Management Plan, the KLCC were asked to complete an Effectiveness Survey. The survey consisted of 20 statements and the committee was asked to rank their agreement to the statements from 0 to 5 (0 = disagree, 5 = agree). The target set by the planning team for this objective is that the "LCC effectiveness survey results indicate a minimum of 60% effectiveness in the development of the FMP".

The overall effectiveness of the committee structure was determined by analysing all responses to all questions of the LCC Effectiveness Survey. Ten committee members completed and submitted the survey. The results of the survey are as follows:

	Question Number																				
KLCC Member	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	***Avg. (%)***
1	3	5	5	3	4	5	2	3	2	1	1	N/A	N/A	2	3	4	2	1	2	3	57
2	4	4	3	4	4	4	4	4	3	4	3	4	4	5	4	5	5	4	4	5	81
3	5	5	4	5	5	5	5	5	5	4	4	4	3	5	5	4	4	5	5	5	92
4	4	4	4	3	4	4	5	5	5	4	4	5	4	5	2	5	4	5	5	3	84
5	5	5	4	5	4	5	5	5	4	4	4	5	4	2	4	4	5	5	4	4	87
6	5	4	4	5	5	4	5	4	5	4	4	5	5	5	4	4	4	4	5	4	89
7	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	100
8	2	2	2	3	2	4	4	3	2	2	2	2	5	5	4	5	4	2	2	4	61
9	4	4	3	4	4	5	4	5	3	2	3	4	4	4	4	4	4	4	4	4	77
10	5	4	3	4	5	5	5	5	5	3	4	5	4	5	5	4	5	4	5	4	89
Total	42	42	37	41	42	46	44	44	39	33	34	39	38	43	40	44	42	39	41	41	817
Avg/Ques.	4.2	4.2	3.7	4.1	4.2	4.6	4.4	4.4	3.9	3.3	3.4	4.3	4.2	4.3	4.0	4.4	4.2	3.9	4.1	4.1	4.1
																				%	**82.0**

The responses to survey questions were analysed and combined to arrive at the following assessments.

When asked how informed the KLCC members felt they were on the process and contents of the FMP, the overall average of the five questions in this section was 4.1/5 (82%).

The questions that assessed how involved the KLCC members felt they were in the development of the FMP resulted in an overall average of 4.3/5 (87%).

When asked how influential KLCC members felt they were in terms of decisions made during FMP development, the average response of the two questions in this section was 3.35 (67%).

The questions that assessed how well KLCC members felt they and other members represented their stakeholders resulted in an overall average of 4.1/5 (82%).

Overall, members believed that the KLCC functioned quite well, with an average response of 4.1/5 (82%).

The results of this analysis indicate that, in general, the KLCC ranks the committee's overall effectiveness at 4.1/5 (82%).

The committee's general agreement or disagreement with the forest management plan

The Kenora LCC is in general agreement with the Whiskey Jack Forest FMP. However, all KLCC members have expressed some level of reservation with one or more specific aspects of the plan.

WHISKEY JACK FOREST
2012-2022 FOREST MANAGEMENT PLAN
Local Citizen's Committee Effectiveness Survey

Public participation is integral to the forest management planning process. In addition to the consultation opportunities for the general public, Local Citizen's Committees (LCCs) participate directly in the forest management planning process. The completion of an LCC self-evaluation can help forest managers assess the effectiveness of the committee in the development of the forest management plan (FMP).

One of the Whiskey Jack Forest 2012-2022 FMP objectives is that the Kenora LCC completes a self-evaluation of its effectiveness in plan development. The target set by the planning team for this objective is that the LCC effectiveness survey results indicate a minimum of 60% effectiveness in the development of the FMP.

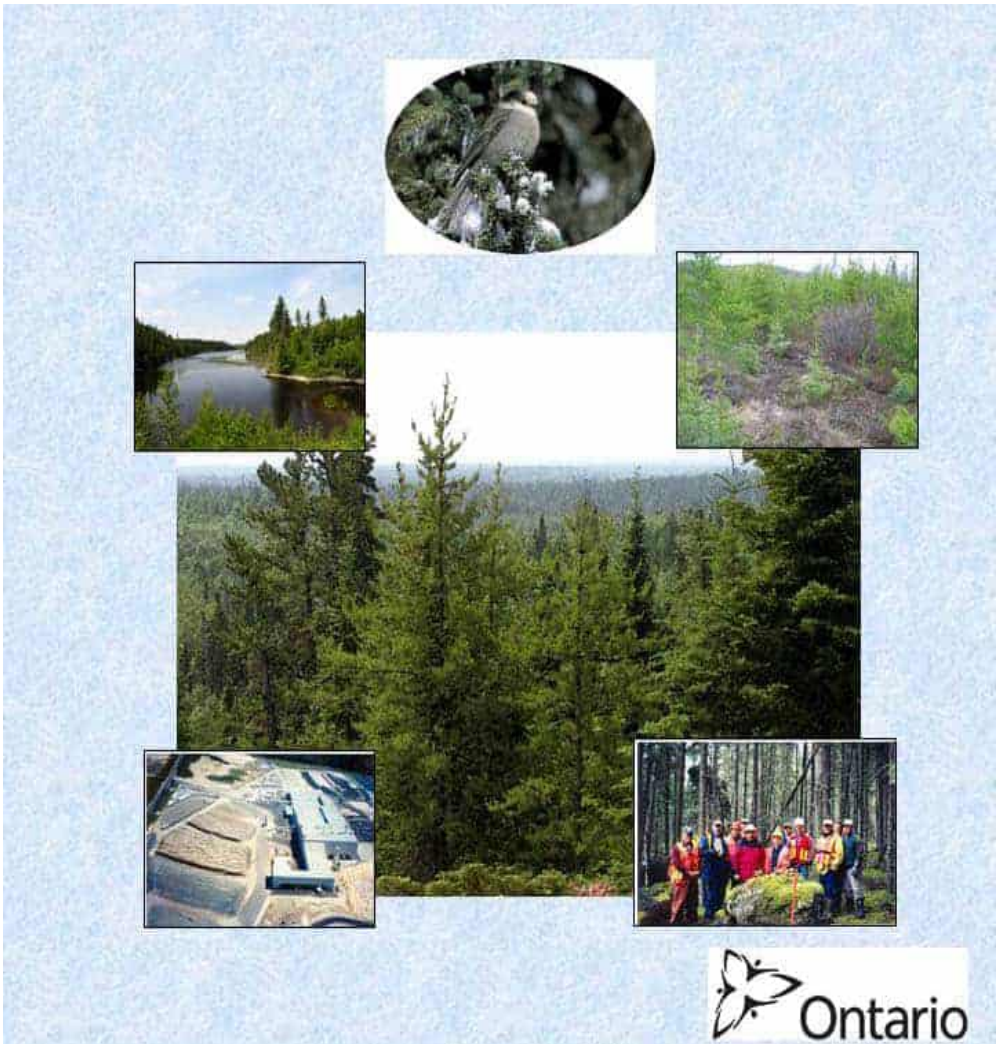
Considering *specifically* the development of the *Whiskey Jack Forest 2012-2022 FMP*, each LCC member is asked to respond to the following 20 questions by circling the appropriate number/ranking. You are not required to provide your name. If you have additional comments, please provide them at the end of the questionnaire. Thank you in advance for taking the time to complete this survey. If you have questions, please contact Abby Anderson at 468-2556 or abby.anderson@ontario.ca.

QUESTIONS	**RANKED RESPONSE**				
INFORMED – these questions assess how informed you as a local citizens committee member believes you were/are on the process and contents of the forest management plan.	**disagree**	←		→	**agree**
1. Adequate training opportunities & information was given to me to assist me in understanding the FMP process	**1**	**2**	**3**	**4**	**5**
2. I have an adequate understanding of the FMP process	**1**	**2**	**3**	**4**	**5**
3. I have an adequate understanding of the contents of the FMP	**1**	**2**	**3**	**4**	**5**
4. Sufficient & accurate information was provided to me to enable me to make informed decisions	**1**	**2**	**3**	**4**	**5**
5. Planning team members assisted me, as necessary, to understand the FMP	**1**	**2**	**3**	**4**	**5**
INVOLVED – these question assess how involved you believe you were in the development of the forest management plan	**disagree**	←		→	**agree**
6. I attended organized LCC functions & events (regular scheduled meetings, information centres, field tours) related to forest management planning	**1**	**2**	**3**	**4**	**5**
7. I have been given adequate opportunity to voice my opinions within the LCC	**1**	**2**	**3**	**4**	**5**
8. I have been a regular participant in LCC discussions	**1**	**2**	**3**	**4**	**5**
9. I feel that the planning team considered all viewpoints in developing the FMP	**1**	**2**	**3**	**4**	**5**
INFLUENTIAL- these questions assess how influential you as a local citizens committee member believed you were in terms of decisions made during the development of the FMP	**disagree**	←		→	**agree**
10. The LCC is effective at influencing decisions made in the FMP	**1**	**2**	**3**	**4**	**5**
11. I feel that the forest management planning team considered my input/viewpoint in forming their decisions	**1**	**2**	**3**	**4**	**5**
REPRESENTATIVE – these question assess your beliefs as to whether you were a representative of your stakeholders (i.e.: interest groups and organizations), and your views on how other LCC members represented their respective stakeholders.	**disagree**	←		→	**agree**
12. I was able to represent the views of my stakeholders as a member of the LCC	**1**	**2**	**3**	**4**	**5**
13. I actively engaged my stakeholders in discussions about the FMP	**1**	**2**	**3**	**4**	**5**
14. The LCC contains a broad cross-section of stakeholders	**1**	**2**	**3**	**4**	**5**
15. I feel that other members on the LCC accurately reflected their stakeholder viewpoints	**1**	**2**	**3**	**4**	**5**
16. Other LCC members were regular attendees of committee meetings & related functions	**1**	**2**	**3**	**4**	**5**
FUNCTIONING – these questions assess how well you as a local citizens committee member believed that your committee functioned	**disagree**	←		→	**agree**
17. The LCC worked toward consensus decisions	**1**	**2**	**3**	**4**	**5**
18. The LCC committee members respected & considered others' viewpoints	**1**	**2**	**3**	**4**	**5**
19. All LCC members participated in discussions & decisions	**1**	**2**	**3**	**4**	**5**
20. LCC meetings & functions were well-organized & well-run	**1**	**2**	**3**	**4**	**5**

Supplementary Documentation K

2012-2022 Whiskey Jack Forest Management Plan

Final List of Required Alterations, and a List of Major Changes from the Draft to Final Contingency Plans



Final List of Required Alterations - Whiskey Jack Forest
2012 - 2022 Whiskey Jack Forest Management Plan

For the 2012 Whiskey Jack Forest Management Plan, I am certifying the required alterations relating to manipulation of the forest cover.

Ian Pyke, R.P.F.
Kenora Forest Area Forester
MNR Kenora District

The original signed and stamped version of this page is retained at the MNR Kenora District Office.

ID	User	Binder Number	Page Number	Line Number	Basemap	Other	Comment Type	Topic	Comment
58031	hassan mohamed	1	V	2	N/A	N/A	Required	Figure B-3: Forest Management Plan Contributors	Please remove "Acting" for Lori Skitt as Lori is the SAR Bio.
58033	hassan mohamed	1	V	2	N/A	N/A	Required	Figure B-3: Forest Management Plan Contributors	Please remove Shannon Rawn from Planning Team Advisors.
58034	hassan mohamed	1	IV	11	N/A	N/A	Required	Figure B-3: Forest Management Plan Contributors	Please add "A/" to Planning and Info for Hassan.
58035	hassan mohamed	1	V	2	N/A	N/A	Required	Figure B-3: Forest Management Plan Contributors	Please add R.P.F. to Mike Davis
58044	hassan mohamed	1	81	34	N/A	N/A	Required	2.1.3.3 Natural Resource Features, Land Uses and Values	Please remove Shoal Lake from this list as its not in the Whiskey Jack Forest.
58045	hassan mohamed	1	81	37	N/A	N/A	Required	2.1.3.3 Natural Resource Features, Land Uses and Values	Please include WMU 2 in the mix.
58087	hassan mohamed	1	225	28	N/A	N/A	Required	4.2.2.1 Silvicultural Ground Rules	Most common SGR for SPD and SPM should be SPD-BA1-SPD & SPM-BA1-SPM. Please adjust Table 38 to read that.
58100	hassan mohamed	1	225	28	N/A	N/A	Required	4.2.2.1 Silvicultural Ground Rules	Please add the SGR code in Table 38
58101	hassan mohamed	1	227	20	N/A	N/A	Required	4.2.2.1 Silvicultural Ground Rules	Please include MNR as signatories to the ES 11/12 Monitoring program as well and not just the Forest Industry. This is also applies to Section 4.7.2 Pg 284 Line 31.
58236	Ian Pyke	1	N/A	N/A	N/A	N/A	Required	6.1 (l) Planning team's terms of reference	Please update terms of reference to match the reviewers and contributors.
58240	hassan mohamed	1	N/A	N/A	N/A	N/A	Required	6.1 (g) Road SupDoc	Please reword the text to read "Whiskey Jack Forest 2012-2022 Forest Management Plan" in all the Road Supdoc.
58275	lil anderson	1	N/A	N/A	N/A	MEA DEA	Required	6.2 (f) Areas Selected of Operations Maps	DEA and MEA areas developed by the Management Biologist for the Kenora District and those developed by the Area Biologist for the WJF do not jive where there is overlap. The shapefiles must be adjusted to reflect entire district MEA and DEA in a consistent manner.
58284	lil anderson	1	N/A	N/A	39557	N/A	Required	6.2 (f) Areas Selected of Operations Maps	Crown land disposition and commercial outpost camp on pennisula of Brown Bear Lake (12.622) is not readily apparent on operational map. Ensure this value is recognized.
58537	abby anderson	1	85	21	N/A	N/A	Required	2.2.1 Overview of Social and Economic Context	Change to "Wabaseemoong Independent Nations (Whitedog)"
58541	lil anderson	1	N/A	N/A	40549	N/A	Required	8.10 (f) Areas Selected of Operations Maps	Tidy up the operational road boundary on block 12.347 so that it doesn't cross private land
59412	Cathy Cavalier	1	112	Nov-28	N/A	3.2.8 IFAs	Required	3.2 Management Considerations	line 11 needs rest of sentence; line 17 last line should come out is is N/A to water crossings (which are AOCs); lines 24-28 do not appear to be relevant as topic is about pit 'rehabilitation', double check if these other sections actually have anything about this; also line 27 'Lands' should be 'Landings'
59413	Cathy Cavalier	1	126	34-35	N/A	N/A	Required	3.4 Desired Forest and Benefits	revise 'category 14 pits' to 'forestry aggregate pits'

59414	Cathy Cavalier	1	132	N/A	N/A	N/A	Required	3.4 Desired Forest and Benefits	RSA & value of tourism industry: refers to implementing mandatory RSA process, RSA contact made, MNR participating in RSA discussions; this needs to be revised/briefly explained to reflect that there are technically no RSAs given is a Crown unit, as per page 77; also does not seem appropriate to include a person's name in this table e.g. revise to 'LCC Tourism Industry contact'
59300	Fred Zroback	1	16	N/A	N/A	N002	Required	FMP-10: Operational Prescriptions for AOCs	Chimney Swift missing from species list.
59304	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	6.1 (m) Statement of Environmental Values (SEV) consideration document	Page 1: 2nd bullet at end of 1st sentence add wording such as 'Some of these guides include: Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales, Forest Management Guide for Natural Disturbance Pattern Emulation, Forest Management Guideline for the Provision of Marten Habitat, Management Guidelines for Forestry and Resource-Based Tourism, and Forest Management Guide for Cultural Heritage Values.'; 4th bullet change 'Contingency Plan' to 'FMP'. Page 2 1st paragraph end add 'or request for an individual environmental assessment'; 6th bullet revise roads guide to 'Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales'. Page 3 add whether or not Aboriginal community consultation approaches were developed & if so very briefly what they were; please resubmit to reviewer in advance of plan resubmission
59354	Fred Zroback	1	27	N/A	N/A	AOC WL01 - Bullet point 7	Required	FMP-10: Operational Prescriptions for AOCs	info to be added to the first sentence; (after .....retained): and marked (flagged) prior to harvesting .....as a potential source of future aquatic coarse woody material.
59389	Cathy Cavalier	1	N/A	N/A	N/A	2.1.3.2.2 Rare Species	Required	2.1.3.2 Fish and Wildlife Inventories	Rare Species: For each of these species, in consultation with SAR and regional biologist, provide explanation in this section [e.g. add a new column at right of table] as to why there is not a specific AOC prescription [e.g. covered by another AOC, etc] or cross reference to/develop AOC prescription (or species specific CROs if determined appropriate). Page 70 lines 33-37 should be revised to cover species that might be discovered but not identified in this plan. Please provide documentation to reviewer in advance of plan resubmission for advice/review

59391	Cathy Cavalier	1	53-67	N/A	N/A	N/A	Required	2.1.3.1 Inventories and Information for Species at Risk	In reviewing this section in conjunction with table 6 on page 53 there seems to be a number of species that require AOCs; for example there is an AOC for eastern cougar with no known locations yet no AOC for barn swallow, flooded jellyskin, olive-sided flycatcher, Canada warbler, common nighthawk, rusty blackbird, snapping turtle; review all species in consultation with SAR and regional biologist and develop needed AOC prescriptions; other recent NWR plans can be checked for examples
59397	Cathy Cavalier	1	54	30-31	N/A	N/A	Required	2.1.3.1 Inventories and Information for Species at Risk	'If avoidance is not possible and disturbance is likely, an ESA permit may be sought in consultation with the MNR SAR biologist' does not seem correct to be included, since AOC D03 already approves conditions underwhich operations are permitted; consult with SAR biologist/reviewer
59401	Cathy Cavalier	1	63	47	N/A	N/A	Required	2.1.3.1 Inventories and Information for Species at Risk	include AOC #[D04] similar to how other species with AOCs have been done
59403	Cathy Cavalier	1	66	48-49	N/A	N/A	Required	2.1.3.1 Inventories and Information for Species at Risk	Stand & Site Guide should not be referenced because it does not provide prescription for common nighthawk; other plans are developing prescription developed by planning team, consult with SAR biologist
59404	Cathy Cavalier	1	67	17	N/A	N/A	Required	2.1.3.1 Inventories and Information for Species at Risk	Rusty blackbird: text refers to Dryden Forest, revise to what is relevant to Whiskey Jack Forest (page 53 identifies has potential to be on WJ)
59405	Cathy Cavalier	1	53	N/A	N/A	N/A	Required	2.1.3.1 Inventories and Information for Species at Risk	table 6: forest context should be worded in a way to include applicable AOC ID where there is one; woodland caribou says 'AOC prescriptions applied to calving/nursery areas' however there are no prescriptions in this plan = revise/update; showy goldenrod include this parcel is not subject to forest management [as noted on page 62]; lake sturgeon state whether or not there are any water crossings & if any what AOC; bats add brief wording why no AOC
59406	Cathy Cavalier	1	65	N/A	N/A	23-25	Required	2.1.3.1 Inventories and Information for Species at Risk	olive-sided flycatcher, Canada warbler: AOCs, not CROs, are required for SAR - consult with SAR biologist to develop prescription developed by planning team, examples from other NWR plans are available
59407	Cathy Cavalier	1	67	50	N/A	N/A	Required	2.1.3.1 Inventories and Information for Species at Risk	snapping turtle: add that would need to be addressed by an AOC, consult with SAR biologist, examples are available from NWR plans e.g. conditions on roads

59408	Cathy Cavalier	1	75	35	N/A	N/A	Required	2.1.3.3 Natural Resource Features, Land Uses and Values	'conditions on regular operations' needs to be removed because does not apply to AOCs in a general sense i.e. they are conditions on 'regular operations'; CROs are already covered starting at line 44
59410	Cathy Cavalier	1	107	23-31	N/A	3.2.4 Species at Risk	Required	3.2 Management Considerations	line 23 remove reference to CROs as all SAR are covered by AOCs; lines 28-30 refer to grey fox dens and yellow rails but these species are not listed in section 2.1.3.1/table 6 as SAR; need to update paragraph for additional AOCs as a result of ID#59391 & related comments on section 2.1.3.1
59418	Cathy Cavalier	1	221	30-35	N/A	N/A	Required	4.2.1 Operational Prescriptions for AOCs	text is contrary to previous paragraph AOC prescription in FMP-10 from Stand & Site Guide which does not require den site management plan and only allows operations outlined in the AOC i.e. outside denning period; remove paragraph and if changes to FMP-10 are needed make changes there; if varies from SSG may require format of prescription developed by planning team (i.e. sup doc); advise/provide to reviewer in advance of plan resubmission
59420	Cathy Cavalier	1	226	46	N/A	N/A	Required	4.2.2.1 Silvicultural Ground Rules	aerial seeding of jack pine shows ES 14 as well as ES 21, but ES 14 is not shown on exceptions page or page 285; fix whichever is in error so all match
59423	Cathy Cavalier	1	246	37-43	N/A	N/A	Required	4.3.1 Harvest Areas	line 37 is about mapped residual but line 42 says there were no mapped residual, clarify
59424	Cathy Cavalier	1	264	25-32	N/A	N/A	Required	4.5.5 Existing Roads	revise contingency plan references to this FMP instead
59432	Chris Schaefer	1	V	N/A	N/A	N/A	Required	Figure B-3: Forest Management Plan Contributors	Note that Hilary Gignac is back in her home position as the regional species at risk biologist, so Hilary should be noted along with Lori in the regional/provincial advisors list and add Hilary to the plan reviewer list on page vi. Add Brian Campbell in as another Forest Industry Liaison as he will be leading the review and add Brian to the plan reviewer list on page vi. Also, add in the regional analyst (Rob Bowen and/or Scott Hole) as an advisor, as they participated in the LTMD development and they will be reviewing the plan.
59441	hassan mohamed	1	245	1	N/A	N/A	Required	4.3.1 Harvest Areas	Please correct the POD numbers in the chart.
59456	Angus Carr	1	N/A	N/A	N/A	N/A	Required	6.2 (i) Information products (coverages)	PRP Coverage seems incorrect. The "RESID" attribute contains only NULL values, and the polygons seem larger than a residual polygon should be. Modify the layer according to FIM Tech Spec.

59460	Darryl Pajunen	0	N/A	N/A	N/A	Values map PDF	Required	6.2 (c) Values Maps	The MU490_2012_FMPDP_P1_MAP_ValFish_00.pdf exceeds 25MB. This map should be reduced to less than 25MB in size.
59461	Darryl Pajunen	0	N/A	N/A	N/A	E00 Submission file	Required	6.2 (i) Information products (coverages)	The MU490_12PRC00.e00: ACC_REM field is empty and needs to be populated.
59466	Jennifer Hughes	1	291	49	N/A	N/A	Required	4.8 Fire Prevention and Preparedness	4.8.1.2 Operational Modifications Line 49 - Any wildfires will be reported immediately to the MNR District Fire Management Headquarters. Add telephone # 548-5837 or 310-FIRE (3473)
59467	Jennifer Hughes	1	293	N/A	N/A	Section 4	Required	4.8 Fire Prevention and Preparedness	4.8.2.1 Trained and Capable, and Limited Operators Section 4 Training - How often will re-fresher training occurr and who will deliver it? (usually 3 years) Need to specify timeframe
59475	sarah mckenzie	1	285	PAR. 3	N/A	DCHS	Required	6.1 (u) Other Supplementary Documentation	Tracts listed available for harvest on this page are 6,7,8,9. In the description of each tract 10 is also listed as being available for the first ten years.
59476	sarah mckenzie	1	287	PAR. 1	N/A	Assessment of Obj. Caribou	Required	6.1 (u) Other Supplementary Documentation	"There is no planned harvesting (with the exception of some initial clean-up of mature wood in the southern section of the caribou zone) for the next 30 years." - Should be 60 years as previously stated in this section.
59477	sarah mckenzie	1	290	2	N/A	Marten	Required	6.1 (u) Other Supplementary Documentation	Says KMU not WJFMU
59478	Chris Schaefer	1	15	1	N/A	N/A	Required	1.0 INTRODUCTION	The date MU boundary was established and a description of any change is required to be included in this section (B-14, ln 11)
59479	sarah mckenzie	1	60	26	N/A	N/A	Required	2.1.3.1 Inventories and Information for Species at Risk	Edit NO4
59480	sarah mckenzie	1	67	18	N/A	N/A	Required	2.1.3.1 Inventories and Information for Species at Risk	Reference to Dryden Forest
59481	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-10: Operational Prescriptions for AOCs	Table headings need to match FMPM, right now 'description of Natural Resource Feature...' is across top but only belongs as 2nd column header; source Stand & Site Guide 'year' needs to be 2010 instead of 2009 [final guide is dated March 18, 2010]; also sup doc 6.7 is referenced in some AOCs as source, however, seems needs to be sup doc H instead
59482	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-10: Operational Prescriptions for AOCs	Nest and water AOCs have cross references to section 4.2.2.2 but include the 'CP' throughout, need to check all and remove this reference

59484	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-10: Operational Prescriptions for AOCs	N02 & ON02 alternate nests after 'No harvest is permitted' add 'If harvest that retains <60% relatively uniform canopy closure occurs within ___ m of an alternate nest prior to its discovery, an additional patch of unharvested forest equivalent to the area harvested will be retained, preferably attached to the remaining unharvested forest surrounding the nest (to provide a supply of potential nest and roost trees).', as per Stand & Site Guide
59485	Chris Schaefer	1	N/A	N/A	N/A	N/A	Required	FMP-3: Summary of Managed Crown Productive Forest by Forest Unit	The unavailable column in the table should add up to the 109,692 as identified in the footnote. The corresponding available production forest in the table would then add up to 538,618, not 667,051.
59486	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-10: Operational Prescriptions for AOCs	HO02 alternate nest at end of definition add 'Any nest in good repair within 400m of primary nest' as per Stand & Site Guide page 80
59487	Chris Schaefer	1	29	3	N/A	N/A	Required	2.1.2.1 Forest Units	Discussion is warranted regarding the lack of supply in the 41-60 age class as this gap is common across all confer dominated FUs.
59488	Chris Schaefer	1	36	16	N/A	N/A	Required	2.1.2.1 Forest Units	Text contradicts earlier text on pg 27, ln 40 which states species increases (not FU increases) are desired.
59490	sarah mckenzie	1	82	24	N/A	N/A	Required	2.1.3.3 Natural Resource Features, Land Uses and Values	speaks to agreements with the SFL.
59492	sarah mckenzie	1	84	10	N/A	N/A	Required	2.1.3.3 Natural Resource Features, Land Uses and Values	Road decommissioning would also occur as a wildlife management strategy (caribou).
59499	Chris Schaefer	1	37	41	N/A	N/A	Required	2.1.2.2 Forest Landscape Classes	While there is a discussion on the implications of the current landscape pattern, it has not been provided for the landscape classes. Please add this discussion or refer the reader to where it is discussed (compare to simulated ranges).
59500	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-10: Operational Prescriptions for AOCs	AOCs NO01, NO02, NO03 combine various species with different AOC dimensions & timing restrictions (and prescriptions) such that if AOC identifier was on a map it could not be determined what from FMP-10 would apply; therefore revise to more separate AOCs e.g. NO01-1, NO01-2, etc or separate within e.g. NO01a, NO01b, etc. reviewer has examples of both available to easily facilitate this change

59502	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-10: Operational Prescriptions for AOCs	AOC NO01 description of value revise 'Stick nests of barred owl...' to 'Stick nests occupied by barred owl...' as per Stand & Site Guide page 82; this AOC only covers occupied nests, unoccupied are covered by CROs therefore 'of' is incorrect; adjust list of AOCs as well
59503	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-10: Operational Prescriptions for AOCs	AOC NO02 description of value revise 'occupied by or previously used by' to 'occupied by' as per Stand & Site Guide page 85; this AOC only covers occupied nests, unoccupied are covered by CROs therefore 'previously used by' is incorrect; adjust list of AOCs as well
59504	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-10: Operational Prescriptions for AOCs	AOC N04 201-400 from nest critical breeding period: 2nd line 'within 400m' needs revision to 'within 201-400m'
59505	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-10: Operational Prescriptions for AOCs	AOC TVgi: revise to state what 'seasonal restriction' is in 2nd sentence i.e. should this wording be replaced by 'No'; remove duplication about Labour Day & Thanksgiving Day
59508	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-10: Operational Prescriptions for AOCs	AOC TVer last sentence belongs in FMP-19 instead as is conditions on roads
59513	Chris Schaefer	1	58	22	N/A	N/A	Required	2.1.3.1 Inventories and Information for Species at Risk	Both this paragraph and the end of the following paragraph need to be updated to reflect recent changes. Please work with your district and regional SAR Biologist on this wording.
59522	sarah mckenzie	1	106	44	N/A	N/A	Required	3.2 Management Considerations	Car10 is described as being available for harvest in Supp Doc N, 06-09 are only listed here.
59536	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-10: Operational Prescriptions for AOCs	AOC WS02 LPS streams remove 1st paragraph as LPS streams need to have an AOC as per direction provided by forests branch in July 2012; also revise AOC list
59539	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-10: Operational Prescriptions for AOCs	FL01 #2 last sentence 'subject to this agreement' reads like agreement approves what happens rather than MNR; revise instead to state what is approved e.g. is the following correct 'Regular harvest, renewal and tending opeations are permitted in allocated blocks outside of the placement of the limit on forest operations outlined in the agreement'
59541	sarah mckenzie	1	112	11	N/A	N/A	Required	3.2 Management Considerations	Line should be finished. Same comment as before -road decommissioning should also be considered as a wildlife management strategy in the caribou zone.

59542	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-10: Operational Prescriptions for AOCs	AOC NE9 modified zone description overlaps with reserve zone, revise wording such as 'Outside of the reserve, within 120 metres measured from the high water mark, the following operations are permitted with restrictions as outlined:'; add whether or not there are conditions on operational roads/landings and forestry aggregate pits
59562	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-19: Road Crossings, Landings, and Forestry Aggregate Pits in AOCs	Part A AOC WS01 page 5 add missing Stand & Site Guide page 137 1st standard 'The installation of a water crossing will not result in the impediment of fish passage; mitigative techniques will be applied if the structure has the potential to impede or block fish migration or passage.'; page 9 last paragraph refers to 'both timining restrictions', it is unclear what 'both' means; 1st guideline on top of page 53 of Stand & Site Guide needs to be included
59563	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-19: Road Crossings, Landings, and Forestry Aggregate Pits in AOCs	Part B AOC A01 2nd heading 'where roads are approved in an APA' needs to be removed as above point already says they are approved subject to these conditions below
59564	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-19: Road Crossings, Landings, and Forestry Aggregate Pits in AOCs	Part B AOC D01 1st bullet remove 'unless the road predates the den and is required for safety reasons or environmental protection' as is not part of this standard in Stand & Site Guide page 95
59577	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-10: Operational Prescriptions for AOCs	AOC H003: remove this AOC from Table and from list, it is already correctly a CRO in plan text as required of Stand & Site Guide page 81
59578	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-19: Road Crossings, Landings, and Forestry Aggregate Pits in AOCs	Part B & Part C all AOCs with more than one species providing a distance range of no operations and cross reference to FMP 19.1: need instead to list what impacts apply to what distance or add a cross reference to FMP-10 if they are listed there e.g. AOC NO01 shows a cross reference
59579	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-19: Road Crossings, Landings, and Forestry Aggregate Pits in AOCs	Part B AOC HO01: 1st bullet states 'or within the 7 ha patch of suitable habitat retained within 200m' as noted in Stand & Site Guide, however, FMP-10 was not done showing this (instead it has no operations within 200m); therefore it does not seem correct to refer to this 7 ha patch; review compared to how FMP-10 was done; also refers to 'reasonable efforts' however does not explain like in all other AOCs, therefore recommend adding e.g. 'unless no practical or feasible alternative locations exist (i.e. due to...)'

59580	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-19: Road Crossings, Landings, and Forestry Aggregate Pits in AOCs	Part B & Part C AOC HO03 remove AOC, as is already correctly a CRO as per Stand & Site Guide page 81
59581	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-19: Road Crossings, Landings, and Forestry Aggregate Pits in AOCs	AOC NO03 Part B: 1st point lists timing but then 2nd bullet refers to FMP-10, should just be done once
59582	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-10: Operational Prescriptions for AOCs	AOC PGP01 operational roads should be showing none permitted instead of 'yes'
59583	Chris Schaefer	1	77	10	N/A	N/A	Required	2.1.3.3 Natural Resource Features, Land Uses and Values	I am unable to find the required FMPM statement in this section of the plan. Please add the required statement. See FMPM B-18, ln 26-30.
59584	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-19: Road Crossings, Landings, and Forestry Aggregate Pits in AOCs	AOC PL01 Part B: add will require a plan amendment at end of 2nd sentence, since plan needs to state whether or not roads are approved by MNR i.e. landowner does not 'approve'; 2nd point needs to be removed and made part of 1st sentence by adding 'with a maximum right of way width of 20m' at end of sentence; any conditions between harvest boundary & patent land would be determined at time of plan amendment in consideration of landowner permission
59585	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-19: Road Crossings, Landings, and Forestry Aggregate Pits in AOCs	AOC LS01 and TVer both need to include that roads will be reclaimed and regenerated and include when this will be done(as per regional direction)
59586	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-19: Road Crossings, Landings, and Forestry Aggregate Pits in AOCs	AOC WS01 Part B: 1st condition before design & location needs to incorporate Stand & Site Guide page 52 1st road guideline 'New roads that are not associated with an approved 'river/stream' crossing are not permitted within the AOC unless...'; then heading 'design and location' should include 'of water crossings'; should instead be cross referencing to conditions in Part A and indicate any other condition that varies as they are same AOC/same SSG requirements [& same review comments as Part A] i.e. 'Refer to Part A for conditions that also apply to this AOC. ' Then include decommissioning conditions unless there is something else that varies; page 22 reference to 'SFL Holder' in 1st & 2nd paragraphs needs to be removed & replaced e.g. SSG refers to 'the proponent'

59597	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-19: Road Crossings, Landings, and Forestry Aggregate Pits in AOCs	AOC WS02 Part B: 1st condition before design & location needs to incorporate Stand & Site Guide page 54 last road guideline 'New roads will not be located within 15 m of the active channel unless...'; then heading 'design and location' should include 'of water crossings'; should instead be cross referencing to conditions in Part A and indicate any other condition that varies as they are same SSG requirements [& same review comments as Part A] i.e. 'Refer to Part A for conditions that also apply to this AOC other than timing restriction____, etc. Refer to Part B for decommissioning provisions that also apply to this AOC.' page 25 reference to 'SFL Holder' in last 2 paragraphs needs to be removed & replaced e.g. SSG refers to 'the proponent'
59599	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-19: Road Crossings, Landings, and Forestry Aggregate Pits in AOCs	AOC WW01 last condition is referring to CRO section 4.2.2.2 for wetlands; SSG page 60 is referring to section 5.2 of SSG - have a look at these sections & add cross reference to those relevant sections in the plan CROs
59600	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-19: Road Crossings, Landings, and Forestry Aggregate Pits in AOCs	AOC BS01 Part C states 'subject to timing restrictions (see below)' however need to add restrictions to next point
59601	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-19: Road Crossings, Landings, and Forestry Aggregate Pits in AOCs	AOC NO01, NO02 Part C: last bullet timing restriction needs revision as does not apply to all nests; also NO02 includes 'chimney swift' however is missing from Part B and FMP-10, revise whichever is in error so all match
59604	Cathy Cavalier	1	239	N/A	N/A	N/A	Required	4.2.2.2 Conditions on Regular Operations	salvage - all Stand & Site Guide standards & guidelines on page 160 with respect to salvage need to be included, not just those that refer to wildlife trees/downed woody material
59605	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	4.2.2.2 Conditions on Regular Operations	Erosion: Stand & Site Guide 'Guidelines' on page 152 need to be included; note these conditions are not only for shallow soils
59606	sarah mckenzie	1	145	17	N/A	N/A	Required	3.5 Objectives and Indicators	The ESA is provincial and SARA is federal.
59607	Cathy Cavalier	1	271	N/A	N/A	section 4.5.7	Required	4.5 Roads	Furbearing mammal dens enduring features: no road construction (of existing roads) and no aggregate extraction needs revision to be about 'occupied dens'; hauling and road maintenance 'within 20 m of the den entrance' should be 'within 20 m of occupied dens' to match Stand & Site Guide page 98

59612	Cathy Cavalier	1	233	N/A	N/A	N/A	Required	4.2.2.2 Conditions on Regular Operations	maintenance of S1, S2, S3: remove condition as is missing actual required conditions on operations; Stand & Site Guide page 13 guideline is about vegetation 'communities' only, if MNR has identified any then add CROs specific to those communities; there are already general statements in plan text page 54 and 70; refer to related ID comments on plan text section 2.1.3.2.2 rare species and section 2.1.3.2 SAR
59614	Cathy Cavalier	1	271	N/A	N/A	section 4.5.7	Required	4.5 Roads	inactive great grey owl...nest: 1st bullet states 'new' will not be constructed, however, Stand & Site Guide refers to 'reasonable efforts' e.g. 'unless no practical or feasible alternative...'; just checking if this should be revised as version incorrectly shown as an AOC in FMP-19 is done this way (related ID#59580 says to remove AOC from table as is supposed to be a CRO)
59617	Chris Schaefer	1	107	1	N/A	N/A	Required	3.2 Management Considerations	Text will need to be updated to reflect regulation changes for SAR (caribou)
59618	Chris Schaefer	1	112	15	N/A	N/A	Required	3.2 Management Considerations	Also include FMP-18 and the associated road SupDocs as monitoring of the road and water crossings is covered as a component of the UMS.
59620	Cathy Cavalier	1	272	N/A	N/A	section 4.5.7	Required	4.5 Roads	1st & 3rd text box say new roads... will not be constructed, however Stand & Site Guide page 84 & 87 refers to reasonable efforts to avoid (e.g. terrain...) for these nests; checking to see if what was shown was intentional or whether SSG requirement was missed
59622	Cathy Cavalier	1	233	N/A	N/A	N/A	Required	4.2.2.2 Conditions on Regular Operations	last text box includes text about nest trees if a safety risk, however, this is not in Stand & Site Guide page 87, just checking if this was meant to be included or was included by mistake
59623	Cathy Cavalier	1	234	N/A	N/A	N/A	Required	4.2.2.2 Conditions on Regular Operations	2nd text box includes chimney swift, but noticed was missing from roads page 272, not sure which is in error, fix so both match
59625	Cathy Cavalier	1	273	N/A	N/A	section 4.5.7	Required	4.5 Roads	Rich lowland dominated forest & Wetlands: 'when practical and feasible' needs revision to 'reasonable efforts will be made to' to match Stand & Site Guide page 59 & 60 and what this means should be shown e.g. terrain...; definition of reasonable efforts is in SSG page 209, 'practical & feasible' are specifically not used
59626	Chris Schaefer	1	114	7	N/A	N/A	Required	3.3 Base Model	Please ensure all components of the required statement is reflected in this section, or just copy the entire statement from the FMPM (B20, ln 25-28) into your text.

59627	Cathy Cavalier	1	235	N/A	N/A	N/A	Required	4.2.2.2 Conditions on Regular Operations	Ponds, streams: remove from CROs as LPS are required to be AOCs as per July 2012 direction previously sent via forests branch
59628	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	FMP-10: Operational Prescriptions for AOCs	AOC WL02 description of value remove 'identified prior to plan approval' and remove 1st paragraph under operational prescription; LPS ponds are required to be AOCs as per direction provided by forests branch in July 2012; also revise list of AOCs
59629	Cathy Cavalier	1	270	N/A	N/A	section 4.5.7	Required	4.5 Roads	general road conditions: 13th & 14th bullets about debris should be part of loss of productive land section instead where seems to be covered; 16th point 'SFL holder' needs revision; Stand & Site Guide page 131 last guideline [engineering safety considerations] and page 132 [have a monitoring program] need to be added, including cross reference to where monitoring program is in plan
59630	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	6.1 (h) AOC SupDoc	AOC PGP01: more information from prescription provided through G&Y program needs to be used in particular rationale & disadvantages/advantages are inadequate i.e. saying prescription was provided does not provide information required; also prescription 'No harvest or new roads in AOC until third measurement has taken place (10 years post-establishment)' is not in FMP-10, both need to be the same; as well this cannot be included without all related information from G&Y program prescription; operational prescriptions do not include 'roads', remove this reference; operational roads remove 2nd statement about not needing sup doc, since no roads are permitted
59631	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	6.1 (h) AOC SupDoc	Remember to make changes in AOC sup doc for any related changes in FMP-10/FMP-19 so all match
59634	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	6.1 (h) AOC SupDoc	AOC FL01 refers to 'federal land' throughout but this is not used in FMP-10 at all (uses First Nation Reserve', revise so terminology is consistent, correct whichever is in error
59635	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	6.1 (h) AOC SupDoc	AOC RR01 prescription needs last sentence of prescription in FMP-10 added, unless table is in error
59636	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	6.1 (h) AOC SupDoc	AOC NG01 prescription contact information as per FMP-10 needs to be added, since sup doc is supposed to be source of what goes in FMP-10

59637	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	6.1 (h) AOC SupDoc	TV01: alt 1 values are not those described in values above & environmental analysis does not match either; proposed alt 2 does not match FMP-10 which only refers to large lakes with tourism values but environmental analysis & rationale refers to different values; revise sup doc throughout to be consistent with/cover all values identified and update FMP-10 to match; operational roads should not be referring to FMP-19 since FMP-10 says no roads/landings are permitted
59638	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	6.1 (h) AOC SupDoc	AOC TVw blocks listed in dimension do not match FMP-10; remove reference to roads/hauling from prescription for H, R, T, as belongs in FMP-19 only
59639	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	6.1 (h) AOC SupDoc	AOC TVai public comments refers to previous RSA, however, instead this belongs as part of rationale and in FMP-19 remove 'yes' from public comments since sup doc says there are none; similarly TVgl & TVwi where public comments says was developed with tourism outfitter this belongs as part of rationale; if there are actually public comments on file then make note of that & if none remove 'yes' from FMP-19
59640	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	6.1 (h) AOC SupDoc	AOC TVnsi part B 1-4 needs to be removed, just note conditions on roads only; what is shown now is about roads but part B is only completed for prescriptions for H, R, T; since there are no public comments this sup doc does not seem to be needed & remove reference in FMP-19 but recommend add '(application of previously negotiated RSA)' after 'conditions on roads only' in FMP-10
59641	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	6.1 (h) AOC SupDoc	AOC LS01 values do not match FMP-10, revise whichever is in error so both match
59642	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	6.1 (h) AOC SupDoc	AOC TVp requires AOC sup doc, FMP-10 identifies as source but could not find it
59643	Cathy Cavalier	1	N/A	N/A	N/A	N/A	Required	6.1 (h) AOC SupDoc	AOC WS01 Part D revise incorrect references to contingency plan
59650	Brian Campbell	2	N/A	N/A	N/A	Table FMP-15	Required	4.3.6 Wood Utilization	For Table FMP-15: The Commitment types, volumes and associated footnotes for Weyerhaeuser need to be adjusted based on more recent Ministerial conditional commitments. The Commitment types, volumes and associated footnotes for Kenora Forest Products need to be adjusted based on the recent Wood Supply Competitve Process offers. Please contact Brian Campbell 807-475-1450 brian.campbell2@ontario.ca, to discuss proposed changes to the table

59651	Brian Campbell	1	255	1 TO 28	N/A	N/A	Required	4.3.6 Wood Utilization	For Section 4.3.6: Plan text may have to be adjusted based on changes to Table FMP-15 Please contact Brian Campbell 807-475-1450 brian.campbell2@ontario.ca, to discuss proposed changes to the text.
59654	Chris Schaefer	1	N/A	N/A	N/A	N/A	Required	FMP-9: Assessment of Objective Achievement	For objective 8a the text states 0.13 (pg 155) as a maximum limit while the table does not provide this maximum. The 'maintain or decrease' from a current level of 0.12 would not permit 0.13.
59655	Chris Schaefer	1	155	24	N/A	N/A	Required	3.5 Objectives and Indicators	For objective 8a the text states 0.13 (pg 155) as a maximum limit while FMP-9 does not provide this maximum. The 'maintain or decrease' from a current level of 0.12 would not permit 0.13. Please reconcile.
59657	Chris Schaefer	1	182	14	N/A	N/A	Required	3.6.2 Selection of Areas for Harvest	53470.5 is identified as the planned harvest area (10-year) in FMP-11
59660	Chris Schaefer	1	187	13	N/A	N/A	Required	3.6.2 Selection of Areas for Harvest	Please confirm the 7% extent of the harvest substitution into younger age classes. In Table 22 only 11,921 ha should have been allocated in all age classes below the age of 80, while the 10-year allocations under the age of 80 were 22,795 ha. Also confirm the paragraph on page 189, ln 32 and correct the 10-year planned harvest area as reported in FMP-11 & table 22 (53,471 ha)
59661	Chris Schaefer	1	184	32	N/A	N/A	Required	3.6.2 Selection of Areas for Harvest	I suggest that text be included to identify the legal direction for planning of allocations within this area, in addition to more details on the scheduling approach taken. I suggest the text express the overall balance between terms within the overall FN areas/zones (or by each zone) so that the balancing strategy is clear to the reader. In addition, the influence of the Aboriginal community input on this criteria is warranted (B-23, ln 8).
59663	Chris Schaefer	1	191	1	N/A	N/A	Required	3.6.3 Assessment of Objective Achievement	Provide a text block in this section regarding the efforts and analysis undertaken to balance objectives (B-23, ln 20), or refer the reader to where this is covered.
59664	Chris Schaefer	1	219	2	N/A	N/A	Required	4.1 Introduction	Introduction needs to also describe the operations that have been planned, for both 5-year terms (B-24, ln 6).
59665	Chris Schaefer	1	225	15	N/A	N/A	Required	4.2.2.1 Silvicultural Ground Rules	Please verify this statement as I understand Large Scale Photography (LSP) is also proposed to evaluate FTG achievement for some intensive stands.
59666	Chris Schaefer	1	226	10	N/A	N/A	Required	4.2.2.1 Silvicultural Ground Rules	Note that the SGR are also required to be identified (portrayed) on the maps (B-26, ln 23), not just the coverages (B26, ln 12). Please adjust this paragraph.

59668	Chris Schaefer	1	N/A	N/A	N/A	N/A	Required	6.2 (f) Areas Selected of Operations Maps	SGRs need to be portrayed for the harvest areas. Since you have the present FU identified on the map for each harvest stand, I suggest that you add a simple lookup table in the legend with FU/SGR so that the link is provided on the map product. Also, note that the SGRs also need to portrayed for the renewal and tending areas.
59669	sarah mckenzie	1	3	N/A	N/A	N/A	Required	FMP-9: Assessment of Objective Achievement	3e and 3f are not reported in table but are specified in text
59670	Chris Schaefer	1	232	N/A	N/A	loss of productive land	Required	4.2.2.2 Conditions on Regular Operations	The text block on 'chip debris' needs to be edited to incorporate the actual treatment practices as outlined on page 249, while removing the reference to burning of chipper debris piles (as this practice is currently restricted). Any final treatment options that identify windrowing and piling of chip debris on productive land must be limited in application (extraordinary circumstances). Please discuss approach with this reviewer prior to final plan submission.
59671	sarah mckenzie	1	158	27	N/A	N/A	Required	3.5 Objectives and Indicators	Reference to 'the company'.
59676	Chris Schaefer	1	247	30	N/A	N/A	Required	4.3.1 Harvest Areas	Text conflicts with pg 247 ln 18 & pg 246, ln 42. Is mapped residual shown on the operations maps?
59677	Chris Schaefer	1	249	1	N/A	N/A	Required	4.3.1 Harvest Areas	As noted in alteration 59670 this entire section needs to be incorporate into the associated CRO for the productive landbase. Any direction for the treatment of the actual landing surface itself needs to be incorporated in 4.5.7.
59679	Chris Schaefer	1	254	44	N/A	N/A	Required	4.3.6 Wood Utilization	The text regarding the renewal of biofibre areas needs to refer the appropriate CRO for the piles and the CORLAP for the landing areas. This will eliminate conflicting direction.
59680	sarah mckenzie	1	182	45	N/A	N/A	Required	3.6.2 Selection of Areas for Harvest	Car10 was identified in Supp Doc N as being available for harvest - was it considered in the decision criteria?
59681	sarah mckenzie	1	188	27	N/A	N/A	Required	3.6.2 Selection of Areas for Harvest	80ha was listed as the min (economically feasible) block size above but says 70ha here.
59683	Gregg Lloyd	1	VI	5	N/A	N/A	Required	Figure B-3: Forest Management Plan Contributors	Please include inforatmion on the Red Lake LCC and their general agreement or disagreement or at least the involvement in the planning.
59687	Gregg Lloyd	1	19	27	N/A	N/A	Required	2.1.1 Current Forest Condition	Please give further details on what the company surrendered (SFL) and either why or a bit of history on this.
59688	Gregg Lloyd	1	19	25	N/A	N/A	Required	2.1.1 Current Forest Condition	Using "manipulation" makes it sound like you are fudging the inventory. Please describe this as the coverage that would require the least amount of update information in order to be usable for planning purposes or something to that extent.

59689	Gregg Lloyd	1	19	33	N/A	N/A	Required	2.1.1 Current Forest Condition	The land base expanded by 7000 due to reduced road ROW buffering? More explanation is required to defend this amount of increase in the size please.
59692	sarah mckenzie	1	189	34	N/A	N/A	Required	3.6.2 Selection of Areas for Harvest	typo on age classes older than LTMD projectsion (1,5900 ha)
59693	Cathy Cavalier	1	266	46	N/A	section 4.5.7	Required	4.5 Roads	'applies to conditions on new' needs to be 'applies to conditions on new and existing'
59694	Chris Schaefer	1	N/A	N/A	N/A	N/A	Required	FMP-17: Planned Renewal and Tending Operations	Plan text (pg 258) states approximately 16ha slash pile burning per year but the table shows far more for the 5-year and 10-year numbers. Please correct, and ensure only the pile area is reported.
59695	Chris Schaefer	1	261	21	N/A	N/A	Required	4.5.1 Primary and Branch Roads	FMP-18 shows 3 new primary roads (Yellow Girl, Bug L., Witch Bay/Loon Lake) while the text only notes one. Please correct.
59696	Chris Schaefer	1	261	39	N/A	N/A	Required	4.5.1 Primary and Branch Roads	FMP-18 shows Bug L.& Aesthetic roads as new branch roads while the text only notes a different road. Please correct.
59697	Chris Schaefer	1	N/A	N/A	N/A	N/A	Required	FMP-18: Road Construction and Use Management	Note that the text discussion regarding the 3 new primary and 2 new branch roads on page 261 does not correspond with the table. Please correct.
59698	Chris Schaefer	1	N/A	N/A	N/A	N/A	Required	FMP-18: Road Construction and Use Management	At the top of the footnotes a couple of the points need to be removed, as the monitoring and maintenance will follow the direction in the plan.
59699	Chris Schaefer	1	N/A	N/A	N/A	N/A	Required	FMP-18: Road Construction and Use Management	Please document the actual decommissioning provisions in the footnote to the table (UMS-3). The clause needs to, at a minimum, address the activities required prior to transfer and the potential removal of water crossings for roads scheduled for transfer in the 5-year term (B-33, ln 4-6).
59700	Chris Schaefer	1	N/A	N/A	N/A	N/A	Required	FMP-18: Road Construction and Use Management	The last clause in the footnotes needs to be edited or removed. As noted in the generic unplanned events footnote, the actions must be consistent with the UMS for the road and as such there is an obligation for your principle access roads that are used by the public. I suggest this extra text be removed, leaving only the generic text block.
59701	Chris Schaefer	1	N/A	N/A	N/A	N/A	Required	FMP-18: Road Construction and Use Management	There are no existing operational roads identified in the table. These roads (from the SupDoc) need to be listed with the UMS.

59702	Chris Schaefer	1	264	17	N/A	N/A	Required	4.5.5 Existing Roads	Please update this section to reflect what is shown in FMP-18. From the table it appears that there are no existing operational roads identified in the table and the ORBs are to cover both existing and new operational roads within the ORB. However, note that the UMS must then be applicable to each and every new and existing operational road within the ORB. You have 5 ORBs identified for transfer and decommissioning during this term (new and existing roads?). You will likely need to break out existing operational roads in these networks if it is only these roads that are to be transferred and decommissioned. Please discuss this with this reviewer.
59703	Chris Schaefer	1	262	1	N/A	N/A	Required	8.5.1.1 Operational Roads	Please update this text as you only have 'networks' shown in FMP-18, the construction is identified for the 5-year term, and you have identifed 5 networks identified for transfer and decommissioning in the 5-year term (all new and existing operational roads in these ORBs?). You will likely need to break out existing operational roads in these networks if it is only these roads that are to be transferred and decommissioned. Please discuss this with this reviewer.
59704	Chris Schaefer	1	264	17	N/A	N/A	Required	4.5.5 Existing Roads	If you have Provincial Parks or Conservation Reserve crossings please build in text to discuss the approvals required for maintenance on the road segments under the Act (PPCRA).
59706	Chris Schaefer	1	N/A	N/A	N/A	N/A	Required	4.5.6 Conditions on Forestry Aggregate Pits	Please edit this section as an aggregate extraction area is not needed to establish a forestry aggregate pit in most cases. It is only required where the pit is to be established outside of the criteria as you noted on page 265 ln 36-44.
59711	lil anderson	1	N/A	N/A	40549	N/A	Required	6.2 (f) Areas Selected of Operations Maps	clean up boundary of proposed road corridor where it enters on private land on block 12.347.
59712	lil anderson	1	N/A	N/A	41549	N/A	Required	6.2 (f) Areas Selected of Operations Maps	Harvest block shown right up to trappers cabin on RTA KE109. Block 12.355. Recommend a buffer on cabin and/or discussion with trapper.
59714	lil anderson	1	N/A	N/A	41552	N/A	Required	6.2 (f) Areas Selected of Operations Maps	Blk 12.998 (contingency) is along a popular canoe/recreational and tourism system. Can we see a TV buffer put on the rapids and portage between Mitchell Pond and Balne Lake (Mitchell on map) Heavy clays (winter harvest?)in this area could also lead to siltation into major spawning area at rapids if not sufficiently buffered.

59716	lil anderson	1	N/A	N/A	N/A	N/A	Required	8.10 (f) Areas Selected of Operations Maps	Road corridor accessing Blk 12.325 passes between two bald eagle nests which are not shown on map and crosses a portage which will need to remain open and unblocked for public use. Apply aoc's for nests and portage.
59719	lil anderson	1	N/A	N/A	41558	N/A	Required	8.10 (f) Areas Selected of Operations Maps	There is a trumpeter swan nest in proposed road corridor to blk 12.651 that requires protection. Draw downs of water in this system while doing road work or culvert maintenance during breeding/nursery stage will put the young at risk.
59720	lil anderson	1	N/A	N/A	42559	N/A	Required	6.2 (f) Areas Selected of Operations Maps	There is an LUP remote outpost on the N. shore of Gordie Lake missing from values. Outpost had moved from a southern location in 2009, but value had not been updated. Owned by Pickerel Creek Outfitter. Blk 12.685 will impact it.
59722	lil anderson	1	N/A	N/A	42554	N/A	Required	6.2 (f) Areas Selected of Operations Maps	Buffer required for trap cabin on Everett (Cox) Lake block 12.278.
59724	Chris Schaefer	1	287	42	N/A	N/A	Required	4.7.3 Assessment of Regeneration Success	Text should be discussing the 10-year term and the projected 16.223 ha proposed for assessment.
59725	Chris Schaefer	1	295	35	N/A	N/A	Required	4.9 Comparison of Proposed Operations	As noted in alteration 59660 you have considerable substitution (20%) into wood under the age of 80 (than was projected in SFMM) and this needs to be discussed. The paragraph will need to be adjusted.
59726	Ian Pyke	1	N/A	N/A	N/A	N/A	Required	FMP-18: Road Construction and Use Management	On page 2 of FMP-18, please put in a total and subtotal in the 10 year construction column.
59727	Chris Schaefer	1	N/A	N/A	N/A	figure 47	Required	4.9 Comparison of Proposed Operations	Please verify the reporting of the final test age classes, given that 10,000 ha of addition 60-80 year old wood was substituted into in term 1. This variance between the planed OPS and the LTMD should be visible in this chart.
59728	Chris Schaefer	1	209	18	N/A	N/A	Required	3.6.3 Assessment of Objective Achievement	Please confirm the number of indicators that did not achieve the Desired Level during the plan period while achieving the Target Level after 10-years.
59729	Chris Schaefer	1	309	3	N/A	N/A	Required	5.0 DETERMINATION OF SUSTAINABILITY	Please confirm the number of indicators that did not achieve the Desired Level during the plan period while achieving the Target Level after 10-years. I also suggest that the assessment notes cover all indicators that were not achieved during the plan period (add 1c, 2c, 2e, 6a)
59730	scott lockhart	1	87	41	N/A	N/A	Required	2.2.2 Summary of Demographic Profiles	remove 'by'
59731	scott lockhart	1	88	1	N/A	N/A	Required	Figure B-1A: Title, Certification and Approval Page	change 'Whiskey Jack' to 'Kenora'

59732	Chris Schaefer	1	N/A	N/A	N/A	N/A	Required	6.1 (l) Planning team's terms of reference	Please place a statement on the TOR approval page identifying where the original is retained if the signed approval page is not being included. Also note that the attached May 28, 2012 addendum deals with the CP and needs to be removed and replaced with the one for the FMP, if applicable.
59733	Julie Sullivan	1	N/A	N/A	N/A	N/A	Required	8.10 (f) Areas Selected of Operations Maps	The WCPP park additions are shown on the values map, but not the operational scale maps. This was pointed out at the Proposed Operations stage.
59734	scott lockhart	1	88	20	N/A	N/A	Required	2.2.2 Summary of Demographic Profiles	Lake of the Woods, the 'second largest inland lake in Ontario'
59735	Julie Sullivan	1	N/A	N/A	N/A	N/A	Required	8.10 (f) Areas Selected of Operations Maps	There is phase 2 harvest adjacent the south shore of Sydney L. There is no AOC prescription addressing harvest or access in this block. In the 2004-09 FMP where there were ops proposed north of Sydney L we asked for: harvesting to occur between Oct 1 and Mar 31 to protect tourism values, and all roads within 500 m of the park boundary be regenerated to prevent future unauthorized access. Similar is needed on the south shore of Sydney Lake. This was requested at the proposed operations stage.
59736	scott lockhart	1	86	6	N/A	N/A	Required	2.2.2 Summary of Demographic Profiles	'Fort' Frances
59737	Julie Sullivan	1	N/A	N/A	N/A	N/A	Required	Figure B-1A: Title, Certification and Approval Page	AOC "TVer" (Tourism – English River Waterway Park) applied to SOME blocks adjacent this park. The locations where it has been applied are all okay based on location of tourism facilities and canoe routes. However the AOC Supp Doc for TVer and Table FMP-19 (Road Crossings, Landings and Forestry Aggregate Pits in Areas of Concern) have conflicting info about roads within TVer. The road condition in AOC supp doc is "All roads within 500 m of park boundary must be regenerated to prevent access". FMP-19 says: "Operational roads and water crossings within 200 m of the park boundary are to be made passable following harvest operations through the removal of the water crossing structures, trenching of roads and/or placement of slash on the road way." The distances and conditions should be the same in both locations; 500 m is preferable.

59738	Julie Sullivan	1	N/A	N/A	N/A	N/A	Required	FMP-18: Road Construction and Use Management	Table FMP-18 (Road Construction and Use Management) indicates that there are NO access restrictions on Windfall Road leading to West English River Provincial Park. This is a problem. The Proposed Operations stage included Road Supp doc for Windfall Road, which indicated access restrictions which applied to public and commercial resource users : Access to West English River Provincial park is prohibited from this road." This supp doc is not included in the draft plan.
59739	Julie Sullivan	1	N/A	N/A	N/A	N/A	Required	FMP-18: Road Construction and Use Management	Conifer and Fly roads accessing north/west side of West English River Provincial Park (north shore Unexpected L and west shore Wilcox Lake) do not appear to have any access restrictions on them. Table FMP-18 indicates that these roads have NO access restrictions. Access restrictions are needed similar to what is on Windfall Road.
59740	Julie Sullivan	1	N/A	N/A	N/A	N/A	Required	Figure B-1A: Title, Certification and Approval Page	A few blocks of phase 1 and 2 harvest adjacent Rushing River, near entrance adjacent block on west side of highway. See BM41550, block 12.339. There is no AOC for aesthetics, noise, or access. No AOC prescription for timing restrictions applied. This needs to be addressed because noise carries and industrial noise is much different than Hwy noise.
59741	Julie Sullivan	1	N/A	N/A	43550	N/A	Required	8.9 (f) AOC SupDoc	A few blocks of phase 1 and 2 harvest adjacent Eagle-Dogtooth. Blocks around Ethelma/Highwind lakes (12.162, 12.158, 12.160) have a timing restriction (Seasonal restriction on harvest and mechanical site preparation operations between May 1 and Oct 31. No restriction on other low-noise renewal activities. All operations permitted between Nov 1 and April 30.). Some Operational Road Blocks (ORB) (170, 172) in the area are scheduled for decommissioning in 2016. AOC is shown on maps, but stands are not listed in supplementary documentation for AOC "TVw". Need to add stands to supp doc.

59742	Julie Sullivan	1	N/A	N/A	42550	N/A	Required	8.10 (f) Areas Selected of Operations Maps	There is no AOC on harvest or access on block 12.333 / ORB 168 east of Kilvert Lake (Eagle-Dogtooth PRovincial Park). At the Proposed Operations stage we asked that the follwowing prescription be applied: "Seasonal restriction on harvest and mechanical site preparation operations between May 1 and Oct 31. No restriction on other low-noise renewal activities. All operations permitted between Nov 1 and April 30.)" This was not done. The prescription should also be applied to block 12.884.
59743	Julie Sullivan	1	N/A	N/A	N/A	N/A	Required	FMP-10: Operational Prescriptions for AOCs	This relates to FMP-10, FMP-18 and AOC supp doc. There is no Road Supplementary documentation for Highwind Road. There was a conference call with district and regional staff about this. The district didn't want to include this Crown-responsibility road in the FMP and would rather deal with it via work permits. Part of the outcome was that operations in block 12.160 /ORB 176 and 178 (not adjacent park) would be carried out via an operational road in winter to ensure no change in condition of Highwind Road or change in accessibility to park beyond this area (i.e. to Hillock L). The maps show this, but Table FMP-10 needs to have block 12.160 added to AOC TVw. Maps show the operational road blocks but do not indicate that operations will be carried out in winter. Table FMP-18 does not indicate that road will only be used in winter; it only indicates that roads will be decommissioned in 2016. Road Supplementary Documentation for these operational roads does not indicate that operations will be carried out in winter only. This concern was raised at proposed operations stage.
59745	scott lockhart	1	89	29	N/A	N/A	Required	2.2.2 Summary of Demographic Profiles	remove 'off' (Jones Road, also known as Highway 671)
59746	scott lockhart	1	89	39	N/A	N/A	Required	2.2.2 Summary of Demographic Profiles	what is the difference between '185 private dwellings and 185 households'?
59748	scott lockhart	1	90	10	N/A	N/A	Required	2.2.2 Summary of Demographic Profiles	change 'Whitefish Bay No. 32C' to 'Sabaskong Bay No. 32C'
59749	scott lockhart	1	90	13	N/A	N/A	Required	2.2.2 Summary of Demographic Profiles	change 'Sabaskong Bay No. 32A' to 'Whitefish Bay No. 32A'
59750	scott lockhart	1	90	29	N/A	N/A	Required	2.2.2 Summary of Demographic Profiles	The community profiles for Wabaseemoong and Dalles do not include as much info as the other FN communities. This info should be available
59753	Ian Pyke	1	227	30, 31	N/A	N/A	Required	4.2.2.1 Silvicultural Ground Rules	Please revise the sentence starting at the end of line 29 to "Actual ES 11 and 12 areas will be identified on the AWS maps."

59756	Julie Sullivan	1	N/A	N/A	42550	N/A	Required	8.10 (f) Areas Selected of Operations Maps	The park superintendent for Eagle-Dogtooth Provincial Park has had ongoing discussions about reomoving a water crossing on an operational road south of Gale Lake at the park boundary (near block 12.884 on the operations map where it says “WS01” on the left side of the purple area, and the road/crossing is just south of that). There is no specific time frame of when this work should or can be completed, but since the company is harvesting in that area and will have machinery there, the water crossing removal could be done whenever the block is harvested.
59757	scott lockhart	1	219	N/A	N/A	N/A	Required	Figure B-1A: Title, Certification and Approval Page	change top header to '4.0 Planned Operations'
59764	Chris Schaefer	1	N/A	N/A	N/A	N/A	Required	FMP-4: Silvicultural Ground Rules	Please review the renewal standards (acceptable species limits) for Intensive and Basic PJD, Intensive and Basic PJM, and Intensive SPD as the resulting forest condition (yield curves) are 100% Pj+Sb while these SGRs would permit up to 30% other species (and up to 20% Po+Bw). These standards should be tighter.
59766	brenda skene	1	N/A	N/A	40548	N/A	Required	8.10 (f) Areas Selected of Operations Maps	There is a patented property (BR54) on the SW corner of phase 2 block 12.349 that was not identified on the FMP maps. The property is located within a shoreline reserve but may require more buffer. Patented land reference is 104823. Location has been marked on the hard copy maps.
59767	sarah mckenzie	1	4	N/A	N/A	N/A	Required	FMP-10: Operational Prescriptions for AOCs	Den prescriptions for furbearing mammals (enduring and transitory features) missing from FMP-10.
59768	brenda skene	1	N/A	N/A	45555	N/A	Required	8.10 (f) Areas Selected of Operations Maps	There is an LUP (LUP 56) very close to the S end of phase 2 block 12.373 that has not been identified on the FMP map. Location is marked on the hard copy map.
59769	sarah mckenzie	1	N/A	N/A	N/A	N/A	Required	FMP-10: Operational Prescriptions for AOCs	AOC for bat hibernacula - should add the SSG (see s.4.2, Table 4.2l, p.99) prescription now that bats have been included on the SAR list.
59773	brenda skene	1	N/A	N/A	48560	N/A	Required	6.2 (f) Areas Selected of Operations Maps	There is a disposition identified in CLAIMaps that may be patented property not identified on FMP map. The dispositions are located in the NE end of phase 1 block 12.360 within the Lac Seul shorline AOC. The area is in the Red Lake district and the nature of the disposition will have to verified by RL district. Location of dispositions marked on hard copy of map. There is also a road to the disposition that runs through the operational area of block 12.360.

59774	sarah mckenzie	1	16	N/A	N/A	N/A	Required	FMP-10: Operational Prescriptions for AOCs	Chimney Swift missing from NO02
59776	sarah mckenzie	1	16	N/A	N/A	N/A	Required	FMP-10: Operational Prescriptions for AOCs	Should have an AOC for Flooded Jellyskin (S. 4.3, Table 4.3a, p.103 SSG)
59777	Chris Schaefer	1	N/A	N/A	N/A	UMS-3	Required	6.1 (g) Road SupDoc	For your operational road SupDoc using UMS-3 clause C) needs to be updated (pg 3, ln 1) as it is dealing with 5 ORBs (not 5 roads) and the timeframe is 2016 not the CP 2012-2014 (pg 3, ln 3). In addition, more detail is required to outline the actual decommissioning provisions to be applied to these roads to address the Regional Direction (recover productive landbase) in clause F). If this detail is covered in the 4.5.8 section of the main text please note this in the SupDoc and the FMP-18 footnotes for UMS-3 (but be aware that this text states that the preliminary provisions including regeneration conditions and timelines are documented for the roads ... in the SupDoc? (pg 274, ln 9). Also look through the other provisions in 4.5.8 closely and ensure that they all apply (progressive rehab, 5-years).
59781	sarah mckenzie	1	N/A	N/A	N/A	N/A	Required	FMP-10: Operational Prescriptions for AOCs	AOC for wolverine dens missing.
59782	Chris Schaefer	1	N/A	N/A	N/A	N/A	Required	6.1 (g) Road SupDoc	Ensure all applicable primary and branch road SupDocs are included in the draft plan. FMP-18, the associated 4.5 plan text, and the Road SupDoc all identify different new primary and branch roads for planned construction during this 5-year term. A SupDoc is required for each new planned Primary or Branch road.
59783	Chris Schaefer	1	N/A	N/A	N/A	N/A	Required	FMP-18: Road Construction and Use Management	Ensure the plan start length (0) and 10-year planned construction length are included for the primary and branch roads that are scheduled for construction during the 5-year term. Some are blank.
59784	John Myshrall	1	N/A	N/A	N/A	N/A	Required	4.3.1 Harvest Areas	"The company" change to Forest Manager
59786	John Myshrall	1	N/A	N/A	47557	N/A	Required	6.2 (c) Values Maps	Patent area's missing. Trap cabin should be at landing area 475980 5578010
59787	John Myshrall	1	N/A	N/A	47560	N/A	Required	6.2 (f) Areas Selected of Operations Maps	Blk 12.751 * indicated on map Nest site? no associated AOC Many maps with this ie 48559
59788	John Myshrall	1	N/A	N/A	49557	N/A	Required	6.2 (f) Areas Selected of Operations Maps	Water crossing in wrong location Blk 12.192
59789	John Myshrall	1	N/A	N/A	50559	N/A	Required	6.2 (f) Areas Selected of Operations Maps	Blk 12.963 Stream labeled WS02-WS01-Wso2 again. Should be Wso2-Wso1
59790	John Myshrall	1	N/A	N/A	50556	N/A	Required	6.2 (c) Values Maps	Patent layers missing Angood lake area again.
59791	John Myshrall	1	N/A	N/A	39556	N/A	Required	6.2 (f) Areas Selected of Operations Maps	Islands in English river id as LUP, none exist same as 39557
59792	sarah mckenzie	1	N/A	N/A	N/A	N/A	Required	FMP-10: Operational Prescriptions for AOCs	Please consider adding the row of titles to the aggregate/roads columns on at least the top AOC.

59793	John Myshrall	1	N/A	N/A	40550	N/A	Required	6.2 (f) Areas Selected of Operations Maps	Roads layer incorrect label- Label storm bay rd
59794	John Myshrall	1	N/A	N/A	41554	N/A	Required	6.2 (f) Areas Selected of Operations Maps	blk 12.260 Orb should be around patent not encompass patent.
59795	John Myshrall	1	N/A	N/A	42549	N/A	Required	6.2 (f) Areas Selected of Operations Maps	blk 12.194 Gelley lake Landfill not identified.
59797	Gregg Lloyd	1	20	38	N/A	N/A	Required	2.1.1 Current Forest Condition	The text shows the total area as 1,063,446 but this is not shown in table 1, are there ownership types that are not being shown in the table? Please ensure these numbers match or explain why they don't.
59798	Todd Skene	1	N/A	N/A	N/A	Maps	Required	8.10 (h) Other Maps	Show Modified AOC (hatching) in Harvest Blocks 12.354, 12.352
59799	Gregg Lloyd	1	21	5	N/A	N/A	Required	2.1.1 Current Forest Condition	Please insert Park Addition into the text.
59801	Gregg Lloyd	1	25	1	N/A	N/A	Required	2.1.2.1 Forest Units	Please provide a description of the FU that are listed on the page or the link to table 2.
59805	Gregg Lloyd	1	27	37-42	N/A	N/A	Required	2.1.2.1 Forest Units	Please explain why the decision has been made to increase the amount of conifer and pine on the unit.
59808	Gregg Lloyd	1	34	1	N/A	N/A	Required	2.1.2.1 Forest Units	The total for the first eight FU equal 96% and the last four equal 2.8%, for a total of 98.8. I"m assuming the remaining 1.2% is rounding but this needs to be shown, especially as you are showing the FU that are less than 1%.
59809	Gregg Lloyd	1	53	9	N/A	Table 6	Required	2.1.3 Forest Resources	Whip-poor-will context is citing the Dixie Lake Road which is not in the Whiskey Jack forest. Either expand title to identify it is a regional context or limit examples to WJ forest.
59812	Rob Bowen	1	1	1	N/A	SFMM Data File	Required	8.9 Supplementary Documentation	The SFMM data file submitted with the draft plan is missing the last few runs, including the final LTMD. Please provide the data file with all the required runs.
59814	Gregg Lloyd	1	78	8	N/A	N/A	Required	2.1.3 Forest Resources	Please indicate if the MNR operates any of these pits as they are managing the unit and if not where the MNR gets the material for road building.
59815	Gregg Lloyd	1	80	20	N/A	N/A	Required	2.1.3.3 Natural Resource Features, Land Uses and Values	Pakwash park is no longer run by Ear Falls 2000 but rather Friends of Pakwash. Please correct.
59816	Gregg Lloyd	1	84	11	N/A	N/A	Required	2.0 MANAGEMENT UNIT DESCRIPTION	Please indicate that roads may be decommissioned for caribou concerns regardless of whether a third party is interested in maintaining the road.
59817	Todd Skene	1	219-223	N/A	N/A	Header	Required	4.0 PLANNED OPERATIONS	Header needs to be changed to 4.0 Planned Operations Page 219 to 223
59819	Gregg Lloyd	1	112	11	N/A	N/A	Required	3.0 DEVELOPMENT OF THE LTMD	Please complete sentence.
59821	sarah mckenzie	1	24	N/A	N/A	N/A	Required	FMP-19: Road Crossings, Landings, and Forestry Aggregate Pits in AOCs	"New roads will not be located within 15m of the active channel unless there is no feasible alternative...." (S. 4.1, p.54 SSG) missing from LPS streams.
59822	Gregg Lloyd	1	118	25	N/A	N/A	Required	3.0 DEVELOPMENT OF THE LTMD	Please explain why this was deleted as an objective or explain how it was incorporated into other objectives.

59824	Todd Skene	1	244	14	N/A	Figure 40	Required	4.3.1 Harvest Areas	Change "Comparison of 10-Year Harvest Area by Forest Unit" to "Comparison of 10-Year Harvest Area by Age Class"
59825	Gregg Lloyd	1	122	43	N/A	N/A	Required	3.0 DEVELOPMENT OF THE LTMD	Was there no objective target to limit the increase of mixwood areas for long term FU targets or for wildlife concerns through silviculture? Please explain how this relates to this objective as this may relate negatively to your target of achieving the lowest cost per metre. (I.e. more spray to limit deciduous species will increase cost).
59826	Gregg Lloyd	1	128	1	N/A	N/A	Required	3.0 DEVELOPMENT OF THE LTMD	Forest composition and structure.... Not sure what note in red means at the end of input, please explain further or remove.
59827	Gregg Lloyd	1	131	1	N/A	N/A	Required	3.0 DEVELOPMENT OF THE LTMD	* are used throughout table that might be indicating a foot note, but no footnote is shown. Please remove * or indicate footnote.
59828	Gregg Lloyd	1	178	2	N/A	Figure 31	Required	3.0 DEVELOPMENT OF THE LTMD	Please explain why PJD is the largest FU on the unit with almost 1/4 of the area but it appears that POD and HMX are the largest FU's being harvested.
59832	Gregg Lloyd	1	199	2	N/A	Table 30	Required	3.0 DEVELOPMENT OF THE LTMD	You have indicated that OLT wasn't used for this FU, so why is it necessary to show it in the table? Having the numbers there just confuses the reader and leads to concerns about the validity of the assumptions for the OLT.
59835	Gregg Lloyd	1	212	17-26	N/A	N/A	Required	3.0 DEVELOPMENT OF THE LTMD	The harvest level is similar to the previous plan so please explain further as to why the spending is dropping 46%. This is in light of your objectives to decrease the amount of mix-woods on the unit and provide habitat for caribou. Appears that extensive treatments are being favoured due to budget constraints rather than the other objectives in the plan.
59838	brenda skene	1	121	8	N/A	N/A	Required	3.4 Desired Forest and Benefits	insert (MEA) after Moose Emphasis Area
59840	brenda skene	1	259	27, 30	N/A	N/A	Required	4.4.2 Renewal Support	The Seed Collection Forecast and the Planting Stock Forecast tables are mislabled or the tables are misplaced (take your pick)
59844	sarah mckenzie	1	230	LLP	N/A	N/A	Required	4.2.2.2 Conditions on Regular Operations	MEA description syas that there are no harvest blocks in the Moose Emphasis Areas - old CP text?
59848	Todd Skene	1	280	45-46	N/A	N/A	Required	4.7.1 Forest Operations Inspections	Todd Skene also is designated to review nad approve FOIP inspections.
59849	Todd Skene	1	281	06-Jul	N/A	N/A	Required	4.7.1 Forest Operations Inspections	Naotcrief Resource Management Inc. is no longer an existign company.
59850	Chris Schaefer	1	N/A	N/A	N/A	N/A	Required	FMP-4: Silvicultural Ground Rules	I add this alteration, so that the standards can be altered after draft plan, if desired. The use of density and stocking needs to be reviewed as it may be better to express these standards differently, so that the LSP method currently being tested on the forest can be directly linked to the standards.

59852	Chris Schaefer	1	N/A	N/A	N/A	N/A	Required	6.2 (f) Areas Selected of Operations Maps	SGR's need to be portrayed for harvest & R/T areas on you operational scale maps. For harvest suggest adding a relationship table (FU=Preliminary SGR) in the legend. For R/T since this has only been shown at a landscape scale, something more creative will be required (as the FU and ecosite information is only shown on the OPS scale maps).
59853	Todd Skene	1	286	24-30	N/A	N/A	Required	4.7.3 Assessment of Regeneration Success	Need to add to bullet points the use of LArge Scale Photoraghy and photo interpretation.
59854	Chris Schaefer	1	N/A	N/A	41549	Loon Lk Rd corridor	Required	6.2 (f) Areas Selected of Operations Maps	The reconstruction of this road is being planned as a new road, including the apparent reconstruction within an N01 value. I see that the corridor excludes the core so this should be OK, as I expect that the AOC does not permit new roads in this zone. However, I am not seeing a crossing location to the west of this value in WS01, or the outer zone of N01 (and I do not think you are going all the way around to the east). Once a 100 m crossing is confirmed, please undertake any necessary updates to the AOC SupDoc, Road SupDoc, FMP-10 and FMP-19.
59855	Gregg Lloyd	1	227	13	N/A	N/A	Required	4.0 PLANNED OPERATIONS	Please indicate if this is the only exception to the SGR in the plan and if not, briefly explain what the others are.
59856	Gregg Lloyd	1	228	1	N/A	biofibre	Required	4.0 PLANNED OPERATIONS	This paragraph leads the reader to think that slash piles are not available for chipping into biofibre, is that the intent? Further to this, any full tree chipping operation will be chipping and using some of the branches from the trees, is this considered part of the harvested tree? Please provide further clarification in this section so it is clear what is allowed to be used and what is not.
59857	Gregg Lloyd	1	228	1	N/A	Downed woody material	Required	4.0 PLANNED OPERATIONS	The last bullet seems to indicate that site prep can't occur. Please clarify, in text, exactly what you are referring to here, please.
59858	Gregg Lloyd	1	228	1	N/A	Erosion	Required	4.0 PLANNED OPERATIONS	2nd bullet point is too wishy-washy. Please replace "where possible" with something more definite or give qualifications on when this can occur.
59859	Gregg Lloyd	1	229	1	N/A	Erosion	Required	4.0 PLANNED OPERATIONS	1st bullet - please define what an extreme slop would be.
59860	Gregg Lloyd	1	229	1	N/A	Erosion	Required	4.0 PLANNED OPERATIONS	4th bullet: Please clarify that only steep slopes (i.e. slopes great than x%) will require this treatment.

59863	Chris Schaefer	1	N/A	N/A	N/A	N/A	Required	FMP-19: Road Crossings, Landings, and Forestry Aggregate Pits in AOCs	I note that you are planning to reconstruct the Bug Lk and Witch Bay road through an APA area (BM41549). While FMP-10 identifies the crossing by this new road, FMP-19 is missing the crossing construction conditions for primary and branch roads crossing AOC A01, and the basemap is missing the 100 m wide crossing location of this value.
59864	Chris Schaefer	1	N/A	N/A	41549	N/A	Required	6.2 (f) Areas Selected of Operations Maps	I note that you are planning to reconstruct the Bug Lk and Witch Bay road through an APA area (BM41549). While FMP-10 identifies the crossing by this new road, FMP-19 is missing the crossing construction conditions for primary and branch roads crossing AOC A01, and the basemap is missing the 100 m wide crossing location of this value.
59865	sarah mckenzie	1	N/A	N/A	N/A	N/A	Required	6.2 (h) Other Maps	MAFA's are missing on the maps - noticed specifically in the MEA.
59866	sarah mckenzie	1	N/A	N/A	N/A	N/A	Required	8.10 (f) Areas Selected of Operations Maps	Residual in the MEA should be mapped out to address low residual zones in harvest blocks.
59868	brenda skene	1	N/A	N/A	N/A	Sup Doc H	Required	List of Supplementary Documentation	Remove the reference to the CP on page 1 - B: Operational Perscription, (b) Description of proposed operational perscription, last bullet
59869	Chris Schaefer	1	N/A	N/A	N/A	N/A	Required	FMP-19: Road Crossings, Landings, and Forestry Aggregate Pits in AOCs	Note that the listing at the front of the table will need to be updated to reflect primary/branch road crossing of A01. There may be others but the OPS maps show Bug lake and Witch Bay crossing A01.
59871	Chris Schaefer	1	N/A	N/A	N/A	N/A	Required	6.2 (f) Areas Selected of Operations Maps	In my spot check I did not see a map product identifying the roads to be decommissioned or roads with UMS changes, or access controls ... nor did I see these identified in the standard OPS legend block. This is needed.
59872	Todd Skene	1	N/A	N/A	N/A	N/A	Required	FMP-4: Silvicultural Ground Rules	CAn you add a PJD and PJM BAS1 to PRW.
59873	Todd Skene	1	N/A	N/A	N/A	N/A	Required	FMP-10: Operational Prescriptions for AOCs	The column headers are missing in each AOC Table. When indicating yes or no within a column the reader does not know what the questions is.
59874	Todd Skene	1	N/A	N/A	N/A	N/A	Required	FMP-4: Silvicultural Ground Rules	The AOC Operation Prescriptions quite often refer to the CP. Should be changede to FMP
59875	Todd Skene	1	N/A	N/A	N/A	N/A	Required	FMP-15: Planned Wood Utilization by Mill	Add a foot note stating why there is a shortfall in the poplar supply.

59876	Gregg Lloyd	1	231	2	N/A	loss of productive land	Required	4.0 PLANNED OPERATIONS	You indicate that ALL chipper debris will be taken back, which is economically impossible and should cause compliance issues immediately with operations. You have six options for dealing with chipper debris but one needs to be the preferred method. (I've since found this on page 249 so please reference this section or elaborate here) Also, when will the discussions happen with the forest manager, why not have them now and figure out what the preferred method will be and list it here and then it will be enforceable with operators. Currently, chipper piles are not allowed to be burnt, so please re-word this section to remove or down play this operation. You also say that all chipped pads will be recorded in the AWS, is this really feasible? Please clarify.
59877	sarah mckenzie	1	N/A	N/A	N/A	N/A	Required	8.10 (f) Areas Selected of Operations Maps	Some nest AOC's are showing inconsistent buffers to labels. Example: Map 44558 Block 12.931 the NO1 nest sizes and buffers are smaller than the NO1's adjacent.
59878	Gregg Lloyd	1	239	1	N/A	Wildlife trees	Required	4.0 PLANNED OPERATIONS	Should consider putting a max limit on the amount of snags allowed in the cutover.
59879	Gregg Lloyd	1	239	1	N/A	Wildlife trees	Required	4.0 PLANNED OPERATIONS	Please explain what will happen if a stand is harvested that does not have 25cm DBH trees.
59880	Gregg Lloyd	1	239	1	N/A	Wildlife trees	Required	4.0 PLANNED OPERATIONS	Please explain how operator will know when he is allowed to stub a stand. I.e. how will he know if the tree is required to be a seed source. When will this direction be given?
59881	Todd Skene	1	N/A	N/A	N/A	SUP DOC F	Required	List of Supplementary Documentation	Withni SUP DOC F - there should be soem discussion around teh use of Large Scale Photo Interpretation.
59883	Gregg Lloyd	1	241	26	N/A	N/A	Required	4.0 PLANNED OPERATIONS	Please add a cover all statement that indicates that if these operations were to be required on the unit an amendment would occur to the FMP where affected stakeholders would be consulted.
59884	Gregg Lloyd	1	249	23	N/A	N/A	Required	4.0 PLANNED OPERATIONS	Please give more details on pilot project for burning chip piles.
59885	Todd Skene	1	4	N/A	N/A	N/A	Required	List of Supplementary Documentation	SUP DOC G - Roads Planning Documentation Section 2 iii) Estimated Cost of Construction and Use Management - needs to include th installation of a 20' bridge.
59886	lil anderson	1	N/A	N/A	42548	N/A	Required	6.2 (f) Areas Selected of Operations Maps	Municipal Sewage Lagoon located in proposed road corridor for blk. 12-204. Realign proposed road corridor to exclude area.
59887	lil anderson	1	N/A	N/A	42558	N/A	Required	6.2 (f) Areas Selected of Operations Maps	Provincially tracked species indicated in blocks 12.568 and 12.675 and 674.

59888	lil anderson	1	N/A	N/A	43548	N/A	Required	6.2 (f) Areas Selected of Operations Maps	NNE side of Blk 12.184 is on patented land that is not shown on map.
59889	lil anderson	1	N/A	N/A	43558	N/A	Required	6.2 (f) Areas Selected of Operations Maps	Trapping cabin at ORB 336 or blk 12.540 should be recognized as value and buffered.
59890	lil anderson	1	N/A	N/A	45555	N/A	Required	6.2 (f) Areas Selected of Operations Maps	Block 12.273 has patented land and lodge within its boundaries. realign block boundaries outside of patented land.
59891	lil anderson	1	N/A	N/A	47559	N/A	Required	6.2 (f) Areas Selected of Operations Maps	Osprey nest on south edge of Block 12.366 (Red Lake District) is in proposed corridor.
59892	lil anderson	1	N/A	N/A	48557	N/A	Required	6.2 (f) Areas Selected of Operations Maps	There is no buffer on lodge and patented land in block 12.772
59893	lil anderson	1	N/A	N/A	N/A	N/A	Required	6.2 (c) Values Maps	Patented land on Land Value Map would be more visable if it too was 'boxed'. Otherwise it appears that small pieces are missing from map, ie. Havik Lake, North side of Silver, Keys, etc. while small lup's are very noticable.
59896	Gregg Lloyd	1	256	10	N/A	N/A	Required	4.0 PLANNED OPERATIONS	Please discuss the snow damage that occurred on the unit last October and if this will potentially be harvested.
59897	Rob Bowen	1	136	1	N/A	N/A	Required	3.5 Objectives and Indicators	Somewhere in this section there should be a reference to the section of the Analsysis Package with the inputs, results and conclusions of the development of the managment objectives and scoping investigations (FMPM B-21 L9-11).
59898	Rob Bowen	1	143	30-32	N/A	N/A	Required	3.5 Objectives and Indicators	This sentence seems to contradict itslef. If OLT did not adequately capture PRW area (not enough?) then how can it grossly overestimate PRW area?? Perhaps it is just in how the sentence is worded? Please correct or clarify this statement.
59900	sarah mckenzie	1	240	N/A	N/A	N/A	Required	4.2.2.2 Conditions on Regular Operations	CRO's missing for barn swallow and snapping turtle
59901	sarah mckenzie	1	230	N/A	N/A	N/A	Required	4.2.2.2 Conditions on Regular Operations	LLP DEA's list 9 blocks planned - is this from the CP?
59902	Rob Bowen	1	150	40	N/A	N/A	Required	3.5 Objectives and Indicators	I would not think it is fair to say the total volume in the long-term is 520,000 in the LTMD. You certainly achieve more than 510,000 in Term 1 (~575,000), but the long-term would be better characterized as between 450,000 and 500,000. The LTMD only ever exceeds 500,000 in one term (T10) after T2. So, "the current harvest level could be sustained through the long-term at 520,000 m3" seems like a stretch. Please fix the paragraph.

59903	brenda skene	1	N/A	N/A	several	N/A	Required	6.2 (f) Areas Selected of Operations Maps	There is a gas line running through blocks, or the operational area of blocks, on several basemaps. This utility line is not shown on the FMP map. Gas line is active, North & Central Gas Corp. EAS #59 (easement). Basemaps and phase 1 blocks affected: 48555 12.308, 48556 12.306, 48557 12.112, 49558 12.340 12.344. Possible blocks in Red Lake district that may be affected (red lake to verify): 48560 12.362 12.360
59904	Rob Bowen	1	150	19	N/A	N/A	Required	Figure B-1A: Title, Certification and Approval Page	SPF from the LTMD is pretty consistently 340,000 m3 (only four terms are higher). So, please re-characterize this sentence to emphasize the 340,000 level, with a few terms higher (as much as 400,000). Feel free to choose appropriate words, but put the emphasis on the 340,000 level being achieved.
59905	Rob Bowen	1	150	20	N/A	N/A	Required	3.5 Objectives and Indicators	Po volume from the LTMD is 90,000 to 100,000 in the long-term (with one term hitting 113,000). The sentence in the text states a long-term range of 90,000 to 150,000. Please correct.
59906	Gregg Lloyd	1	259	14	N/A	N/A	Required	4.0 PLANNED OPERATIONS	Please explain why there is no tree improvement at all planned for the next ten years on the unit.
59907	brenda skene	1	N/A	N/A	41554	N/A	Required	6.2 (f) Areas Selected of Operations Maps	There is a 'Ballast Pit' identified in phase 1 block 12.254 on the lands control maps and in CLAIMaps, no evidence of disturbance on 2009 imagery. Will need to verify with Janet F to determine protection required (if any)
59908	brenda skene	1	N/A	N/A	43561	N/A	Required	6.2 (f) Areas Selected of Operations Maps	There is a alienation identified in CLAIMaps WKRL 93/94 in phase 1 block 12.488 in the Red Lake District area. May be an aggregate permit (quarry). No evidence of disturbance on 2009 imagery. Needs to be verified by Red Lake district and/or Provincial Mining Recorder
59909	Gregg Lloyd	1	262	25	N/A	N/A	Required	4.0 PLANNED OPERATIONS	As this is a Crown unit, aren't the roads all MNR roads anyway? Please clarify why you are discussing MNR transfer.
59910	Gregg Lloyd	1	276	15	N/A	N/A	Required	4.0 PLANNED OPERATIONS	Please mention that all compliance inspections are required to be completed by a certified compliance inspector.
59911	lil anderson	1	N/A	N/A	48559	N/A	Required	6.2 (f) Areas Selected of Operations Maps	There is patented land at north side of Wabaskang Lake that should have buffer RFD 247,187,

59914	Rob Bowen	1	126	Jan-25	N/A	N/A	Required	3.4 Desired Forest and Benefits	You should refer to the indicators as coming from the "Science and Information in support of Ontario's Forest Management Guides for Landscapes", rather than the draft guide ...the draft guide can't give direction (and it's certainly not coming out before this plan is approved...). Throughout the rest of the plan text you have been good about referring to OLT or the science package rather the guide that is not approved. Please adjust the paragraph to maintain the context, but make sure it is the science package you are drawing the indicators from.
59916	Rob Bowen	1	162	48-51	N/A	N/A	Required	3.6 Long-Term Management Direction	OLT does not represent PRW well. So, go with no decrease. However, argument here (continued on top of next page) doesn't seem to quite make sense. I thought OLT under-estimated PRW, not the other way around? Please contact me to make sure we are both on the same wave-lenght on the facts, and to discuss a potential adjustment to this piece of text.
59918	lil anderson	1	N/A	N/A	46558	N/A	Required	6.2 (f) Areas Selected of Operations Maps	It would appear that company is not using the most up to date water layer, as Anishinabi Lake is not showing as a cool water lake. Values map shows correct thermal value.
59919	Rob Bowen	1	184	1	N/A	N/A	Required	3.6.2 Selection of Areas for Harvest	In the list of criteria for harvest area selection, there is no mention of ESA listed species and specifically caribou (the caribou mosaic). Please add something about how the caribou mosaic may have been a selection criteria (or not!).
59920	Rob Bowen	1	184	1	N/A	N/A	Required	3.6.2 Selection of Areas for Harvest	You need to make some comments on how the criteria reflect the strategic modelling (FMPM B-22, L31-33).
59921	Rob Bowen	1	N/A	N/A	N/A	N/A	Required	FMP-11: Planned Harvest Area	The available harvest area numbers (...the numbers from the model) are missing from the table (greyed out!). The footnote indicates where they numbers come from, but they are not in the table. Please provide.
59922	Glen Hooper	1	246	1	N/A	N/A	Required	4.3.1 Harvest Areas	RE 4.3.1.1 Stand Level Residual in Harvest Areas: Please add reference that the residual requirement does not apply in your caribou emphasis area, which is the area covered by the DCHS. (wildlife tree requirements still apply, but not the patch sized residual).

59923	Rob Bowen	1	187	21	N/A	N/A	Required	3.6.2 Selection of Areas for Harvest	I am generally not too concerned with the level of subsitution and the rationales provided. However, the SPD in the available was about 45% less than 100 years old, but in the allocations 82% is less than 100 years old. This one stands out a bit and requires some specific mention within the rationales that follow the tables (not necessarily it's own sub-topic, just some specific highlighting).
59924	Rob Bowen	1	204	4	N/A	N/A	Required	3.6.3 Assessment of Objective Achievement	The statement that the SPF volume is projected to remain over 450,000 m3 is incorrect (I think that would be the Total volume?). Please correct discussion to reflect the SPF numbers.
59925	Rob Bowen	1	207	1	N/A	N/A	Required	3.6.3 Assessment of Objective Achievement	In the discussion of the indicators to be assessed during plan implementation (3.6.3.7...?), there should be some discussion of how the planned activities will contribute to the overall objective achievement (FMPM B-23, L28-30).
59926	Rob Bowen	1	299	10	N/A	N/A	Required	4.9 Comparison of Proposed Operations	The pdf supplied does not appear to document the same "Final_Test" run that was included with the SFMM data file? The pdf appears to agree with the plan text, but the provided SFMM run. Please verify and correct the appropriate documentation or data file.
59927	Rob Bowen	1	N/A	N/A	N/A	N/A	Required	FMP-9: Assessment of Objective Achievement	Forest Composition medium term projected numbers for Mature/Late Balsam don't seem to agree with the model projection ...perhaps just a typo?? Please correct.
59928	Angus Carr	1	N/A	N/A	N/A	N/A	Required	6.2 (i) Information products (coverages)	PRP Layer contains areas not in the PHR layer. The layer is not the raw output of the EFRT. Include only areas where mapped residual (SSG 3.2.2.2) is required.
59931	Glen Hooper	1	N/A	N/A	N/A	N/A	Required	FMP-10: Operational Prescriptions for AOCs	FMP-10 AOC's: Canoe route portages and campsites need an AOC, because they are a value and are nmappable. CRO's on roads is not enough for this value. The good news is that an AOC for both canoe route portages and campsites have recently been developed on Resolute Plans for Phase 2. This one can be borrowed as-is See Caribou FMP Phase-2 for latest approved version. If you need to discuss, please contact GH for details, thanks.

Summary of Major Changes between Draft and Final Plans

The *Forest Management Planning Manual (2009)* requires that a list of major changes to the draft forest management plan be prepared and be included in the supplementary documentation of the final FMP.

There were no major changes required to the draft plan during preparation of final forest management plan.

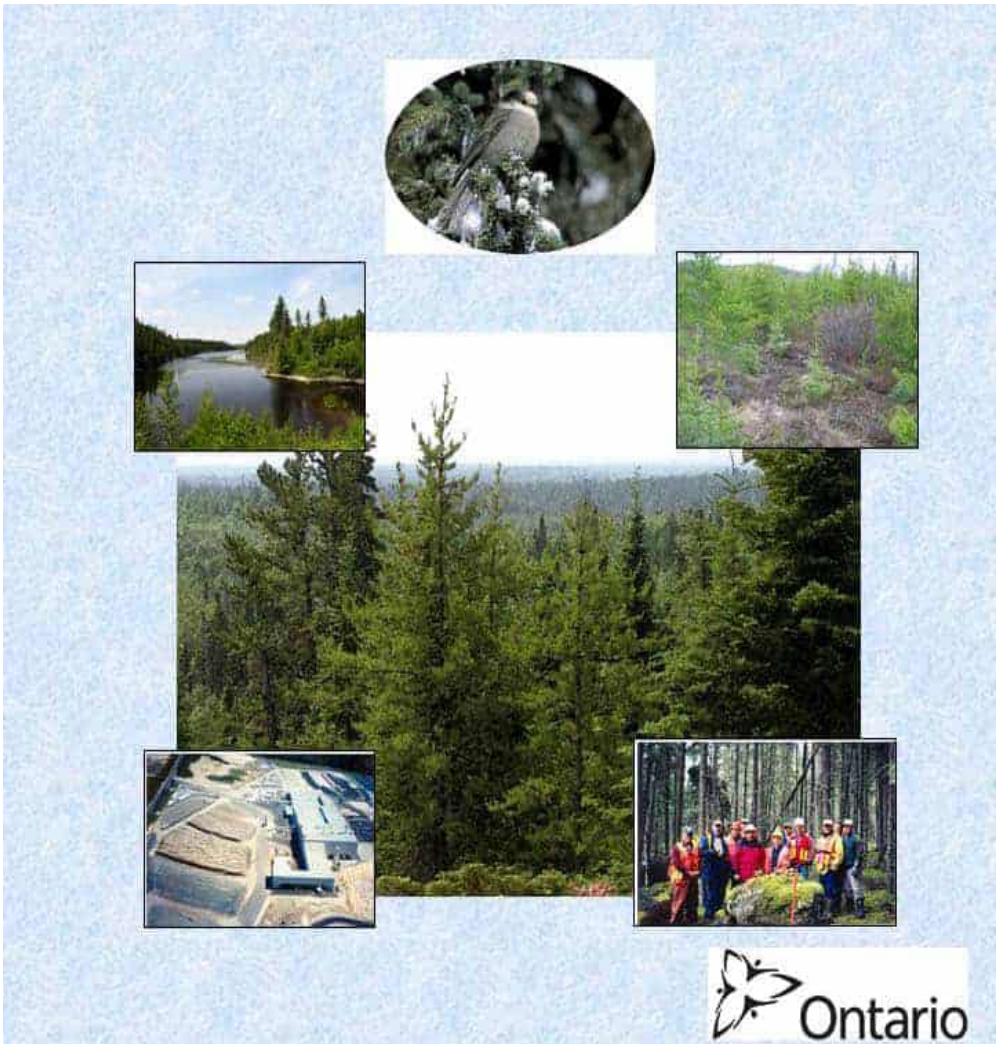
The changes and revisions included in the final plan were of a minor nature and did not change the Long-term Management Direction or the majority of the planned operations. Minor changes included:

- Minor revisions to planned harvest areas to address public comments and to address no harvest portions of areas of concern associated with newly identified values.
- Area of concern (AOC) prescriptions added to address protection for additional Species At Risk.
- Revised portions of the plan text and supplementary documentation as per required, suggested and editorial review comments. No changes were made to the long-term strategic management direction.

Supplementary Documentation L

2012-2022 Whiskey Jack Forest Management Plan

Planning Team
Terms of Reference



Terms of Reference

for the

Preparation of the 2012-2022 Whiskey Jack Forest Management Plan

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Terms of Reference
for the
Preparation of the

2012 to 2022
FOREST MANAGEMENT PLAN

for the
Whiskey Jack Forest

This Terms of Reference meets the requirements of the Forest Management Planning Manual (2009) and the Forest Information Manual (FIM). As Plan Author, I am committed to my role in ensuring that this Forest Management Plan (FMP) is produced on schedule as described in this Terms of Reference and in compliance with all relevant legislation.

Prepared By:

_____ _____
Kurt Pochailo, R.P.F., Plan Author Date
Area Forester
Kenora
Ministry of Natural Resources

I acknowledge the responsibilities of the Plan Author and other employees of the Ministry of Natural Resources who are members of the Planning Team:

_____ _____
Andrew Applejohn Date
District Manager
Kenora
Ministry of Natural Resources

Approved By:

_____ _____
Andrew Applejohn Date
District Manager
Kenora
Ministry of Natural Resources

_____ _____
Allan Willcocks, R.P.F. Date
Regional Director
Northwest Region
Ministry of Natural Resources

The original signed version of this page is retained at the MNR Kenora district office in Kenora.

1.0 INTRODUCTION

This Terms of Reference in conjunction with the associated project plan will guide Phase I planning efforts to prepare the Whiskey Jack Forest Management Plan (FMP) for the ten-year period from April 1, 2012 to March 31, 2022 including detailed operational planning for the first five-year term April 1, 2012 to March 31, 2017. Prior to the start of Phase II planning, the Terms of Reference and Project Plan will be reviewed and updated.

2.0 ORGANIZATION FOR PLANNING

This section provides the organizational structures established to ensure the timely completion of the FMP. Those structures include the steering committee, Planning Team, plan advisors and plan reviewers. More detailed descriptions of roles and responsibilities for these groups including any Task Teams set up to facilitate production of the FMP, can be found in the associated project plan.

2.1 Steering Committee

List of Steering Committee Members:

Steering Committee Member Name	Organization and Title	Role
Andrew Applejohn	MNR District Manager	Leader
Shawn Stevenson	Area Supervisor	Member
Kevin Ride, R.P.F.	Representative of Regional Director	Member

2.2 Planning Team

List of Planning Team Members

Planning Team Member Name	Representing	Role
Kurt Pochailo, R.P.F.	MNR	Area Forester/Plan Author
Stephen Duda	MNR	Planning & Information Management Supervisor/ Planning Team Chair (strategic) /Project Manager
Shawn Stevenson	MNR	Area Supervisor/Planning Team Chair (operational)
Hassan Mohamed, R.P.F.	MNR	Resource Analyst
Mary Duda	MNR	Area Biologist
Abby Anderson, R.P.F.	MNR	District Planner

Planning Team Member Name	Representing	Role
Henry Dribnenky	Kenora LCC	LCC Representative
Laurent Tetreault	Red Lake LCC	LCC Representative
Dale Munro, R.P.F.	Kenora Forest Products	Industry Representative - Receiving Facility
Bob Boyce, R.P.F.	Weyerhaeuser	Industry Representative - Receiving Facility
Norm Hissa	MNR	Aboriginal Community Liaison
Greg Lloyd, R.P.F.	MNR	MNR Forester (Red Lake District)
Debora Henry	Ochiichagwe'babigo'inning (Dalles) First Nation	Aboriginal Community Representative
Joel Henley	Kenora Métis Council	Aboriginal Representative
Doug Riffel	Wabauskang First Nation	Aboriginal Community Representative
Marvin McDonald	Wabaseemoong Independent Nations	Aboriginal Community Representative
Conrad Tom	Naotkamegwanning (Whitefish Bay) First Nation	Aboriginal Community Representative
TBA	Grassy Narrows First Nation (Asubpeeschoseewagong Netum Anishinabek)	Aboriginal Community Representative

2.3 Key Advisors and Support

The following identifies those individuals who will act as Key Plan advisors and Support.

Support/Key Advisor Name	Representing	Role
Jason Suprovich	MNR	Logistics and forestry support
Lil Anderson	MNR	Communications support
Gerry Simmons	MNR	GIS support
Todd Skene	MNR	Operational Support
Shannon Rawn, R.P.F.	Forest Resource Licence Holder	Wincrief/Naotcrief Support
Matt Yeo	Ontario Parks – Parks Superintendent	Operational Support

2.4 Other Plan Advisors

District MNR Advisors:	
Walt Lesenke	Fire Management
MNR Regional/Provincial Advisors:	
Kevin Ride, R.P.F.	A/Senior Forest Management Planner
Chris Schaefer, R.P.F.	Forest Mgmt. Planning Specialist
Rob Bowen, R.P.F.	Regional Analyst
Darren Elder	A/Regional Planning Biologist
Angus Carr	Regional Planning Analyst
Cathy Cavalier, R.P.F.	Forest Program Specialist
Jenn Chikoski	A/Species at Risk Biologist
Garnet Beemer	Regional Analyst Information Specialist
Evan Simpson	Senior Planner
Renee Carrière	Cultural Heritage Specialist
John Stephens	Provincial Planning Economist
Bill Taylor	Native Liaison Officer
Ontario Parks Advisors:	
Julie Sullivan	Senior Park Planner
Matt Yeo	Park Superintendent
Ron Leekam	Natural Heritage Specialist
MNR Science Advisors:	
Bob White	Science Advisor
Colin Bowling	Science Advisor
Other Provincial Advisors:	
Ministry of Northern Development, Mines and Forests:	
Hugh Lockwood	Regional Land Use Geologist
Andreas Lichtblau	Resident Geologist
Pat Corbett / Mike Davis	Forest Industry Liaison
Mark Vermette	Northern Development Officer
Frank Bastone	Tourism Consultant
Ministry of Citizenship and Culture:	
Paige Campbell/Andrew Hinshelwood	Regional Archaeologist

2.5 Plan Reviewers

List of Plan Reviewers

Plan Reviewer Name	**Position**
Greg Lloyd, R.P.F.	MNR Area Forester (Red Lake)
Hassan Mohamed, R.P.F.	Resource Analyst
Stephen Duda	Planning and Information Management Supervisor, Planning Team Chair and Project Manager
Shawn Stevenson	Area Supervisor
Mary Duda	Biologist
Abby Anderson, R.P.F.	District Planner

Plan Reviewer Name	Position
Norm Hissa	Aboriginal Community Liaison
Todd Skene	IRM Technical Specialist
Fred Zroback	Area Technician
Kevin Ride, R.P.F.	Senior Forest Management Planner (Acting)
Chris Schaefer, R.P.F.	Forest Mgmt. Planning Specialist
Rob Bowen, R.P.F.	Regional Analyst
Angus Carr	Regional Planning Analyst
Garnet Beemer	Regional Analyst Information Specialist
Cathy Cavalier, R.P.F.	Forest Program Specialist
Julie Sullivan	Senior Park Planner
Ron Leekam	Natural Heritage Specialist
Jenn Chikoski	A/SAR Biologist
Darren Elder	A/Regional Biologist

2.6 Operation of the Planning Team

Planning Team Meetings

- Meetings will be monthly (more frequently if required).
- Stephen Duda will chair.
- Agenda items are submitted to the chair prior to distribution of the agenda by the Chair.
- Meeting protocols:
    - All members will have an opportunity to express their views.
    - Members will be respectful of other members or visitors.
    - Discussions should remain focused on the topic at hand.
    - The Chair will control the speaking order, to ensure that all Planning Team members have an opportunity to participate in the discussions.
- Standing Agenda items will include a schedule update, updates from active Task Teams, correspondence received and discussions held with stakeholders and Aboriginal Planning Team member items for discussion.
- Freedom of Information and Protection of Privacy Act (FIPPA) will apply such that other than Planning Team members' names, personal information will not appear in the minutes.
- Discussion items not on the agenda, or beyond the scope of the FMP, will be discussed as time permits or scheduled for a separate meeting.

The Planning Team will also be available to meet to discuss issues with stakeholders directly affected by proposed operations. This will provide an opportunity to engage in discussions that will initiate the process for resolution of any conflicts. Where major issues arise, a separate process of stakeholder meetings may be required.

Decision Process:

Whenever possible, decisions by consensus.

- To seek consensus:
  - All members will be provided with the necessary opportunity to fully express their viewpoints, and will be expected to provide input.
  - All members will be respectful of the opinions of other members and will give their input full consideration.
  - The chair will periodically poll the group to determine if there is a progression toward consensus and to focus discussion on any significant difference of opinion.
  - Differences of opinion will be thoroughly discussed with an emphasis placed on,
    - Attempting to understand conflicting viewpoints;
    - Clarifying any misinterpretations and focusing discussions on specifics; and
    - Seeking to identify modifications that will move toward a mutually acceptable solution.
- If a consensus cannot be attained, the issue may be forwarded to the Steering Committee for advice or action.
- The Decision Making Process may involve The Process Streamlining Test (PST) for considering the need for additional plan content or products. The PST is comprised of the following questions:
  1. What is the objective of the requirement (for additional plan content/products)?
  2. Is the requirement necessary to meet the objective?
  3. Is the requirement as simple, cost effective and efficient as it can be?
  4. What alternatives or change will lead to a positive response to the above?

3.0 PLAN PRODUCTION, REVIEW AND APPROVAL

3.1 Schedule for Plan Production

See Appendix 2 of the Project Plan for a schedule of plan production which details the plan component/requirements as per the FMPM.

3.2 Key Plan Production Deliverables and Associated Issues

Issues and challenges exist for the development of this FMP. The following issues have the potential to impact the plan production schedule. Where appropriate, Task Teams have been established and advisors have been identified to address these issues.

Furthermore, there has been recognition of the unique challenges to forest management planning in the Kenora District at the Regional and District level. Efficiencies to planning are expected by coordinating planning efforts between the Kenora and Whiskey Jack Forests, taking advantage of much of the previous planning effort which was part of the Planning for the 2009 Whiskey Jack Forest (strategic inputs and outputs) where possible, and assuming similar on the Kenora Forest. As well, there is Regional commitment to support these planning processes with the appropriate staff and resources necessary to meet the challenges of these planning processes.

- SFL transfer.
- Maintaining consistency and timelines between Kenora and Whiskey Jack FMPs.
- Landscape Guide approval and implementation.
- Stand and Site Guide implementation.
- Caribou Conservation Plan implementation.
- Resources currently available within MNR and SFL holder to achieve the planning schedule.
- The current planning schedule has been compressed to meet the required timelines in order to achieve an April 1, 2012 implementation target date.

For a listing of key plan production deliverables refer to the production schedule of the Project Plan.

3.3 Additional Plan Products

The Aboriginal Task Team may produce supplemental documentation for inclusion with the FMP which outlines the process as perceived by the First Nation and recognized Aboriginal Communities. Aboriginal topics/items brought forward in the planning process and how they were considered and/or other information that the Task Team and Planning Team feel is relevant to the plan productions or products thereof.

During plan production, the Planning Team may be asked (by a Planning Team member or external to the Planning Team) to include an additional plan product in the FMP. The Planning Team will consider inclusion of these additional products using the decision making process identified above in 2.5. The decision on the request for additional plan product/ content will be documented in the minutes to the Planning Team meeting (or some other agreed upon forum).

3.4 Analysis Tools

The FIM requires that all information systems (analytical models and tools) used in the development of the FMP are identified. Specifically, the plan project plan must identify the timelines for the provision of information prepared for each information system (inputs) and the results generated by each information system (outputs). The schedule must identify the critical stages in plan production where inputs and outputs/ results from the various information systems must be verified and accepted by the Planning Team. The schedule for plan production must also account for the interactive nature and integration of information between dependent information since results produced from one analytical tool are often inputs to another analytical model. The schedule must identify, for each information system, the following: when the input information will be provided to the Planning Team members for verification and acceptance; when the information inputs must be verified and accepted; and when the results produced from the various information systems must be verified and accepted by the appropriate Planning Team members and the MNR. The Planning Team members involved with each analysis tool are identified in the Project Plan in section 2.2 Task Teams.

1. Strategic Forest Management Model (SFMM)
SFMM is based on linear programming techniques and is used to model timber production capabilities of a forest for various levels of management intensity. The model is designed to be compatible with information currently available in Ontario. The model is also used to model wildlife habitat abundance for a range of species. SFMM version 3.5 will be used.

2. Stand and Site Coarse Filter Residual Tool
Evaluates the amount of residual forest at 50 and 500 ha scales and identifies areas where additional residual may be required.

3. Ontario Landscape Tool (OLT)
OLT is a tool to quantify landscape conditions and comparison with simulated range of natural variation. Specifically, the purpose of the tool is to: assign young forest classes to forest inventories; assign forest unit age class groupings to forest inventories; calculate old growth values from forest inventories; calculate frequency histograms of current and planned young forest pattern to allow comparisons with the landscape guide range; calculate landscape signature of current and planned texture of the mature forest matrix to allow comparisons with the landscape guide range. This tool measures both songbirds and wildlife indicator species, such as moose, marten, fisher, etc.

4. The Heritage Assessment Tool (HAT)
The HAT model is designed to identify high potential Cultural Heritage sites across the forest. A review of the proposed areas of operations by the MNR provincial archaeologist, Plan Author and Planning Team will subsequently refine the high potential areas.

5. Ontario Forest Analyst (OFA)
This program is designed to assist in applying the "Forest Management Guidelines for the Conservation of Woodland Caribou". It contains a caribou habitat classification query set, based on the guidelines, which identifies both preferred and useable habitat.

6. Socio-Economic Impact Model (SEIM)
SEIM is used to specify financial details of natural resource based projects and will produce an economic, social and environmental analysis. This model will may be used to detect relative socio-economic impacts among optional management alternative between the current level of operations and the proposed management strategy.

7. *Ontario Marten Analyst 2 (OMA2)
This tool has been developed in the Northwest Region to classify the landbase into "capable" forest types and "suitable" habitat. Suitable habitat can then be modelled through time, based on the current forest condition. OMA2 contains a "core builder" tool where the user can create various core habitat area scenarios and generate core habitat statistics.

8. *Natural Disturbance Pattern Emulation Guide Tool (NDPEGtool)
Is a GIS tool (ArcView based) designed to estimate forest disturbance perimeter, estimate residual (insular and peninsular) within forest disturbances, estimate planned clear cut.

Note: The Forest Management Guide for Landscapes has not yet been formally approved for implementation into 2012 plans. It is understood that the tools listed above will be used in the preparation of the 2012 FMPs and that the intent of the Forest Management Guide for Landscapes will be followed based upon the assumption that this Guide is soon to be approved with the expectation that 2012 FMP's will be prepared following its direction.

** In the event the landscape guide is not approved, these tools will be used to replace the OLT.*

3.5 Draft and Approved Forest Management Plan Distribution

The Plan Author will submit the plans in electronic format (via the Forest Information Portal) as described by the Forest Information Manual FMP Technical Specification and the FMPM 2009.

4.0 COMMUNICATIONS PLAN

4.1 General

The Forest Management Planning Manual (FMPM) identifies the need for a Communications Plan to ensure all interested parties are involved with, and are aware of formal opportunities to comment on all aspects of the development of the FMP. MNR is responsible for the preparation and delivery of the Communications Plan.

4.2 Internal Communications

The Planning Team will hold meetings and record/distribute minutes of these meetings to the appropriate groups. The Planning Team chair will maintain frequent communications with team members to assess progress and share information.

4.3 Communications with the Local Citizens Committee

The Local Citizens Committee (LCC) will be kept informed and updated with respect to the plan production through regular updates at LCC meetings. Individual issues or concerns that arise during the preparation of the plan may also be brought to the LCC for discussion and advice.

Copies of FMP Planning Team meeting minutes will be provided to LCC members and discussed at regularly scheduled LCC meetings.

4.4 Communications with Plan Advisors

Plan Advisors will be contacted to provide advice and assistance within their area of expertise during the development of the FMP. Advisors will also be available to review specific plan components in advance of Progress Checkpoints and/or key milestone dates. Planning Team minutes will be provided to the Forest Management Planning Specialist to keep the MNR Regional Plan Advisors informed as to plan developments.

Where other Agencies or Ministries have determined they have specific interests that should be addressed in the FMP, the Advisors for those organizations will be contacted when those interests are to be discussed by the Planning Team. Every attempt will be made to provide the Advisors with sufficient lead-time to arrange to attend specific Planning Team meetings if they wish. These Advisors will also be provided copies of all Planning Team minutes in order to stay current with planning developments.

4.5 Consultation Schedule

The schedule for consultation is included in the Project Plan (Appendix 2).

4.6 Public Notices

External notification throughout the planning process will occur primarily through direct mailings, local newspaper ads, and *Environmental Bill of Rights* (EBR) information notices through the Environmental Registry. Other notification methods may include e-mail, web postings etc. The required public notices for each stage of the planning process will be developed/arranged by the Planning Team and posted/organized by the MNR.

Supplementary notices, approximately one week prior to the scheduled date of information centres, may be issued by MNR, in consultation with the LCC and the Planning Team as a reminder to the public of their opportunity to participate.

An updated EBR information notice will be placed on the EBR Registry, at each stage of consultation.

Summary of Notices for Each Stage of Consultation

Note: Consultation timelines as prescribed in the FMPM will commence with the public postings that are placed in the local Kenora media (i.e. *Kenora Daily Miner and News*, *Lake of the Woods Enterprise*; whichever is first available to the public)

Notice Type	Remarks
Mailed	Whiskey Jack Forest mail-out
Newspaper	Notices to be placed in the following newspapers: *Kenora Daily Miner and News, Lake of the Woods Enterprise*, *Northern Sun News*, *Dryden Observer*, *Wawatay News*
EBR Notice	Information Notice on the Environmental Registry

4.7 Aboriginal Community Notices

If a customized consultation approach has not been agreed to with an Aboriginal community, a direct written notice will be provided to the Aboriginal Community in English, and upon request, in the Aboriginal language specified by the Community for each notice required for the FMP. A media notice will also be placed in the *Wawatay News*. The Aboriginal Communities to be provided direct written notice are:

- Ochiichagwe'babigo'inning First Nation (Dalles)
- Wabauskang First Nation
- Wabaseemoong Independent Nations
- Naotkamegwanning First Nation (Whitefish Bay)
- Grassy Narrows First Nation (Asubpeeschoseewagong Netum Anishinabek)
- Kenora Métis Council

4.8 Summary of Input and Confidentiality

Input will be acknowledged and brought to the Planning Team for response. The Planning Team will evaluate and analyse input during meetings to determine how the input could be considered in the development of the FMP. MNR, or the Plan Author, will respond in writing, in a timely way, to all written comments and submissions received from any person or organization during the preparation of the FMP. This requirement will also apply to all verbal comments if a written response has been requested.

After each stage of consultation, a summary of input received and response provided will be produced. This summary will form an Appendix to both the draft and final FMP but will not include names or address of people providing input into the FMP. Normally, the names and addresses of persons who provide input will be added to the mailing list unless advised not to.

Notices will identify that comments will become part of the public record, but that under the *Freedom of Information and Protection of Privacy Act*, personal information will remain confidential unless prior consent is obtained.

5.0 MNR FUNDING REQUIREMENTS

Summary Description of MNR Funding Requirements	**Fiscal Year (April 1 to March 31)**			
	2009/2010	**2010/2011**	**2011/2012**	**Total**
Public and Aboriginal Consultation Funding Requirements	15.0	25.0	25.0	65.0
Customized Aboriginal Consultation Funding Requirements - estimated on basis of 5 Aboriginal communities involved with Planning Team and anticipated efforts with Grassy Narrows First Nation.	15.0	20.0	20.0	55.0
Total	30.0	45.0	45.0	120.0

6.0 RECORD OF CHANGES TO TERMS OF REFERENCE

Changes to the terms of reference will be recorded and approved as necessary during the planning process, and included as an addendum.

Addendum 1

CHANGES TO TERMS OF REFERENCE
Draft Plan Stage

Some minor changes to the Terms of Reference were made to reflect the additional task of preparing the 2012 – 2014 Contingency Plan and 2012-2022 Forest Management Plan. These changes are noted below in blue.

1.0 INTRODUCTION

This Terms of Reference in conjunction with the associated project plan will guide Phase I planning efforts to prepare the Whiskey Jack Forest Management Plan (FMP) for the ten-year period from April 1, 2012 to March 31, 2022 including detailed operational planning for the first five-year term April 1, 2012 to March 31, 2017. Prior to the start of Phase II planning, the Terms of Reference and Project Plan will be reviewed and updated.

2.0 ORGANIZATION FOR PLANNING

This section provides the organizational structures established to ensure the timely completion of the FMP. Those structures include the steering committee, Planning Team, plan advisors and plan reviewers. More detailed descriptions of roles and responsibilities for these groups including any Task Teams set up to facilitate production of the FMP, can be found in the associated project plan.

2.1 Steering Committee

List of Steering Committee Members:

Steering Committee Member Name	Organization and Title	Role
~~Andrew Applejohn~~ Deb Weedon	MNR District Manager	Leader
Shawn Stevenson	Area Supervisor	Member
Kevin Ride, R.P.F.	Representative of Regional Director	Member

At Draft plan stage no significant changes were required to the Terms of Reference. Most notable were the name changes associated with changes to individual roles/responsibility changes (e.g. no longer in the position). Therefore the following wording will be added to the Terms of Reference through this addendum…

Within the Terms of Reference individual names are provided as guidance only at the start of the planning process. Throughout the planning process it is understood that specific roles of individuals will change, new people will become involved and others

will no longer. Specific roles, responsibilities, approvals, memberships, etc should only be considered as assigned to the position or representation listed. Generally speaking individual names outside of the Planning Team members have been included in the development of the Terms of Reference as reference only.

Despite the above, the List of Planning Team Members and Key Advisors / Support staff active at Draft Plan stage include:

2.2 Planning Team

List of Planning Team Members

Planning Team Member Name	**Representing**	**Role**
Kurt Pochailo, R.P.F.	MNR	Area Forester/Plan Author
Stephen Duda	MNR	Planning & Information Management Supervisor/ Planning Team Chair ~~(strategic)~~ /Project Manager
Shawn Stevenson	MNR	Area Supervisor~~/Planning Team Chair (operational)~~
Hassan Mohamed, R.P.F.	MNR	Resource Analyst
Mary Duda	MNR	Area Biologist
Abby Anderson, R.P.F.	MNR	District Planner
Henry Dribnenky	Kenora LCC	LCC Representative
~~Laurent Tetreault~~ Dutchie Lowman	Red Lake LCC	LCC Representative
Dale Munro, R.P.F.	Kenora Forest Products	Industry Representative - Receiving Facility
~~Bob Boyce, R.P.F.~~ Matt Wilkie	Weyerhaeuser	Industry Representative - Receiving Facility
~~Norm Hissa~~ Scott Lockhart	MNR	Aboriginal Community Liaison
TBA	MNR	MNR Forester (Red Lake District)
Debora Henry	Ochiichagwe'babigo'inning (Dalles) First Nation	Aboriginal Community Representative
Joel Henley	Kenora Métis Council	Aboriginal Representative

Planning Team Member Name	Representing	Role
Doug Riffel	Wabauskang First Nation	Aboriginal Community Representative
TBA	Wabaseemoong Independent Nations	Aboriginal Community Representative
~~Conrad Tom~~ Alex Tom	Naotkamegwanning (Whitefish Bay) First Nation	Aboriginal Community Representative
TBA	Grassy Narrows First Nation (Asubpeeschoseewagong Netum Anishinabek)	Aboriginal Community Representative
Susan Jarvis, R.P.F.	Forest Concepts	Planning Contractor
Bob Boyce, R.P.F.	Miisun	Planning Contractor

2.3 Key Advisors and Support

The following identifies those individuals who will act as Key Plan advisors and Support.

Support/Key Advisor Name	Representing	Role
~~Jason Suprovich~~	~~MNR~~	~~Logistics and forestry support~~
Lil Anderson	MNR	Communications support
~~Gerry Simmons~~ Darryl Pajunen	MNR	GIS support
Todd Skene	MNR	Operational Support
Shannon Rawn, R.P.F.	Forest Resource Licence Holder	Wincrief/Naotcrief Support
Donna Puls	Miisun	Planning Contractor
Matt Yeo	Ontario Parks – Parks Superintendent	Operational Support

Approved

Addendum 1 to the Terms of Reference for the Preparation of the 2012-2022 Whiskey Jack Forest Management Plan

_____ _____

Deb Weedon
District Manager
Kenora District

Date

The original signed version of this page is retained at the MNR Kenora district office in Kenora.

Addendum 2

CHANGES TO TERMS OF REFERENCE
Final Plan Stage

Some minor changes to the Terms of Reference were made to reflect the additional task of the preparing the 2012 – 2022 Whiskey Jack Forest Management Plan. These changes are noted below in blue.

1.0 INTRODUCTION

This Terms of Reference in conjunction with the associated project plan will guide Phase I planning efforts to prepare the Whiskey Jack Forest Management Plan (FMP) for the ten-year period from April 1, 2012 to March 31, 2022 including detailed operational planning for the first five-year term April 1, 2012 to March 31, 2017. Prior to the start of Phase II planning, the Terms of Reference and Project Plan will be reviewed and updated.

2.0 ORGANIZATION FOR PLANNING

This section provides the organizational structures established to ensure the timely completion of the FMP. Those structures include the steering committee, Planning Team, plan advisors and plan reviewers. More detailed descriptions of roles and responsibilities for these groups including any Task Teams set up to facilitate production of the FMP, can be found in the associated project plan.

2.1 Steering Committee

2.2 Planning Team

List of Planning Team Members

Planning Team Member Name	Representing	Role
Kurt Pochailo, R.P.F.	MNR	Area Forester/Plan Author
~~Stephen Duda~~ Hassan Mohamed, R.P.F.	MNR	A/Planning & Information Management Supervisor/ Planning Team Chair ~~(strategic)~~ /Project Manager/ Resource Analyst
Shawn Stevenson	MNR	Area Supervisor~~/Planning Team Chair (operational)~~
~~Hassan Mohamed, R.P.F.~~	~~MNR~~	~~Resource Analyst~~

Planning Team Member Name	Representing	Role
~~Mary Duda~~ Sarah McKenzie	MNR	~~Area~~ Management Biologist
Abby Anderson, R.P.F.	MNR	District Planner
~~Henry Dribnenky~~ Wayne Bruce	Kenora LCC	LCC Representative
Dutchie Lowman	Red Lake LCC	LCC Representative
Dale Munro, R.P.F.	Kenora Forest Products	Industry Representative - Receiving Facility
Matt Wilkie	Weyerhaeuser	Industry Representative - Receiving Facility
Scott Lockhart	MNR	Aboriginal Community Liaison
Greg Lloyd R.P.F.	MNR	MNR Forester (Red Lake District)
~~Debora Henry~~ TBA	Ochiichagwe'babigo'inning (Dalles) First Nation	Aboriginal Community Representative
Joel Henley	Kenora Métis Council	Aboriginal Representative
Doug Riffel	Wabauskang First Nation	Aboriginal Community Representative
TBA	Wabaseemoong Independent Nations	Aboriginal Community Representative
Alex Tom	Naotkamegwanning (Whitefish Bay) First Nation	Aboriginal Community Representative
TBA	Grassy Narrows First Nation (Asubpeeschoseewagong Netum Anishinabek)	Aboriginal Community Representative
Susan Jarvis, R.P.F.	Forest Concepts	Planning Contractor
~~Bob Boyce, R.P.F.~~ Shannon Rawn, R.P.F.	Miisun	Planning Contractor

2.3 Key Advisors and Support

The following identifies those individuals who will act as Key Plan advisors and Support.

Support/Key Advisor Name	Representing	Role

Support/Key Advisor Name	Representing	Role
Lil Anderson	MNR	Communications support
Darryl Pajunen	MNR	GIS support
Todd Skene	MNR	Operational Support
~~Shannon Rawn, R.P.F.~~	~~Forest Resource Licence Holder~~	~~Wincrief/Naotcrief Support~~
Donna Puls	Miisun	Planning Contractor
Matt Yeo	Ontario Parks – Parks Superintendent	Operational Support

2.4 Other Plan Advisors

District MNR Advisors:	
Jennifer Hughes ~~Walt Lesenke~~	Fire Management
MNR Regional/Provincial Advisors:	
Kevin Ride, R.P.F.	Regional Forest Resources Supervisor ~~A/Senior Forest Management Planner~~
Chris Schaefer, R.P.F.	Forest Mgmt. Planning Specialist
Rob Bowen, R.P.F.	Regional Analyst
Glen Hooper ~~Darren Elder~~	~~A/~~Regional Planning Biologist
Angus Carr	Regional Planning Analyst
Cathy Cavalier, R.P.F.	Forest Program Specialist
Hilary Gignac ~~Jenn Chikoski~~	~~A/~~Species at Risk Biologist
Garnet Beemer	Regional Analyst Information Specialist
Evan Simpson	Senior Planner
Renee Carrière	Cultural Heritage Specialist
John Stephens	Provincial Planning Economist
Bill Taylor	Native Liaison Officer
Ontario Parks Advisors:	
Julie Sullivan	Senior Park Planner
Matt Yeo	Park Superintendent
Ron Leekam	Natural Heritage Specialist
MNR Science Advisors:	
Bob White	Science Advisor
Colin Bowling	Science Advisor
Other Provincial Advisors:	
Ministry of Northern Development, Mines and Forests:	
Hugh Lockwood	Regional Land Use Geologist
Andreas Lichtblau	Resident Geologist
Pat Corbett / Mike Davis	Forest Industry Liaison
Mark Vermette	Northern Development Officer

Frank Bastone	Tourism Consultant
Ministry of Citizenship and Culture:	
Paige Campbell/Andrew Hinshelwood	Regional Archaeologist

2.5 Plan Reviewers

List of Plan Reviewers

Plan Reviewer Name	Position
Greg Lloyd, R.P.F.	MNR Area Forester (Red Lake)
Hassan Mohamed, R.P.F.	A/Planning and Information Management Supervisor, Planning Team Chair and Project Manager/ Resource Analyst
Shawn Stevenson	Area Supervisor
Sarah McKenzie	Management Biologist
Abby Anderson, R.P.F.	District Planner
Scott Lockhart	Aboriginal Community Liaison
Todd Skene	IRM Technical Specialist
Fred Zroback	Area Technician
Kevin Ride, R.P.F.	Regional Forest Resources Supervisor
Chris Schaefer, R.P.F.	Forest Mgmt. Planning Specialist
Rob Bowen, R.P.F.	Regional Analyst
Angus Carr	Regional Planning Analyst
Garnet Beemer	Regional Analyst Information Specialist
Cathy Cavalier, R.P.F.	Forest Program Specialist
Julie Sullivan	Senior Park Planner
Ron Leekam	Natural Heritage Specialist
Hilary Gignac	SAR Biologist
Glen Hopper	Regional Biologist
Brian Campbell, R.P.F.	Forest Industry Liaison Officer

Approved

Addendum 2 to the Terms of Reference for the Preparation of the 2012-2022 Whiskey Jack Forest Management Plan

_____ _____

Deb Weedon
District Manager
Kenora District

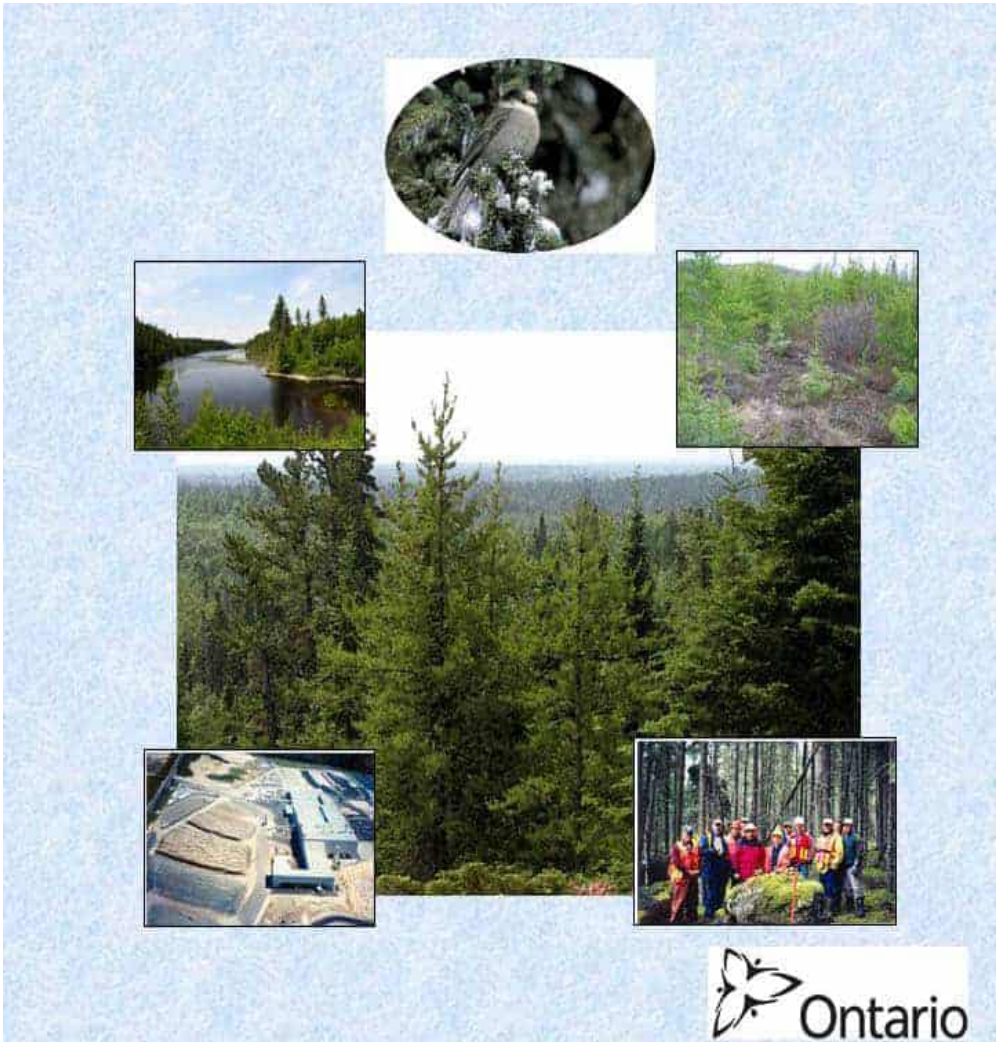
Date

The original signed version of this page is retained at the MNR Kenora district office in Kenora.

Supplementary Documentation M

2012-2022 Whiskey Jack Forest Management Plan

Statement of Environmental Values (SEV)



Consideration of MNR's Statement of Environmental Values for the Whiskey Jack Forest 2012 - 2022 Forest Management Plan

Description of Proposal

The Whiskey Jack Forest is over 11,000 square kilometres in area and is located in Northwest Region of Ontario. The major community within the unit is Kenora. Approximately 99% of the management unit is Crown land. It is located within the Kenora and Red Lake Districts of the Ontario Ministry of Natural Resources (MNR). The Whiskey Jack Forest is situated within the Boreal Forest. Tree species common to the forest include Jack Pine and Black Spruce with significant amounts of Poplar, Balsam Fir, and White Birch. Smaller amounts of White Spruce, Red and White Pine and Eastern White Cedar are scattered components of mixedwood stands.

The Whiskey Jack Forest has been a Crown Management Unit since Abitibi Company of Canada surrendered the Sustainable Forest Licence in August 2009. The Whiskey Jack Forest primarily supplies fibre to the Weyerhaeuser iLevel mill in Kenora, with other receiving mills being the, Domtar mill in Dryden and the Kenora Forest Products mill in Kenora. The anticipated dates that the Forest Management Plan (FMP) will be in effect are for the 10-year period of April 1, 2012 to March 31, 2022.

1. Each of the following principles of resource stewardship as outlined in MNR's Statement of Environmental Values, 2008 have been considered in the context of this proposal. The following describes how these principles have been applied:

- **A sound understanding of natural and ecological systems and how our actions affect them is key to achieving sustainability.**
  Through preparation of the FMP in accordance with the Forest Management Planning Manual (FMPM) the plan incorporates indicators of sustainability. The Natural Disturbance Template for the Whiskey Jack Forest provides the basis for establishing landscape pattern targets. The FMPM and the Forest Management Guide for Natural Disturbance Pattern Emulation (NDPEG) both require the FMP to examine landscape pattern based on the frequency distribution of disturbances (clear cuts and wildfires) by size class. The template incorporates expressions of landscape processes which serve as measurable indicators for forest sustainability.

- **As our understanding of the way the natural world works and how our actions affect it is often incomplete, MNR staff should exercise caution and special concern for natural values in the face of such uncertainty.**
  The plan makes use of the appropriate existing guides for the protection of values (e.g. water quality, fish habitat, caribou habitat, moose habitat, marten habitat, and raptors). These guides take into account data gaps and provide the basis for adaptive management. Some of these guides include: Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales, Forest Management Guide for Natural Disturbance Pattern Emulation, Forest Management Guideline for the Provision of Marten Habitat, Management Guidelines for Forestry and Resource-Based Tourism, and Forest Management Guide for Cultural Heritage Values.

- **The finite capacity of our natural systems should be recognized in planning and allocation decisions.**
  This plan recognizes forests have natural limits in terms of their capacity to produce timber and, by extension, specific types of wildlife habitat. This is incorporated into the plan by using the Strategic Forest Management Model (SFMM) computer modelling tool which outputs an "available harvest area" based on the social, environmental and economic inputs provided by the planning team. This optimization model solves by selecting silvicultural prescriptions to renew harvested areas to meet desired future forest conditions and objectives. Determining the most effective treatment will require consideration and understanding of the site. This plan has also incorporated the results of a "Bounds of Natural Variation" analyses and spatial analysis of landscape features, processes, and habitat.

- **Natural resources should be properly valued to provide a fair return to Ontarians and to reflect their ecological, social and economic contributions.**
  Determination of rates charged for Crown timber is not a component of an FMP. The continued provision of sustainable timber resources through this FMP provides economic value to Ontarians. Social, economic and ecological value of other forest resources (habitat, tourism, etc.) has been recognized and is considered in this

FMP. Strategies and prescriptions have been developed to ensure continued contributions of non-timber resources to the province of Ontario.

- **Participation in resource management by all those who share an interest is a necessary ingredient, particularly in support of communities who must balance economic diversity with other needs. Those affected by proposed changes must have access to information and opportunities to provide input to decisions that affect their lives.**
  The plan's public consultation and Aboriginal involvement process provided opportunities for the public to access information and become involved with planning of the forest operations. MNR played a major role on the planning team including being the author of the plan. Other planning team members included representatives from 5 local First Nations and the Kenora Métis Council. Members from the Kenora Local Citizens Committee (KLCC) and the Red Lake Advisory Committee (RLAC) also had representation on the planning team and were both used as a forum for plan development and meaningful input. Decisions proposed during the planning process can be appealed through an issue resolution process or request for an individual environmental assessment.

- **Applied research and sharing of scientific and technological knowledge and innovative technologies must be fostered to support the sustainable development of natural resources.**
  The plan used existing models [Ontario Marten Analyst 2 (OMA2), SFMM], a Geographic Information System, satellite imagery, and science based guides to assist in determination of resource sustainability.

- **An ecosystem approach to managing our natural resources enables a holistic perspective of social, economic and ecological aspects and provides the context for integrated resource management.**
- **In order to achieve sustainable development, environmental protection must be an integral part of the development process and cannot be considered in isolation.**
- **From both a sound business and environmental perspective, it is less costly and more effective to anticipate and prevent negative environmental impacts before undertaking new activities than it is to correct environmental problems after the fact.**
  To the extent possible, the Whiskey Jack Forest 2012 FMP has adopted strategies that support an integrated approach to management and recognizes the impact of forestry activities on the entire ecosystem. The plan recognizes that in some areas no harvesting should be allowed and in other areas normal forest harvesting activities need to be modified to prevent or mitigate impacts on forest ecosystems or other known values. Area of Concern (AOC) prescriptions to guide operations have been used to maintain the integrity of these values.

  Planning was done by a multidisciplinary team charged with the responsibility of ensuring decisions took into consideration all known forest values. Use of the model SFMM and a qualitative social and economic description analysis was used to evaluate management objectives and strategies in order to provide for the best mix of social and economic benefits. Similarly, SFMM, the NDPEG tool as well as the OMA2 model were used to model the effects of various objectives and strategies on wildlife habitat.

- **The planning for and management of natural resources should strive for continuous improvement and effectiveness through adaptive management of natural resources.**
  This plan implements most recent policy, information sources, science, and analysis tools developed through continuous learning. Ontario's FMP process requires evaluation of current and previous FMPs and the assessment of achievement of objectives, including analysis of effectiveness of LCCs.

- **Rehabilitating degraded environments is an important aspect of resource stewardship**.
  Identification of forest structure and composition, and habitat issues and concerns, and development of strategies to address these concerns are key elements of this FMP. The plan makes use of appropriate existing guides and computer models to evaluate strategies and develop management prescriptions that promote healthy ecosystems, sites, and natural populations (such as NDPEG, Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales, SFMM, and OMA2).

2. Opportunities for Consultation: how in the context of this proposal MNR provided for

- **An open and consultative process when making decisions that might significantly affect the environment; and**
- **Opportunities for involvement of Aboriginal people whose interests may be affected by decisions that might significantly affect the environment.**

Formal Public Consultation

In accordance with provisions of the 2009 FMPM, formal public consultation has occurred at four stages during preparation and review of this FMP: Invitation to Participate, Review of Long Term Management Direction (30 days), Information Centre – Review of Proposed Operations (60 days), and Information Centre – Review of Draft Plan (60 days). Public Inspection of the Approved Plan (30 days) will occur following plan approval. Direct written notice is provided to individuals and organizations at each stage of the planning process as required of the FMPM. Individuals and organizations may request to be added to this list, which is updated at each stage. Public notice is provided through advertisements in local newspapers. All comments and submissions received from public consultation to date have been considered as part of the decision-making process by MNR. A written response has been provided to written comments and submissions, and upon request, to all verbal comments. All comments and submissions are part of the public record. There is an opportunity during the FMP process to seek resolution of issues with the plan author, the MNR District Manager or the MNR Regional Director. During the 30-day inspection period for the approved plan any person may make a written request to the Director of Environmental Assessment and Approvals Branch, Ministry of the Environment, for an individual environmental assessment of specific proposed forest management activities in the FMP. A response to a request for an individual environmental assessment will normally be provided after the completion of the 30-day inspection period.

Opportunities for Involvement of Aboriginal People

Representatives of the Kenora Metis Council were members of the LCC and representatives of Kenora Metis Council, Wabaseemoong Independent Nations, Natokamegwanning (Whitefish Bay) First Nation, Ochiichagwe'babigo'inning (Dalles) First Nation, and Wabauskang First Nation were members of the planning team. This participation provided for an integral role in plan preparation.

Each Aboriginal community in or adjacent to the Whiskey Jack Forest was provided with the opportunity to develop a consultation approach for forest management planning. There were no formal consultation approaches developed, but Natokamegwanning (Whitefish Bay) First Nation, Ochiichagwe'babigo'inning (Dalles) First Nation, and Wabauskang First Nation all took the opportunity to have the Plan Author and other planning team members come to the communities to discuss the planning process and discuss the 2012-2022 FMP.

Early in the planning process the Aboriginal Background Information Report was prepared. This report documents Aboriginal use of the natural resources on the Whiskey Jack Forest, forest management related problems and issues for those Aboriginal communities, Aboriginal values, and a summary of negotiations between MNR and Aboriginal communities. The Report on the Protection of Identified Aboriginal Values was prepared following operational planning. This report documents proposed operations and road corridors of interest to the community, Aboriginal and other values, a discussion of the AOC prescriptions for Aboriginal values and a discussion of how Aboriginal use of the forest has been addressed in the plan. A Summary of Aboriginal Involvement in the production of the FMP has also been prepared and included in the FMP.

3. Additional Information: any other considerations of MNR's SEV in the context of this proposal

The MNR has taken into account social, economic and other considerations. These have been integrated with the purposes of the EBR. The broad objective of forest management on Crown land in Ontario and in this plan is to provide for the wise use of forest resources, which is sustainable over the long term. The planning process and related guides see that environmental, ecological, social and economic values are identified and measures are taken to protect, conserve or enhance these values. A strategy of adaptive management allows new science findings to be incorporated into the FMP. Harvesting activities are planned within the context of silvicultural systems and the sustainability of the resource is addressed through the use of computer modelling and professional knowledge to determine appropriate allocation levels. Sites that may be affected by operations, including cultural heritage values,

are protected by AOC prescriptions. The health of the forest is maintained through regeneration activities and landscape diversity strategies. The public's right to a healthy environment is protected through the planning process, which requires identification of environmental values and prevention or mitigation of potential damage to those values. This right is further protected through mandatory reporting of accomplishments, and associated compliance and effectiveness monitoring. These monitoring efforts will ensure the FMP is followed and future planning strategies are modified as required.

Other considerations have been addressed by following the Class Environmental Assessment for Timber Management on Crown Lands in Ontario, as extended and amended by MNR's Class Environmental Assessment Approval for Forest Management on Crown Lands in Ontario (MNR-71 as amended by MNR-71/2) and adhering to the Crown Forest Sustainability Act (1994) in preparation of the FMP. This process requires the integration of social, economic, ecological considerations through use of the FMPM for Ontario's Crown Forests (2009) in preparation of the FMP.

Prepared by:

_____ _____

Kurt Pochailo
Management Forester
MNR, Kenora District

Date

I have taken into consideration the aforementioned in my decision to recommend approval of the Whiskey Jack Forest 2012 - 2022 Forest Management Plan

_____ _____

Deb Weedon
District Manager
MNR, Kenora District

Date

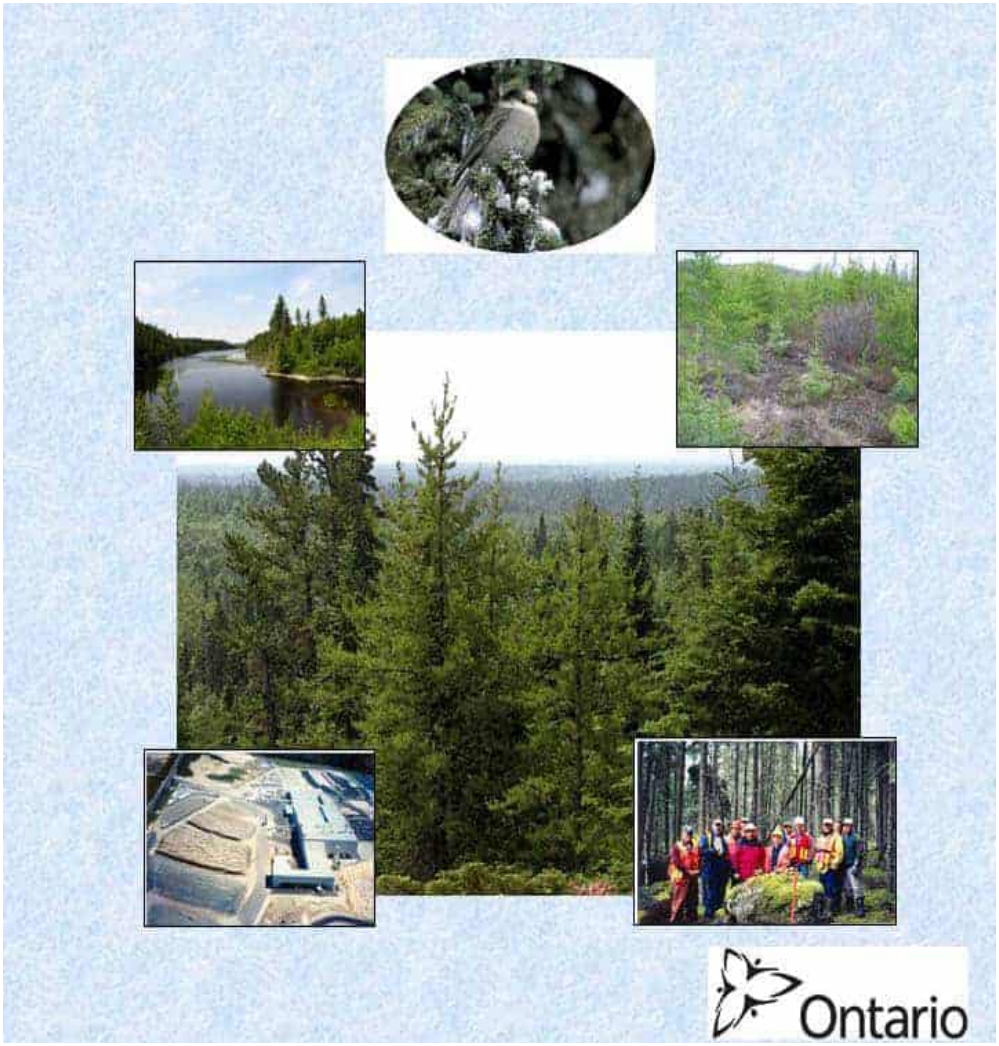
(original signed SEV consideration note is retained at the MNR Kenora District office)

Supplementary Documentation N

2012-2022 Whiskey Jack Forest Management Plan

Spatial Analysis Reports

Part A – Caribou Habitat Management
Part B – Marten Habitat Management
Part C – Landscape Pattern (OLT and NDPE indicators)



Supplementary Documentation N – Spatial Analysis Reports
Part A – Caribou Habitat Management

WHISKEY JACK FOREST MANAGEMENT PLAN 2012-2022 WOODLAND CARIBOU MANAGEMENT STRATEGY

This document is intended to provide an update on the current status of woodland caribou on the Whiskey Jack Forest in addition to providing the results of habitat modeling that was used to predict the availability of suitable habitat into the future. The intent of these recommendations is to ensure the provision of suitable habitat for the long-term maintenance of woodland caribou use on the Whiskey Jack Forest.

The Caribou Conservation Plan (CPP) has been developed to meet the requirements under subsection 11(8) of the Endangered Species Act (ESA) 2007 to identify and prioritize the actions the government intends to take in response to the final Recovery Strategy for Woodland Caribou (forest-dwelling, boreal population) in Ontario. The CPP provides direction to manage the quality, quantity and location of caribou habitat in the area of continuous extent of caribou occurrence. In accordance with the CPP, the Whiskey Jack Forest Management Plan will use a variety of tools to provide for caribou habitat, including silviculture, scheduling of harvesting and deferrals, science-based modeling, precautionary planning in the face of natural uncertainty such as wildfire, and a dynamic caribou habitat schedule. This document will outline the planning decisions made to best provide for an uninterrupted supply of year-round caribou habitat within the limits of natural forest variability, recognizing the influence of both forest harvesting and wildfire.

The Whiskey Jack FMP also requires the effective renewal of caribou habitat through a number of silvicultural initiatives, including

- a caribou-based objective for silviculture to be included in all forest management plans within the geographic distribution of caribou;
- use of the Silvicultural Effectiveness Monitoring and Independent Forest Audit programs to assess the effectiveness of forest renewal for caribou, provide recommendations for improvements, and monitor how successfully logged areas are tracking toward a suitable future habitat condition, before any long-term deferrals are made available for harvest;

Preliminary ranges across the area of southern caribou distribution (within and immediately adjacent to areas licensed for forest management) have been identified for the *Caribou Conservation Plan* (Figure 1), based upon the following criteria (in priority order):

- Animal survey data – movements, distribution, and evidence of shared geography;
- Habitat functions and behavioural responses; and
- Predominant risk factors.

Boundaries will be refined on a criteria-based approach as new scientific and management information and Aboriginal Traditional Knowledge become available, as part of the adaptive management process.

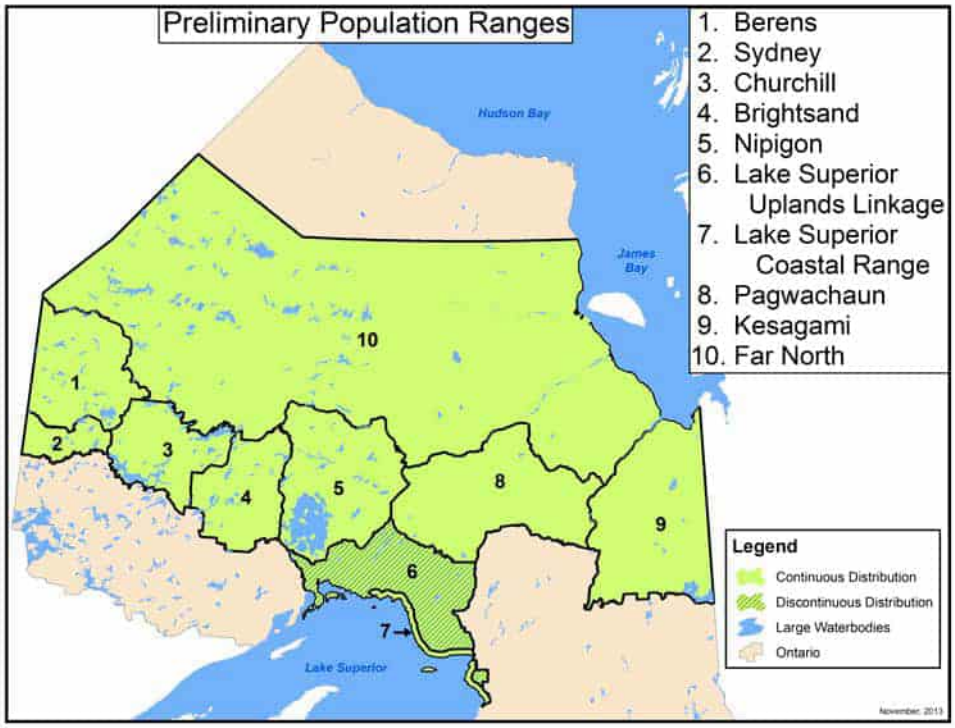


Figure 1. Preliminary delineation of local Woodland Caribou populations ranges along the southern edge of the Provincial extent of occurrence (OMNR, 2009)

Woodland Caribou Populations on the Whiskey Jack Forest

Historical records indicate that caribou distribution on the Whiskey Jack Forest has remained relatively static since the 1960's. The exception to this is the loss of an isolated group of caribou occupying the Cliff Lake area (southwest of Perrault Falls). The Cliff Lake caribou herd declined rapidly during the 1970's and was essentially gone by 1980. Brouseau (1978) attributed the loss of this caribou herd to the effects of logging which started in the area south of Cliff Lake in 1972. The disappearance of the Cliff Lake caribou herd is not unique in Ontario and is indicative of a larger range recession for this species. Surveys throughout the last five years have identified caribou occupancy west of Sydney Lake on the Kenora Forest Management Unit. On March 14, 2008 fourteen caribou were located in the area west of Medicine Stone Lake in the Whiskey Jack Forest. This area is currently the only area of mature forest on the Whiskey Jack that is suitable caribou habitat and has been maintained on the landscape primarily for its historical use by caribou for calving. The 2008 survey indicates, for the first time since the most recent harvesting in the 1999 FMP that caribou occupancy persists in this area.

Woodland Caribou Habitat Management on the Whiskey Jack Forest

In the 1999-2004 FMP most of the eligible harvest area, in the northern portion of the forest that historically supported caribou, was harvested (Figure 2). This area was subsequently deferred for 100 years in the 2004-2009 FMP. During preliminary planning of the 2009 FMP, which was never finalized, a more formal caribou mosaic was developed in conjunction with the approved Forest Management Guidelines for the Conservation of Woodland Caribou: a Landscape Approach (1999). This resulted in the identification of an expanded area for caribou management consideration based on both the existing, and long-term potential caribou habitat. This analysis product was used to develop the area identified as the southern caribou distribution which is currently identified in the CPP (Figure 1), and will be used as a basis for caribou habitat management in the 2012-2022 FMP (Figure 2).

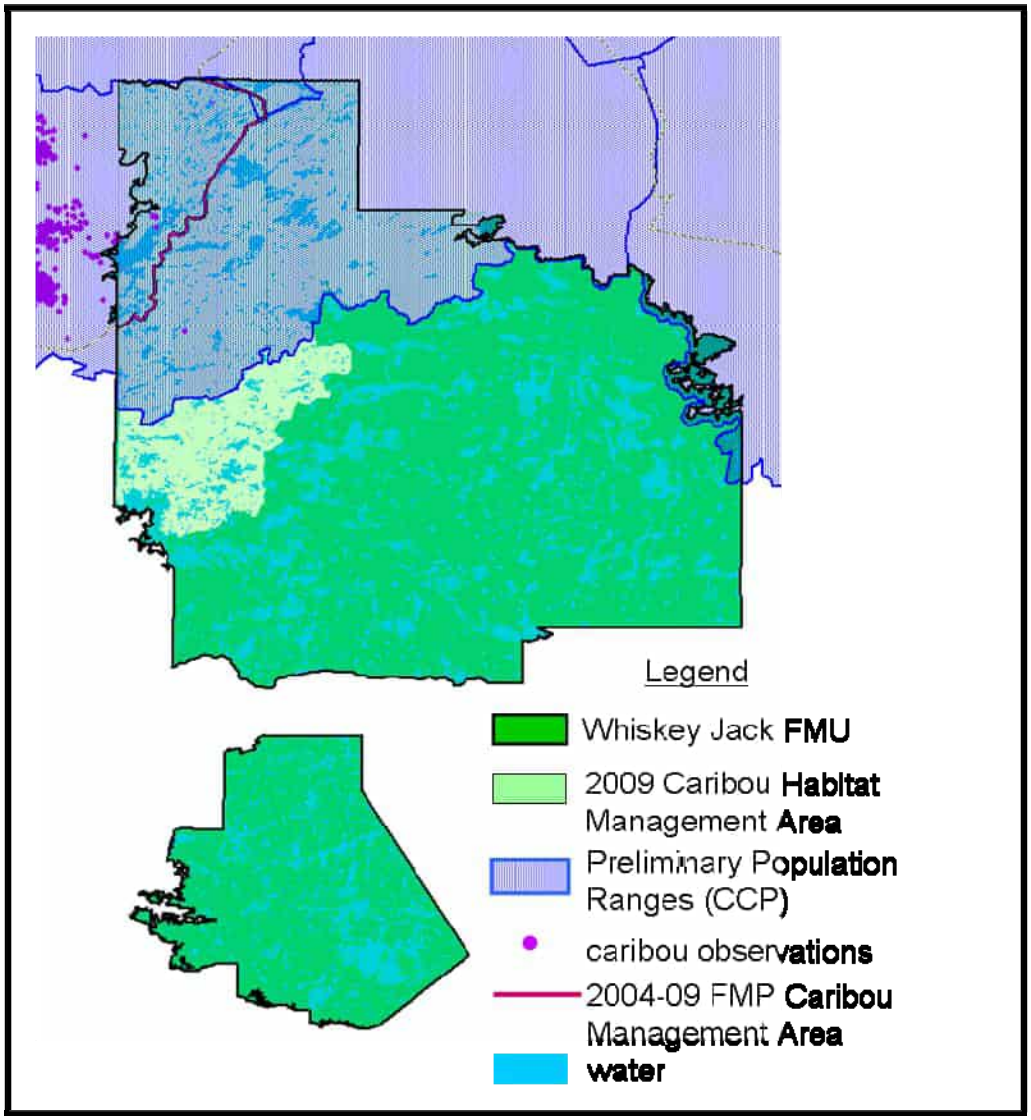


Figure 2. Location of historical and current caribou management areas and animal occurrences on the Whiskey Jack FMU.

Caribou Habitat Capability and Suitability/ Identification of Habitat Tracts

Woodland caribou use habitat differently in various parts of their range. Their range usually includes some habitat that supplies abundant arboreal or terrestrial lichens. Caribou winter range typically includes open coniferous forest with abundant ground cover of reindeer lichens (*Cladina* spp.). Arboreal lichens are generally a secondary food source, but may be locally important (Schaefer and Pruitt 1991, Darby and Pruitt 1984).

Cladina lichen cover tends to be low in younger fire-origin stands, gradually building to approach pre-disturbance levels by a minimum age of approximately 40 years (Schaefer and Pruitt 1991, Harris 1996), although in many stands lichen cover may continue to accumulate to 60 to 80 years. Caribou will start to use these areas once they have self-thinned and continue until the lichen crop declines as the gaps in the canopy close with understory trees (Schaefer and Pruitt 1991, at approximately 100 years.

Caribou are most common in areas where alternate prey and wolf (*Canis lupus*) densities tend to be low (Seip 1992, Cumming 1992, Cumming *et al.* 1996). These are typically large areas dominated by mature coniferous forest and sometimes open peatland complexes where deciduous browse and edge habitat are minimal. Caribou habitat in the boreal forest has been shaped primarily by fire. Fire size in the boreal forest is variable, with fires ranging in size from less than 0.1 ha to more than 1,000,000 ha. Winter habitat quality changes with age. Habitat starts to become available in the 40 to 60 years age range. Habitat tracts in the 60 to 80 year range can be counted on to provide winter habitat and tracts greater than 80 years of age can be considered as prime habitat.

Habitat Tract Analysis

Caribou habitat on the Whiskey Jack forest was identified by identifying areas that are current and/or potential future caribou habitat. Areas were identified if they had ecosites which have a relatively higher probability of providing suitable caribou habitat as specified in the "woodland caribou habitat suitability matrix for northwestern Ontario. This product was used as the basis for identifying "Ecosite Tracts" which represent current and future caribou habitat at a landscape scale on the WJ FMU (Figure 3). The 'Ecosite Tracts' were subdivided into 'Age Class Tracts' representing areas with forest cover of relatively similar ages (Figure 3.). The 'Age Class Tracts' were then subsequently subdivided into "Species Tracts" representing differences with respect to operationally feasibility and potential eligible timing for harvest in the mosaic (Figure 3). These final eleven tracts formed that basis of the habitat tracts/sub-units which will be scheduled for disturbance for the next 100 years in a manner which would best provide suitable habitat for the long-term maintenance of woodland caribou on the Whiskey Jack Forest (Figure 3, Figure 4)

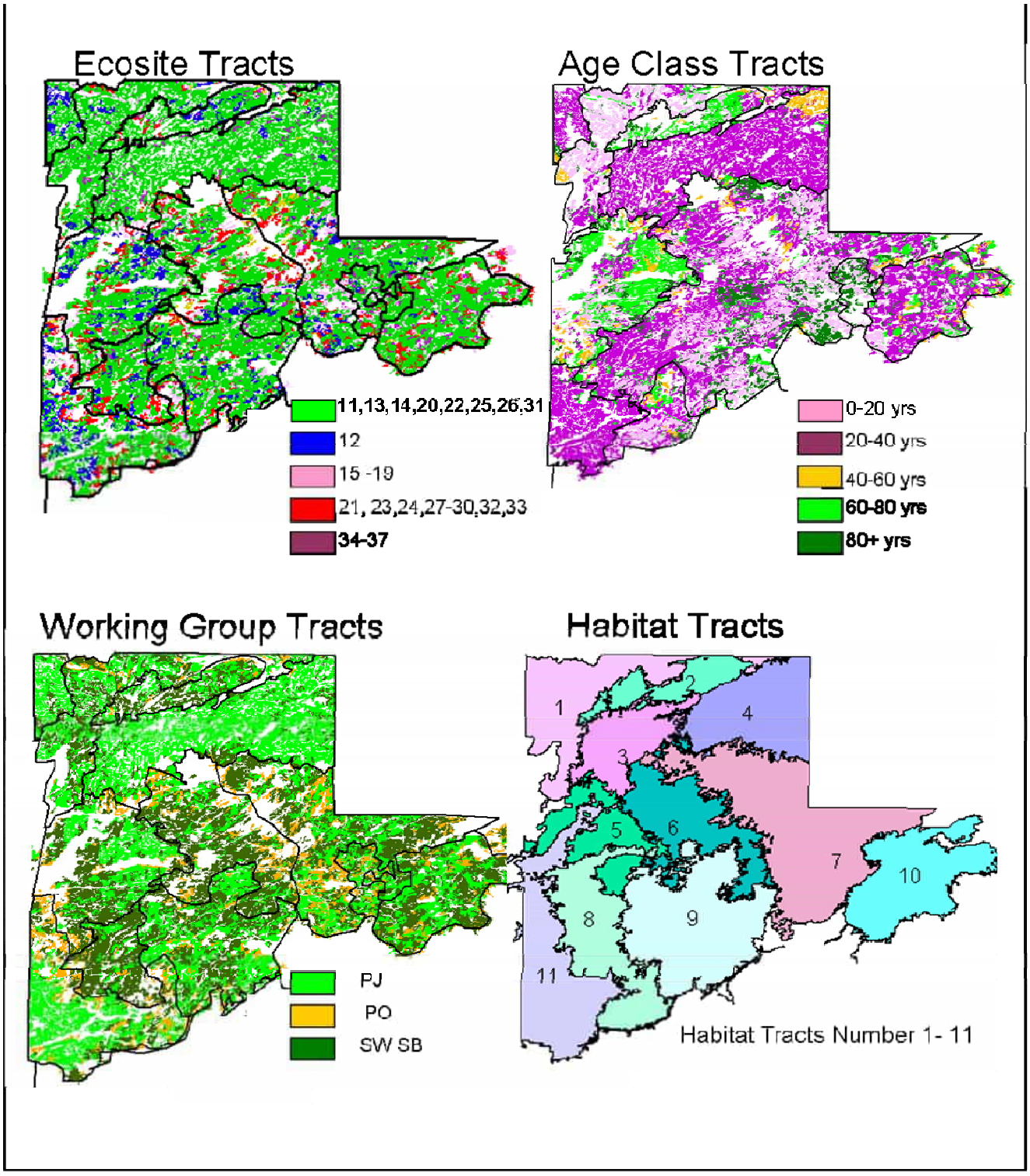


Figure 3: Caribou Habitat Analysis, Whiskey Jack FMU, FMP 2012-2022

Habitat Tract Descriptions

Habitat Tract 1	Comprised of ecosites 12, 13, 14, 20 and 22. A large portion of this tract was harvested, seeded and/or planted in the last 10 years, and is currently dominated by 10 year old conifer forest. This tract also consists of a large 1988 burn which is currently regenerating as 20 year old pure jack pine and spruce. This young habitat tract is capable of producing high quality caribou habitat in approximately 40-60 years.
Habitat Tract 2	Comprised of ecosites 12, 13, 20, 22, 31 and 35. A large portion of this tract is 60-80 years old and consists of pure jack pine and spruce stands. In March 2008, 14 caribou were observed in this tract confirming its current suitability for caribou. This tract contains confirmed caribou nursery and rearing areas. There is a portion of this tract that was harvested in 1997/98 and is currently 10 year old conifer.
Habitat Tract 3	Comprised primarily of ecosites 13, 14 and 35. This tract is a 1983 burn with regeneration dominated by jack pine. This tract is projected to have suitable caribou habitat by approximately 2062.
Habitat Tract 4	Comprised of ecosites 11, 13, and 14. A large portion of this tract was harvest in the last 10 years was seeded/planted and is currently approximately 10 year conifer dominated area. This tract also consists of a large 1988 burn which is currently 20 year old pure stands of jack pine and spruce. This young habitat tract is capable of producing high quality caribou habitat in approximately 40 years.
Habitat Tract 5	Comprised of ecosites 11, 12, and 13. A large portion of this tract is a result of a 1937 burn and is currently 73 year old jack pine. A small portion of this tract burnt in 1978. This tract should be capable of supporting caribou within the 10 years.
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Habitat Tract 6	Comprised of ecosites 12, 13, 14, 19, 20 and 22 this is a more heterogeneous tract composition than the more northern tracts. Harvesting has taken place throughout this tract resulting in a younger forest 0-40 years of age with comfier dominated stands mixed with jack pine and spruce. This tract is similar to Tract 7 with a larger portion of the tract having a spruce working group. Due to it's current age heterogeneity, this tract this tract has been scheduled to allow harvesting in the first ten years of the plan to permit further defragmentation of the area. This will provide for the production of a more uniform aged patch of large conifer forest which is predicted to be capable for supporting caribou in 2062.

Habitat Tract 7	Comprised of ecosites 12, 13, 14, 19, 20 and 22 this is a more heterogeneous tract composition than the more northern tracts. Harvesting has taken place throughout this tract resulting in a younger forest 0-40 years of age with comfier dominated stands mixed with jack pine and spruce. This tract is similar to Tract 6 with a larger portion of the tract having a jack pine working group. Poplar leading stands are in the more productive ecosites along the waterways throughout this tract. Due to it's current age heterogeneity, this tract this tract has been scheduled to allow harvesting in the first ten years of the plan to permit further defragmentation of the area. This will provide for the production of a more uniform aged patch of large conifer forest which is predicted to be capable for supporting caribou in 2072.
Habitat Tract 8	Comprised of ecosites 12, 13, 14, 20 and 22. Significant harvesting has taken place within this tract generating a 1-40 year conifer dominated forest with a predominance of the spruce working group. Due to it's current age heterogeneity, this tract this tract has been scheduled to allow harvesting in the first ten years of the plan to permit further defragmentation of the area. This will provide for the production of a more uniform aged patch of large conifer forest which is predicted to be capable for supporting caribou in 2062.
Habitat Tract 9	Comprised of ecosites 12, 13, 14, 20 and 21. Significant harvesting has taken place within this tract generating a 0-40 year conifer dominated forest with a predominance of the spruce and jack pine working groups. Due to it's current age heterogeneity, this tract this tract has been scheduled to allow harvesting in the first ten years of the plan to permit further defragmentation of the area. This will provide for the production of a more uniform aged patch of large conifer forest which is predicted to be capable for supporting caribou in 2062.
Habitat Tract 10	Comprised of ecosites 13, 14, 20, 21, 22 31, and 35. Significant harvesting has taken place within this tract generating a 20-40 year conifer dominated forest with a predominance of the jack pine and spruce working groups. Due to it's current age heterogeneity, this tract has been scheduled to allow harvesting in the first ten years of the plan to permit further defragmentation of the area. This will provide for the production of a more uniform aged patch of large conifer forest which is predicted to be capable for supporting caribou in 2062.
Habitat Tract 11	Comprised of ecosites 12, 13, 14. This tract is a result of a 1983 burn and is currently 27 year old jack pine. This young habitat

tract has is capable of producing high quality caribou habitat in 2062.

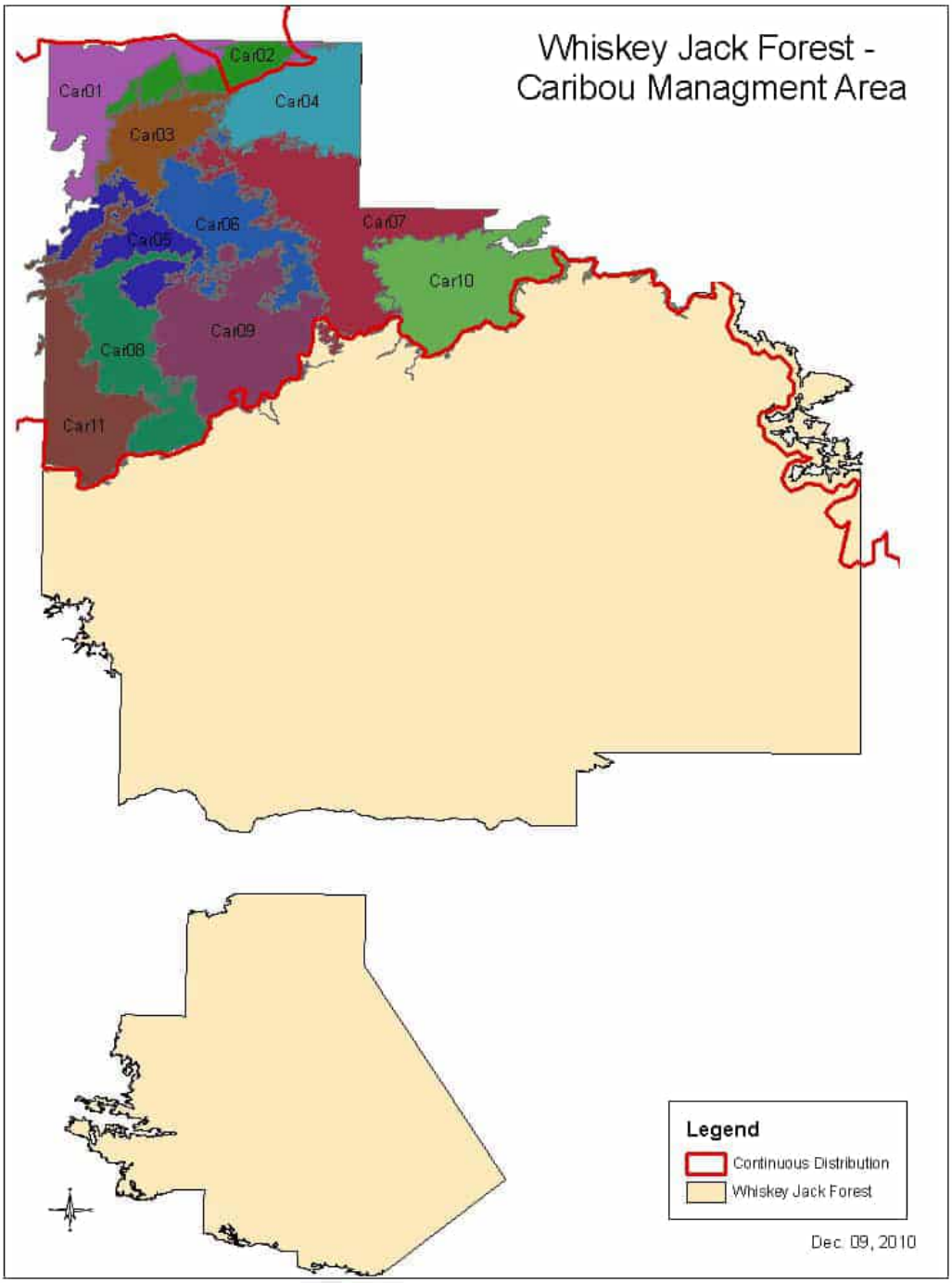

Figure 4. Caribou Habitat Tracts

Caribou Dynamic Habitat Schedule

The Caribou Dynamic Habitat Schedule is intended to provide strategic direction to the areas and timing of harvest in order to fulfill long-term caribou habitat needs. The delineation of tracts of forest land across the landscape is based on the potential winter habitat, estimated knowledge of habitat requirements, soils, age class and tree species. The habitat schedule represents large areas of conifer dominated landscape that provide refuge habitat from predation, tracts of terrestrial lichen, and winter habitat for the caribou. The habitat tracts stratify the forest into areas available for harvest in 10 years periods, and areas that are set aside for one or more 10 year periods.

The habitat tracts were used to plan a series of disturbances (harvest areas) on the landscape in order to:

i) maintain a current habitat supply,
ii) ensure a continuous supply of large areas containing winter (40-120 years old) or summer habitat, and
iii) account for existing distribution of caribou and alternate future habitat.

The proposed Caribou Dynamic Habitat Schedule is illustrated in the Figure 4, which displays the caribou habitat supply through time in 10 year terms. Terms where no changes in supply occurred were omitted from Figure 4. In general, there is no harvest scheduled in the entire caribou management area for 50 years. The exception to this is Tracts 6, 7, 8, 9 and 10 which are open to clean-up harvest for Term 1 and then closed to all harvesting for 60 years. Allowing harvest in these four tracts is based on the high degree of fragmentation that currently exists in this area. Cleaning up these areas will result in further defragmentation of the tracts and provide a more even aged forest in the future. In addition, this clean up activity contributes to fulfilling volume objectives in areas where there are currently no caribou.

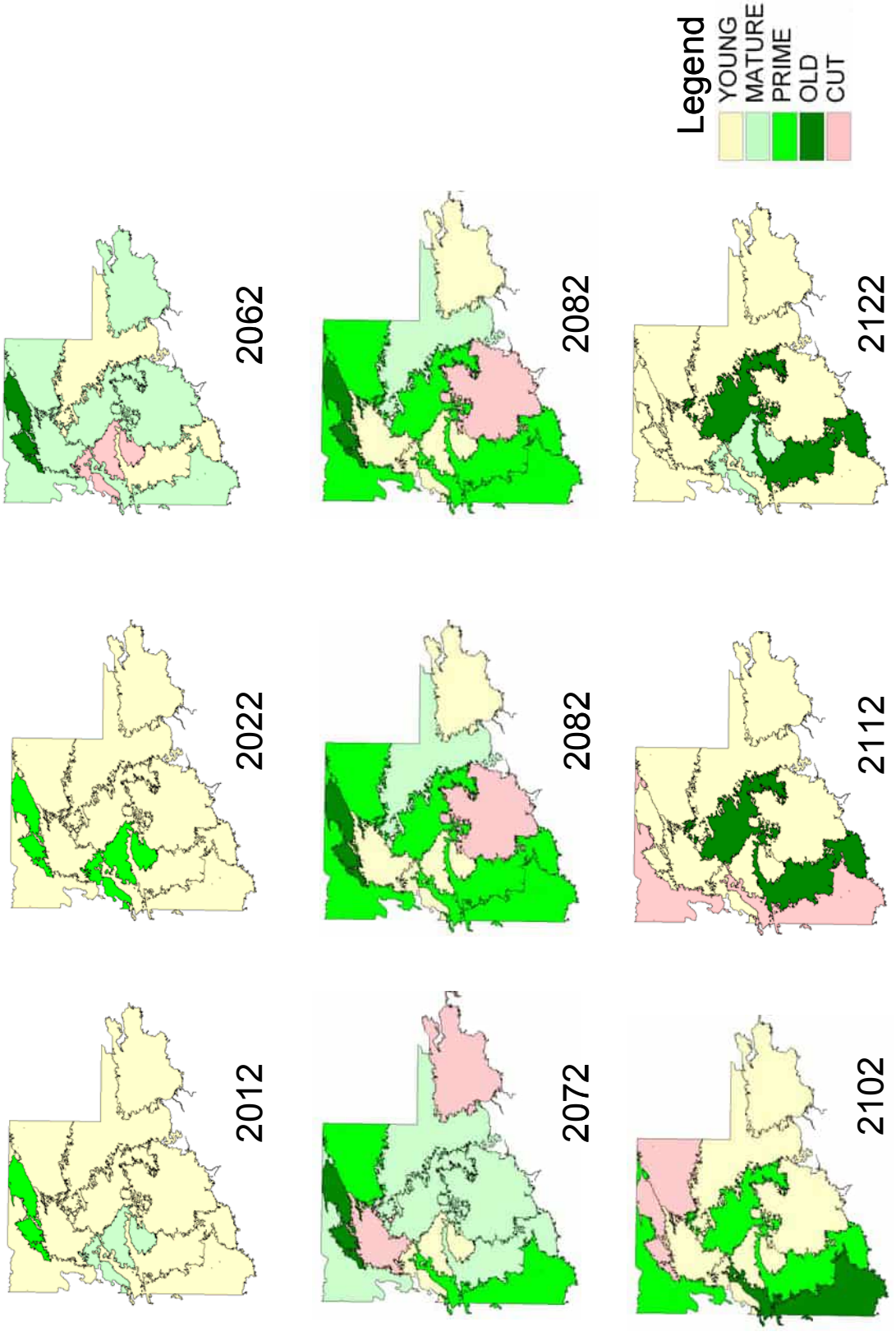

Figure 4. Caribou Dynamic Habitat Schedule 2012-2122

Assessment of Objective Achievement

The objective for caribou habitat is to maintain the landscape in a suitable supply of an interconnected arrangement of on-line habitat tracts/mosaic blocks through time. The desired level is to maintain at least 40-50% of the landscape in tracts/mosaic blocks that are at least 60 years of age (all forest units). The target is based on the best case scenario resulting from the dynamic habitat schedule that has been developed for the Whiskey Jack FMP (Table 1). Table 1 indicated that for the initial thirty years of the plan the amount of interconnected caribou habitat is significantly lower that the desired level. This is a result of the current age classes that exists on the forest, however it still represents the best possible scenario available to meet the long-term caribou habitat objectives. There is no planned harvesting (with the exception of some initial clean-up of mature wood in the southern section of the caribou zone) for the next 60 years. At this time much of the forest starts to become suitable for caribou.

Table 1. Results of Assessment of Objective Achievement

Year	Desired Level (ha)	Target (ha)	Desired Level (%)	Target (ha)
2012	102,317	23,065	40	9
2022	102,317	23,065	40	9
2042	102,317	23,065	40	9
2062	102,317	174,625	40	70
2082	102,317	158,897	40	62
2102	102,317	92,935	40	36
2122	102,317	58,183	40	22

WHISKEYJACK FOREST MANAGEMENT UNIT
MARTEN HABITAT ANALYSIS

INTRODUCTION

The marten (*Martes amer*icana) is a small furbearing animal in the weasel family that is commonly found in Ontario's boreal forest. Marten prefer habitat comprised of large contiguous areas of mature coniferous forest especially those with complex physical structures near the ground. Although the marten is a predatory animal whose diet consists mainly of rodents and small animals such as rabbit, it is also known to feed extensively on vegetation such as berries, nuts and seeds.

Natural resource sustainability is an integral component of forest management planning. The marten was elevated to the status of a "provincially featured species" in the mid 1990's. In 1994 the Crown Forest Sustainability Act (CFSA) and the Class Environmental Assessment (EA) Board for Timber Management set forth requirements for the sustainable resource management. In an April 1994 decision the EA Board set forth terms and conditions for which the development and implementation of the marten guidelines were mandated. In 1995 the Forest Operations and Silviculture Manual (OMNR 1995) listed the marten guidelines to be considered in the preparation and implementation of forest management plans in the boreal regions of Ontario. In 1996 the Forest Management Guidelines for the Provision of Marten Habitat were developed to ensure that there are large, relatively unfragmented core habitat areas maintained on the landscape that consist mostly of mature conifer dominated stands. Secondly, the provision for marten habitat supplies habitat for other species that are associated with the mature and over mature forest, cavity trees and downed and woody debris (Watt et al. 1996, Elkie, Hooper, Carr and Rempel, 1996)

In accordance with the CFSA and the EA terms and conditions, the Whiskey Jack Forest Management Unit (WJFMU) planning team have applied the marten guidelines in the Whiskey Jack Forest Management Plan. This report documents the development and analysis of the WJFMU marten core habitat areas. Twenty-five cores will be identified for the three twenty year planning periods beginning April 1, 2012, and ending March 31, 2072. Associated rationale for the location, size and deferral periods will also be provided in the analysis of the cores.

RECOMMENDED MARTEN GUIDELINES

The EA Board decision to elevate the marten to a featured species for the boreal forest was made to maintain large contiguous areas of mature to over mature coniferous forest. The habitat of the marten is representative of such forest types and it is one of the most demanding species to occupy mature and over mature coniferous forest.

The Forest Management Guidelines for the Provision of Marten Habitat (1996) breaks down the criteria for marten habitat at the landscape and stand levels as follows:

Landscape Level

1. Maintain 10-20 percent of the forest[1], which has the capability to produce marten in suitable conditions.
2. Suitable conditions are achieved where stands have the following characteristics:
   - The composition of the overstory is greater than 40% in spruce, fir or cedar. Mixed composition is preferred over pure stands
   - Canopy closure of conifer is preferred over pure stands.
   - Found within preferred Northwest Forest Ecosite Classes (NWFEC) site and vegetation types (those rated as ""good" or "fair").
     GOOD-6, 7, 14, 15, 16, 19, 20, 21, 24, 25, 31
     FAIR-1, 4, 8, 9, 10, 11, 22, 32, 33, 34
     POOR-2, 3, 5, 12, 13, 17, 18, 23, 26, 27, 28, 29, 30, 35, 36, 37, 38
   - Are at least 15m in height (approximately 80 years old). Uneven canopies are preferred.[2]
3. Suitable marten habitat should be arranged in "core habitat areas" between 30 and 50 km^2 (3000 to 5000 ha) in size. A minimum of 75% of core habitat should be comprised of suitable stands.[3]
4. Partial harvesting can occur in as much as 30% of the core habitat provided it retains 50% of the original conifer basal area and crown closure of at least 50%.
5. Riparian reserves and other unharvested forest should connect core area. While connection need not be contiguous, gaps of open habitat more that 1-2 km across should be avoided.

Stand Level

Maintenance of suitable marten habitat at the stand level, which was previously found in the marten guide, has been replaced by direction now provided by the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (2009); (the 'Stand & Site Guide). Direction in the Stand & Site Guide that pertains to marten habitat is specific to the silvicultural system or stage of management used during harvest operations. Additional direction on managing downed woody material is also provided by the Stand & Site Guide.

[1] OMNR Regional direction has clarified that the 10-20% target is measured as suitable marten habitat in functioning (50% suitable and/or minimum 1000 ha suitable) marten core areas.

In brief, the following general direction will apply to most areas where forest operations occur on the Whiskey Jack Forest (i.e., where clearcut silviculture is practised):

1. an average of ≥ 25 stems/ha (referred to as wildlife trees) will be retained during harvest operations; of which an average of ≥ 10 will be large stems or large stubs/ha with at least five large living trees on each ha;
2. wildlife trees that fall to the ground become downed woody material and will be left on site; and
3. downed woody material present prior to harvest will be left on site.

More detailed direction on wildlife tree retention and management of downed woody material with respect to silvicultural systems/stage of management, types of trees (e.g., species) to be retained, number of trees, dispersion of trees, and operational considerations during renewal and tending are provided in the Stand & Site Guide.

METHODS

Ontario Marten Analyst and Forest Resource Inventory

The development of the marten habitat cores areas began by identifying existing capable and suitable habitat. ArcView was the tool used to identify, analyze and portray the marten habitat and the cores. The Ontario Marten Analyst (OMA), an ArcView application, was used to help in the identification of marten habitat.

OMA requires the following stand information in order to classify marten habitat over the next sixty years:

- Height
- Species composition
- Site Class
- Year of Origin (age)
- Stocking

The forest polygon coverage of the WJFMU forest resource inventory (FRI), consisting of forecasted depletions up to April 1, 2012, was used for the analysis of marten habitat. This FRI planning inventory is the same as that used in the Strategic Forest Management Model (SFMM).

Habitat Classification

The required FRI fields were selected for year of origin, height, site class, stocking and species composition. From this information new fields for the selected attributes were created and populated. Among the new fields created are the fields for all tree species (working groups) that would be contained in the species composition. These species fields were populated with values associated with the percentage of each species composition string.

The queries for habitat classification are presented in Appendix A, and resulted in the addition of fourteen new fields that contain the base information on habitat capability, suitability, and the cores.

IDENTIFICATION AND SELECTION OF CORES

Benchmark Scenario

When all fields describing capability and suitability of stands through time are fully populated and saved to the Marten FRI coverage, an analysis of the spatial distribution of the suitable stands can be completed. A ‘benchmark scenario’ was developed to determine the maximum level of suitable marten habitat that the Whiskey Jack forest was capable of supplying over the next sixty years. Core areas were chosen from concentrations of suitable habitat by viewing suitability of stands on 20 year time horizons and sixty year suitability maps. Areas of habitat concentrations for each period were identified on a habitat suitability map. Using the core builder tool in OMA, suitable stands were selected and assigned to a core. A new core was created from each large concentration area. Unsuitable stands were also selected and assigned to cores to maintain connectivity between suitable stands within a core.

Preliminary core areas were reviewed to determine if the minimum recommended core area guidelines were met. Statistics were generated to identify the suitability and size for each core over time. Cores which were not 50% suitable or a minimum of 1000 ha suitable during a particular time period were considered 'non-functioning', and did not contribute to the landscape statistics for that respective term. OMA's statistical tools provide data for 20 years terms. .

RESULTS

Landscape

A total of 753,707.4 ha of the Whiskey Jack Forest was classified. Of this 676,468.7 ha of the unit area is capable of producing marten habitat. Based on this total capable area, the 10% minimum objective for marten habitat is 67,646.9 ha and the 20% goal is 135,293.7 ha (TABLE 1).

TABLE 1: Marten Habitat Classification: Landbase Summary

Total Area Classified (Capable & Non-capable) (ha)	753,707.4
Total Amount of Capable Forest (ha)	676,468.7
Total Amount of Non-Capable Forest (ha)	77,238.7
Proportion of Landbase that is Capable (%)	89.8
Minimum 10% Objective (ha)	67,646.9
20% Objective (ha)	135,293.7

A total of 25 marten cores were identified in the benchmark scenario Figure 1. The current forest condition (2012) provided for 38,592.20 ha of suitable habitat in marten cores, representing 5.70% of the total capable area. It is expected that the deferral of these 25 cores for the next 60 years, providing there is no natural disturbance, will provide for an increase of suitable marten habitat to 62,811.10 ha (9.29 % capable) by 2069 (Figure 1, Table 2). While this scenario does not meet the 10-20% marten habitat objectives, it does represent the best case scenario for the WJFMU.

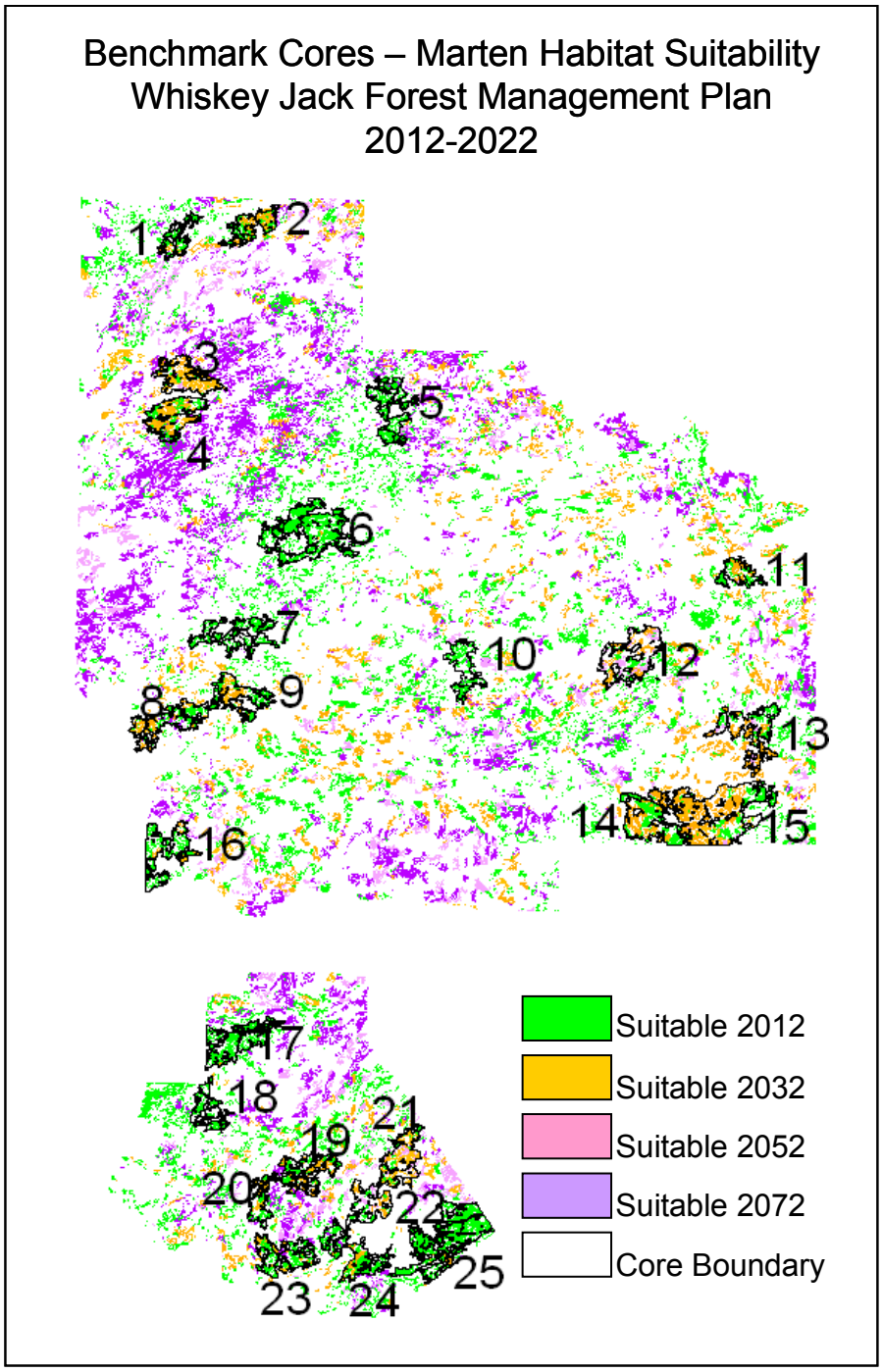

FIGURE 1; Whiskey Jack Forest Management Unit, Suitable Marten Habitat in Cores, Benchmark Scenario

DISCUSSION

Benchmark Scenario

The Benchmark Scenario was completed in order to amalgamate concentrations of suitable marten habitat into core areas. Ideally the task team would provide spatial and temporal management recommendations of these areas in consideration of the 10-20% marten habitat objective. In some cases this may have resulted in the selection of the highest quality cores for deferral, or cores being released from deferral once adjacent cores started to provide adequate suitable habitat. However, with a benchmark scenario which does not meet the 10-20% marten habitat objective, and our inability to predict where any natural disturbance may occur in the next sixty years such opportunities did not present themselves and resulted in the need to maintain all 25 cores throughout the sixty years in the benchmark scenario.

TABLE 2: Bench Mark Scenario: Suitable Habitat Summary

TERM	Total Amount of Suitable Area (ha)	% Capable
2012	33,172	4.9
2032	58,428	8.6
2052	60,871	9.0
2072	31,676	9.1

Having relatively small amounts of suitable habitat available on a landscape which is highly fragmented by water, provided limited opportunities with respect to the spatial and temporal management of the cores. It also resulted in the creation of a number of cores which may not meet the recommended criteria, but remain a relative valuable component of marten habitat on the WJFMU. The individual core statistics for each term are presented in Appendix B. While the benchmark scenario does not allow the WJFMU to meet the minimum 10% marten objective, it provides for the maximum amount of marten habitat possible on the WJFMU for the next sixty years.

APPENDIX A

'Capability
$1|(([Ab]>20) or ([Ms]>20) or ([Mh]>20) or ([La]>=30))

;1|([Pw]>=50) and (([SITE]="3")or([SITE]="4"))

;1|([Pr]>=50) and (([SITE]="3")or([SITE]="4"))

;1|([Pj]>=70) and (([SITE]="3")or([SITE]="4")) and ([STKG]<0.6) and (2012-[YR_ORG]>19)

;1|([Pj]=100) and (2012-[YR_ORG]>19)

;1|([Sb]>=80) and (([SITE]="3")or([SITE]="4")) and ([STKG]<=0.6)

;1|([Bw]+[Po]>=70) and (([SITE]="1")or([SITE]="X"))

;2|([Capable]=0)

;0|([Pw]+[Sb]+[Sw]+[Pj]+[Pr]+[Po]+[La]+[Ab]+[Bf]+[Bw]+[Ce]+[Mh]+[Ms]=0)

'Suitability

$10|([HT]>=14.99) and ([STKG]>0.5)

;11|(2012-[YR_ORG]>79) and ([STKG]>0.5)

;0| ([Suitable]=10) and (([Po]>70)or([Bw]>70)) and (2012-[YR_ORG]<80)

;2|([Sw]+[Sb]+[Bf]+[Ce]+[Pj]+[Pr]+[Pw]>40) and (not ([Pj]>40)) and (not ([Sb]>70))
and (not ([Bf]>80)) and (not ([Pr]>50)) and (not ([Pw]>70)) and (not ([La]>0)) and (not([Ab]>20))
and ([Suitable]>=10)

;2|([Sb]+[Pj]>60) and (not ([Sb]>80)) and (not ([Pj]>80)) and (([Sb]>[Pj])or([Sb]=[Pj]))
and (not ([La]>0)) and ([Suitable]>=10)

;1|([Sw]+[Sb]+[Bf]+[Ce]+[Pj]+[Pr]+[Pw]>40) and (not ([Pj]>70)) and (not ([Sb]>70))
and (not ([Bf]>80)) and (not ([La]>20)) and (not ([Pr]>50)) and (not([Pw]>70)) and
(not([Ab]>20)) and ([Suitable]>=10)

;1|([Sb]+[Pj]>60) and (not ([Sb]>80)) and (not ([Pj]>80)) and ([Pj]>[Sb])
and ([Suitable]>=10)

;1|([Sb]>80) and (([SITE]="3")or([SITE]="2")or([SITE]="1")or ([SITE]="X")) and ([Suitable]>=10)

;0|([Pw]+[Sb]+[Sw]+[Pj]+[Pr]+[Po]+[La]+[Ab]+[Bf]+[Bw]+[Ce]+[Mh]+[Ms]=0)

'Marten 20_Year Suitability

$100|([HT]>=12.5) and ([STKG]>0.5)

;100|(2012-[Yr_Org]>60) and ([STKG]>0.5)

;0| ([Suit20]=100) and ([Po]>70) and (2012-[Yr_Org]<60)

;0| ([Suit20]=100) and ([Bw]>70) and (2012-[Yr_Org]<60)

;2|([Sw]+[Sb]+[Bf]+[Ce]+[Pj]+[Pr]+[Pw]>40) and (not ([Pj]>40)) and (not ([Sb]>70))
and (not ([Bf]>80)) and (not ([Pr]>50)) and (not ([Pw]>70)) and (not ([La]>0)) and ([Suit20]=100)

;2|([Sb]+[Pj]>60) and (not ([Sb]>80)) and (not ([Pj]>80)) and ([Sb]>[Pj])
and (not ([La]>0)) and ([Suit20]=100)

;1|([Sw]+[Sb]+[Bf]+[Ce]+[Pj]+[Pr]+[Pw]>40) and (not ([Pj]>70)) and (not ([Sb]>70))
and (not ([Bf]>80)) and (not ([La]>20)) and (not ([Pr]>50)) and (not([Pw]>70)) and
([Suit20]>=100)

;1|([Sb]+[Pj]>60) and (not ([Sb]>80)) and (not ([Pj]>80)) and ([Pj]>[Sb])
and ([Suit20]=100)

;1|([Sb]>80) and ([SITE]="3") and ([Suit20]=100)

;1|([Sb]>80) and ([SITE]="2") and ([Suit20]=100)

;1|([Sb]>80) and ([SITE]="1") and ([Suit20]=100)

;1|([Sb]>80) and ([SITE]="X") and ([Suit20]=100)

;0|([Pw]+[Sb]+[Sw]+[Pj]+[Pr]+[Po]+[La]+[Ab]+[Bf]+[Bw]+[Ce]+[Mh]+[Ms]=0)

'Marten 40_Year Suitability

$100|([HT]>=9.0) and ([STKG]>0.5)

;100|(2012-[Yr_Org]>40) and ([STKG]>0.5)

;0| ([Suit40]=100) and ([Po]>70) and (2012-[Yr_Org]<40)

;0| ([Suit40]=100) and ([Bw]>70) and (2012-[Yr_Org]<40)

;2|([Sw]+[Sb]+[Bf]+[Ce]+[Pj]+[Pr]+[Pw]>40) and (not ([Pj]>40)) and (not ([Sb]>70))
and (not ([Bf]>80)) and (not ([Pr]>50)) and (not ([Pw]>70)) and (not ([La]>0)) and ([Suit40]=100)

;2|([Sb]+[Pj]>60) and (not ([Sb]>80)) and (not ([Pj]>80)) and ([Sb]>[Pj])
and (not ([La]>0)) and ([Suit40]=100)

;1|([Sw]+[Sb]+[Bf]+[Ce]+[Pj]+[Pr]+[Pw]>40) and (not ([Pj]>70)) and (not ([Sb]>70))
and (not ([Bf]>80)) and (not ([La]>20)) and (not ([Pr]>50)) and (not([Pw]>70)) and
([Suit40]>=100)

;1|([Sb]+[Pj]>60) and (not ([Sb]>80)) and (not ([Pj]>80)) and ([Pj]>[Sb])
and ([Suit40]=100)

;1|([Sb]>80) and ([SITE]="3") and ([Suit40]=100)

;1|([Sb]>80) and ([SITE]="2") and ([Suit40]=100)

;1|([Sb]>80) and ([SITE]="1") and ([Suit40]=100)

;1|([Sb]>80) and ([SITE]="X") and ([Suit40]=100)

;0|([Pw]+[Sb]+[Sw]+[Pj]+[Pr]+[Po]+[La]+[Ab]+[Bf]+[Bw]+[Ce]+[Mh]+[Ms]=0)

'Marten 60_Year Suitability

$100|([HT]>=3.5) and ([STKG]>0.5)

;100|(2012-[Yr_Org]>20) and ([STKG]>0.5)

;0| ([Suit60]=100) and ([Po]>70) and (2012-[Yr_Org]<20)

;0| ([Suit60]=100) and ([Bw]>70) and (2012-[Yr_Org]<20)

;2|([Sw]+[Sb]+[Bf]+[Ce]+[Pj]+[Pr]+[Pw]>40) and (not ([Pj]>40)) and (not ([Sb]>70))
and (not ([Bf]>80)) and (not ([Pr]>50)) and (not ([Pw]>70)) and (not ([La]>0)) and ([Suit60]=100)

;2|([Sb]+[Pj]>60) and (not ([Sb]>80)) and (not ([Pj]>80)) and ([Sb]>[Pj])
and (not ([La]>0)) and ([Suit60]=100)

;1|([Sw]+[Sb]+[Bf]+[Ce]+[Pj]+[Pr]+[Pw]>40) and (not ([Pj]>70)) and (not ([Sb]>70))
and (not ([Bf]>80)) and (not ([La]>20)) and (not ([Pr]>50)) and (not([Pw]>70)) and
([Suit60]>=100)

;1|([Sb]+[Pj]>60) and (not ([Sb]>80)) and (not ([Pj]>80)) and ([Pj]>[Sb])
and ([Suit60]=100)

;1|([Sb]>80) and ([SITE]="3") and ([Suit60]=100)

;1|([Sb]>80) and ([SITE]="2") and ([Suit60]=100)

;1|([Sb]>80) and ([SITE]="1") and ([Suit60]=100)

;1|([Sb]>80) and ([SITE]="X") and ([Suit60]=100)

;0|([Pw]+[Sb]+[Sw]+[Pj]+[Pr]+[Po]+[La]+[Ab]+[Bf]+[Bw]+[Ce]+[Mh]+[Ms]=0)

'Marten 5_Year Suitability

$100|([HT]>=14) and ([STKG]>0.5)

;100|(2012-[YR_ORG]>75) and ([STKG]>0.5)

;0| ([Suit5]=10) and (([Po]>70)or([Bw]>70)) and (2012-[YR_ORG]<75)

;2|([Sw]+[Sb]+[Bf]+[Ce]+[Pj]+[Pr]+[Pw]>40) and (not ([Pj]>40)) and (not ([Sb]>70))
and (not ([Bf]>80)) and (not ([Pr]>50)) and (not ([Pw]>70)) and (not ([La]>0)) and (not([Ab]>20))
and ([Suit5]=100)

;2|([Sb]+[Pj]>60) and (not ([Sb]>80)) and (not ([Pj]>80)) and (([Sb]>[Pj])or([Sb]=[Pj]))
and (not ([La]>0)) and ([Suit5]=100)

;1|([Sw]+[Sb]+[Bf]+[Ce]+[Pj]+[Pr]+[Pw]>40) and (not ([Pj]>70)) and (not ([Sb]>70))

and (not ([Bf]>80)) and (not ([La]>20)) and (not ([Pr]>50)) and (not([Pw]>70)) and (not([Ab]>20)) and ([Suit5]>=100)

;1|([Sb]+[Pj]>60) and (not ([Sb]>80)) and (not ([Pj]>80)) and ([Pj]>[Sb])
and ([Suit5]=100)

;1|([Sb]>80) and (([SITE]="3")or([SITE]="2")or([SITE]="1")or ([SITE]="X")) and ([Suit5]>=100)

;0|([Pw]+[Sb]+[Sw]+[Pj]+[Pr]+[Po]+[La]+[Ab]+[Bf]+[Bw]+[Ce]+[Mh]+[Ms]=0)

'Full Multi

$11|([Suitable]=1)
;12|([Suitable]=2)
;21|([Suit20]=1) and (not([Suitable]>0))
;22|([Suit20]=2) and (not([Suitable]>0))
;41|([Suit40]=1) and (not([Suit20]>0)) and (not([Suitable]>0))
;42|([Suit40]=2) and (not([Suit20]>0)) and (not([Suitable]>0))
;61|([Suit60]=1) and (not([Suit20]>0)) and (not([Suit40]>0)) and (not([Suitable]>0))
;62|([Suit60]=2) and (not([Suit20]>0)) and (not([Suit40]>0)) and (not([Suitable]>0))

Appendix B
Individual Marten Core Statistics

Core	2012		2032		2052		2072		Total Core
	Suitable (ha)	% suitable	Suitable (ha)	% suitable	Suitable (ha)	% suitable	Suitable (ha)	% suitable	(ha)
1	865.0	64.4%	1,150.0	85.7%	1,150.0	85.7%	1,190.0	88.6%	1,342.4
2	753.1	35.4%	1,857.3	87.3%	1,868.2	87.8%	1,877.4	88.3%	2,127.1
3	325.9	10.8%	2,185.1	72.5%	2,271.2	75.4%	2,311.3	76.7%	3,012.1
4	1,111.2	34.0%	2,548.4	77.9%	2,548.4	77.9%	2,677.8	81.9%	3,271.1
5	2,277.3	72.7%	2,277.3	72.7%	2,296.6	73.4%	2,348.4	75.0%	3,130.4
6	4,691.2	75.6%	4,740.3	76.3%	4,741.6	76.4%	4,741.6	76.4%	6,208.7
7	2,129.2	66.3%	2,129.2	66.3%	2,129.2	66.3%	2,143.9	66.8%	3,210.5
8	1,114.9	33.6%	2,213.0	66.7%	2,223.3	67.0%	2,382.1	71.8%	3,318.7
9	1,127.7	41.1%	2,063.9	75.2%	2,063.9	75.2%	2,072.5	75.5%	2,744.7
10	1,435.1	62.9%	1,435.1	62.9%	1,454.8	63.8%	1,476.2	64.7%	2,281.1
11	744.5	46.2%	1,250.5	77.6%	1,272.0	79.0%	1,272.0	79.0%	1,610.7
12	548.9	12.0%	1,520.8	33.2%	2,463.6	53.8%	2,463.6	53.8%	4,577.7
13	1,009.7	26.8%	2,293.4	60.8%	2,727.7	72.3%	2,731.6	72.4%	3,771.1
14	1,807.9	39.1%	3,499.4	75.7%	3,513.4	76.0%	3,513.4	76.0%	4,619.9
15	1,515.3	17.3%	5,761.9	65.7%	5,909.4	67.4%	5,909.4	67.4%	8,768.8
16	1,860.6	54.3%	2,191.5	64.0%	2,191.5	64.0%	2,191.5	64.0%	3,425.7
17	2,614.8	70.8%	2,642.5	71.6%	2,642.5	71.6%	2,646.8	71.7%	3,690.7
18	1,173.7	62.9%	1,173.7	62.9%	1,173.7	62.9%	1,173.7	62.9%	1,865.7
19	1,036.8	36.9%	2,027.9	72.3%	2,027.9	72.3%	2,049.5	73.0%	2,806.7
20	613.1	43.3%	1,002.8	70.9%	1,002.8	70.9%	1,054.6	74.5%	1,414.8
21	577.1	18.0%	2,009.6	62.6%	2,379.1	74.2%	2,389.3	74.5%	3,207.8
22	505.9	21.3%	936.3	39.4%	1,185.0	49.9%	1,185.0	49.9%	2,373.7
23	1,601.3	49.7%	2,133.7	66.2%	2,133.7	66.2%	2,242.0	69.5%	3,225.1
24	1,748.1	54.6%	2,291.8	71.6%	2,376.3	74.2%	2,507.3	78.3%	3,202.2
25	4,917.5	75.3%	5,092.6	78.0%	5,125.8	78.5%	5,125.8	78.5%	6,527.6
	33,172.3	**4.9%**	**58,428.0**	**8.6%**	**60,871.6**	**9.0%**	**61,676.7**	**9.1%**	**85,735.0**

Supplementary Documentation N

Spatial Analyses for the 2012-2022 Whiskey Jack Forest Management Plan

PART C – Spatial Analysis: Landscape Pattern

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PART C – Spatial Analysis: Landscape Pattern

A. Developing Simulated Range of Natural Variation 2012 Whiskey Jack Forest FMP

1.0 Introduction

The Simulated Range of Natural Variation (SRNV) provides the basis for establishing landscape pattern targets for the FMP. The Forest Management Planning Manual (FMPM), and Science Packages of the Landscape Guide both require the FMP to examine landscape pattern. The SRNV developed in this plan will provide targets based on natural fire history, disturbance succession and weather patterns to assess how proposed areas selected for operations will influence the landscape pattern on the Whiskey Jack Forest and to determine whether the proposed plan will create a pattern consistent with Simulated Range of Natural Variation.

2.0 Methodology

Please refer to the Science Packages for methodology and calibration used in developing the SRNV. The Boreal Forest Landscape Dynamics Simulator (BFOLDS), a grid-based, spatially explicit model that contains a simulation module for Crown-fire regimes (FSM) and a vegetation transition module (VTM) was used to estimate ranges of variation in the Boreal Forest Region. BFOLDS simulates the fire regime and fire induced forest cover dynamics at broad spatial and temporal scales (>10 million hectares and >300 year), but uses a relatively fine spatial scale for some processes (1- hectare spatial resolution). BFOLDS is a modelling tool developed specifically for modeling stand initiating fire, succession and post fire transitions in the Boreal Forest Region of Ontario.

The first consideration in the development of a SRNV is the "study area" or the geographic extent to which historic data will be used to represent the management unit. The basis for this selection is the ecological planning units (eco- districts) associated with Ontario's Ecological Land Classification (Crins et al). The analysis for the Whiskey Jack Forest was based on the ecological regions in which it is situated. This includes eco-regions 3S and 4S.

The selection of a "study area" based on certain ELC eco-districts ensures that the areas chosen to be representative of the management unit have similar climatic and edaphic conditions and thus provide a reasonable basis in which to examine pre-industrial condition data for the Whiskey Jack Forest.

Once the selection of the geographic extent was completed, the descriptions of information sources including the SRNV, historical survey records (Pre-Industrial Condition), and, current ecological databases (e.g. FRI, remote sensing, growth and yield plots) was prepared by the Ministry of Natural Resources Regional Planning Unit and provided to the Whiskey Jack Forest Planning Team.

2.1 Method of Comparing Simulated Range of Natural Variation to Harvesting

Boreal Forest Landscape Simulation model data used in the development of the Simulated Range of Natural Variation (SRNV comes from Ontario Landscape Tool (OLT)).

The assessment of disturbance perimeter is completed using the computer analysis OLT. This tool generates the measurable values as described above. Three scenarios are run through the tool:

Scenario 1: Plan Start 2012 Plan Start
Scenario 2: Plan End 2022 Plan End without harvesting.
Scenario 3: Plan End 2022 Plan End with planned harvest areas for 2012 to 2022.

Scenario 1 and 2 use the approved base model inventory to determine existing (Scenario 1) and future disturbance patterns. The base model inventory is simply aged by 10 years to identify changes in pattern assuming no new disturbances to 2022 (Scenario 2). Scenario 3 uses the 10-year planned harvest areas for operations from the planning coverages to update the inventory. Forest description attributes are updated to reflect depleted age, height, year of origin, stocking and year of depletion. Stand composition was not updated for forecasted silviculture treatments or for expected future forest condition. Forest composition is assumed to stay the same and there are no changes for forest succession included.

2.2 Ontario Landscape Tool Analysis

One of the key directions in the 2009 Forest Management Plan Manual (FMPM) is to develop an FMP with the best available science and information, new legislation, regulation and policy, and changes to forest conditions and land base (FMPM A-29). The expectation was to utilize the Forest Management Guides for Boreal Landscapes (hereafter called the Landscape Guide) in development of the 2012 Whiskey Jack FMP. Since the landscape guide was not approved for implementation during the development of this FMP, regional advice has been to utilize the draft Landscape Guide science package as a reference for the estimated natural forest condition. The science packages used in the development and prepared for the support of the landscape guide were prepared by science teams.

The **goal** of the landscape guide is to provide direction to forest managers on how to meet the objective of conserving biodiversity in an effective and efficient manner through landscape-level approaches, thereby contributing to the achievement of forest sustainability in an effective and efficient manner. The direction identifies and helps to set landscape mosaic goals and targets for forest composition (forest tree species groups and age classes) and structure (pattern) in forest management plans.

Landscape guide indicators measured the Whiskey Jack Forest Management Plan is the landscape pattern indicators. The indicators measured by running the Ontario Landscape Tool (OLT) are:

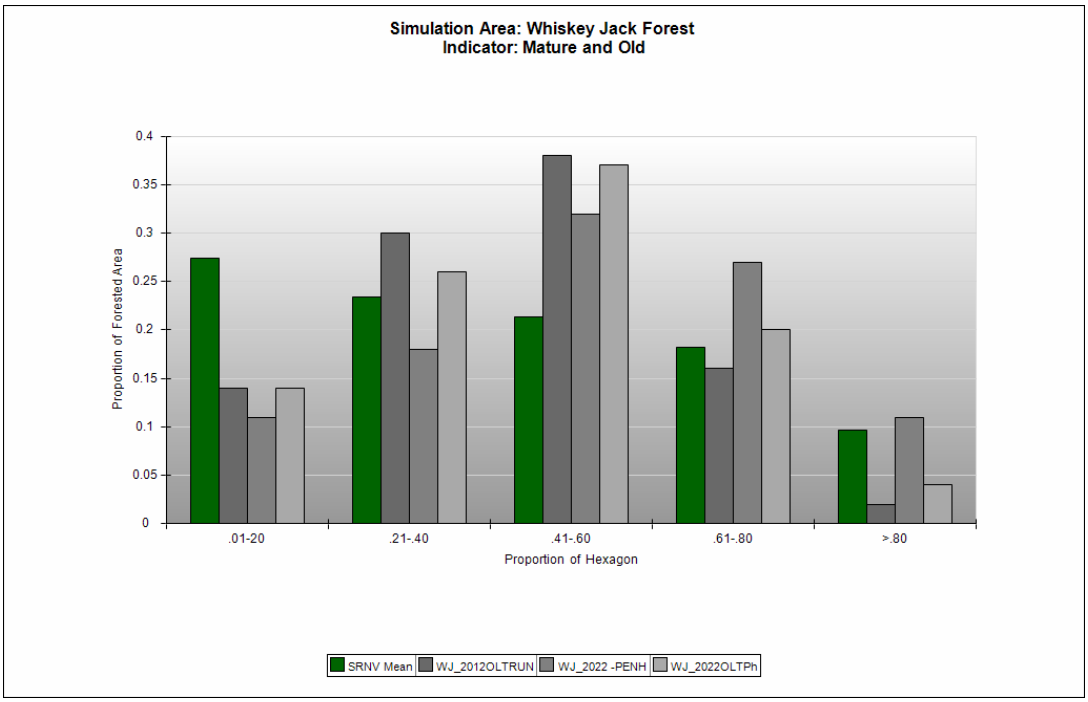
- Indicator 1a - Mature and old forest
- Indicator 1b - Young Forest Patch Size

- Indicator 1c - Mature and Old conifer forest
- Indicators 3b and 3c - Landscape level caribou refuge and winter habitat pattern.

Please refer to the science packages embedded in OLT for a full detail of methodology and result interpretation. The results are provided in Table FMP-9.

Indicator 1a - Mature and Old Forest

Mature and old forest indicator is used to provide habitat for certain song birds and wildlife habitat that requires this seral stage. The SRNV for this indicator is compared to the Plan Start, Plan End no harvest and Plan End with harvest and is depicted below:



Two scales were used to measure this indicator. 500 and 5,000 hectare hexagons are draped on the planning inventory. The measurement is done for 60-80% and 80%+ concentrations added together. For the 500 hectare hexagon analysis, the plan start is at 24% moving to 27% at plan end. The SRNV for the 500 ha scale analysis of this indicator is 35%, therefore the change from plan start to end shows movement towards the SRNV. For the 5,000 hectare hexagon analysis, the plan start is at 18% moving to 24% by plan end. The SRNV for the 5,000 ha analysis of this indicator is 28 %, therefore the change during this plan period shows movement towards the SRNV.

Indicator 1b - Young Forest Patch Size

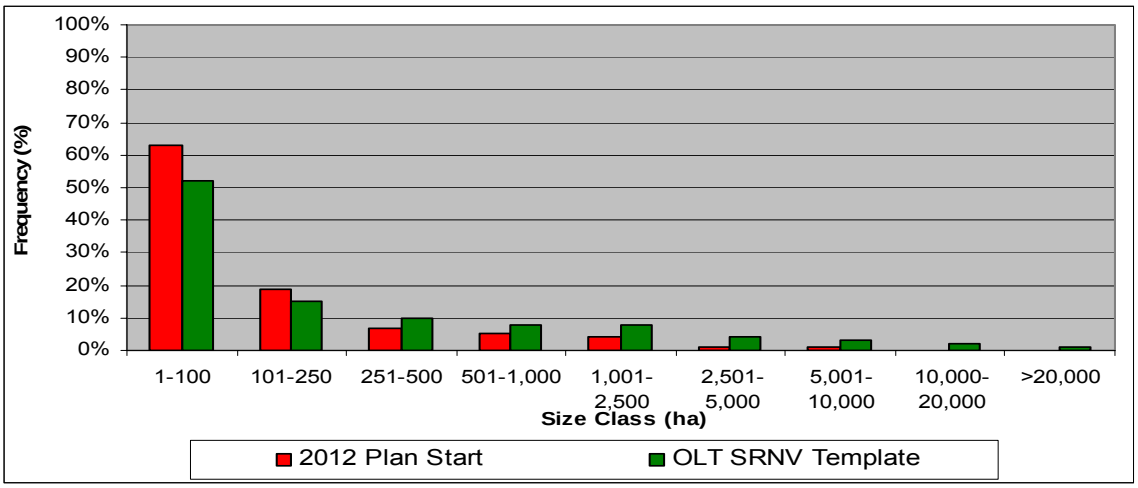
Patches deal with the *extent* of the homogeneous forest types that make up the landscape mosaic. Patch size can influence the availability of habitat conditions. From the Simulated Range of Natural Variation (SRNV) work done for the Whiskey Jack Forest, young forest patch is classified the forest into stands less than 36 years old. A 7 hectare hexagon fabric is draped onto the classified surface and estimates the amount of young forest within each hexagon. The proportion of young forest is estimated based on the total area of forest within each hexagon. For hexagons that have less than 50% forest in them the hexagon is considered as 0. A hexagon is considered to be young if it has 50% or greater young forest in it. Patch size is then estimated based on the adjacency of hexagons classes as young.

OLT produces both a map and a histogram of the result. The histogram is a frequency distribution representing the proportion of patches (relative to the total number of patches) in various size classes. The resulting SRNV estimated natural landscape pattern for young forest is used as the "Template" of the natural forest landscape pattern for the Whiskey Jack Forest. The SRNV template is illustrated in the following subsection.

Comparison of Plan Start Young Forest Frequency to SRNV

The young forest frequency by size class of the land base at Plan Start 2012 was compared to the SRNV template for the management unit to determine a baseline distribution of young forest patch size at the start of this planning period. Figure 1 shows the relationship of the current young forest patch size frequency compared to the SRNV. Significant differences are observed in the smaller young forest size patch frequencies where the SRNV developed for the Whiskey Jack Forest suggests there would naturally be significantly less small disturbances (1-100 and 101-250 ha), and more large disturbances (> 250 ha) than is evident at 2012. This larger proportion of smaller young forest patch at 2012 is a result of past forest management, unprecedented natural disturbance and harvesting practices on the Whiskey Jack Forest, and is typical of the management units in the Northwest Region. Management direction in the last 10 years has been moving to larger harvest blocks to emulate natural disturbance pattern more closely. It will take the implementation of several forest management plans with larger harvest area patches to reverse the legacy of small disturbance patches on the Whiskey Jack Forest.

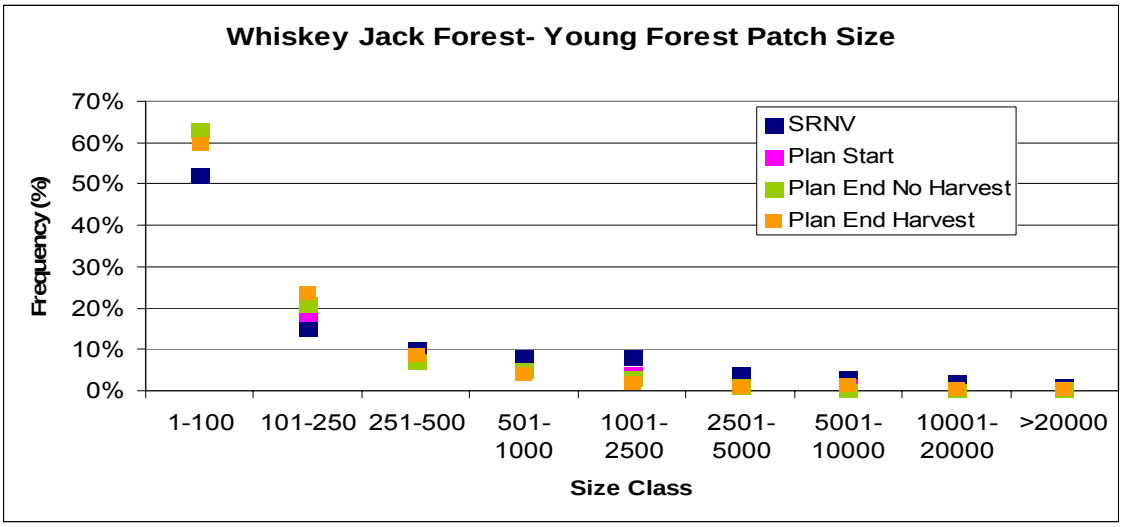
Figure 1 Frequency Distribution of Young Forest by Size Class - 2012 vs SRNV



Given this Plan Start information, the planning team decided to look at the current (Plan Start 2012) and future disturbance patterns (Plan End 2022 with no harvest, and also analyze landscape pattern at Plan End 2022 with planned harvest depletions) on the Whiskey Jack Forest and compare them to the SRNV.

A total of 10 years of planned harvest allocations have been included for assessment to see how much movement towards the SRNV is projected to be achieved through implementation of the forest management plan. The results are presented below.

Figure 2 Frequency Distribution of Young Forest by Size Class



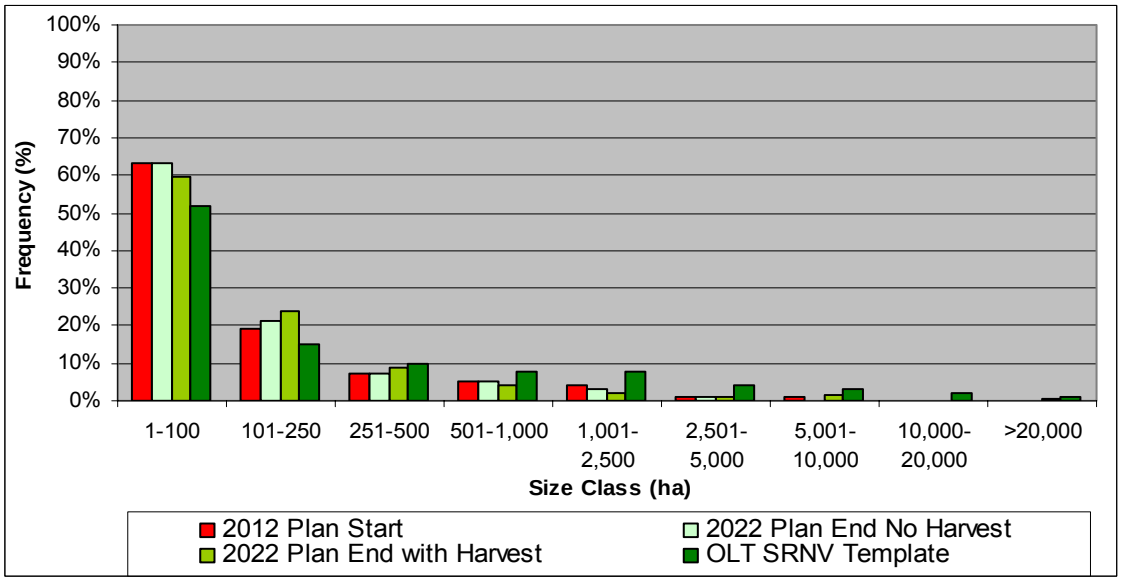


Table 1 Frequency Distribution of Young Forest by Size Class

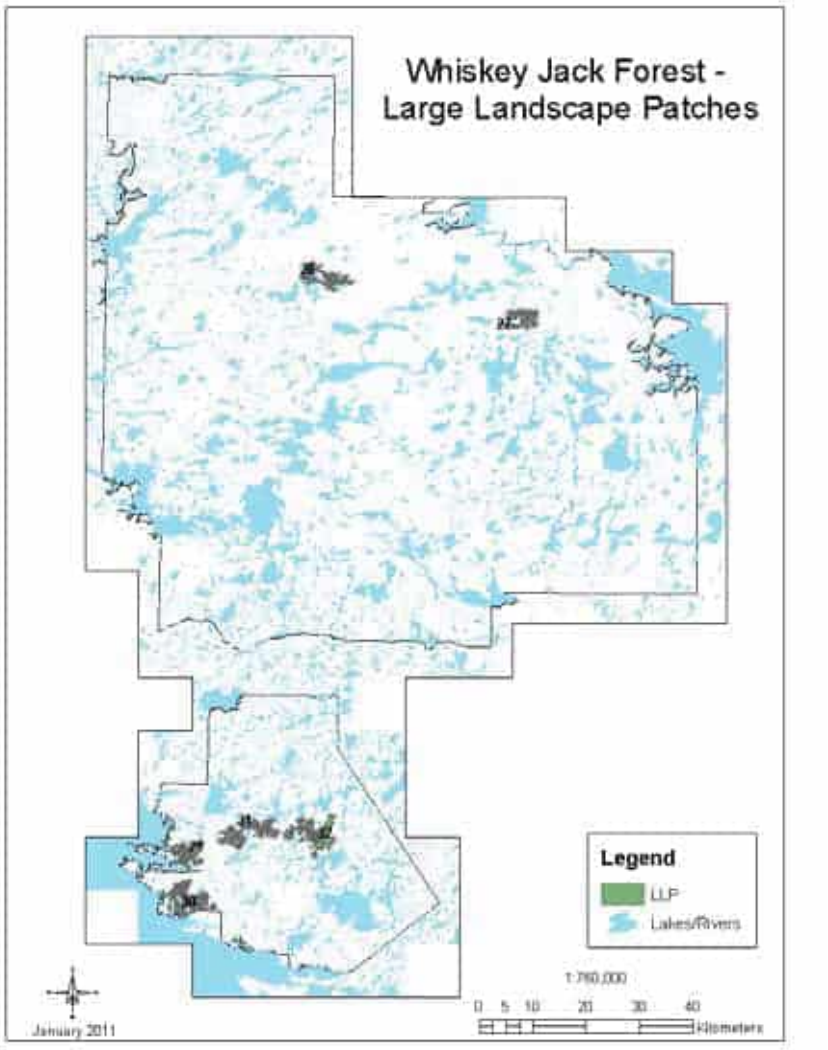
	As a Percent				Assessment
Size Class (ha)	2012 Plan Start	2022 Plan End No Harvest	2022 Plan End with Harvest	OLT SRNV Template	Assessment of Movement Towards Natural SRNV Template
1-100	63%	63%	60%	52%	Movement towards
101-250	19%	21%	24%	15%	Movement away
251-500	7%	7%	9%	10%	Movement towards
501-1,000	5%	5%	4%	8%	Minor movement away
1,001-2,500	4%	3%	2%	8%	Minor movement away
2,501-5,000	1.0%	1.0%	1.1%	4.0%	Towards - but no significant change
5,001-10,000	1.0%	0.0%	1.3%	3.0%	Towards - but no significant change
10,000-20,000	0.0%	0.0%	0.2%	2.0%	Towards - but no significant change
>20,000	0.0%	0.2%	0.3%	1.0%	Towards - but no significant change
Total					

Six of nine young forest patch size classes project movement from Plan Start distribution towards the Simulated Range of Natural Variation (SRNV) through implementation of planned harvest areas for this plan period. Four of these size classes that show movement towards the SRNV do not change significantly from the Plan Start frequency. Three size classes project movement away from the SRNV at the end of this plan period. The 101-250 ha class increases in frequency from 19% to 24% whereas the template suggests a reduction to 15%. The 501-1,000 and 1,001-2,500 ha class frequencies decrease slightly at Plan End compared to higher desirable levels, but only change by 1-2%. Overall assessment is that the target level for this indicator is achieved, as the movement toward the template frequency distribution is greater than the minor shortfalls in 3 classes.

Indicator 1c - Mature and old Conifer Forest

This indicator is intended to influence the supply and arrang ement of mature and older conifer-dominated forest across the Whiskey Jack Forest. The conifer dominated forest is composed of PJD, PJM, SPD and SPM. In ad dition to the marten cores, large la ndscape patches (LLP) which are >500 hectares were selected from OLT output and deferred in the strategic model for 40 years. This will provide future habitat for coarse filter wildlife such as marten. The map shows the location of the LLP in the Whiskey Jack Forest.

Two scales were used to measure this indicator. A 500 and 5,000 hectare hexagon is draped on the planning inventory. The measurement is done for 60-80% and 80%+ concentrations added together. For the 500 hectare hexagon, the plan start is at 4% moving to 6% at plan end. The SRNV for this indicator is 19 % showing move ment towards the SRNV. For the 5,000 hectare hexagon, the plan start is a t 1% movin g to 1.3%. The SRNV f or this indicator is 9% showing movement towards the SRNV. The re sults show movement towards SRNV from plan start.



Indicators 3b and 3c - Landscape Level Caribou Habitat Pattern

Using the caribou habitat dynamics area, part of the Whiskey Jack Forest inventory was clipped and the caribou management zone was run through OLT. The intent of this analysis is to compare the Plan Start and End results with the estimated SRNV provided by MNR. There is little harvesting activity happening on the caribou zone of the Whiskey Jack Forest and the results show movement towards the SRNV for both the caribou refuge habitat pattern and caribou winter habitat pattern.

Two scales were used to measure this indicator. A 6,000 and 30,000 hectare hexagon is draped on the planning inventory. The measurement is done for 60-80% and 80%+ concentrations added together.

For the caribou refuge habitat, the 6,000 hectare hexagon, the plan start is at 36% moving to 37% at plan end. The SRNV for this indicator is 87% showing movement through plan implementation towards the SRNV. For the 30,000 hectare hexagon, the plan start is at 25% moving to 24%. The SRNV for this indicator at this scale is 92%, therefore implementation of planned harvest projects minor (1%) movement away from the SRNV. Spatial assessment of caribou refuge habitat pattern shows 1% movement towards the desirable level for analysis of caribou refuge habitat at the 6,000 ha scale and 1% movement away from the desirable level at the 30,000 ha scale which is not considered significant. There is clean-up occurring in four caribou blocks which accounts for the reduction in refuge habitat at the 300 km2 scale. Overall assessed as ACHIEVED.

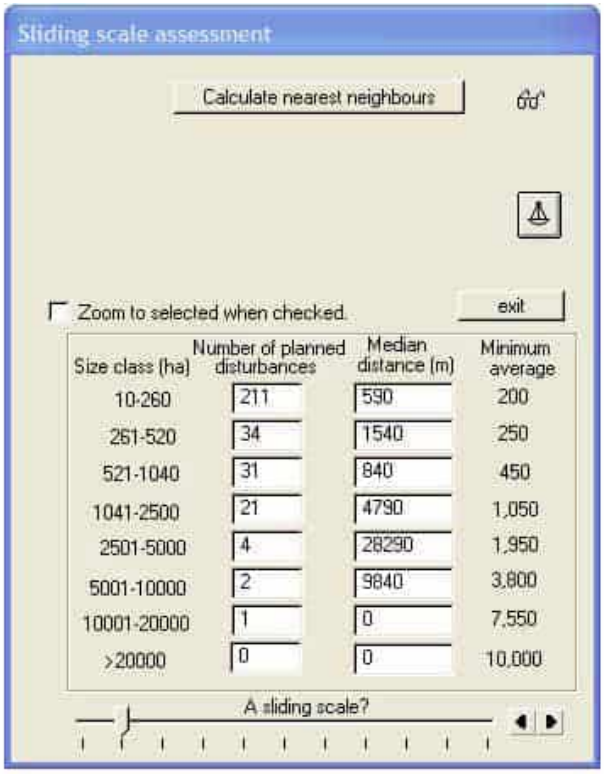
For the caribou winter habitat, the 6,000 hectare hexagon, the plan start is at 0% moving to 4% at plan end. The SRNV for this indicator is 45% therefore implementation of the planned harvest is projected to move caribou winter habitat pattern towards the SRNV. For the 30,000 hectare hexagon, the plan start is at 0%, remaining at 0% after implementation of the planned harvest. The SRNV for this indicator is 40%, therefore at this scale, there is no movement towards or away from the SRNV. Spatial assessment shows movement towards the desirable level for analysis at the 6,000 ha scale. The second analysis shows no movement away from the Plan Start 0% level (constant). Overall assessed as ACHIEVED.

Sliding Scale Assessment

A sliding scale assessment was conducted on forest disturbances to evaluate the spatial separation of planned disturbances across the landscape. This analysis identifies the average distance between disturbances in each size class at Plan End with Harvest (2022) and measures how well like-sized disturbances are spread out over the landscape.

The goal of the Sliding Scale Assessment is to have the median distance for each size class greater than the minimum average target distance for the size class. The sliding scale assessment is based on the product from the NDPE tool. The following figure shows the minimum average distance required between like-sized disturbances, with the number of disturbances and the median distance between them.

Figure 1 Sliding Scale Assessment



Size class (ha)	Number of planned disturbances	Median distance (m)	Minimum average
10-260	211	590	200
261-520	34	1540	250
521-1040	31	840	450
1041-2500	21	4790	1,050
2501-5000	4	28290	1,950
5001-10000	2	9840	3,800
10001-20000	1	0	7,550
>20000	0	0	10,000

The results of this sliding scale analysis project that the six size classes with planned disturbances (all disturbance classes up to 10,000 ha in size) are well distributed and have median distances that exceed the minimum target distances. Since there are no measured disturbances in the >20,000 ha size class and only one disturbance in the 10,001-20,000 ha size class, the median distances are recorded as 0 for these two classes as a median distances cannot be calculated unless there are two points in the size class.

Planned Harvest Disturbances by Size Class

The planned harvest disturbance analysis considers areas disturbed by harvest activities within a 20 year analysis window as does the disturbance analyses. However for this planned harvest disturbance analysis, only five years of planned harvest is considered therefore Plan End for the planned harvest disturbance analysis is five years after Plan Start (2017) for Phase I planning of the 2012 forest management plan. Planned harvest disturbances include all planned harvest area for the five year plan term and any "old" harvest areas less than or equal to 15 years old within 200 metres of the "new" cut area. Each "planned harvest disturbance" must be separated by 200 metres of forest greater than or equal to 3 metres in height and 30% stocking or greater than 20 years old in order not to be part of the same planned harvest disturbance. Planned harvest disturbances do not include any area naturally disturbed (unlike the disturbance analysis that does include natural disturbances).

According to the (NDPE guide), 80% (in the *Forest Management Guide for Natural Disturbance Pattern Emulation* Boreal Forest) of planned harvest disturbances (referenced as planned clearcuts in the guide) determined by frequency should be less than 260 hectares in size. The guide also states that, although less than 80-90% of fires are smaller than 260 hectares, this direction recognizes the public sensitivity concerning large harvest disturbances.

This analysis identified planned harvest disturbances projected to be present in 2017, the end of the first five-year term of the plan. In the assessment of the "80 % under 260 hectares" standard, the assessment has identified 76% of planned harvest disturbances to be equal to or under 260 hectares in size, leaving 24% of planned harvest disturbances greater than 260 ha. This result is acceptable to the Planning Team as it is close to the target level and exceeds the result of 2004 FMP which was 60% under 260 hectares and 40% of planned harvest disturbances greater than 260 ha. There are spatial constraints to the allocations that contribute to not meeting the standard, in this case the Planning Team placed an emphasis on meeting the landscape-level habitat supply of marten and Woodland Caribou.

Planned harvest disturbances range from 2 to 7,904 hectares in size, with an average of 302 hectares. It should be noted that planned harvest disturbances contain both new and older harvest areas (up to 20 years old). For those planned harvest disturbances over 260 hectares (average size 964 ha), the average size of "new cut" in these planned harvest disturbances is 533 hectares (55% of gross planned harvest disturbance area).

Each planned harvest disturbance that exceeds 260 hectares is identified in Table FMP-12. These planned harvest disturbances over 260 hectares will provide large landscape patches for forest diversity and wildlife habitat in the future and contribute to a range of disturbance sizes on the forest which emulates a more natural disturbance pattern than if all planned harvest disturbances were the same size. These planned harvest disturbances result from the consolidation of eligible new cut harvest area adjacent to harvest areas from the past 20 years, or the allocation of a concentration of eligible harvest area in this plan period.

Court File No. **446 / 15**

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

APPLICATION RECORD

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DECEMBER 10, 2021

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Court File No. **446 / 15**

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO),
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

APPLICATION UNDER Section 2(1)
of the *Judicial Review Procedure Act*
R.S.O. 1990, c. J.1

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VOLUME 3 OF 5

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2012 - 2022
Forest Management Plan
for the
Whiskey Jack Forest

Analysis Package

Supplementary Documentation A

Analysis Package for the Whiskey Jack Forest 2012 – 2022 Forest Management Plan

Ontario

January 2011

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1.0 Introduction

The Analysis Package is used to document the information, assumptions and decisions made during the strategic analysis conducted to support the development of the Long-term Management Direction (LTMD) for the Whiskey Jack Forest 2012-2022 Forest Management Plan. The Analysis Package consists of text, tables, maps and other information prepared by the Sustainable Forest Licence holder, the Ontario Ministry of Natural Resources, (Kenora District).

2.0 Analytical Tools

The following tools were used during the development of the management strategy for the 2012-2022 Forest Management Plan for the Whiskey Jack Forest:

Strategic Forest Management Model (SFMM)

SFMM is based on linear programming techniques and is used to model timber production capabilities of a forest for various levels of management intensity. The model is designed to be compatible with information currently available in Ontario. The model is also used to non-spatially model wildlife habitat abundance for a range of species. SFMM version 3.5 Build 2010.04.23 was used with AIMMS solver version 3.8.4.10433.

The Strategic Forest Management Model (SFMM) was used as the primary analysis tool for the strategic analysis. This tool is used to track the entire Whiskey Jack Forest land base through time, and produce projections of changes to the forest structure and composition for 160 years into the future. SFMM also allows for the evaluation of forested areas and their contribution to forest diversity, socio-economic benefits including timber production, old forest and wildlife habitat through time.

Ontario Landscape Tool (OLT)

Ontario's Landscape Tool contains science and information that was used in the development of Ontario's Landscape Guides. OLT provides a direct link to the science and information packages which contain inputs, rationale, simulation results and several tools which can be used when writing a forest management plan or when interested from a science perspective in testing model inputs, assumptions and results. OLT version 3.0.3827 loaded with the updated forest inventory was used for this FMP.

OLT was used as a source of direction for the setting of desirable levels for landscape level forest composition and age structure, caribou habitat and landscape texture and pattern indicators in the forest management plan.

Ontario Marten Analyst 2 (OMA-2)

This tool has been developed in the Northwest Region to classify the land base into "capable" forest types and "suitable" habitat for marten. Suitable habitat can then be modelled through time, based on the current forest condition. OMA-2 contains a "core builder" tool where the user can create various core habitat area scenarios and generate marten core habitat statistics.

Natural Disturbance Pattern Emulation Guide Tool (NDPEG Tool)
Is a GIS tool (ArcView based) designed to estimate forest disturbance perimeter, estimate residual (insular and peninsular) within forest disturbances, estimate planned clear cut and assess a sliding scale of goodness of fit, using the definitions in the NDPEG Guide.

ArcGIS Spatial Analyst
The ArcGIS based computer model was used to determine estimated slope based riparian reserve widths. Data was used to determine estimated reserve percentages for the SFMM modelling inputs and for preliminary area of concern reserves for operational planning.

3.0 Progress Checkpoints

A summary of the key production tasks and responsibilities is found in the Terms of Reference and Project plan for the 2012-2022 Whiskey Jack Forest Management Plan. The Terms of Reference and Project Plan identify the roles and responsibilities for developing the above-mentioned analytical models, data compilation, update, classification, and conducting the analysis required under the *Forest Management Planning Manual for Ontario's Crown Forests (2009).*

Progress checkpoints are key steps in the development of the Long-Term Management Direction of a forest management plan. The progress checkpoints are:

(A) Planning Inventory (approved February 2, 2010);
(B) Current Forest Condition (approved January 19, 2011);
(C) Base Model Inventory and Base Model (approved October 8, 2010);
(D) Management Objectives (approved January 13, 2011);
(E) Proposed Long-term Management Direction (approved March 9, 2011); and
(F) Preliminary Endorsement of Long-term Management Direction.

Development and decisions related to the completion of the above progress checkpoints are detailed in the following parts of the Analysis Package.

PART 1: PLANNING INVENTORY

4.0 Development of the Planning Inventory

The planning inventory for the management unit provides information required for forest management planning, including forest modelling, habitat modelling and forest diversity analyses. The planning inventory contains updated Forest Resource Inventory information as a result of forest management activities and natural disturbances. The planning inventory also contains expected (forecast) changes, based on anticipated harvest for the remainder of the term of the current forest management plan.

The detailed technical requirements, responsibility and timing for production and submission of the planning inventory are described in the *Forest Information Manual (2009)* and *FIM Forest Management Planning Technical Specifications (November 2009)*. Under these specifications, the planning inventory is made up of two different pieces, the planning composite and the forecasted depletions. The planning inventory reflects forest inventory updated with most up to date depletions and silviculture information, but does not include depleting forecasted depletions to the 2012 plan start. The forecast depletions coverage consists of those depletions from the last actual reported depletions (2008/2009 Annual Report) to the end of the 2012 FMP not yet depleted and recorded.

The Crown forest portion of the management unit is the land base used for decision-making in the forest management plan. For forest management planning purposes, the Crown forest is categorized as areas managed for timber production and other areas. Other areas include provincial parks and conservation reserves, and areas that have been designated through legal or policy means, or a land use decision, as unavailable for timber production. The areas managed for timber production include all remaining Crown forest lands. The total area of Crown forest on the management unit can contribute to the achievement of non-timber objectives in the forest management plan.

The planning composite was developed based on the 2004 Whiskey Jack FMP planning collection inventory. The Inventory Task Team considered the 2004 PCOL inventory as the most up to date inventory information available and would require the least amount of manipulation to be updated for the 2012 FMP production. The following is a summary of update process to create the planning inventory.

<u>Data Source</u>

The Whiskey Jack FRI updates history is:

1997: Last full FRI – new photos and interpretation

2003: Information converted from UTM Zone 15 NAD 27 datum to UTM Zone 15 NAD 83 datum

2006: Historical information related to natural and harvest depletions updated, ownership and roads base coverages updated

2009: As part of the surrender conditions, Abitibi Bowater Inc. updates the forest polygon coverage to include actual harvest depletion, silviculture and Free-To-Grow information from April 1, 2004 to March 31, 2009. MNR created a seamless coverage from this inventory.

The composite planning inventory was assembled using the following methodology:

1. Incorporated hydro corridor, railway bed and ownership with buffer distances depicted below.
2. Incorporated roads by creating new road buffers.

The Base Model Inventory was assembled using the following methodology:

3. Created a Forecast Depletion layer from the approved 2009-2012 Contingency Plan. Estimated depletions were given a YRDEP of 2012.
4. This was merged with the MU wide AOC reserves to create the Base Model Inventory (BMI). The BMI layer was utilized for FMP-3 and SFMM initial land base.

Base Feature	Last Update	Comments
Water	January 1, 2009	Used FRI water which came from OBM
Wetlands		No Provincial significant wetland identified
Streams (permanent feature)	January 27, 2010	- Buffered 15m
Streams (Intermittent feature)	January 27, 2010	- Buffered 1.5m
MU Boundary	January 29, 2010	Used NRVIS data
Ownership and Land Tenure	January 27, 2010	Used NRVIS data
Parks and Reserves	January 27, 2010	Used NRVIS data
Railways	December 12, 2009	Buffered 20m
Utility Line	December 15, 2009	Buffered 20m
Roads	July 12, 2005	- Primary roads were buffered 20m - Branch roads were buffered 10m

B&S area is now classified as a variety of “Below Regeneration Standards” classes as per FIM. This area has reduced slightly from the 2004 FMP – mainly because the B&S area in the 2004 FMP was artificially inflated due to the 1991 blow down and forecast depletion inventory update estimates (i.e. clearcut forest unit stands were depleted to B&S when not all of these ended up being cut and those that were cut often did not become B&S).

The overall Crown land base decreased by 103 ha as a result of boundary adjustment to match the management unit metes and bounds. As a result of the major inventory update undertaken in 2005, the production landbase increased by 7,012 ha. These are some area that was shifted to protection forest and a decrease in unclassified land (road right-of-way buffering).

Area summaries in all tables reflect the base model inventory (after the union on the planning inventory and the forecast depletions). This usually results in an over estimation of "recent disturbance" and "below regeneration standards" area due to the full depletion of all forecast clearcut forest unit stands.

Planning Inventory File: mu490_2012_inv_p1.zip, containing:
Mu490_12pcm00.e00
Mu490_12fdp00.e00

4.1 Documentation of the Planning Inventory Checkpoint

Progress Checkpoint #1 approval of the Planning Inventory was received on February 2, 2010.

----- Original Message -----
From: Mohamed, Hassan (MNR)
To: Susan Jarvis
Sent: Wednesday, September 29, 2010 9:40 AM
Subject: RE: KF and WJ Progress checkpoint #1 and #2 approval?

We (Matt and I) could not load the inventory in the portal so neither of us has notification. But the Kenora Forest PI was approved by the District on: mu644_2012_inv_p1.zip, modified 1/25/2010. The Whiskey Jack Forest was approved on February 2, 2010.

Hassan

PART 2: CURRENT FOREST CONDITION

5.0 Current Forest Condition

The planning inventory products are combined and updated with forest classification information to produce the base model inventory, in accordance with the requirements of the *Forest Information Manual*. The base model inventory and landscape level information are used to describe the current forest condition. The following sub-sections describe the development of the various forest condition classifications.

5.1 Forest Units

The Forest Management Planning Manual (FMPM) defines forest units as: "aggregates of forest stands which normally have similar species composition; develop in a similar manner (both naturally and in response to silvicultural treatments); and are managed under the same silvicultural system."

Two types of forest unit classifications are used in the current FMP. Both types of forest units have a specific purpose in the analysis of the Whiskey Jack Forest. The Northwest Region Standard forest units are used as a standard classification that can be compared to other forest and for the classification of landscape classes, old forest and wildlife habitat. The second set of forest units are the planned forest units. These classes are similar to the standard forest units, but reflect a more local characterization. The planned forest units will be the primary classification for the planning process. They will be used in the development of the modelling inputs, allocations and annual operations until the next FMP.

5.1.1 Regional Standard Forest Units (SFU)

The standard forest units are developed regionally to reflect the different forest conditions found across the province and the different forest types. The Northwest region is dominated by Boreal Forest with a minor portion of Great Lakes - St. Lawrence Forest and Carolinian Forest. Therefore, the dominant forest types reflect conifer forest types such as spruce, jack pine and balsam fir, and hardwood forests are dominated by aspen and white birch and mixedwood. The Northwest Region standard forest units cover these forest types and try to include some regional ecosite considerations.

Standard forest units were developed to allow forest planning teams across the Boreal part of Northwest Region to work with a common set of forest cover descriptions that were consistent for a number of reasons:

1. To allow forest planning across the region to use a consistent description of forest cover.
2. To ensure a close match of forest units to ecosites.
3. To allow science, planning and industry to develop a common set of parameters for modelling:
    a) yield curves
    b) post-disturbance succession rules
    c) natural succession (old age) rules
    d) maintenance of biodiversity

e) Landscape Guide Classes

4. To ensure all forest plans maintain a consistent base set of principles for their forest units:
   a) remove rare and unique forest units first
   b) pure forest units at 70%+, mixed forest units at 40-60%
   c) separate upland conifer into rich (spruce-fir) versus poor (spruce-pine) communities
   d) separate upland mixedwoods into rich (Ecosite 28) versus poor (Ecosite 13) communities
5. To create a direct relationship between units of forest management and units of habitat.
6. To allow for a consistent "roll-up" of forest cover descriptions to higher planning levels.
7. To allow for a simple assignment of higher-order targets to each FMP.

The Northwest Region standard forest units are presented in Table 1.

Table 1 Northwest Regional Standard Forest Units

Standard Forest Unit	Descriptions	SQL Query (SFUs assigned based on specific sort order. Query copied from MIST version 2.0)
PwDom	White Pine Dominant	PW >= 40
PrDom	Red Pine Dominant	PR >= 70
PrwMx	Red and White Pine Mixedwood	PW + PR >= 40
UplCe	Cedar Dominant Uplands	CE >= 20 And (ECOSITE1 Like 'NW17%')
OCLow	Other Conifer Lowlands (Ce/La)	((CE + LA >= 50) Or (WG = 'Ce' Or WG = 'La')) And PR + PW + PJ + SW + BW < 10
SbLow	Black Spruce Lowlands	(ECOSITE1 Like 'NW34%' And PR + PW + PJ + SW + BF <= 20) Or (ECOSITE1 Like 'NW35%' Or ECOSITE1 Like 'NW36%' Or ECOSITE1 Like 'NW37%') Or (ECOSITE1 Like 'NW38%' And (WG = 'Sx' Or WG = 'Sb' Or WG = 'Ce' Or WG = 'Sb' Or WG = 'Ce' Or WG = 'La'))
SbSha	Shallow Spruce Dominated Uplands	SB >= 70 And PO + BW <= 20 And (ECOSITE1 Like 'NW12%' Or ECOSITE1 Like 'NW11%')
SbDee	Productive Spruce Dominant Uplands	SB >= 70 And PO + BW <= 20
PjSha	Shallow Jack Pine Dominated Uplands	((PJ >= 70 And PO + BW <= 20) Or (PJ >= 50 And PO + BW <= 20 And AGE >= 120)) And (ECOSITE1 Like 'NW12%' Or ECOSITE1 Like 'NW11%')
PjDee	Productive Jack Pine Dominated Uplands	(PJ >= 70 And PO + BW <= 20) Or (PJ >= 50 And PO + BW <= 20 And AGE >= 120) Or (PJ >= 70 And (ECOSITE1 Like 'NW13%' Or ECOSITE1 Like 'NW14%'))
PoSha	Shallow Aspen Dominated Uplands	PO >= 70 And (ECOSITE1 Like 'NW12%' Or ECOSITE1 Like 'NW11%')
PoDee	Productive Aspen Dominated Uplands	PO >= 70
BwSha	Birch Dominated Shallow Soils	BW >= 60 And BW + PO >= 70 And (ECOSITE1 Like 'NW12%' Or ECOSITE1 Like 'NW11%')
BwDom	Productive White Birch Dominated	BW >= 60 And BW + PO >= 70

Standard Forest Unit	Descriptions	SQL Query (SFUs assigned based on specific sort order. Query copied from MIST version 2.0)
OthHd	Tolerant Hardwoods	TOL >= 30
SbMx1	Spruce Dominant Conifer Mixedwoods	PR + SB + PJ + SW + BF >= 70 And BF <= 10 And PO + BW <= 20 And (SB + SW) > PJ
PjMx1	Jack Pine Dominant Conifer Mixedwoods	PR + SB + PJ + SW + BF >= 70 And BF <= 10 And PO + BW <= 20 And PJ >= (SB + SW)
BfPur	Balsam Fir Dominated	BF >= 70
BfMx1	Balsam Fir Dominated Conifer Mixedwood	SFT >= 70 And BF >10 And BF + SW >=30
ConMx	Conifer Dominant Mixedwood	HWD >= 70
HrDom	Hardwood Dominant	HWD >= 50
HrdMw	Hardwood Dominant Mixedwood	SFT >= 50

General Ecosite Relationships for Standard Forest Units

PwDom - white-pine dominated stands (white pine > 40%)
- suitable for management using shelterwood or patch clearcut
- primary ecosites: 11, 24, 18
- secondary ecosite: 15

PrDom - pure red pine (red pine > 70%)
- developed to capture pure stands, usually as a result of plantations
- primary ecosites: 15
- secondary ecosite: 11, 18

PrwMx - white and/or red pine in the overstorey
- might be suitable for shelterwood, often clearcut and regenerated to more pine
- primary ecosites: 15, 18
- secondary ecosite: 11, 24

UplCe - White cedar
- primary ecosite: 17

OCLow - lowland conifer, mixture of black spruce, larch and cedar
- primary ecosites: 36, 37

SBLow - lowland pure black spruce, or black spruce dominated conifer lowland
- primary ecosites: 35, 36
- secondary ecosite: 37

SbSha - black spruce pure upland (Shallow Soil)
- does not contain white spruce or cedar
- primary ecosites: 12

SbDee - black spruce pure upland (Deep Soil)
- does not contain white spruce or cedar
- primary ecosites: 20, 22, 26
- secondary ecosite: 21, 31

PjSha - pure jack pine, usually on shallow soil
- primary ecosite:12

PjDee - pure jack pine, usually on fresh sandy
- primary ecosite: 13, 20, 25
- secondary ecosites: 21, 14

PoSha - pure poplar on shallow soil
- primary ecosites: 12
- secondary ecosites: 19, 29

PoDee - pure poplar and poplar-dominated hardwood mix
- primary ecosites: 29, 19
- secondary ecosites: 33, 16, 28

BwSha - pure white birch on shallow or poor soils
- primary ecosite: 12

BwDom - pure white birch and white birch dominated hardwood mix
- primary ecosite: 19, 29
- secondary ecosites: 16, 33

OthHd - transitional (GLSL/Boreal) Forest Unit in most cases
- in transitional areas, mostly soft maple, otherwise black ash
- primary ecosites: 30, 38
- secondary ecosite: 33

SbMx1 - black spruce dominated mixed conifer
- will contain white spruce (and often cedar)
- primary ecosites: 21, 20, 26
- secondary ecosites: 12, 22, 14, 13

PjMx1 - jack pine dominated mixed conifer on sandy soils
- primary ecosite: 20, 12, 21, 13
- secondary ecosites: 25, 14

BfPur - Balsam fir dominated (balsam fir > 70%)
- primary ecosites: 21, 27
- secondary ecosite: 14

BfMx1 - balsam fir dominated mixed conifer
- primary ecosite: 14, 20, 21, 26, 27
- secondary ecosites: 12, 22

HrDom - hardwood dominated (>70%)
- primary ecosites: 19, 29
- secondary ecosites: 33, 28

HrMw - hardwood dominated (>70%)
- primary ecosites: 19, 21, 29
- secondary ecosites: 28

ConMx - Conifer dominated mixedwood
- primary ecosites: 21, 27, 12
- secondary ecosites: 14, 26

The correlation between the site and forest unit is depicted in the edaphic grid below and in Table 2:

Figure 1 Edaphic Grid of the Standard Forest Units

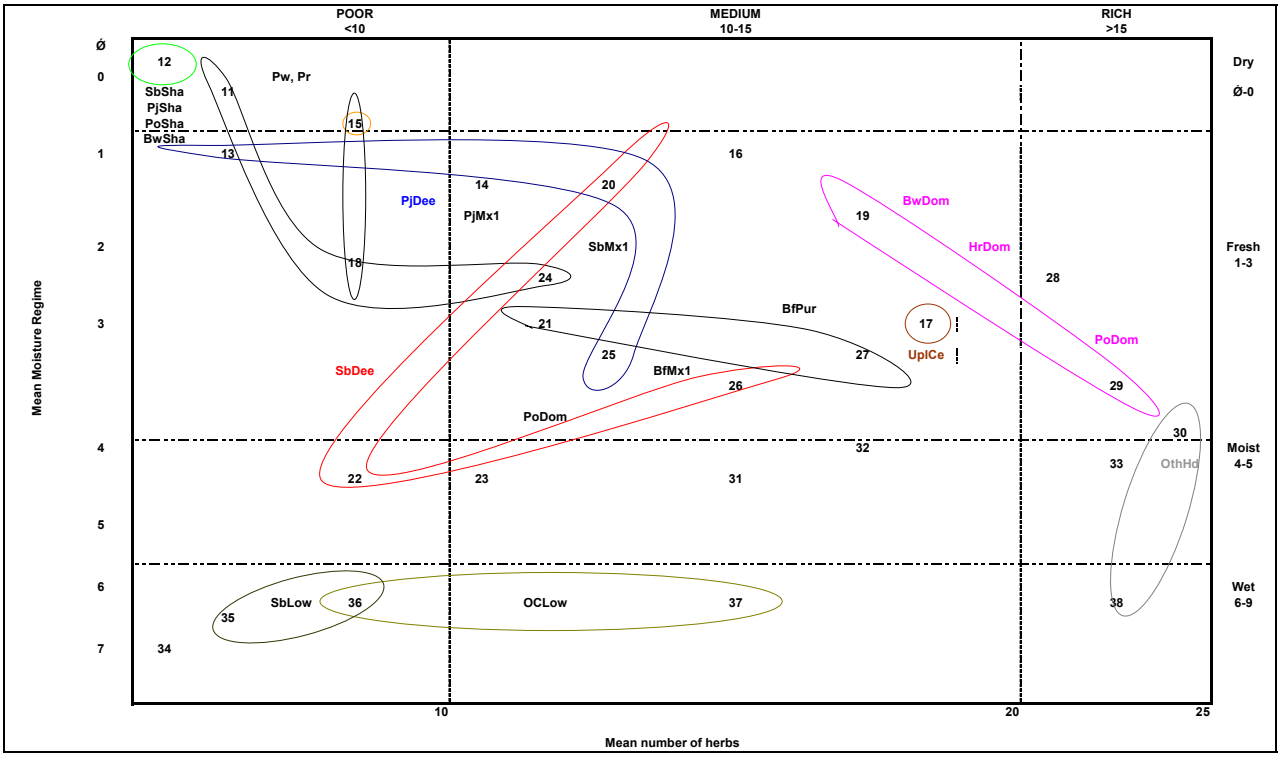


Table 2 SFU by Area of the Whiskey Jack Forest

SFU	CNT	Tarea	A HT	A STKG	A SC	A PO	A PJ	A PR	A PW	A SB	A SW	A LA	A CE	A AB	A BF	A BW	A PB	A OW	A MR
BfMx1	1,302.0	28,913.8	7.6	0.6	1.5	7.5	3.7	0.0	0.0	34.8	8.1	0.0	0.5	0.0	37.7	7.6	0.0	-	-
BfPur	502.0	7,436.4	2.9	0.6	1.9	1.8	0.3	0.0	0.0	14.1	3.9	-	0.0	-	78.1	1.7	0.0	-	-
BwDee	227.0	5,151.8	10.7	0.8	2.2	8.0	0.8	0.0	-	6.9	1.6	-	1.1	0.1	6.9	74.4	-	-	-
BwSha	3.0	36.4	3.1	0.6	3.0	3.3	-	-	-	6.7	-	-	-	-	3.3	86.7	-	-	-
ConMx	4,409.0	91,121.4	8.0	0.7	1.8	21.9	23.6	0.2	0.1	34.3	1.8	0.2	0.5	0.0	6.2	11.3	0.0	-	-
HrdMw	3,047.0	71,993.6	12.8	0.7	2.5	42.0	13.1	0.2	0.3	19.1	3.8	0.0	0.7	0.2	7.7	12.8	0.0	-	-
HrDom	1,138.0	32,359.0	13.5	0.7	2.6	50.1	3.7	0.2	0.2	10.7	3.5	0.0	0.9	1.4	6.5	22.6	0.1	-	-
OCLow	175.0	2,373.2	10.9	0.7	2.9	0.5	-	-	-	16.1	-	34.9	44.3	3.8	0.3	-	-	-	-
OthHd	184.0	2,549.4	14.9	0.8	2.6	22.6	0.4	-	-	8.9	1.4	0.4	2.9	55.4	1.7	2.3	3.8	0.2	-
PjDee	5,843.0	147,386.0	8.3	0.8	2.2	3.6	84.4	0.0	0.0	10.6	0.2	0.0	0.0	-	0.2	1.0	-	-	-
PjMx1	3,404.0	62,077.3	8.6	0.7	2.4	6.9	53.2	0.3	0.0	35.6	0.4	0.0	0.0	-	1.0	2.4	-	-	-
PjSha	1,180.0	38,681.9	7.7	0.6	3.2	3.0	85.6	0.1	0.0	10.3	0.0	-	0.0	-	0.1	0.8	-	-	-
PoDee	4,342.0	77,665.7	13.6	0.7	2.5	83.1	4.0	0.1	0.1	5.7	1.9	-	0.2	0.4	2.4	2.1	0.0	0.0	-
PoSha	45.0	454.8	8.5	0.7	3.4	83.6	7.8	0.2	0.2	4.9	0.7	-	-	0.2	0.9	1.6	-	-	-
PrDom	67.0	803.1	13.4	0.8	2.3	3.7	2.7	83.9	5.5	2.5	0.9	-	-	-	0.6	0.1	-	-	-
PrwMx	90.0	1,767.1	15.6	0.6	2.3	11.4	13.9	40.2	12.9	12.2	1.1	-	0.4	-	5.1	2.7	-	-	-
PwDom	36.0	808.6	17.1	0.5	2.2	10.0	1.4	16.4	57.8	3.9	3.1	-	3.1	-	0.8	3.6	-	-	-
PwDom	1.0	5.3	16.0	0.3	2.0	10.0	10.0	20.0	40.0	10.0	-	-	-	-	-	-	-	-	10.0
SbDee	6,350.0	96,789.8	7.0	0.7	1.5	1.9	6.3	0.0	0.0	86.7	0.7	0.3	0.2	0.0	2.4	1.5	0.1	-	-
SbLow	1,975.0	18,966.6	7.9	0.7	2.6	1.8	4.2	-	0.0	86.4	0.2	3.1	1.4	1.5	0.5	0.9	0.0	-	-
SbMx1	2,875.0	54,957.2	7.8	0.7	1.3	6.6	27.1	0.3	0.0	53.0	6.3	0.1	0.2	0.0	2.8	3.5	0.0	-	-
SbSha	361.0	7,863.9	8.8	0.6	1.7	1.4	10.6	0.0	-	83.0	0.1	-	-	-	2.4	2.4	-	-	-
UplCe	128.0	3,545.0	12.2	0.7	1.9	6.4	0.4	-	0.2	11.8	1.7	0.2	61.0	1.4	8.3	8.7	-	-	-

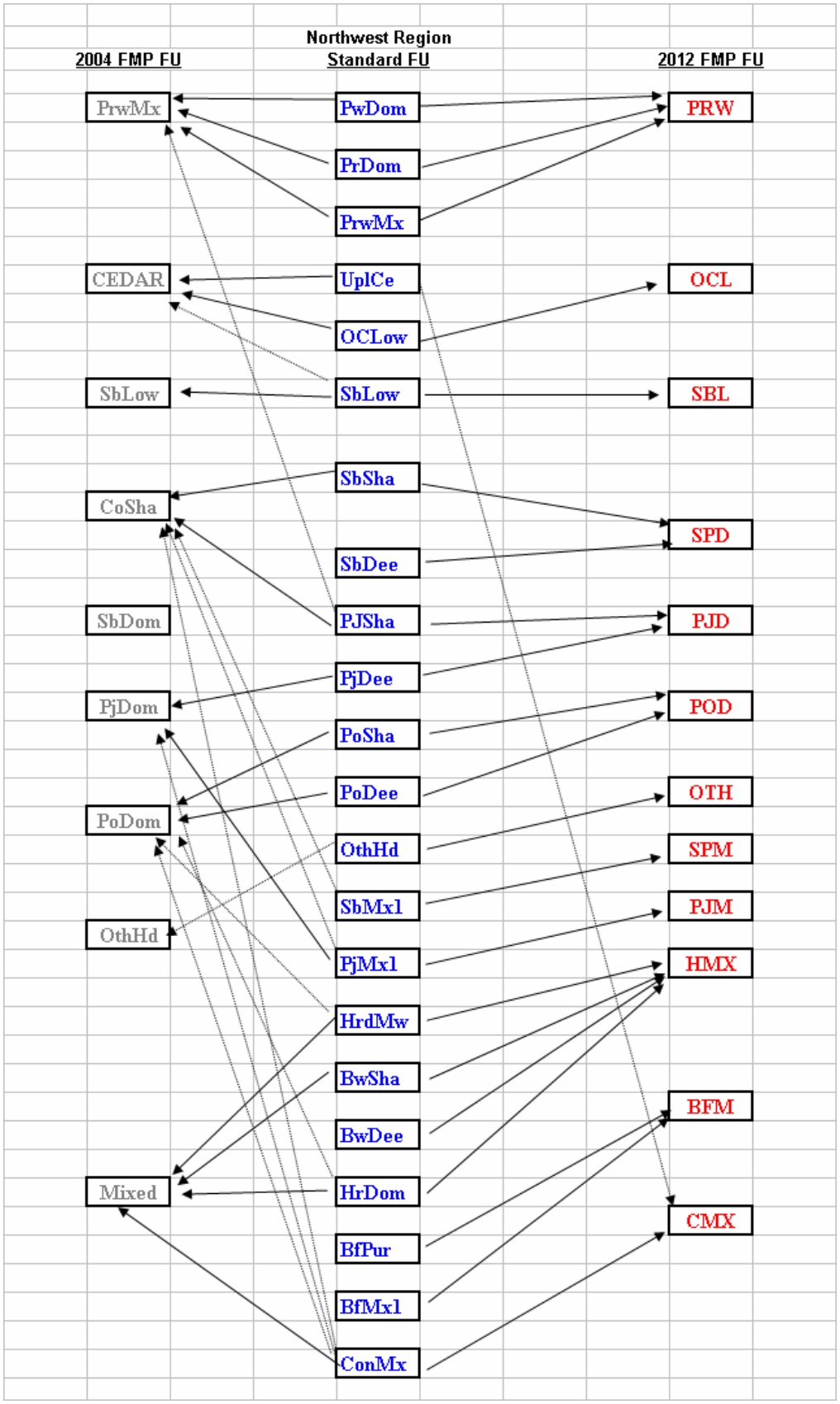
5.1.2 Plan Forest Units (PLANFU)

The first step in the development of plan forest units for this 2012 FMP was agreement that it was a cooperative process with the Kenora Forest 2012-2022 Planning Team and that both forest management plans would be prepared using the same forest unit definitions. Preparing 2012 plans for these adjacent forests utilizing the same forest units was considered a key objective as identical forest units would streamline future planning if there was a potential land base amalgamation and identical forest units would streamline future reporting of forest management activities. Another consideration was that by utilizing the same suite of forest units, there were some efficiencies to be realized in plan development for the 2012 plans (e.g. strategic modelling inputs, plan documentation, etc.). While development of forest units was a joint process between two planning teams, both teams separately demonstrated the appropriateness of the final PLANFUs to each of the two individual management units.

The Forest Resource Inventory parameters used for the development of these forest units were species composition, stocking, site class, age and ecosite (for shallow and wet soils). A number of adjustments were made to the Whiskey Jack Forest 2004 FMP forest units to be more consistent with the Northwest Region Standard Forest Units. With only very minor exceptions, each standard forest unit fit into a single PLANFU. The relationship between standard forest units and plan forest units are documented in Figure 2 below. This strong correlation between PLANFUs and SFUs was important since many forest diversity and forest condition desirable levels and targets were based on science developed for the Ontario Landscape Tool, which utilized inputs documented primarily by standard forest units. Better correlation in forest units to SFUs allowed better analysis of projections to Ontario Landscape Tool Simulated Ranges of Natural Variation (SRNV)(Section 6.2.4).

A number of Regional Standard Forest Units were amalgamated to create the 2012-2022 Whiskey Jack Plan Forest Unit. Major ones are the **UplCe** was lumped into **CMX** since **UplCe** is on a much more productive site than **OCLow**, and only makes up 3,545 ha , **HrDom, HrdMw, BwDom and BwSha** was lumped to create **HMX, BfPur** was lumped with **BfMx1** to create **BFM, PrDom, PwDom and PrPrMx** was lumped to create **PRW.** These areas were lumped because they represent small area as shown in Table 2.

Figure 2 Correlation Between 2004 and 2012 FMP Planned Forest Units



The PLANFU forest units are summarized in Table 3 and are consistent with Table FMP-2. These PLANFU descriptions were used to classify stands in the planning inventory.

Table 3 Whiskey Jack Forest 2012-2022 FMP Forest Units

Planned Forest Unit Code	Name	Ecosites (descending order of NW ES occurrence, only areas >100 ha)	FRI Parameters & Criteria (Script to be applied in specific sort order)
PRW	Red Pine and White Pine Mixedwood	11, 18, 15, 24.	SORT ORDER 1: PW+PR >= 40
CMX	Conifer Mixedwood	12, 21, 11, 17, 18, 27, 26, 14, 25, 29, 22, 32, 15, 20, 19, 24.	SORT ORDER 2: CE>=20 And (ECOSITE1 Like 'NW17*') SORT ORDER 13: SB+PJ+BF+SW+CE+PW+PR+LA+HE>=50
OCL	Other Conifer Lowland	37, 36, 12, 35.	SORT ORDER 3: ((CE+LA>=50 Or WG='Ce' Or WG='La')) And PR+PW+PJ+SW+BW<10
SBL	Black Spruce Lowland	35, 36, 37, 34.	SORT ORDER 4: (((ECOSITE1 Like 'NW34*' And PR+PW+PJ+SW+BF<=20) Or (ECOSITE1 Like 'NW35*' Or ECOSITE1 Like 'NW36*' Or ECOSITE1 Like 'NW37*') Or (ECOSITE1 Like 'NW38*' And (WG='Sx' Or WG='Sb' Or WG='Ce' Or WG='La'))))
SPD	Spruce Dominated Upland	12, 20, 22, 21, 26, 31, 27, 25.	SORT ORDER 5: SB+SW>=70 And PO+PB+BW<=20
PJD	Jack Pine Dominated	12, 20, 21, 25, 14, 13, 11.	SORT ORDER 6: ((PJ>=70 And PO+PB+BW<=20) Or (PJ>=50 And PO+PB+BW<=20 And AGE>=120) Or (PJ>=70 And (ECOSITE1 Like 'NW13*' Or ECOSITE1 Like 'NW14*')))
POD	Poplar Dominated	29, 19, 12, 30, 23, 33, 16, 28, 11.	SORT ORDER 7: PO+PB>=70
OTH	Other Hardwood	38, 33, 30, 29, 19, 12, 11.	SORT ORDER 8: MS+AB+EW+OW+QR+BD>=30
SPM	Spruce Dominated Mixedwood	12, 21, 20, 26, 11, 22.	SORT ORDER 9: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And (SB+SW)>PJ
PJM	Jack Pine Mixedwood	12, 21, 20, 11, 25, 14, 18.	SORT ORDER 10: PR+SB+PJ+SW+BF>=70 And BF<=10 And PO+PB+BW<=20 And PJ>=(SB+SW)
BFM	Balsam Fir Mixedwood	12, 21, 11, 27, 18, 26, 14, 32, 24, 22.	SORT ORDER 11: PR+SB+PJ+SW+BF+PW+CE+LA+HE>=70 And BF>10 And BF+SW>=30
HMX	Hardwood Mixedwood	12, 19, 29, 11, 30, 16, 23, 18, 21, 33, 28, 27, 24, 15.	SORT ORDER 12: PO+PB+BW+MS+AB+EW+OW+QR+BD>=50

The average species composition, site class and stocking for the planned forest units are reported below in Table 4:

Table 4 Average Stand Information by Forest Unit

PLANFU	CNT	TAREA	A HT	A STKG	A SC	A PO	A PJ	A PR	A PW	A SB	A SW	A LA	A CE	A AB	A BF	A BW	A MR
BFM	2,565	22,443	7.19	0.66	2	7	3	0	0	29	7	0	0	0	46	7	-
CMX	8,052	70,611	8.65	0.69	2	21	25	0	0	31	2	0	3	0	7	11	-
HMX	9,132	77,897	13.36	0.68	3	43	9	0	0	16	4	0	1	1	8	17	-
OCL	255	1,556	11.76	0.69	3	0	-	-	-	18	-	31	46	4	0	-	-
OTH	322	1,475	14.98	0.73	3	12	0	-	-	8	1	1	7	67	1	1	-
PJD	17,280	145,069	7.73	0.85	2	4	84	0	0	10	0	0	0	-	0	1	-
PJM	6,897	47,807	10.62	0.71	2	7	53	1	0	33	1	0	0	-	1	2	-
POD	7,520	52,826	15.06	0.74	2	81	4	0	0	6	3	-	0	1	3	3	-
PRW	493	1,133	16.50	0.60	2	17	6	34	23	8	2	-	1	-	5	3	-
PRW	1	5	16.00	0.30	2	10	10	20	40	10	-	-	-	-	-	-	10
SBL	363	1,382	6.12	0.68	2	11	22	-	0	38	0	9	9	2	2	6	-
SPD	13,734	110,870	7.94	0.67	2	2	6	0	0	84	2	1	0	0	3	2	-
SPM	4,250	38,960	8.45	0.66	1	7	30	0	0	54	1	0	0	0	3	4	-

5.1.3 Forest Landscape Classes

The *Forest Management Guide for Landscapes* (Landscape Guide) was still being drafted and was not required to be applied to forest management plans in the Boreal Forest at the time of preparation of this 2012 Whiskey Jack Forest FMP. However, the information on biodiversity indicators and the simulated ranges of natural variation for these biodiversity indicators was considered the best available science by the Planning Team and regional advisors. Therefore a management objective indicator related to landscape class area was included in this 2012 FMP in Table FMP-9. This approach was endorsed by the Planning Team and LCC and was consistent with regional and provincial FMP training provided to 2012 FMP Planning Teams.

The following excerpt discussing landscape classes is from the draft *Forest Management Guide for Landscapes (MNR, 2008)*:

> *"A landscape provides habitat for a mixture of wildlife species, each with its own preferences for combinations of vegetation types, seral stages, patch sizes and configurations. It would be impossible to assess landscapes for each species of wildlife individually within the context of a forest management plan therefore the landscape guide uses a classification of landscapes according to our understanding of how forests function as habitat (as codified through wildlife habitat matrices (e.g., Holloway et al. 2004)). Landscape classes for both the Boreal Forest and the Great Lakes – St. Lawrence Forest are based on a cluster analysis of the preferred habitat types (forest units and seral stages) used by a range of wildlife."*

The amount of area by landscape class is a non-spatial measure of the area, in hectares, of the landscape classified into landscape classes. Seven landscape classes have been developed for assessment in the Northwest Region. These landscape classes incorporate forest type attributes, age and to a limited degree site (e.g. upland / lowland designation for conifer forests).

The assessment of area by landscape class is new for 2012 FMP Planning Teams and has not been included in forest management plans for the Whiskey Jack Forest previously. Landscape classes are measured during strategic modelling analysis and areas are not tagged within the Base Model Inventory. Areas by landscape class have been incorporated into the Ontario Landscape Tool (OLT) to approximate the best estimate of the simulated range of natural variation for the Whiskey Jack Forest. The planning team compared the Plan Start 2012 landscape class areas to the OLT suggested natural range in area and determined an

appropriate landscape class objective indicator and desirable levels during development of the Long-term Management Direction.

The seven landscape classes are described in **Table 5** with reference added for which plan forest units are included in each landscape class (subject to age criteria included in Table 6).

Table 5 Northwest Region Landscape Classes

(excerpt from Ontario Landscape Tool Science and Information Package A with PLANFU column added)

Landscape Class	Northwest Region 3W, 4S, 4W, 3S Landscape Guide Forest Unit	Development Stages	Corresponding Plan Forest Units (PLANFUs)
1 - Presapling & Sapling	All	Pre-sapling, Sapling	All
2 - Immature Conifer	BfDom, ConMX, PjDee, PjMx1, PrwMx, SbDee &SbMx1	Immature	BFM, CMX, OCL, PJD, PJM, PRW, SBL, SPD, SPM.
3 - Immature Hardwood	BwDom, HrdMw, HrDom, OthHd, PoDee,	Immature	HMX, POD, OTH
4 – Mature & Late Balsam Fir	BfDOM	Mature, Late	BFM
5 – Mature & Late Lowland Conifer	OcLow, SbLow	Mature, Late	OCL, SBL.
6 – Mature & Late Hardwood & Mixed	BwDom, HrdMw, HrDom, PoDee	Mature, Late	HMX, POD, OTH
7 – Mature & Late Upland Conifer & Mixed	ConMx, PjDee, PjMx1, PrwMx, SbDee & SbMx1	Mature, Late	CMX, PJD, PJM, PRW, SPD, SPM.

Table 6 Northwest Region Landscape Development Stage Onset Ages by Forest Unit

Onset Age (years) by Stage:	Forest Unit:											
	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
Presapling	0	0	0	0	0	0	0	0	0	0	0	0
Sapling	5	10	5	10	5	10	10	5	10	10	10	10
Immature	10	30	10	30	10	30	30	10	20	30	30	30
Mature	60	70	60	70	60	70	70	60	80	70	70	70
Late Successional	80	100	100	100	90	100	100	100	140	160	120	110

5.2 Management Decision Information

5.2.1 Management Zones (SMZ, OMZ)

In the development of the long-term management direction, the planning team chose to partition the management unit into management zones. A management zone is a geographical area within a management unit that provides spatial context to the long-term management direction, and may influence strategic analysis, and operational planning. Two types of management zones, strategic and operational, were used to represent spatial considerations. Strategic management zones represent areas with distinct ecological characteristics, landscape biodiversity requirements or forest-level harvest and retention considerations. Strategic management zones are identified in the SMZ field of the spatial PCM inventory information, and operational management zones are identified in the OMZ field.

The Planning Team recognized the area of caribou habitat management as a strategic management zone. The Planning Team decided to consider deer and moose management areas at the operational level and did not classify related areas as strategic management zones.

These management zones are described in more detail below:

Strategic Management Zones

Patch patterns which simulate those believed to occur naturally from fire, blowdown, insects and disease, in conjunction with use of the appropriate wildlife and silvicultural guidelines, should ensure the broad range of habitats needed for all of the wildlife species found in the Whiskey Jack Forest. Population monitoring (in Ontario, but not necessarily in the Whiskey Jack Forest) will be required to help assess some of the assumptions being made with respect to the present and future habitats used by wildlife in Ontario forests.

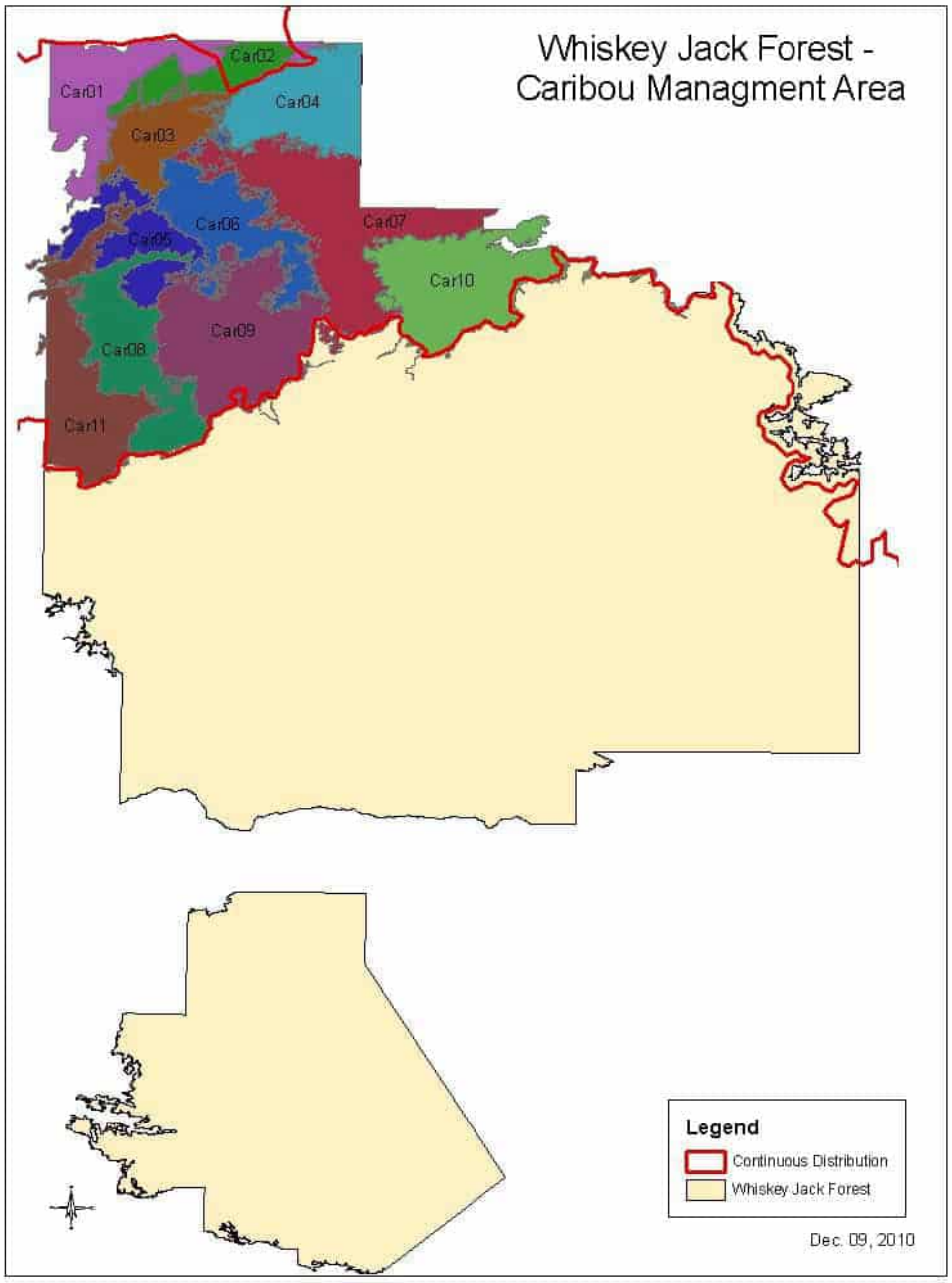
Currently, MNR's delineation of the area of continuous range occupancy for woodland caribou is the primary division of the management zone for caribou (strategic zone) and the rest of the management unit being managed primarily for marten (strategic), moose (operational) and deer (operational).

For strategic purposes in this 2012 FMP, it was agreed to continue to implement the existing 2004 FMP sub-management units which represented the caribou habitat mosaic blocks where caribou habitat management was the primary consideration. The caribou zone and the caribou mosaic blocks within the caribou zone are shown in Figure 3. Caribou dynamic habitat schedule blocks (caribou blocks Car01 through to Car11) are strategic management zones and are identified in the SMZ field of the spatial PCM inventory information.

The *Forest Management Guidelines for the Provision of Marten Habitat (MNR, 1996)* was applied to the Whiskey Jack Forest for this plan. Spatial analysis was conducted for marten with additional habitat definitions of capable and suitable included. The intent of the marten guideline is to provide large contiguous areas of mature conifer-dominated forest as habitat. The strategic landscape level application of the guidelines directed planning teams to develop core areas of suitable marten habitat in 3,000 to 5,000 hectare blocks to be deferred from harvesting. The planning team applied the strategic landscape level section of the marten guidelines on 25 relatively large contiguous areas (marten core habitat areas or large, landscape patches) of Crown land on Whiskey Jack Forest (

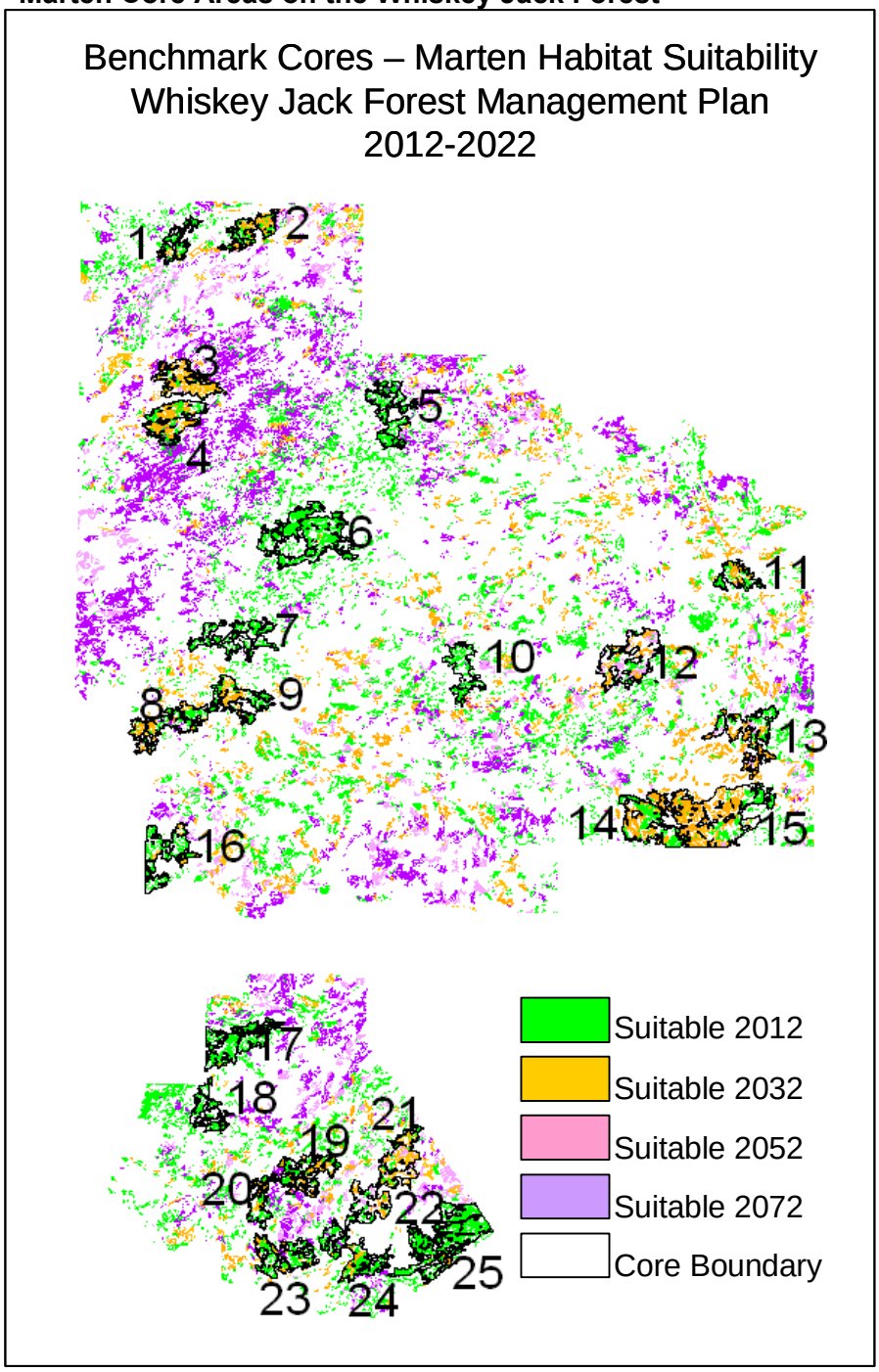
Figure **4**). Marten core areas outside of the caribou management zone are strategic management zones and are identified in the SMZ field of the spatial PCM inventory information. The caribou blocks are the primary SMZ in the caribou management zone, therefore marten cores in the caribou zones Car01 to Car11 are not identified in the SMZ field of the PCM inventory.

Figure 3 Caribou Habitat Management Zone on the Whiskey Jack Forest



Detailed spatial habitat analysis is documented in Supplementary Documentation N – Spatial Analyses: Caribou Habitat.

Figure 4 Marten Core Areas on the Whiskey Jack Forest



Detailed spatial habitat analysis is documented in Supplementary Documentation N – Spatial Analyses: Marten Habitat.

5.2.2 Sub-management Units (SUBMU)

The management unit was classified into sub-management units to recognize the areas within the caribou management zone that have defined dynamic caribou habitat schedules.

5.2.3 Silviculture Intensity (SI)

Silviculture Intensity (SI) indicates a term in forest modelling to provide an indicator of productivity and the expected growth and development pattern and applies only to even-aged forest stands that are managed under the clear-cut silvicultural system.

The Strategic Task Team started by reviewing the previous plan SI by forest unit to determine if they were consistent with current thinking or needed to be update based on operations and silvicultural regeneration standards. The team used a strategy to identify silviculture intensity by defining the objective of the SI and then determining how to represent it in the inventory and modelling. The intent was also to be consistent with the Silvicultural Ground Rules (SGRs)(Table FMP-4). The forest condition objectives for each silviculture Intensity are declared in Table 7 Silvicultural Intensities which represents the Strategic Task Team's decision on how to classify the managed forest stands by silvicultural intensity.

Silvicultural intensities are used to represent both present and future forest conditions.

***Present*:** All stands in current forest except those classified as treated (seeding, plantations) in the inventory.(>30 years of age).

***Extensive*:** Current and Future forest: all areas renewed naturally or with low-cost silviculture. (Current forest that does meet present stocking condition, may or may not be managed)

***Basic1*:** Current forest: all stands that received seed or low density planting in the inventory, that are not density regulated. Future forest: all areas renewed with moderate silvicultural investment (seeding or plantation/natural combination).

***Intensive1*:** Current forest: all stands identified as plantations (including spaced-seeded areas) in the inventory. Future forest: all areas renewed with higher silvicultural investment or resulting in a density regulated forest.

***Basic2*:** Not Used.

***Intensive2*:** Not Used. Can be utilized to reflect a second density regulated condition in addition to Intensive1 (i.e. different average species composition with density regulation).

Assumptions used to Define Silvicultural Intensities in Base Model Inventory:

Silvicultural Intensity (SI) classification is based on forest unit species definition, stocking, DEVSTAGE and age.

Stands must meet forest unit species composition definitions.

Sort for Present intensity stands first, then sort for the highest valid silvicultural intensity followed by classification downwards to Basic and Extensive.

Stocking = site occupancy.

1 Table 7 Silvicultural Intensities

	Silvicultural Intensity					
Forest Unit	**Present**	**Extensive**	**Basic1**	**Intensive1**	**Basic2**	**Intensive2**
BFM	Average species composition and stocking from inventory for stands >= 30 years old and any DEPNAT, NEWPLANT, NEWSEED, FTGNAT	All NEWNAT. All stands less than 30 years old not already tagged with higher intensity. (<66%)	(FTGPLANT, FTGSEED, or THINPRE) (>=75%)	Not used	Not used	Not used
CMX	Average species composition and stocking from inventory for stands >= 30 years old and any DEPNAT, NEWPLANT, NEWSEED,FTGNAT	All NEWNAT. All stands less than 30 years old not already tagged with higher intensity. (<70%)	(FTGPLANT, FTGSEED, or THINPRE) (>=70% and <80%) or >110%.	(FTGPLANT, FTGSEED, or THINPRE). (>=80% and <=110%)	Not Used	Not Used
HMX	Average species composition and stocking from inventory for stands >= 30 years old and any DEPNAT, FTGNAT, NEWPLANT, NEWSEED and any stands < 30 years old with stocking >= 70%.	All stands less than 30 years old and stocking <70% The extensive curve will be the same as the present curve	Not used	Not used	Not used	Not used
OCL	Average species composition and stocking from inventory for stands >= 30 years old and any DEPNAT, NEWPLANT, NEWSEED	All stands less than 30 years old, not tagged as Present.	Not used	Not used	Not used	Not used
OTH	Average species composition and stocking from inventory for stands >= 30 years old and any DEPNAT, NEWPLANT, NEWSEED	All stands less than 30 years old. -(<75%)	Not used	Not used	Not used	Not used
PJD	Average species composition and stocking from inventory for stands >= 30 years old and any DEPNAT, NEWPLANT, NEWSEED, FTGNAT	All NEWNAT. All stands less than 30 years old not already tagged with higher intensity. (<80%)	(FTGPLANT, FTGSEED, or THINPRE). (>=80% and <90%)	(FTGPLANT, FTGSEED, or THINPRE) where stocking (>=90% and <=110%)	Not used	Not used
PJM	Average species composition and stocking from inventory for stands >= 30 years old and any DEPNAT, NEWPLANT, NEWSEED, FTGNAT	All NEWNAT. All stands less than 30 years old not already tagged with higher intensity. (<70%)	(FTGPLANT, FTGSEED, or THINPRE) (>=70% and <80%) or >110%.	(FTGPLANT, FTGSEED, or THINPRE) where stocking (>=80% and <=110%)		
POD	Average species composition and stocking from inventory for stands >= 30 years old and any DEPNAT, NEWPLANT, NEWSEED	All stands less than 30 years old. (<80%) The extensive curve will be the same as the present curve	Not used	Not used	Not used	Not used
PRW	Average species composition and stocking from inventory for stands >= 30 years old and any DEPNAT, NEWPLANT, NEWSEED, FTGNAT	All NEWNAT. All stands less than 30 years old not already tagged with higher intensity. (<60%)	(FTGPLANT, FTGSEED, or THINPRE) (>=60% and <80%) or >110%.	(FTGPLANT, FTGSEED, or THINPRE) where stocking >=80 and <=110% **and Pr >= 70%.**	Not used	Not used

	Silvicultural Intensity					
Forest Unit	**Present**	**Extensive**	**Basic1**	**Intensive1**	**Basic2**	**Intensive2**
SBL	Average species composition and stocking from inventory for stands >= 30 years old and any DEPNAT, NEWPLANT, NEWSEED, FTGNAT	All NEWNAT. All stands less than 30 years old not already tagged with higher intensity. (<70% and >110%)	(FTGPLANT, FTGSEED, or THINPRE) where stocking >=70% and <=110%	Not used	Not used	Not used
SPD	Average species composition and stocking from inventory for stands >= 30 years old and any DEPNAT, NEWPLANT, NEWSEED, FTGNAT	All NEWNAT. All stands less than 30 years old not already tagged with higher intensity. (<70%)	(FTGPLANT, FTGSEED, or THINPRE) (>=70% and <80%) and >110%.	(FTGPLANT, FTGSEED, or THINPRE) where stocking >=80 and <=110%.	Not used	Not used
SPM	Average species composition and stocking from inventory for stands >= 30 years old and any DEPNAT, NEWPLANT, NEWSEED, FTGNAT	All NEWNAT. All stands less than 30 years old not already tagged with higher intensity. (<70%)	(FTGPLANT, FTGSEED, or THINPRE) (>=70% and <80%) or >110%.	(FTGPLANT, FTGSEED, or THINPRE) where stocking (>=80% and <=110%)		

Note: All NEWPLANT, NEWSEED will be PRESENT.

1

5.3 Documentation of the Current Forest Condition Checkpoint

Progress Checkpoint #2 approval of the Current Forest Condition was received on January 19, 2011.

From: Hole, Scott (MNR)
To: Duda, Steve (MNR) ; Mohamed, Hassan (MNR) ; Pochailo, Kurt (MNR) ; Susan Jarvis
Cc: Salter, David (MNR) ; Ride, Kevin (MNR)
Sent: Wednesday, January 19, 2011 8:57 AM
Subject: Current Forest Condition checkpoint

All:

I have received confirmation from the Regional advisors that the materials submitted for the Current Forest Condition Checkpoint satisfy the requirements of the Forest Management Planning Manual.

Provided the rest of the advisors and planning team members agree, the checkpoint can be considered passed.

Scott Hole, R.P.F.
Resource Analyst
Northwest Region Planning Unit
p. 807-475-1444
f. 807-473-3023

PART 3: BASE MODEL INVENTORY and BASE MODEL

6.0 Base Model Inventory and Base Model

The Strategic Forest Management Model (SFMM) was used as the primary analysis tool for the strategic analysis. This tool is used to track the entire Whiskey Jack Forest land base through time, and produce projections of changes to the forest structure and composition for 160 years into the future. SFMM also allows for the evaluation of forested areas and their contribution to forest diversity, timber production, old forest area and wildlife habitat through time.

The first step in the strategic analysis for the management plan was development of a base model inventory used for the initial forest land base within the Strategic Forest Management Model. Secondly, a suite of SFMM modelling inputs for natural forest dynamics, silvicultural options and management options were developed that would provide structure to the projected natural and human-influenced changes projected within the SFMM model. The base model serves as the common starting point for development of the long-term management direction.

6.1 Development of the Base Model Inventory

The *Forest Information Manual Forest Management Planning Technical Specifications,* Nov. 2009, Section 4.1.9.1 gives the following description and direction towards creating a base model inventory.

> *"The base model inventory is a union of the planning composite and the forecast depletions into one spatial data layer. This layer provides the necessary information to generate the inputs for spatial and non-spatial models required for strategic modelling in the long-term management direction."*
>
> "The tabular attributes associated with the base model inventory will be the same as those of the planning composite. This process requires that forest stand description information be updated to reflect the estimated result of activities planned for the remainder of the current plan term – this is a best approximation. Forest Classification attributes, as identified in the planning composite coverage polygon attribute table, will be populated for forest polygons."

The Base Model Inventory for the Whiskey Jack Forest was created through updating information in the Forest Classification Fields in the Approved Planning Inventory (Planning Composite and Forecast Depletion Layer (MU490_12PCM00 & MU490_12FDP00) and then creating a union of these two layers. What follows is a description of how each Forest Inventory and Classification attribute was updated.

Forecast Depletions - The forecast depletion coverage was prepared based on the Forest Management Planning Technical Specification (2009) requirement. The coverage contains projected harvest allocations from the 2004-2012 Whiskey Jack Forest FMP not yet declared harvested through annual reports for the Whiskey Jack Forest, and the draft (not from an approved Annual Report yet) actual depletions from 2009-2010. The LTMD task team reviewed the forecast depletions and agreed that this was the best estimate based on current information.

6.1.1 Management Decision Information

6.1.1.1 Managed / Unmanaged Indicator (MANAGED)

This attribute applies to Crown forest area only and indicates whether or not there is a legal or land use planning decision which prevents the land from being managed for timber. The classification is as follows:

- Ownership (OWNER) = 1 ---------- Managed
- OWNER = 5 or 7 ---------- Unmanaged.
- OWNER = 2, 3, 4, 6 or 9 ---------- Null.

6.1.1.2 Stand Type (TYPE)

The TYPE attribute was populated with standard historical stand type data.

6.1.1.3 MNR Code (MNRCODE)

The MNRCODE attribute was populated with standard historical values.

6.1.1.4 Stand Age (AGE)

This attribute indicates the average age of the dominant and co-dominant trees based on the working group species in a forest stand at the start of the new plan term (2012). This was calculated from the difference between the plan start (2012) and the YRORG value.

6.1.1.5 Silviculture System (SILVSYS)

This attribute indicates the Silvicultural System for forest stands that have been identified as available for timber production in the AVAIL attribute. The main harvest method for the Whiskey Jack Forest is clearcut harvest. At current time there are not plans on performing shelterwood or selection harvest in the area. It was agreed that all available forest stands would be designated as “CC” (Clearcut).

6.1.1.6 Stage of Management (MGMTSTG)

This attribute indicates the next harvest or cut treatment that is scheduled to occur in a productive forest stand being managed for timber production (AVAIL=A). The main harvest method for the Whiskey Jack Forest is clearcut harvest. Therefore, by default the only available management stage under the clearcut harvest system is “CLEARCUT”. It was agreed to populate this attribute with “CLEARCUT”.

6.1.1.7 Source of Silviculture Intensity (SISRC)

The source of silviculture intensity attribute indicates how the silviculture intensity (Section 4.1.2.6) values was determined. For this FMP, the values of SI were calculated based on inventory attribute information. This type of classification is represented by “ASSIGNED” value. Therefore, the majority of the SISRC was classified as “ASSIGNED”. For those stand that may have had actual survey results information available, there was the potential to classify the SI with a value that best represented the yield curve and SI criteria. However, most of the survey information that has been gather over the past few years has either not been analyzed to generate the SI value or lacks the required information to assign the individual stand SI as is defined for the 2012 FMP. Therefore, at this time no stands were updated with survey information for SI. The decision was to classify all stands as “ASSIGNED”.

6.1.1.8 Availability Indicator (AVAIL)

The availability indicator identifies which portions of the managed Crown production forest are available for timber production or not. The availability of forest is based on several pieces of information such as access, land use designation, physical operability limitation and managed decisions. Those MANAGED Crown land stands that are deemed unavailable are considered as reserves for the modeling purposes. An additional attribute field (RESERVE) was added to the inventory information to classify the unmanaged forest into different reserve types. A summary of the classification for Available and Reserves are include in the following table.

Table 8 Summary of Crown Forest Availability and Reserve Types

SFMM Reserve Code	Reserve Query for Inventory	Availability	Reserve
Protection Forest	FORMOD = "PF"	U	Protf
Parks and Protected Areas	OWNER = "5" or "7"	U	Parks
Islands	Access1 = "ISL"	U	Islnd

Once the Base Model Inventory was created the following modifications were made to enhance the strategic modelling:

6.1.1.8.1 Slope-based Reserves

Slope based shoreline reserves were added to all lakes, rivers and streams. Reserve widths were based on slope calculated through MNR's digital terrain model and widths were applied as follows:

Slope%	Reserve Width
0-15	30 m reserve
16-30	50 m reserve
31-45	70 m reserve
>45	90 m reserve

Reserves were applied from the treed edge (polytype FOR, TMS, RCK, BSH) to simulate the guidelines direction that the reserve will be measured from the edge of vegetation communities capable of providing a effective barrier to the movement of sediment such as alders, willows, labrador tea and leatherleaf. There was discussion regarding whether or not to use standing timber as the start of the reserve width, however this was considered an overestimate of the amount of reserves. This is taking into consideration that the new Stand and Site Guide allows for harvesting of a portion of the shoreline reserves and operationally shoreline reserves along rivers and streams are usually measured from woody shrubs and not from standing timber. These reserves were then intersected with the inventory, and each stand was analyzed to determine the amount of area in reserve. This area was then added as additional attribute in the inventory (no stands were harmed in the making of this inventory).

Reserve widths will be reviewed and adjusted during operational planning to ensure proper reserve widths as measured from the woody shrub line as directed in the Stand and Site Guide.

6.1.1.8.2 Tourism Reserves

It was recognized that high usage lakes will require larger reserves than what is necessary to protect the environment as generally there arises concerns from the public and the tourism industry that the aesthetics of the lake will be reduced if harvesting is adjacent to the shoreline. In order to portray this concern Tourism reserves of 90m width were placed on lakes that, based on past experience, would require reserves wider than the water quality buffers for social reasons. This includes virtually all lakes with cottages or resource based tourism operation accommodations. As per the water quality reserves (6.1.1.8.1), the area of reserve in each stand was calculated and updated in the inventory.

6.1.1.8.3 Nest Reserves

All stick nests currently identified on MNR's NRVIS layer were buffered using the new Stand and Site Guide direction with the following reserves:

Eagle: 200m reserve
Osprey: 150 m reserve
Blue Heron: 300 m reserve

As per the water quality reserves (6.1.1.8.1), the area of reserve in each stand was calculated and updated in the inventory.

6.1.1.8.4 Harvest Reserves and Deferrals

The Whiskey Jack Forest is a fragmented forest with a long history of harvesting. It was observed that there are numerous areas where there is merchantable wood adjacent to recently harvested areas; however the area is too small to be allocated as harvest area on its own. In order to ensure that SFMM does not overestimate available harvest area it was decided to defer the harvest of these smaller older (>70 years old) forest stands until the adjacent recently harvested areas would become eligible for harvest. The classification was done manually by spatially identifying the operational eligible areas and comparing adjacent stand information. A new attribute field (OP_DEF) was created to identify these areas in the inventory. A total of 7,823 ha were deferred for 40 years (net area not already tagged as reserve area) and an additional 33,417 ha were classified as unavailable reserve area type PASS and were not expected to be available in the future.

6.2 Development of the Base Model

The use of the SFMM model requires that land base, forest dynamics, silvicultural options, and management constraints and targets data be entered into the model. Within the four categories, the following items are required:

i) **Land Base Definition (Section 6.2.1)**: forest unit descriptions, listing of areas available and unavailable for timber production (by forest unit and age class), and non-forested land type descriptions. Land base data for unmanaged land within the management unit (e.g. Crown land parks and exclusions) is entered to facilitate the analysis of wildlife habitat and biodiversity. Islands and site class 4 sites are categorized as "reserve". Riparian reserves were estimated in the land base for strategic modelling purposes and were included as a "reserve" category. Non-Crown land (i.e. patent land) is not entered into the SFMM land base and does not contribute to wildlife habitat or forest diversity indices because the company does not have any control over activities on this patent land.

ii) **Forest Dynamics Information (Section 6.2.2)**: rates of natural succession from one forest type to another, rates of natural succession of non-forested land types to forested, forest development information (yield curves) for natural forest development and various silvicultural treatments.

iii) **Silvicultural Options (Section 6.2.3)**: harvest operability ranges, stumpage values, allowances for reserve prescriptions and unharvested volumes within harvest areas, conversion of harvested areas to non-forested land, forest renewal options, post-renewal forest succession rates, commercial thinning and tending treatment options, and active non-forest rehabilitation treatments options.

iv) **Management Objectives and Targets (Section 6.2.5)**: silvicultural budgets, stability of forest units, desired future forest condition, minimum landscape class and old forest area targets, minimum growing stock, species group definitions, harvest flow policies, harvest volume targets, stability and limits of harvest area, forest renewal limits, mid-rotation tending limits, non-forest rehabilitation limits, seedling availability and distribution limits.

Land base classifications have already been described in Analysis Package Sections 5.1 to 5.3 and Section 6.1. A summary of other base model inputs, data sources, and other model assumptions developed for the 2012 Whiskey Jack FMP by the planning team follows in Sections 6.2.1 to 6.2.5 of this Analysis Package.

6.2.1 Land Base Assumptions

Although the Planning Composite identified most areas that were not available for harvesting due to access, peninsula etc. further area was deemed as unharvestable, such as inoperable or had some management consideration, and then classified as Access or Management Reserve, and Unavailable. These areas were classified in the Base Model Inventory based on a spatial review of the inventory and were manually updated (described in Section 6.1.1).

In order to help with the classification and input of the inventory information into the modelling and for use in analysis, additional inventory attribute were included in the BMI. These attribute include individual species fields, three different age class attributes, standard forest unit and the plan forest unit from the 2004 FMP.

The individual tree species fields reflect the tree species contained in the Species Composition (SPCOMP) attribute. Each tree species attribute contains the percent composition included in the species string for that species. These attributes were included for ease of analysis of forest composition and is used in several modelling utility tool such as Ontario Marten Analyst 2.

The three age class attributes reflect a 20-year age class, a 10-year age class and a SFMM 10-year model input age class. The two regular age class attributes are used in the production of FMP tables and ease of use for operations and summarizing data. The SFMM age class will be used to directly input the inventory land base into the SFMM model. All the age classes reflect the age at plan start (2012).

This attribute is used to create sub management units such as ecological zones, watershed zones, wilderness zones, industrial working circles etc. Sub management units were used in the 2004 FMP for caribou management subunits, and to recognize the varied management considerations for the historic working circle areas. This approach was continued in the 2012 FMP.

For previous forest management plans, strategic modelling included inputs for wildlife habitat units and seral stages. These inputs were not used for this 2012 FMP as the forest condition (including various conditions providing varied wildlife habitat) was included and considered using different model inputs.

After the Base Model Inventory is completed and accepted for use, the various land base classifications are sorted to ensure the initial land base is entered correctly into the Strategic Forest Management Model (SFMM) for use in investigations and developing a Long-term Management Direction for the Whiskey Jack Forest. This SFMM initial land base was reconciled to Tables FMP-1 and FMP-3 (Table 9).

Table 9 Reconciliation of SFMM Initial Land Base to Tables FMP-1 and FMP-3

SFMM Classification	Area in Hectares		Inventory Classification (OWNER, and POLYTYPE)
	SFMM Model	FMP-1 and FMP-3	
Available	538,619	667,051	OWNER = 1, POLYTYPE = FOR.
			Available breakdown from FMP-3.
Reserve (Unavailable)			Includes OWNER = 1, LOWNAT DEVSTAGE area (20,036 ha).
Slope-based Riparian	64,763		Estimated reserve areas in SFMM are classified as available in FMP-3.
Tourism	10,373		Estimated reserve areas in SFMM are classified as available in FMP-3.
Nests	1,129		Estimated reserve areas in SFMM are classified as available in FMP-3.
Pass	33,417		Estimated reserve areas in SFMM are classified as available in FMP-3.
Protf	34,149	34,149	FORMOD = PF, OWNER = 1, 5, 7 (excludes forested islands)
Forested Islands - Crown Managed	3,123		ACCESS1 = ISL, OWNER = 1
Forested Islands - Park		2,003	ACCESS1 = ISL, OWNER = 5, 7.
Parks	38,309	36,306	FORMOD = FOR, OWNER = 5 or 7 only. (includes forested islands in SFMM)
Management Reserve	1,389		
Access	124		POLYTYPE = FOR, ACCESS1=LUD, NAT, PEN. OWNER = 1.
		6,039	Unavailable in Table FMP-3, OWNER = 1
Reserve (Unavailable) Subtotal	186,776	78,496	(unavailable includes 104 ha LOWNAT and 3,123 ha Forested Islands).
Non-forest and Non-Productive			
OpMsk	33,594	33,594	POLYTYPE = OMS, OWNER = 1, 5, or 7.
TrMsk	22,070	22,070	POLYTYPE = TMS, OWNER = 1, 5, or 7.
BrsAld	26,761	26,761	POLYTYPE = BSH, OWNER = 1, 5, or 7.
Grass & Meadow	13	13	POLYTYPE = GRS, OWNER = 1, 5, or 7.
Rock	19,001	19,001	POLYTYPE = RCK, OWNER = 1, 5, or 7.
Agricultural Land	0	0	POLYTYPE = DAL, OWNER = 1, 5, or 7.
Water	203,040	203,040	POLYTYPE = WAT, OWNER = 1, 5, or 7.
UCL	3,489	3,489	POLYTYPE = UCL, RRW, or BFL, OWNER = 1, 5, or 7.
Older LOWNAT	20,140		OWNER=1 only.
Non-forested Islands ISL	0	0	POLYTYPE = RCK, ACCESS1 = ISL, OWNER = 1, 5, or 7.
Subtotal	328,108	307,967	
TOTAL SFMM AREA	1,053,501	1,053,515	Total Ownerships 1, 5, and 7.
TOTAL CROWN LAND BASE	**1,053,501**	**1,053,515**	10 ha variance due to rounding convention during SFMM area import. Acceptable.
Patent Land	0	0	Total Patent Ownership = 2 (not included in SFMM land base).
TOTAL LAND BASE OF THE FOREST	**1,053,501**	**1,053,515**	

Hierarchy for Classification of SFMM Initial Land Base: (unique sort - once an area is tagged, it is not retagged.)

Order:

1 **Patent** - Sort for non-Crown ownership 2, all land types. (not included in SFMM land base, but is included in land base reconciliation to Table FMP-1)
NOTE: Non-Crown ownerships 6, 8, 9, and Patent ownership 3, 4, all land types, are not included in SFMM land base and not included in Table FMP-1.

2 **RESERVE - ProtF** - Sort for Protection Forest

3 **NON-FOREST** - Sort for non-productive forest classes based on POLYTYPE, includes:

ISL POLYTYPE = RCK and ACCESS1 = ISL (sorted before rock is tagged)
LOW LOWNAT and LOWMGMT (team decision to consider Crown, managed, non-productive for SFMM modelling).
OMS Open Muskeg
TMS Treed Muskeg
BSH Brush & Alder
GRS Grass & Meadow
DAL Designated Agricultural Land
UCL UCL, PIT, RRW, BFL
WAT Water
RCK Rock

4 Sort for unavailable **RESERVE** classifications:

PARKS Productive Crown park land (ownership 5 and 7)
ISLND Forested islands (Ownership 1)
RIPAR Estimated slope-based Riparian reserve
TOURS Estimated Tourism Reserve
NESTS Estimated Nest Reserve
Access Classified actual areas with access issues.
MgRes Classified Management Reserves not otherwise classified as reserve (above).

5 **AVAIL** - Remainder of forest available for timber production
- Crown, managed ownership 1 only
- productive, forested land and not otherwise estimated to be reserved from harvest or non-forest.
(deferrals for large landscape patches and delay in availability of certain stands (harvest deferral) is applied to this AVAIL land base only.)

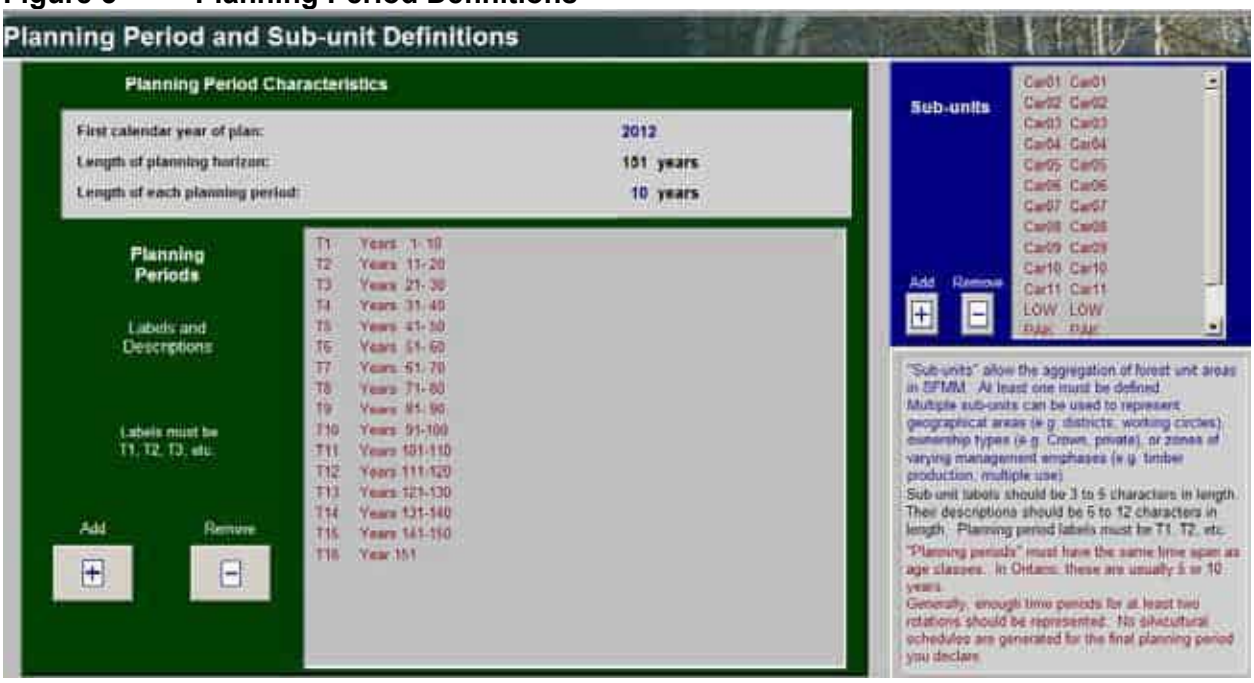
2

6.2.1.1 Other SFMM Land Base Information

6.2.1.1.1 Planning Period Definition

Ten-year terms were used for modelling which correspond with the 10-year period of this forest management plan (Figure 5). One 10-year annual available harvest area would apply to the full 10-year FMP. Ten-year terms were also suitable for other applications (dynamic caribou habitat schedule, and marten core area and operational deferrals). Ten-year terms were also used for the modelling for the 2001 and 2004 FMPs.

Figure 5 Planning Period Definitions



6.2.1.1.2 Estimated Riparian Reserves

Estimated riparian reserve area was included in the initial SFMM land base and was not included in the planning inventory (Section 4.0) but was used to refine AVAILABILITY in the Base Model Inventory (Section 4.1.1.8.1 Slope based Reserves). The estimated riparian reserve is not a management decision, but rather an estimate of a reduction to the available forest land base to better strategically modelling what is expected to occur during implementation of forest management plans. Estimated riparian reserves were derived from a computer based terrain analysis tool to use actual slope information to vary the projected reserve widths around waterbodies. This estimate of riparian reserve was intended to account for reserve area adjacent to water bodies based on actual percentage slopes. The degree of slope of the shoreline of the water body was used to determine the width of reserve suggested by the Stand and Site Guide. Riparian reserve area estimates calculated through the use of GIS spatial analysis were included in the modelling as “reserve” area by forest unit, age class and silvicultural intensity affected. This detailed estimate for modelling purposes reflects the “best information available” to the Planning Team and shows improvement in modelling assumptions since the 2004 FMP.

6.2.1.1.3 Provincial Landscape Classes

The assessment of area by landscape class is new for 2012 FMP Planning Teams and has not been included in forest management plans for the Whiskey Jack Forest previously. Landscape classes are measured during strategic modelling analysis (based on forest unit and age class) and areas are not tagged within the Base Model Inventory.

In order to assess non-spatial area by landscape class, inputs into the Strategic Forest Management Model (SFMM) were needed to allow the classification of the future forest into landscape classes (projected 10-160 years in the future during development of the Long-term Management Direction). This measurement of Plan Start 2012 areas by landscape class and comparison to future projected area by landscape class gave the Planning Team another tool to measure forest condition and regulate change in order to improve sustainability of the forest. The analysis of landscape class area through time is consistent with information projected by the Ontario Landscape Tool which was used for the setting of desirable levels for forest condition management objective indicators.

The representation of landscape class area was incorporated into SFMM through the use of additional "tree species" as a proxy for the additional landscape class areas. In order to measure the projected landscape class areas, SFMM inputs related to the landscape class were added to the growth and yield curves to count the hectares in each landscape class. Unharvested volume percentages were also refined ensure that projected harvest volumes were accurate and were not inflated due to the additional proxy tree species (count of hectares within landscape classes). Specific inputs for landscape class areas are included in the yield curves embedded in the SFMM input file.

6.2.1.1.4 Old Forest Area

As was discussed for landscape class area above, the area of old forest by groupings was included in the SFMM modelling to facilitate the projection and analysis of old forest area through time. Again, as with landscape class area, the area of old forest was accomplished through the tagging of "tree species" within the yield curves which are simply counters for area of old forest based on the forest unit and age class of the SFMM land base. Specific inputs for old forest areas are included in the yield curves embedded in the SFMM input file.

6.2.2 Forest Dynamics Assumptions

Assumptions pertaining to old-age natural forest succession and natural disturbances were also incorporated into the base SFMM model. Natural forest disturbance rates included in the base model reflected that fire suppression would be conducted should fires start on the Whiskey Jack Forest. The assumptions used are included in the SFMM Base Model and summarized in this Analysis Package.

6.2.2.1 Natural Succession

Natural succession patterns portray how certain forest types tend to succeed to other forest types once they reach a certain age, without intervention from catastrophic natural disturbances or harvesting. These transition rules are portrayed in strategic modelling as succession pathways.

Multiple succession entries are required to capture the dynamic nature of forests. Not all forest unit stands succeed at the same age. Multiple entries are also required to ensure that the full land base in a given forest unit eventually succeeds to younger age classes (and in some cases other forest units) in accordance with SFMM conventions for ageing and succeeding the forest.

The main assumptions for the development of the natural succession rules is succession occurs at the points where the species composition no longer meets the description of the forest unit. That is the main transition point between one forest unit to another. A second assumption is that the Present silviculture represents both naturally disturbed and successional forest conditions whereas Extensive, Basic1 and Intensive1 reflect silviculturally treated forest conditions. This mean all other silviculture intensities naturally succeed to a Present forest condition. The third natural succession assumption within each specific forest unit was based on gap phase and sub canopy dynamics. Succession to a lower age class occurs where overstory stocking in a forest unit is no longer the dominant forest type. At that point sub canopy composition and age class are assigned.

Natural succession inputs for this 2012 FMP originated with the baseline natural succession inputs used in the BFOLDS model (Boreal Forest Landscape Dynamics Simulator) which are prorated for the standard forest units of the forest inventory. These BFOLDS forest dynamics inputs form part of the science package developed to support the Ontario Landscape Tool (OLT) which is considered the best available science for landscape level forest composition and pattern simulations. Use of the BFOLDS natural succession inputs was considered important for this FMP as many of the forest composition targets included in the long-term management direction were derived from this same forest dynamic information. By using similar forest dynamics assumptions for each forest unit, the strategic LTMD modelling would be using the same underlying natural succession rules.

The natural succession rules for each forest unit and silvicultural intensity was checked to ensure all of the current stands were caught by a succession rule and that no areas were able to slip through and continue to age beyond a reasonable age for the forest unit. The succession rules were also checked and refined as necessary to ensure that any volume change resulting from application of the succession rule was reasonable and would not result in major volume gains or losses.

A delay of one 10-year term was included in the natural succession base model inputs. The inventory was already updated to 2012 therefore there was no need to apply natural succession rules in the strategic modelling to Term 1. Natural succession was included in the Base Model and not adjusted for any subsequent investigations.

Documentation of natural succession patterns by forest unit used for all SFMM investigations is detailed below (same for all subunits) and included electronically in investigation files in provided to MNR for plan review and approval.

```
*===================================================================*
* Natural Forest Succession                                        *
*===================================================================*

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 Car01 . BFM   . A85   . EXTEN   .  SPD   . A65   . Prsnt     0.02
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 Car01 . BFM   . A105  . EXTEN   .  SPD   . A85   . Prsnt     0.04
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 Car01 . BFM   . A125  . EXTEN   .  SPD   . A75   . Prsnt     0.04
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 Car01 . BFM   . A135  . Prsnt   .  SPD   . A135  . Prsnt     0.04
 Car01 . BFM   . A135  . EXTEN   .  BFM   . A55   . Prsnt     0.96
 Car01 . BFM   . A135  . EXTEN   .  SPD   . A135  . Prsnt     0.04
 Car01 . BFM   . A165  . Prsnt   .  BFM   . A55   . Prsnt     1.00
 Car01 . CMX   . A105  . Prsnt   .  BFM   . A105  . Prsnt     0.02
 Car01 . CMX   . A105  . Prsnt   .  SPD   . A65   . Prsnt     0.01
 Car01 . CMX   . A105  . Prsnt   .  SPM   . A75   . Prsnt     0.03
 Car01 . CMX   . A105  . EXTEN   .  BFM   . A105  . Prsnt     0.02
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 Car01 . CMX   . A105  . EXTEN   .  SPM   . A75   . Prsnt     0.03
 Car01 . CMX   . A105  . BASC1   .  BFM   . A105  . Prsnt     0.02
 Car01 . CMX   . A105  . BASC1   .  SPD   . A65   . Prsnt     0.01
 Car01 . CMX   . A105  . BASC1   .  SPM   . A75   . Prsnt     0.03
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 Car01 . CMX   . A125  . Prsnt   .  SPD   . A125  . Prsnt     0.09
 Car01 . CMX   . A125  . Prsnt   .  SPM   . A65   . Prsnt     0.24
 Car01 . CMX   . A125  . EXTEN   .  BFM   . A65   . Prsnt     0.05
 Car01 . CMX   . A125  . EXTEN   .  SPD   . A125  . Prsnt     0.09
 Car01 . CMX   . A125  . EXTEN   .  SPM   . A65   . Prsnt     0.24
 Car01 . CMX   . A125  . BASC1   .  BFM   . A65   . Prsnt     0.05
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 Car01 . CMX   . A125  . BASC1   .  SPM   . A65   . Prsnt     0.24
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 Car01 . CMX   . A135  . EXTEN   .  SPM   . A55   . Prsnt     0.75
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 Car01 . OTH   . A155  . EXTEN   .  OTH   . A85   . Prsnt     1.00
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Car01 . PJD  . A125 . BASC1  . CMX  . A65  . Prsnt    0.03
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Car01 . PJM  . A145 . BASC1  . SPD  . A55  . Prsnt    1.00
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Car01 . POD  . A85  . EXTEN  . HMX  . A85  . Prsnt    0.06
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 Car01 . POD   . A125  . Prsnt   .  HMX   . A45   . Prsnt     0.95
 Car01 . POD   . A125  . Prsnt   .  SPD   . A45   . Prsnt     0.04
 Car01 . POD   . A125  . EXTEN   .  BFM   . A65   . Prsnt     0.01
 Car01 . POD   . A125  . EXTEN   .  HMX   . A45   . Prsnt     0.95
 Car01 . POD   . A125  . EXTEN   .  SPD   . A45   . Prsnt     0.04
 Car01 . POD   . A145  . Prsnt   .  HMX   . A45   . Prsnt     1.00
 Car01 . PRW   . A205  . Prsnt   .  CMX   . A105  . Prsnt     0.25
 Car01 . PRW   . A205  . EXTEN   .  CMX   . A105  . Prsnt     0.25
 Car01 . PRW   . A205  . BASC1   .  CMX   . A105  . Prsnt     0.25
 Car01 . PRW   . A205  . INTN1   .  CMX   . A105  . Prsnt     0.25
 Car01 . PRW   . A225  . Prsnt   .  PRW   . A155  . Prsnt     1.00
 Car01 . PRW   . A225  . EXTEN   .  PRW   . A155  . Prsnt     1.00
 Car01 . PRW   . A225  . BASC1   .  PRW   . A155  . Prsnt     1.00
 Car01 . PRW   . A225  . INTN1   .  PRW   . A155  . Prsnt     1.00
 Car01 . PRW   . A255  . Prsnt   .  PRW   . A155  . Prsnt     1.00
 Car01 . SBL   . A215  . Prsnt   .  SBL   . A135  . Prsnt     1.00
 Car01 . SBL   . A215  . EXTEN   .  SBL   . A135  . Prsnt     1.00
 Car01 . SBL   . A215  . BASC1   .  SBL   . A135  . Prsnt     1.00
 Car01 . SBL   . A245  . Prsnt   .  SBL   . A135  . Prsnt     1.00
 Car01 . SPD   . A185  . Prsnt   .  BFM   . A55   . Prsnt     0.03
 Car01 . SPD   . A185  . Prsnt   .  SPD   . A145  . Prsnt     0.97
 Car01 . SPD   . A185  . EXTEN   .  BFM   . A55   . Prsnt     0.03
 Car01 . SPD   . A185  . EXTEN   .  SPD   . A145  . Prsnt     0.97
 Car01 . SPD   . A185  . BASC1   .  BFM   . A55   . Prsnt     0.03
 Car01 . SPD   . A185  . BASC1   .  SPD   . A145  . Prsnt     0.97
 Car01 . SPD   . A185  . INTN1   .  BFM   . A55   . Prsnt     0.03
 Car01 . SPD   . A185  . INTN1   .  SPD   . A145  . Prsnt     0.97
 Car01 . SPD   . A205  . Prsnt   .  SPD   . A135  . Prsnt     1.00
 Car01 . SPM   . A125  . Prsnt   .  SPD   . A125  . Prsnt     0.44
 Car01 . SPM   . A125  . EXTEN   .  SPD   . A125  . Prsnt     0.44
 Car01 . SPM   . A125  . BASC1   .  SPD   . A125  . Prsnt     0.44
 Car01 . SPM   . A125  . INTN1   .  SPD   . A125  . Prsnt     0.44
 Car01 . SPM   . A145  . Prsnt   .  SPD   . A145  . Prsnt     1.00
 Car01 . SPM   . A145  . EXTEN   .  SPD   . A145  . Prsnt     1.00
 Car01 . SPM   . A145  . BASC1   .  SPD   . A145  . Prsnt     1.00
 Car01 . SPM   . A145  . INTN1   .  SPD   . A145  . Prsnt     1.00
 Car01 . SPM   . A165  . Prsnt   .  SPD   . A155  . Prsnt     1.00
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6.2.2.2 Natural Rehabilitation of Non-forest to Forest

Some areas of low stocking, previously classified as Barren and Scattered (B&S) were assessed prior to this FMP. Where appropriate these areas were reclassified as productive forest. The remaining low stocking stands within the inventory are either naturally burnt areas or a form of permanent B&S. These areas were classified in the planning inventory with the development stage (DEVSTAGE) of LOWNAT. Therefore, no values for natural rehabilitation of non-forest to forest were included in the SFMM modelling.

Natural rehabilitation of roads and landing was accounted for in the proportions of area converted to non-forest (Silvicultural Option - accumulating roads and landings). Operational roads and landings would in most cases be actively rehabilitated after harvesting. For the most part, primary and branch roads would not be abandoned during this FMP. Therefore, no natural rehabilitation of roads and landing were included in the model.

6.2.2.3 Natural Disturbances

Resource managers need to understand the implication of forest disturbance specifically fire, windthrow and insect damage so that they can gain insight into natural forest development. Natural events such as forest fires and insect infestations are important elements of forest dynamics and are an important consideration to enable the accurate prediction of the future forest condition. Fire regimes vary across regions and climates and greatly affect forest stand composition and structure.

The Natural Disturbance Cycles and Succession screen allows you to specify an average natural disturbance cycle for each forest unit, and the succession rules that describe how disturbed areas succeed to new forest types. SFMM assigns areas naturally disturbed to the youngest age class of the future (post-disturbance) forest units with a silvicultural intensity of Present.

6.2.2.3.1 Fire Cycles

Natural disturbance rates portray expected annual rates of catastrophic disturbances such as fire, blow down, and lethal insect infestations. Two rates of natural disturbance were utilized in development of the SFMM Base Model. The first rate depicted a "cycle rate" of forest disturbance by forest unit that the forest would sustain without human intervention (without fire suppression called "Pre-suppression") as determined by the MNR historical records and base line data from the BFOLDs simulated fire cycle inputs incorporated into the Ontario Landscape Tool (OLT) model. This Natural Scenario is not an investigation, but rather is a run used to ensure that the forest dynamics within the Base Model are calibrated similarly to the projections in the OLT Model, that also includes pre-suppression fire cycles.

The second rate of natural disturbance is an average annual rate of disturbance based on MNR historical records of natural disturbance under fire suppression strategy (called "Suppression"). These rates for various management units were summarized by the MNR. The Fresch report and NW Forestry Forum bulletin entitled *Forest Fire Disturbance: Factors for Modelling and Mapping Procedures (2001)* were used to determine the suppression fire cycle.

The fire cycle analysis estimated a natural pre-suppression fire cycle for the Whiskey Jack Forest of 60 to 200 years depending on the forest unit for the natural scenario calibration run (average of 81 years) – data from MNR information (regional estimates).

Suppression fire cycle from Forestry Forum technical paper with 299 years for the Whiskey Jack Forest (used 299 years, same as 2004 FMP). Forest unit transitions based on Northwest Region Bounds of Natural Variation science data and forest unit definitions. The impacts of disturbance rates and resulting forest unit transitions were tested on their own and in combination with other natural succession rules. The planning team evaluated the future forest condition in all scenarios and made refinements where necessary to ensure reasonable calibration with the OLT model.

6.2.2.3.2 Post Natural Disturbance Forest Unit Transitions

Forest unit transitions after natural disturbance were primarily based on natural disturbance inputs to the BFOLDs model as used in the OLT Model, based on the area weighted average of standard forest units and eco-districts located on the forest. This information was considered the best available information and allowed for a successful calibration between the natural scenario and the OLT model. Natural succession assumptions are reasonably consistent with the inputs used for the 2004 FMP strategic modelling.

Forest unit transitions resulting from fire disturbance were consistent for all of the investigations. Natural disturbance inputs are summarized in Table 10 below.

Table 10 Natural Disturbance Cycles and Succession

Forest Unit	Pre-Suppression Fire Cycle (yrs)	Suppression Fire Cycle (yrs)	Proportion Succeeding to Forest Unit after Disturbance:											
			BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
BFM	75	299		0.20	0.20				0.35	0.05				0.20
CMX	90	299		0.17	0.21				0.35	0.03			0.05	0.19
HMX	95	299		0.07	0.52				0.03	0.38				
OCL	300	299				1.00								
OTH	150	299					1.00							
PJD	60	299						1.00						
PJM	60	299		0.03	0.02			0.60	0.35					
POD	100	299								1.00				
PRW	200	299									1.00			
SBL	250	299										1.00		
SPD	85	299		0.15	0.05			0.10	0.25				0.25	0.20
SPM	80	299		0.10	0.01			0.25	0.40				0.04	0.20

6.2.2.3.3 Additional Natural Disturbance Input Development Information

FOREST DYNAMICS

Whiskey Jack Forest 2012 FMP

Natural Disturbance Cycles and Succession

Calculations for Pre-suppression and Suppression Fire Cycles

1. Bounds of Natural Variation (BNV) Report (MNR TR-136) reviewed for relative flamability of tree species.

Breakdown (BNV TR-136)			
short -10 years	medium no change	long +10 years	very long +25 years
BfDom	HrdMx	BwDom	OCLow
ConMx	SbDee	HrDom	OthHd
PjDee	SbMx1	PoDee	PrDom
PjMx1			PrwMx
			PwDom
			SbLow

2. The relative flamability by forest unit is compared for standard regional forest units, Ontario Landscape Tool SNRV, and 2004 natural benchmark.
3. Compare various fire cycles and determine which average cycle is most appropriate for the forest.

Forest Unit Relative Flammability Index (RFI)(BNV TR-136)		WJF forest units	BFOLDS LG analysis units	WJF SRNV	WJF 2004	WJF Adjusted	WJF	Adjusted Fire Cycles Pre-suppression Fire Cycles					Compare fire c 2004NATURE-80
Regional Forest Unit	Years change	matched	matched	Analysis	Natural Benchmark	RFI	Forest area current BMI	60	70	80	90	100	80
BfMx1, BfDom	-10	BFM	BfDom	-na-	80	-5	34,324	55	65	**75**	85	95	-na-
ConMx	-10	CMX	ConMx	-na-	80	10	90,775	70	80	**90**	100	110	10
HrdMx, HrDom, BwDom	0	HMX	HrdMx	-na-	110	15	112,184	75	85	**95**	105	115	-15
OCLow	25	OCL	OcLow	-na-	120	220	2,302	280	290	**300**	310	320	-na-
OthHd	25	OTH	OthHd	-na-	130	70	2,115	130	140	**150**	160	170	20
PjDee	-10	PJD	PjDom	-na-	80	-20	187,454	40	50	**60**	70	80	-20
PjMx1	-10	PJM	PjMx1	-na-	80	-20	62,664	40	50	**60**	70	80	-20
PoDee	10	POD	PoPur	-na-	130	20	79,897	80	90	**100**	110	120	-30
PrwMx, PrDom, PwDom	25	PRW	-na-	-na-	200	120	3,492	180	190	**200**	210	220	0
SbLow	25	SBL	SbLow	-na-	130	170	1,876	230	240	**250**	260	270	120
SbDee	0	SPD	SbDom	-na-	90	5	136,771	65	75	**85**	95	105	-5
SbMx1	0	SPM	SbMx1	-na-	80	0	46,789	60	70	**80**	90	100	0
				Avg.: 81 years									
	(a) Yrs from avg. fire cycle based on #1 above.	PLANFU	similar Landscape Class	(b) Landscape Tool	.(c) 2004 FMP	(d) Adj. based on relative flamability	760,645	61	71	81	91	101	
								Area Weighted Average Fire Cycles (years)					
										(e) FMP SFMM Input			

BFOLDS (Van Wagner, OLT) Average Fire Cycle (b)	81
2004 Natural Benchmark Weighted Average Fire Cycle (c)	92
"adjusted" Weighted Average Fire Cycle (e)	81

(based on 80 years +/- relative flammability)

4. Compare to average area proportions of mature and late successional (M&L) landscape classes from OLT:
This comparison is only valid for forest units dominated by fire origin species (jack pine, poplar).
Review PJD, PJM and POD forest units OLT proportions then adjust forest unit relative flammability (above) while maintaining OLT overall average fire cycle.

PLANFU forest units	LG - SNRV analysis unit match	OLT GOAL for LG area	LG - SNRV M & L Indicator Onset Age	LG - SNRV M & L Indicator % of AU that meets	Fire Cycle	
BFM	BfDom	0.846	60	0.845	356	
CMX	ConMx	0.663	70	0.663	170	
HMX	HrdMx	0.654	60	0.654	141	
OCL	OCLow	0.718	70	0.718	211	
OTH	OthHd	0.438	70	0.823	360	Above:
PJD	**PjDee**	**0.264**	**70**	**0.263**	**52**	Use 60
PJM	**PjMx1**	**0.344**	**60**	**0.343**	**56**	Use 60
POD	**PoDom**	**0.459**	**70**	**0.459**	**90**	Change to 100
PRW	PrwMx	-na-	-na-	-na-	-na-	
SBL	SbLow	0.662	70	0.662	169	
SPD	SbDee	0.755	60	0.756	214	
SPM	SbMx1	0.548	60	0.548	100	

Findings:

Pre-suppression
2004 FMP average fire cycle higher than Landscape Tool average, and adjusted 80 year cycle.
Task team reviewed and adjusted relative flamability index (yellow) and agreed that fire cycles (e) looked reasonable for use in the FMP.

1
2
3
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COMPARISON OF NATURAL DISTURBANCE FOREST UNIT TRANSITIONS BETWEEN FMPs:

Note: Order changed and blank columns added to future forest unit transitions for previous FMPs to align columns with forest units approved for the 2012 FMP.

Natural Disturbance Cycles and Succession from 2004 FMP:

Forest Unit	Pre-Suppression Fire Cycle (yrs)	Suppression Fire Cycle (yrs)	Proportion Succeeding to Forest Unit after Disturbance: CEDAR		MIXED	COSHA	OTHWD	PJDOM		PODOM	PRWMX	SBLOW	SPDOM	
CEDAR	80	299	1.00											
COSHA	60	299				0.99					0.01			
MIXED	80	299			0.45			0.03		0.49	0.01		0.02	
OTHWD	100	299					0.98			0.02				
PJDOM	50	299			0.03			0.95					0.02	
PODOM	80	299			0.03					0.97				
PRWMX	150	299			0.02	0.01				0.02	0.95			
SBLOW	80	299										1.00		
SPDOM	60	299			0.04			0.35		0.06			0.55	

Natural Disturbance Cycles and Succession from 2009 (unapproved) FMP LTMD:

Forest Unit	Pre-Suppression Fire Cycle (yrs)	Suppression Fire Cycle (yrs)	Proportion Succeeding to Forest Unit after Disturbance: CEDAR	CONMX	MIXED	COSHA	OTHWD	PJDOM	PJSBM	PODOM	PRWMX	SBLOW	SBDOM	
CEDAR	100	299	0.94	0.01	0.01	-	0.01		0.01		0.01	0.01		
CONMX	80	299		0.23	0.09			0.36	0.21	0.02			0.09	
COSHA	80	299	-			1.00	-	-			-	-	-	
MIXED	110	299		0.07	0.40				0.08	0.45				
OTHWD	130	299			0.03		0.96			0.01				
PJDOM	80	299		0.03				0.95	0.02					
PJSBM	90	299		0.07	0.01			0.60	0.25				0.07	
PODOM	130	299		0.08	0.12					0.80				
PRWMX	200	299		0.01	0.02						0.97			
SBDOM	90	299		0.13	0.07			0.10	0.23	0.01			0.46	
SBLOW	130	299	0.01									0.99		

Natural Disturbance Cycles and Succession from BFOLDS Inputs for 2012 FMP:

Forest Unit	Pre-Suppression Fire Cycle (yrs)	Suppression Fire Cycle (yrs)	Proportion Succeeding to Forest Unit after Disturbance: BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
BFM	75			0.15	0.19			0.15	0.18	0.06			0.13	0.14
CMX	90			0.17	0.21				0.30	0.03			0.10	0.19
HMX	95				0.52				0.03	0.38			0.01	0.06
OCL	300					1.00								
OTH	150				0.07		0.89			0.04				
PJD	60							0.95	0.05					
PJM	60				0.02			0.60	0.35				0.01	0.02
POD	100									1.00				
PRW	200										1.00			
SBL	250											1.00		
SPD	85			0.15	0.05			0.16	0.19				0.26	0.19
SPM	80			0.10	0.01			0.25	0.31				0.12	0.21

Natural Disturbance Cycles and Succession REVISED Inputs for 2012 FMP: **Base Model review with regional input June 28, July 5-6, July 13, 2010.**

Natural Disturbance Cycles and Succession Revised XXXXXXXXX: = changed.

Forest Unit	Pre-Suppression Fire Cycle (yrs)	Suppression Fire Cycle (yrs)	Proportion Succeeding to Forest Unit after Disturbance: BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
BFM	75	299		0.20	0.20				0.35	0.05				0.20	PJD moved to PJM, SPD to CMX.
CMX	90	299		0.17	0.21				0.35	0.03			0.05	0.19	23% Pj SPC, shift 5% SPD to PJM
HMX	95	299		0.07	0.40				0.03	0.50					SB fus not likely. Shift to CMX
OCL	300	299				1.00									
OTH	150	299					1.00								Shift to 100% OTH to maintain area.
PJD	60	299						0.99	0.01						9% SB SPC, should create 5% PJM.
PJM	60	299		0.03	0.02			0.60	0.35						<10% hwd. Shift % SB to CMX.
POD	100	299								1.00					
PRW	200	299									1.00				
SBL	250	299										1.00			
SPD	85	299		0.10				0.10	0.20				0.10	0.50	4% hwd, shift more to SBM, CMX
SPM	80	299		0.10	0.01			0.25	0.30				0.04	0.30	10% hwd, shift more to SBM

consider if too high compared to OLT?

Natural Disturbance Cycles and Succession REVISED Inputs for 2012 FMP: **Base Model review with regional input July 14, 2010. OLT comparison**

Natural Disturbance Cycles and Succession Revised July 14, 2010: = changed. NatDist3

Forest Unit	Pre-Suppression Fire Cycle (yrs)	Suppression Fire Cycle (yrs)	Proportion Succeeding to Forest Unit after Disturbance: BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
BFM	75	299		0.20	0.20				0.35	0.05				0.20	
CMX	90	299		0.17	0.21				0.35	0.03			0.05	0.19	
HMX	95	299		0.07	0.40				0.03	0.50					
OCL	300	299				1.00									
OTH	150	299					1.00								
PJD	60	299						1.00							100% PJD
PJM	60	299		0.03	0.02			0.80	0.15						20% shift PJM to PJD
POD	100	299								1.00					
PRW	200	299									1.00				
SBL	250	299										1.00			
SPD	85	299		0.10				0.10	0.20				0.30	0.30	20% shift to SPM to SPD (BFOLDS)
SPM	80	299		0.10	0.01			0.25	0.40				0.04	0.20	10% SPM to PJM

Natural Disturbance Cycles and Succession REVISED Inputs for 2012 FMP: **Base Model review with regional input July 15, 2010. OLT comparison**

Natural Disturbance Cycles and Succession Revised July 16, 2010: = changed. NatDist4

Forest Unit	Pre-Suppression Fire Cycle (yrs)	Suppression Fire Cycle (yrs)	Proportion Succeeding to Forest Unit after Disturbance: BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
BFM	75	299		0.20	0.20				0.35	0.05				0.20	
CMX	90	299		0.17	0.21				0.35	0.03			0.05	0.19	
HMX	95	299		0.07	0.52				0.03	0.38					revert to BFOLDS to reduce POD.
OCL	300	299				1.00									
OTH	150	299					1.00								
PJD	60	299						1.00							
PJM	60	299		0.03	0.02			0.80	0.15						
POD	100	299								1.00					
PRW	200	299									1.00				
SBL	250	299										1.00			
SPD	85	299		0.10				0.10	0.20				0.30	0.30	
SPM	80	299		0.10	0.01			0.25	0.40				0.04	0.20	

Natural Disturbance Cycles and Succession REVISED Inputs for 2012 FMP: **Base Model review with regional input July 15-26, 2010. OLT comparison**

Natural Disturbance Cycles and Succession Revised July 26, 2010: = changed. NatDist5

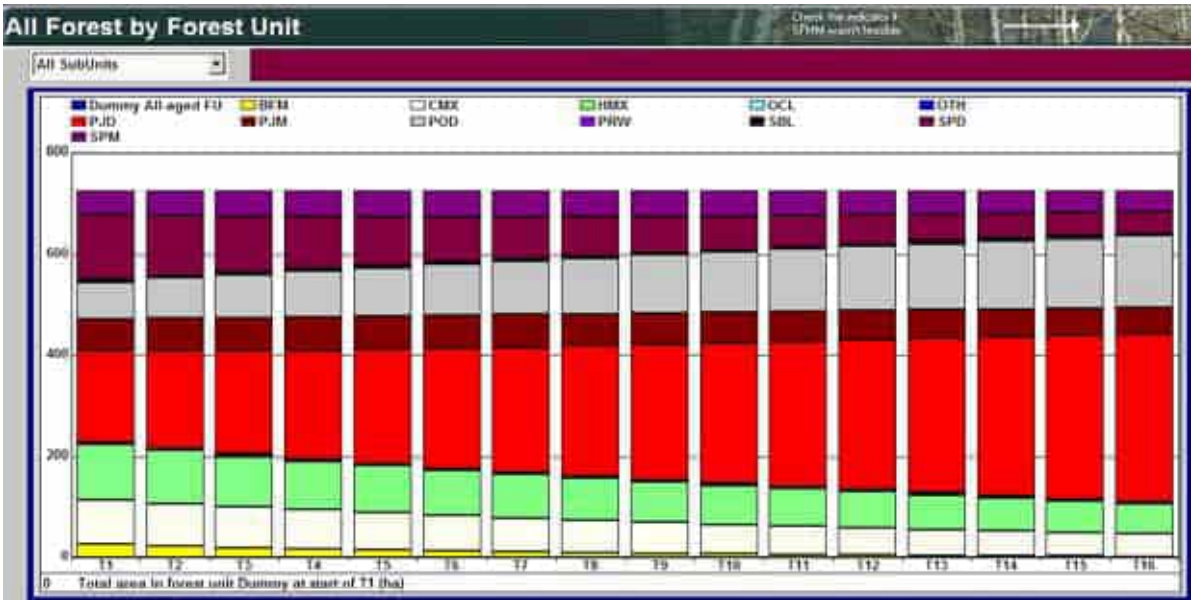
Forest Unit	Pre-Suppression Fire Cycle (yrs)	Suppression Fire Cycle (yrs)	Proportion Succeeding to Forest Unit after Disturbance: BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
BFM	75	299		0.20	0.20				0.35	0.05				0.20	
CMX	90	299		0.17	0.21				0.35	0.03			0.05	0.19	
HMX	95	299		0.07	0.52				0.03	0.38					
OCL	300	299				1.00									
OTH	150	299					1.00								
PJD	60	299						1.00							
PJM	60	299		0.03	0.02			0.60	0.35						revert to BFOLDS to reduce PJD.
POD	100	299								1.00					
PRW	200	299									1.00				
SBL	250	299										1.00			
SPD	85	299		0.15	0.05			0.10	0.25				0.25	0.20	revert to BFOLDS to reduce SPM and incr
SPM	80	299		0.10	0.01			0.25	0.40				0.04	0.20	CMX, PJM.

FOREST DYNAMICS

Whiskey Jack Forest 2012 FMP

Natural Disturbance Cycles and Succession - Results

Based on natural benchmark with only pre-suppression disturbance transitions and cycles.



Forest Unit:

	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	TOTAL
T1	27,148	88,490	107,239	2,216	1,995	182,833	61,845	73,978	3,312	1,807	128,589	45,937	725,390
T2	23,738	84,427	103,670	2,216	1,995	193,280	63,546	79,813	3,312	1,807	119,228	48,358	725,390
T3	20,756	80,541	100,149	2,216	1,995	203,905	64,617	85,435	3,312	1,807	110,588	50,070	725,390
T4	18,149	76,825	96,684	2,216	1,995	214,616	65,150	90,849	3,312	1,807	102,610	51,178	725,390
T5	15,869	73,272	93,282	2,216	1,994	225,336	65,224	96,061	3,312	1,807	95,242	51,773	725,390
T6	13,876	69,875	89,950	2,216	1,994	236,002	64,911	101,076	3,312	1,807	88,433	51,937	725,390
T7	12,133	66,627	86,693	2,216	1,995	246,557	64,271	105,901	3,312	1,807	82,139	51,739	725,390
T8	10,609	63,521	83,514	2,216	1,994	256,957	63,359	110,541	3,312	1,807	76,318	51,240	725,390
T9	9,276	60,553	80,416	2,216	1,994	267,165	62,222	115,002	3,312	1,807	70,934	50,493	725,390
T10	8,111	57,715	77,400	2,216	1,994	277,150	60,901	119,290	3,312	1,807	65,951	49,542	725,390
T11	7,092	55,003	74,469	2,216	1,994	286,887	59,432	123,410	3,312	1,807	61,337	48,429	725,390
T12	6,201	52,411	71,623	2,216	1,994	296,358	57,847	127,368	3,312	1,807	57,065	47,186	725,390
T13	5,422	49,935	68,862	2,216	1,994	305,549	56,172	131,169	3,312	1,807	53,107	45,844	725,390
T14	4,741	47,569	66,186	2,216	1,994	314,448	54,432	134,819	3,312	1,807	49,438	44,426	725,390
T15	4,146	45,309	63,594	2,216	1,994	323,050	52,646	138,322	3,312	1,807	46,037	42,955	725,390
T16	3,625	43,150	61,086	2,216	1,994	331,349	50,832	141,685	3,312	1,807	42,883	41,449	725,390

6.2.2.4 Growth and Yield in Even-age Forest

Each forest unit has a distinct yield curve for the "Present" forest condition (i.e., natural origin), and additional yield curves to reflect post-harvest stand development based on varying levels of silviculture investment or management intensity (Extensive, Basic1 and Intensive 1).

The main assumption used in the development of the curves, is that all points in time, the curves species composition is consistent with the forest unit definition. At any point where the composition of the yield curve suggest the composition no longer meet the forest unit definition, the final point of succession is established. This is consistent for all forest units at all intensities.

Most yield curves for this FMP (all except OCL, OTH, and PRW) were designed by Dr. Margaret Penner and modified by the planning team to account for management strategies, consistency with the planning inventory and timber utilization standards. The planning team's modification to the yield curves developed by Margaret Penner included changing average species composition by silviculture intensity, stand stocking and site index. Weighted averages were derived from the planning inventory. The planning inventory was refined only to use stands that were Free to Grow and were not site class 4. All other stands either had an estimated stand description or were protected from harvesting.

Yield curves for OCL, OTH and PRW were derived from area weighted forest inventory information imported into the MIST program (Modelling and Inventory Support Tool). Their derivation was similar to those for the other, larger forest units as the MIST program was provincially developed using Margaret Penner's growth and yield calculations.

Yield curves development and yield curves for each forest unit and silviculture intensity can be found in Appendix 1.

6.2.2.5 Timber Product Proportions in Even-aged Forest

The following tree species were included in the strategic modelling:

14 Boreal tree species. Product "ALL" only used.

PW	"White Pine"		41	LA	"Larch"
PR	"Red Pine"		42	HE	"Hemlock"
PJ	"Jack Pine"		43	PO	"Poplar"
SB	"Black Spruce"		44	BW	"White Birch"
SW	"White Spruce"		45	MH	"Maple"
BF	"Balsam Fir"		46	UH	"Upland Hardwood"
CE	"Cedar"		47	LH	"Lowland Hardwood"

6.2.2.6 Wildlife Habitat Classification

In previous plans, wildlife habitat units and the regional wildlife matrixes used in the SFMM modelling were based on regional definitions and values. With the inclusion of landscape class areas and specific inputs to relate to caribou habitat, the use of these inputs in the strategic modelling was not required for this FMP.

Therefore wildlife habitat units, wildlife habitat seral stages, the wildlife habitat suitability matrix, selected wildlife species (other than Species At Risk), the correlation of forest unit area to wildlife habitat units and the non-forest land to wildlife habitat units proportions were not used in the SFMM modelling.

6.2.3 Strategic Silvicultural Options

Silvicultural Options are used to specify the silvicultural strategies (i.e. renewal and tending treatments) appropriate for the forest. There are options for harvesting, renewal, tending and partial harvesting, and active non-forest rehabilitation treatments, such as afforestation.

6.2.3.1 Clearcut Harvest Operability Ranges

Harvest operability ranges define the youngest and oldest ages that may be considered eligible for harvest. These ranges are constant through the planning period. Projected available harvest areas and volumes are sensitive to these operability limits. Narrow operability limits can produce misleadingly reduced long-term wood supply estimates because a high proportion of stands tend to pass through these ages without a stand growing up to replace them for long periods of time. Operability limits are therefore set fairly wide. A lower operability limit of 50 years does not necessarily imply a rotation age of 50 years for that forest type; rather, it means that more forest area can be considered for harvesting during times of projected timber shortages, and that some stands over the age of 50 can be considered within the mix of older ages harvested. Lower operability limits are likely to exist for the more intensive silvicultural intensities. One reason for performing more intensive renewal and tending treatments is to prepare stands for potential harvesting sooner than they would be under less intensive regimes. Thus more intensively managed areas should be eligible for harvest at younger age, or as a minimum, contain higher value products at the same time as harvest would occur in less intensively managed stands.

Lower operability ages generally correspond to 80 cubic metres per hectares harvest volumes. These minimum volume requirements were related to yield curves for each forest unit and silviculture intensity to determine the minimum operability age limits for the SFMM modelling. Some adjustment to lower operability ages were done to improve product piece size or to facilitate clean-up of BFM areas.

The upper operability limit used is generally infinite. This is not to say that a forest type is eligible for harvest infinitely. It does indicate that the forest type is deemed to be operable until the age at which it naturally succeeds (through old age), as defined in the natural succession pattern for a given forest type in SFMM. The difference between the lower operability limit in the operability age table and the age of forest succession define a window of harvest operability. Operability ranges used in modelling are listed below in Table 11.

a. **Lower Age** represents age of stand at beginning of modelling term (10 year).
b. **inf** represents no upper age limit for harvesting. Natural succession dictates when stand no longer available for harvest.
c. **na** for lower or upper age represent ineligible treatment (does not exist). Applied to current or future forest unit/silvicultural intensity combinations.

Table 11 Clearcut Harvest Operability Ranges

Revised Operability Limits

AIISU	Present		Extensive		Basic 1		Intensive 1		
Forest Unit	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	
BFM	60	inf	65	inf	na	inf	na	inf	lowered to improve clean-up.
CMX	55	inf	65	inf	60	inf	na	inf	lowered to improve clean-up.
HMX	55	inf	65	inf	na	inf	na	inf	
OCL	90	inf	90	inf	na	inf	na	inf	
OTH	70	inf	70	inf	na	inf	na	inf	
PJD	55	inf	55	inf	50	inf	50	inf	improve sawlog piece size (non-caribou).
PJM	60	inf	60	inf	55	inf	55	inf	improve sawlog piece size & recognize Sb component.
POD	55	inf	55	inf	na	inf	na	inf	increase piece size.
PRW	65	inf	65	inf	65	inf	65	inf	improve sawlog piece size.
SBL	90	inf	90	inf	90	inf	na	inf	reduced to allow spatial operability.
SPD	70	inf	70	inf	60	inf	60	inf	better piece size overall.
SPM	60	inf	70	inf	60	inf	60	inf	

Notes:
Rationale for Lower Harvest Operability Ages:

- Ages generally correspond to 80 cubic metres per hectares harvest volumes.

Harvest operability ages revised and accepted by Strategic Task Team July 12, 2010. Base Model Review.

6.2.3.2 Clearcut Growing Stock Volumes Left Unharvested

Clearcut Growing Stock Volumes Left Unharvested

The unharvest volume percentage in the strategic modelling is used to account for several types of reductions to available harvest volumes:

Component (1) - Unharvested volumes associated with scattered live wildlife trees retained according to the Stand and Site Guide.

Calculations for volumes associated with retention of scattered wildlife trees included consideration for the average size of trees at average harvest age by forest unit by silvicultural intensity , and number of live trees required to make up the average 25 tree per hectare required by the Stand and Site Guide. See discussion (1a) for details and rationale (below). The yield curve by forest unit at the average age of harvest to determine the volume per hectare associated with the number of live trees expected to be retained. The unharvested volume percentages by tree species within each forest unit were calculated to achieve the calculated "retained" volume based on the estimated number of live trees required by tree species (Calculation 1b).

Component (2) - Retention of area-based volume associated with inoperable area or unmapped residual areas allocated as part of the harvest area, but not able to be harvested.

Unharvested area within the harvest blocks is assigned based on expected operability by forest unit. The same average forest unit proportion (of residual) is assigned to each species in the yield curve equally since yield curves include proportional volume based on species composition. Unharvested volume percentages by forest unit were based on estimated unmapped residual retention according to the Stand and Site Guide requirement for an average of 0.5 ha of residual within each 50 ha polygon of harvest area (equals 1% of harvest area).

Note: Associated estimated riparian area is already netted out in the SFMM initial land base and is not considered in unharvested volume percentages.

The above two components are combined to determine the total unharvested volume percents for each tree species within each yield curve for each forest unit.

(1a) Considerations for the Retention of Wildlife Trees

Stand & Site Guide Direction

Stand and Site Guide requires an avg. of 25 stems/ha (>10cm.) of which >=10 large (= 25cm. Dbh) living or large stubs/ha (>=3 m.ht.) with a minimum of 5 large living trees/ha. Stubbing 80%+ (>=20 stems/ha.) is recommended for Sb and Pj trees.

Large Living Trees Direction

The operational intention is that 10 large living (full crowns) trees/ha will be left after harvest. Large poplar are the desired species to leave behind to meet the 10 large living stems/ha. behind as they provide the best opportunities for cavity nesters and stick nesters; however when not available jack pine, white spruce, black spruce and black ash will be chosen. Stubbing is not currently practiced extensively on the Whiskey Jack Forest so it is not reflected in the volumes.

Small Trees Direction

Of the 15 remaining required small stems, it is likely that 5 will be alive and 10 will be dead. White birch typically does not meet the diameter size requirement of 25 cm. dbh to be considered a 'large' living tree and will be typically left on site to meet the requirement to leave a minimum of 15 stems/ha of smaller diameter stems. If no white birch volume was found, then other species such as cedar, spruce and larch will be left to meet the requirements.

• The trees per metre is based on reference to Plonski's Yield Tables and local MNR experience and volume sampling don

Calculated Merchantable Tree Length Volume

Equation Diameter cm	Tree Length Factor x # tree x ((100 - cull factor)/100)							
	Jack Pine	Red Pine	White Pine	Spruce	Balsam Fir	Poplar	White Birch	Cedar
10	0.02	0.07	0.02	0.04	0.03	0.00	0.06	0.00
12	0.05	0.08	0.03	0.05	0.04	0.00	0.08	0.00
14	0.08	0.10	0.06	0.07	0.05	0.03	0.10	0.02
16	0.12	0.13	0.09	0.09	0.07	0.08	0.12	0.04
18	0.16	0.17	0.12	0.12	0.10	0.14	0.15	0.07
20	0.21	0.21	0.17	0.15	0.13	0.20	0.18	0.09
22	0.26	0.26	0.22	0.19	0.17	0.27	0.22	0.13
24	0.31	0.31	0.28	0.24	0.21	0.34	0.26	0.16
26	0.37	0.38	0.35	0.29	0.26	0.42	0.30	0.20
28	0.44	0.45	0.43	0.35	0.31	0.50	0.34	0.24
30	0.51	0.53	0.51	0.41	0.37	0.58	0.39	0.28

white spruce
black spruce

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Whiskey Jack Forest 2012 FMP

Clearcut Growing Stock Volumes Left Unharvested

(1b) Calculation for Percentage of Volume Associated with Retention of Wildlife Trees - Rationale for average percentage used per forest unit.

Average age determined by peak of yield curve minus 10 years.

BFM	AGE:	Pw	Pr	Pj	Sb	Sw	Bf	Ce	La	He	Po	Bw	Mh	UH	LH	TOTAL
PRSNT Avg. Vol. per species /ha.	A85	1	2	12	20	11	20	1	0	0	15	7	0	0	0	89
# of Wildlife Trees		2	2		3		2	2			2	2				15
Avg. m3/tree		0.22	0.21	0.16	0.07	0.19	0.13	0.04	0.14		0.34	0.12			0.10	
Volume (m3) loss		0.44	0.42		0.21		0.26	0.08			0.68	0.24				2.33
% Volume Unharvested		**0.44**	**0.21**		**0.01**		**0.01**	**0.08**			**0.05**	**0.03**				0.03
CMX	AGE:	Pw	Pr	Pj	Sb	Sw	Bf	Ce	La	He	Po	Bw	Mh	UH	LH	TOTAL
PRSNT Avg. Vol. per species /ha.	A85	3	2	32	19	5	6	3	0	0	23	9	0	0	0	102
# of Wildlife Trees		2	2	2	2			1			3	3				15
Avg. m3/tree		0.22	0.21	0.16	0.07	0.19	0.13	0.04	0.14		0.34	0.12			0.10	
Volume (m3) loss		0.44	0.42	0.32	0.14			0.04			1.02	0.36				2.74
% Volume Unharvested		**0.15**	**0.21**	**0.01**	**0.01**			**0.01**			**0.04**	**0.04**				0.03
HMX	AGE:	Pw	Pr	Pj	Sb	Sw	Bf	Ce	La	He	Po	Bw	Mh	UH	LH	TOTAL
PRSNT Avg. Vol. per species /ha.	A65	1	1	14	9	7	10	1	0	0	50	13	0	0	2	108
# of Wildlife Trees		1	1	2	2						5	4				15
Avg. m3/tree		0.22	0.21	0.16	0.07	0.19	0.13	0.04	0.14		0.34	0.12			0.10	
Volume (m3) loss		0.22	0.21	0.32	0.14						1.70	0.48				3.07
% Volume Unharvested		**0.22**	**0.21**	**0.02**	**0.02**						**0.03**	**0.04**				0.03
OCL	AGE:	Pw	Pr	Pj	Sb	Sw	Bf	Ce	La	He	Po	Bw	Mh	UH	LH	TOTAL
PRSNT Avg. Vol. per species /ha.	A105	0	0	0	19	0	2	34	20	0	2	0	0	0	11	88
# of Wildlife Trees					4			4	5		1				1	15
Avg. m3/tree		0.22	0.21	0.16	0.04	0.19	0.13	0.04	0.14		0.34	0.12			0.10	
Volume (m3) loss					0.16			0.16	0.70		0.34				0.10	1.46
% Volume Unharvested					**0.01**				**0.04**		**0.17**				**0.01**	0.02
OTH	AGE:	Pw	Pr	Pj	Sb	Sw	Bf	Ce	La	He	Po	Bw	Mh	UH	LH	TOTAL
PRSNT Avg. Vol. per species /ha.	A95	0	0	0	5	2	5	4	1	0	29	3	0	0	92	141
# of Wildlife Trees								2	1		3	1			8	15
Avg. m3/tree		0.22	0.21	0.16	0.04	0.19	0.13	0.04	0.14		0.34	0.12			0.10	
Volume (m3) loss								0.08	0.14		1.02	0.12			0.80	2.16
% Volume Unharvested								**0.02**	**0.14**		**0.04**	**0.04**			**0.01**	0.02
PJD	AGE:	Pw	Pr	Pj	Sb	Sw	Bf	Ce	La	He	Po	Bw	Mh	UH	LH	TOTAL
PRSNT Avg. Vol. per species /ha.	A65	0	0	92	14	0	0	0	0	0	9	2	0	0	0	117
# of Wildlife Trees				7	2						2	4				15
Avg. m3/tree		0.22	0.21	0.16	0.07	0.19	0.13	0.04	0.14		0.34	0.12			0.10	
Volume (m3) loss				1.12	0.14						0.68	0.48				2.42
% Volume Unharvested				**0.01**	**0.01**						**0.08**	**0.27**				0.02
PJM	AGE:	Pw	Pr	Pj	Sb	Sw	Bf	Ce	La	He	Po	Bw	Mh	UH	LH	TOTAL
PRSNT Avg. Vol. per species /ha.	A75	0	0	62	23	2	3	0	0	0	9	3	0	0	0	101
# of Wildlife Trees				4	2						4	5				15
Avg. m3/tree		0.22	0.21	0.16	0.07	0.19	0.13	0.04	0.14		0.34	0.12			0.10	
Volume (m3) loss				0.64	0.14						1.36	0.60				2.74
% Volume Unharvested				**0.01**	**0.01**						**0.15**	**0.24**				0.03
POD	AGE:	Pw	Pr	Pj	Sb	Sw	Bf	Ce	La	He	Po	Bw	Mh	UH	LH	TOTAL
PRSNT Avg. Vol. per species /ha.	A65	0	0	4	4	7	9	0	0	0	112	5	0	0	1	142
# of Wildlife Trees					1	2	2				6	4				15
Avg. m3/tree		0.22	0.21	0.16	0.07	0.19	0.13	0.04	0.14		0.34	0.12			0.10	
Volume (m3) loss					0.07	0.38	0.26				2.04	0.48				3.23
% Volume Unharvested					**0.02**	**0.05**	**0.03**				**0.02**	**0.10**				0.02
PRW	AGE:	Pw	Pr	Pj	Sb	Sw	Bf	Ce	La	He	Po	Bw	Mh	UH	LH	TOTAL
PRSNT Avg. Vol. per species /ha.	A95	50	44	5	3	5	6	3	0	0	21	9	0	0	0	146
# of Wildlife Trees		6	5								2	2				15
Avg. m3/tree		0.22	0.21	0.16	0.07	0.19	0.13	0.04	0.14		0.34	0.12			0.10	
Volume (m3) loss		1.32	1.05								0.68	0.24				3.29
% Volume Unharvested		**0.03**	**0.02**								**0.03**	**0.03**				0.02
SBL	AGE:	Pw	Pr	Pj	Sb	Sw	Bf	Ce	La	He	Po	Bw	Mh	UH	LH	TOTAL
PRSNT Avg. Vol. per species /ha.	A105	0	0	0	65	0	0	3	4	0	1	1	0	0	1	75
# of Wildlife Trees					7			2	1		2	3				15
Avg. m3/tree		0.22	0.21	0.16	0.04	0.19	0.13	0.04	0.14		0.34	0.12			0.10	
Volume (m3) loss					0.28			0.08	0.14		0.68	0.36				1.54
% Volume Unharvested								**0.02**	**0.03**		**0.68**	**0.60**				0.02
SPD	AGE:	Pw	Pr	Pj	Sb	Sw	Bf	Ce	La	He	Po	Bw	Mh	UH	LH	TOTAL
PRSNT Avg. Vol. per species /ha.	A95	0	0	35	92	5	3	0	0	0	7	2	0	0	0	145
# of Wildlife Trees				2	10						2	1				15
Avg. m3/tree		0.22	0.21	0.16	0.12	0.19	0.13	0.04	0.14		0.34	0.12			0.10	
Volume (m3) loss				0.32	1.20						0.68	0.12				2.32
% Volume Unharvested				**0.01**	**0.01**						**0.09**	**0.06**				0.02
SPM	AGE:	Pw	Pr	Pj	Sb	Sw	Bf	Ce	La	He	Po	Bw	Mh	UH	LH	TOTAL
PRSNT Avg. Vol. per species /ha.	A95	0	0	56	42	4	3	0	0	0	11	3	0	0	0	119
# of Wildlife Trees				2	6						4	3				15
Avg. m3/tree		0.22	0.21	0.16	0.12	0.19	0.13	0.04	0.14		0.34	0.12			0.10	
Volume (m3) loss				0.32	0.72						1.36	0.36				2.76
% Volume Unharvested				**0.01**	**0.02**						**0.12**	**0.13**				0.02

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SILVICULTURAL OPTIONS

Whiskey Jack Forest 2012 FMP

Clearcut Growing Stock Volumes Left Unharvested

Summary of Component 1: Percentage of Volume Associated with Retention of Wildlife Trees

AIISU Forest Unit	Average Volume for Wildlife Trees	AIISU Forest Unit	Average Volume for Wildlife Trees
BFM	0.03	PJM	0.03
CMX	0.03	POD	0.02
HMX	0.03	PRW	0.02
OCL	0.02	SBL	0.02
OTH	0.02	SPD	0.02
PJD	0.02	SPM	0.02

(2) Calculation for Area-based Volume Associated with Allocated Inoperable Areas

Inoperable percentages below do not include mistyped or merchantable areas that will be harvested in the future.
- These percentages by forest unit are carried forward into the "Volumes Left Unharvested" along with Component 1.
- Average of 1% per forest unit estimated for all forest units as exact measurements were not possible since insular residual and inoperable not mapped.
- Only Component 2 is also considered in the calculation of the need for additional "Areas Reserved From Harvesting" as this component is areas based and can be mapped. Volumes associated with scattered wildlife trees are not mappable and do not contribute to area-based forest retention.

Calculation 2: Inoperable %		Tree Species:													
Forest Unit:	Total	Pw	Pr	Pj	Sb	Sw	Bf	Ce	La	He	Po	Bw	Mh	UH	LH
BFM	2%	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
CMX	2%	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
HMX	2%	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
OCL	2%	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
OTH	2%	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
PJD	2%	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
PJM	2%	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
POD	2%	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
PRW	2%	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
SBL	2%	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
SPD	2%	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
SPM	2%	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02

<== Carry forward percent by forest unit to areas reserved from harvesting worksheet.

Same percentage used for each tree species in yield curve as inoperable percentage applies to the forest unit area as a whole.

(blank signifies "0")

SSG 0.5 ha in every 50 ha = retention of 0.01 (1%) of area, but periphery of harvest blocks will not need additional 0.5 ha patches retained.
SFMM tracks net downs in volume to the nearest full percentage, therefore no additional net down required for insular residual patches.

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Clearcut Growing Stock Volumes Left Unharvested - SUMMARY

Summary of Component 1 (scattered wildlife trees) and Component 2 (inoperable/residual area).
For each forest unit, all silvicultural intensities are populated. When pasted into SFMM, only valid silvic. intensities will be used.

Forest		Tree Species:													
Unit	SI	Pw	Pr	Pj	Sb	Sw	Bf	Ce	La	He	Po	Bw	MH	UH	LH
BFM	Prsnt	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Exten	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Basic	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Inten	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Basc2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
CMX	Prsnt	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Exten	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Basic	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Inten	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Basc2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
HMX	Prsnt	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Exten	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Basic	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Inten	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Basc2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
OCL	Prsnt	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Exten	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Basic	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Inten	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Basc2	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
OTH	Prsnt	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Exten	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Basic	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Inten	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Basc2	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
PJD	Prsnt	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Exten	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Basic	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Inten	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Basc2	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
PJM	Prsnt	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Exten	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Basic	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Inten	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
	Basc2	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
POD	Prsnt	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Exten	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Basic	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Inten	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Basc2	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
PRW	Prsnt	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Exten	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Basic	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Inten	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Basc2	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
SBL	Prsnt	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Exten	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Basic	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Inten	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Basc2	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
SPD	Prsnt	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Exten	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Basic	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Inten	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Basc2	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
SPM	Prsnt	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Exten	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Basic	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Inten	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
	Basc2	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04

6.2.3.3 Clearcut Post-Renewal Forest Succession and Costs

Strategic silviculture renewal options represent the broad renewal treatments appropriate for the forest. Renewal strategies reflect the most appropriate treatment or blend of treatments for the average forest unit condition. Various renewal intensity options (e.g. extensive, basic and intensive silvicultural treatments) were incorporated into the Strategic Forest Management Model for each forest unit, and included assumptions about how the forest will develop after these general treatments are applied, their associated costs, success rates and future forest conditions. Clearcut post-renewal forest succession identifies the level of treatment of the forest, regardless of what intensity it was at harvest.

Standard proportions were used for all investigations to direct SFMM to transfer area from one forest unit to another, based on the silvicultural intensity of the applied treatment. The information on post-renewal forest succession is a vital link between the acceptable silvicultural treatments for each ground rule included in Table FMP-4, and the strategic silvicultural assumptions included in the SFMM model. While the silvicultural ground rules included in Table FMP-4 should remain reasonably constant over time, the post-renewal forest succession is refined regularly (from term to term) as more detailed post-treatment survey data is available. Adjustments were made from the 2004 to 2012 FMP for post-renewal forest succession forest unit transitions, proportions and costs.

The strategic silvicultural options were developed based on the renewal strategy for the Whiskey Jack Forest. The post harvest renewal rules and cost were based on forest unit criteria, yield curve development strategy, planning inventory and the silvicultural ground rules. With input from MNR foresters and MNR Science and Information Advisors, the best knowledge and experience was used to develop the strategic post-renewal rules. Renewal data from the 2004 FMP was reviewed and compared to actual renewal treatments and regeneration survey results. Renewal inputs were revised to reflect the revised forest unit definitions. For each forest unit renewal level, an analysis of the planning inventory was completed. The most appropriate treatments were identified by proportion and associate cost for those treatments were calculated. Based on the proportion of treatments by renewal intensity, the appropriate future forest condition was determined. The main assumptions of assigning proportions of treatment were based on 100% of forest unit area being treated. It is acknowledged that the most appropriate treatment for the area will be applied in the field and not all term allocations are representative of the entire managed forest unit area. Associated with the success of those rules, renewal limits were identified. These limits reflect the proposed renewal strategy.

Projected costs per hectare were included for each silvicultural treatment level by forest unit. The costs associated with extensive treatments include general forest management planning and renewal assessment costs. Strategic silvicultural options and associated costs used in the SFMM modelling are documented in Table 12.

Table 12 Clearcut Post-renewal Forest Succession and Costs

Post Renewal Forest Succession			Future Forest Unit:																											
			Proportion transferred to future forest unit:																											
		Cost ($/ha)	BFM		CMX		HMX		OCL		OTH		PJD		PJM		POD		PRW		SPD		SPM		SBL	
BFM	Prsnt																													
	Exten	55	0.35	E	0.15	E	0.30	E							0.10	E	0.10	E												
	Basc1	900	0.30	E											0.40	B					0.10	B	0.20	B						
	Intn1																													
	Intn2																													
CMX	Prsnt																													
	Exten	55			0.40	E	0.30	E							0.20	E	0.10	E	0.00											
	Basc1	900			0.12	B							0.10	B	0.45	B			0.03	B	0.10	B	0.20	B						
	Intn1	1350											0.10	I	0.15	I			0.05	B	0.40	I	0.30	I						
	Intn2																Base Model had 1% to PRW for Basic and Intensive treatments.													
HMX	Prsnt																													
	Exten	55			0.05	E	0.30	E									0.65	E												
	Basc1	950			0.05	B									0.65	B							0.30	B						
	Intn1																													
	Intn2																													
OCL	Prsnt																													
	Exten	55							0.95	E															0.05	E				
	Basc1																													
	Intn1																													
	Intn2																													
OTH	Prsnt																													
	Exten	55									1.00	E																		
	Basc1																													
	Intn1																													
	Intn2																													
PJD	Prsnt																													
	Exten	55			0.10	E							0.75	E	0.15	E														
	Basc1	550			0.05	B							0.90	B	0.05	B														
	Intn1	1000											0.95	I							0.05	I								
	Intn2																													
PJM	Prsnt																													
	Exten	55			0.10	E							0.20	E	0.70	E														
	Basc1	550			0.05	B							0.90	B	0.05	B														
	Intn1	1000											0.25	I	0.25	I					0.05	I	0.45	I						
	Intn2																													
POD	Prsnt																													
	Exten	55															1.00	E												
	Basc1																													
	Intn1																													
	Intn2																													
PRW	Prsnt																													
	Exten	55	0.10	E	0.40	E	0.20	E											0.30	E										
	Basc1	900													0.05	B			0.90	B			0.05	B						
	Intn1	1350													0.01	B			0.98	I			0.01	B						
	Intn2																													
SBL	Prsnt																													
	Exten	55																							1.00	E				
	Basc1	500																							1.00	B				
	Intn1																													
	Intn2																													
SPD	Prsnt																													
	Exten	55	0.01	E	0.15	E	0.05	E							0.20	E					0.15	E	0.44	E						
	Basc1	700			0.05	B									0.10	B					0.55	B	0.30	B						
	Intn1	1100																			0.90	I	0.10	I						
	Intn2																													
SPM	Prsnt																													
	Exten	55	0.01	E	0.10	E	0.05	E							0.15	E					0.05	E	0.64	E						
	Basc1	700			0.04	B	0.01	E					0.05	B	0.30	B					0.35	B	0.25	B						
	Intn1	1100											0.05	I							0.85	I	0.10	I						
	Intn2																													

6.2.3.4 Stumpage Values and Timber Harvesting Costs

Stumpage values are the contributions to the Forest Renewal Trust Fund (FRTF) on a per cubic metre of harvested timber basis (by tree species). Stumpage rates do not represent real timber prices, or mill-gate values of wood harvested. The renewal rates modelled were sufficient for future forest projections. FRTF rates are set annually, and no other scoping of renewal rates was required. Changes through inflation factors between planning terms are not accounted for in any SFMM runs. The renewal fund contribution rate per cubic metre of wood harvested is documented in Table 13. Harvesting costs were not included in the SFMM modelling.

Table 13 Stumpage Values and Timber Harvesting Costs

Tree Species	Product	Stumpage Values	Harvesting Costs
Pw	All	$11.00	$ -
Pr	All	$11.00	$ -
Pj	All	$5.50	$ -
Sb	All	$5.50	$ -
Sw	All	$5.50	$ -
Bf	All	$5.50	$ -
Ce	All	$5.50	$ -
La	All	$5.50	$ -
He	All		$ -
Po	All	$0.75	$ -
Bw	All	$0.75	$ -
Mh	All		$ -
UH	All		$ -
LH	All	$0.75	$ -

(Species with no stumpage value are generally not harvested.)

6.2.3.5 Areas Reserved from Harvesting

Areas reserved from harvesting are represented as percentages of harvest area which is not harvested but transferred to reserved forest classes. SFMM tracks reserved forest classes throughout the remainder of the planning horizon, as they accumulate area and increase in age. Proportions of forest harvest area transferred to reserve forest classes can be found in Section 6.1.1.8.

Estimated riparian reserve, nest reserves and tourism reserves were included in the initial SFMM land base and were therefore not added to this “areas reserved” screen in SFMM. This inclusion of estimated reserve area for modelling purposes reflects the “best information available” to the Planning Team and shows improvement in modelling assumptions since the 2004 FMP.

Analysis was conducted to check that the area being left unharvested during operations was strategically sufficient to account for estimated residual area required by the Stand and Site Guide. This analysis considered the area-based inoperable area already accounted for in the Unharvested Volume Percentages (Section 6.2.3.2), and the estimated reserve area included in the initial land base for riparian, nest and tourism reserves. This analysis is documented below. The analysis indicated that more than enough residual area is projected to be left unharvested to meet Stand and Site Guide targets through the application of normal operations and regular implementation of area of concern prescriptions.

SILVICULTURAL OPTIONS

Whiskey Jack Forest 2012 FMP

Areas Reserved from Harvesting

Accumulating Reserves

- Accumulating riparian reserves (lake and streams) were estimated for each forest unit using slope based DEM data and classified in the initial SFMM land base. No additional riparian reserves required. Estmated tourism and nest reserves were added to initial land base as reserve. No additional nest reserves required. All reserves classified as "EstRes" in SFMM.

- Accumulating reserves may apply to first rotation (i.e. up to first 30-80 years), but are not further deducted during second harvest.

- The estimated reserves from the initial land base, the area-based unharvested volume percentages, and the target percentages for landscape pattern (Stand and Site Guide) were compared to determine if additional residual (RESID) reserve percentages were required in the SFMM modeling.

Calculation for Additional Accumulating Reserve Residual Required

Planned residual already accounted for through riparian reserves, other AOCs (tourism, nests), and area based unharvested volume reductions:

Forest Unit:	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	Total	
	63	187	315	2	12	84	30	278	17	-	109	33	1,129	<== Nest AOCs (reserve in initial land base)
EstRes (ha)	3,580	8,244	12,152	261	281	13,530	4,472	8,255	324	202	9,984	3,656	64,941	<== Riparian AOCs (reserve in initial land base)
	697	1,432	3,007	10	43	1,279	322	2,203	32	14	935	398	10,374	<== Tourism AOCs (reserve in initial land base)
Total Reserve (ha)	4,340	9,864	15,475	272	336	14,893	4,824	10,736	372	216	11,028	4,088	76,444	<== Total estimated AOC reserves
Total Avail+EstRes(ha)	26,783	80,475	93,371	1,828	1,811	159,963	52,632	63,563	1,511	1,598	121,898	43,047	648,478	<== Total area in available and estimated reserve (OWN=1, not otherwise classified as reserve).
Reserve Percent	0.16	0.12	0.17	0.15	0.19	0.09	0.09	0.17	0.25	0.14	0.09	0.09	0.12	<== Est. Reserved percent of available land base.
Unharv Vol % (inop)	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	<== Unmapped residual area data from Unharv_Vol %.
Total Residual Est.	**0.18**	**0.14**	**0.19**	**0.17**	**0.21**	**0.11**	**0.11**	**0.19**	**0.27**	**0.16**	**0.11**	**0.11**	**0.14**	<== Estimated reserve and inoperable area(%)
Est. SSG Target	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	
Add'l RESID% required in SFMM?	**-0.12 NO**	**-0.08 NO**	**-0.13 NO**	**-0.11 NO**	**-0.15 NO**	**-0.05 NO**	**-0.05 NO**	**-0.13 NO**	**-0.21 NO**	**-0.10 NO**	**-0.05 NO**	**-0.05 NO**	**More area is being left unharvested in and adjacent to harvest areas than required by the Stand and Site guide.**	

No Additional residual accumulating area is required to be included in the modelling as per June 2010 estimates.

Stand and Site Guide Direction:

Pg. 19

25 ha residual in 500 ha circle (mapped, greater than 0.1 ha in size).

5 ha of the above 25 ha must be in patches of greater than or equal to 5 ha.

- equals 5% and includes adjacent stands that are at least 10 m tall or older than 20 years.
- expect this residual will be met through AOCs, inoperable areas and adjacent unallocated stands.

0.5 ha residual in 50 ha circle (mapped, greater than 0.1 ha in size).

- equals 1% but includes adjacent stands that are at least 10 m tall or older than 20 years.
- may be met through estimated inoperable areas, nest reserves, etc.
- determine if additional net-down in SFMM modelling required (use unharvested volumes if not mapping in advance, use areas reserved if will map in advance at FMP stage).

Decision to map whole harvest areas and then determine inoperable areas and residual as appropriate. Therefore mapped harvest areas will include any estimated inoperable areas and planned harvest area is not amended into the plan if additional residual or inoperable areas are retained within the harvest blocks than estimated. Likewise, if guide residual requirements are met and less inoperable area is encountered than strategically estimated, the company will harvest the harvest blocks more fully.

Pg. 21

>= 25 wildlife trees per ha on average (>= 10 cm dbh), NOTE: only portion are live, see Volumes Left Unharvested worksheet.

>= 10 large wildlife trees or stubs on average per ha (>= 25 cm dbh) of which a minimum of 5 must be living.

- wildlife trees must be well dispersed with a minimum of 15 trees per ha (other 10 trees per ha may be clumped).
- residual trees accounted for in the unharvested volume percentages in the SFMM modelling

SFMM Inputs for: AREAS RESERVED FROM HARVESTING **(all inputs are zero (0).)**

Forest Unit	Reserve Type	Planning Period: T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15
BFM	n/a															
CMX	n/a															
HMX	n/a															
OCL	n/a															
OTH	n/a															
PJD	n/a															
PJM	n/a															
POD	n/a															
PRW	n/a															
SBL	n/a															
SPD	n/a															
SPM	n/a															

6.2.3.6 Conversion of Harvested Areas to Non-Forest Land

SFMM inputs contain rates of harvest area converting to non-forested land. These rates represent the portion of harvested area that is not regenerated back to forest, but instead transfers to non-forest land types. This input is used to reduce the potential available harvest area by forest unit to account for the construction of addition permanent primary and branch roads and landings. SFMM classifies the resulting accumulating roads and landings as "non'-forest" area and reduces the available land base accordingly. This input does not consider operational roads that will be constructed and decommissioned promptly after forest management activities are complete.

The Whiskey Jack Forest is generally well accessed at Plan Start, with minimal construction of primary access roads required. It is estimated that approximately 1% of the Available Harvest Area will convert to roads and landings over the next two 10-year terms (2012-2032) in the non-caribou management zone. Thereafter, road construction will be equal to future road decommissioning, except in caribou subunits that are still being accessed and harvested for the first time (caribou zone road construction extended out to 110 years when last blocks are being cut for the first time).

The projected loss of harvested area to non-forest, through road development, is set at 1% for 20-110 years (Table 14) based on the caribou zone and non-caribou zone. This conversion of harvested productive land to permanent non-productive roads is projected to be 1,300 hectares over the next 110 years.

Table 14 Conversion of Harvested Area to Non-forest Land

		All Subunits:		Caribou Subunits Only:												
	Forest Unit	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15
RdLdg	BFM	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01				
	CMX	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01				
	HMX	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01				
	OCL	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01				
	OTH	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01				
	PJD	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01				
	PJM	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01				
	POD	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01				
	PRW	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01				
	SBL	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01				
	SPD	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01				
	SPM	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01				

6.2.3.7 Strategic (Biological) Forest Renewal Limits by Proportion

Forest renewal limits by proportion are set in the Base Model to represent biological limitations of local conditions on the Whiskey Jack Forest. These proportions reflect local knowledge of suitable sites for silvicultural treatment packages included in Table FMP-4, and common, effective silvicultural practices. For example, if funding and planting stock were not limited, it is expected that only 80% of the jack pine dominant (PJD) could be planted or seeded and result in a Basic1 jack pine plantation due to site conditions (limited those stands with low competition, site class 2 or better and not wet ecosites).

The biological limits documented below were duplicated for all terms of the strategic modelling. Biological limits are ecologically site related and are consistent with the definitions used in the development of yield curves to represent current and future forest conditions. Biological limits

are not related to funding or desired future forest condition. These inputs were included in the SFMM base model, all subsequent investigations and development of the LTMD (Table 15).

Table 15 Biological Forest Renewal Limits by Proportion

Applies to AllSU combined and is duplicated for all 15 10-year terms within the SFMM model.
Grey shading indicates invalid treatment intensities.

Forest Unit	Minimum proportion renewed: Prsnt	EXTEN	BASC1	INTN1	Basc2
BFM	0			0	0
CMX	0			0	0
HMX	0		0	0	0
OCL	0		0	0	0
OTH	0		0	0	0
PJD	0			0	0
PJM	0			0	0
POD	0		0	0	0
PRW	0				0
SBL	0			0	0
SPD	0			0	0
SPM	0			0	0

No minimum proportion limits used in the modelling.

Forest Unit	Maximum proportion renewed: Prsnt	EXTEN	BASC1	INTN1	Basc2	Note:
BFM	0		0.5		0	1
CMX	0		0.6	0.15	0	2, 3
HMX	0		0.1		0	4
OCL	0				0	
OTH	0				0	
PJD	0		0.8	0.1	0	5,6
PJM	0		0.7	0.1	0	7,8
POD	0				0	
PRW	0			0.15	0	14
SBL	0		0.2		0	13
SPD	0			0.1	0	9, 10
SPM	0			0.1	0	11, 12

NOTE	Forest Unit	Treatment Intensity	Treatment Description	Min/Max Limit	Rationale
1	BFM	BASIC	Mech SIP, Plant or seed	50% Max	Ecological consideration to apply treatment only to sites where there is growth potential. This would include wet sites or where access for mechanical site preparation is limited.
2	CMX	BASIC	Mech SIP, Plant or seed	60% Max	Treatments are limited to where hardwood competition will not prevent successful application of this treatment. Limits also include unproductive sites or wet sites.
3	CMX	INTEN	Mech SIP, Plant and spacing	15% Max	Apply treatment only to sites where there is best growth potential. Limits to potential area for treatment includes wet sites, restricted access for mechanical site preparation and low productive site class 3.
4	HMX	BASIC	Mech SIP, Plant or seed	10% Max	Treatments are limited to where hardwood competition will not prevent successful application of this treatment of conversion to conifer dominated stands. Limits also include unproductive sites or wet sites.
5	PJD	BASIC	Mech SIP, Plant or seed	80% Max	The treatment should be limited to sites where hardwood competition would not prevent successful application of this treatment. Limits to treatment also include unproductive sites, wet sites or unsuitable ecosites.
6	PJD	INTEN	Mech SIP, Plant or seed and spacing	10% Max	10% of sites are suitable for the application of this treament based on site class, management considerations, suitable ecosites (based on silvicultural effectivenesss results for the forest).
7	PJM	BASIC	Mech SIP, Plant or Seed	70% Max	The treatment should be limited to sites where hardwood competition would not prevent successful application of this treatment. Limits to treatment also include unproductive sites of wet sites.
8	PJM	INTEN	Mech SIP, Plant or seed and spacing	10% Max	10% of sites are suitable for the application of this treament based on site class, management considerations, suitable ecosites (based on silvicultural effectivenesss results for the forest).
9	SPD	BASIC	Mech SIP, Plant or Seed	no limit	The treatment should be limited to sites where hardwood competition would not prevent successful application of this treatment. Limits to treatment also include unproductive sites of wet sites.
10	SPD	INTEN	Mech SIP, Plant and spacing	10% Max	10% of sites suitable for the application of this treament based on site class, management considerations and ecosites.
11	SPM	BASIC	Mech SIP, Plant or Seed	no limit	the treatment should be limited sites where hardwood competition would not prevent successful application of this treatment. Limits to treatment include unproductive sites of wet sites.
12	SPM	INTEN	Mech SIP, Plant or seed and spacing	10% Max	10% of sites are suitable for the application of this treament based on site class, management considerations, suitable ecosites (based on silvicultural effectivenesss results for the forest).
13	SBL	BASIC	Mech SIP, Plant and spacing	20% Max	Percentage of area in lowland condition that will convert to non-forest without a minimum amount of silviculture. For successful regeneration to productive forest, Sb must be planted promptly on site.
14	PRW	INTEN	Mech SIP, Plant and spacing	15% Max	The treatment should be limited sites where hardwood competition would not prevent successful application of this treatment. Limits to treatment also include unproductive sites of wet sites.

6.2.3.8 Mid-rotation Tending and Non-forest Rehabilitation Options

Juvenile spacing is conducted as a component of stand establishment and was factored into the refinement of the post-renewal forest succession treatment costs and forest unit transitions associated with intensive treatment options for CMX, PRW, SPD, SPM, PJD and PJM forest units (Section 6.2.3.3). No commercial thinning options are included in the strategic modelling as none are operationally implemented on the management unit.

6.2.4 Correlation to the Simulated Range of Natural Variation (SRNV)

In accordance with management objectives, it is desirable that the FMP project forest management activities that will create a future forest landscape with a composition and structure that is similar to those created by natural processes. During development of the Base Model, it was important to correlate the SFMM natural forest dynamics (without fire suppression) to the Simulated Ranges of Natural Variation (SRNV) incorporated into the Ontario Landscape Tool (OLT), so that both models projected similar future natural forest conditions. If this correlation was not completed, there could be a situation where planning teams could not achieve desirable target results, no matter what was projected for harvest and renewal in the Long-term Management Direction. This correlation ensures that OLT SRNVs are achievable, or in fact may identify where certain OLT projections are not reasonable for the FMP considering the planning inventory used. In this latter situation, differences would be identified and desirable levels for management objective indicators would need to be developed from sources other than the OLT model.

The first step in this correlation was the development of a SFMM run to simulate the natural forces of change in the forest, which are disturbance (principally fire disturbance with no fire suppression) and old age succession (stands convert to different species composition through time, or stands break up to form younger stands from understory trees). The Natural Scenario (Natural12) is this simulation using the Strategic Forest Management Model (SFMM) of how the forest might develop in the absence of human intervention.

The result of the correlation of SFMM natural forest projections (no fire suppression or harvesting) was that natural (old age) succession and fire disturbance (cycles and transitions) were reviewed and refined in SFMM as necessary to align with the OLT SRNV projections using BFOLDs inputs. This was an iterative process and resulted in the two models generally being comparable for the forest composition classes being reviewed: landscape classes, caribou habitat, old forest area, forest unit area.

The following components were initially identified as not being comparable between SFMM and OLT otherwise the team achieved a good correlation between the two models:

(a) The Mature and Late Successional Lowland Landscape Class (**MLl**) was not well correlated between the OLT model as compared to the SFMM model. Plan Start values for MLl for SFMM are 2,889 hectares (based on forest inventory sort) whereas the OLT simulation suggests a Plan Start level of 15,219 hectares and a lower simulated range of natural variation (SRNV) of 12,845 hectares. Since MLl area is related to only lowland ecosites and also to only the mature and older age classes, it is considered impossible to project forest management activities in SFMM to increase the MLl area significantly enough to ever reach the lower SRNV area.

(b) Old forest Spruce Lowland (**SLo**) was also not well correlated between the OLT model and SFMM. This area is lowland ecosite and old age related as is the Mature/Late Lowland landscape class discussed above (all SLo old forest area would also be classified as MLl landscape class area). Based on the inventory, SFMM projected only 97 hectares of SLo at 2012, whereas the OLT model was based on 1,631 ha at 2012 and calculated a lower SRNV of 3,319 ha for SLo. While it is possible to increase the area of SLo through time (some conversion from OCL), it was not

possible to convert enough area to SBL and let it age to create enough old spruce lowland forest in the future up to the projected OLT minimum levels.

(c) NOTE: in Sept. 2010 when Run 27a was developed, the land base contained an adjustment correcting the classification of 15,800 ha of SPD to the SBL forest unit. This adjustment corresponded to the correct application of the forest unit script and related to standard forest unit definitions. This the results of this correction served to make the correlation between SFMM and OLT land bases better for the (a) MLl landscape class and the (b) SLo old forest area. The natural scenario was not revised at this late time as the correlation of the SFMM model to the OLT model was already completed.

Details of the comparison of SFMM natural scenario to the OLT model follow.

Landscape Class Area and Caribou Habitat

Tree Species: HECTARES AllSU

Nature12	PSp	ICn	IHd	MLb	MLl	MLh	MLc	Cr	Cwu	Cwp
T1	200,327	152,744	62,934	8,361	2,889	105,229	192,907	101,492	45,035	18,032
T2	174,858	169,143	45,610	8,572	2,844	119,630	204,733	102,260	46,953	15,735
T3	169,407	192,553	57,286	8,416	2,784	104,506	190,438	117,085	70,319	12,632
T4	197,400	180,021	65,465	9,408	2,687	87,535	182,874	126,825	69,346	13,763
T5	199,024	157,778	68,254	15,214	2,797	79,662	202,660	129,656	71,125	31,168
T6	201,039	141,794	73,255	16,444	2,862	64,385	225,612	134,378	76,673	30,437
T7	203,345	135,895	75,196	15,652	3,162	54,018	238,122	136,067	77,162	25,525
T8	206,000	147,444	74,211	14,908	3,119	49,785	229,923	136,613	77,695	27,213
T9	208,715	153,489	68,764	14,465	3,119	50,297	226,541	137,420	78,159	28,630
T10	211,301	152,852	64,835	13,562	3,119	52,065	227,656	138,621	78,483	28,780
T11	213,609	152,987	61,866	12,791	3,119	53,117	227,900	139,413	78,695	29,766
T12	215,487	157,480	59,474	12,002	3,119	53,547	224,280	140,109	79,832	30,325
T13	217,100	161,396	57,407	11,304	3,119	52,919	222,144	140,706	81,716	30,060
T14	218,610	161,696	56,516	10,583	3,119	50,812	224,053	141,094	82,231	29,758
T15	220,025	161,099	55,184	9,914	3,119	49,058	226,991	141,626	82,476	30,091
T16	221,436	162,608	53,851	9,361	3,119	47,357	227,658	142,265	82,809	31,043

OLT SRNV Levels: **(May 28, 2010 excel information)**

SRNV:	**from OLT version 3.0.3827**									
upper	263,084	228,782	63,469	16,237	16,276	65,739	269,185	161,804	47,453	68,169
med	203,534	152,718	48,222	11,624	14,800	51,953	226,975	155,405	37,590	52,891
lower	143,268	103,333	36,052	8,706	12,845	43,021	178,461	147,605	26,809	36,912
							709,824			
Plan Start										
OLT	242,714	123,071	89,450	7,168	15,219	79,080	175,378	101,492	45,035	18,032
SFMM	200,327	152,744	62,934	8,361	2,889	105,229	192,907	120,361	24,749	21,797

Old Forest Groupings:

Nature12	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo
T1	3,707	1,851	8,811	17,199	1,251	23,309	97	18,431
T2	4,279	1,920	15,096	27,428	1,523	42,927	225	21,073
T3	6,414	1,883	21,264	26,317	1,590	44,101	310	26,688
T4	6,697	1,835	30,608	21,442	1,500	35,399	358	33,299
T5	6,390	1,785	38,086	38,191	1,427	28,324	441	39,337
T6	6,946	1,727	41,897	34,616	1,349	19,224	438	46,945
T7	11,358	1,670	40,777	21,714	1,264	13,414	461	52,122
T8	12,063	1,647	36,993	14,396	1,200	25,908	420	52,264
T9	10,917	1,599	32,133	10,995	1,168	30,665	472	53,222
T10	10,246	1,629	28,999	9,270	1,092	26,304	481	54,928
T11	10,422	1,587	23,686	10,225	1,092	21,343	445	64,318
T12	9,440	1,587	18,840	13,269	1,092	24,744	488	72,264
T13	6,934	1,587	16,824	16,040	1,092	24,664	484	75,651
T14	6,247	1,587	16,947	15,971	1,092	25,171	564	77,306
T15	7,189	1,587	17,941	15,068	1,092	26,524	623	78,112
T16	7,208	1,587	17,850	13,955	1,092	28,782	782	77,061

OLT SRNV Levels:

SRNV:								
upper	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427
med	7,416	1,499	27,174	9,550	1,149	28,494	4,366	34,144
lower	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840
Plan Start								
OLT	3,278	1,864	6,923	11,936	744	18,359	1,631	7,908
SFMM	3,707	1,851	8,811	17,199	1,251	23,309	97	18,431

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Nature12 AllSU
Forest Unit: Total Avail + Res Area by Forest Unit

	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	27,148	88,490	107,239	2,216	1,995	182,833	61,845	73,978	3,312	1,807	128,589	45,937
T2	23,738	85,144	105,680	2,216	1,995	191,367	66,177	78,521	3,312	1,807	118,510	46,923
T3	21,201	85,837	104,116	2,216	1,995	195,602	68,133	76,427	3,310	1,807	114,702	50,043
T4	19,194	90,645	98,975	2,216	1,994	198,614	70,661	72,072	3,303	1,807	112,024	53,883
T5	17,614	89,225	94,588	2,216	1,994	202,489	73,716	70,688	3,299	1,807	110,278	57,477
T6	16,637	88,940	86,448	2,216	1,994	207,135	74,886	67,632	3,277	1,807	110,589	63,831
T7	15,652	87,466	77,356	2,216	1,995	213,842	75,319	67,293	3,252	1,807	111,062	68,130
T8	14,908	81,254	72,547	2,216	1,995	222,411	77,084	66,066	3,233	1,807	108,974	72,895
T9	14,465	71,713	65,883	2,216	1,994	229,040	80,422	67,004	3,168	1,807	107,726	79,952
T10	13,562	64,911	61,961	2,216	1,994	236,417	83,014	68,245	3,126	1,807	105,954	82,182
T11	12,791	60,224	58,518	2,216	1,995	241,816	87,436	69,407	3,061	1,807	103,236	82,883
T12	12,002	54,956	56,456	2,216	1,994	249,007	89,177	69,133	3,003	1,807	101,555	84,083
T13	11,304	52,056	53,841	2,216	1,994	256,058	88,275	68,670	2,913	1,807	103,113	83,143
T14	10,583	51,262	51,986	2,216	1,994	263,989	87,442	67,176	2,863	1,807	103,645	80,425
T15	9,914	51,520	50,149	2,216	1,994	271,508	87,529	65,594	2,845	1,807	104,127	76,187
T16	9,361	50,811	48,335	2,216	1,994	278,957	88,026	64,031	2,792	1,807	103,594	73,464
SFU	BfMx1, BfPur, ConMx	ConMx, UplCe	HrdMw, HrDom, BwDee, BwSha	OCLow	OthHd	PjSha, PjDee	PjMx1	PoDee, PoSha	PrwMx, PwDom, PrDom	SbLow	SbDee, SbSha, SbMx1, BfMx1	SbMx1
OLT	BfMx1	ConMx	HrdMx, HrDom, BwDom	OcLow	OthHd	PjDom	PjMx1	PoDom	PrwMx, PwDom, PrDom	SbLow	SbDom	SbMx1

OLT SRNV Levels: **(May 28, 2010 excel information)**

SRNV:		**from OLT version 3.0.3827**										
upper	19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175
med	14,397	52,990	60,613	2,563	2,237	245,315	93,801	39,017	73,763	19,151	55,466	57,708
lower	10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174
Plan Start												
OLT	27,215	86,831	99,624	2,635	2,447	219,851	46,359	75,469	-	18,297	103,153	46,871
SFMM	27,148	88,490	107,239	2,216	1,995	182,833	61,845	73,978	3,312	1,807	128,589	45,937
Lower Range	4,268	14,323	13,746	842	491	55,744	22,432	7,268	14,664	6,236	19,957	13,611
Lower Quartile	10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174
Median	14,397	52,990	60,613	2,563	2,237	245,315	93,801	39,017	73,763	19,151	55,466	57,708
Upper Quartile	19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175
Upper Range	27,303	138,903	175,229	6,068	5,976	739,602	263,605	131,990	236,962	42,131	140,823	162,227
Year0	25,332	56,282	75,965	12,213	871	160,061	22,337	39,187	856	7,758	75,375	26,923

Red Pine/White Pine, Upland Pine and Spruce and Upland Conifer Percentage:

Nature12

	auto	auto	auto	These forest unit contribute to Indicator 3e (CarSU only):												auto	auto
	(2d) Amount of red pine and white pine forest (ha, all ages, PRW forest unit)	**(2e) Amount of upland pine and spruce forests** (ha, all ages, total of PJD, PJM, SPD, and SPM forest unit areas)	**(3e) % of conifer dominated forest in caribou zone.**	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	TOTAL Conifer in CarSU	TOTAL CarSU
T1	3,312	419,205	89%	7,681	17,857	13,032	204	63	61,114	20,602	7,351	154	448	43,853	13,516	164,980	185,875
T2	3,312	422,977	88%	6,716	17,564	13,318	204	63	63,915	21,430	7,953	154	448	40,341	13,768	164,092	185,875
T3	3,310	428,481	88%	5,936	17,874	13,400	204	63	65,623	21,359	7,727	154	448	38,816	14,271	164,236	185,875
T4	3,303	435,183	89%	5,288	18,263	13,263	204	63	67,250	21,542	7,315	154	448	37,310	14,776	164,786	185,875
T5	3,299	443,959	89%	4,739	17,733	13,108	204	63	69,434	21,634	7,440	154	448	35,692	15,226	164,816	185,875
T6	3,277	456,440	89%	4,280	16,748	12,693	204	63	71,696	21,555	7,873	154	448	34,131	16,032	164,798	185,875
T7	3,252	468,353	89%	3,867	15,984	12,326	204	63	74,025	21,581	8,252	154	448	32,949	16,022	164,785	185,875
T8	3,233	481,363	89%	3,451	15,533	11,817	204	63	76,585	21,756	8,614	154	448	31,069	16,180	164,932	185,875
T9	3,168	497,140	89%	3,123	14,930	11,438	204	63	78,815	22,041	8,964	154	448	29,483	16,211	164,962	185,875
T10	3,126	507,567	89%	2,816	15,106	10,745	204	63	79,246	22,767	9,049	154	448	28,929	16,348	165,569	185,875
T11	3,061	515,371	89%	2,590	14,931	10,289	204	63	81,164	22,884	9,285	154	448	27,483	16,379	165,790	185,875
T12	3,003	523,822	89%	2,452	13,830	10,058	204	63	80,913	24,677	9,231	154	448	27,019	16,826	166,075	185,875
T13	2,913	530,589	90%	2,359	11,985	9,702	204	63	82,773	23,422	9,303	154	448	27,374	18,088	166,358	185,875
T14	2,863	535,501	90%	2,218	11,395	9,585	204	63	83,805	22,789	9,314	154	448	27,750	18,150	166,465	185,875
T15	2,845	539,350	90%	2,076	11,263	9,371	204	63	85,293	22,198	9,289	154	448	28,172	17,344	166,704	185,875
T16	2,792	544,041	90%	1,932	11,067	9,150	204	63	86,874	22,171	9,256	154	448	27,291	17,265	166,957	185,875

SRNV:	All ages Target to not decrease
Upper Quartile	497,902 conifer %.
Median	481,681 (don't want more hardwood)
Lower Quartile	457,260
Year0 OLT	389,842
Year0 SFMM	419,205
	497,902
	457,260

Observations:

PRW Forest unit area decreases through time.
May want to adjust PRW nat succ so it is stable.
Maintaining conifer in the caribou zone looks OK. This conifer component will increase with forest renewal options.

6.2.5 Base Model and LTMD Management Options

The management objectives inputs are used to define current policies, practices, targets, and strategies that apply to specific forest management situations in investigations or development of the long-term management direction. Inputs related to management decisions are discussed in the following sub-sections. Various inputs were used to define specific scoping investigations and also were added through development of the Proposed LTMD to aid in projections of forest sustainability or objective achievement.

6.2.5.1 Silvicultural Budgets, Distribution and Discount Rates

The base model did not include any constraints to renewal budgets. It allowed all necessary silvicultural expenditures to be projected ("infinite" budget). The LTMD does limit the renewal expenditures to the level generated by revenues to the Forest Renewal Trust Fund based on projected harvest volumes per term, all subunits combined.

6.2.5.2 Stability of Forest Unit Areas

The SFMM model does not constrain the variation in area in each forest unit from term to term, unless specific constraints are added to limit increases or decreases in area. Percentages are a measure of allowable change in the total productive forest through time as compared to the initial land base in 2012. Constraints on one input parameter can inadvertently affect the results concerning another parameter therefore the use of constraints should be minimized. No forest unit area stability constraints were added to the Base Model, nor were any used in the Long-term Management Direction and the area by forest unit was limited through the use of other constraints (Section 6.2.5.3 and Section 6.2.5.5).

6.2.5.3 Age Class Area Limits by Forest Unit Group and Age Class Group

This input was not used in the Base Model. During investigations and development of the LTMD, the Strategic Task Team reviewed projected results for the forest units by age grouping (immature versus mature+). The task team decided to constrain the model to improve projected results for the mature+ age grouping by forest unit. The area in the immature age group by forest unit was not considered a priority to force in the SFMM model as sufficient younger forest would be projected to be retained through time in order to meet the mature+ area targets included in the model.

Certain forest units required constraints in the LTMD for area of mature+ added: HMX, OTH, PJD, PJM, and SBL as documented in Table 16.

Table 16 Age Class Area Limits by Forest Unit and Age Group

None used in Base Model.

The LTMD includes targets for minimum hectares of mature/late successional forest by forest unit.

This input was used to improve the projected area by foest unit by development stage, however it was noted that the achievement of other OLT landscape indicators would be considered more important in the hierarchy of balancing objective achievement.

	Base Model		Long-term Management Direction							
	Min. Ha.	Max. Ha	Min. Ha.	Min. Ha.	Min. Ha.	Min. Ha.	Min. Ha	Max. Ha	Min. Ha.	Max. Ha
	all FUs	all FUs	HMX >60 yrs	OTH >60 yrs	PJD >70 yrs	PJM >70 yrs	SBL >70 yrs	all FUs	PJD, PJM, SPD, SPM	
T1									all AC	all AC
T2										
T3										
T4										
T5										
T6										
T7										
T8			20,000	1,250	52,500	27,500	10,100		458,000	
T9			20,000	1,250	52,500	27,500	10,100		458,000	
T10			20,000	1,250	52,500	27,500	10,100		458,000	
T11			20,000	1,250	52,500	27,500	10,100		458,000	
T12			20,000	1,250	52,500	27,500	10,100		458,000	
T13			20,000	1,250	52,500	27,500	10,100		458,000	
T14			20,000	1,250	52,500	27,500	10,100		458,000	
T15			20,000	1,250	52,500	27,500	10,100		458,000	
T16			20,000	1,250	52,500	27,500	10,100		458,000	
			Regulation of forest unit area by age grouping						Upland Pine and Spruce	

6.2.5.4 Age Class Proportion Limits by Forest Unit (Old Forest Area)

Not used in the Base Model or LTMD as old forest was regulated using Growing Stock targets (Section 6.2.5.5, item 4).

6.2.5.5 Growing Stock Targets

Four types of growing stock limits were used in the strategic modelling.

1. A minimum total **Growing Stock Limit** in the available forest (all subunits combined) was added to control a potential over harvest at the end of the planning horizon (35.0 million of net merchantable cubic metres in Term 16 only). Otherwise, without additional constraints, SFMM will project maximum harvest areas in order to maximize the value of harvest volumes. The addition on the one constraint serves to regulate the activities projected at the end of the planning horizon into more reasonable ranges. This constraint was included in the Base Model and all subsequent investigations, including the Long-term Management Direction.

2. Growing Stock Limits by Species Groups were included as a surrogate for **Landscape Class Area** targets (related to Section 4.1.4.3).

Landscape classes were included in the SFMM strategic modeling inputs, not as area, but as volume placeholders. This approach was supported by regional advisors which ensured regional consistency in landscape class modelling inputs.

Each landscape class was represented as a unique "tree species" that was not available to be harvested. This allowed tracking of hectares per landscape class through time, and also allowed for the addition of minimum or maximum targets for each landscape class. This

approach did not affect projected harvest volumes at all as these volumes were assumed to be 100% unharvested. These classification inputs were included in the Base Model and all subsequent investigations, including the LTMD.

The seven landscape classes are:

1 Pre-sapling
2 Immature Conifer
3 Immature Hardwood
4 Mature/Late Successional Balsam Fir
5 Mature/Late Successional Lowland Spruce
6 Mature/Late Successional Hardwood
7 Mature/Late Successional Conifer

During development of the LTMD, the Strategic Task Team decided include minimum targets for the landscape class areas to ensure the projected forest condition would meet minimum desirable levels for the landscape class area indicator (Table 17). The Planning Team was satisfied that they had met the direction from the draft Landscape Guide which was supported by the best available science incorporated into the Ontario Landscape Tool (OLT).

Table 17 Growing Stock Targets by Species Group – Landscape Class Area

The following minimum areas for mature/late successional landscape classes were included in the LTMD:
(applies to AllSU, target for mature/late successional classes as per Landscape Guide indicator direction.)

AllSU	Pre-Sapling, Sapling	Immature Conifer	Immature Hardwood	Mature/Late Successional Balsam Fir	Mature/Late Successional Lowland Spruce	Mature/Late Successional Hardwood	Mature/Late Successional Upland Conifer
T1							
T2							
T3							
T4							
T5							
T6	160,000	150,000	50,000	10,000	-	43,100	200,000
T7	160,000	150,000	50,000	10,000	-	43,100	200,000
T8	160,000	150,000	50,000	10,000	12,850	43,100	200,000
T9	160,000	150,000	50,000	10,000	12,850	43,100	200,000
T10	160,000	150,000	50,000	10,000	12,850	43,100	200,000
T11	160,000	150,000	50,000	10,000	12,850	43,100	200,000
T12	160,000	150,000	50,000	10,000	12,850	43,100	200,000
T13	160,000	150,000	50,000	10,000	12,850	43,100	200,000
T14	160,000	150,000	50,000	10,000	12,850	43,100	200,000
T15	160,000	150,000	50,000	10,000	12,850	43,100	200,000
T16	160,000	150,000	50,000	10,000	12,850	43,100	200,000

3. Growing Stock Limits by Species Groups were included as a surrogate for **Caribou Habitat Area** targets.

Caribou habitat classes were included in the SFMM strategic modeling inputs, not as area, but as volume placeholders, in a similar fashion as landscape classes.

Caribou habitat minimum targets were not included in the Base Model. Minimum caribou habitat area targets were included in various investigations and the Long-term Management Direction (Table 18).

Caribou habitat as included in the Ontario Landscape Tool (OLT) were included in the SFMM strategic modeling inputs, not as area, but as volume placeholders. These placeholders were applied to only the caribou subunits (CarXX SUBMUs only; not LOW, PAK, or PAT).

Each caribou habitat class was represented as a unique "tree species" that was not available to be harvested (100% unharvested volume). This allowed tracking of hectares per habitat type class through time, and also allowed for the addition of minimum or maximum targets for each caribou habitat type. This approach did not affect projected harvest volumes.

Table 18 Growing Stock Targets by Species Group – Caribou Habitat

The three caribou habitat types from OLT are:

1 Cr - Caribou refuge
2 Cwu - Caribou winter used
3 Cwp - Caribou winter preferred

The following minimum areas for caribou habitat were included in the LTMD:
(applies to caribou subunits only (CarSU)).

CarSU only	Cr	Cwu	Cwp
T1			
T2			
T3			
T4			
T5			
T6	150,000	38,000	40,000
T7	150,000	38,000	40,000
T8	150,000	38,000	40,000
T9	150,000	38,000	40,000
T10	150,000	38,000	40,000
T11	150,000	38,000	40,000
T12	150,000	38,000	40,000
T13	150,000	38,000	40,000
T14	150,000	38,000	40,000
T15	150,000	38,000	40,000
T16	150,000	38,000	40,000

4. Growing Stock Limits by Species Groups were included as a surrogate for **Old Forest Area** targets.

Old forest groupings were included in the SFMM strategic modeling inputs, not as area, but as volume placeholders, in a similar fashion as landscape classes.

Old forest area definitions were based on criteria from the *Old Growth Forest Definitions for Ontario*. Old forest area definitions based on primary working group species growing on the primary ecosite (from forest unit analysis). The definitions for old forest were consistent with the old forest area calculated in the Ontario Landscape Tool (OLT) model which was used to set desirable levels for this indicator.

The groupings of Old Forest related to OLT (with the corresponding PLANFUs noted) are:

1 BFo - Old Forest BF (BFM) (>80 years)
2 CLo - Old Forest Conifer Lowland (OCL) (>100 years)
3 CMo - Old Forest Conifer Mixedwood (CMX) (>100 years)
4 HWo - Old Forest Hardwood (POD, HWD) (>100 years)
5 OHo - Old Forest Other Hardwood (OTH) (>90 years)
6 PJo - Old Forest Jack Pine (PJD, PJM) (>100 years)
7 SLo - Old Forest Black Spruce Lowland (SBL) (>160 years)
8 SPo - Old Forest Upland Spruce (SPD, SPM) (>110 years for SPM and >120 years for SPD)

Note: PRW is not included in the OLT old forest calculations, and was not unintentionally missed. A desirable level was later added for old forest PRW (>140 years old) based on maintaining the Plan Start amount of area, as no OLT SRNV was available.

Old forest minimum targets were not included in the Base Model. Minimum old forest area targets were included in various investigations and the Long-term Management Direction (Table 19).

Table 19 Growing Stock Targets by Species Group – Old Forest Area

The following minimum areas for Old Forest were included in the LTMD:
(applies to AllSU).

AllSU	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo
T1								
T2								
T3								
T4								
T5								
T6	-	1,400	21,000	8,000	1,000	21,000	3,400	30,000
T7	6,000	1,400	21,000	8,000	1,000	21,000	3,400	30,000
T8	6,000	1,400	21,000	8,000	1,000	23,000	3,400	30,000
T9	6,000	1,400	21,000	8,000	1,000	23,000	3,400	30,000
T10	6,000	1,400	21,000	8,000	1,000	23,000	3,400	30,000
T11	6,000	1,400	21,000	8,000	1,000	23,000	3,400	30,000
T12	6,000	1,400	21,000	8,000	1,000	23,000	3,400	30,000
T13	6,000	1,400	21,000	8,000	1,000	23,000	3,400	30,000
T14	6,000	1,400	21,000	8,000	1,000	23,000	3,400	30,000
T15	6,000	1,400	21,000	8,000	1,000	23,000	3,400	30,000
T16	6,000	1,400	21,000	8,000	1,000	23,000	3,400	30,000

6.2.5.6 Timber Volume Species Group Definitions & Harvest Flow Policies

Timber volume species groups included in the strategic modelling reflect the volume species groups used by the Forest Resource Assessment Policy required for this 2012 FMP.

This SFMM input is used to define harvest volume by groupings of timber species. For the Whiskey Jack Forest FMP, Spruce-Pine-Fir (SPF), Red Pine – White Pine (PWR), Poplar (PO) and White Birch (BW) were defined and reported. Also additional volume groups for the total of all species (TOTAL) and for the total of poplar and birch (PO+BW) were defined to aid analysis and inclusion of management objective targets. Major harvest volume group definition inputs for SFMM are documented in Table 20.

Ontario Forest Accord Advisory Board (OFAAB) data does not include significant volumes for the OC (other conifer, cedar, larch) or TOL (tolerant hardwood) species volume groups. Therefore these volume groups are not considered major on the forest, and will not be included in SFMM investigations.

Table 20 Major Harvested Timber Species Groups

Major Species Group Definitions:
Inclusion in a species group denoted by "1", exclusion denoted by "0".

	Tree Species:													
FU	Pw	Pr	Pj	Sb	Sw	Bf	Ce	La	He	Po	Bw	Mh	UH	LH
SPF	0	0	1	1	1	1	0	0	0	0	0	0	0	0
PO	0	0	0	0	0	0	0	0	0	1	0	0	0	0
BW	0	0	0	0	0	0	0	0	0	0	1	0	0	0
PWR	1	1	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1	1	1	1	1	1	1	1	1	1	1	1	1	1
PO+BW	0	0	0	0	0	0	0	0	0	1	1	0	0	0

In the SFMM model, additional definitions were included for harvest volume groups to be proxies for each of the Landscape Classes, Old Forest Areas and Caribou Habitat Types. These proxy species groups allowed the inclusion of targets for area by landscape class, old forest and caribou habitat to be entered into the strategic modelling. However the modelling team did not use these species group targets in the modelling, but rather used growing stock targets that accomplished the same result (Section 6.2.5.5).

For the Base Model and LTMD, no harvest flow control limits were used. The LTMD included targets by major species group therefore additional volume flow constraints were not needed.

Various harvest volume targets were included in investigations and the LTMD in order to either define the investigation (investigate achievement of specific volumes per term), or to aid in the overall harvest volume achievement of certain runs. No harvest volume targets were included in the Base Model. Harvest volume targets included in the LTMD are documented in Table 21. No volume targets by individual species were included in the Base Model or the LTMD.

Table 21 Harvest Volume Targets By Species Group

None in the Base Model. Volume levels added to LTMD to regulate harvest volumes.

Annual Volume in 1,000s:	Tree Species Group:				
	SPF	PO	BW	TOTAL	
Term	Lower	Lower	Lower	Lower	
T1	340	190			Term 1 volume to meet short-term harvest volume indicator.
T2	340	130			Mid- and Long-term targets set to regulate SPF and PO volume through time (predictable and sustainable).
T3	340	90			
T4	340	90			
T5	340	90			No upper limits used (infinite)
T6	340	90			
T7	340	90			
T8	340	100			
T9	340	100			
T10	340	100			
T11	340	100			
T12	340	100			
T13	340	100			
T14	340	100			
T15	340	100			

Volume targets = Binding for the LTMD

6.2.5.7 Sub-Unit Harvest and Renewal Operability Timing

This input is used to prevent scheduling of harvest and silviculture in an entire subunit during a planning term. Subunits were included in the modelling to allow scheduling of the caribou habitat subunits (Car01 to Car11 series). No timing limits on LOW, Pak and PAT (Table 22).

Table 22 Operability Windows for Harvest and Renewal Activities by Subunit

BASE MODEL INPUTS: Same for LTMD.
"1" denotes subunit not operable during term.

Harvest term start		Subunit: Car01	Car02	Car03	Car04	Car05	Car06	Car07	Car08	Car09	Car10	Car11
T1	2012	1	1	1	1	1					1	1
T2	2022	1	1	1	1	1	1	1	1	1	1	1
T3	2032	1	1	1	1	1	1	1	1	1	1	1
T4	2042	1	1	1	1	1	1	1	1	1	1	1
T5	2052	1	1	1	1	1	1	1	1	1	1	1
T6	2062	1	1	1	1		1	1	1	1	1	1
T7	2072	1	1		1	1	1	1	1	1		1
T8	2082	1	1	1	1	1	1	1	1		1	1
T9	2092	1	1	1	1	1	1		1	1	1	1
T10	2102	1		1		1	1	1	1	1	1	1
T11	2112		1	1	1	1	1	1	1	1	1	
T12	2122	1	1	1	1	1	1	1	1	1	1	1
T13	2132	1	1	1	1	1		1		1	1	1
T14	2142	1	1	1	1	1	1	1	1	1	1	1
T15	2152	1	1	1	1	1	1	1	1	1	1	1

terms when forest management activites may be scheduled.

6.2.5.8 Stability of Harvest Areas (Area Regulation)

This input is used to constrain the amount of change in harvest area between 10-year terms by forest unit. This input is typically used to reflect the biological limitations to operational harvest areas (i.e. must moderate lowland spruce area since you want some winter harvest every year). This constraint may be used to moderate projected harvest area for small forest units or other sensitive sites (shallow soiled forest units). Finally, constraints may be considered for other forest units that have projected harvest area significantly fluctuating between terms. Ensuring some harvest area is projected in each term ensures that operational block planning will not leave patches of unallocated mature timber simply because there is no available harvest areas for certain forest units for a full 10-year period. Constraints must be kept general enough to not dictate the specific Available Harvest Area (AHA) by forest unit.

No Harvest Area regulation constraints were included in the Base Model, investigations or the Long-term Management Direction.

6.2.5.9 Harvest Area Limits by Forest Unit

No harvest area limits were included in the Base Model. During development of the LTMD, the projected harvest area by forest unit was reviewed and an additional minimum harvest area target (Term 1 10 ha/year) was added for PRW to ensure there was some harvest area in this plan period. Also a maximum harvest area was added for SBL for Terms 1-3 (80 ha/year) to ensure there was not too much lowland harvest area in any term due to the operational limitations of implementing winter harvest.

6.2.5.10 Forest Renewal Limits by Proportion (Biological Limits and Management Decisions)

The Base Model renewal proportions limits are documented in Table 23 and were based on biological site limitations to forest renewal and management decisions. These limits are ecologically or site related and are based on successful achievement of the defined renewal strategy for each silviculture treatment level. No additional changes to the biological limits were required for the LTMD. Projected renewal activities (proportion by intensity for each forest unit) and were assessed as being reasonable and operationally achievable.

Table 23 Forest Renewal Limits by Proportion

No minimum proportion limits used in the modelling.

Forest Unit	Maximum proportion renewed:				
	Prsnt	EXTEN	BASC1	INTN1	Basc2
BFM	0		0.5		0
CMX	0		0.6	0.15	0
HMX	0		0.1		0
OCL	0				0
OTH	0				0
PJD	0		0.8	0.1	0
PJM	0		0.7	0.1	0
POD	0				0
PRW	0			0.15	0
SBL	0		0.2		0
SPD	0			0.1	0
SPM	0			0.1	0

During the development of the Proposed LTMD, questions were raised concerning the maximum limits placed on intensive renewal treatments for PJD, PJM, SPD and SPM forest units. The Strategic Task Team considered the 10% maximum treatment level to be consistent with those sites where silvicultural success was expected to achieve the forest conditions defined by the intensive silvicultural intensity condition for these forest units.

The definition of intensive used for this plan must be recognized as being narrower than is traditionally classified as “intensive”. The suite of basic treatments in this plan are considered a “blended approach” of seeding, planting and tending – all resulting in a “basic” forest condition that is either not well-stocked, or over stocked, or not density regulated. The intensive, well-stocked, density regulated forest condition defined for this 2012 FMP was used as the basis for the intensive growth and yield curves that are expected to result 100% of the time when intensive treatments are applied to PJD, PJM, SPD, and SPM areas on the Whiskey Jack Forest. The definitions of the jack pine and spruce intensive forest conditions were consistently applied to development of the yield curves, the silvicultural ground rules, the post-renewal forest succession assumptions (i.e. treatment components, success rates, resulting forest units and intensities and associated treatment costs) and the forest renewal treatment limits by proportion.

After further discussion, it was agreed that recent intensive treatments on the Whiskey Jack Forest have not typically resulted in well-stocked, density regulated (intensive) forests. This finding was also noted during the last Independent Forest Audit which resulted in a

recommendation to use silvicultural survey information during development of the silvicultural program for this FMP.

The Strategic Task Team reviewed the available Silvicultural Effectiveness Monitoring (SEM) survey results to guide them in determining the appropriate level of intensive treatment to be used in the modeling. As there were only 2-3 years of treated area assessed, the reasons for low success could not be accurately quantified. The task team could not determine with any degree of confidence the reason for this low silvicultural success rate of intensive treatments.

The task team has concluded that more silvicultural success information must be collected and evaluated in order to accurately asses the success or failure of this forest renewal treatment. Additional information and local knowledge should allow for a better understanding of the biological and management decision limits for intensive treatments for the next plan. The task team believes that a cautious approach to applying intensive, density regulated silviculture is warranted and that the maximum intensive treatment limits of 10% for PJD, PJM, SPD and SPM forest units would be applied for the 2012 plan.

Additional Rationale for Decision - The Strategic Task Team and regional advisors tested the sensitivity of the decision to limit intensive silviculture to ten percent through the completion of an additional investigative SFMM run - 27e_INTEN. In this investigation, the modelling inputs were kept the same as the Proposed LTMD Run 27d_OLTMS except that the maximum limits for intensive treatment for PJD, PJM, SPD and SPM forest units were relaxed (increased) from 10% to 75% of the treated area. The results of Run 27e_INTEN (documented in Appendix 2) showed that:

- Similar results as Run 27d_OLTMS. Same average total harvest volume T1-4;. Increasing intensive silviculture results in no significant change in total harvest volume for the next 150 years. Intensive treatment will likely result in a density regulated condition, with potentially a higher proportion of large sawlogs .
- Increased intensive treatments results in approximately 300 ha more intensive treatment per year in T1, and 800 ha/year more T2-4 with increased treatment proportion limits.
- SFMM does not project an increase in PJM and SPM intensive treatments even if treatment limits are increased - change occurs in SPD and PJD.
- Run 27e_INTEN does project some differences as a result of conducting more intensive treatments as compared to LTMD 27d_OLTMS; pure jack pine and pure black spruce stands are increased while mixed conifer stands are decreased over time.
- Average renewal cost increase of $84,000/year T1-4 with increased intensive treatment, however, the LTMD Run 27d_OLTMS has unspent funding in T1-2 therefore the increased intensive renewal will not exceed estimated stumpage.

DECISION: The precautionary principle was applied in the Base Model as the task team was not certain of the success of the intensive silviculture. It was agreed that the 10% maximum intensive treatment limit for PJD, PJM, SPD, and SPM forest unit areas would remain in the LTMD for the 2012 FMP. More information must be analyzed to refine the forest renewal limits by proportion for the next 2022 FMP. It is expected that a better understanding of past operations and the resulting forests may support an increase in the proportion of intensive treatment for future plans.

6.2.5.11 Mid-rotation Tending Limits and Partial Harvest Options

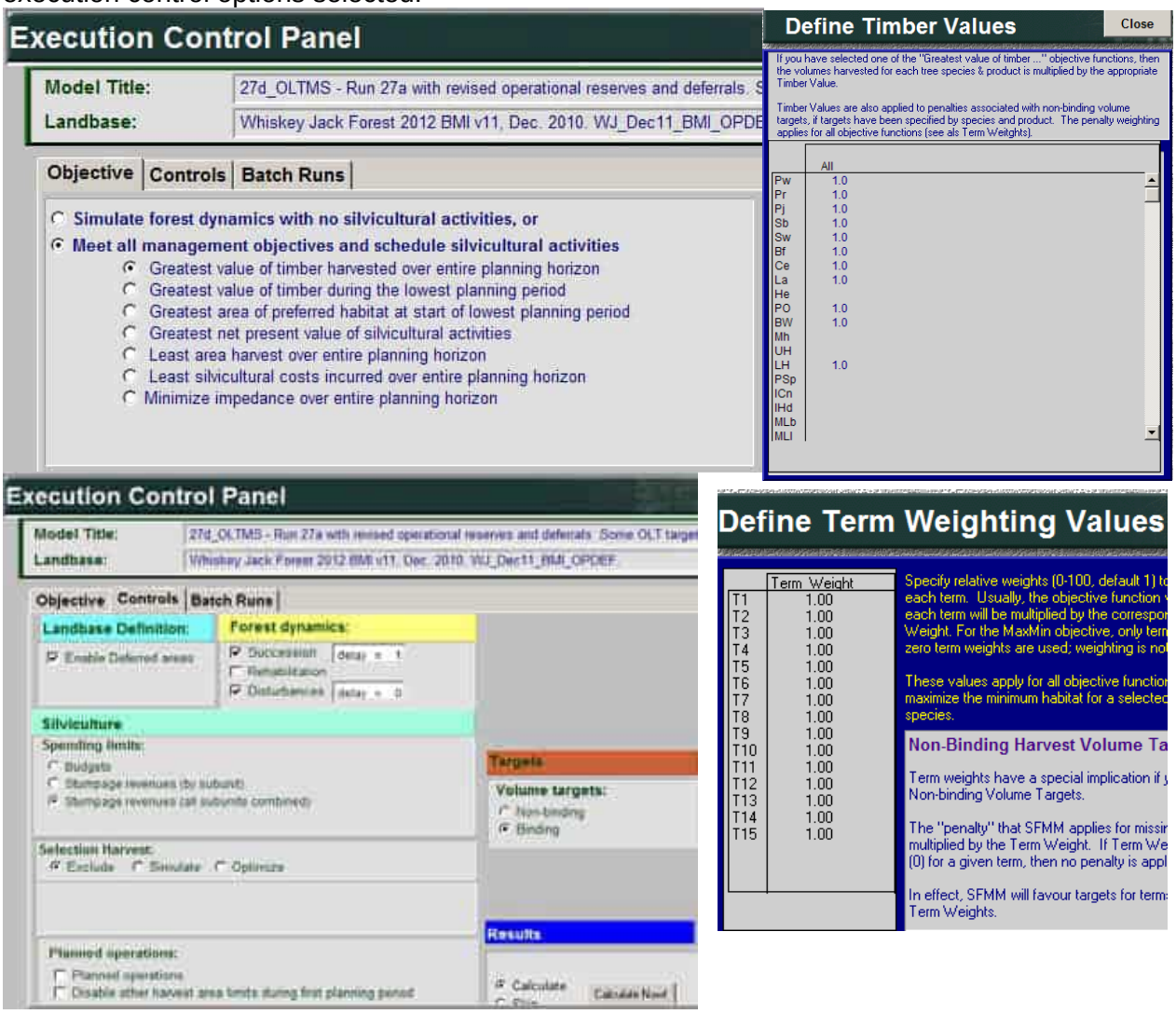
Input not used.

6.2.5.12 Timber Values

Strategic task team members determined relative timber values which were set to reflect estimated relative value of each tree species' volume. Timber values were constant for all investigations at 1.0 for all timber species expected to be harvested. These timber values were used consistently in the Base Model, investigations and development of the LTMD.

6.2.5.13 Execution Control Options

The following screen grabs from the SFMM Long-term Management Direction confirm the execution control options selected:



6.3 Documentation of the Base Model Inventory and Base Model Checkpoint

Progress Checkpoint #3 approval of the Base Model Inventory and the Base Model was received on October 8, 2010.

----- Original Message -----
From: Bowen, Rob (MNR)
To: Duda, Steve (MNR) ; Mohamed, Hassan (MNR) ; Pochailo, Kurt (MNR) ; Jarvis, Susan
Cc: Ride, Kevin (MNR) ; Schaefer, Chris (MNR) ; Hooper, Glen (MNR) ; Beemer, Garnet (MNR)
Sent: Friday, October 08, 2010 9:39 AM
Subject: Whiskey Jack Base Model Checkpoint

We have now received the latest version of the base model inventory for the Whiskey Jack Forest. With that, **I can confirm that the Region supports the information and products associated with the base model and base model inventory (FMPM Part A Sect. 1.2.4) for the Whiskey Jack 2012 FMP**.

Rob Bowen R.P.F.
Regional Analyst
Northwest Region Planning Unit
Ministry of Natural Resources

7.0 Documentation of SFMM Model Results

The results of all strategic planning investigations were assessed for projections and implications on forest conditions (forest composition and age structure components), caribou habitat, wood supply and other non-timber resources (e.g. old forest conditions) for the short-term (10 years), medium-term (20-80 years) and long-term (90-100 years).

The investigations and development of the LTMD were documented with key investigations included in the analysis package. Investigations are part of the iterative process used in the development of the management strategy, therefore not all of the investigations were considered noteworthy.

A three-page results summary forms the documentation for the key investigations and includes:

(a) changes and/or additions that are made to base model inputs and assumptions;
(b) results by forest condition, wildlife habitat, old forest and harvest area and volumes; and
(c) conclusions.

Results for the Long-term Management Direction are summarized in Appendix 3. Any other key investigation results are summarized and included in Appendix 2. The ASCII text input and results files for the Long-term Management Strategy are included in electronic files provided to MNR. The executable SFMM files for investigations, LTMD development runs, and the proposed LTMD do not form part of the electronic FMP, but are supplied to MNR for review and verification purposes.

PART 4: MANAGEMENT OBJECTIVES

8.0 Introduction

This section of the Analysis Package documents the information, assumptions, and decisions made during the determination of management objectives during development of the Long-term Management Direction (LTMD).

Required information is included or referenced in the following sub-sections:

(a) Results of the planning team's review of management objectives from the current forest management plan including rationale for decisions to confirm, update or revise existing management objectives;
(b) How background information, specifically recommendations from the Year Seven management unit annual report and forest management guides, was considered in the development of management objectives;
(c) Summary of scoping investigations and significant conclusions or results including:
    (i) changes and/or additions that are made to base model inputs and assumptions;
    (ii) results and conclusions that provide rationale for specific management objectives, indicators and desired levels and;
    (iii) a digital copy of a selected model run(s) that best represents each investigation;
(d) Documentation of Management Objectives Checkpoint.

8.1 Review of Objectives from the 2004 FMP

This review is included in Section 3.4.1 of the FMP text.

The Planning Team and Local Citizens Committees (Kenora and Red Lake) reviewed and discussed objectives from the 2004-2024 forest management plan to confirm which objectives were still desired forest and benefits applicable to the 2012 FMP. The following desired forest and benefits from the 2004 FMP were confirmed as being important to include in this forest management plan.

Each 2004 FMP management objective is noted below with reference to the decision to include or not include the objective in this 2012 FMP. Several 2004 FMP objectives are not carried forward as management objectives in this FMP, but will continue to be considered through operational planning or plan implementation strategies.

1. Forest Structure Objective:
The objective is to maintain or move toward a natural age class structure that is within the estimated bounds of natural variation for the Whiskey Jack Forest through management planning and silviculture.

Targets: - Maintain old forest area;
- Forest age class distribution.

Consideration in 2012 FMP:

- Area of old forest assessment required by FMPM and draft Landscape Guide. Old forest indicator carried forward and included in Objective 2 Forest Composition by area of old forest and area of mature and late successional landscape classes.

2. Forest Composition Objective:

The objective is to maintain or move toward a range of forest units and age classes within the bounds of natural variation as developed for the Whiskey Jack Forest.

Targets: - Area of each forest unit by age class;
- Maintain or increase the amount of PRWMX forest unit.

Consideration in 2012 FMP:

- Forest type (forest unit) and age grouping indicators carried forward and included as indicators in Objective 2. Forest Composition as required by the FMPM.
- Red pine and white pine forest (PRW) area indicator carried forward as required by FMPM(2009) and draft Landscape Guide.

3. Natural Disturbance Pattern Emulation Objective:

The objective is to emulate natural disturbance patterns, characteristic of the Whiskey Jack Forest.

Targets: - Maintain or move toward a pattern of natural forest disturbance;
- Disturbance size class and frequency distribution;
- Percentage of planned clearcuts >260 ha;
- Amount of peninsular and insular residual forest retained; and
- Retention of wildlife trees.

Consideration in 2012 FMP:

- Natural disturbance pattern (originally required by the *Natural Disturbance Pattern Emulation Guideline)* was initially replaced by mandatory biodiversity indicators as required by the Draft Landscape Guide (see Section 3.4.2: Indicators Resulting from New MNR Direction). Incorporated into Objective 1: Landscape Pattern. During LTMD development, the Planning Team was informed that the Landscape Guide would not be approved in time for full implementation for 2012 FMPs, therefore the landscape disturbance frequency by size class indicator from the NDPE guide and 2004 FMP was added back into the suite of indicators for the 2012 FMP.
- The stand level residual component from the NDPE guide is now required as per the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales.* Residual and wildlife tree requirements are related to operational practices and are included in the forest management plan as Conditions on Regular Operations (Section 4.2.2.2) and are not included as objectives or indicators.

4. Sustained Wood Supply Objective:

The objective is to provide a predictable and continuous supply of wood to the forest products industry from the Whiskey Jack Forest.

Targets: - Maintain specific minimum annual harvest volume by species group (spruce-pine-fir, poplar and white birch)

Consideration in 2012 FMP:

- Long-term annual harvest volume carried forward as a mandatory FMPM (2009) indicator in Objective 4: Wood Supply.
- Variance of projected harvest volumes between 10-year terms will be assessed during development of the Long-term Management Direction for acceptability to the Planning Team of projected harvest volumes in the short-term and long-term in relation to the balanced achievement of all management objectives.

5. Working with Aboriginal Peoples Objective:

The objective is to work with local Aboriginal peoples, whose communities are situated in or adjacent to the Whiskey Jack Forest, to identify and implement forest operations (harvest, access, renewal, maintenance and protection) that will maintain or enhance social and economic benefits to Aboriginal peoples.

Targets: - Provide opportunity to harvest 10,000m^3, on an annual basis, to members of the Grassy Narrows First Nation.

Consideration in 2012 FMP:

- Harvest area allocations and assignment of licensees will occur during development of the forest management plan. All licensee commitments will be incorporated into the planned operations and reported in Table FMP-14 Planned Harvest Volume and Wood Utilization.

6. Forest Resources for Personal and Commercial Use Objective:

The objective is to make available incidental volumes of timber for other uses such as fuelwood, building logs, furniture and other materials. (These incidental volumes will come from areas allocated within this FMP).

Targets: - Provide opportunities for the public to obtain fuelwood; and
- Provide opportunities for the public to obtain incidental quantities of timber for a variety of uses including building logs.

Consideration in 2012 FMP:

- Delete as a management objective. Harvest area allocations, including the identification of public fuelwood collection areas, will occur during operational planning for the forest management plan. Provision of fuelwood areas is carried forward and included in harvest area and volume included in Objective 4: Wood Supply. Fuelwood areas are specifically discussed in the FMP text Section 4.2.2.3 Silvicultural Treatments of Special Public Interest.
- Harvest of specific incidental quantities of timber will be considered either during planned harvest allocation development by the SFL (if known) or by MNR after plan implementation through regular incidental harvest volume permits.

7. Tourism, Commercial and Non-Commercial Forest Users Objective:

The objective is to select and prescribe forest operations (harvest, renewal, maintenance, protection and access) that consider the requirements of other forest users, allowing continued use of the forest while minimizing conflict between forest operations and other forest users.

Targets: - Maintain a system of active forest access roads available for public travel;
- Contact licensed tourism operators for RSA negotiations; and
- Minimize conflict between forest industry and all other users.

Consideration in 2012 FMP:

- Delete as a separate forest users management objective.
- It is required that all resource-based tourism operators must be contacted early in the planning process and offered the opportunity to negotiate Resource Stewardship Agreements.
- The planning process requires that known stakeholders and identified values be considered during operational planning for harvest, renewal and tending activities and for road access planning. Conflict between the forest industry and other users will be minimized through implementation of this requirement.
- Mandatory consideration for stakeholders and known values are documented in the Table FMP-10 Prescriptions for Areas of Concern, Table FMP-19 Road Crossings, Landings, and Forestry Aggregate Pits in Areas of Concern, text Section 4.2.2.2 Conditions on Regular Operations, text Section 4.5.3 to 4.5.4 Area of Concern Crossings – Roads, and associated supplementary documentation for areas of concern and road planning.
- The success in implementation of area of concern prescriptions for the protection of values is included in the FMP in Objective 10: Forest Values (see new mandatory indicators Section 3.4.2, FMPM (2009)).
- Maintenance of road access is a component of the mandatory road density indicator required by the FMPM(2009)(Objective 8: Road Density). See new mandatory indicators Section 3.4.2, FMPM (2009).

8. Other Land Uses Objective:

The objective is to conduct forest management activities in a manner that considers private land, parks and other land designations or values.

Targets: - Protect known values through implementation of the area of concern prescriptions approved in the forest management plan.

Consideration in 2012 FMP:

- Delete as a separate Other Land Uses management objective.
- The planning process requires that known stakeholders and identified values, including land ownership and management status, be considered during operational planning for harvest, renewal and tending activities and for road access planning.
- Consideration for stakeholders and known values are documented in the Table FMP-10 Prescriptions for Areas of Concern, Table FMP-19 Road Crossings, Landings, and Forestry Aggregate Pits in Areas of Concern, and associated supplementary documentation for areas of concern and road planning.
- The success in implementation of area of concern prescriptions for the protection of values is included in the FMP in Objective 10: Forest Values (see new mandatory indicators Section 3.4.2, FMPM (2009)).

9. Cultural Heritage Values Objective:

The objective is to protect identified, registered, or high potential archaeological and cultural heritage sites from conditions that could potentially damage or cause an increase in rates of deterioration.

Targets: - No negative impacts on identified archaeological or cultural heritage values resulting from forest management activities;
- Minimal fibre loss and archaeological mitigation costs through value protection

Consideration in 2012 FMP:

- Delete as a separate Cultural Heritage Values objective.
- The planning process requires that cultural heritage values, including archaeological potential areas, be considered during operational planning for harvest, renewal and tending activities and for road access planning.
- Mandatory consideration for known values, including cultural heritage values, are documented in the Table FMP-10 Prescriptions for Areas of Concern, Table FMP-19 Road Crossings, Landings, and Forestry Aggregate Pits in Areas of Concern and associated supplementary documentation for areas of concern and road planning.
- The success in implementation of area of concern prescriptions for the protection of values is included in the FMP in Objective 10: Forest Values (see new mandatory indicators Section 3.4.2, FMPM (2009)).

10. Wildlife Habitat Objectives

10(a) Selected Wildlife Species Objective:

The objective is to provide suitable/preferred habitat within the bounds of natural variability for the selected wildlife species within the Whiskey Jack Forest.

Targets: - Maintain habitat for selected species within a specified range; and
- Avoid any significant reductions in habitat available for selected species.

Consideration in 2012 FMP:

- Modelled wildlife non-spatial preferred habitat is not required for species other than the Species At Risk (carried forward in Objective 3). Habitat for selected species are accounted for in the multiple forest biodiversity, forest composition and structure indicators that are indicators of various habitats (Objectives 1-3).

10(b) Caribou Objective:

The objective is to maintain or improve contribution of the Whiskey Jack Forest to continued range occupancy and healthy populations of woodland caribou in Northwestern Ontario.

Target: - NWEST portion of the forest to contribute to the habitat range for woodland caribou.

Consideration in 2012 FMP:

- Consideration for woodland caribou habitat (a Species At Risk) is carried forward in the 2012 plan in Objective 3: Wildlife Habitat. This consideration is required by the Endangered Species Act 2007 and is in accordance with the Caribou Recovery Plan 2009.
- Management zones were identified, one of which is the area of the forest to be management primarily for woodland caribou habitat. These management zones are discussed in plan text Section 2.1.2.3.
- The draft *Forest Management Guide for Boreal Landscapes (Landscape Guide)* suggested two new indicators that relate to caribou habitat in the caribou zone.
  - Amount of woodland caribou habitat (refuge, winter)(Objective 3); and
  - Texture (arrangement) of woodland caribou habitat (refuge, winter)(Obj. 3).
- The FMPM(2009) requires an indicator for habitat for forest-dependent Species At Risk. Therefore the Landscape Guide indicator for amount of woodland caribou habitat (first bullet above) also satisfies the FMPM requirement.

10(c) Marten Objective:

The objective is to maintain or move toward having 10-20% of capable marten habitat area in suitable conditions arranged in core areas of 3,000 to 5,000 hectares.

Target: - Maintain specific portion of suitable forest land base in marten core habitat areas.

Consideration in 2012 FMP:

- Marten core areas were required by the *Forest Management Guidelines for the Provision of Marten Habitat* for the 2004 FMP. This habitat management guide is still in effect as the Landscape Guide has not been approved in time for full application for 2012 FMPs. The Draft Landscape Guide also suggests direction and indicators for forest diversity, including landscape forest composition, pattern and texture. The Stand and Site Guide requires the provision of large landscape patches. Therefore, marten core areas are carried forward in the 2012 FMP in Objective 3: Wildlife Habitat, as well as consideration in the new landscape indicators in Objective 1: Landscape Pattern.

10(d) Moose Objective:

The objective is to retain a year round supply of suitable habitat (including foraging and winter habitat) for moose on the Whiskey Jack Forest.

Target: - Amount of preferred habitat for moose foraging and moose winter habitat.

Consideration in 2012 FMP:

- Consideration for moose habitat is carried forward in the 2012 plan.
- Management zones were identified, one of which is the area of the forest to be management primarily for moose habitat. These management zones are discussed in plan text Section 2.1.2.3.
- Habitat for selected species, including moose, are accounted for in the multiple forest biodiversity, forest composition and structure indicators that are indicators of various habitats.
- The draft Landscape Guide includes suggested biodiversity indicators for mature and late successional forest and for young forest distribution (see Section 3.4.2: Indicators Resulting from New MNR Direction). These indicators are incorporated into Objective 2: Forest Composition and in Objective 1: Landscape Pattern and will measure some components of moose habitat.
- The *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* provides direction for the consideration of Moose Emphasis Areas. If MEAs are warranted for the management unit, discussion is included in text Section 2.1.2.3 Management Zones, with detailed analysis of the MEAs included in plan supplementary documentation. Operational planning of harvest areas must consider proportion of area in specific forest composition classes with MEAs if MEAs are identified for a FMP.

10(e) Stick Nest Objective:

The objective is to provide for the protection of nest sites and associated habitat of bald eagle, osprey, great blue heron and other locally significant forest dwelling raptors.

Target: - Minimize negative impacts on stick nests (i.e. bald eagle, great blue heron, osprey, and forest dwelling raptors).

Consideration in 2012 FMP:

- Delete as a separate stick nest management objective.
- The *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* provides mandatory direction for prescriptions for the protection of nests for many bird species, including stick nests.

- Mandatory consideration and appropriate prescriptions for the protection of stick nests are documented in the Table FMP-10 Prescriptions for Areas of Concern, Table FMP-19 Road Crossings, Landings, and Forestry Aggregate Pits in Areas of Concern, text Section 4.2 Prescriptions for Operations, text Section 4.2.2.2 Conditions on Regular Operations, text Section 4.5.3 to 4.5.4 Area of Concern Crossings – Roads, and associated supplementary documentation for areas of concern and road planning.
- The success in implementation of area of concern prescriptions for the protection of values, including stick nests, is included in the FMP in Objective 10: Forest Values (see new mandatory indicators Section 3.4.2, FMPM (2009)).

11. Soil Objective:

The objective is to minimize any possible adverse effects of forest practices on soil quality.

Targets: - No forest operations in areas where forest practices threaten the long-term site productivity;
- No Forest Operations Compliance Information System (FOCIS) reports with non-compliances related to site damage; and
- Limit area of roads and landings to 1% of area proposed for forest operations.

Consideration in 2012 FMP:

- Delete as a separate forest users management objective.
- The *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* provides direction for management practices that prevent, minimize or mitigate site damage, and practices to mitigate erosion, hydrological impacts, loss of productive land, and nutrient retention on shallow soil sites.
- Consideration for sensitive sites is documented in text Section 4.2.2.1 Silvicultural Ground Rules, Section 4.2.2.2 Conditions on Regular Operations, and Section 4.7.2 Monitoring and Assessment for Exceptions.
- The success in implementation of management practices that prevent, minimize or mitigate site damage is included in the FMP in Objective 10: Forest Values (see new mandatory indicators Section 3.4.2, FMPM (2009)).
- Maintenance of sustainable amounts of Crown managed forest available for timber production is carried forward as it is a mandatory indicator required by the FMPM (2009) in Objective 5: Managed, Crown Forest. This indicator is directly affected by the quantity of productive land converted to roads and landings.

12. Fisheries and Water Quality Function Objective:

The objective is to maintain riparian habitat, water quality and to prevent the harmful alteration, disruption or destruction of fisheries habitat where forest management activities occur.

Targets: - Minimize impact to riparian areas from harvest through the application of no-cut reserves; and
- To implement forest practices that do not create the harmful alteration, disruption or destruction of fisheries habitat without Department of Fisheries and Oceans consent.

Consideration in 2012 FMP:

- Delete as a separate fisheries and water quality management objective.
- The *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* provides mandatory direction for the protection of fisheries and water quality values.

- The planning process requires that identified values be considered during operational planning for harvest, renewal and tending activities and for road access planning.
- Mandatory consideration and appropriate prescriptions for the protection of known values are documented in the Table FMP-10 Prescriptions for Areas of Concern, Table FMP-19 Road Crossings, Landings, and Forestry Aggregate Pits in Areas of Concern, text Section 4.2 Prescriptions for Operations, text Section 4.2.2.2 Conditions on Regular Operations, text Section 4.5.3 to 4.5.4 Area of Concern Crossings – Roads, and associated supplementary documentation for areas of concern and road planning.
- The success in implementation of area of concern prescriptions for the protection of values, including aquatic values, is included in the FMP in Objective 10: Forest Values (see new mandatory indicators Section 3.4.2, FMPM (2009)).

13. Silviculture Objective:

The objective is to apply the most appropriate level of silviculture that will ensure the long-term forest sustainability while consistent with all other objectives of this plan.

Target: - Assess and silviculturally treat depleted areas to achieve the level of forest cover and wood supply required to sustain the forest resources of the Whiskey Jack Forest.
- Lowest achievable silviculture costs per cubic metre.
- Maximize yield and product quality.

Consideration in 2012 FMP:

- Maintenance of sustainable amounts of Crown managed forest available for timber production is carried forward as it is a mandatory indicator required by the FMPM (2009) in Objective 5: Managed, Crown Forest.
- Consideration for silvicultural treatment costs is included in the development of silvicultural option assumptions in the strategic modelling during development of the Long-term Management Direction. Projected LTMD silvicultural treatments are determined after consideration for the achievement of management objectives, treatment costs and estimated available funding from the Forest Renewal Trust Fund.
- The FMPM(2009) requires three new indicators of regeneration success (achieve free-growing status), silvicultural success (free-growing to projected forest unit) and strategic silvicultural planning (area treated by planned silvicultural treatment intensity) (see Section 3.4.2: Indicators Resulting from New MNR Direction). These three indicators are incorporated into Objective 9: Forest Renewal.
- Successful regeneration (three indicators above) will contribute to the maximization of timber yields through time (Objective 4: Wood Supply).

8.2 Consideration of Background Information and MNR Guides

Background information considered during development of management objectives and indicators included forest management guides (including new MNR forest management guides and direction) and general findings from the 2009 Independent Forest Audit. There has not been any Year Seven Annual Report required to be prepared for the Whiskey Jack Forest.

Forest Management Guides

Since the approval of the 2004 FMP, several major MNR guidance documents have been revised or prepared that are being implemented on the Whiskey Jack Forest for the first time for this 2012 forest management plan. These documents contain new (and some previously measured) indicators of forest sustainability to be included in forest management plan development. Where new indicators are prescribed by new MNR direction, the indicators may be assessed in association with existing, confirmed management objectives from the 2004 FMP (if appropriate), or be included with new objectives for the 2012 FMP. The documents containing new MNR direction include:

1. Forest Management Planning Manual for Ontario's Crown Forests (Dec. 2009)

The Forest Management Planning Manual prescribes the requirements for Ontario's forest management planning system including a detailed description of the planning process and the products. The forest management planning cycle, established by the manual, consists of planning, implementation, monitoring and reporting. Since preparation of the 2004 FMP, the FMP manual was revised twice: once in 2004 for implementation by 2007-2011 FMP planning teams, and again in late 2009 for implementation by 2011+ FMP planning teams.

The FMPM(2009) requires certain new indicators of forest sustainability be included in each forest management plan. Indicators that were previously included in the 2004 FMP and are being carried forward into this plan (Section 3.4.1) are not duplicated in the following bullets:

New Indicators:

- Indicator for Aboriginal community involvement in plan development (Obj. 6);

  The Aboriginal communities and MNR recognized that information in previous FMPs on Aboriginal values and background community information have not been as complete or accurate as they could have been with information reviewed or supplied by the communities themselves. Additional indicators have been added to the 2012 FMP (Objective 6) to ensure better communication with Aboriginal communities and input throughout the forest management planning process. These indicators reflect opportunities for involvement provided to, and involvement of Aboriginal Communities in the plan development process. The indicators include:

  (a) Number of Aboriginal communities in or adjacent to the Whiskey Jack Forest with representation on the planning team;

(b) Number of Aboriginal communities (that are in or adjacent to the Whiskey Jack Forest) that contribute information to the planning process.

- Indicator for Local Citizens Committee self-evaluation of its effectiveness in plan development (Objective 7);

  This is a new objective for this plan included for the associated mandatory indicator from the *Forest Management Planning Manual (2009)* required for this FMP. This indicator will relate to both the Kenora LCC and the Red Lake LCCs. While involvement of the LCCs has been encouraged and well received during preparation of past plans, the quality and effectiveness of the LCCs involvement will now form one of the indicators by which forest sustainability is measured.

  (a) Local citizens committee's self-evaluation of its effectiveness in plan development.

  Specific desired forest conditions and goods and services discussed with the Local Citizens Committees are included in Sections 3.4.1 to 3.4.3. The management objectives and indicators are detailed in Section 3.5 with rationale for desirable levels.

- Indicator for habitat for species at risk (Objective 3):

  The importance of considering the forest dependent species at risk is discussed in text Section 2.1.3.1. In recognition of this importance, the FMPM (2009) requires the inclusion of an objective indicator related specifically to the non-spatial habitat estimated for Species at Risk (Objective 3).

  (a) Area of habitat for forest-associated species at risk.

  The only Species at Risk on the Whiskey Jack Forest that have habitat that can be effectively modelled non-spatially through time in the strategic modelling is the woodland caribou. Reporting will occur at the time of Long-term Management Direction and in Year Seven and Year Ten Annual Reports.

New Indicators:

- Actual harvest area by forest unit (% of planned)(Objective 4);
- Actual harvest volume by species group (% of planned)(Objective 4);
- Kilometres of SFL roads per square kilometre of Crown forest (Objective 8);
- Regeneration Success: Percent of harvested forest assessed as free-growing by forest unit (Objective 9);
- Silvicultural Intensity: Planned and actual percent of harvest area treated by silvicultural intensity (Objective 9);
- Silvicultural Success: Planned and actual percent of area successfully regenerated to the projected forest unit by forest unit (Objective 9);
- Percent of forest operation inspections in non-compliance by activity and remedy type (Objective 10);
- Compliance with management practices that prevent, minimize or mitigate site damage (% of inspections in non-compliance, by remedy type)(Objective 11); and
- Compliance with management practices that protect water quality and fish habitat (% of inspections in non-compliance, by remedy type)(Objective 11).

2. Ontario's Woodland Caribou Conservation Plan (Oct. 2009)

The Caribou Conservation Plan provides broad policy direction regarding woodland caribou conservation and recovery. This plan states that in areas licensed for forest management within the continuous extent of caribou occurrence, Ontario will ensure that forest management practices fully consider both current and future Woodland Caribou habitat needs, reflecting natural forest conditions and dynamics. The plan requires that all management plans include:

(a) Provision for caribou habitat during forest management planning by requiring the development of a "dynamic caribou habitat schedule" for each forest management plan.
(b) A caribou-based objective for silviculture to be included in all forest management plans within the geographic distribution of caribou.
(c) Use of the Silvicultural Effectiveness Monitoring to assess the effectiveness of forest renewal for caribou, provide recommendations for improvements, and monitor how successfully logged areas are tracking toward a suitable future habitat condition.
(d) Determination of densities (thresholds) of roads to support caribou persistence.

The Planning Team has considered these requirements and included a dynamic caribou habitat schedule (formerly referred to the "caribou mosaic" in the previous FMPs) in the management zones and strategic planning for the management plan. The following objective indicators are included in the plan and address points (b) to (d) above.

New Indicators:

- Indicator for % of upland conifer dominated forest units in caribou zone. (Objective 3);
- Indicator for % of conifer species composition in caribou zone. (Objective 3);
- Indicator for density of SFL road per square kilometre of Crown forest, specifically in the caribou zone of the forest (Objective 8).

3. (DRAFT) Forest Management Guide for Boreal Landscapes

This draft guide may be considered by 2012 Planning Teams as suggested direction for maintaining or enhancing natural landscape structure, composition and patterns that provide for the long-term health of forest ecosystems in an efficient and effective manner. When approved, the Landscape Guide will replace existing landscape, stand and site scale direction previously found in several other documents. In the meantime, the science package developed by MNR to support the Landscape Guide is considered the best available science and information for many of the landscape related indicators. The Planning Team also relied on the Ontario Landscape Tool (OLT) that was developed by MNR to support the Landscape Guide (when approved) for the determination of desirable levels for many management indicators. The OLT projections were considered more appropriate for the forest than just relying on broad descriptions included in the historic forest condition.

The Landscape Guide suggests several new indicators of forest biodiversity be included in each forest management plan. The Planning Team reviewed these suggested indicators and decided to include them in the 2012 FMP:

New Indicators:

- Landscape class area for mature and older age classes (Objective 2);
- Old forest by appropriate grouping (plan forest unit or landscape guide forest unit)(Objective 2);
- Red pine and white pine forest unit areas (grouped)(Objective 2);
- Upland spruce and jack pine dominated forest areas (grouped)(Objective 2);
- Texture (arrangement) of the mature and old forest (all forest units combined)(Objective 1);
- Young forest patch size (Objective 1);
- Amount of woodland caribou habitat (refuge, winter)(Objective 3); and
- Texture (arrangement) of woodland caribou habitat (refuge, winter)(Objective 3).

4. Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (March 2010)

The Stand and Site Guide provides direction on various aspects of conserving biodiversity, including aquatic and wetland habitats and shoreline forests, special habitat features (e.g. bird nests, dens, bat hibernacula), and habitat for species at risk. It also addresses topics like road and water crossing construction and maintenance, category 14 aggregate pits, and soil and water conservation (e.g. rutting, erosion, nutrient loss), and salvage and biofibre harvest operations. The Stand and Site Guide replaces existing stand and site scale direction previously found in numerous forest management guides.

While most direction in the Stand and Site Guide is “operational direction” at the stand and site level, the guide contains some landscape level direction that may be applicable in the Long-term Management Direction of a forest management plan. Each planning team will determine if any direction from this guide warrants an indicator in the strategic planning of the FMP. No indicators have been included in the Whiskey Jack Forest FMP that relate to Stand and Site Guide direction.

5. Landscape Direction from Existing MNR Guides

Landscape direction from the following guides was included in the 2012 FMP. (Note: These guides would have been replaced by the Landscape Guide, but it was not approved for full implementation in this FMP.)

Forest Management Guide for Natural Disturbance Pattern Emulation (2001)

- Landscape pattern (Objective 1), disturbance frequency and planned clearcuts.
- Note: the approved Stand and Site Guide replaces stand level direction from the NDPE guide.

Forest Management Guidelines for the Provision of Marten Habitat (1996)

- Marten core habitat (Objective 3).
- During development of the LTMD, it was thought that the marten guide was going to be replaced by the Landscape Guide for use in the FMP. The Planning Team decided to include one additional indicator to approximate the landscape pattern of concentrated (>60%) mature and old conifer (Objective 1) in addition to the other indicators suggested by the draft Landscape Guide. There was concern that the combination of indicators for mature/old landscape pattern (spatial),

mature/late conifer landscape class (non-spatial), and upland pine and spruce (non-spatial) may not cover all the area currently assessed according to the marten habitat guide. This concentrated conifer indicator area is similar to marten core habitat but allows a greater range in sizes and distribution of this older conifer area. This indicator is measured through use of the OLT Model. This concentrated conifer landscape pattern indicator was retained in the Whiskey Jack plan after the provincial decision was made to continue use of the marten habitat guide.

Independent Forest Audit (IFA)

Independent Forest Audits (IFA) are required to occur on the Whiskey Jack Forest at least every five years. The last IFA was conducted in 2009 resulting in recommendations, some of which were relevant during preparation of this forest management plan. While the audit report is not public at this time, a general summary of issues and how they were considered during development of this plan follows:

i) Update the forest resources inventory with free-to-grow information and barren and scattered survey information.

Considerations in FMP: The planning composite inventory was updated by MNR with all recent free-to-grow information and barren and scattered survey results. This update was approved in Progress Checkpoint #1 of the planning process.

ii) Use silvicultural survey information to develop the silvicultural program.

Considerations in FMP: The planning composite inventory was updated by MNR with recent free-to-grow and silvicultural effectiveness monitoring information. Silvicultural effectiveness monitoring results were also used in the development of post-renewal forest succession assumptions for the strategic modelling component of LTMD development (what forest units are expected to result from various regeneration treatments). A discussion of silvicultural treatments that are successful on the Whiskey Jack Forest is included in FMP Section 4.2.2.1 Silvicultural Ground Rules and documented in Table FMP-4.

iii) Silvicultural strategies are reflected in the operational renewal program.

Considerations in FMP: For each forest unit, the Silvicultural Ground Rules (Table FMP-4) identify broad silvicultural strategies and specific acceptable operational treatments in accordance with approved provincial silvicultural guides. The strategic renewal assumptions are included in the strategic SFMM modelling during development of the Long-term Management Direction. The linkage between strategic and operational silviculture and the application of the LTMD projected renewal program is discussed in FMP Section 4.4 Renewal and Tending Operations and Table FMP-17. Projections from the LTMD are considered during operational planning of the renewal program. Confirmation that the implementation of the operational silvicultural program will support the LTMD is included in FMP Section 4.9 Comparison of Proposed Operations to the LTMD, the SFMM modelling Final Test of Sustainability (plan supplementary documentation), and Section 5.0 Determination of Sustainability.

iv) The natural condition be considered in development of indicator desirable levels.

Considerations in FMP:

The support tool for the draft Landscape Guide, the Ontario Landscape Tool (OLT), provides Simulated Ranges Natural of Variation (SRNV) for the indicators included in the

model. These SRNV s are based on the best available science and reflect the estimated natural forest condition. These SRNV s will be incorporated into desirable levels for many FMP indicators, and assessed during development of the Long-term Management Direction.

v) Moose habitat shelter patches.

Considerations in FMP:

Moose management strategies are discussed in text Section 2.1.2.3 Management Zones. The Stand and Site Guide directs the consideration of forest cover for moose habitat. Planned and mapped residual forest patches are identified on the geospatial information layer (MU490_12PRP00.E00) submitted in the FMP. During harvest operations, some patches of mapped residual may be moved as long as the patches are designated as being acceptable to move (e.g. not required in a certain specific location for habitat) and the same amount of residual forest area is retained as was approved in the FMP.

vi) Operations on fine-textured soils.

Considerations in FMP:

This is an operational consideration related to implementation of planned operations. Conditions on Regular Operations (Section 4.2.2.2) are included in the FMP to direct operations on sensitive sites, and conditions to minimize erosion, rutting and compaction.

vii) Quality of site preparation results.

Considerations in FMP:

This is an operational consideration related to implementation of the silvicultural program, including site preparation, as forecast in Table FMP-17. Site preparation quality standards are included in work contracts issued for site preparation to ensure payment for a good quality result, suitable for subsequent planting or seeding treatments. Monitoring and assessment of regeneration (Section 4.7.3) to confirm that Silvicultural Ground Rule (Table FMP-4, Section 4.2.2.1) regeneration standards are met that will contribute to the achievement of management objectives (Section 3.6).

viii) Less common species planted on appropriate sites.

Considerations in FMP:

This is an operational consideration related to implementation of the silvicultural program. Silvicultural Ground Rules (Table FMP-4 and Section 4.2.2.1) identifies acceptable species and regeneration standards for each ground rule on specific ecosites. Forest Operations Prescriptions are prepare annually and confirm specifically what SGR and what acceptable treatments will be carried out on what area during that operating year. Planned silvicultural treatments must conform to approved SGRs.

ix) Slash management in harvest areas.

Considerations in FMP:

Slash pile management and limited loss of productive land to landings and slash piles is included in Conditions on Regular Operations (Section 4.2.2.2).

x) Survey silviculturally treated areas and identify any areas requiring retreatment or tending.

Considerations in FMP:

The monitoring procedures for the assessment of regeneration success are documented in Section 4.7.3 of the forest management plan. Survey methodology will include the timing of assessments and survey for the identification of areas requiring additional treatments. The Silvicultural Ground Rules (Table FMP-4) include reference to regeneration standards used to determine regeneration success.

xi) Adequate tree seed for implementation of the regeneration program.

Considerations in FMP:

Renewal support including tree seed and planting stock required for the five-year term of the plan is discussed in Section 4.4.2.2 Cone Collections and Planting Stock Procurement. Implementation of the identified renewal support activities will ensure adequate tree seed and planting stock to carry out the forecast renewal program (Table FMP-17).

xii) Road decommissioning strategy.

Considerations in FMP:

Table FMP-18 Road Construction and Use Management identifies all roads to be decommissioned during the plan period. Road use management strategies (Section 4.5.8 and Supplementary Documentation 14) outline use management strategies, including decommissioning and rehabilitation options, when the roads are no longer required for forest management purposes. Road decommissioning is included as a silvicultural strategy to

xiii) Water crossing monitoring strategy.

Considerations in FMP:

Water crossing monitoring and assessment is discussed in the FMP in Section 4.74 Roads and Water Crossings. Conditions on water crossings in areas of concern are detailed in Table FMP-19 and supplementary Documentation 13. Conditions on Roads, Landings, and Aggregate Pits outside of areas of concern are discussed in text Section 4.5.7.

xiv) Forestry aggregate pit rehabilitation.

Considerations in FMP:

Forestry Aggregate Pits are discussed in FMP Section 4.5.6 and include operational standards accordance with the FMPM (2009) Appendix VII. Conditions on operations associated with aggregate pits in areas of concern are detailed in Table FMP-19 Road Crossings, Landings and Aggregate Pits in Areas of Concern. Conditions on Roads, Lands, and Aggregate Pits (Section 4.5.7) discuss conditions on operations outside of areas of concern.

8.3 Summary of Scoping Investigations

Desirable levels that were not provided directly by guides or other sources of direction were refined through scoping analysis. Scoping analysis is an iterative process that involves a series of investigations to provide insight to what the forest is capable of producing in order to develop realistic and feasible desirable levels for objective indicators. Scoping investigations consider implications on wood supply, forest conditions, habitat, and other non-timber resources for the short- term, medium-term, and long-term.

For all scoping investigations, unless specifically noted otherwise, the following management decisions were consistently included in each investigation as per the Base Model:

- management decisions for caribou management (SUBMUs and operational timing);
- large landscape patch deferrals (includes marten core habitat management);
- estimated reserve areas as per the Stand and Site Guide (riparian, nests) and estimates of known tourism reserves;
- crude control of projected TOTAL harvest volumes of +/- 20% variance allowed between 10-year terms; and
- execution of SFMM for the greatest volume of timber harvested over the entire planning period.

Specific SFMM model inputs varied for each investigation and projected results are documented in a standardized 3-Page Summary for all documented investigations in Appendix 2. Digital copies of selected model runs (labels with SFMM Case code noted in bold below) that best represent the following investigations to support strategic analysis are included in the SFMM executable DAT file provided to MNR for review. They do not form part of the public portion of the electronic FMP.

The following summary of scoping investigations and significant conclusions or results were considered in the development and rationalization of desirable levels for management indicators.

(a) An investigation into the ability of the forest to meet forest diversity and forest cover desirable levels (based on current forest condition and forest dynamics);

Investigations on impact of forcing the achievement of the SNRV (stay within "box" ASAP) for various Landscape Guide/OLT indicators.

SFMM Case:	Description:
01-OLT-70	Achieve SRNV for OLT combined - (below) parameters together:
02-OLT-50	Achieve SRNV for mature/late OLT landscape classes
	Achieve SRNV for OLT old forest classes
	Achieve SRNV for OLT upland conifer
	Achieve SRNV for OLT Caribou Habitat (Cr, Cwu, Cwp)
03-FUgroup	Achieve SRNV for forest units by immature/mature+ stages

Based on results, it was investigated when the Simulated Range of Natural Variation (SRNV) achievement for OLT investigations could occur (e.g. in 70 years, or in 50 years).

From runs **01-OLT-70** and **02-OLT-50** it was observed that OLT minimum SRNV levels for mature/late landscape classes, old forest classes, upland conifer and caribou habitat

could be generally met from 50 years (Term 6) onwards with two exceptions. It was initially noted that one component in each of two indicators showed limitations in achieving OLT desirable levels (note this was corrected point (iii) below):

i) The Mature and Late Successional Lowland Landscape Class (MLl) was not well correlated between the OLT model as compared to the SFMM model. Plan Start values for MLl for SFMM are 2,889 hectares (based on forest inventory sort) whereas the OLT simulation suggests a Plan Start level of 15,219 hectares and a lower simulated range of natural variation (SRNV) of 12,845 hectares. Since MLl area is related to only lowland ecosites and also to only the mature and older age classes, it is considered impossible to project forest management activities in SFMM to increase the MLl area significantly enough to ever reach the lower SRNV area.

ii) Old forest Spruce Lowland (SLo) was also not well correlated between the OLT model and SFMM. This area is lowland ecosite and old age related as is the Mature/Late Lowland landscape class discussed above (all SLo old forest area would also be classified as MLl landscape class area). Based on the inventory, SFMM projected only 97 hectares of SLo at 2012, whereas the OLT model was based on 1,631 ha at 2012 and calculated a lower SRNV of 3,319 ha for SLo. While it is possible to increase the area of SLo through time (some conversion from OCL), it was not possible to convert enough area to SBL and let it age to create enough old spruce lowland forest in the future up to the projected OLT minimum levels.

iii) Prior to the Base Model Inventory and Base Model Progress Checkpoint #3 being approved, there was an error identified and corrected related to the classification of the SBL forest unit productive area in the Base Model Inventory. Approximately 16,000 ha. had been classified as SPD forest unit area whereas it should have been classified as SBL forest unit area. This correction was made prior to selection of the LTMD (runs 27 and 27a). The correction served to decrease the SPD forest unit area, decrease the MLc landscape class area and decrease the SPo old forest area. These decreases were not significant as these classes all had large areas in them and the change was proportionately small. The corresponding increases in classes associated with lowland spruce (MLl landscape class and SLo old forest area) were equivalent in hectares, but more significant in magnitude because these classes contained smaller areas. The positive result of this correction was that it confirmed better correlation between SFMM and the OLT Plan Start values for MLl and SLo and allowed the minimum OLT SRNV area levels to be appropriately used as desirable levels for these indicators.

CONCLUSION: There was no reason to not meet OLT suggested minimum levels within 50-60 years (e.g. not meeting levels until 70-100 years in the future) for all OLT landscape classes, old forest, upland conifer area and non-spatial caribou habitat except MLl as noted above. Desirable levels for mature/late landscape class area (Indicator 2a), old forest class area (Indicator 2d), upland conifer (Indicator 2e) and caribou habitat (Indicator 3a) were agreed to be the minimum OLT SRNV levels.

CONCLUSION: From run **03-FUgroup**, it was concluded that constraints to force the general achievement of projected forest unit area by age grouping (young versus mature/late) to OLT minimum SRNV levels could not be utilized in the absence of OLT desirable level constraints. In isolation, forest unit age groupings had reasonable projections but the achievement of landscape class areas and old forest areas were negatively impacted.

CONCLUSION: Constraints for the mature age groupings by forest unit from Term 8 (70 years) were considered acceptable for forest unit / age grouping desirable levels for Indicator 2b. Control of forest unit area for the young age grouping was not considered as significant to manage as was the need to ensure sufficient area in the mature and older age grouping. The LTMD Task Team and Planning Team also agreed that the achievement of desirable levels for landscape class area was a higher priority as compared to total forest unit area through time, or forest unit by age grouping (young versus mature/late).

CONCLUSION: The total area of the PRW forest unit was consistently below the range projected by OLT (SFMM 2012 - 3,312 ha versus OLT 2012 - 0 ha with a minimum SRNV of 46,338 ha). It was recognized that OLT does not adequately simulate the forest dynamics for red pine and white pine regeneration and natural succession. Therefore a desirable level of maintaining a minimum of the Plan Start PRW value (no decrease) was adopted rather than a level prescribed by the OLT model.

CONCLUSION: The LTMD Task Team and Planning Team agreed that spatial indicators for landscape pattern/texture and caribou habitat would have desirable levels as projected by the OLT model. This represented the best science and information on natural landscape pattern. This related to Indicators 1a, 1b, 1c, 3b and 3c.

The management objectives, indicators, desirable levels and the timing of assessment for each indicator are documented in Table FMP-9.

(b) An investigation and assessment of the ability of the forest to continue to supply forest benefit levels associated with the current forest management plan;

Several items related to wood supply, forest condition and age, and wildlife habitat were reviewed to complete this assessment.

Wood Supply - First, a SFMM investigation was completed that incorporated wood supply by species group from the 2004 FMP, with the objective of sustaining 2004 wood supply levels for as many terms as possible. This investigation was built upon the 02-OLT-50 run to ensure the projections would be favourable for landscape class area, old forest, upland conifer and caribou habitat (just to investigate a balance of forest and benefits, not just wood supply).

SFMM Case:	Description:
04-2004Wood	Achieve approved plan T1 volume for as long as possible

Inputs:

Unlimited budget, will determine if minimum demand volumes by species group are achievable, and for how many terms, and at what future cost to wood. Binding volume targets added for as long as they can be met. Volume flow constraints infinite for allowable decreases and increases between terms.

Group:	Demand	thousands of m3 per year.	
PWR	1.6	from T1 2004 FMP.	**BUILT ON OLT_50 investigation, vol targets added.**
SPF	400.0	from T1 2004 FMP.	
PO	265.0	from T1 2004 FMP.	
BW	25.0	from T1 2004 FMP.	
Total	691.6		

CONCLUSION: The Spruce-Pine-Fir and the Red Pine-White Pine wood supplies were projected to be met for 40 years (Terms 1-4). Hardwood volumes (Poplar, Birch) were limited after Term 2 or 3 respectively. Wood supply can be comparable to the 2004 FMP for this plan period, but without added constraints to force the projected increase in hardwood volumes in Terms 3-7, future hardwood will be less than projected in the 2004 FMP. This is not unexpected as the yield curves were revised for this plan and it was noted that hardwood volumes in the curves were lower than previous plans, but appeared to be reasonable for Whiskey Jack Forest conditions and available data.
NOTE: Additional comparison of wood supply projections between plans is included in PART 5, Section B (c) Historic Wood Utilization.

Productive Area by Forest Unit – This comparison is a reflection of the forest condition that contributes to other desired forest and benefits such as wildlife habitat, forest diversity and harvest area. Habitat for selected wildlife species are no longer measured in the strategic modelling, rather the combination of landscape class area, old forest groupings and landscape pattern/texture indicators are considered as better measure of forest condition. However landscape class area and many of the old forest and landscape pattern indicators from this 2012 FMP were not included in the 2004 FMP. Hence, a comparison of productive area by forest unit is provided. Forest units from the 2004 FMP are aligned to roughly correspond to the 2012 FMP PLANFUs, though it must be noted that this is a rough comparison only. Barren and Scattered (B&S) and LOWNAT area is included in the table as it contributes to the productive forest land base.

The table below shows some minor variance in productive area by forest unit between plans, but differences are minor (mainly due to refined forest unit definitions) and should not compromise the Whiskey Jack Forest's ability to continue to provide forest benefits associated with the productive forest.

2004 FMP			2012 FMP	
PLANFU	**Ha**		**PLANFU**	**Ha**
CEDAR	5,202		OCL	2,217
COSHA	77,726		BFM	27,150
MIXED	58,550		CMX	88,492
			HMX	107,239
OTHWD	1,813		OTH	1,995
PJDOM	235,392		PJD	182,832
			PJM	61,845
PODOM	133,214		POD	73,977
PRWMX	4,216		PRW	3,312
SBLOW	12,542		SBL	17,611
SPDOM	197,610		SPD	112,785
			SPM	45,937
TOTAL	726,265		TOTAL	725,394

Old Forest Area – Next, the quantity of old forest was compared for Plan Start 2004 and 2012. The comparison utilizes the PLANFUs and old forest definitions used in each of the plans, with 2004 PLANFUs organized and grouped to roughly align with the 2012 FMP old forest groupings. It is evident that through aging of the forest over the past eight years, significantly more area has now aged enough to be classified as old forest. Therefore, this increase in area of old forest may be detrimental to future wood supply and provide a greater fire hazard in some portions of the forest, it does provide more of the inherent benefits associated with older forest structure (e.g. wildlife habitat for those species preferring old forest, forest diversity).

Old Forest Area at Plan Start

2004 FMP			2012 FMP	
PLANFU	Ha		PLANFU	Ha
CEDAR >140 years	329		OLD - BFo >80 years	3,707
COSHA > 110 years	1,554		OLD - CLo >100 years	1,851
MIXED >100 years	1,875		OLD - CMo >100 years	8,811
PODOM >100 years	5,812		OLD - HWo >100 years	17,199
OTHWD >100 years	146		OLD - OHo >90 years	1,252
PJDOM >110 years	4,598		OLD - PJo >100 years	23,309
SBLOW >160 years	-		OLD - SLo >160 years	2,007
SPDOM >120 years	4,879		OLD - SPo >110-120 years	10,207
PRWMX >130 years	456		OLD - PRW >140 years	457
TOTAL	19,649		TOTAL	68,801

Caribou Habitat – A similar dynamic caribou habitat schedule was spatially applied for both the 2004 and 2012 forest management plan land bases. Therefore it is expected that the projected benefits to caribou are comparable for both plans.

Marten Habitat – a similar spatial distribution of marten core areas was incorporated into both the 2004 and 2012 FMPs. Plan Start achievement of % suitable of total capable % was 3.7% for the 2004 FMP (13 cores) and 4.9% for the 2012 FMP (17 cores or Large Landscape Patches). These results support the forest's ability to continue to supply spatial marten core area.

CONCLUSION: Based on the comparison of projected wood supply, productive forest area, old forest area, caribou habitat and marten habitat, it is expected that the 2012 Whiskey Jack Forest will continue to be able to supply forest benefit levels associated with the 2004 forest management plan.

8.4 Documentation of the Management Objectives Checkpoint

Progress Checkpoint #4 approval of the Management Objectives was received on January 13, 2011.

From: Hole, Scott (MNR)
To: Duda, Steve (MNR) ; Mohamed, Hassan (MNR) ; Pochailo, Kurt (MNR) ; Susan Jarvis
Cc: Salter, David (MNR) ; Ride, Kevin (MNR)
Sent: Thursday, January 13, 2011 3:09 PM
Subject: Whiskey Jack Forest Management Objectives Checkpoint

All:

I have received confirmation from the Regional advisors that the materials submitted for the Management Objectives Checkpoint satisfy the requirements of the Forest Management Planning Manual.

Provided the rest of the advisors and planning team members agree, the checkpoint can be considered passed.

Scott Hole, R.P.F.
Resource Analyst
Northwest Region Planning Unit

PART 5: PROPOSED LONG-TERM MANAGEMENT DIRECTION

9.0 Introduction

This section of the Analysis Package documents the development of the proposed Long-term Management Direction (LTMD). Information required by the FMPM in this section of the Analysis Package includes:

(a) How management objectives were represented in the analysis;
(b) How the achievement of objectives was interpreted from the model results;
(c) A summary of changes to the base model and rationale for those changes;
(d) A summary of modelling results including:
    (i) key results and conclusions that provide rationale for adjustment to targets, if applicable; and
    (ii) the conclusions of the analysis, with a digital copy of the model run for the proposed long-term management direction.
(e) Documentation of Support for the Proposed Long-Term Management Direction, Determination of Sustainability and Primary Road Corridors Checkpoint

This information and a summary of development of the LTMD are documented in the following sections.

9.1 Management Objective Representation and Interpretation of Results in the Analysis

How management objectives and indicators were represented in the analysis and how the achievement of objectives was interpreted from the model results (points (a) and (b) above) are documented in the following table (Table 24).

1 **Table 24 How Management Objectives were Represented and Interpreted from the Analysis**

OBJECTIVE	INDICATOR	HOW REPRESENTED IN ANALYSIS	HOW INTERPRETED FROM RESULTS
1 Landscape Pattern	1a % mature and old forest	spatial measurement in OLT model at 500 ha and 5,000 ha scales.	Results are compared at the 500 ha and 5,000 ha scales to assess if results achieve minimum desirable levels (from OLT projection) or are showing movement from Plan Start % towards desirable level.
	1b young forest patch size by size class	spatial measurement in OLT model.	Results compared to projected proportions by size class from OLT for this indicator to assess if results achieve minimum desirable levels or are showing movement from Plan Start % towards desirable level.
	1c % mature and old conifer forest	spatial measurement in OLT model at 500 ha and 5,000 ha scales.	Results are compared at the 500 ha and 5,000 ha scales to assess if results achieve minimum desirable levels (from OLT projection) or are showing movement from Plan Start % towards desirable level.
2 Forest Composition	2a Crown productive forest by landscape class	SFMM model includes extra "species" in yield curves to track area by landscape class through time.	Projected area of the mature and late successional landscape classes is compared to minimum desirable levels to determine achievement.
	2b Crown productive forest by forest unit and age grouping	SFMM projected area by forest unit and 10-year age class.	Forest unit area is summed by age grouping based on split between young/immature and mature/late ages (varies by forest unit). Projected area is compared to minimum desirable levels by age grouping to determine achievement.
	2c amount and distribution of old forest	SFMM model includes extra "species" in yield curves to track area by old forest grouping through time.	Projected area by old forest class is compared to minimum desirable levels to determine achievement.
	2d amount of red pine and white pine forest	SFMM projected area by forest unit.	Projected area of PRW forest unit (all ages) is compared to minimum desirable level to determine achievement.
	2e amount of upland pine and spruce	SFMM projected area by forest unit.	Projected area of PJD, PJM, SPD and SPM is summed and compared to the minimum desirable level to determine achievement.
3 Wildlife Habitat	3a Area of habitat for forest-dependent Species At Risk.	SFMM model includes extra "species" in yield curves to track area by caribou habitat type (3 types: refuge, winter used and winter preferred).	Projected areas for the 3 caribou habitats are compared to minimum desirable levels to determine achievement.
	3b % caribou refuge habitat in caribou zone	spatial measurement in OLT model at 6,000 ha and 30,000 ha scales.	Results are compared at the 6,000 ha and 30,000 ha scales to assess if results achieve minimum desirable levels (from OLT projection) or are showing movement from Plan Start % towards desirable level.
	3c % caribou winter habitat in caribou zone	spatial measurement in OLT model at 6,000 ha and 30,000 ha scales.	Results are compared at the 6,000 ha and 30,000 ha scales to assess if results achieve minimum desirable levels (from OLT projection) or are showing movement from Plan Start % towards desirable level.
	3d marten core habitat	OMA model used to classify and summarize suitable marten in identified core areas with subsequent measurement in GIS system.	Core areas are identified and then the percentage is calculated for suitable habitat in cores divided by total capable habitat. This proportion is comapred to the desirable range percentages to assess achievement. Marten core areas are included as deferrals in the SFMM modelling during development of the LTMD but SFMM is not used to assess this indicator.
	3e % conifer dominated forest units in the caribou zone	Not measured in strategic modelling. GIS query of the updated forest inventory	In the caribou zone, total productive forest area of targeted conifer forest units (only PJD, PJM, SBL, SPD and SPM forest units) divided by the total productive area, expressed as a percentage. Information is reported by forest unit, but indicator is for combined total percentage of the targeted forest units in the caribou zone (not individually).
	3f % jack pine and spruce species composition by forest unit in the caribou zone	Not measured in strategic modelling. GIS query of the updated forest inventory	Forest composition to be derived using the Base Model Inventory with the species composition string parsed out. Indicator calculated for only PJD, PJM, SBL, SPD and SPM forest units within the caribou zone: the combined species composition percentage for jack pine, black spruce and white spruce (only) is calculated, based on the area weighted average tree species composition by forest unit.
4 Wood Supply	4a Long-term projected available harvest area	SFMM projected AHA by forest unit.	Projected total available harvest area is compared to the minimum desirable level to determine achievement.
	4b Long-term projected available harvest volume	SFMM projected AHV by species group.	Projected available harvest volume by species group is compared to the minimum desirable level to determine achievement.
	4c Short-term projected available harvest volume	SFMM projected total AHV for Term 1.	Projected Term 1 total available harvest volume is compared to the minimum desirable level to determine achievement.
	4d % actual harvest area by forest unit	Not measured in strategic modelling. Measurement based on analysis of GIS updated harvest area.	Not assessed through strategic analysis.
	4e % actual harvest volume by species group	Not measured in strategic modelling. Measurement based on analysis of actual harvest volumes.	Not assessed through strategic analysis.
5 Managed Crown Fores	5a managed Crown forest available for timber production	SFMM projected total available area.	Projected total long-term (Term 11) available forest area is compared to minimum desirable level to determine achievement.
6 Aboriginal Involvemer	6a Representation on the Planning Team	Not included in strategic modelling.	Not assessed through strategic analysis.
	6b Aboriginal communities that contribute information to the planning process	Not included in strategic modelling.	Not assessed through strategic analysis.
7 LCC Involvement	7a LCC self-evaluation on its effectiveness in plan development	Not included in strategic modelling.	Not assessed through strategic analysis.
8 Road Access	8a km SFL road per km2 of prodctive forest	Not included in strategic modelling.	Not assessed through strategic analysis.
9 Forest Renewal	9a Regeneration Success: Percent of Harvested Forest Area Assessed as Free-Growing by Forest Unit	Not included in strategic modelling.	Not assessed through strategic analysis.
	9b Silviculture Intensity: Planned and Actual Percent of Harvested Area Treated by Silvicultural Intensity	Not included in strategic modelling.	Not assessed through strategic analysis.
	9c Silvicultural Success: Planned and Actual Percent of Harvested Forest Area Assessed as Free-Growing and Successfully Regenerated to the Projected Forest Unit	Not included in strategic modelling.	Not assessed through strategic analysis.
10 Forest Values	10a % of forest operation inspections in non-compliance, by activity and remedy type (i.e. severity).	Not included in strategic modelling.	Not assessed through strategic analysis.
11 Soil and Water Resou	11a % of forest operations inspections in non-conpliance with management practices that prevent, minimize or mitigate site damage (by remedy type)	Not included in strategic modelling.	Not assessed through strategic analysis.
	11b % of forest operations inspections in non-compliance with prescriptions developed for the protection of water quality and fish habitat (by remedy type)	Not included in strategic modelling.	Not assessed through strategic analysis.

2

9.2 Summary of Development of the Long-term Management Direction

The base model was used as the starting point for the development of the proposed long-term management direction. The Strategic Forest Management Model (SFMM) was used as a decision support system during strategic analysis. Strategic analysis is an iterative process used to determine the types and levels of access, harvest, renewal, and tending activities required to balance the achievement of management objectives associated with the management of forest cover, and to develop achievable targets in the proposed long-term management direction.

Targets were established for each indicator. The establishment of targets for each indicator considered:

(a) The current forest condition;
(b) A balance of social, economic and environmental considerations;
(c) The associated indicator and the desirable level;
(d) The potential achievement for the short term (10 years), medium term and long-term; and
(e) Projections from past forest management plans and historical levels of objective achievement.

In addition, for harvest level indicators, the targets also considered:

(a) Ontario Forest Accord Advisory Board benchmark harvest levels, as identified in the Regional Wood Supply Strategies;
(b) Maximum even-flow harvest volume by major species group; and
(c) Historic wood utilization.

Upon completion of the investigation of the types and levels of activities and setting of desirable levels (FMP Section 3.5.1 and 3.5.2) and conducting broad and specific scoping investigations, the Planning Team began developing a Long-term Management Direction (LTMD). All investigations conducted for the development of the LTMD considered implications on wood supply, forest conditions, habitat, and other non-timber resources for the short-term (10 years), medium-term (20-70 years) and long-term (80-100 years). These values were also considered throughout the 160-year planning horizon. These investigations were part of the iterative process used in the development of the Long-term Management Direction. All strategic modelling was conducted and reviewed co-operatively between SFL staff and MNR district staff, with valued input and advice from the plan advisors.

Specific SFMM model inputs varied for each investigation and projected results are documented in a standardized 3-Page Summary for all documented investigations in Appendix 3. Digital copies of selected model runs (labels with SFMM Case code noted in bold below) that best represent the following investigations to support strategic analysis are included in the SFMM executable DAT file provided to MNR for review. They do not form part of the public portion of the electronic FMP.

The following summary of investigations and significant conclusions were considered in the development of the Long-term Management Direction and indicator target levels.

(a) Ontario Forest Accord Advisory Board (OFAAB) benchmark harvest levels, as identified in the Regional Wood Supply Strategies.

SFMM Case:		Description:
05-BENCH		Achieve OFAAB benchmark volumes by species group
Group:	**Bench**	thousands of m3 per year
PWR	0.6	
SPF	354.0	**BUILT ON OLT_50 investigation, vol targets added. Non-binding to allow solve.**
PO	149.0	
BW	4.0	
Total	507.6	

CONCLUSION: OLT landscape indicator targets achievement was good due to the constraints added to all LTMD development scenarios. PWR (red pine – white pine), SPF (spruce-pine-fir) and BW (white birch) OFAAB benchmark volume targets were able to be met in all terms. The PO (poplar) species group benchmark level was projected to be met in all terms except Terms 4-6.

(b) Maximum even-flow harvest volume by major species group.

SFMM Case:	Description:
06-Flat-PWR	Even PWR volume all terms
07-Flat-SPF	Even SPF volume all terms
08-Flat-PO	Even PO volume all terms
09-Flat-BW	Even BW volume all terms

BUILT ON OLT_50, no vol targets added, only vol flow control.
Volume flow constraints of 0% decrease and 0% increase for each species group as individual scoping runs, no volume
Will determine lowest point that can be achieved for timber by each species group in any given term.

The even flow (flat line) harvest volume investigations gave ballpark estimates of how much volume by species group could be sustained through time if there was the same volume projected in every term. Additional information was derived from the even-flow runs to see what volumes were projected if volumes could increase, but not decrease, between terms. This information was recorded as the non-declining volumes by species group but are not saved investigations. The non-declining information gave an indication of what terms limited the projected harvest volumes for each species group.

Results	**Even Flow Volumes (m3/year)**
06-Flat-PWR	1,290 m3
07-Flat-SPF	392,370 m3
08-Flat-PO	110,507 m3
09-Flat-BW	17,467 m3
09-Flat-TOTAL	551,399 m3

Non-declining volumes: **(Information point only, not saved cases.)**

1,290 increases to 1,431 in T9 and then 2,178 in T13 and 2,200 in T15.

389,174 then increases to 474,804 T7 to end.

110,051 limited to T6, then incr to 117,878 in T7. Incr to 134,591 in T15.

Same as even flow, so limited by last term

546,319 m3 to T6, then incr to 616,460 m3 in T7-T14, then incr to 705,091 m3 for T15.

CONCLUSION: Increased volumes can be realized by allowing increases in volumes between terms or by adjusting the OLT achievement targets or timeframe for achievement. Poplar volumes were confirmed to be a challenge that needed to be addressed in the LTMD, particularly for the short-term. Spruce-Pine-Fir projected volumes were generally at an acceptable level.

Development of the LTMD Management Strategy

After approval of the Base Model, work progressed to develop a Long-term Management Direction.

10_MS – This run was built on run 02_OLT_50 (with OLT class minimum SRNV levels built into the SFMM model for mature/late landscape class area, old forest area, upland pine and spruce area and non-spatial caribou habitat). Minimum volume targets were added for Term 1 (table below) and also for SPF all terms to balance wood flow more evenly. The budget was balance by all subunits combined. Also an additional deferral was added (WC2 called LLP_00) for area near Grassy Narrows in preparation for additional investigations, but this area did not have any operational timing deferrals included in this scenario (deferral turned OFF).

Group:		thousands of m3 per year.	
PWR	1.5	T1 only	
SPF	390.0	all terms	
PO	200.0	T1 only	(Lower than 2004 FMP (265), but higher than even flow (110)).
BW	20.0	T1 only	
Total	600.0	all terms	

11_MS – This run was a refinement of run 10_MS with additional constraints from Term 6 onwards to ensure achievement the minimum SRNV area of mature and late successional area by forest unit. Also included a volume flow control of a maximum of 10% decrease in total volume between terms.

12_medOLT – This run included increased OLT targets at the median level, rather than the lower SRNV level (solved for all classes except left at min. SRNV for PSp, MLI, CLo, and SPo). These targets were included from Term 11 onwards as it took longer (than T6 used in previous scenarios) for enough change to the current forest condition to achieve the higher median values.

16_MS – This run was built on run 11_MS with OLT targets raised above minimum SRNV levels but not as high as median levels (14_OLT50+). This improved overall OLT area projections. Additional constraints were added to ensure the minimum OLT SRNV levels of the mature/late successional age grouping by forest unit were achieved from Term 6 onwards.

17_MS – This run included refined non-binding harvest volume targets to reduce Term 1 volume as noted below, and to control the variation in poplar harvest volume T1 through to T15. Overall volume projections were acceptable but there was significant variation for individual species groups between terms.

Group:		thousands of m3 per year.	
PWR	1.5	T1-T2 only	
SPF	350.0	T1-T2 only	
PO	200.0	T1-T2 only	then T3-T15 at 100.00
BW	20.0	T1-T2 only	
Total	500.0	all terms	

20_MS – Harvest volume targets were added for TOTAL volume (all terms) and PO (Terms 1-6) to better balance harvest volumes. These constraints served to increased and stabilize future total harvest volumes, and project acceptable short-term volumes.

Group:		thousands of m3 per year.
PWR		
SPF		
PO	200.0	T1 only, then T2 150, T3-6 90.
BW		
Total	520.0	all terms to raise harvest in lowest terms

22_OLTPO – This scenario included some minor refinements to subunits and LLP deferrals to closely align with the projected deferrals for marten core areas. Other LLPs were revised to be deferred for 30 years rather than the original 60 year estimate (LLP_27-32, and LLP_28 was turned OFF). An additional operational deferral was included (LLP_40, deferral of 7,616 ha) to reflect area that was not expected to be operated for the next 40 years.

27_OLTMS – This scenario included a constraint for non-declining PRW area compared to the Plan Start level (as per an objective indicator). In order for this to solve, a refinement in the minimum target for old forest CMo was needed to allow the conversion of a small amount of area from the CMX to PRW forest units. The resulting minimum target of 21,000 ha CMo was still above the minimum SRNV as was considered acceptable to the Planning Team.

CONCLUSION: This scenario was reviewed at length by the Strategic Task Team and Planning Team and considered a viable LTMD option. It provided a good balance of objective achievement and included forest management activities of harvest and renewal that were reasonable for the forest and had the potential to be successfully implemented.

As previously noted, after scenario 27 was investigated, there was an error identified and corrected related to the **classification of the SBL forest unit productive area** in the Base Model Inventory. Approximately 16,000 hectares had been classified as SPD forest unit area whereas it should have been classified as SBL forest unit area. This correction was made prior to selection of the LTMD (between runs 27 and 27a). The correction served to decrease the SPD forest unit area, decrease the MLc landscape class area and decrease the SPo old forest area. These decreases were not significant as these classes all had large areas in them and the change was proportionately small. The corresponding increases in classes associated with lowland spruce (MLl landscape class and SLo old forest area) were equivalent in hectares, but more significant in magnitude because these classes contained smaller areas. The positive result of this correction was that it confirmed better correlation between SFMM and the OLT Plan Start values for MLl and SLo.

27a_OLTMS – The initial land base and deferred areas from Run 27 were updated with the reclassification of SPD to SBL area described above. The projected harvest area by forest unit was reviewed and an additional minimum harvest area target (Term 1 10 ha/year) was added for PRW to ensure there was some harvest area in this plan period, and a maximum harvest area was added for SBL for Terms 1-3 (80 ha/year) to ensure there was not too much lowland harvest area in any term due to the operational limitations of winter harvest. The OLT targets were again reviewed for achievement. Targets were added for mature/late SBL, mature/late Lowland and old forest SLo as these classes did not already have targets because they had not been well correlated to the OLT ranges before the forest unit classification correction, and now could be controlled to ensure favourable projections. Results were again reviewed in detail by the Strategic Task Team and Planning Team and accepted for further spatial planning.

Scenario 27a_OLTMS was considered as a potential Proposed Long-term Management Direction. Eligible harvest areas on the forest were reviewed to investigate if the projected available harvest area in Run 27a was feasible for implementation. Several areas were classified as being available for harvest that the Operations Task Team did not think were realistic to allocate due to bypassed areas that were not feasible to harvest or would be better suited for harvest when adjacent areas were old enough to be included in operationally feasible operating blocks. The task team decided that the LTMD run should be refined to remove the area of estimated bypass from the available forest in SFMM (reserve category PASS added 33,417 ha), and to defer other areas from being projected for harvest for the next 40 years (7,823 ha). At this time, regional input was also received to consider the balancing of Spruce-Pine-Fir harvest volumes through time rather than having the level of variation that was included in Run 27a. Another run was built onto Run 27a to balance the SPF wood supply with the revised land base (PASS and deferrals).

27d_OLTMS – After preliminary harvest allocations and regional MNR review, further adjustments to operational reserves and deferrals and the balancing of Spruce-Pine-Fir harvest volume was completed in Dec. 2010. Adjustments to poplar and total wood supply targets were included as well as for SPF, as were very minor refinements in OLT forest condition modelling targets. There was no change in the minimum desirable levels for forest condition related indicators – all desirable levels were still being met. The task team simply agreed that a predictable wood supply was necessary and that a higher achievement of OLT desirable levels within the SRNV was not as critical. All targets in Run 27a were maintained with minor reductions in the modelled targets for Mature/Late hardwood landscape class (Term 6 onwards) and Old PJ from Term 8 onwards. The projected AHA by forest unit was feasible to allocate. Results of this revised run and preferred harvest allocations based on this run were reviewed by the task team, Planning Team, regional advisors and LCCs.

Scenario 27d_OLTMS was selected as the Proposed Long-term Management Direction.

(c) Historic wood utilization

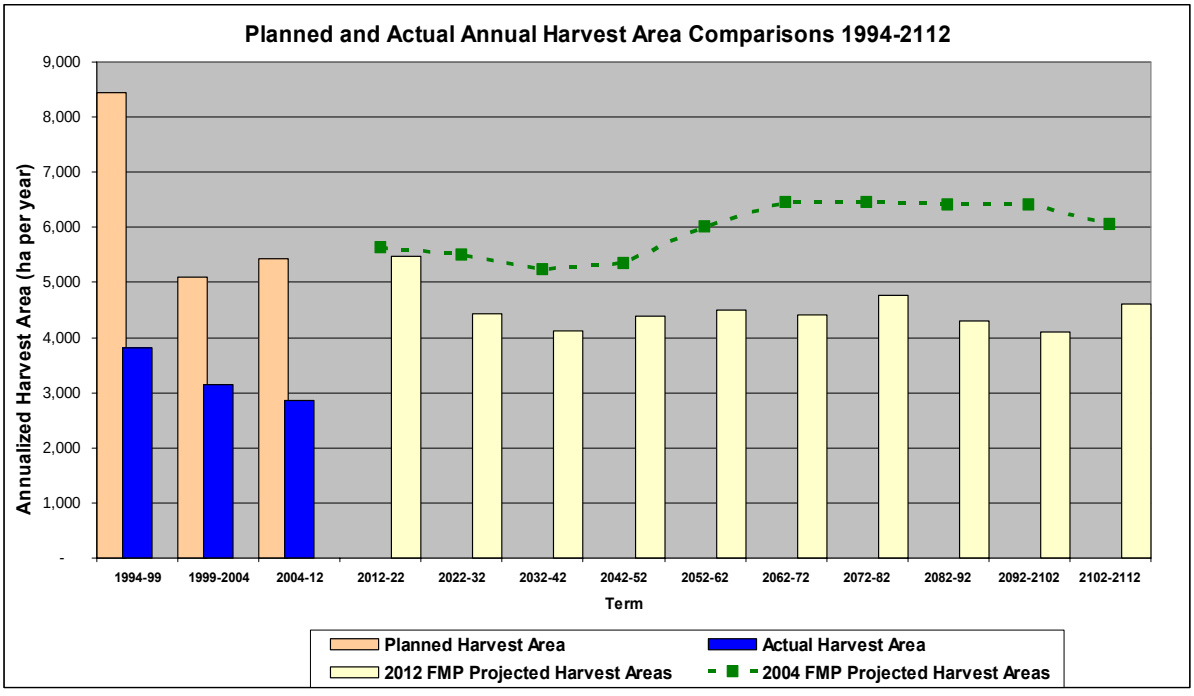
Short-term Harvest Areas 2012-2022

The Long-term Management Direction (27d_OLTMS) projects a harvest of 5,483 hectares per year from 2012-2022. The projected annual harvest area in the LTMD was compared to the historical planned and actual total harvest areas for 1994 through to 2112 (Figure 6). The total available harvest area planned for 2012-2022 (5,483 ha per year) is comparable to the total harvest area projected in the 2004 FMP (5,423 ha per year), and similar to planned harvest areas approved in the previous 1999 forest management plan (5,099 ha per year). This level of harvest for the 2012-2022 plan period was determined in response to identified management considerations for short-term harvest volumes (Indicator 4c) while balancing long-term objective achievement and forest sustainability.

Long-term Harvest Areas 2022-2112

The total annual harvest area (AHA) is projected to average approximately 4,500 hectares per year for the next 100 years, lower than projections in the 2004 FMP (average of 5,950 ha per year over 100 years). The lower long-term projected harvest area in this plan is a result of (a) a major revision to the objective indicators and desirable levels based on the OLT model simulated ranges of natural variation and (b) the balancing of socio-economic benefits from the Whiskey Jack Forest within the context of overall forest sustainability.

Figure 6 Planned and Actual Annual Harvest Area Comparisons 1994-2112



Short-term Harvest Volume 2012-2022

The 2012-2022 Long-term Management Direction annual harvest area is projected to yield approximately 574,000 cubic metres of timber each year from 2012-2022. This is comprised of 340,000 cubic metres of Spruce-Pine-Fir (SPF), 190,000 cubic metres of Poplar (PO), 33,000 cubic metres White Birch (BW) per year and 4,000 cubic metres per year of Red Pine and White Pine (PWR). Incidental species (cedar, larch and black ash) total approximately 7,000 cubic metres per year but are not considered major species groups.

The annual total harvest volume level in the LTMD for the 2012 Whiskey Jack FMP (574,600 cubic metres) is 20% lower than the harvest volumes projected in the selected management alternative for the 2004-2024 FMP (718,300 cubic metres per year). The decrease in harvest area and associated harvest volume is a result of desired forest and benefits while balancing other socio-economic indicators and forest sustainability. The Planning Team carefully considered the impact of the 2012-2022 projected harvest area on long-term harvest area/volume and future desired forest and benefits. The Planning Team supports this balance of long-term objective achievement.

Associated with the available harvest volumes are additional potential volumes of defect volume (branches, twigs, leaves, bark) and undersize volumes (top wood). These defect and undersized volumes were estimated through use of a MNR NW Region spreadsheet calculation based on the available harvest volume in the Long-term Management Direction. As reported in Table FMP-8, there are an estimated 104,400 m3 per year of defect volume and 20,700 m3 per year of undersized volume potentially available through harvest of the full available harvest area during this 10-year plan period. The total of available harvest volume, defect and undersized volume is estimated to be 6,997,400 m3 for this plan period 2012-2022 (699,700 m3 per year).

Long-term Harvest Volume 2022-2112

The LTMD projects that the total harvest volume will be sustained at 501,000 m3 per year in the 2022-2032 period, later decreasing to approximately 477,000 m3 per year from 2032 through to 2112. Strategic total harvest volumes projections are lower in this FMP as compared to the 2004 forest management plan. Spruce-Pine-Fir volume is projected to be comparable for 2012-2052 period as was projected in the 2004 FMP but then volumes are projected to be lower than the 2004 FMP for the following 60 years to 2112. Poplar volumes are projected to be significantly lower than 2004 projected levels. This variance is attributed to the refinement of the growth and yield curves and revision of modelling assumptions for the 2012 FMP and also due to the maximization of harvest area and total volumes, rather than forcing constant levels for any particular volume species groups. White Birch harvest volume is projected to be very variable in this 2012 FMP but is on average comparable to 2004 FMP volume projections for the next 50 years.

OFAAB Benchmark Levels

The projected volume in the LTMD was compared to the historical and benchmark levels identified in the Ontario Forest Accord Advisory Board (OFAAB) report. The following graphs show the historical and benchmark harvest levels which have occurred on the Whiskey Jack Forest from 1994 to the present. The planned and actual harvest volumes are also illustrated by 10-year FMP term from 1994 to 2012 (includes three additional years for 2009-2012 Contingency Plan period), and planned volumes from 2012 to 2112. Volume comparisons are included for all volumes (TOTAL, Figure 7), Spruce-Pine-Fir (Figure 8), Poplar, (Figure 9), White Birch (Figure 10) and White Pine and Red Pine, (Figure 11).

LTMD projections for Spruce-Pine-Fir harvest volumes are above the OFAAB level in this plan period, but then are projected to be comparable or marginally lower than the benchmark level through the long-term. Poplar harvest volumes are projected to be greater than the OFAAB benchmark level for this plan period, then are projected to be lower than the benchmark through the long-term. The fluctuation in poplar volume is a result of revised modelling assumptions and yield curves and the maximization of short-term harvest volume (not by species group) noted above. White Birch projections are consistently above the OFAAB benchmark. Red Pine – White Pine is also projected to exceed the OFAAB benchmark level for this 10-year plan period, then to be comparable to the benchmark over the following 80 years (except 2032-2042 when no PWR is projected to be harvested). Total harvest volume (not a provincial species group, but informative) is projected to be sustainable at a level slightly below the OFAAB total volume benchmark level.

Figure 7 Planned and Actual Harvest Volume Comparisons, Species Group – TOTAL

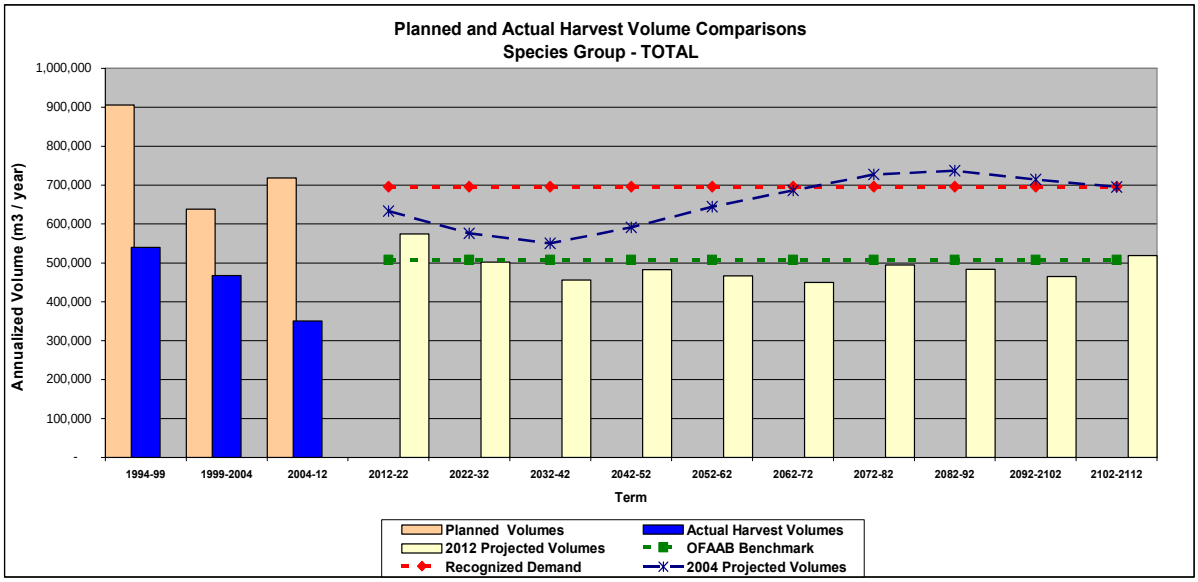


Figure 8 Planned and Actual Harvest Volume Comparisons, Species Group – Spruce-Pine-Fir

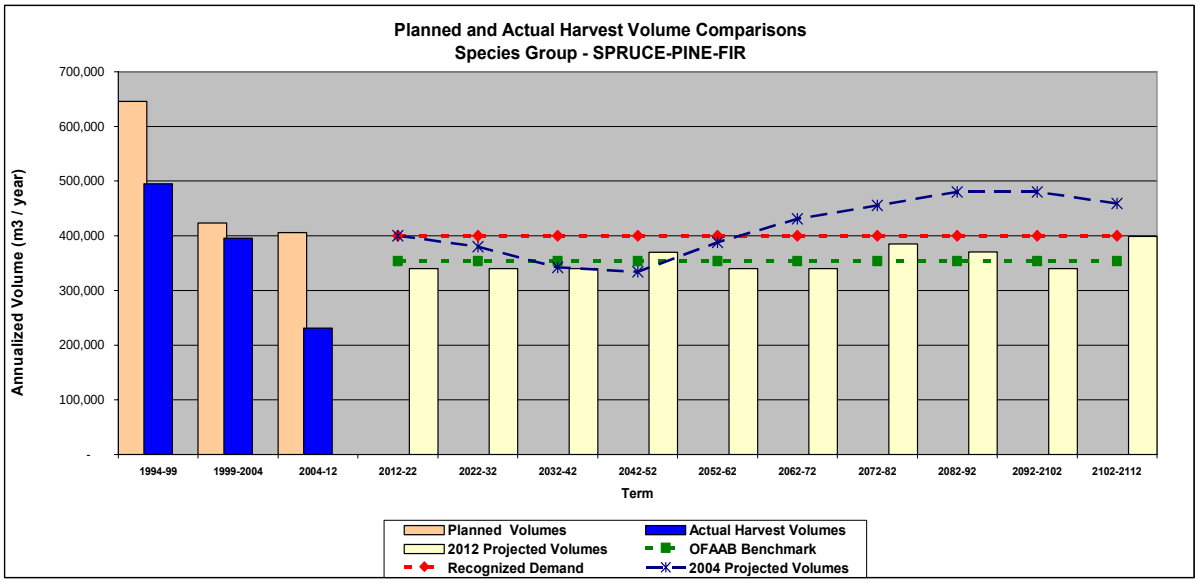


Figure 9 Planned and Actual Harvest Volume Comparisons, Species Group – Poplar

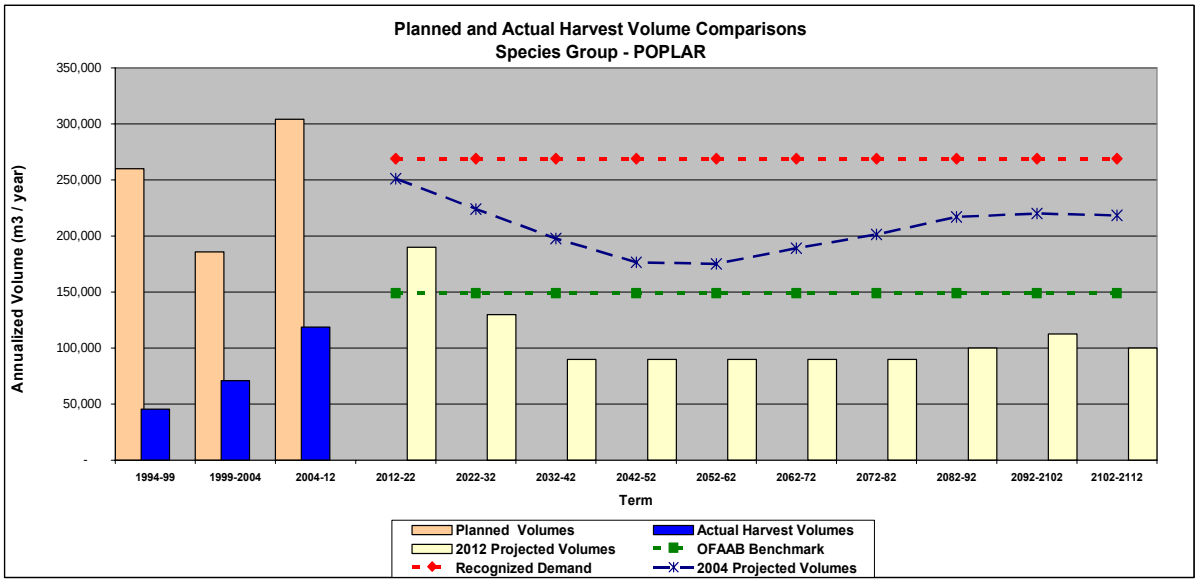


Figure 10 Planned and Actual Harvest Volume Comparisons, Species Group – White Birch

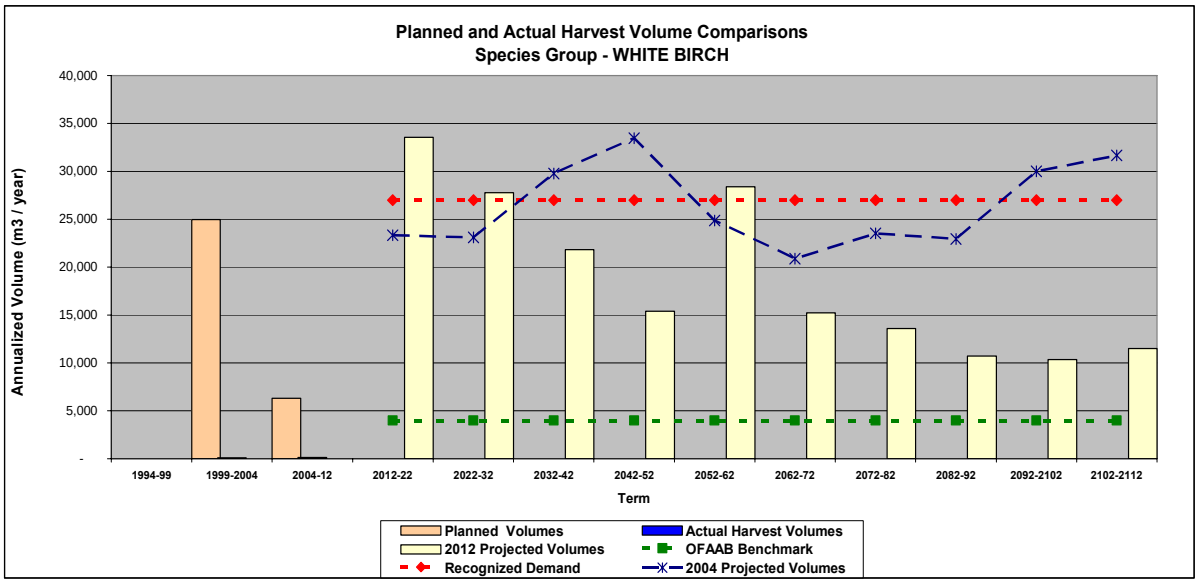
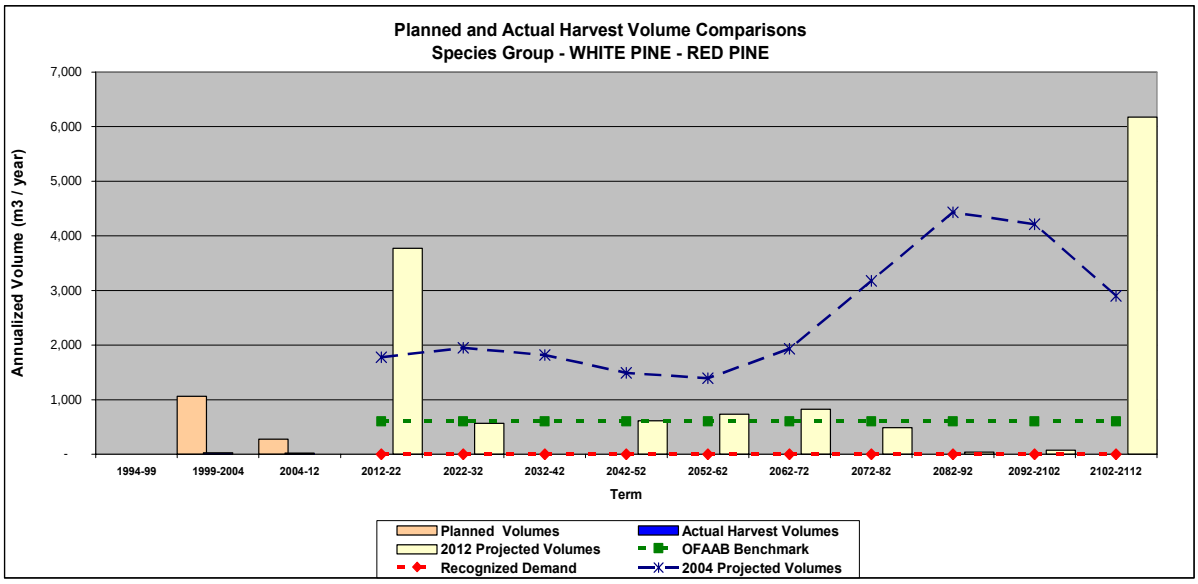


Figure 11 Planned and Actual Harvest Volume Comparisons, Species Group – White Pine and Red Pine



9.3 Long-term Management Direction Documentation

The management objectives, indicators, desirable levels, target levels and the timing of assessment for each indicator are documented in Table FMP-9. Projected results for the Long-term Management Direction are documented or discussed in:

FMP Tables:

FMP-5	Projected Forest Condition for the Crown Productive Forest
FMP-6	Projected Habitat for Species at Risk and Selected Wildlife Species
FMP-7	Projected Available Harvest Area by Forest Unit (10-Year)
FMP-8	Projected Available Harvest Volume by Species Group (10-Year)
FMP-9	Assessment of Objective Achievement

FMP Text Sections:

3.6	Long-term Management Direction
5.0	DETERMINATION OF SUSTAINABILITY
5.1	Collective Achievement of Management Objectives
5.2	Preliminary Spatial Assessment
5.3	Social and Economic Assessment
5.4	Prescriptions for the Protection of Values
5.5	Conclusion on the Sustainability of the FMP

9.4 Documentation of Proposed LTMD Checkpoint

This progress checkpoint confirmed support by the MNR district and regional staff for the information and products associated with the long-term management direction, the preliminary determination of sustainability and the primary road corridors developed in the FMPM Part A, Section 1.2 to 1.2.7.

Progress Checkpoint #5 approval of the Proposed Long-term Management Direction was received on March 9, 2011.

From: Hole, Scott (MNR)
To: Duda, Steve (MNR) ; Susan Jarvis ; Mohamed, Hassan (MNR) ; Pochailo, Kurt (MNR)
Cc: Salter, David (MNR) ; Ride, Kevin (MNR) ; Schaefer, Chris (MNR)
Sent: Wednesday, March 09, 2011 8:22 AM
Subject: Whiskey Jack LTMD Checkpoint

All

The Region has completed its review of the materials and information supplied for the Proposed Long Term Management Direction, Determination of Sustainability and Preliminary Spatial Assessment checkpoint for the Whiskey Jack Forest. We are satisfied that the requirements of this checkpoint have been met. Provided the rest of the team and relevant advisors are in agreement, the district can consider this checkpoint passed.

Scott Hole, R.P.F.
Resource Analyst
Northwest Region Planning Unit

APPENDICES

Appendix 1 Yield Curves

Appendix 2 Summary of Investigation and LTMD Development Results

Appendix 3 Summary of Long-term Management Direction Results

Appendix 1

Yield Curves

Development of Yield Curves for the Kenora & Whiskey Jack Forests

PREPARED FOR:
Colin Bowling/Hassan Mohamed
Ontario Ministry of Natural Resources
Kenora, Ontario

PREPARED BY:
Margaret Penner
Forest Analysis Ltd.

June 14, 2010

Introduction

This report documents the production of yield curves for the Kenora and Whiskey Jack forests.

Forest Units

Two versions of the standard forest unit SQL were used. The first uses ecosite, the second does not use ecosite but uses stocking to identify shallow sites. If ecosite was available, the first version was used. Otherwise, the second version was used.

The SQL for the Kenora and Whiskey Jack forest units (Planfu) is given in Table 3. The original SQL was modified so the breakpoints corresponded to 0.05 fractions of basal area rather than 0.1 fractions as much of the data had a finer resolution than the species composition in the inventory.

Table 1. The standard forest unit SQL using ecosite is given.

Order	Name	Description	Query
1	PwDom	White pine dominated	([PW]>=40)
2	PrDom	Red pine dominated	([PR]>=70)
3	PrwMx	Red - white pine mix	([PW]+[PR]>=40)
4	UplCe	Upland Cedar	([CE]>=20) AND ([ECOSITE]=17)
5	OcLow	Other conifer - Low	(([CE]+[LA]>=50) OR WG=22 OR WG=25) AND ([PR]+[PW]+[PJ]+[SW]+[BW]<10)
6	SbLow	Black spruce low	([ECOSITE]=34 AND [PJ]+[PW]+[PR]+[BF]+[SW]<=20) OR ([ECOSITE]=35 OR [ECOSITE]=36 OR [ECOSITE]=37) OR ([ECOSITE]=38 AND (WG=12 OR WG=13 or WG=22 OR WG=25))
7	SbSha	Spruce shallow	([SB]>=70) AND ([PO]+[BW]<=20) AND ([ECOSITE]=11 OR [ECOSITE]=12)
8	SbDee	Spruce deep	([SB]+[SW]>=70) AND ([PO]+[BW]<=20)
9	PjSha	Jack pine Shallow	([PJ]>=70) AND ([PO]+[BW]<=20) AND ([ECOSITE]=11 OR [ECOSITE]=12)
10	PjDee	Jack pine deep	(([PJ]>=70) AND ([PO]+[BW]<=20)) OR (([PJ]>=50) AND ([PO]+[BW]<=20) AND AGE >= 120) OR (([PJ]>=70) AND ([ECOSITE]=13 OR [ECOSITE]=14))
11	PoSha	Poplar Shallow	([PO]>=70) AND ([ECOSITE]=11 OR [ECOSITE]=12)
12	PoDee	Poplar deep	([PO]>=70)
13	BwSha	White birch shallow	([BW]>=60) AND ([PO]+[BW]>=70) AND ([ECOSITE]=11 OR [ECOSITE]=12)
14	BwDee	White birch deep	([BW]>=60) AND ([PO]+[BW]>=70)
15	OthHd	Other hardwood	([MH]+[MS]+[AB]>=30)
16	SbMx1	Black spruce mixedwood	([SB]+[SW]+[PJ]+[PR]+[PW]+[BF]>=70) AND ([BF]<=10) AND ([PO]+[BW]<=20) AND ([SB]+[SW]>[PJ])
17	PjMx1	Jack pine mixedwood	([SB]+[SW]+[PJ]+[PR]+[PW]+[BF]>=70) AND ([BF]<=10) AND ([PO]+[BW]<=20) AND ([SB]+[SW]<[PJ])

18	BfPur	Balsam fir dominated	([BF]>=70)
19	BfMx1	Balsam fir mixedwood	([BF]>=20) AND ([BF]+[SW]+[SB]+[PJ]=[CE]+[LA]+[PW]+[PR]>=70) AND ([BF]+[SW]>=30)
20	HrDom	Hardwood dominated	([PO]+[BW]+[MH]+[MS]+[AB]>=70)
21	HrdMw	Hardwood mixedwood	([PO]+[BW]+[MH]+[MS]+[AB]>=50)
22	ConMx	Conifer mixedwood	([PW]+[PR]+[SB]+[Sw]+[Bf]+[PJ]+[CE]+[LA]>=50)

Table 2. The standard forest unit SQL is given for instances when ecosite is missing.

Order	Name	Description	Query
1	PwDom	White pine dominated	([PW]>=40)
2	PrDom	Red pine dominated	([PR]>=70)
3	PrwMx	Red - white pine mix	([PW]+[PR]>=40)
4	UplCe	Upland Cedar	([CE]>=20) AND ([PR]+[PW]+[PJ]+[SW]+[BF]>30)
5	OcLow	Other conifer - Low	(([CE]+[LA]>=50) OR WG=22 OR WG=25) AND ([PR]+[PW]+[PJ]+[SW]+[BW]<10)
6	SbLow	Black spruce low	([SB]+[CE]+[LA]>=90 AND SC=4) OR ([SB]+[CE]+[LA]>=90 AND [CE]+{LA}>=10)
7	SbSha	Spruce shallow	([SB]>=70) AND ([PO]+[BW]<=20) AND (STKG <= 50)
8	SbDee	Spruce deep	([SB]+[SW]>=70) AND ([PO]+[BW]<=20)
9	PjSha	Jack pine Shallow	([PJ]>=70) AND ([PO]+[BW]<=20) AND (STKG <= 50)
10	PjDee	Jack pine deep	(([PJ]>=70) AND ([PO]+[BW]<=20)) OR (([PJ]>=50) AND ([PO]+[BW]<=20) AND AGE >= 120)
11	PoSha	Poplar Shallow	([PO]>=70) AND (STKG <= 50)
12	PoDee	Poplar deep	([PO]>=70)
13	BwSha	White birch shallow	([BW]>=60) AND ([PO]+[BW]>=70) AND (STKG <= 50)
14	BwDee	White birch deep	([BW]>=60) AND ([PO]+[BW]>=70)
15	OthHd	Other hardwood	([MH]+[MS]+[AB]>=30)
16	SbMx1	Black spruce mixedwood	([SB]+[SW]+[PJ]+[PR]+[PW]+[BF]>=70) AND ([BF]<=10) AND ([PO]+[BW]<=20) AND ([SB]+[SW]>[PJ])
17	PjMx1	Jack pine mixedwood	([SB]+[SW]+[PJ]+[PR]+[PW]+[BF]>=70) AND ([BF]<=10) AND ([PO]+[BW]<=20) AND ([SB]+[SW]<[PJ])
18	BfPur	Balsam fir dominated	([BF]>=70)
19	BfMx1	Balsam fir mixedwood	([BF]>=20) AND ([BF]+[SW]+[SB]+[PJ]=[CE]+[LA]+[PW]+[PR]>=70) AND ([BF]+[SW]>=30)

Order	Name	Description	Query
20	HrDom	Hardwood dominated	([PO]+[BW]+[MH]+[MS]+[AB]>=70)
21	HrdMw	Hardwood mixedwood	([PO]+[BW]+[MH]+[MS]+[AB]>=50)
22	ConMx	Conifer mixedwood	([PW]+[PR]+[SB]+[Sw]+[Bf]+[PJ]+[CE]+[LA]>=50)

Table 3. The SQL for the Kenora and Whiskey Jack forest units is given.

PlanFU	Standard forest units
BFX	BfPur + BfMx1
CMX	UplCe + ConMx
HRX	BwSha + BwDee + HrDom + HrdMw
OCL	OCLow
OTH	OthHd
PJD	PjDee + PjSha
PJX	PjMx1
POD	PoDee + PjSha
PRW	PwDom + PrDom + PrwMx
SPD	SbDee + SbSha
SBL	SbLow
SPX	SbMx1

Forest Resources Inventory

The FRI was provided by the OMNR (Figure 1). Only the productive (formod="RP") and available (avail="A") forest polygons were used to summarize the present forest.

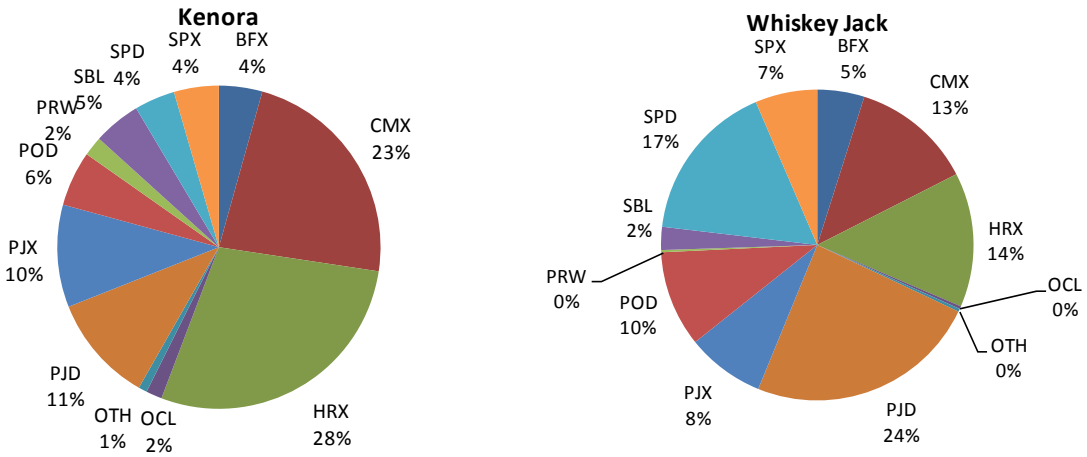


Figure 1. The areas of the Kenora and Whiskey Jack productive forests are summarized by forest unit.

Data

The main data sources were the historic cruise data recovered by the MNR-Northwest Region, the Forest Ecosystem Science Coop and MNR permanent growth plots (PGPs), and the MANDO dataset (Table 4).

1 **Table 4.** The datasets used in this project are given by origin.

Source	Company	Cruise Type	Year	Management Units	Concessions
Whiskeyjack Patricia	Boise Cascade	OPC	1987		
Lakc Seul	Buchanan	FRI	1999		
Wabigoon	Canadian Pacific Forest Products	OPC	1991		
Dryden	Crown	FRI	1998		
Kenora	Crown	OPC	1985		
Kenora/Minaki	Crown	OPC	1987		
Red Lake	Crown	OPC	1988		
Red Lake	Crown	OPC	1981		
Wabigoon	Great Lakes Forest Products	FRI	1985		
Wabigoon	Weyerhauser	OPC	1987		
Wabigoon	Dryden Paper Company	FRI	1967		
Coop & MNR PGPs				Wabigoon, Crossroute, Whiskey Jack, Dryden, Kenora, Lac Seul, Red Lake	
Mando					Manitou, Packwash, Lake of the Woods, East & West Patricia

2

3 **Table 5.** The data used in yield curve development are summarized by plan forest unit. The means are
4 followed in brackets by the range.

Planfu	N	Age (years)	Stocking	Basal area (m^2/ha)	Density (stems/ha)	Gross total volume (m^3/ha)	N GTV
BFX	732	52 (8 - 156)	0.77 (0.02 - 2.63)	23.5 (0.3 - 49.3)	1792 (35 - 6898)	73 (1 - 198)	732
CMX	903	71 (10 - 152)	0.81 (0.01 - 2.30)	22.5 (0.1 – 56.0)	1028 (33 - 9434)	126 (0 - 334)	903
HRX	877	67 (9 - 141)	0.8 (0.02 - 2.40)	19.1 (0.2 – 52.0)	1009 (17 - 10903)	129 (1 - 411)	877
OCL	70	96 (24 - 160)	0.78 (0.03 - 1.93)	25.5 (0.8 – 56.0)	1417 (35 - 4181)	66 (3 - 193)	70
OTH	30	80 (32 - 141)	0.66 (0.13 - 1.51)	17.6 (5.3 – 38.0)	938 (69 - 2637)	87 (44 - 153)	30
PJD	203 4	69 (8 - 157)	0.97 (0 - 2.85)	22.2 (0 - 56.7)	867 (17 - 15031)	100 (0 - 329)	203 4
PJX	725	72 (12 - 123)	1.17 (0.06 - 2.35)	28 (1.3 – 56.0)	1041 (52 - 6271)	118 (7 - 290)	725
POD	481	64 (11 -	0.79 (0.02 -	20.1 (0.2 –	895 (17 - 5100)	171 (2 -	481

Planfu	N	Age (years)	Stocking	Basal area (m^2/ha)	Density (stems/ha)	Gross total volume (m^3/ha)	NGTV
		141)	2.46)	52.0)		502)	
PRW	70	83 (9 - 150)	0.65 (0.01 - 1.37)	22.9 (0.3 - 50.5)	758 (17 - 3575)	153 (2 - 410)	70
SBL	68	104 (19 - 155)	0.36 (0.01 - 1.04)	11.4 (0.5 - 34.9)	896 (35 - 3350)	78 (3 - 297)	68
SPD	172 5	86 (11 - 160)	0.68 (0.01 - 2.63)	24.9 (0.3 – 60.0)	1053 (17 - 10702)	88 (1 - 313)	172 5
SPX	617	77 (20 - 159)	0.7 (0.07 - 1.70)	26.5 (2.1 - 56.7)	1053 (86 - 6255)	113 (12 - 256)	617

For the MANDO plots, plot age was estimated as follows. For some plots individual tree heights, Dbh's and ages were available. If so, the average age was calculated, weighted by tree basal area (giving more weight to the larger trees). The year of origin was calculated by subtracting the average age from the measurement year. If no tree ages were available, the plot summary table was checked. For some plots and age class was given, generally in 20 year age classes, e.g., 1-20, 21-40, 41-60, etc. If no tree ages were available and a plot age class was given, the plot was assigned the midpoint of the age class (e.g., age class 21-40 was assigned an age of 31). If tree ages were not available and age class was unavailable, no age was assigned.

Ht-dbh curves were fit by species and plot and measurement, if data were available.

$$ht = 1.3 + a_0 \cdot (1 - e^{b_0 \cdot dbh^{c_0}})$$

If sufficient data were not available, equations were fit by species and study.

$$ht = 1.3 + (a_0 + a_1 \cdot age) \cdot (1 - e^{b_0 \cdot dbh^{c_0}})$$

Very few poplar heights were available for the MANDO plots so a poplar ht-dbh curve was estimated from the FEC, Patricia 86, Coop PGPs and the MANDO data.

Data Censoring: There were a number of plots in the calibration data that were older (generally 130+ years) and had low stocking (< 30%). These were all associated with the Mando dataset. These were omitted for two reasons. The first is that these plots are likely going through succession with considerable mortality occurring in the dominant canopy layer. The second is that these plots are not considered productive forest. Removing these plots had a significant impact on the gross total and gross merchantable volume estimates (and consequently affected the net merchantable volume estimates).

Individual tree volumes were estimated using Zakrzewki's (1999) taper model.

For each plot, the Dbh and height (some heights were measured and some estimated) for each tree was used to predict the individual tree volume. For each tree, the gross total volume, gross merchantable volume and close utilization volume were estimated. These were then summed across all live trees to estimate the volume/ha.

Yield Predictions

Height development

Top height was predicted using published site index curves.

Table 6. The references for the site index curves are given by species.

Species	Reference
Jack pine	Carmean (2001) equation 3.
Black spruce, larch	Carmean (1996) figure 11
Trembling aspen	Carmean et al. (2002)
Cedar	Carmean et al (1989) figure 57
White Pine	Woods and Miller (1996)
Red pine	Woods and Miller (1996)
White birch	Carmean (1996) figure 14

Basal area and density

For natural origin stands, basal area (BA) was predicted as a function of stocking, site index, and age.

(1) $$\hat{BA} = stocking \cdot (\alpha_0 + \alpha_1 \cdot \hat{SI}) \cdot (1 - e^{-\beta_0 \cdot age^{\gamma_0}})$$

Stocking was predicted as a function of age from the FRI data (Figure 7). Only polygons with ages between 40 and 160 were used except for aspen leading which had to be between 20 and 160 years old. A normal distribution was assumed.

(2) $$stocking = \frac{b_2}{\sqrt{2\pi} \cdot b_1} \cdot e^{\frac{(age - b_0)^2}{2 \cdot b_1^2}}$$

After peaking, stocking generally declines sharply with age. Stocking for intensities other than *present*, the stocking are scaled by relative stocking. For instance, if the stocking for *present* is 0.85 and the average stocking for *extensive* is 0.70, the stocking curve for *extensive* is the stocking curve for *basic* scaled by 0.70/0.85. Density was estimated as a function of SI, stocking, BA, and age.

(3) $$\hat{stems} = \frac{x_0}{SI} \cdot stocking^{-x_1} \cdot \hat{BA} \cdot age^{-x_2}$$

The variance of the residuals increased with predicted stems so the observations were weighted by $\frac{1}{\hat{BA}}$ resulting in a more homogenous variance for the residuals. For some forest units, the density increases initially and then starts to decrease. The density is only those stems > 5cm Dbh (this is partly an artifact of sample plots which generally don't include stems less than some minimum Dbh). So part of the increase is due to trees growing larger than the lower threshold. There are few data points for young natural stands so the density estimates, in particular, are poor at young ages.

Species composition

The species composition over time was examined by looking at the inventory. In general, for the more pure planFUs, the species composition was relatively constant with age except for the BFM CMX, OCL, OTH and PRW planFUs. ConMx contains Pj, Sb, Po and Ce leading polygons and is difficult to model as a homogenous planFU. Therefore, it was split by leading species and each predicted separately. These leading species curves were combined into an area-weighted average curve for use in SFMM. There is some evidence of a decline in jack pine and

increase in black spruce with age for the PJD. This is partly an artifact of the SQL which allows lower Pj content at older ages.
The species composition trends with age observed in the FRI may be an artifact of selecting particular stands for harvesting in the past as well as other disturbances (fire, insects, windthrow). These events are not necessarily random and may not have the same occurrence pattern in the future. Nevertheless, the FRI species composition is likely the most reliable source of composition trends for the Kenora and Whiskey Jack forests.

Volume

The following equation form was used to predict total stem volume (m^3/ha). The coefficient is analogous to the cylindrical form factor $f = \frac{vol}{BA \cdot ht}$ (Husch et al. 1972).

(4) $\hat{vol} = z_0 \cdot \hat{BA} \cdot \hat{topht}$

The variance of the residuals increased with predicted volume so the observations were weighted by $\frac{1}{\hat{BA}}$ resulting in a more homogenous variance for the residuals.

Crown Standard (NMV crown) has the following utilization standards. These are the volumes that appear in the tab "SFMM input" and in column P of the present tab.

Table 7. NMV crown or scale utilization standards.

Species	Crown standard	
	Stump height (cm)	Top outside bark diameter (cm)
Pw, Pr,	30	13.1
Other conifer	30	9.1
Poplar, white birch	30	13.1
Other hardwood	30	17.1

Merchantable volume was predicted as a function of total volume and quadratic mean Dbh (Dbh_q).

(5) $\hat{mvol} = z_3 \cdot (1\text{-}e^{-z_1 * Dbh_q^{z_2}}) \cdot \hat{vol}$

The relationship between net merchantable volume and age was obtained by fitting the following equation to the cull factors from OMNR (1978), by species. This predicts the cull fraction increases as a sigmoidal function of age.

(6) $\hat{cull}_i = (1 - e^{-d_0 \cdot age})^{d_1}$

For each species, the relationship between the volume (GTV) to basal area ratio (VBAR), site index and age was estimated using the entire data set.
For each species, the net merchantable volume was estimated using the following equation.

(7) $\hat{nmvol}_i = \frac{sppba_i \cdot \hat{cull}_i \cdot \hat{vbar}_i}{\sum_i sppba_i \cdot \hat{cull}_i \cdot \hat{vbar}_i} \cdot \hat{mvol}$ where $sppba_i$ is the basal area for species i

Product volumes were estimated from the NMV.

Table 8. The product specifications for SPF. Note the products are mutually exclusive. First any SPF16 products are removed from the SFP volume. Then SPF8 is estimated from the residual volume.

Product Name	Species	Length	Small end diameter	Additional requirements
SPF16	Pw, Pr, Pj, Sw, Sb, Bf	5.0m	16cm	Dbh_q > 16cm
SPF8	Pw, Pr, Pj, Sw, Sb, Bf	2.5m	16cm	Dbh_q > 12cm
SPF2	Pw, Pr, Pj, Sw, Sb, Bf	2.5m	12cm	Dbh_q > 12cm
SFP3	Pw, Pr, Pj, Sw, Sb, Bf	None	None	

Age to breast height

The number of years to reach breast height in the draft curves is given below. The planning team should review these.

Table 9. The number of years to reach breast height is given by species and intensity. For the CMX, the age to breast height is also given by leading species.

PlanFU	Years to breast height
	Present
BFM	10
CMX	Ce-5, Pj-5, Sb-14, Po-5
HRX	5
OCL	
OTH	
PJD	5
PJX	5
POD	5
PRW	
SBL	8
SPD	8
SPX	8

Cull

Provincial cull figures are included in the yield tables.

Curve Tails

The yield of overmature stands is not well predicted due in part to a lack of PSPs in older age classes and the higher variation in development patterns for overmature stands relative to younger stands. Table 10 gives the area by age class by forest. The Kenora forest has very little area in stands greater than 140 years old. On the Whiskey Jack, the lowland forest units (OCL, SBL) and white and red pine units (PRW) have a higher proportion of area in older age classes but these forest units do represent a large parto f the land base..
Overmature stands have higher incidences of damaging agents and differential mortality rates by species. As a consequence, the stocking development is highly variable and there is a higher probability of shifting to different forest units (succession). Due to the high variation and

the lack of data, the estimation of yields for overmature stands should incorporate expert knowledge.

Table 10. The available forest area is given by forest unit and age class.

Forest	Planfu	% of landbase	Stocking	Site Class	% of area by age class							
					10	30	50	70	90	110	130	141+
Kenora	BFX	4%	0.56	14.7	13%	16%	31%	30%	9%	1%	0%	0%
	CMX	23%	0.67	16.4	22%	12%	19%	33%	11%	2%	1%	0%
	HRX	28%	0.66	21.2	16%	11%	26%	41%	6%	0%	0%	0%
	OCL	2%	0.63	11.1	17%	1%	3%	33%	28%	9%	8%	1%
	OTH	1%	0.78	15.8	4%	3%	11%	53%	25%	2%	2%	0%
	PJD	11%	0.68	16.4	44%	12%	17%	18%	5%	1%	3%	0%
	PJX	10%	0.63	16.2	31%	4%	10%	32%	16%	5%	0%	0%
	POD	6%	0.65	21.8	34%	6%	18%	35%	6%	0%	0%	0%
	PRW	2%	0.61	14.8	27%	2%	7%	28%	23%	8%	4%	1%
	SBL	5%	0.54	10.3	22%	1%	5%	25%	31%	10%	6%	1%
	SPD	4%	0.52	11.5	38%	1%	7%	23%	14%	9%	7%	0%
	SPX	4%	0.58	12.1	13%	2%	9%	33%	25%	9%	9%	0%
Whiskey Jack	BFX	5%	0.65	1.56	61%	11%	14%	9%	4%	1%	0%	0%
	CMX	13%	0.68	1.68	42%	8%	22%	17%	9%	2%	1%	0%
	HRX	14%	0.7	2.5	23%	15%	44%	9%	8%	1%	0%	0%
	OCL	0%	0.67	2.8	9%	3%	1%	3%	9%	24%	32%	18%
	OTH	0%	0.73	2.68	6%	3%	24%	31%	29%	7%	0%	0%
	PJD	24%	0.9	2.31	67%	5%	5%	14%	7%	1%	1%	0%
	PJX	8%	0.7	2.32	41%	6%	9%	18%	21%	5%	0%	0%
	POD	10%	0.74	2.44	28%	5%	36%	12%	17%	0%	0%	0%
	PRW	0%	0.61	2.01	20%	1%	4%	22%	13%	12%	15%	13%
	SBL	2%	0.67	2.47	37%	10%	2%	5%	5%	8%	18%	15%
	SPD	17%	0.67	1.27	42%	3%	23%	18%	8%	3%	2%	1%
	SPX	6%	0.66	1.21	38%	3%	18%	20%	15%	3%	1%	0%

The results of Uhlig et al. (2001) to identify the age of onset and the duration of old growth were used to estimate the yield curve tails. The yield at the onset of old growth was taken from the data. The yield at the end of old growth was estimated as 30% of unmodified yield. Note the old growth definitions are intended to identify when the original leading species starts to fall out of the stand. In general, the leading species is replaced by another more shade tolerant species. Only the drop in leading species is built into the yield curves, not ingrowth.
The age of onset of old growth and the duration of old growth are given in Table 11.

Table 11. The age of onset of old growth and the duration are given by species and are taken from Appendix A (p. 34) of Uhlig et al. (2001).

Species	PlanFU	Uhlig et al. (2001) Forest Unit	Age of onset of old growth	Duration
Pj	PJD	Pj (Pure)	100	55
	All others	Con Mix 1	100	50
Sb	SBL	Sb (Low)	160	190
	SPD	Sb (Deep)	120	55

Species	PlanFU	Uhlig et al. (2001) Forest Unit	Age of onset of old growth	Duration
	All others	Sb (Mix)	110	40
Sw	All	Sb (Mix)	120	60
Bf	All	Bf (Dominant)	80	55
Ce	All	OC	140	210
La	All	OC	100	NA (used 100)
Po	POD	Po (Pure)	100	45
	All others	Hardwood (Mix)	100	35
Bw	All	Harwood (Mix)	110	30

An example of the effects of modifying the tails of the yield curve is given in the following figure. The old growth modifier was the based on the cumulative normal distribution with a mean equal to (age of onset + 0.5*duration) and a standard deviation equal to (duration/4).

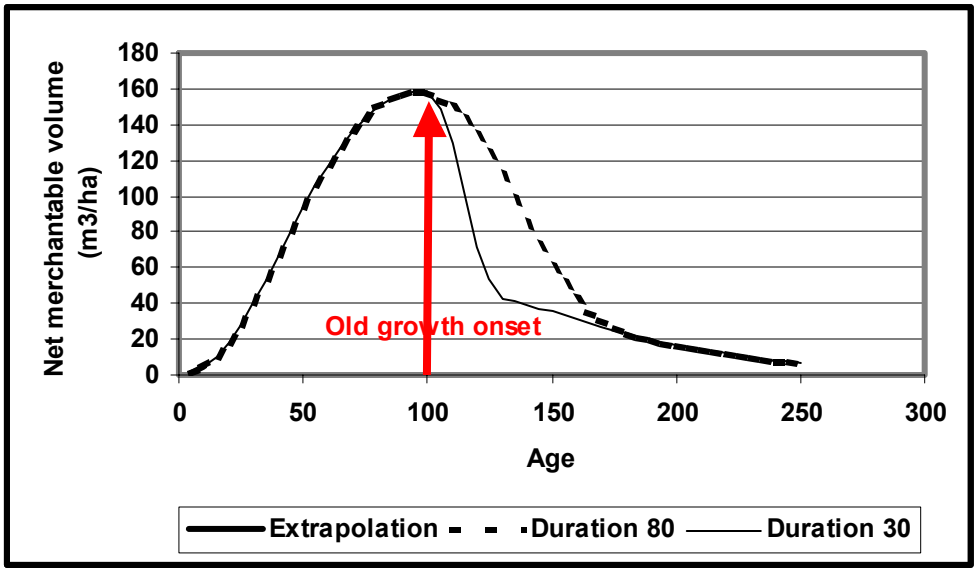


Figure 2. The extrapolated yield curve (solid, bold line) is compared to using the old growth definition with a duration of 80 years (dashed line), and duration of 30 years (thin line).

Netdowns not accounted for

The yield curves predict NMV by species. This does not account for retention trees or losses due to waste and breakage or losses due to unproductive areas within a stand. These reductions are accounted for in a term called “additional netdown”. This term is set to 5% of net merchantable volume for all intensities. The NDPEG netdowns are dealt with separately in SFMM as is are unproductive areas within a stand (including bypass).

Yield Table inputs

Present intensity

The inputs for the *Present* management intensity were derived from the FRI.

Stocking - The stocking values for the *Present* intensity are the area-weighted average for productive (formod="RP") and available (avail="A") forest polygons. In addition, the polygons had to have an age between 40 and 160, except for aspen leading which had to be between 20 and 160.
Site Index – Site Class averages for the *Present* intensity were derived in the same manner as stocking (see above) and then converted to site index.

Managed intensities

Yield curves for managed intensities have not yet been developed.

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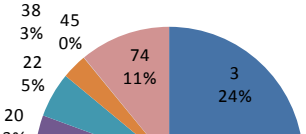
Notes

BFM – The stocking profile fit to the Whiskey Jack forest predicted a dramatic decline with stocking with age and showed none of the peak observed in the Kenora forest. The bulk of the area in the BFM for the WhiskeyJack is in young ages classes. Without much area in the older age classes, there was little to base a stocking profile on. Therefore, the shape of the Kenora stocking pofile was used for the Whiskey Jack.

ConMx – This forest unit was split into Jack pine leading, Spruce leading (including balsam fir) and aspen (including birch). This was because the different leading species showed different growth trajectories. Separate curves were estimated and then combined by intensity.

Whiskey CMX area by leading speces



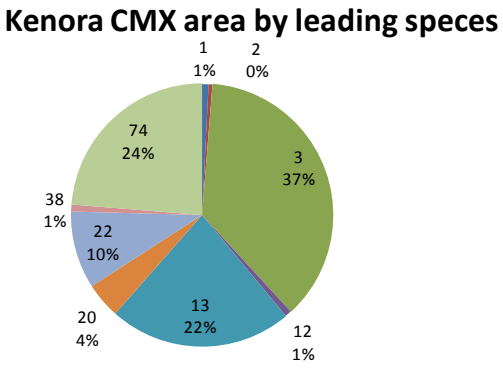


Figure 3. The area of the CMX forest unit by leading species and management unit.

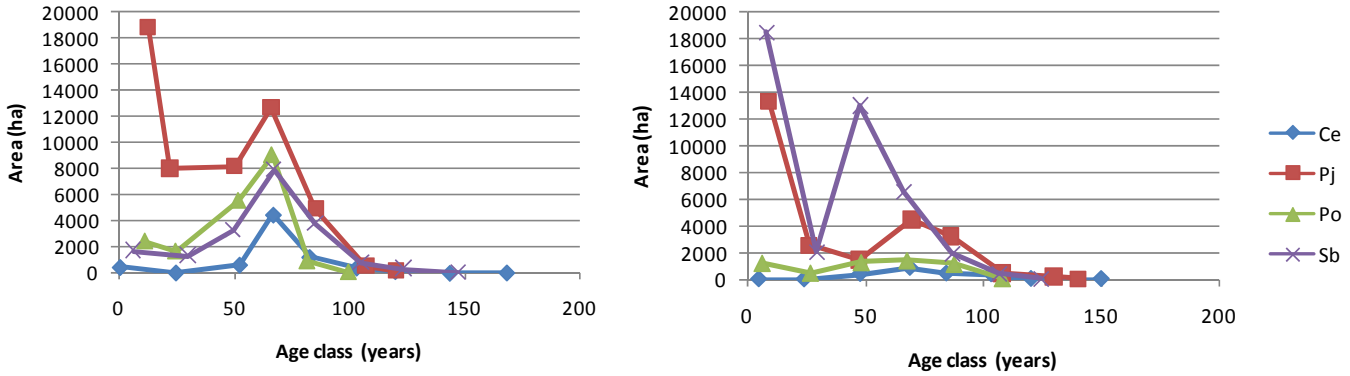


Figure 4. The area by age class for the Kenora (left) and WhiskeyJack (right) forests. The Whiskey Jack has much more area in spruce-leading forests and little area older than 30 except in spruce leading. The Kenora crown has more area in 40-80 year old stands.

HMX – The HMX is a combination of the BwDee, BwSha, HrDom and HrdMw standard forest units.

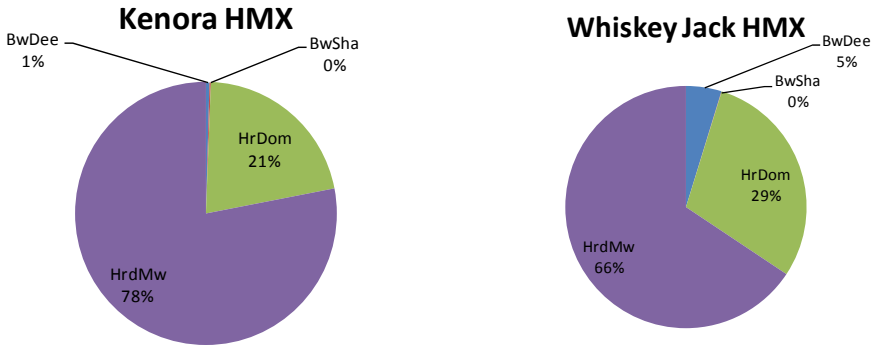


Figure 5. The HMX is largely composed of HrdMx with some HrDom in both the Kenora and Whiskey Jack. The birch forest units are minor components.

Appendix A – stocking trends

The stocking over age trends for the Kenora forest are given in Figure 6 and for the Whiskey Jack in Figure 7.

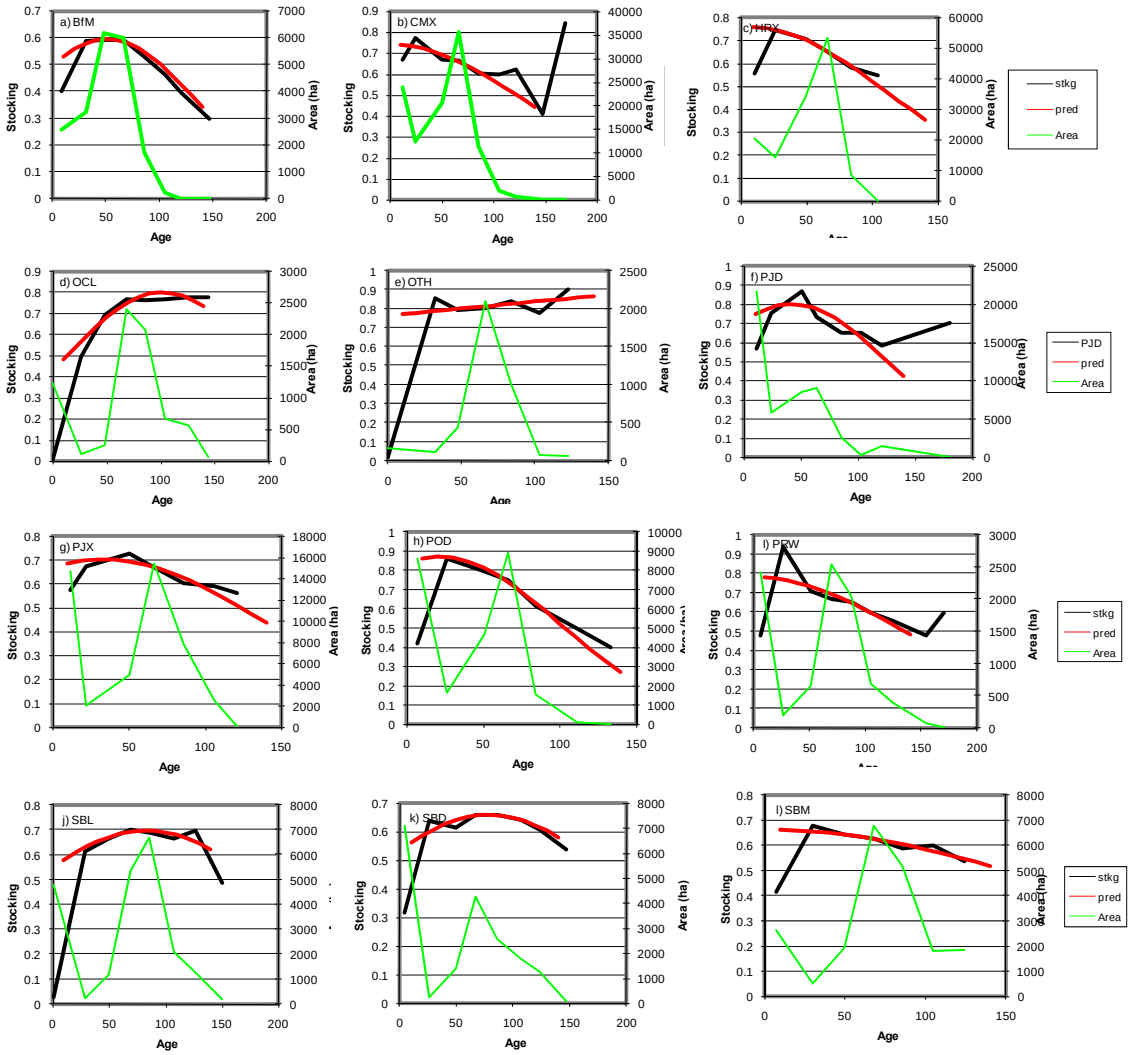


Figure 6. The actual stocking (—), predicted stocking (—) and area (—) are given by age and planFU for the Kenora Forest

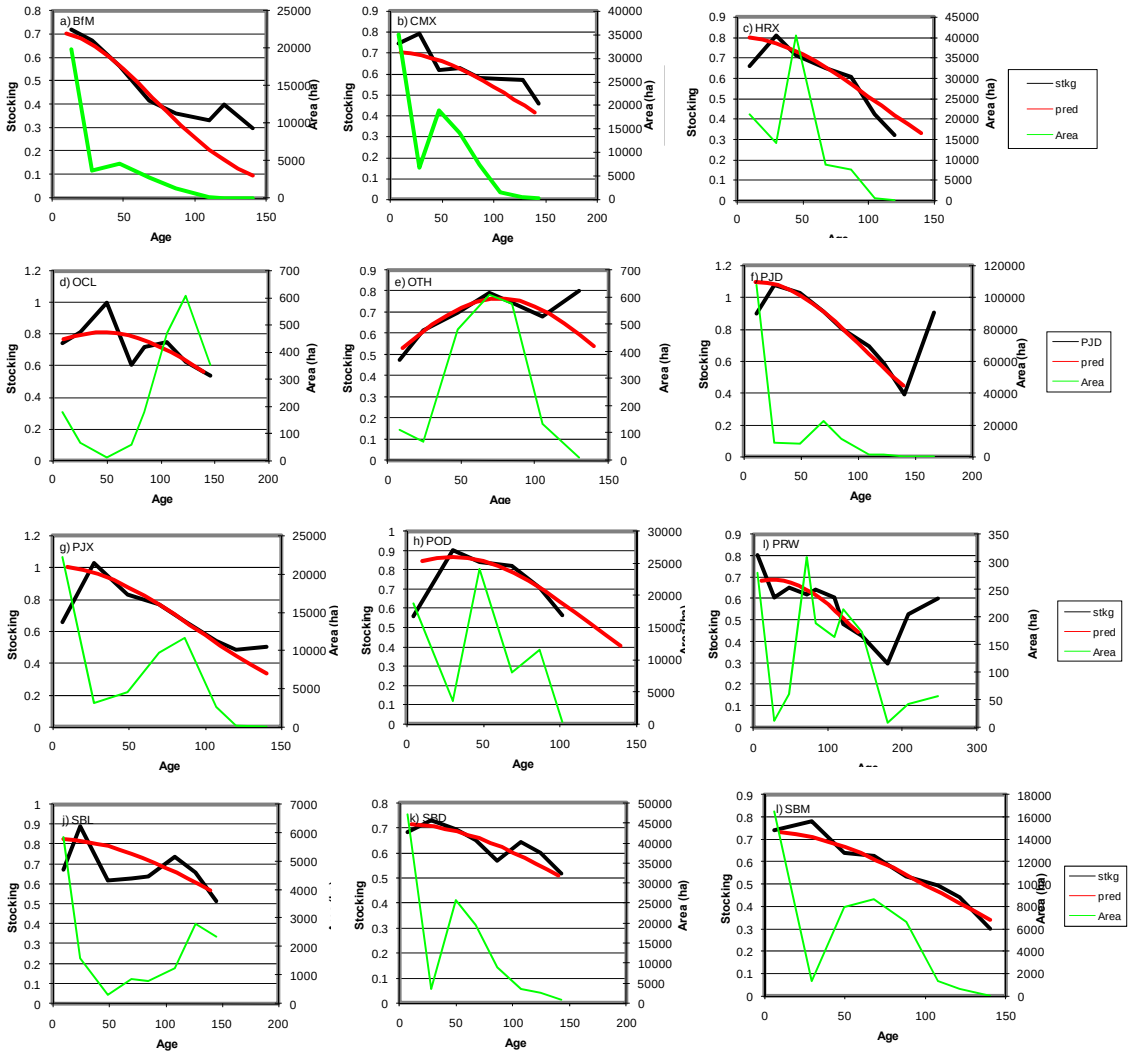


Figure 7. The actual stocking (—), predicted stocking (—) and area (—) are given by age and planFU for the Whiskey Jack Forest.

Appendix B – species composition trends

The species composition trends are given in Figure 8 for the Kenora forest and in Figure 9 for the Whiskey Jack forest.

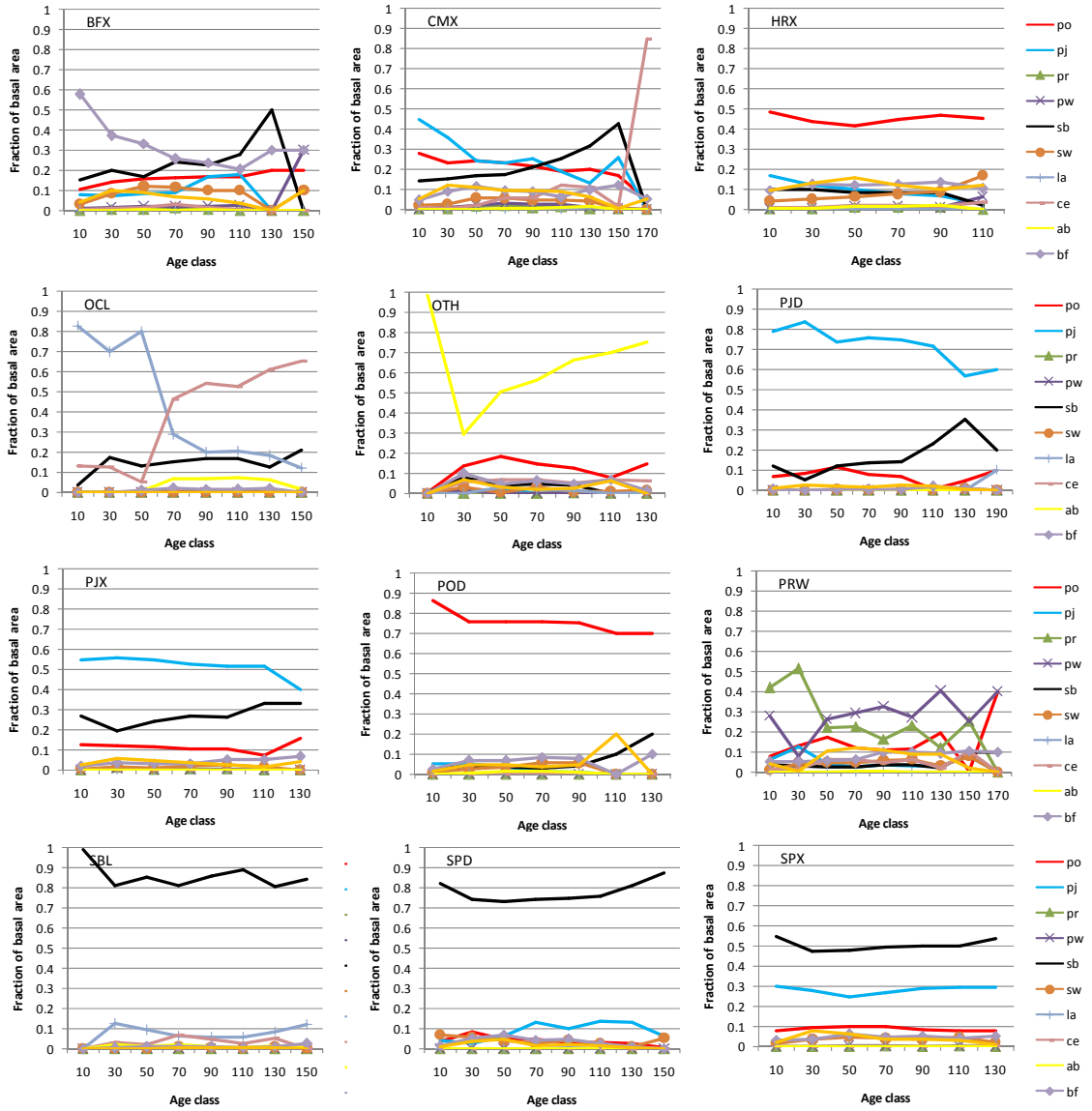


Figure 8. The relationship between species composition and age is given by planFU for the Kenora forest.

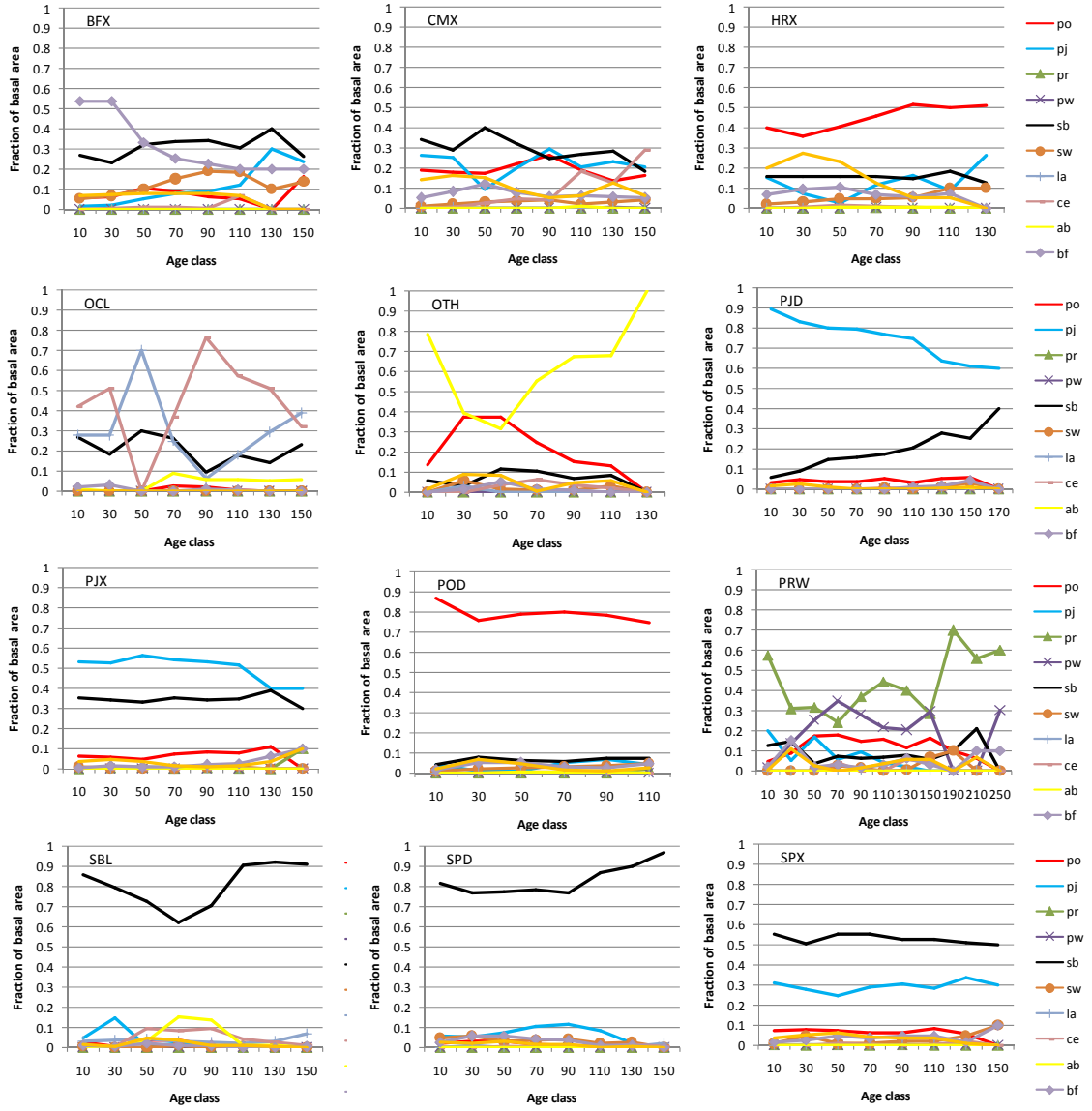
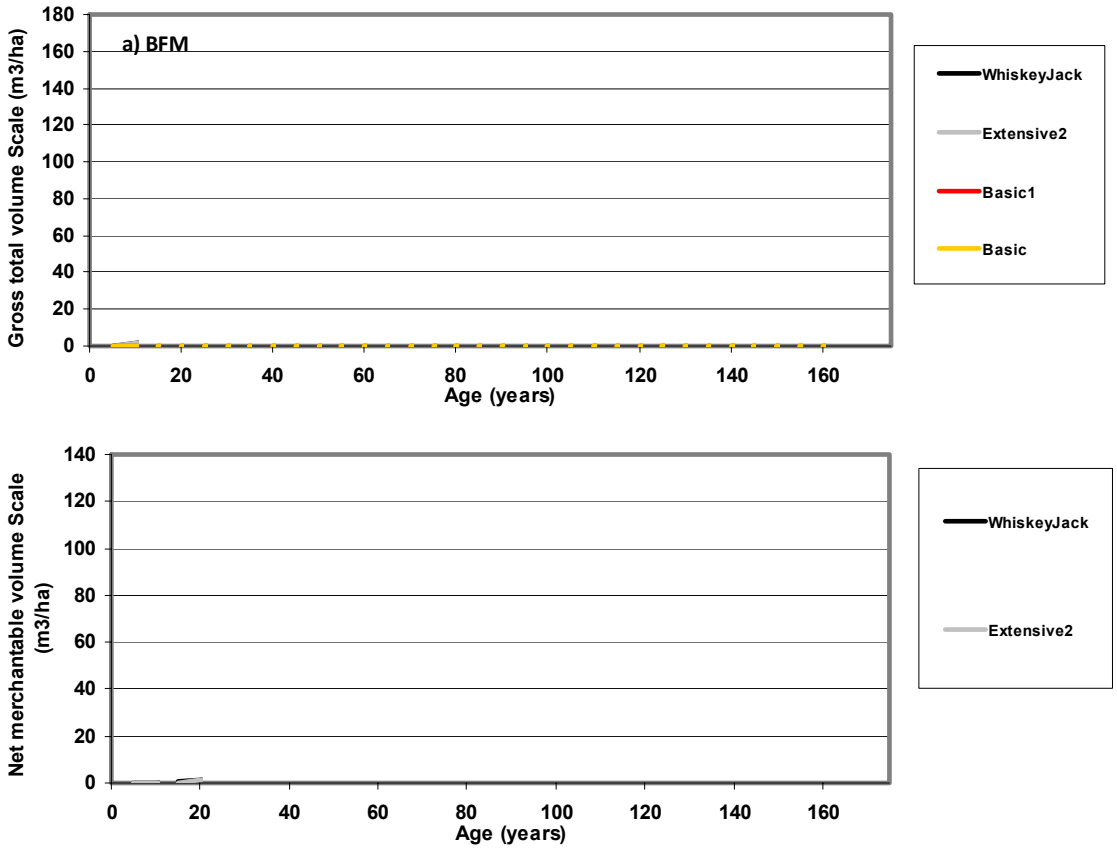


Figure 9. The relationship between species composition and age is given by planFU for the Whiskey Jack forest.

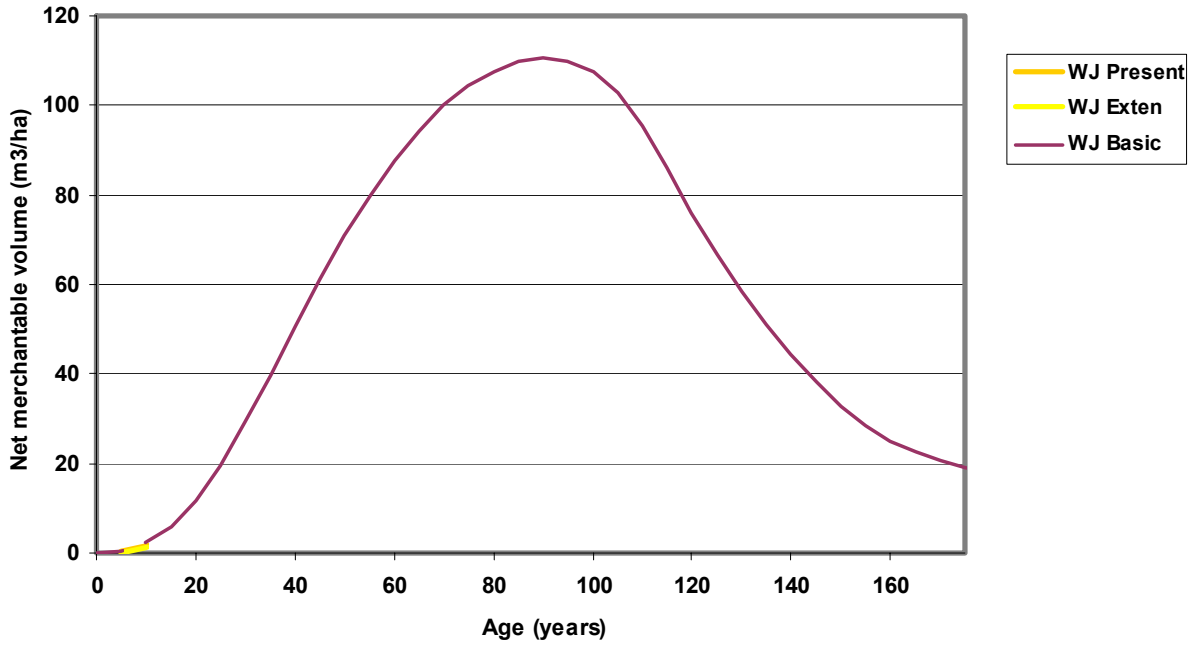
BFM Forest Unit

Volume by tree species included in the electronic SFMM input files.



CMX Forest Unit

Volume by tree species included in the electronic SFMM input files.



HMX Forest Unit

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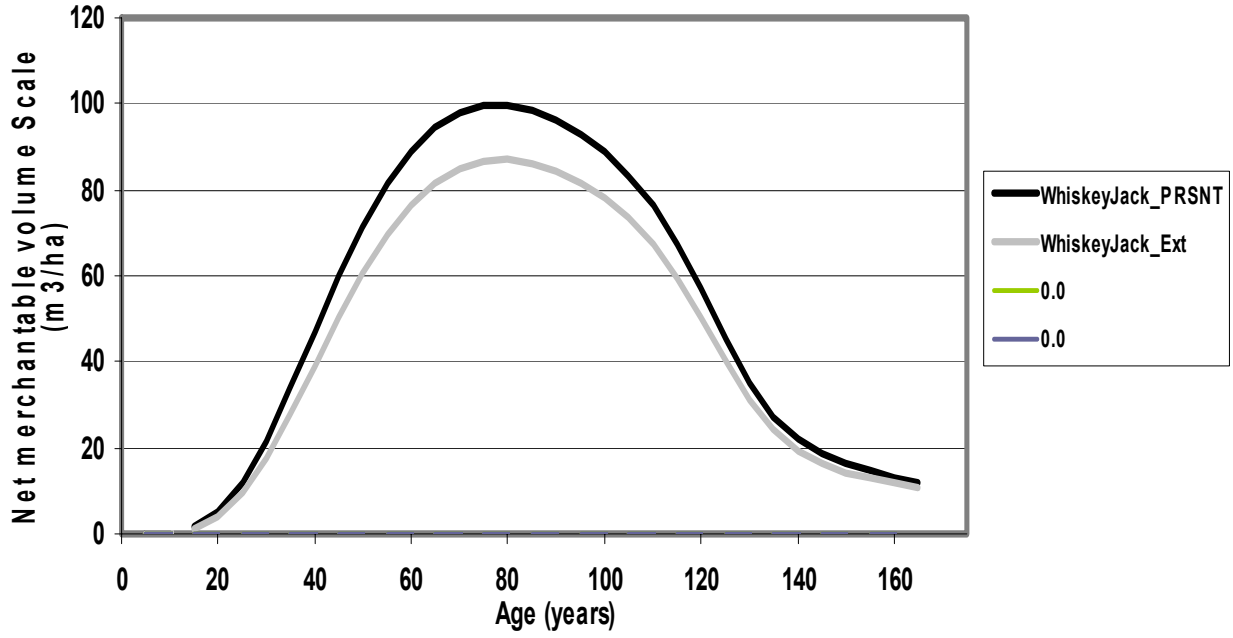

OCL Forest Unit

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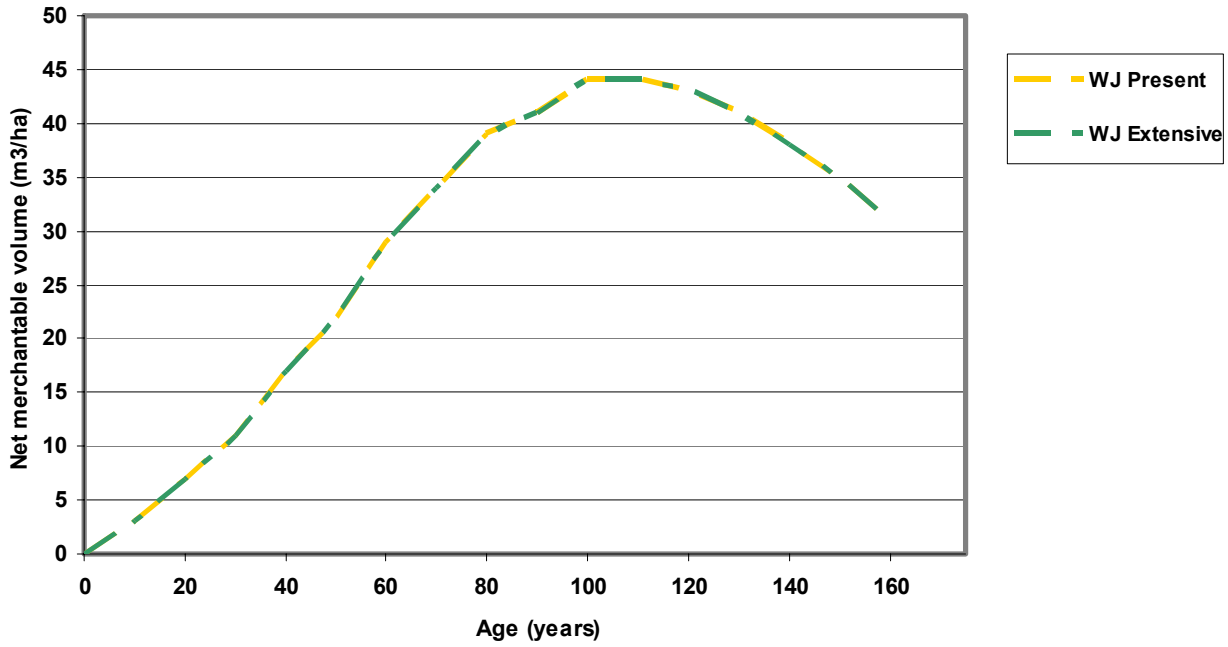
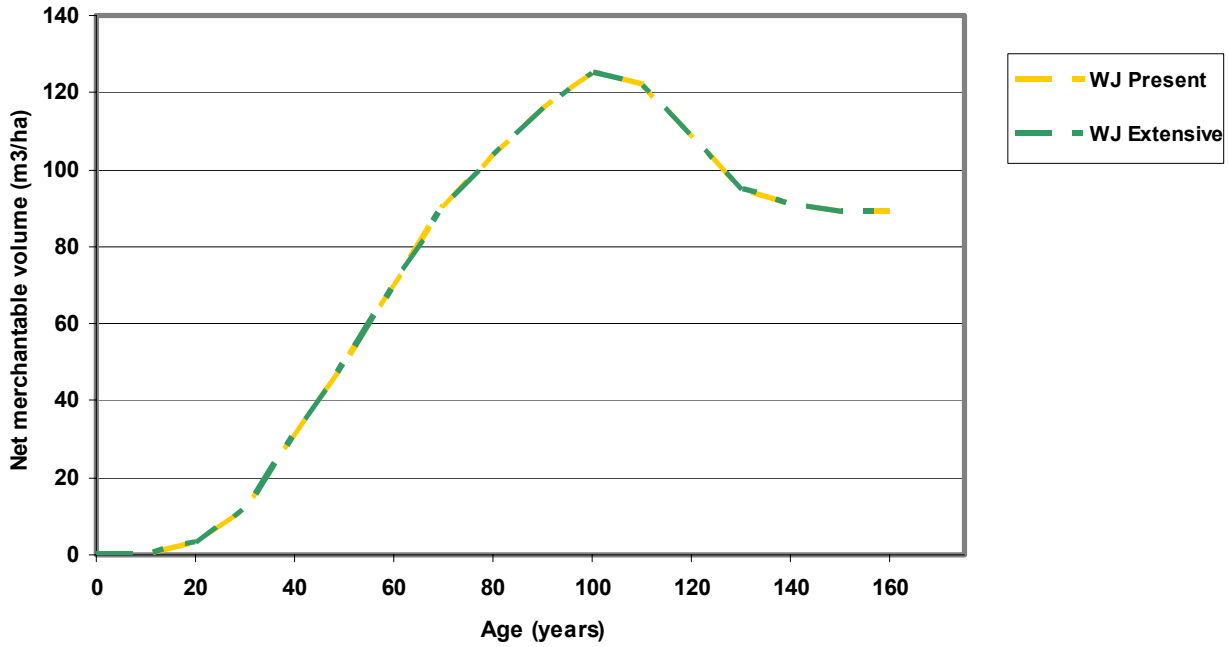


OTH Forest Unit

Volume by tree species included in the electronic SFMM input files.



PJD Forest Unit

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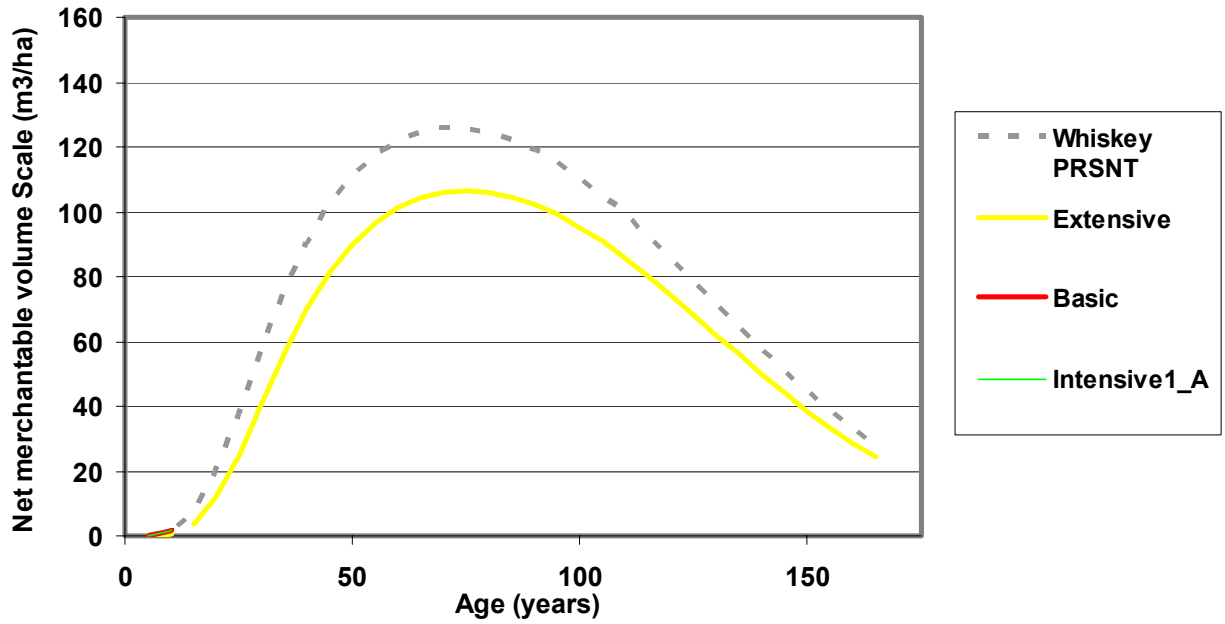

PJM Forest Unit

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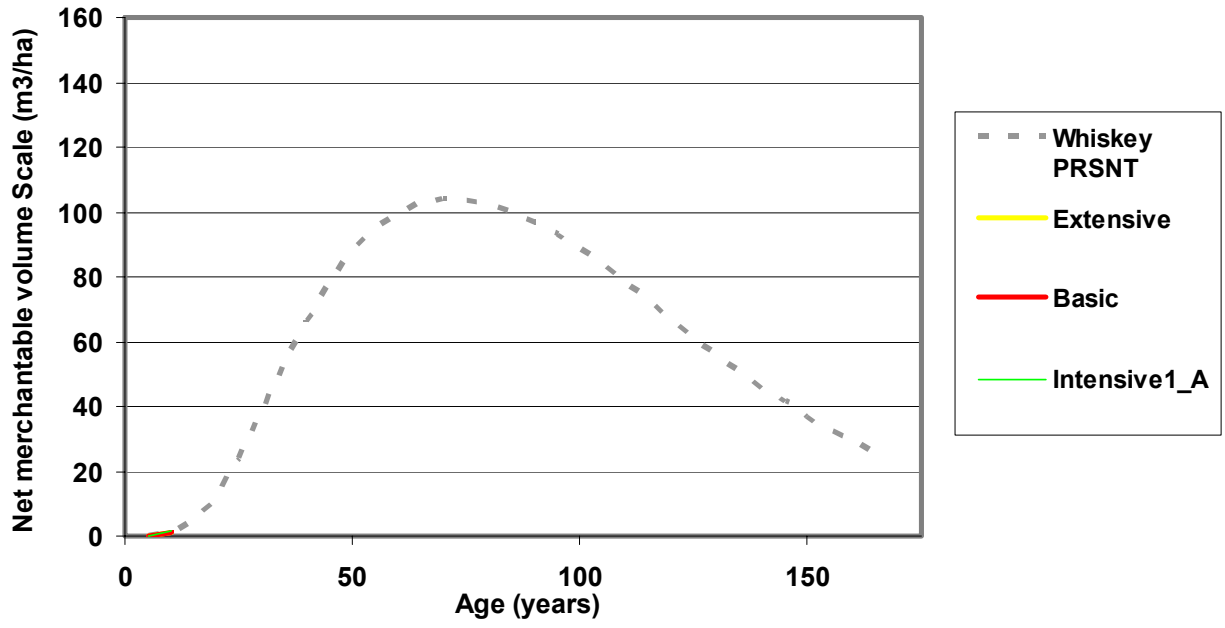

POD Forest Unit

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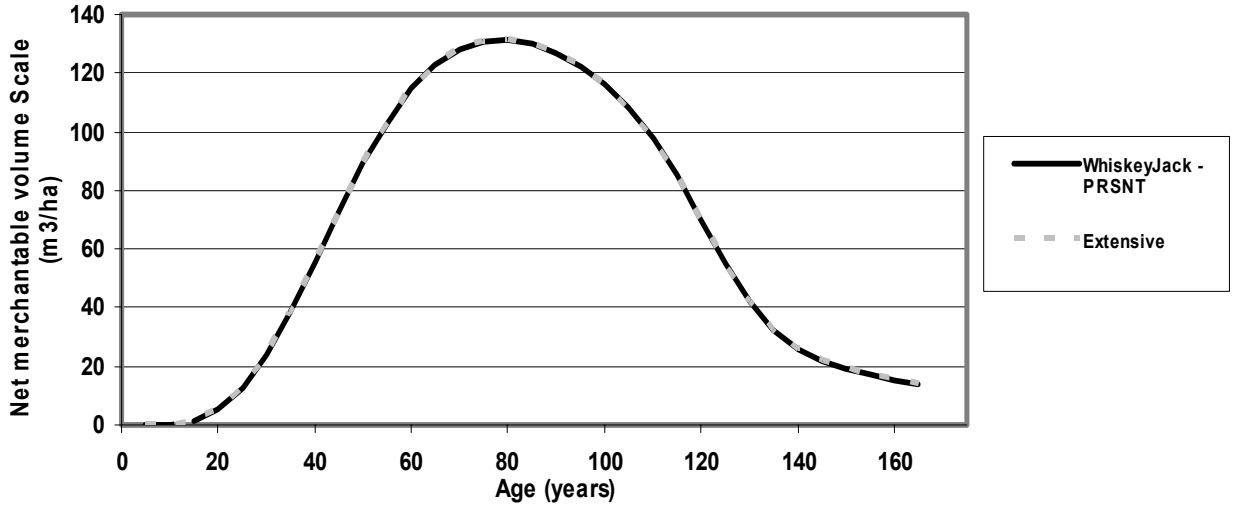
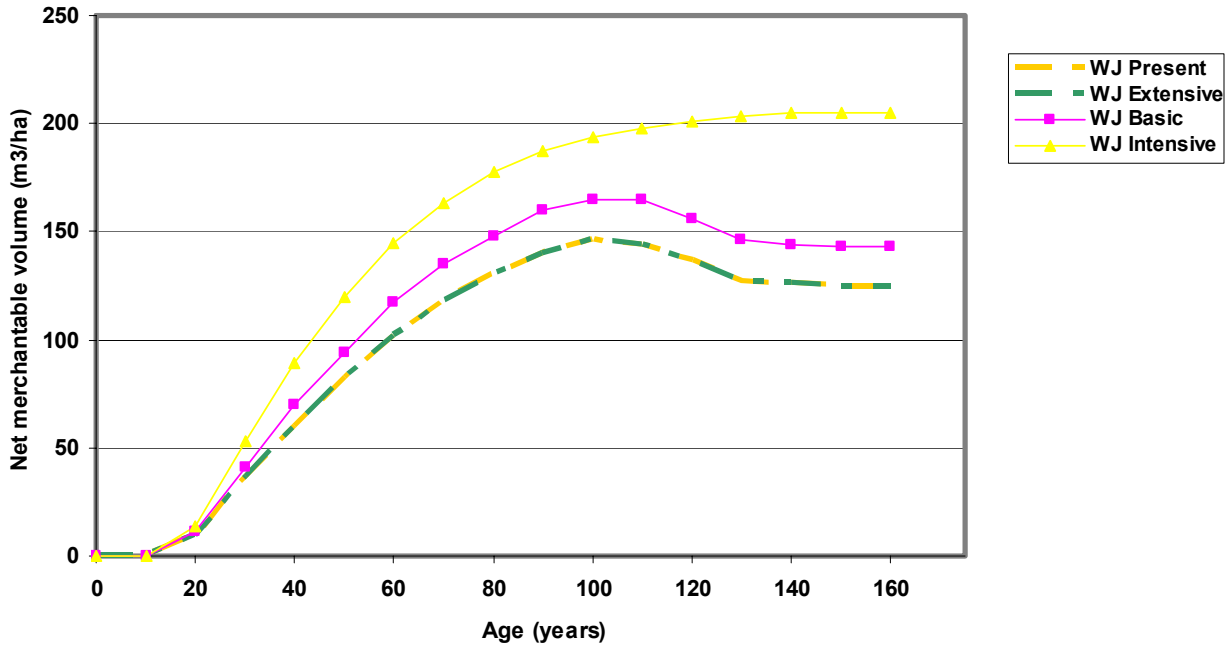


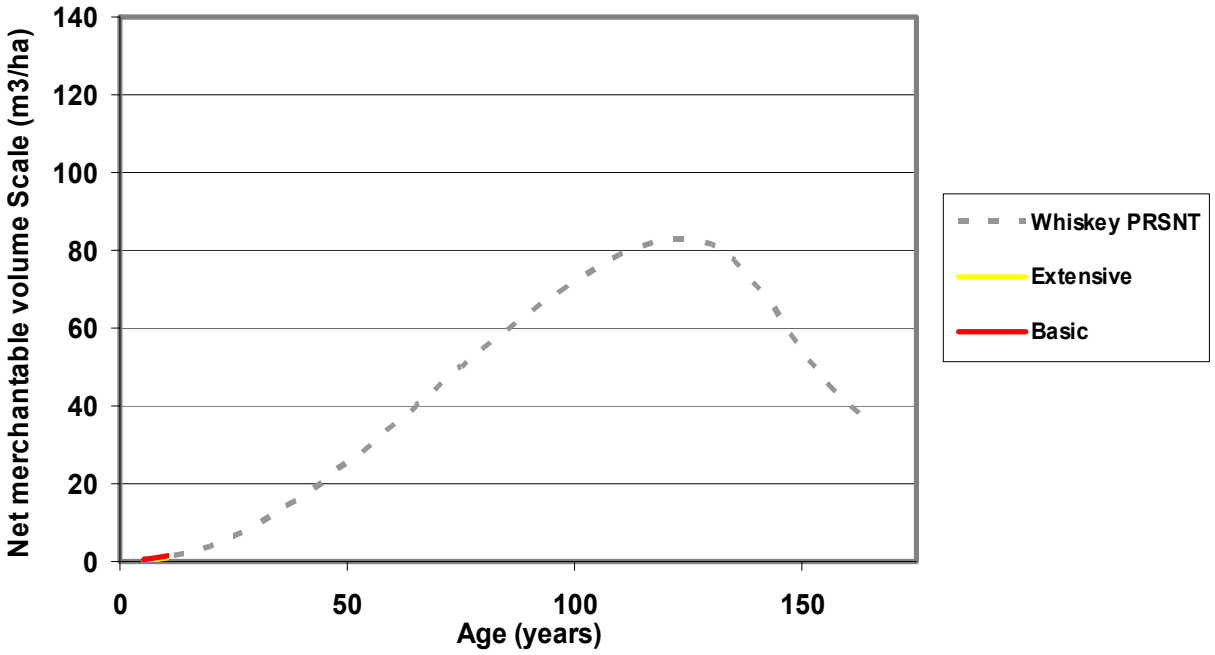
PRW Forest Unit

Volume by tree species included in the electronic SFMM input files.



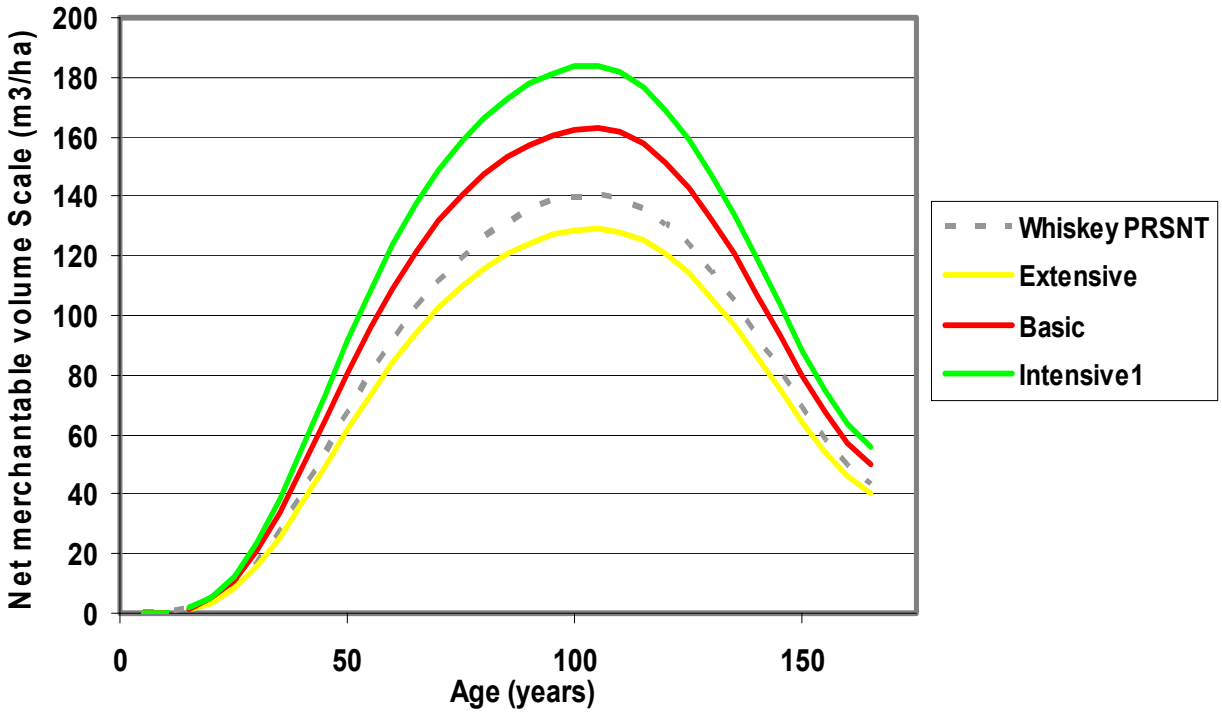
SBL Forest Unit

Volume by tree species included in the electronic SFMM input files.



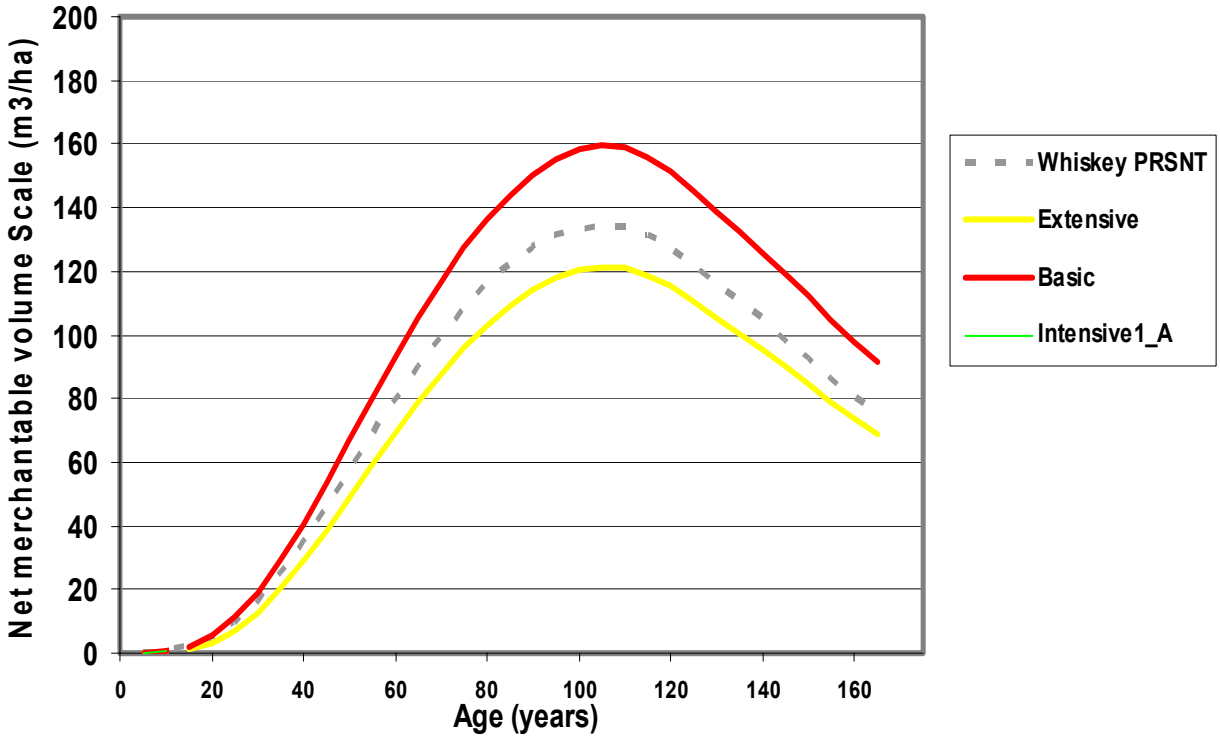
SPD Forest Unit

Volume by tree species included in the electronic SFMM input files.



SPM Forest Unit

Volume by tree species included in the electronic SFMM input files.



Appendix 2

Summary of Investigation and LTMD Development Results

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATIONS - OVERVIEW**

Desirable levels that are not provided directly by guides or other sources of direction are refined through scoping analysis. Scoping analysis is an iterative process that involves a series of investigations to provide insight to what the forest is capable of producing in order to develop realistic and feasible desirable levels for objective indicators. Scoping investigations will consider implications on wood supply, forest conditions, habitat, and other non-timber resources for the short-term, medium-term, and long-term.

For all investigations, unless specifically noted otherwise, the following management decisions were consistently included in each investigation as per the Base Model:

- management decisions for caribou management (SUBMUs and operational timing)
- large landscape patch deferrals (includes marten habitat management),
- estimated reserve areas as per the Stand and Site Guide (riparian, nests) and estimates of known tourism reserves.
- crude control of projected TOTAL harvest volumes of +/- 20% variance allowed between 10-year terms.
- greatest volume of timber harvested over the entire planning period

Developing Management Objectives

The following investigations will be considered in the development of desirable levels (FMPM A-37):

(a) An investigation into the ability of the forest to meet forest diversity and forest cover desirable levels (based on current forest condition and forest dynamics);

Investigations on impact of forcing the achievement of the SNRV (stay within "box" ASAP) for various Landscape Guide/OLT indicators.

SFMM Case:	Description:	
01-OLT-70	Achieve SNRV for OLT combined - (below) parameters together:	Based on results, can vary when SNRV achievement occurs (i.e. 70 years, 50 years or earlier/later) for OLT runs and the LTMD.
02-OLT-50	Achieve SNRV for mature/late OLT landscape classes	
	Achieve SNRV for OLT old forest classes	
	Achieve SNRV for OLT upland conifer	
	Achieve SNRV for OLT Caribou Habitat (Cr, Cwu, Cwp)	
03-FUgroup	Achieve SNRV for forest units by immature/mature+ stages	Based on results, can vary when SNRV achievement

(b) An investigation and assessment of the ability of the forest to continue to supply forest benefit levels associated with the current forest management plan;

Development of the Proposed Long-term Management Direction

The establishment of targets for each indicator will consider (FMPM A-38):

(a) the current forest condition;
(b) a balance of social, economic and environmental considerations;
(c) the associated indicator and the desirable level;
(d) the potential achievement for the short term (10 years), medium term and long term; and
(e) projections from past forest management plans and historical levels of objective achievement.

In addition, for harvest level indicators, the targets will also consider:

(a) historic wood utilization;

Current wood demand by species group:

SFMM Case:	Description:
04-DEMAND	Achieve approved plan T1 volume for as long as possible

Inputs:

Unlimited budget, will determine if minimum demand volumes by species group are achievable, and for how many terms, and at what future cost to wood.
Binding volume targets added for as long as they can be met. Volume flow constraints infinite for allowable decreases and increases between terms.

Group:	Demand	thousands of m3 per year.
PWR	1.6	from T1 2004 FMP. **BUILT ON OLT_50 investigation, vol targets added.**
SPF	400.0	from T1 2004 FMP.
PO	265.0	from T1 2004 FMP.
BW	25.0	from T1 2004 FMP.
Total	691.6	

(b) Ontario Forest Accord Advisory Board benchmark harvest levels, as identified in the Regional Wood Supply Strategies; and

Benchmark volume by species group (OFAAB):

SFMM Case:	Description:
05-BENCH	Achieve OFAAB benchmark volumes by species group

Group:	Bench	thousands of m3 per year
PWR	0.6	
SPF	354.0	**BUILT ON OLT_50 investigation, vol targets added. Non-binding to allow solve.**
PO	149.0	
BW	4.0	
Total	507.6	

(c) maximum even-flow harvest volume by major species group.

Volume flow constraints of 0% decrease and 0% increase for each species group as individual scoping runs, no volume targets.
Will determine lowest point that can be achieved for timber by each species group in any given term.

SFMM Case:	Description:	
06-Flat-PWR	Even PWR volume all terms	**BUILT ON OLT_50, no vol targets added, only vol flow control.**
07-Flat-SPF	Even SPF volume all terms	
08-Flat-PO	Even PO volume all terms	
09-Flat-BW	Even BW volume all terms	

Next Steps:

10-MS + others	**Integration of all objectives into a LTMD**

Review investigations to determine combinations of target achievement to project the best balance of objective achievement and forest sustainability.
Conflicts in achievmeent of all objectives may dictate the minor refinement of previous decisions or target levels.
Review silvicultural projections and add any management limitations required.
Review any additional desired levels or investigations that are suggested by the planning team, advisors, LCC, etc.
Only key scenarios or conclusions are documented for development of the Proposed LTMD.
Proposed LTMD is reviewed by planning team, LCC, plan advisors (Progress Checklpoint #5) and ultimately the public.

When acceptable, the 10-year harvest from the Proposed LTMD is allocated to confirm that projections are reasonable and able to be implemented.
Spatial analysis is conducted on the proposed allocations. Assessment of objective achievement, determination of sustainability and primary road corridor planning.

WHISKEY JACK FOREST 2012 FMP — **SUMMARY of SFMM INVESTIGATION**

Case Name: NATURE11 **Input File:** NATURE11.inp **Date:** July 19, 2010.

Purpose: NATURAL SCENARIO. Use to compare SFMM natural forest dynamics to OLT projections (calibration).

Specific Inputs: Pre-suppression fire cycles by forest unit. Operational and LLP deferrals ON.

RESULTS: Where projections in the following tables fall below the min. target, the data is shaded yellow; where projections exceed max. targets, the data is shaded green.

FOREST CONDITION RESULTS

Implications on Forest Condition -

Good correlation to OLT after iterative review and revisions.
Mature/Late lowland lowland, CMo and SLo compared to OLT.
PWR and SBL forest unit areas consistently lower than OLT projections through time.
Caribou refuge and winter preferred habitat lower than OLT through time.

(2a) Productive Area by Landscape Class

Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional: Balsam	Lowland	Hardwood	Conifer
T1	200,327	152,744	62,934	8,361	2,889	105,229	192,907
T2	174,858	169,143	45,610	8,572	2,844	119,630	204,733
T3	170,053	192,553	56,640	8,416	2,784	104,506	190,438
T4	198,674	180,021	64,191	9,409	2,687	87,535	182,874
T5	200,383	158,318	66,355	15,215	2,797	79,662	202,660
T6	202,503	142,850	70,733	16,445	2,862	64,385	225,613
T7	204,928	137,457	72,048	15,653	3,162	54,018	238,123
T8	207,722	149,481	70,811	14,909	3,119	49,405	229,943
T9	210,593	155,675	65,091	14,466	3,119	49,546	226,901
T10	213,335	155,191	60,887	13,562	3,119	50,944	228,352
T11	215,792	155,495	57,644	12,792	3,119	51,670	228,878
T12	217,810	160,169	54,994	12,002	3,119	51,769	225,527
T13	219,564	164,120	52,682	11,297	3,119	50,918	223,689
T14	221,231	164,577	51,555	10,570	3,119	48,574	225,764
T15	222,812	164,042	49,991	9,881	3,119	46,640	228,904
T16	224,381	165,604	48,433	9,300	3,119	44,758	229,796
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

(2c) Area of Old Forest Area by Grouping of Productive Forest (ha)

	Lower Old Forest Age (Years): 80	100	100	100	90	100	160	110-120
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo
T1	3,707	1,851	8,811	17,199	1,251	23,309	97	18,431
T2	4,279	1,920	15,096	27,428	1,523	42,927	225	21,073
T3	6,414	1,883	21,264	26,317	1,590	44,101	310	26,688
T4	6,697	1,835	30,608	21,442	1,500	35,399	358	33,299
T5	6,390	1,785	38,086	38,191	1,427	28,324	441	39,337
T6	6,946	1,727	41,897	34,616	1,349	19,224	438	46,945
T7	11,358	1,670	40,777	21,714	1,264	13,414	461	52,122
T8	12,064	1,647	36,999	14,396	1,200	25,920	420	52,264
T9	10,918	1,599	32,139	10,995	1,168	30,675	472	53,222
T10	10,247	1,629	29,004	9,270	1,092	26,312	481	54,929
T11	10,422	1,587	23,690	10,225	1,092	21,350	445	64,318
T12	9,440	1,587	18,568	13,057	1,092	24,615	488	72,266
T13	6,928	1,587	16,228	15,734	1,092	24,500	484	76,008
T14	6,235	1,587	16,059	15,565	1,092	24,990	564	78,142
T15	7,171	1,587	16,827	14,619	1,092	26,411	623	79,351
T16	7,177	1,587	16,669	13,459	1,092	28,724	782	78,655
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840

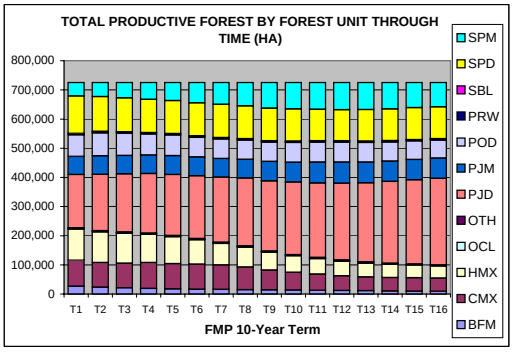
(2b partial) Productive Forest Area Through Time Data (hectares): **(2d)** **(2e) Upland Conifer**

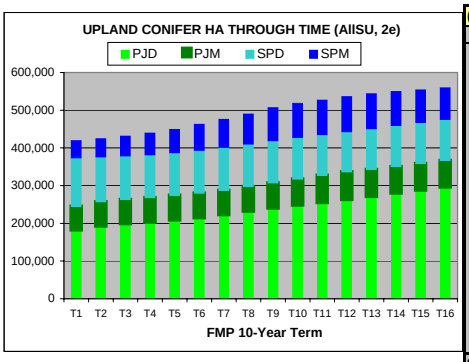
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	(2e) Upland Conifer
T1	725,390	27,148	88,490	107,239	2,216	1,995	182,833	61,845	73,978	3,312	1,807	128,589	45,937	419,205
T2	725,390	23,738	84,427	104,963	2,216	1,995	193,280	63,546	78,521	3,312	1,807	119,228	48,358	424,412
T3	725,390	21,201	84,509	102,729	2,216	1,995	199,265	63,198	76,397	3,310	1,807	116,048	52,714	431,225
T4	725,390	19,194	88,785	96,951	2,216	1,994	203,851	63,724	71,985	3,303	1,807	113,933	57,646	439,154
T5	725,390	17,614	86,898	91,954	2,216	1,994	209,184	65,003	70,518	3,299	1,807	112,694	62,208	449,089
T6	725,390	16,637	86,197	83,227	2,216	1,994	215,163	64,610	67,354	3,277	1,807	113,470	69,437	462,680
T7	725,390	15,653	84,348	73,564	2,216	1,995	223,063	63,695	66,885	3,252	1,807	114,374	74,539	475,670
T8	725,390	14,909	77,803	68,195	2,216	1,995	232,734	64,291	65,503	3,233	1,807	112,675	80,028	489,729
T9	725,390	14,466	67,960	60,992	2,216	1,994	240,430	66,553	66,264	3,168	1,807	111,794	87,746	506,523
T10	725,390	13,562	60,893	56,557	2,216	1,994	248,860	68,147	67,307	3,126	1,807	110,355	90,566	517,927
T11	725,390	12,792	55,942	52,675	2,216	1,994	255,341	71,612	68,251	3,061	1,807	107,927	91,772	526,651
T12	725,390	12,002	50,440	50,199	2,216	1,994	263,617	72,446	67,743	3,003	1,807	106,505	93,417	535,985
T13	725,390	11,297	47,230	47,295	2,216	1,994	271,573	70,964	67,035	2,913	1,807	108,264	92,800	543,601
T14	725,390	10,570	46,145	45,155	2,216	1,994	280,333	69,654	65,290	2,863	1,807	108,980	90,381	549,348
T15	725,390	9,881	46,171	43,105	2,216	1,994	288,520	69,514	63,454	2,845	1,807	109,706	86,176	553,916
T16	725,390	9,300	45,390	41,094	2,216	1,994	296,619	69,771	61,638	2,792	1,807	109,379	83,390	559,158
OLT Max.		19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175	497,902
OLT Min.		10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174	457,260

(5a)

Available Forest:

Term	
T1	572,034
T2	572,034
T3	572,034
T4	572,034
T5	572,034
T6	572,034
T7	572,034
T8	572,034
T9	572,034
T10	572,034
T11	572,034
T12	572,034
T13	572,034
T14	572,034
T15	572,034
T16	572,034





(3f)

(3a) Caribou Habitat Through Time:

Term	Cr	Cwu	Cwp	% Con in CarSUs
T1	101,492	45,035	18,032	89%
T2	102,898	46,953	15,735	89%
T3	118,282	70,319	12,632	89%
T4	128,501	69,346	13,763	89%
T5	131,758	71,125	31,168	89%
T6	136,848	76,548	30,437	90%
T7	138,868	76,941	25,525	90%
T8	139,731	77,751	27,124	90%
T9	140,728	78,465	28,472	90%
T10	142,137	79,022	28,570	90%
T11	143,124	79,446	29,519	91%
T12	144,060	80,778	30,055	91%
T13	144,808	82,835	29,816	91%
T14	145,313	83,505	29,544	91%
T15	145,915	83,858	29,936	91%
T16	146,602	84,247	30,935	92%
OLT Max.	161,804	47,453	68,169	maint or
OLT Min.	147,605	26,809	36,912	increase.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: NATURE11 **Input File:** NATURE11.inp **Date:** July 19, 2010.

HARVEST AREA and VOLUME RESULTS:

Implications on Wood Supply - Natural benchmark, no forest management activities.

Available Harvest Area by Term Data (hectares harvested annually)

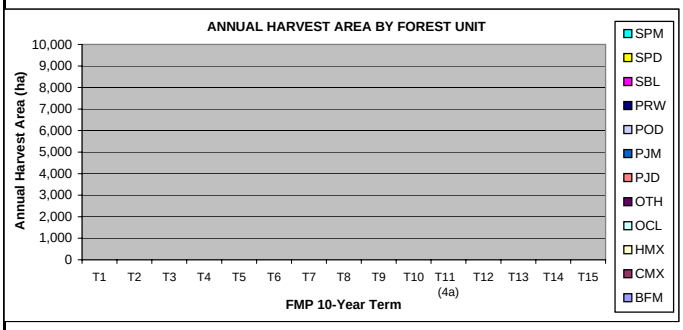
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	0	0	0	0	0	0	0	0	0	0	0	0	0
T2	0	0	0	0	0	0	0	0	0	0	0	0	0
T3	0	0	0	0	0	0	0	0	0	0	0	0	0
T4	0	0	0	0	0	0	0	0	0	0	0	0	0
T5	0	0	0	0	0	0	0	0	0	0	0	0	0
T6	0	0	0	0	0	0	0	0	0	0	0	0	0
T7	0	0	0	0	0	0	0	0	0	0	0	0	0
T8	0	0	0	0	0	0	0	0	0	0	0	0	0
T9	0	0	0	0	0	0	0	0	0	0	0	0	0
T10	0	0	0	0	0	0	0	0	0	0	0	0	0
T11 (4a)	0	0	0	0	0	0	0	0	0	0	0	0	0
T12	0	0	0	0	0	0	0	0	0	0	0	0	0
T13	0	0	0	0	0	0	0	0	0	0	0	0	0
T14	0	0	0	0	0	0	0	0	0	0	0	0	0
T15	0	0	0	0	0	0	0	0	0	0	0	0	0

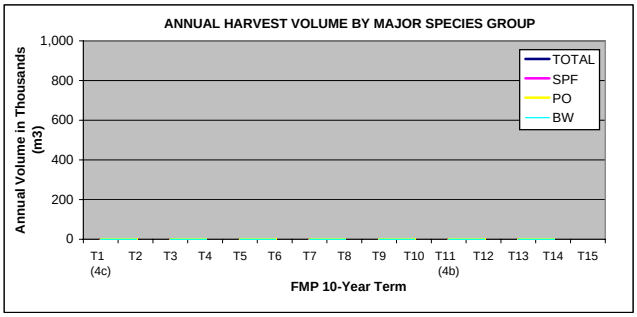
Annual Harvest Volumes by Major Species Groups (1,000s net merchantable cubic metres)

Term	TOTAL	SPF	PO	BW	PRW
T1 (4c)	0.0	0.0	0.0	0.0	0.0
T2	0.0	0.0	0.0	0.0	0.0
T3	0.0	0.0	0.0	0.0	0.0
T4	0.0	0.0	0.0	0.0	0.0
T5	0.0	0.0	0.0	0.0	0.0
T6	0.0	0.0	0.0	0.0	0.0
T7	0.0	0.0	0.0	0.0	0.0
T8	0.0	0.0	0.0	0.0	0.0
T9	0.0	0.0	0.0	0.0	0.0
T10	0.0	0.0	0.0	0.0	0.0
T11 (4b)	0.0	0.0	0.0	0.0	0.0
T12	0.0	0.0	0.0	0.0	0.0
T13	0.0	0.0	0.0	0.0	0.0
T14	0.0	0.0	0.0	0.0	0.0
T15	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0

Projected Revenues, Expenditures & Renewal Area

Term	Revenue M$	Expend. M$	Unspent M$	Renewal ha	Exten ha	Basc1 ha	Intn1 ha
T1	0	0	0	0	0	0	0
T2	0	0	0	0	0	0	0
T3	0	0	0	0	0	0	0
T4	0	0	0	0	0	0	0
T5	0	0	0	0	0	0	0
T6	0	0	0	0	0	0	0
T7	0	0	0	0	0	0	0
T8	0	0	0	0	0	0	0
T9	0	0	0	0	0	0	0
T10	0	0	0	0	0	0	0
T11	0	0	0	0	0	0	0
T12	0	0	0	0	0	0	0
T13	0	0	0	0	0	0	0
T14	0	0	0	0	0	0	0
T15	0	0	0	0	0	0	0





NOTES:

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: NATURE12 **Input File:** NATURE12.inp **Date:** July 26, 2010.

Purpose: NATURAL SCENARIO. Use to compare SFMM natural forest dynamics to OLT projections (calibration).

Specific Inputs: Pre-suppression fire cycles(5) by forest unit. Adjusted for OLT calibration. Operational and LLP deferrals ON.
SUBMU revision for WC1 incorporated (most not caribou zone)

RESULTS: Where projections in the following tables fall below the min. target, the data is shaded yellow; where projections exceed max. targets, the data is shaded green.

FOREST CONDITION RESULTS

Implications on Forest Condition - Good correlation to OLT after iterative review and revisions.
Mature/Late lowland lowland, CMo and SLo compared to OLT.
PWR and SBL forest unit areas consistently lower than OLT projections through time.
Caribou refuge and winter preferred habitat lower than OLT through time.

(2a) Productive Area by Landscape Class

Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional: Balsam	Lowland	Hardwood	Conifer
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T5	199,024	157,778	68,254	15,214	2,797	79,662	202,660
T6	201,039	141,794	73,255	16,444	2,862	64,385	225,612
T7	203,345	135,895	75,196	15,652	3,162	54,018	238,122
T8	206,000	147,444	74,211	14,908	3,119	49,785	229,923
T9	208,715	153,489	68,764	14,465	3,119	50,297	226,541
T10	211,301	152,852	64,835	13,562	3,119	52,065	227,656
T11	213,609	152,987	61,866	12,791	3,119	53,117	227,900
T12	215,487	157,480	59,474	12,002	3,119	53,547	224,280
T13	217,100	161,396	57,407	11,304	3,119	52,919	222,144
T14	218,610	161,696	56,516	10,583	3,119	50,812	224,053
T15	220,025	161,099	55,184	9,914	3,119	49,058	226,991
T16	221,436	162,608	53,851	9,361	3,119	47,357	227,658
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

(2c) Area of Old Forest Area by Grouping of Productive Forest (ha)

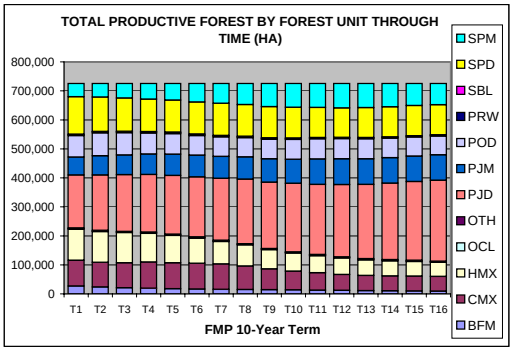
	Lower Old Forest Age (Years): 80	100	100	100	90	100	160	110-120
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo
T1	3,707	1,851	8,811	17,199	1,251	23,309	97	18,431
T2	4,279	1,920	15,096	27,428	1,523	42,927	225	21,073
T3	6,414	1,883	21,264	26,317	1,590	44,101	310	26,688
T4	6,697	1,835	30,608	21,442	1,500	35,399	358	33,299
T5	6,390	1,785	38,086	38,191	1,427	28,324	441	39,337
T6	6,946	1,727	41,897	34,616	1,349	19,224	438	46,945
T7	11,358	1,670	40,777	21,714	1,264	13,414	461	52,122
T8	12,063	1,647	36,993	14,396	1,200	25,908	420	52,264
T9	10,917	1,599	32,133	10,995	1,168	30,665	472	53,222
T10	10,246	1,629	28,999	9,270	1,092	26,304	481	54,928
T11	10,422	1,587	23,686	10,225	1,092	21,343	445	64,318
T12	9,440	1,587	18,840	13,269	1,092	24,744	488	72,264
T13	6,934	1,587	16,824	16,040	1,092	24,664	484	75,651
T14	6,247	1,587	16,947	15,971	1,092	25,171	564	77,306
T15	7,189	1,587	17,941	15,068	1,092	26,524	623	78,112
T16	7,208	1,587	17,850	13,955	1,092	28,782	782	77,061
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840

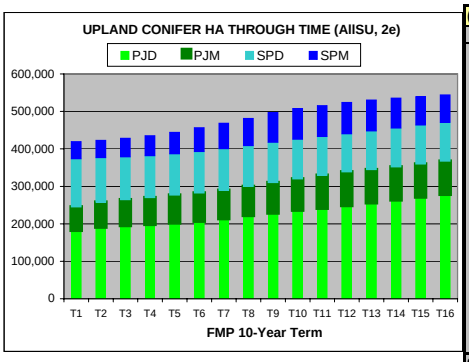
(2b partial) Productive Forest Area Through Time Data (hectares): **(2d)** **(2e) Upland**

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	Conifer
T1	725,390	27,148	88,490	107,239	2,216	1,995	182,833	61,845	73,978	3,312	1,807	128,589	45,937	419,205
T2	725,390	23,738	85,144	105,680	2,216	1,995	191,367	66,177	78,521	3,312	1,807	118,510	46,923	422,977
T3	725,390	21,201	85,837	104,116	2,216	1,995	195,602	68,133	76,427	3,310	1,807	114,702	50,043	428,481
T4	725,390	19,194	90,645	98,975	2,216	1,994	198,614	70,661	72,072	3,303	1,807	112,024	53,883	435,183
T5	725,390	17,614	89,225	94,588	2,216	1,994	202,489	73,716	70,688	3,299	1,807	110,278	57,477	443,959
T6	725,390	16,637	88,940	86,448	2,216	1,994	207,135	74,886	67,632	3,277	1,807	110,589	63,831	456,440
T7	725,390	15,652	87,466	77,356	2,216	1,995	213,842	75,319	67,293	3,252	1,807	111,062	68,130	468,353
T8	725,390	14,908	81,254	72,547	2,216	1,995	222,411	77,084	66,066	3,233	1,807	108,974	72,895	481,363
T9	725,390	14,465	71,713	65,883	2,216	1,994	229,040	80,422	67,004	3,168	1,807	107,726	79,952	497,140
T10	725,390	13,562	64,911	61,961	2,216	1,994	236,417	83,014	68,245	3,126	1,807	105,954	82,182	507,567
T11	725,390	12,791	60,224	58,518	2,216	1,994	241,816	87,436	69,407	3,061	1,807	103,236	82,883	515,371
T12	725,390	12,002	54,956	56,456	2,216	1,994	249,007	89,177	69,133	3,003	1,807	101,555	84,083	523,822
T13	725,390	11,304	52,056	53,841	2,216	1,994	256,058	88,275	68,670	2,913	1,807	103,113	83,143	530,589
T14	725,390	10,583	51,262	51,986	2,216	1,994	263,989	87,442	67,176	2,863	1,807	103,645	80,425	535,501
T15	725,390	9,914	51,520	50,149	2,216	1,994	271,508	87,529	65,594	2,845	1,807	104,127	76,187	539,350
T16	725,390	9,361	50,811	48,335	2,216	1,994	278,957	88,026	64,031	2,792	1,807	103,594	73,464	544,041
OLT Max.		19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175	497,902
OLT Min.		10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174	457,260

(5a)

Available Forest: Term	
T1	572,034
T2	572,034
T3	572,034
T4	572,034
T5	572,034
T6	572,034
T7	572,034
T8	572,034
T9	572,034
T10	572,034
T11	572,034
T12	572,034
T13	572,034
T14	572,034
T15	572,034
T16	572,034





(3f)

(3a) Caribou Habitat Through Time: Term	Cr	Cwu	Cwp	% Con in CarSUs
T1	101,492	45,035	18,032	89%
T2	102,260	46,953	15,735	89%
T3	117,085	70,319	12,632	89%
T4	126,825	69,346	13,763	89%
T5	129,656	71,125	31,168	89%
T6	134,378	76,673	30,437	89%
T7	136,067	77,162	25,525	89%
T8	136,613	77,695	27,213	89%
T9	137,420	78,159	28,630	89%
T10	138,621	78,483	28,780	89%
T11	139,413	78,695	29,766	89%
T12	140,109	79,832	30,325	90%
T13	140,706	81,716	30,060	90%
T14	141,094	82,231	29,758	90%
T15	141,626	82,476	30,091	90%
T16	142,265	82,809	31,043	90%
OLT Max.	161,804	47,453	68,169	maint or
OLT Min.	147,605	26,809	36,912	increase.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: NATURE12 **Input File:** NATURE12.inp **Date:** July 26, 2010.

HARVEST AREA and VOLUME RESULTS:

Implications on Wood Supply - Natural benchmark, no forest management activities.

Available Harvest Area by Term Data (hectares harvested annually)

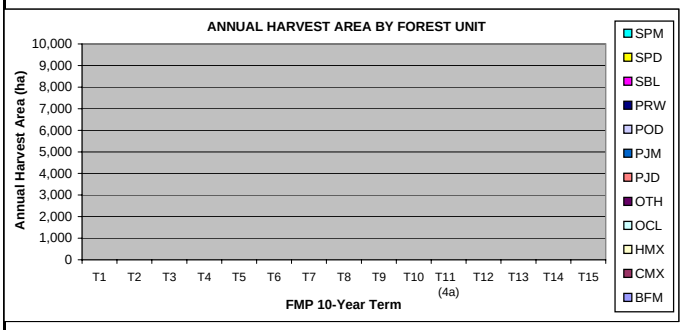
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	0	0	0	0	0	0	0	0	0	0	0	0	0
T2	0	0	0	0	0	0	0	0	0	0	0	0	0
T3	0	0	0	0	0	0	0	0	0	0	0	0	0
T4	0	0	0	0	0	0	0	0	0	0	0	0	0
T5	0	0	0	0	0	0	0	0	0	0	0	0	0
T6	0	0	0	0	0	0	0	0	0	0	0	0	0
T7	0	0	0	0	0	0	0	0	0	0	0	0	0
T8	0	0	0	0	0	0	0	0	0	0	0	0	0
T9	0	0	0	0	0	0	0	0	0	0	0	0	0
T10	0	0	0	0	0	0	0	0	0	0	0	0	0
T11 (4a)	0	0	0	0	0	0	0	0	0	0	0	0	0
T12	0	0	0	0	0	0	0	0	0	0	0	0	0
T13	0	0	0	0	0	0	0	0	0	0	0	0	0
T14	0	0	0	0	0	0	0	0	0	0	0	0	0
T15	0	0	0	0	0	0	0	0	0	0	0	0	0

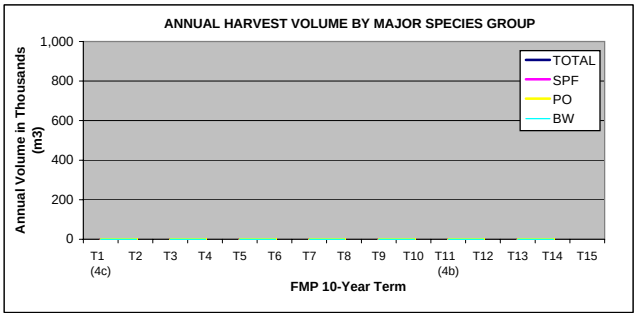
Annual Harvest Volumes by Major Species Groups (1,000s net merchantable cubic metres)

Term	TOTAL	SPF	PO	BW	PRW
T1 (4c)	0.0	0.0	0.0	0.0	0.0
T2	0.0	0.0	0.0	0.0	0.0
T3	0.0	0.0	0.0	0.0	0.0
T4	0.0	0.0	0.0	0.0	0.0
T5	0.0	0.0	0.0	0.0	0.0
T6	0.0	0.0	0.0	0.0	0.0
T7	0.0	0.0	0.0	0.0	0.0
T8	0.0	0.0	0.0	0.0	0.0
T9	0.0	0.0	0.0	0.0	0.0
T10	0.0	0.0	0.0	0.0	0.0
T11 (4b)	0.0	0.0	0.0	0.0	0.0
T12	0.0	0.0	0.0	0.0	0.0
T13	0.0	0.0	0.0	0.0	0.0
T14	0.0	0.0	0.0	0.0	0.0
T15	0.0	0.0	0.0	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0

Projected Revenues, Expenditures & Renewal Area

Term	Revenue M$	Expend. M$	Unspent M$	Renewal ha	Exten ha	Basc1 ha	Intn1 ha
T1	0	0	0	0	0	0	0
T2	0	0	0	0	0	0	0
T3	0	0	0	0	0	0	0
T4	0	0	0	0	0	0	0
T5	0	0	0	0	0	0	0
T6	0	0	0	0	0	0	0
T7	0	0	0	0	0	0	0
T8	0	0	0	0	0	0	0
T9	0	0	0	0	0	0	0
T10	0	0	0	0	0	0	0
T11	0	0	0	0	0	0	0
T12	0	0	0	0	0	0	0
T13	0	0	0	0	0	0	0
T14	0	0	0	0	0	0	0
T15	0	0	0	0	0	0	0





NOTES:

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: NATURE12 **Input File:** NATURE12.inp **Date:** July 26, 2010.

Immature Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	416,005	18,788	57,263	51,501	188	162	133,100	29,828	26,319	635	947	73,007	24,268
T2	389,611	15,166	46,178	36,573	243	251	144,789	36,524	29,741	710	937	54,773	23,726
T3	419,245	12,785	42,677	40,160	307	345	159,082	43,744	37,525	700	932	52,526	28,461
T4	442,886	9,786	41,774	41,686	370	450	170,291	49,956	43,371	802	966	51,175	32,260
T5	425,056	2,400	38,674	39,210	396	528	155,888	55,418	47,870	919	831	48,364	34,559
T6	416,088	192	33,238	39,477	449	567	152,654	58,418	51,645	1,030	713	39,833	37,871
T7	414,435	0	28,944	41,382	415	659	167,126	59,930	50,584	1,123	446	29,031	34,794
T8	427,654	0	29,664	41,441	462	659	181,557	64,533	48,722	1,002	442	23,785	35,387
T9	430,968	0	29,228	37,102	462	659	186,869	65,192	46,823	1,082	442	23,921	39,188
T10	428,988	0	28,788	34,192	462	659	192,359	65,754	45,285	1,075	442	23,034	36,939
T11	428,462	0	28,235	32,044	462	659	198,093	66,108	44,099	1,067	442	22,419	34,834
T12	432,442	0	27,627	30,191	462	659	203,895	66,289	43,186	1,055	442	22,393	36,242
T13	435,904	0	27,068	28,436	462	659	209,604	66,149	42,492	1,041	442	23,690	35,863
T14	436,822	0	26,484	27,841	462	659	215,145	65,745	41,845	1,024	442	23,381	33,794
T15	436,307	0	25,846	26,835	462	659	220,496	65,154	41,186	1,006	442	22,061	32,160
T16	437,895	0	25,271	25,926	462	659	225,683	64,446	40,418	989	442	21,168	32,429
	Max OLT	3,260	31,472	42,688	1,328	1,063	292,834	96,487	30,987	115,789	10,363	18,903	44,874
	Min OLT	1,948	11,696	21,591	465	448	106,124	36,541	12,670	45,886	3,667	6,479	17,441

Mature+ Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	309,386	8,361	31,227	55,738	2,029	1,833	49,734	32,017	47,659	2,678	860	55,582	21,669
T2	335,779	8,572	38,967	69,107	1,973	1,744	46,577	29,652	48,780	2,602	870	63,737	23,198
T3	306,145	8,416	43,160	63,955	1,909	1,649	36,520	24,389	38,902	2,611	875	62,177	21,582
T4	282,504	9,408	48,871	57,289	1,846	1,545	28,323	20,706	28,701	2,501	841	60,849	21,623
T5	300,334	15,214	50,551	55,377	1,821	1,467	46,600	18,298	22,818	2,380	976	61,914	22,918
T6	309,303	16,444	55,701	46,971	1,767	1,428	54,481	16,468	15,986	2,247	1,094	70,755	25,960
T7	310,955	15,652	58,522	35,974	1,801	1,335	46,716	15,389	16,709	2,129	1,361	82,030	33,336
T8	297,736	14,908	51,590	31,107	1,754	1,335	40,854	12,550	17,343	2,231	1,365	85,189	37,508
T9	294,422	14,465	42,485	28,781	1,754	1,335	42,171	15,230	20,181	2,086	1,365	83,805	40,764
T10	296,402	13,562	36,123	27,769	1,754	1,335	44,057	17,260	22,960	2,051	1,365	82,921	45,244
T11	296,928	12,791	31,989	26,474	1,754	1,335	43,723	21,328	25,308	1,994	1,365	80,817	48,049
T12	292,948	12,002	27,329	26,265	1,754	1,335	45,112	22,888	25,947	1,948	1,365	79,162	47,841
T13	289,486	11,304	24,988	25,405	1,754	1,335	46,454	22,126	26,178	1,873	1,365	79,423	47,280
T14	288,568	10,583	24,778	24,146	1,754	1,335	48,844	21,697	25,332	1,840	1,365	80,264	46,631
T15	289,083	9,914	25,674	23,314	1,754	1,335	51,011	22,375	24,408	1,838	1,365	82,066	44,026
T16	287,495	9,361	25,540	22,409	1,754	1,335	53,274	23,580	23,613	1,803	1,365	82,426	41,036
	Max OLT	15,933	42,682	39,118	2,219	1,962	99,173	46,652	27,723	1,131	15,367	58,117	40,301
	Min OLT	8,361	24,197	19,993	1,499	1,240	52,493	27,435	12,933	452	10,078	34,643	21,733
	Mature Onset Age:	60	70	60	70	60	70	70	60	80	70	70	70

WHISKEY JACK FOREST 2012 FMP — **SUMMARY of SFMM INVESTIGATION**

Case Name: 01_Base **Input File:** 01_Base.inp **Date:** July 27, 2010.

Purpose: BASE MODEL inputs only. Use as building block for harvest investigations. Not a viable LTMD option without target achievement incorporated.

Specific Inputs: BASE model inputs. Suppression fire cycle of 299 years. Operational and LLP deferrals ON, budget infinite.
Harvest TOTAL Volume flow control of +/- 20% between terms to very roughly control volumes through time.
Updated with final forest dynamics refinements.

RESULTS: Where projections in the following tables fall below the min. target, the data is shaded yellow; where projections exceed max. targets, the data is shaded green.

FOREST CONDITION RESULTS

Implications on Forest Condition - No targets for OLT achievement. Will need controls for mature Landscape Classes and Old Forest.
Harvest declines significantly through next 60 years until marten deferrals off and caribou SUBMUs are operable.
Harvest area and volumes will need regulation for predictability.
PRW and SBL forest unit areas are lower than OLT projections - same underachievement as NATURE. HMX also low.

(2a) Productive Area by Landscape Class

Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional: Balsam	Lowland	Hardwood	Conifer
T1	200,327	62,934	152,744	8,361	2,889	105,229	192,907
T2	192,058	48,922	189,737	8,605	1,902	109,407	173,999
T3	175,573	67,191	239,960	7,639	1,618	70,258	161,810
T4	174,589	94,478	249,411	9,029	1,466	47,648	147,429
T5	138,433	105,997	238,668	15,522	1,619	44,829	178,980
T6	149,192	107,236	195,087	18,424	1,646	39,613	212,850
T7	172,790	101,733	168,666	12,854	1,925	35,486	230,568
T8	200,326	93,771	165,908	12,736	1,599	46,775	202,695
T9	231,558	66,625	165,683	11,843	2,363	59,348	186,203
T10	258,497	62,994	180,300	11,218	2,365	38,383	169,654
T11	236,478	91,900	205,130	11,528	2,204	22,495	153,529
T12	223,519	107,042	220,225	10,348	1,692	18,350	141,890
T13	213,125	104,441	241,298	11,167	1,372	20,646	131,018
T14	202,005	107,025	240,548	11,042	1,462	23,236	137,748
T15	200,739	94,310	236,113	9,794	1,597	28,029	152,485
T16	218,861	72,099	224,804	9,852	1,553	32,711	163,185
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

(2c) Area of Old Forest Area by Grouping of Productive Forest (ha)

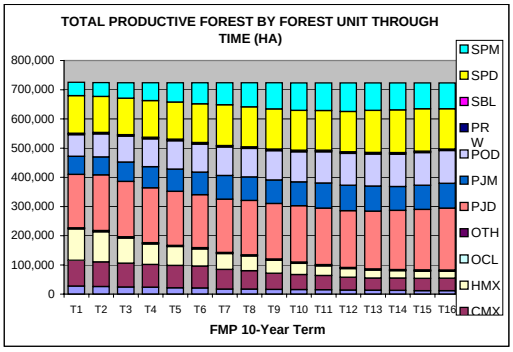
	Lower Old Forest Age (Years): 80	100	100	100	90	100	160	110-120
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo
T1	3,707	1,851	8,811	17,199	1,251	23,309	97	18,431
T2	3,973	1,158	11,862	17,897	1,260	30,629	182	13,136
T3	5,226	893	14,761	16,149	981	34,990	224	16,302
T4	5,711	877	18,714	12,849	962	32,434	241	19,763
T5	3,398	854	22,602	19,411	581	29,942	292	24,626
T6	4,934	826	25,097	16,978	542	23,763	290	32,671
T7	9,445	799	24,416	10,854	455	18,380	233	40,400
T8	10,583	551	19,639	7,546	431	24,054	202	27,919
T9	9,212	529	17,697	8,110	465	39,063	224	31,882
T10	8,548	501	16,079	6,135	397	33,392	226	34,471
T11	8,859	476	13,326	4,435	398	22,743	163	44,089
T12	7,576	507	8,730	4,111	620	16,344	175	49,742
T13	5,079	509	6,786	4,703	429	13,108	196	57,131
T14	4,926	535	6,032	4,049	737	9,216	192	55,278
T15	7,051	505	5,826	3,701	390	8,928	183	60,545
T16	7,357	507	5,733	3,371	390	10,562	221	64,370
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840

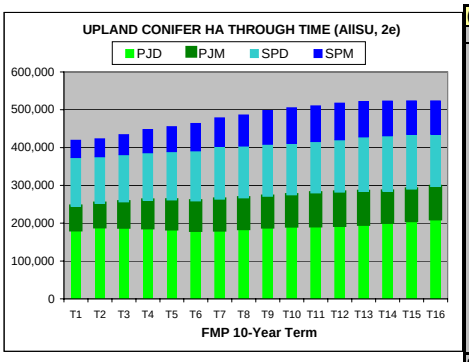
(2b partial) Productive Forest Area Through Time Data (hectares): **(2d)** **(2e) Upland Conifer**

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	Conifer
T1	725,390	27,148	88,490	107,239	2,216	1,995	182,833	61,845	73,978	3,312	1,807	128,589	45,937	419,205
T2	724,630	25,670	84,557	103,121	2,169	1,991	190,823	61,184	78,747	3,320	1,844	123,359	47,845	423,211
T3	724,049	24,106	81,907	85,847	2,154	1,987	189,808	66,273	88,525	3,368	1,857	124,909	53,307	434,297
T4	724,049	23,341	77,812	70,420	2,154	1,987	188,151	72,288	95,523	3,441	1,857	125,364	61,710	447,514
T5	724,049	21,189	76,982	64,380	2,153	1,987	185,134	76,082	96,957	3,455	1,857	127,512	66,359	455,087
T6	724,049	20,935	74,893	58,910	2,153	1,987	181,334	77,084	96,177	3,479	1,858	132,712	72,527	463,658
T7	724,021	16,995	67,494	53,926	2,153	1,987	182,313	80,891	97,534	3,546	1,858	139,704	75,620	478,528
T8	723,810	16,717	63,437	50,167	2,140	1,987	186,202	80,464	97,707	3,572	1,870	137,011	82,536	486,212
T9	723,622	15,851	55,595	44,419	2,139	1,987	190,249	80,716	100,247	3,575	1,870	137,186	89,788	497,938
T10	723,410	15,168	51,609	38,444	2,134	1,987	193,033	81,698	103,319	3,551	1,875	136,098	94,494	505,323
T11	723,262	14,729	48,978	32,987	2,133	1,987	193,251	86,341	106,672	3,496	1,875	136,014	94,799	510,404
T12	723,066	13,757	43,909	29,302	2,107	1,987	194,522	87,084	108,966	3,470	1,902	138,415	97,646	517,667
T13	723,066	13,087	41,517	27,596	2,096	1,987	197,620	85,911	109,760	3,419	1,912	144,056	94,106	521,692
T14	723,066	12,805	41,854	25,144	2,096	1,987	202,713	81,455	110,944	3,387	1,913	146,477	92,293	522,938
T15	723,066	11,656	42,223	24,581	2,092	1,987	207,443	82,371	111,830	3,282	1,916	144,950	88,736	523,499
T16	723,066	11,582	42,710	23,933	2,091	1,987	211,983	84,647	112,355	3,247	1,918	138,165	88,448	523,244
OLT Max.		19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175	497,902
OLT Min.		10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174	457,260

(5a) Available Forest:

Term	
T1	572,034
T2	571,274
T3	570,692
T4	570,692
T5	570,692
T6	570,692
T7	570,664
T8	570,453
T9	570,266
T10	570,054
T11	569,906
T12	569,710
T13	569,710
T14	569,710
T15	569,710
T16	569,710





(3a) Caribou Habitat Through Time: **(3f) % Con in CarSUs**

Term	Cr	Cwu	Cwp	% Con in CarSUs
T1	101,492	45,035	18,032	89%
T2	92,835	40,986	14,155	89%
T3	112,079	78,185	13,150	89%
T4	128,042	88,335	17,847	90%
T5	136,645	101,366	51,175	90%
T6	153,056	115,097	58,167	90%
T7	154,221	115,654	55,317	90%
T8	143,952	106,018	49,831	91%
T9	133,080	94,294	43,023	90%
T10	121,368	81,240	34,532	91%
T11	118,057	70,580	25,690	91%
T12	117,731	66,966	17,071	91%
T13	127,553	78,494	18,348	92%
T14	123,787	75,442	23,260	92%
T15	131,007	90,969	30,159	92%
T16	141,182	108,768	37,004	92%
OLT Max.	161,804	47,453	68,169	maint or
OLT Min.	147,605	26,809	36,912	increase.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 01_Base **Input File:** 01_Base.inp **Date:** July 27, 2010.

HARVEST AREA and VOLUME RESULTS:

Implications on Wood Supply -

Available Harvest Area by Term Data (hectares harvested annually)

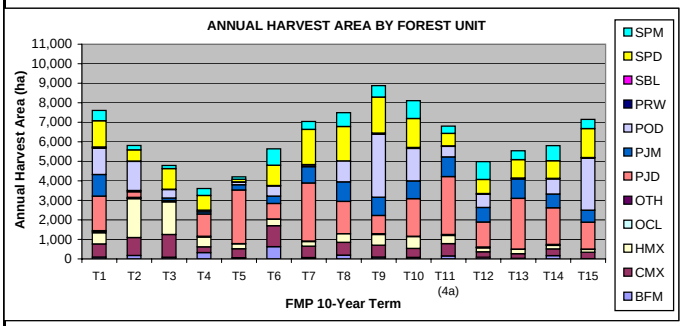
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	7,605	91	675	569	79	33	1,767	1,106	1,347	44	19	1,345	530
T2	5,811	170	918	1,990	26	43	288	62	1,493	21	1	568	231
T3	4,783	84	1,161	1,671	0	0	68	130	435	7	10	1,056	161
T4	3,608	319	297	498	0	39	1,142	114	78	4	0	756	360
T5	4,207	57	460	255	0	4	2,747	270	137	1	9	137	130
T6	5,635	622	1,076	337	0	9	791	375	527	4	8	1,044	842
T7	7,044	66	579	237	26	2	2,975	838	88	6	8	1,802	416
T8	7,488	187	656	442	1	1	1,652	1,007	1,072	0	2	1,762	706
T9	8,877	92	602	551	10	34	930	939	3,232	43	14	1,844	587
T10	8,108	71	464	607	2	12	1,929	909	1,663	23	25	1,485	917
T11 (4a)	6,800	144	637	413	53	1	2,963	1,014	539	17	3	638	378
T12	4,987	85	279	201	21	23	1,275	745	682	7	24	726	920
T13	5,541	25	236	233	1	1	2,604	987	35	13	3	943	461
T14	5,800	168	336	188	7	41	1,875	705	777	16	12	898	776
T15	7,150	12	323	149	3	14	1,378	610	2,675	13	9	1,487	476

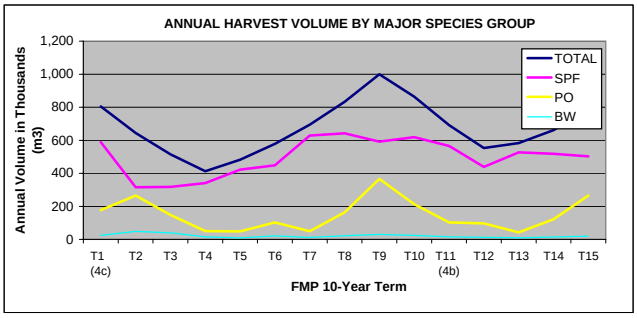
Annual Harvest Volumes by Major Species Groups (1,000s net merchantable cubic metres)

Term	TOTAL	SPF	PO	BW	PRW
T1 (4c)	804.9	589.0	177.5	23.9	4.7
T2	643.9	315.3	265.1	48.3	2.2
T3	515.1	317.6	148.6	39.8	0.8
T4	412.1	340.6	49.9	15.8	0.4
T5	482.0	422.2	48.1	8.8	0.1
T6	578.4	448.6	103.0	21.6	0.3
T7	694.1	628.9	49.3	11.7	0.7
T8	832.9	642.3	163.6	22.8	0.0
T9	999.5	591.5	365.6	30.0	4.3
T10	863.9	619.1	213.2	24.3	2.2
T11 (4b)	691.1	565.6	102.9	16.0	1.6
T12	552.9	439.0	96.6	12.7	0.6
T13	583.5	527.3	43.1	9.5	2.2
T14	661.4	518.0	122.2	14.8	1.5
T15	793.6	502.9	265.8	19.4	1.2
Average	674.0	497.9	147.6	21.3	1.5

Projected Revenues, Expenditures & Renewal Area

Term	Revenue M$	Expend. M$	Unspent M$	Renewal ha	Exten ha	Basc1 ha	Intn1 ha
T1	3,478	3,618	-139	**7,529**	2,572	4,380	577
T2	2,035	1,926	110	**5,753**	3,673	1,827	253
T3	1,933	2,193	-260	**4,783**	2,312	2,154	317
T4	1,941	1,963	-23	**3,608**	938	2,388	282
T5	2,379	2,252	126	**4,207**	849	2,960	398
T6	2,585	3,205	-620	**5,633**	1,580	3,586	467
T7	3,530	4,183	-654	**7,023**	976	5,357	689
T8	3,689	3,924	-235	**7,469**	2,094	4,766	609
T9	3,617	3,555	63	**8,856**	4,255	4,076	525
T10	3,623	3,859	-236	**8,093**	2,768	4,729	596
T11	3,241	3,516	-275	**6,781**	1,695	4,490	595
T12	2,514	2,575	-61	**4,987**	1,315	3,355	317
T13	2,970	3,129	-159	**5,541**	778	4,367	396
T14	2,979	2,310	669	**5,800**	2,465	3,077	258
T15	3,001	2,016	984	**7,150**	4,580	2,187	383





NOTES:

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 01_Base **Input File:** 01_Base.inp **Date:** July 27, 2010.

Immature Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	416,005	18,788	57,263	51,501	188	162	133,100	29,828	26,319	635	947	73,007	24,268
T2	430,717	17,065	48,899	34,335	957	503	154,620	37,955	39,614	1,098	1,154	66,987	27,530
T3	482,724	16,466	47,080	38,104	1,236	943	159,588	45,222	67,055	1,279	1,157	70,748	33,845
T4	518,477	14,312	48,026	38,317	1,266	975	160,527	52,611	80,991	1,473	1,279	77,861	40,840
T5	483,099	5,667	44,066	33,502	1,264	1,361	126,940	57,405	83,634	1,587	1,128	81,429	45,117
T6	451,516	2,511	36,377	30,732	1,287	1,352	118,087	57,909	85,378	1,689	1,078	69,012	46,105
T7	443,189	4,141	29,712	31,028	1,224	1,460	121,351	60,086	85,473	1,824	863	62,020	44,008
T8	460,006	3,982	31,758	29,450	1,482	1,186	139,589	65,980	72,451	1,748	929	62,992	48,459
T9	463,866	4,008	31,783	23,753	890	835	149,208	66,762	62,718	1,826	757	67,843	53,483
T10	501,790	3,950	31,764	19,949	774	1,146	159,494	68,555	84,273	1,881	870	74,630	54,505
T11	533,507	3,202	31,295	19,592	782	927	171,095	71,345	98,634	1,892	1,023	78,215	55,506
T12	550,786	3,409	32,668	19,595	1,257	883	179,868	74,475	101,427	1,919	1,059	77,454	56,772
T13	558,863	1,920	32,205	17,209	1,421	1,014	184,632	74,126	100,474	1,926	1,215	83,158	59,564
T14	549,578	1,763	31,521	16,115	1,395	984	190,031	72,742	97,740	2,010	1,152	79,233	54,893
T15	531,161	1,862	31,164	15,614	1,234	1,352	187,537	72,345	93,402	1,939	1,177	69,537	53,996
T16	515,765	1,729	31,086	14,672	1,230	1,190	187,548	71,063	89,703	1,933	1,225	60,802	53,583
	Max OLT	3,260	31,472	42,688	1,328	1,063	292,834	96,487	30,987	115,789	10,363	18,903	44,874
	Min OLT	1,948	11,696	21,591	465	448	106,124	36,541	12,670	45,886	3,667	6,479	17,441

Mature+ Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	309,386	8,361	31,227	55,738	2,029	1,833	49,734	32,017	47,659	2,678	860	55,582	21,669
T2	293,913	8,605	35,658	68,785	1,212	1,488	36,203	23,229	39,133	2,222	690	56,372	20,316
T3	241,325	7,639	34,827	47,744	918	1,044	30,220	21,051	21,470	2,089	700	54,162	19,462
T4	205,571	9,029	29,786	32,103	888	1,012	27,624	19,678	14,532	1,968	578	47,503	20,870
T5	240,950	15,522	32,916	30,879	889	626	58,194	18,677	13,324	1,868	730	46,083	21,241
T6	272,533	18,424	38,516	28,178	866	635	63,247	19,176	10,800	1,789	780	63,700	26,422
T7	280,831	12,854	37,782	22,897	930	527	60,962	20,805	12,061	1,722	995	77,684	31,612
T8	263,804	12,736	31,678	20,717	658	801	46,612	14,484	25,257	1,825	941	74,018	34,077
T9	259,756	11,843	23,812	20,667	1,250	1,152	41,041	13,953	37,529	1,749	1,114	69,343	36,305
T10	221,620	11,218	19,845	18,495	1,360	841	33,539	13,143	19,047	1,670	1,005	61,468	39,989
T11	189,755	11,528	17,683	13,396	1,352	1,060	22,156	14,996	8,039	1,604	852	57,799	39,293
T12	172,280	10,348	11,241	9,707	850	1,104	14,654	12,609	7,539	1,551	842	60,961	40,874
T13	164,203	11,167	9,312	10,387	675	973	12,988	11,784	9,286	1,494	697	60,898	34,542
T14	173,488	11,042	10,333	9,029	701	1,003	12,681	8,713	13,205	1,376	761	67,243	37,400
T15	191,905	9,794	11,059	8,967	858	635	19,906	10,026	18,428	1,342	739	75,413	34,739
T16	207,302	9,852	11,624	9,261	860	797	24,436	13,584	22,652	1,313	693	77,363	34,865
	Max OLT	15,933	42,682	39,118	2,219	1,962	99,173	46,652	27,723	1,131	15,367	58,117	40,301
	Min OLT	8,361	24,197	19,993	1,499	1,240	52,493	27,435	12,933	452	10,078	34,643	21,733
Mature Onset Age:		60	70	60	70	60	70	70	60	80	70	70	70

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 01_OLT_70 **Input File:** 01_OLT_70.inp **Date:** July 27, 2010.

Purpose: Investigation to see if OLT minimum SNRV targets are achievable in 70 years and maintained thereafter.

Specific Inputs: BASE MODEL inputs plus minimum SNRV for OLT landscape classes, old forest, caribou habitat and upland conifer from T8 onwards as per OLT min below. MLb, SLo no targets added.

RESULTS: Where projections in the following tables fall below the min. target, the data is shaded yellow; where projections exceed max. targets, the data is shaded green.

FOREST CONDITION RESULTS

Implications on Forest Condition -

Min SNRVs (or better) achieved T8 onwards, except for MLI, SLo as noted above. No forest unit targets included.
PRW and SBL underachieved - calibration issue - not resolved with targets. HMX low but may be able to be improved.
Good caribou habitat projections with targets.

(2a) Productive Area by Landscape Class

Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional: Balsam	Lowland	Hardwood	Conifer
T1	200,327	152,744	62,934	8,361	2,889	105,229	192,907
T2	197,937	189,737	48,922	8,605	2,486	99,336	177,545
T3	175,768	239,999	75,663	7,618	2,284	68,825	153,800
T4	178,527	245,956	99,073	8,866	2,103	51,752	137,680
T5	150,344	235,273	107,413	15,273	2,242	45,505	167,906
T6	146,234	195,880	112,840	18,280	2,222	40,780	207,722
T7	159,746	174,719	107,323	12,855	2,507	36,196	230,582
T8	178,277	171,834	92,546	13,066	2,494	55,056	210,526
T9	202,542	169,035	68,206	12,843	2,794	59,758	208,545
T10	217,710	167,168	71,096	12,733	2,895	43,021	209,009
T11	189,145	181,766	89,619	13,170	2,719	43,021	204,129
T12	182,966	192,768	92,385	13,297	2,607	43,021	196,473
T13	177,809	212,212	83,416	14,073	2,428	43,021	190,558
T14	172,535	209,387	86,961	14,189	2,321	43,021	195,102
T15	186,579	202,932	70,386	13,188	2,320	43,021	205,091
T16	209,991	188,830	58,907	12,795	2,240	43,021	207,733
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

(2c) Area of Old Forest Area by Grouping of Productive Forest (ha)

	Lower Old Forest Age (Years): 80	100	100	100	90	100	160	110-120
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo
T1	3,707	1,851	8,811	17,199	1,251	23,309	97	18,431
T2	3,973	1,743	9,642	14,380	1,575	30,629	182	14,809
T3	5,204	1,558	12,614	13,998	1,700	34,990	224	16,302
T4	5,691	1,516	17,426	11,996	1,253	32,434	241	19,763
T5	3,299	1,477	22,602	19,411	1,097	29,942	292	24,626
T6	4,898	1,428	25,097	16,978	1,042	23,763	290	32,671
T7	9,447	1,381	24,416	10,854	1,010	18,380	233	40,400
T8	10,850	1,367	20,692	7,651	999	24,054	229	31,067
T9	10,133	1,328	20,925	8,677	1,026	39,954	245	34,386
T10	9,952	1,362	21,649	7,309	992	36,570	244	38,684
T11	10,320	1,328	20,665	7,050	1,008	28,844	187	50,443
T12	10,074	1,328	20,665	7,414	1,023	32,901	199	57,959
T13	5,902	1,328	20,665	9,625	1,304	28,324	211	67,830
T14	5,858	1,328	20,665	9,348	1,415	22,144	285	69,326
T15	9,862	1,328	20,665	8,708	1,010	20,800	309	74,977
T16	10,240	1,328	20,665	7,050	992	20,800	373	80,678
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840

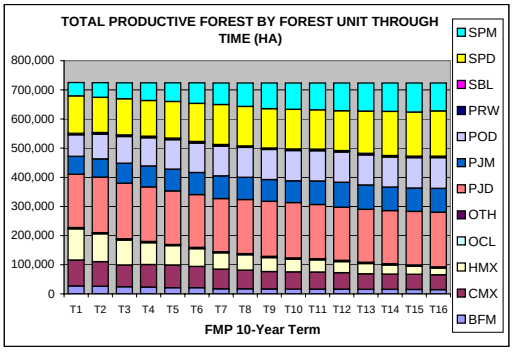
(2b partial) Productive Forest Area Through Time Data (hectares): **(2d)**

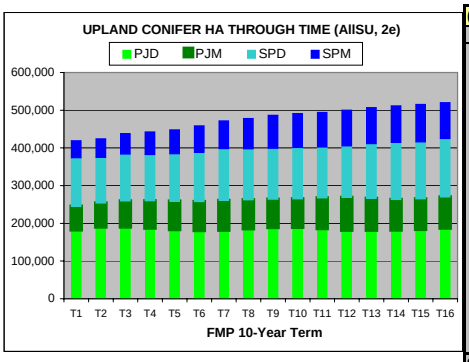
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	(2e) Upland Conifer
T1	725,390	27,148	88,490	107,239	2,216	1,995	182,833	61,845	73,978	3,312	1,807	128,589	45,937	419,205
T2	724,568	25,707	84,552	95,517	2,205	1,994	190,328	62,795	84,965	3,358	1,814	121,273	50,059	424,455
T3	723,956	24,121	74,862	85,665	2,196	1,994	190,548	68,407	91,986	3,424	1,822	124,111	54,821	437,886
T4	723,956	23,213	77,088	74,858	2,196	1,994	187,605	71,652	96,745	3,435	1,822	122,771	60,577	442,604
T5	723,956	20,967	77,666	66,463	2,196	1,994	183,861	74,436	101,339	3,446	1,822	125,637	64,128	448,062
T6	723,956	20,785	72,998	61,215	2,196	1,994	181,177	75,962	100,813	3,491	1,822	131,102	70,402	458,643
T7	723,928	16,943	67,528	56,002	2,196	1,994	182,047	77,952	102,243	3,538	1,822	137,389	74,274	471,661
T8	723,799	16,866	64,631	52,317	2,196	1,994	185,658	76,252	102,292	3,552	1,822	135,366	80,851	478,127
T9	723,723	16,465	59,998	47,642	2,196	1,994	189,113	74,359	103,240	3,514	1,822	134,960	88,420	486,852
T10	723,632	16,143	59,084	43,773	2,195	1,994	189,783	74,516	103,906	3,489	1,823	136,162	90,764	491,225
T11	723,570	15,822	58,885	41,517	2,195	1,994	186,207	80,591	103,714	3,371	1,823	135,180	92,269	494,247
T12	723,516	15,818	56,618	38,035	2,189	1,994	182,144	85,843	103,570	3,317	1,829	136,965	95,194	500,146
T13	723,516	15,263	53,133	35,348	2,183	1,994	181,844	83,662	103,362	3,253	1,835	145,434	96,205	507,145
T14	723,516	15,333	52,431	31,311	2,182	1,994	182,483	80,249	103,394	3,222	1,836	151,728	97,354	511,814
T15	723,516	14,643	52,296	27,472	2,182	1,994	184,296	79,904	104,517	3,138	1,836	151,329	99,908	515,438
T16	723,516	14,470	50,856	22,923	2,182	1,994	187,612	81,655	105,761	3,103	1,836	155,239	95,886	520,391
OLT Max.		19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175	497,902
OLT Min.		10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174	457,260

(5a)

Available Forest:

Term	
T1	572,034
T2	571,212
T3	570,600
T4	570,600
T5	570,600
T6	570,600
T7	570,572
T8	570,442
T9	570,367
T10	570,276
T11	570,213
T12	570,160
T13	570,160
T14	570,160
T15	570,160
T16	570,160





(3f)

(3a) Caribou Habitat Through Time:

Term	Cr	Cwu	Cwp	% Con in CarSUs
T1	101,492	45,035	18,032	89%
T2	94,299	40,986	14,155	90%
T3	113,561	78,185	13,150	90%
T4	129,544	88,338	17,847	90%
T5	138,160	101,373	51,175	90%
T6	153,750	117,157	58,167	91%
T7	155,252	117,705	55,317	91%
T8	152,013	111,660	53,157	92%
T9	150,048	106,574	50,577	92%
T10	147,605	101,267	44,929	93%
T11	147,605	98,152	40,642	94%
T12	147,605	104,586	39,288	94%
T13	151,588	114,367	36,912	95%
T14	147,605	113,772	38,143	95%
T15	150,128	121,655	36,912	95%
T16	154,729	126,929	38,206	95%
OLT Max.	161,804	47,453	68,169	maint or
OLT Min.	147,605	26,809	36,912	increase.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 01_OLT_70 **Input File:** 01_OLT_70.inp **Date:** July 27, 2010.

HARVEST AREA and VOLUME RESULTS:

Implications on Wood Supply - Area by forest unit age grouping worse with OLT forest condition achievement - some improvements are possible.

Available Harvest Area by Term Data (hectares harvested annually)

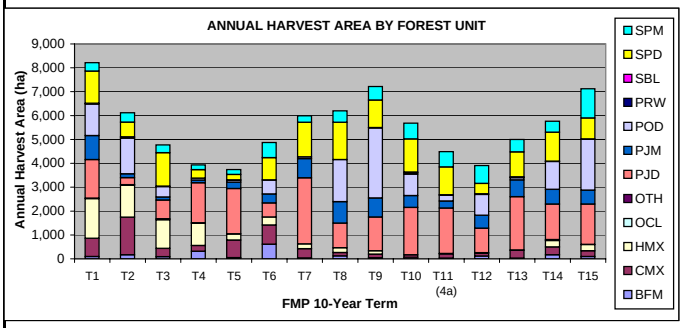
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	8,219	91	766	1,662	18	0	1,615	1,005	1,328	12	19	1,345	357
T2	6,120	170	1,569	1,349	16	0	294	159	1,493	52	1	618	398
T3	4,770	84	354	1,195	0	42	782	130	435	9	10	1,403	325
T4	3,933	317	237	936	0	15	1,678	114	78	3	0	355	200
T5	3,740	47	738	255	0	4	1,895	270	84	1	12	229	205
T6	4,871	607	807	337	0	0	590	375	579	4	6	933	633
T7	5,993	36	387	202	0	0	2,770	801	74	3	0	1,443	278
T8	6,199	121	140	198	0	0	1,038	898	1,760	3	1	1,558	484
T9	7,215	40	152	145	1	0	1,414	797	2,936	6	3	1,154	568
T10	5,682	61	105	0	0	0	1,984	495	898	62	28	1,389	660
T11 (4a)	4,490	25	180	0	13	0	1,904	295	249	11	0	1,170	642
T12	3,910	113	124	0	12	3	1,030	538	872	9	18	436	755
T13	4,997	27	326	15	1	0	2,231	701	94	18	17	1,042	524
T14	5,765	165	330	266	1	45	1,487	614	1,167	13	2	1,212	463
T15	7,123	91	241	265	1	3	1,687	589	2,126	7	11	877	1,225

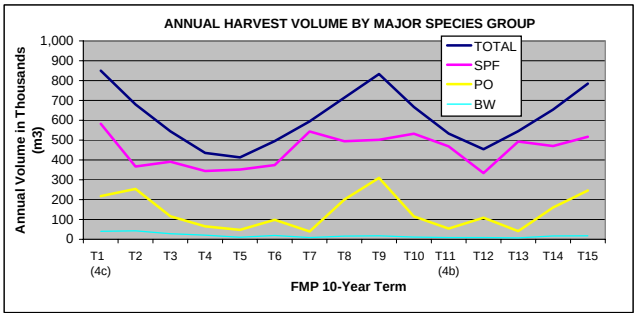
Annual Harvest Volumes by Major Species Groups (1,000s net merchantable cubic metres)

Term	TOTAL	SPF	PO	BW	PRW
T1 (4c)	850.1	582.3	217.8	40.6	1.2
T2	680.1	366.6	254.0	43.0	5.6
T3	544.0	391.1	116.5	28.3	0.9
T4	435.2	344.5	65.5	20.9	0.2
T5	412.9	351.3	47.3	10.5	0.1
T6	495.5	374.6	98.2	19.0	0.3
T7	594.6	543.7	39.8	8.7	0.4
T8	713.5	494.5	200.3	15.8	0.3
T9	833.4	502.0	309.6	17.6	0.6
T10	666.7	532.2	115.7	10.9	6.4
T11 (4b)	533.4	468.5	54.0	8.7	1.0
T12	454.2	333.7	109.1	8.8	0.8
T13	545.1	492.8	41.3	7.3	2.7
T14	654.1	470.3	160.4	16.7	1.2
T15	784.9	516.9	246.0	18.0	0.6
Average	613.2	451.0	138.4	18.3	1.5

Projected Revenues, Expenditures & Renewal Area

Term	Revenue M$	Expend. M$	Unspent M$	Renewal ha	Exten ha	Basc1 ha	Intn1 ha
T1	3,443	3,311	132	**8,137**	3,797	3,797	543
T2	2,347	2,433	-86	**6,058**	3,363	2,309	386
T3	2,288	2,178	111	**4,770**	1,916	2,535	318
T4	1,976	1,772	203	**3,933**	1,437	2,225	271
T5	1,994	2,091	-97	**3,740**	803	2,565	371
T6	2,166	2,634	-468	**4,868**	1,544	2,950	375
T7	3,041	3,504	-464	**5,980**	822	4,571	586
T8	2,891	2,809	82	**6,192**	2,316	3,457	418
T9	3,019	2,758	261	**7,206**	3,425	3,364	416
T10	3,097	3,051	45	**5,676**	1,274	3,924	477
T11	2,641	2,694	-54	**4,485**	569	3,487	429
T12	1,938	1,886	51	**3,910**	1,199	2,490	220
T13	2,781	2,945	-164	**4,997**	581	4,072	345
T14	2,741	1,877	864	**5,765**	3,165	2,390	210
T15	3,054	2,591	463	**7,123**	3,618	3,090	415





NOTES:

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 01_OLT_70 **Input File:** 01_OLT_70.inp **Date:** July 27, 2010.

Immature Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	416,005	18,788	57,263	51,501	188	162	133,100	29,828	26,319	635	947	73,007	24,268
T2	436,596	17,102	49,771	37,304	409	191	152,658	38,594	45,645	825	1,125	64,902	28,071
T3	491,429	16,503	48,923	40,180	612	231	158,972	47,356	70,408	1,335	1,122	70,427	35,359
T4	523,556	14,347	48,590	38,942	669	692	162,332	51,974	82,213	1,479	1,247	79,275	41,798
T5	493,030	5,694	44,751	35,424	684	852	136,261	55,759	88,015	1,578	1,093	79,552	43,369
T6	454,954	2,505	36,425	32,882	727	860	117,930	56,786	89,500	1,701	1,069	68,498	46,069
T7	441,788	4,088	29,737	32,963	684	898	121,085	57,147	90,182	1,816	827	59,699	42,661
T8	442,657	3,801	31,091	28,705	721	880	137,906	61,772	71,963	1,700	803	57,877	45,438
T9	439,782	3,622	28,816	22,702	581	863	142,998	58,178	69,553	1,765	643	61,841	48,220
T10	455,973	3,410	26,946	18,776	468	516	149,661	57,826	87,361	1,685	655	62,907	45,763
T11	460,530	2,652	26,347	15,682	464	394	155,557	59,527	88,129	1,768	835	63,505	45,671
T12	468,119	2,521	26,138	14,201	584	363	155,420	60,418	86,015	1,765	827	69,600	50,267
T13	473,437	1,191	25,074	11,730	686	396	158,954	59,597	85,558	1,759	905	73,489	54,100
T14	468,883	1,144	24,929	10,672	688	396	161,798	59,713	82,610	1,877	1,008	73,999	50,049
T15	459,897	1,455	25,910	11,664	688	829	159,109	61,294	78,470	1,793	1,010	66,275	51,400
T16	457,728	1,674	26,939	12,175	687	847	160,323	64,014	74,635	1,791	1,091	60,434	53,117
	Max OLT	3,260	31,472	42,688	1,328	1,063	292,834	96,487	30,987	115,789	10,363	18,903	44,874
	Min OLT	1,948	11,696	21,591	465	448	106,124	36,541	12,670	45,886	3,667	6,479	17,441

Mature+ Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	309,386	8,361	31,227	55,738	2,029	1,833	49,734	32,017	47,659	2,678	860	55,582	21,669
T2	287,972	8,605	34,781	58,213	1,797	1,803	37,670	24,201	39,320	2,533	690	56,372	21,989
T3	232,527	7,618	25,939	45,484	1,584	1,763	31,576	21,051	21,578	2,089	700	53,683	19,462
T4	200,400	8,866	28,498	35,916	1,527	1,303	25,273	19,678	14,532	1,957	576	43,496	18,779
T5	230,926	15,273	32,916	31,039	1,512	1,143	47,600	18,677	13,324	1,868	730	46,085	20,759
T6	269,003	18,280	36,573	28,333	1,468	1,134	63,247	19,176	11,313	1,789	753	62,603	24,332
T7	282,140	12,855	37,791	23,038	1,512	1,097	60,962	20,805	12,061	1,722	995	77,690	31,612
T8	281,142	13,066	33,540	23,612	1,474	1,114	47,752	14,480	30,330	1,851	1,020	77,489	35,414
T9	283,941	12,843	31,182	24,940	1,615	1,132	46,115	16,181	33,687	1,749	1,180	73,119	40,200
T10	267,659	12,733	32,138	24,997	1,727	1,479	40,121	16,690	16,545	1,804	1,168	73,255	45,001
T11	263,039	13,170	32,538	25,835	1,731	1,600	30,650	21,064	15,585	1,604	987	71,675	46,598
T12	255,398	13,297	30,480	23,834	1,604	1,631	26,725	25,425	17,556	1,552	1,002	67,365	44,927
T13	250,079	14,073	28,059	23,618	1,497	1,598	22,890	24,065	17,804	1,494	930	71,945	42,105
T14	254,634	14,189	27,502	20,638	1,494	1,599	20,685	20,537	20,784	1,345	827	77,729	47,305
T15	263,620	13,188	26,386	15,808	1,494	1,166	25,187	18,610	26,048	1,344	826	85,055	48,508
T16	265,789	12,795	23,917	10,748	1,494	1,148	27,289	17,641	31,125	1,312	746	94,805	42,769
	Max OLT	15,933	42,682	39,118	2,219	1,962	99,173	46,652	27,723	1,131	15,367	58,117	40,301
	Min OLT	8,361	24,197	19,993	1,499	1,240	52,493	27,435	12,933	452	10,078	34,643	21,733
	Mature Onset Age:	60	70	60	70	60	70	70	60	80	70	70	70

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 02_OLT_50 **Input File:** 02_OLT_50.inp **Date:** July 27, 2010.

Purpose: Investigation to see if OLT minimum SNRV targets are achievable in 50 years and maintained thereafter.

Specific Inputs: BASE MODEL inputs plus minimum SNRV for OLT landscape classes, old forest, caribou habitat and upland conifer from T6 onwards as per OLT min below.
MLI, SLo no targets added.

RESULTS: Where projections in the following tables fall below the min. target, the data is shaded yellow; where projections exceed max. targets, the data is shaded green.

FOREST CONDITION RESULTS

Implications on Forest Condition - Min SNRVs achieved T6 onwards, except for MLb, SLo as noted above.
Min SNRV can be generally achieved in 50 years, or earlier.
PRW and SBL underachieved - calibration issue - no targets added to fix. HMX low but may be able to be improved.
Good caribou habitat projections with targets.

(2a) Productive Area by Landscape Class

Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional: Balsam	Lowland	Hardwood	Conifer
T1	200,327	152,744	62,934	8,361	2,889	105,229	192,907
T2	194,497	189,737	48,922	8,743	2,545	100,120	180,041
T3	170,659	239,960	74,897	7,749	2,284	68,742	159,731
T4	171,298	248,522	99,011	9,027	2,103	51,767	142,291
T5	142,288	233,598	107,414	15,476	2,242	50,927	172,076
T6	146,249	193,677	108,225	18,743	2,248	43,021	211,858
T7	159,378	167,636	105,500	12,866	2,507	43,021	233,085
T8	181,769	171,685	87,257	13,201	2,494	56,724	210,733
T9	204,412	166,720	66,593	12,970	2,749	62,530	207,815
T10	215,211	171,921	68,390	12,862	2,895	45,892	206,528
T11	188,754	182,104	91,072	13,333	2,719	43,021	202,633
T12	182,837	194,510	90,304	13,261	2,646	43,021	197,003
T13	176,948	211,557	87,100	14,162	2,373	43,021	188,419
T14	174,816	210,145	83,381	14,312	2,321	43,021	195,584
T15	188,319	201,284	70,606	13,181	2,320	43,021	204,851
T16	209,078	191,264	57,717	12,855	2,259	43,021	207,387
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

(2c) Area of Old Forest Area by Grouping of Productive Forest (ha)

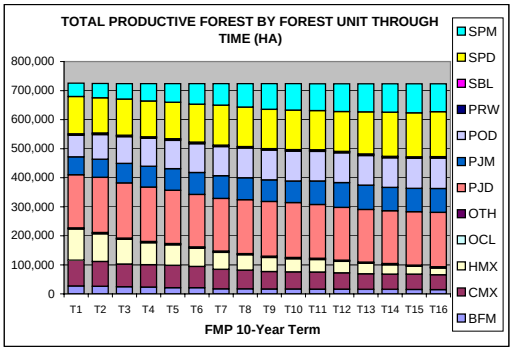
	Lower Old Forest Age (Years): 80	100	100	100	90	100	160	110-120
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo
T1	3,707	1,851	8,811	17,199	1,251	23,309	97	18,431
T2	4,111	1,801	10,820	14,373	1,575	30,629	182	14,809
T3	5,334	1,558	13,753	13,887	1,700	34,990	224	16,302
T4	5,694	1,516	18,134	12,079	1,253	32,434	241	19,763
T5	3,360	1,477	22,632	19,466	1,097	29,942	292	24,626
T6	5,315	1,428	25,133	17,004	1,042	23,763	290	32,673
T7	9,456	1,381	24,444	10,892	1,010	20,800	233	40,403
T8	11,020	1,367	20,747	7,741	999	24,054	229	31,059
T9	10,143	1,328	21,074	9,033	1,026	39,914	245	34,380
T10	9,932	1,362	21,965	7,578	992	36,540	244	38,685
T11	10,474	1,328	20,817	7,050	1,008	28,850	187	50,451
T12	10,088	1,328	20,665	7,864	1,023	32,911	199	57,854
T13	5,931	1,328	20,665	10,278	1,337	28,328	211	67,398
T14	5,895	1,328	20,665	10,134	1,415	22,149	285	68,683
T15	9,910	1,328	20,665	7,891	1,010	20,800	309	74,294
T16	10,291	1,328	20,665	7,050	992	20,800	373	80,075
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840

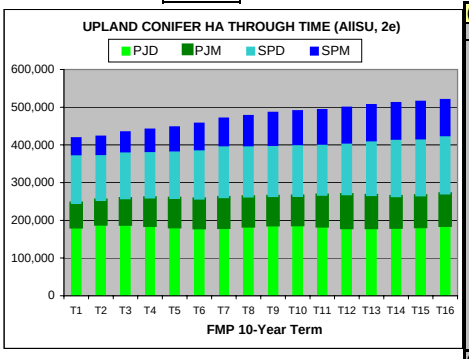
(2b partial) Productive Forest Area Through Time Data (hectares): **(2d)** **(2e) Upland Conifer**

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
T1	725,390	27,148	88,490	107,239	2,216	1,995	182,833	61,845	73,978	3,312	1,807	128,589	45,937	419,205
T2	724,604	25,799	85,429	95,415	2,209	1,994	190,399	62,290	84,937	3,349	1,811	121,117	49,855	423,660
T3	724,021	24,207	78,502	84,994	2,196	1,994	190,195	66,731	92,164	3,389	1,822	124,139	53,686	434,753
T4	724,021	23,331	77,205	75,397	2,196	1,994	187,277	71,445	96,631	3,421	1,822	123,019	60,283	442,025
T5	724,021	21,128	76,975	70,584	2,196	1,994	183,388	74,378	97,897	3,431	1,822	125,628	64,598	447,993
T6	724,021	21,118	73,016	63,041	2,196	1,994	180,704	75,351	99,353	3,470	1,822	130,691	71,263	458,010
T7	723,993	16,975	67,112	58,594	2,196	1,994	181,463	78,201	100,224	3,523	1,822	137,648	74,241	471,552
T8	723,862	17,006	64,305	52,872	2,196	1,994	185,501	75,792	102,047	3,537	1,822	135,815	80,976	478,083
T9	723,788	16,596	59,740	48,757	2,196	1,994	188,372	74,498	102,497	3,499	1,822	135,058	88,760	486,687
T10	723,699	16,275	58,991	45,519	2,195	1,994	188,921	74,719	102,521	3,472	1,823	136,297	90,971	490,908
T11	723,636	15,978	58,849	43,035	2,195	1,994	185,444	80,746	102,362	3,359	1,823	135,270	92,581	494,041
T12	723,581	15,892	56,398	39,424	2,191	1,994	181,391	85,831	102,246	3,306	1,827	137,180	95,901	500,302
T13	723,581	15,340	53,417	36,233	2,183	1,994	181,024	84,011	102,100	3,241	1,835	145,106	97,096	507,237
T14	723,581	15,461	52,105	32,172	2,183	1,994	182,159	80,259	102,095	3,216	1,835	152,062	98,040	512,519
T15	723,581	14,692	52,869	27,006	2,182	1,994	183,937	80,327	103,918	3,128	1,836	151,034	100,657	515,955
T16	723,581	14,559	51,118	23,049	2,182	1,994	187,273	82,145	104,966	3,094	1,836	154,656	96,709	520,782
OLT Max.		19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175	497,902
OLT Min.		10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174	457,260

(5a)

Available Forest: Term	
T1	572,034
T2	571,248
T3	570,664
T4	570,664
T5	570,664
T6	570,664
T7	570,637
T8	570,506
T9	570,432
T10	570,343
T11	570,280
T12	570,225
T13	570,225
T14	570,225
T15	570,225
T16	570,225





(3f)

(3a) Caribou Habitat Through Time: Term	Cr	Cwu	Cwp	% Con in CarSUs
T1	101,492	45,035	18,032	89%
T2	94,319	40,986	14,155	90%
T3	113,592	78,189	13,150	90%
T4	129,624	88,348	17,847	90%
T5	138,247	101,401	51,175	91%
T6	153,841	117,200	58,167	91%
T7	155,376	117,762	55,317	91%
T8	152,183	111,669	53,122	92%
T9	150,271	106,593	50,543	92%
T10	147,605	100,902	44,901	93%
T11	147,605	97,760	40,651	94%
T12	147,605	104,219	39,298	95%
T13	151,588	114,120	36,912	95%
T14	147,605	113,330	38,188	95%
T15	150,250	121,283	36,912	95%
T16	154,980	126,879	38,177	95%
OLT Max.	161,804	47,453	68,169	maint or
OLT Min.	147,605	26,809	36,912	increase.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 02_OLT_50 **Input File:** 02_OLT_50.inp **Date:** July 27, 2010.

HARVEST AREA and VOLUME RESULTS:

Implications on Wood Supply - Area by forest unit age grouping worse with OLT forest condition achievement - some improvements are possible.

Available Harvest Area by Term Data (hectares harvested annually)

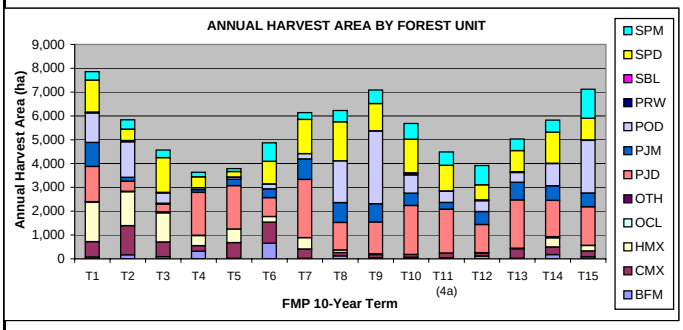
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	7,859	76	644	1,662	12	0	1,479	1,005	1,247	12	19	1,345	357
T2	5,836	170	1,219	1,423	22	0	426	159	1,493	52	1	474	398
T3	4,568	84	623	1,217	0	42	331	36	435	9	10	1,454	325
T4	3,636	317	234	420	0	15	1,805	114	78	3	0	451	200
T5	3,790	19	661	566	0	4	1,816	270	84	1	9	229	130
T6	4,868	653	882	237	0	0	791	375	195	4	8	945	777
T7	6,137	19	391	478	0	0	2,444	859	220	3	0	1,439	284
T8	6,229	121	140	110	0	0	1,154	832	1,753	3	1	1,632	484
T9	7,088	40	135	30	1	0	1,340	767	3,054	6	3	1,141	571
T10	5,679	58	127	0	0	0	2,054	518	764	60	28	1,410	662
T11 (4a)	4,487	39	194	0	9	0	1,838	288	467	11	0	1,074	567
T12	3,918	113	128	0	15	0	1,179	549	456	10	22	632	814
T13	5,034	19	404	15	1	3	2,033	733	412	18	14	887	496
T14	5,822	178	319	382	1	45	1,525	613	932	13	2	1,304	506
T15	7,117	82	245	231	1	3	1,617	580	2,211	7	9	911	1,219

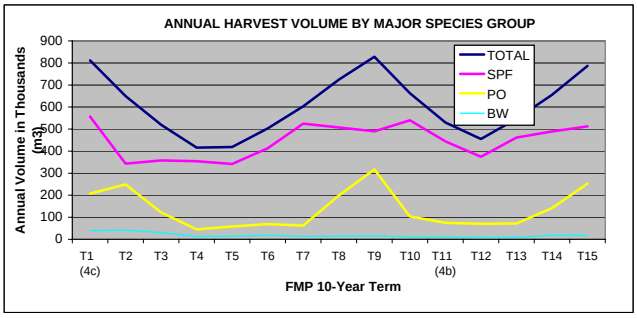
Annual Harvest Volumes by Major Species Groups (1,000s net merchantable cubic metres)

Term	TOTAL	SPF	PO	BW	PRW
T1 (4c)	811.6	556.3	207.6	39.2	1.2
T2	649.3	343.5	248.8	41.6	5.6
T3	519.4	357.6	122.2	30.4	0.9
T4	415.6	354.0	45.0	13.2	0.2
T5	419.0	342.0	58.0	14.8	0.1
T6	502.9	412.6	68.7	18.0	0.3
T7	603.4	524.6	62.4	13.5	0.4
T8	724.1	507.5	199.0	14.8	0.3
T9	828.1	490.3	317.5	16.2	0.6
T10	662.5	540.2	103.9	10.8	6.1
T11 (4b)	530.0	444.0	74.5	9.1	1.1
T12	455.2	374.4	70.5	8.0	0.9
T13	546.3	461.4	72.0	8.4	2.7
T14	655.5	489.3	141.8	17.8	1.2
T15	786.6	512.1	252.7	17.8	0.6
Average	607.3	447.3	136.3	18.2	1.5

Projected Revenues, Expenditures & Renewal Area

Term	Revenue M$	Expend. M$	Unspent M$	Renewal ha	Exten ha	Basc1 ha	Intn1 ha
T1	3,287	3,135	153	**7,781**	3,660	3,609	512
T2	2,209	2,141	68	**5,778**	3,368	2,077	333
T3	2,116	2,129	-13	**4,568**	1,941	2,317	309
T4	2,003	1,881	122	**3,636**	933	2,411	292
T5	1,955	1,938	18	**3,790**	1,072	2,374	344
T6	2,354	2,909	-555	**4,865**	1,126	3,317	422
T7	2,958	3,376	-418	**6,124**	1,216	4,347	561
T8	2,961	2,882	79	**6,222**	2,229	3,562	431
T9	2,959	2,672	287	**7,079**	3,424	3,253	402
T10	3,129	3,123	6	**5,672**	1,155	4,026	492
T11	2,522	2,556	-35	**4,482**	785	3,289	407
T12	2,133	2,141	-7	**3,918**	805	2,856	257
T13	2,634	2,796	-162	**5,034**	901	3,793	340
T14	2,834	1,937	897	**5,822**	3,133	2,475	214
T15	3,033	2,549	484	**7,117**	3,688	3,018	412





NOTES:

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 02_OLT_50 **Input File:** 02_OLT_50.inp **Date:** July 27, 2010.

Immature Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	416,005	18,788	57,263	51,501	188	162	133,100	29,828	26,319	635	947	73,007	24,268
T2	433,156	17,056	49,469	37,202	354	191	151,412	38,089	44,834	816	1,122	64,745	27,866
T3	485,516	16,458	48,034	40,179	612	231	158,619	45,681	70,000	1,300	1,122	69,055	34,224
T4	518,832	14,304	47,999	39,545	669	692	160,235	50,862	82,018	1,464	1,247	78,559	41,240
T5	483,300	5,652	44,030	34,158	684	852	132,788	54,825	84,538	1,563	1,093	79,534	43,583
T6	448,150	2,375	36,407	32,479	727	860	115,802	55,328	88,029	1,680	1,042	67,942	45,478
T7	432,514	4,110	29,277	32,448	684	898	118,901	56,577	84,445	1,801	827	59,925	42,622
T8	440,710	3,805	30,651	29,102	721	880	137,790	61,312	70,207	1,686	802	58,182	45,573
T9	437,724	3,626	28,641	22,879	624	863	142,281	58,327	66,976	1,750	645	62,596	48,514
T10	455,522	3,413	27,112	18,443	468	516	148,814	58,045	85,183	1,675	655	64,515	46,683
T11	461,930	2,645	26,393	16,588	464	394	154,772	59,696	87,389	1,756	835	64,752	46,247
T12	467,651	2,632	26,405	14,431	547	363	154,574	60,496	85,849	1,754	825	69,536	50,239
T13	475,605	1,178	25,429	12,069	686	363	158,046	60,041	84,874	1,747	959	75,117	55,095
T14	468,343	1,150	25,030	10,404	688	395	161,383	59,832	82,441	1,871	1,008	74,073	50,066
T15	460,209	1,511	26,218	11,939	688	829	158,651	61,789	77,129	1,784	1,010	66,660	52,001
T16	458,059	1,703	27,213	12,590	688	847	159,897	64,599	73,552	1,782	1,071	60,486	53,630
	Max OLT	3,260	31,472	42,688	1,328	1,063	292,834	96,487	30,987	115,789	10,363	18,903	44,874
	Min OLT	1,948	11,696	21,591	465	448	106,124	36,541	12,670	45,886	3,667	6,479	17,441

Mature+ Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	309,386	8,361	31,227	55,738	2,029	1,833	49,734	32,017	47,659	2,678	860	55,582	21,669
T2	291,448	8,743	35,960	58,213	1,855	1,803	38,987	24,201	40,103	2,533	690	56,372	21,989
T3	238,505	7,749	30,468	44,815	1,584	1,763	31,576	21,051	22,164	2,089	700	55,085	19,462
T4	205,188	9,027	29,206	35,852	1,527	1,303	27,042	20,584	14,613	1,957	576	44,459	19,043
T5	240,721	15,476	32,945	36,425	1,512	1,143	50,600	19,553	13,359	1,868	730	46,095	21,015
T6	275,870	18,743	36,609	30,562	1,468	1,134	64,902	20,023	11,325	1,789	780	62,750	25,785
T7	291,479	12,866	37,835	26,145	1,512	1,097	62,562	21,624	15,779	1,722	995	77,723	31,619
T8	283,152	13,201	33,655	23,770	1,474	1,114	47,711	14,480	31,839	1,851	1,020	77,633	35,403
T9	286,064	12,970	31,098	25,878	1,571	1,132	46,091	16,170	35,521	1,749	1,177	72,462	40,246
T10	268,177	12,862	31,879	27,076	1,728	1,479	40,107	16,675	17,338	1,797	1,168	71,782	44,288
T11	261,706	13,333	32,456	26,448	1,731	1,600	30,672	21,050	14,973	1,604	987	70,517	46,335
T12	255,930	13,261	29,993	24,993	1,644	1,631	26,817	25,335	16,397	1,552	1,002	67,644	45,662
T13	247,976	14,162	27,988	24,164	1,497	1,631	22,978	23,970	17,226	1,494	876	69,989	42,001
T14	255,238	14,312	27,075	21,768	1,494	1,599	20,776	20,427	19,654	1,345	827	77,988	47,974
T15	263,372	13,181	26,651	15,067	1,494	1,166	25,286	18,538	26,788	1,344	826	84,375	48,656
T16	265,523	12,855	23,905	10,459	1,494	1,148	27,376	17,546	31,414	1,312	765	94,170	43,078
	Max OLT	15,933	42,682	39,118	2,219	1,962	99,173	46,652	27,723	1,131	15,367	58,117	40,301
	Min OLT	8,361	24,197	19,993	1,499	1,240	52,493	27,435	12,933	452	10,078	34,643	21,733
Mature Onset Age:		60	70	60	70	60	70	70	60	80	70	70	70

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 03_FUgroup **Input File:** 03_FUgroup.inp **Date:** July 27, 2010.

Purpose: Investigation to see if forest unit grouping minimum SNRV targets are achievable in 50 years and maintained thereafter.

Specific Inputs: BASE MODEL inputs plus minimum SNRV for OLT forest unit area projections for all and mature+ ages from T6 onwards as per OLT min below (except PRW, SBL).

No min SNRV targets possible for OCL, OTH and SBL mature+ groups.

RESULTS: Where projections in the following tables fall below the min. target, the data is shaded yellow; where projections exceed max. targets, the data is shaded green.

FOREST CONDITION RESULTS

Implications on Forest Condition -

AllAC min OLT achieved immature for all forest units except PRW, SBL (as noted above).
AllAC min OLT achieved mature+ for all forest units except OCL, OTH and SBL (as noted above).
Matching forest unit groupings does not accommodate OLT Landscape Classes (that receive higher priority in achievement).
Worse achievement for caribou habitat when targets are only by forest unit age grouping.

(2a) Productive Area by Landscape Class

Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional: Balsam	Lowland	Hardwood	Conifer
T1	200,327	152,744	62,934	8,361	2,889	105,229	192,907
T2	194,254	189,737	48,922	7,664	1,705	103,909	178,416
T3	173,034	241,203	74,039	7,616	1,516	70,258	156,349
T4	178,849	242,325	93,901	8,902	1,462	52,062	146,514
T5	149,148	235,293	103,966	16,139	1,619	47,560	170,290
T6	145,086	194,374	108,304	17,032	1,620	40,413	217,188
T7	151,310	176,183	107,795	12,854	1,925	36,358	237,563
T8	165,722	173,984	95,762	13,283	1,700	53,600	219,739
T9	194,379	167,174	74,694	11,873	2,616	64,910	207,981
T10	215,913	168,958	71,282	10,886	2,603	39,406	214,390
T11	182,336	187,336	101,564	11,185	2,291	33,752	204,840
T12	169,250	202,604	106,257	10,759	1,641	33,803	198,846
T13	168,713	197,528	103,621	11,285	1,443	33,899	206,672
T14	163,251	198,055	108,609	8,511	1,332	33,718	209,685
T15	169,605	192,243	102,562	8,426	1,517	36,288	212,520
T16	198,039	175,126	78,386	8,681	1,456	44,750	216,723
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

(2c) Area of Old Forest Area by Grouping of Productive Forest (ha)

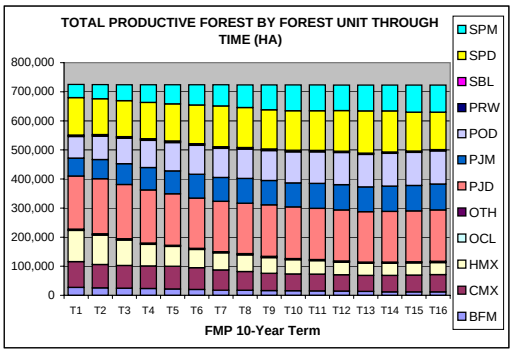
	Lower Old Forest Age (Years): 80	100	100	100	90	100	160	110-120
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo
T1	3,707	1,851	8,811	17,199	1,251	23,309	97	18,431
T2	3,032	961	9,501	19,464	1,260	38,525	182	11,945
T3	5,226	893	12,477	16,149	981	39,243	224	15,151
T4	5,688	876	17,294	12,849	719	36,955	241	18,650
T5	4,132	854	22,475	19,411	581	33,761	292	24,626
T6	3,650	826	25,097	17,123	542	27,271	290	32,671
T7	9,445	799	24,416	10,854	455	19,666	233	40,400
T8	10,874	641	17,712	7,609	431	31,769	213	27,919
T9	9,212	617	17,697	8,083	465	45,179	235	31,882
T10	8,438	586	16,080	6,135	397	39,162	236	34,471
T11	8,715	558	13,316	4,469	398	29,892	173	44,089
T12	7,566	586	11,448	4,344	393	28,332	184	49,742
T13	5,086	586	11,050	6,935	608	22,786	205	56,965
T14	4,788	503	11,376	6,012	526	23,225	192	55,317
T15	5,680	505	9,931	6,300	386	32,630	183	60,750
T16	6,080	507	9,820	6,231	387	39,522	221	64,730
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840

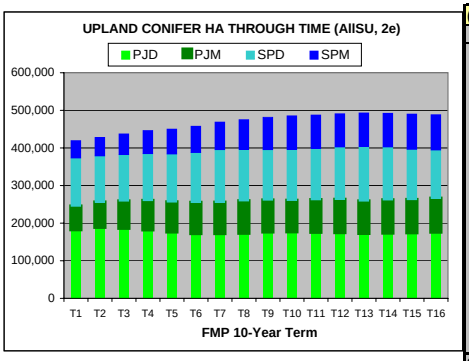
(2b partial) Productive Forest Area Through Time Data (hectares): **(2d)** **(2e) Upland**

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	Conifer
T1	725,390	27,148	88,490	107,239	2,216	1,995	182,833	61,845	73,978	3,312	1,807	128,589	45,937	419,205
T2	724,607	25,042	80,774	101,295	2,157	1,991	189,329	65,853	80,667	3,353	1,854	123,395	48,897	427,474
T3	724,015	24,094	78,188	87,604	2,153	1,987	186,656	71,585	87,612	3,399	1,857	124,006	54,874	437,121
T4	724,015	23,226	77,313	74,645	2,153	1,987	182,443	77,214	93,611	3,453	1,857	124,924	61,189	445,770
T5	724,015	21,587	78,226	67,800	2,153	1,987	177,196	78,633	97,373	3,453	1,857	127,949	65,801	449,579
T6	724,015	20,068	74,695	62,561	2,153	1,987	172,640	81,969	99,594	3,451	1,857	133,225	69,813	457,647
T7	723,987	17,183	69,757	58,827	2,153	1,987	172,884	81,990	100,293	3,495	1,857	140,356	73,205	468,435
T8	723,789	17,103	64,468	57,295	2,144	1,987	173,593	85,258	100,584	3,489	1,864	137,544	78,460	474,855
T9	723,627	16,054	59,597	53,845	2,144	1,987	177,012	83,636	103,379	3,437	1,865	134,655	86,017	481,319
T10	723,437	15,156	58,077	48,794	2,139	1,987	177,287	82,550	106,995	3,376	1,869	136,432	88,776	485,044
T11	723,303	14,894	57,864	45,819	2,138	1,987	176,322	85,501	108,684	2,946	1,870	136,289	88,990	487,101
T12	723,161	14,053	56,375	43,048	2,104	1,987	175,470	87,093	110,415	2,816	1,903	139,922	87,975	490,460
T13	723,161	13,440	54,843	41,584	2,100	1,987	173,204	85,170	111,688	2,693	1,907	145,434	89,110	492,918
T14	723,161	11,702	56,794	41,584	2,094	1,987	174,117	87,043	112,482	2,509	1,913	141,572	89,364	492,095
T15	723,161	11,442	58,031	41,584	2,092	1,987	174,744	87,565	113,703	2,429	1,915	134,018	93,650	489,977
T16	723,161	11,589	59,286	41,584	2,091	1,987	176,573	89,104	114,092	2,341	1,916	128,979	93,618	488,275
OLT Max.		19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175	497,902
OLT Min.		10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174	457,260

(5a) Available Forest:

Term	
T1	572,034
T2	571,251
T3	570,658
T4	570,658
T5	570,658
T6	570,658
T7	570,631
T8	570,433
T9	570,271
T10	570,081
T11	569,947
T12	569,804
T13	569,804
T14	569,804
T15	569,804
T16	569,804





(3a) Caribou Habitat Through Time:

Term	Cr	Cwu	Cwp	(3f) % Con in CarSUs
T1	101,492	45,035	18,032	89%
T2	93,304	41,002	14,171	89%
T3	112,553	78,200	13,166	89%
T4	128,522	88,350	17,861	90%
T5	137,130	101,380	51,190	90%
T6	152,962	116,002	58,176	90%
T7	154,163	116,547	55,326	91%
T8	144,842	107,171	51,950	91%
T9	135,039	97,746	47,205	90%
T10	124,135	86,508	40,110	90%
T11	120,833	77,175	32,071	90%
T12	119,885	77,731	27,836	90%
T13	128,195	87,192	26,885	90%
T14	122,701	84,702	32,847	90%
T15	129,501	97,447	35,335	90%
T16	138,002	109,636	39,497	90%
OLT Max.	161,804	47,453	68,169	maint or
OLT Min.	147,605	26,809	36,912	increase.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 03_FUgroup **Input File:** 03_FUgroup.inp **Date:** July 27, 2010.

HARVEST AREA and VOLUME RESULTS:

Implications on Wood Supply - Wood supply still fluctuates more than is predictable for the forest industry.

Available Harvest Area by Term Data (hectares harvested annually)

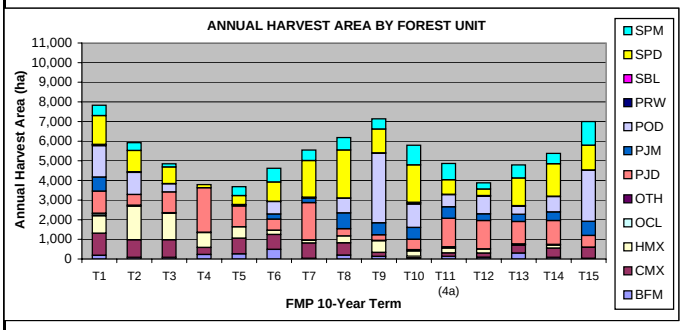
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	7,834	188	1,125	885	99	33	1,124	719	1,599	44	19	1,468	530
T2	5,921	79	900	1,706	7	43	546	0	1,129	21	11	1,081	397
T3	4,852	84	895	1,351	0	25	1,055	0	418	7	0	853	165
T4	3,787	231	357	760	0	15	2,260	0	0	1	0	164	0
T5	3,686	263	794	580	0	4	1,056	55	0	4	12	456	462
T6	4,622	486	759	215	0	9	556	264	636	4	6	982	705
T7	5,547	36	777	140	17	2	1,895	229	39	6	7	1,862	536
T8	6,182	199	622	353	1	1	360	812	749	2	2	2,445	636
T9	7,135	128	203	596	10	5	293	606	3,548	5	7	1,218	516
T10	5,796	54	86	264	2	64	531	603	1,191	60	33	1,905	1,005
T11 (4a)	4,868	130	179	244	67	1	1,451	583	620	12	3	745	833
T12	3,881	92	208	204	8	0	1,447	336	895	8	27	331	324
T13	4,795	300	412	23	12	22	1,137	368	405	21	10	1,409	675
T14	5,377	77	474	158	4	31	1,213	438	784	9	3	1,656	530
T15	6,995	31	564	0	3	4	594	721	2,595	6	11	1,267	1,200

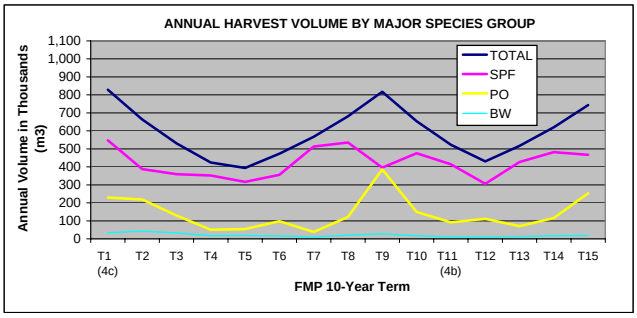
Annual Harvest Volumes by Major Species Groups (1,000s net merchantable cubic metres)

Term	TOTAL	SPF	PO	BW	PRW
T1 (4c)	828.9	547.4	229.2	34.0	4.8
T2	663.1	387.6	219.2	42.7	2.2
T3	530.5	358.8	130.0	32.5	0.7
T4	424.4	352.3	51.0	16.9	0.1
T5	394.1	316.7	53.8	18.5	0.4
T6	472.9	355.5	97.5	16.2	0.3
T7	567.5	513.5	38.3	11.1	0.7
T8	681.0	535.5	121.4	20.2	0.1
T9	817.2	396.0	386.2	28.4	0.5
T10	653.7	475.6	149.3	16.9	6.5
T11 (4b)	523.0	414.1	91.7	11.9	1.1
T12	430.4	305.6	111.3	10.4	0.8
T13	516.4	426.9	70.4	12.3	2.9
T14	619.7	481.6	115.7	17.1	0.8
T15	743.7	466.5	253.1	18.5	0.5
Average	591.1	422.2	141.2	20.5	1.5

Projected Revenues, Expenditures & Renewal Area

Term	Revenue M$	Expend. M$	Unspent M$	Renewal ha	Exten ha	Basc1 ha	Intn1 ha
T1	3,314	3,614	-300	**7,756**	3,143	4,059	554
T2	2,388	2,416	-28	**5,862**	3,012	2,513	337
T3	2,133	2,149	-16	**4,852**	2,165	2,344	342
T4	2,004	1,499	505	**3,787**	1,535	1,956	296
T5	1,822	1,532	290	**3,686**	1,647	1,716	323
T6	2,056	2,347	-291	**4,619**	1,633	2,621	365
T7	2,889	3,123	-234	**5,527**	1,132	3,827	568
T8	3,068	3,017	51	**6,166**	2,091	3,621	454
T9	2,507	1,984	524	**7,116**	4,644	2,210	263
T10	2,821	2,845	-24	**5,783**	1,909	3,462	412
T11	2,386	2,313	73	**4,854**	1,511	2,981	362
T12	1,788	1,317	471	**3,881**	1,948	1,722	211
T13	2,455	1,420	1,035	**4,795**	2,799	1,845	151
T14	2,770	1,084	1,686	**5,377**	3,934	1,277	165
T15	2,790	927	1,864	**6,995**	5,954	982	59





NOTES:

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 03_FUgroup **Input File:** 03_FUgroup.inp **Date:** July 27, 2010.

Immature Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	416,005	18,788	57,263	51,501	188	162	133,100	29,828	26,319	635	947	73,007	24,268
T2	432,913	17,378	49,464	35,568	1,142	503	146,910	38,879	43,973	1,137	1,165	68,214	28,581
T3	488,276	16,479	47,736	39,861	1,235	943	153,970	46,549	66,142	1,316	1,258	75,867	36,919
T4	515,074	14,323	48,348	38,055	1,267	1,218	155,287	52,114	78,908	1,485	1,281	81,038	41,750
T5	488,406	5,448	45,438	35,097	1,264	1,361	137,215	54,736	83,142	1,560	1,127	79,552	42,467
T6	447,763	3,036	38,122	35,716	1,287	1,352	109,393	54,534	86,661	1,662	1,104	70,156	44,739
T7	435,288	4,330	31,974	35,929	1,223	1,460	111,922	54,362	87,360	1,773	862	62,503	41,590
T8	435,467	3,819	34,699	34,635	1,396	1,186	121,100	57,823	70,446	1,665	913	62,826	44,960
T9	436,247	4,181	34,953	31,178	660	835	124,519	56,201	62,289	1,700	733	70,253	48,747
T10	456,153	4,271	33,880	28,801	694	672	124,794	55,115	88,897	1,334	711	70,228	46,758
T11	471,235	3,709	32,838	25,826	703	1,161	123,829	58,066	95,751	1,348	1,013	77,688	49,303
T12	478,110	3,294	32,178	23,055	1,308	1,109	122,977	59,658	97,482	1,262	1,058	81,366	53,363
T13	469,862	2,155	30,646	21,591	1,348	1,014	120,711	57,735	98,755	1,204	1,216	79,959	53,527
T14	469,915	3,192	32,597	21,591	1,426	1,195	121,624	59,608	99,549	1,165	1,249	73,772	52,948
T15	464,410	3,016	33,834	21,591	1,302	1,458	122,251	60,130	97,937	1,087	1,188	63,804	56,812
T16	451,551	2,908	35,089	21,591	1,296	1,417	124,080	61,669	89,905	1,031	1,255	49,187	62,122
	Max OLT	3,260	31,472	42,688	1,328	1,063	292,834	96,487	30,987	115,789	10,363	18,903	44,874
	Min OLT	1,948	11,696	21,591	465	448	106,124	36,541	12,670	45,886	3,667	6,479	17,441

Mature+ Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	309,386	8,361	31,227	55,738	2,029	1,833	49,734	32,017	47,659	2,678	860	55,582	21,669
T2	291,693	7,664	31,310	65,727	1,015	1,488	42,419	26,974	36,693	2,216	690	55,181	20,316
T3	235,738	7,616	30,451	47,744	918	1,044	32,686	25,036	21,470	2,083	598	48,138	17,955
T4	208,940	8,902	28,965	36,590	887	769	27,157	25,100	14,703	1,968	576	43,886	19,438
T5	235,608	16,139	32,788	32,703	889	626	39,981	23,896	14,230	1,893	730	48,397	23,335
T6	276,252	17,032	36,573	26,845	866	635	63,247	27,435	12,933	1,789	753	63,069	25,074
T7	288,699	12,854	37,782	22,897	930	527	60,962	27,628	12,933	1,722	995	77,854	31,615
T8	288,322	13,283	29,769	22,660	748	801	52,493	27,435	30,138	1,825	952	74,717	33,500
T9	287,380	11,873	24,644	22,667	1,484	1,152	52,493	27,435	41,090	1,737	1,132	64,402	37,270
T10	267,284	10,886	24,197	19,993	1,445	1,314	52,493	27,435	18,098	2,042	1,159	66,204	42,018
T11	252,067	11,185	25,026	19,993	1,434	826	52,493	27,435	12,933	1,598	857	58,601	39,686
T12	245,050	10,759	24,197	19,993	796	877	52,493	27,435	12,933	1,554	845	58,556	34,612
T13	253,299	11,285	24,197	19,993	752	973	52,493	27,435	12,933	1,488	691	65,475	35,584
T14	253,245	8,511	24,197	19,993	668	792	52,493	27,435	12,933	1,345	664	67,800	36,415
T15	258,750	8,426	24,197	19,993	790	529	52,493	27,435	15,766	1,342	727	70,214	36,838
T16	271,610	8,681	24,197	19,993	795	569	52,493	27,435	24,187	1,311	661	79,792	31,496
	Max OLT	15,933	42,682	39,118	2,219	1,962	99,173	46,652	27,723	1,131	15,367	58,117	40,301
	Min OLT	8,361	24,197	19,993	1,499	1,240	52,493	27,435	12,933	452	10,078	34,643	21,733
	Mature Onset Age:	60	70	60	70	60	70	70	60	80	70	70	70

WHISKEY JACK FOREST 2012 FMP — **SUMMARY of SFMM INVESTIGATION**

Case Name: 04_DEMAND **Input File:** 04_DEMAND.inp **Date:** July 27, 2010.

Purpose: Investigation to how long Term 1 2004 FMP harvest volume is achievable with OLT minimum SNRV targets from T6 onwards.

Specific Inputs: 02_OLT_50 inputs plus lower volume targets by species group from 2004 FMP, and deleted volume flow controls. Non-binding.

Group:		thousands of m3 per year.
PWR	1.6	from T1 2004 FMP.
SPF	400.0	from T1 2004 FMP.
PO	265.0	from T1 2004 FMP.
BW	25.0	from T1 2004 FMP.
Total	691.6	

TOTAL vol flow +/- 20% between terms.

RESULTS: Where projections in the following tables fall below the min. target, the data is shaded yellow; where projections exceed max. targets, the data is shaded green.

FOREST CONDITION RESULTS

Implications on Forest Condition - OLT forest condition projections good due to constraints included in model (except MLI, Slo, PRW, SBL).
Forest unit total area generally good, but underachievement of PJD and PJM mature+ area.
Caribou habitat good.

(2a) Productive Area by Landscape Class

Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional: Balsam	Lowland	Hardwood	Conifer
T1	200,327	152,744	62,934	8,361	2,889	105,229	192,907
T2	185,680	189,737	48,922	8,743	2,590	91,729	197,295
T3	157,550	240,863	82,755	8,477	2,545	60,532	171,356
T4	163,947	250,463	105,862	7,236	2,103	46,298	148,171
T5	153,790	219,190	111,556	16,437	2,173	48,364	172,569
T6	156,810	179,312	108,958	18,781	2,248	43,021	214,947
T7	165,829	163,021	103,793	12,856	2,507	43,021	233,025
T8	182,428	175,324	79,176	13,191	2,494	61,261	210,042
T9	201,440	174,449	61,149	12,750	2,713	65,070	206,271
T10	209,335	180,480	67,501	13,351	2,691	45,623	204,777
T11	185,328	183,094	92,784	13,274	2,721	43,021	203,473
T12	184,462	191,554	91,048	12,565	2,733	43,021	198,254
T13	181,432	207,396	85,996	14,401	2,583	43,021	188,809
T14	177,626	210,144	79,243	14,293	2,322	43,021	196,989
T15	187,822	202,255	67,106	13,159	2,271	43,021	208,003
T16	205,948	196,437	54,611	13,314	2,260	43,021	208,048
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

(2c) Area of Old Forest Area by Grouping of Productive Forest (ha)

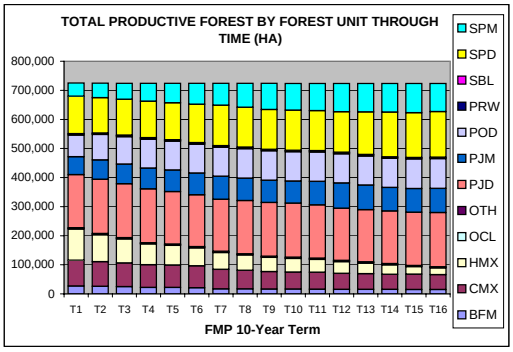
	Lower Old Forest Age (Years): 80	100	100	100	90	100	160	110-120
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo
T1	3,707	1,851	8,811	17,199	1,251	23,309	97	18,431
T2	4,111	1,847	11,862	15,934	1,575	40,823	182	16,371
T3	6,101	1,812	14,761	15,376	1,700	38,285	224	18,536
T4	3,798	1,516	18,714	11,996	1,067	32,559	241	19,763
T5	4,222	1,477	22,602	19,411	1,059	29,942	292	24,626
T6	5,315	1,428	25,097	16,978	1,042	23,763	290	32,671
T7	9,448	1,381	24,416	10,883	1,010	20,800	233	40,400
T8	11,013	1,367	20,728	8,141	999	24,073	229	30,561
T9	10,135	1,328	21,007	9,078	1,026	39,899	245	33,922
T10	9,919	1,362	21,720	7,448	992	36,528	244	38,237
T11	10,464	1,328	20,665	7,050	1,008	28,840	187	50,078
T12	9,872	1,328	20,665	9,867	1,023	32,928	199	57,203
T13	5,911	1,328	20,665	10,877	1,475	28,346	211	67,401
T14	5,874	1,328	20,665	11,275	1,415	22,170	285	69,404
T15	9,876	1,328	20,665	8,080	992	20,800	309	75,008
T16	10,250	1,328	20,665	7,050	992	20,800	373	80,719
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840

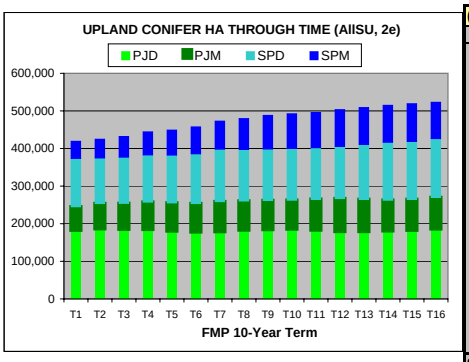
(2b partial) Productive Forest Area Through Time Data (hectares): **(2d)** **(2e) Upland Conifer**

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
T1	725,390	27,148	88,490	107,239	2,216	1,995	182,833	61,845	73,978	3,312	1,807	128,589	45,937	419,205
T2	724,696	25,799	84,711	92,763	2,212	1,994	186,691	66,562	87,323	3,346	1,809	121,390	50,096	424,739
T3	724,079	24,679	81,748	82,393	2,212	1,994	185,697	67,750	94,103	3,388	1,809	123,277	55,028	431,752
T4	724,079	22,156	77,928	71,399	2,199	1,994	185,245	71,574	99,034	3,454	1,822	125,681	61,592	444,092
T5	724,079	21,794	77,072	67,824	2,199	1,994	180,827	74,271	98,822	3,453	1,822	127,109	66,890	449,097
T6	724,079	21,169	75,339	61,453	2,199	1,994	178,354	74,809	99,165	3,467	1,822	132,156	72,151	457,470
T7	724,051	16,996	67,186	57,811	2,199	1,994	179,242	78,969	99,532	3,533	1,822	139,477	75,290	472,978
T8	723,916	17,025	64,103	52,362	2,199	1,994	183,316	76,846	101,171	3,546	1,822	137,410	82,123	479,695
T9	723,843	16,614	59,637	49,055	2,199	1,994	184,715	76,618	100,957	3,497	1,822	136,951	89,784	488,068
T10	723,758	16,288	58,731	46,553	2,198	1,994	186,027	76,103	100,444	3,461	1,822	138,051	92,086	492,267
T11	723,695	16,120	58,376	43,775	2,198	1,994	183,434	81,122	100,282	3,392	1,822	137,306	93,873	495,734
T12	723,638	15,440	54,886	40,471	2,195	1,994	179,602	86,733	100,254	3,344	1,825	139,362	97,529	503,227
T13	723,638	15,512	54,007	36,069	2,195	1,994	179,674	84,635	99,811	3,266	1,826	146,362	98,287	508,958
T14	723,638	15,454	51,933	32,319	2,186	1,994	181,371	80,799	99,734	3,247	1,835	153,959	98,807	514,936
T15	723,638	14,683	52,908	25,886	2,185	1,994	182,944	81,179	101,925	3,136	1,835	154,355	100,608	519,086
T16	723,638	14,858	51,412	22,796	2,185	1,994	186,192	83,053	102,447	3,091	1,836	156,555	97,218	523,018
OLT Max.		19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175	497,902
OLT Min.		10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174	457,260

(5a)

Available Forest: Term	
T1	572,034
T2	571,340
T3	570,722
T4	570,722
T5	570,722
T6	570,722
T7	570,695
T8	570,560
T9	570,486
T10	570,402
T11	570,339
T12	570,282
T13	570,282
T14	570,282
T15	570,282
T16	570,282





(3f)

(3a) Caribou Habitat Through Time: Term	Cr	Cwu	Cwp	% Con in CarSUs
T1	101,492	45,035	18,032	89%
T2	94,425	40,992	14,155	90%
T3	113,692	78,191	13,150	90%
T4	129,673	88,348	17,847	90%
T5	138,287	101,383	51,175	90%
T6	153,802	117,203	58,167	91%
T7	155,320	117,779	55,350	91%
T8	151,584	111,196	53,154	92%
T9	149,667	106,125	50,556	92%
T10	147,605	101,229	44,914	93%
T11	147,605	98,044	40,665	94%
T12	147,605	104,208	39,312	94%
T13	151,525	113,910	36,912	95%
T14	147,605	114,024	38,238	95%
T15	150,310	121,872	36,912	95%
T16	155,237	126,916	38,075	95%
OLT Max.	161,804	47,453	68,169	maint or
OLT Min.	147,605	26,809	36,912	increase.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 04_DEMAND **Input File:** 04_DEMAND.inp **Date:** July 27, 2010.

HARVEST AREA and VOLUME RESULTS:

Implications on Wood Supply - PO, BW vol met T1-2 only. SPF met T1-5. PWR met T1-4.

Available Harvest Area by Term Data (hectares harvested annually)

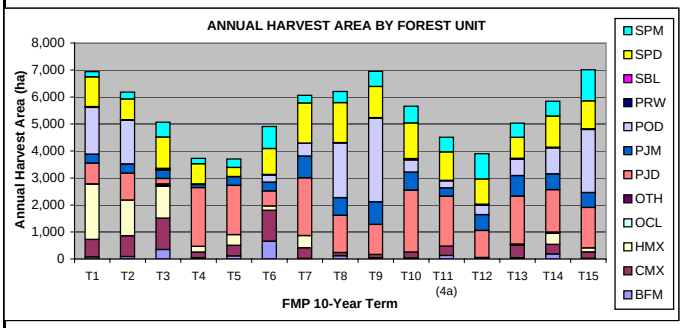
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	6,938	76	649	2,048	8	0	767	332	1,729	15	19	1,099	195
T2	6,178	90	772	1,318	0	0	995	347	1,620	16	0	765	255
T3	5,065	350	1,162	1,180	26	61	203	304	40	15	11	1,162	549
T4	3,728	43	214	210	0	0	2,173	114	0	15	7	752	200
T5	3,702	111	391	396	0	0	1,826	319	0	6	2	339	311
T6	4,906	658	1,143	162	0	0	556	324	268	11	8	961	814
T7	6,063	19	399	448	0	0	2,138	809	474	6	0	1,487	284
T8	6,206	121	115	0	0	0	1,384	652	2,025	13	1	1,477	418
T9	6,949	40	127	0	1	0	1,115	836	3,097	17	3	1,151	562
T10	5,661	37	217	0	0	0	2,293	673	448	17	28	1,321	626
T11 (4a)	4,511	129	339	0	6	0	1,852	303	265	17	0	1,053	547
T12	3,898	24	29	0	1	0	1,000	586	350	17	18	935	938
T13	5,028	42	469	15	18	6	1,779	761	604	17	17	775	525
T14	5,840	182	359	410	1	44	1,572	585	958	17	8	1,154	551
T15	7,012	26	236	147	1	2	1,496	555	2,334	17	4	1,035	1,160

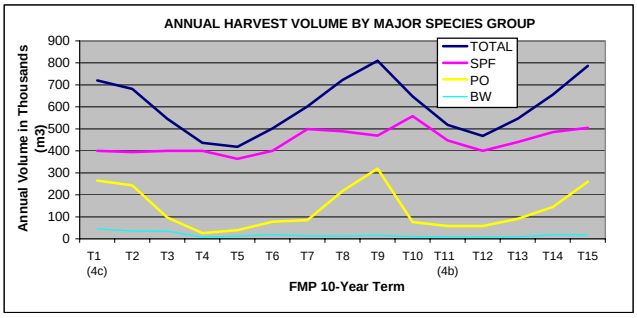
Annual Harvest Volumes by Major Species Groups (1,000s net merchantable cubic metres)

Term	TOTAL	SPF	PO	BW	PRW
T1 (4c)	720.3	400.0	265.0	45.3	1.6
T2	682.0	394.5	243.0	35.7	1.6
T3	545.6	400.0	96.8	34.7	1.6
T4	436.5	400.0	26.3	7.2	1.6
T5	418.2	363.7	39.4	12.0	0.6
T6	501.8	400.0	77.8	18.8	1.1
T7	602.2	499.4	85.1	14.1	0.7
T8	722.6	488.7	217.5	12.7	1.1
T9	809.6	469.3	319.2	16.0	1.6
T10	647.7	558.1	76.6	9.9	1.6
T11 (4b)	518.1	447.8	58.1	9.6	1.6
T12	468.2	400.0	58.2	7.7	1.6
T13	546.2	440.0	90.9	9.5	2.6
T14	655.4	485.3	144.9	17.9	1.6
T15	786.5	504.9	259.7	17.1	1.6
Average	604.0	443.4	137.2	17.9	1.5

Projected Revenues, Expenditures & Renewal Area

Term	Revenue M$	Expend. M$	Unspent M$	Renewal ha	Exten ha	Basc1 ha	Intn1 ha
T1	2,480	2,175	306	**6,869**	4,311	2,222	336
T2	2,422	2,248	175	**6,116**	3,312	2,454	351
T3	2,360	2,660	**-300**	**5,065**	1,863	2,803	399
T4	2,249	2,153	96	**3,728**	531	2,839	358
T5	2,057	2,011	46	**3,702**	798	2,565	339
T6	2,305	3,000	**-695**	**4,903**	1,158	3,306	438
T7	2,841	3,239	**-398**	**6,050**	1,402	4,116	531
T8	2,878	2,743	135	**6,199**	2,383	3,404	412
T9	2,855	2,586	270	**6,940**	3,428	3,125	387
T10	3,158	3,246	**-88**	**5,654**	907	4,222	526
T11	2,536	2,686	**-150**	**4,505**	666	3,411	428
T12	2,269	2,254	15	**3,898**	602	3,037	259
T13	2,536	2,685	**-149**	**5,028**	1,124	3,578	327
T14	2,820	2,002	817	**5,840**	3,057	2,567	216
T15	3,008	2,415	593	**7,012**	3,792	2,816	404





NOTES:

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 04_DEMAND **Input File:** 04_DEMAND.inp **Date:** July 27, 2010.

Immature Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	416,005	18,788	57,263	51,501	188	162	133,100	29,828	26,319	635	947	73,007	24,268
T2	424,339	17,056	48,798	38,279	311	191	140,820	35,850	51,882	847	1,119	62,641	26,545
T3	481,168	16,203	46,911	40,445	374	231	153,991	42,436	77,282	981	1,102	67,972	33,242
T4	520,271	14,920	48,142	39,968	672	878	157,496	50,990	85,284	1,253	1,246	77,711	41,712
T5	484,536	5,357	44,156	33,889	687	890	132,600	54,718	85,499	1,464	1,161	79,967	44,148
T6	445,081	2,389	36,158	31,688	730	860	113,486	54,786	87,043	1,604	1,042	69,290	46,004
T7	432,643	4,140	29,379	31,662	687	898	116,713	57,312	83,757	1,811	827	61,780	43,678
T8	436,928	3,834	30,599	27,365	724	880	135,621	62,347	66,022	1,721	802	60,272	46,740
T9	437,038	3,863	28,968	21,561	661	863	138,556	60,503	64,512	1,805	646	65,120	49,979
T10	457,316	2,936	27,715	16,937	659	363	145,849	59,486	86,070	1,791	671	66,508	48,332
T11	461,206	2,847	26,325	15,723	465	363	152,690	60,129	86,944	1,788	835	66,163	46,934
T12	467,064	2,875	26,868	14,281	519	363	152,490	61,711	85,055	1,792	769	69,648	50,694
T13	474,823	1,111	25,874	11,763	525	363	156,426	60,974	82,727	1,772	913	76,355	56,021
T14	467,013	1,161	25,183	10,268	691	424	160,362	60,663	80,335	1,902	1,007	74,457	50,560
T15	457,184	1,524	26,424	12,106	691	847	157,468	62,834	73,832	1,785	1,058	66,781	51,835
T16	456,996	1,545	27,523	12,546	691	847	158,663	65,698	70,824	1,778	1,070	61,519	54,292
	Max OLT	3,260	31,472	42,688	1,328	1,063	292,834	96,487	30,987	115,789	10,363	18,903	44,874
	Min OLT	1,948	11,696	21,591	465	448	106,124	36,541	12,670	45,886	3,667	6,479	17,441

Mature+ Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	309,386	8,361	31,227	55,738	2,029	1,833	49,734	32,017	47,659	2,678	860	55,582	21,669
T2	300,358	8,743	35,913	54,484	1,901	1,803	45,871	30,712	35,442	2,499	690	58,749	23,551
T3	242,910	8,477	34,837	41,948	1,838	1,763	31,706	25,313	16,821	2,407	707	55,305	21,787
T4	203,807	7,236	29,786	31,432	1,527	1,116	27,749	20,584	13,750	2,202	576	47,970	19,881
T5	239,543	16,437	32,916	33,936	1,512	1,105	48,227	19,553	13,324	1,989	661	47,142	22,742
T6	278,998	18,781	39,181	29,765	1,468	1,134	64,868	20,023	12,122	1,863	780	62,866	26,146
T7	291,409	12,856	37,807	26,149	1,512	1,097	62,529	21,657	15,775	1,722	995	77,697	31,612
T8	286,988	13,191	33,503	24,996	1,474	1,114	47,695	14,499	35,150	1,825	1,020	77,138	35,382
T9	286,804	12,750	30,669	27,494	1,537	1,132	46,159	16,114	36,445	1,693	1,176	71,831	39,805
T10	266,442	13,351	31,016	29,617	1,539	1,631	40,178	16,618	14,374	1,670	1,152	71,543	43,753
T11	262,489	13,274	32,052	28,052	1,734	1,631	30,744	20,993	13,338	1,604	987	71,143	46,939
T12	256,573	12,565	28,019	26,190	1,677	1,631	27,112	25,022	15,200	1,552	1,056	69,715	46,835
T13	248,814	14,401	28,133	24,306	1,670	1,631	23,249	23,661	17,084	1,494	912	70,006	42,266
T14	256,625	14,293	26,749	22,051	1,494	1,571	21,009	20,136	19,399	1,345	828	79,502	48,247
T15	266,454	13,159	26,484	13,780	1,494	1,148	25,476	18,346	28,093	1,351	777	87,574	48,773
T16	266,642	13,314	23,889	10,250	1,494	1,148	27,529	17,355	31,623	1,312	765	95,036	42,926
	Max OLT	15,933	42,682	39,118	2,219	1,962	99,173	46,652	27,723	1,131	15,367	58,117	40,301
	Min OLT	8,361	24,197	19,993	1,499	1,240	52,493	27,435	12,933	452	10,078	34,643	21,733
	Mature Onset Age:	60	70	60	70	60	70	70	60	80	70	70	70

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 05_BENCH **Input File:** 05_BENCH.inp **Date:** July 27, 2010.

Purpose: Investigation to see if OFAAB Benchmark harvest volume is achievable with OLT minimum SNRV targets.

Specific Inputs: 02_OLT_50 inputs plus lower volume targets by species group from OFAAB Benchmark, non-binding.

Group:	Bench
PWR	0.6
SPF	354.0
PO	149.0
BW	4.0
Total	507.6

thousands of m3 per year.

RESULTS: Where projections in the following tables fall below the min. target, the data is shaded yellow; where projections exceed max. targets, the data is shaded green.

FOREST CONDITION RESULTS

Implications on Forest Condition - OLT forest condition projections good due to constraints included in model (except MLI, SPo as per NATURE).
Total forest unit area underachievement of PRW and SBL. Underachievment of PJD and PJM mature+ area (no constraints included).
HMX low in later terms but is controllable with added constraint if needed.
Caribou habitat projections good.

(2a) Productive Area by Landscape Class

Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional: Balsam	Lowland	Hardwood	Conifer
T1	200,327	152,744	62,934	8,361	2,889	105,229	192,907
T2	186,618	189,737	48,922	8,605	2,450	104,497	183,857
T3	162,875	240,897	71,194	6,753	2,282	81,696	158,446
T4	172,088	242,756	89,346	8,932	2,103	60,648	148,271
T5	151,108	229,154	101,149	15,378	2,242	51,400	173,713
T6	143,268	190,246	111,719	18,696	2,222	44,187	213,805
T7	157,006	165,989	109,693	12,860	2,507	43,021	233,039
T8	179,564	176,950	98,255	13,103	2,494	43,021	210,596
T9	194,061	166,824	92,928	13,147	2,823	48,247	205,880
T10	206,060	161,718	88,111	12,616	2,674	49,992	202,647
T11	202,376	172,490	87,455	13,566	2,712	50,185	194,979
T12	186,384	188,103	91,311	13,071	2,576	43,021	199,241
T13	164,950	216,815	92,798	14,215	2,424	43,021	189,486
T14	162,722	216,952	84,066	14,467	2,336	43,391	199,774
T15	173,742	197,149	83,030	13,203	2,320	43,021	211,244
T16	195,244	180,674	81,462	12,899	2,240	43,021	208,168
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

(2c) Area of Old Forest Area by Grouping of Productive Forest (ha)

	Lower Old Forest Age (Years): 80	100	100	100	90	100	160	110-120
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo
T1	3,707	1,851	8,811	17,199	1,251	23,309	97	18,431
T2	3,973	1,707	13,330	13,276	1,575	33,387	182	14,809
T3	4,364	1,557	12,614	13,664	1,700	34,990	224	16,302
T4	5,692	1,516	17,426	11,890	1,658	32,434	241	19,763
T5	3,383	1,477	22,602	19,411	1,625	29,942	292	24,626
T6	5,315	1,428	25,097	16,979	1,457	23,763	290	32,671
T7	9,452	1,381	24,416	10,908	1,260	20,800	233	40,400
T8	10,876	1,367	20,730	7,050	1,239	24,054	229	31,161
T9	10,137	1,328	21,091	8,815	1,026	39,664	245	34,477
T10	9,777	1,362	21,942	7,385	992	36,094	244	38,774
T11	10,857	1,328	20,771	7,050	1,008	29,178	187	50,537
T12	9,850	1,328	20,665	7,050	1,023	33,055	199	58,067
T13	5,904	1,328	20,665	8,420	1,038	28,390	211	67,763
T14	5,912	1,328	20,665	8,515	992	22,050	285	69,164
T15	9,884	1,328	20,665	8,198	1,106	20,800	309	74,751
T16	10,279	1,328	20,665	7,171	1,197	20,800	373	80,519
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840

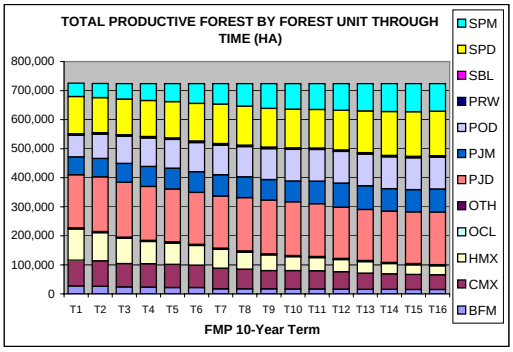
(2b partial) Productive Forest Area Through Time Data (hectares): **(2d)**

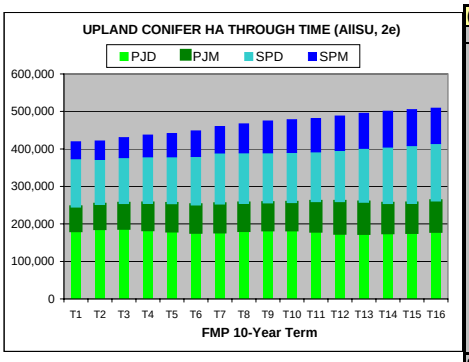
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	(2e) Upland Conifer
T1	725,390	27,148	88,490	107,239	2,216	1,995	182,833	61,845	73,978	3,312	1,807	128,589	45,937	419,205
T2	724,687	25,721	87,518	97,106	2,203	1,994	188,072	63,377	83,794	3,303	1,816	120,710	49,074	421,232
T3	724,143	23,638	80,765	86,566	2,196	1,994	189,007	64,860	93,551	3,346	1,822	122,552	53,846	430,265
T4	724,143	23,375	79,953	76,578	2,195	1,994	185,341	69,244	97,892	3,379	1,823	123,990	58,380	436,954
T5	724,143	21,244	80,066	73,475	2,195	1,994	181,861	71,509	99,061	3,374	1,823	125,046	62,494	440,910
T6	724,143	21,265	77,533	67,502	2,195	1,994	178,559	71,503	100,383	3,368	1,823	129,510	68,508	448,078
T7	724,115	17,296	70,805	64,877	2,195	1,994	179,296	73,357	102,084	3,406	1,823	136,106	70,876	459,635
T8	723,982	17,221	67,367	58,875	2,195	1,994	183,261	71,627	104,242	3,419	1,823	134,322	77,635	466,845
T9	723,908	16,812	63,214	53,685	2,195	1,994	184,950	70,724	106,410	3,374	1,823	133,420	85,306	474,399
T10	723,818	16,369	63,501	47,846	2,195	1,994	184,805	71,659	108,944	3,344	1,823	133,471	87,868	477,802
T11	723,762	16,340	62,986	45,057	2,195	1,994	181,376	77,800	109,189	3,240	1,823	132,705	89,055	480,937
T12	723,709	15,972	60,049	41,775	2,187	1,994	175,893	83,333	109,119	3,183	1,831	136,401	91,971	487,598
T13	723,709	15,497	55,814	39,318	2,183	1,994	175,521	81,677	108,949	3,125	1,835	144,112	93,684	494,994
T14	723,709	15,653	53,417	34,911	2,182	1,994	176,915	76,920	109,852	3,099	1,836	150,832	96,097	500,764
T15	723,709	14,722	52,213	32,950	2,182	1,994	177,985	76,755	109,791	2,995	1,836	153,684	96,602	505,025
T16	723,709	14,606	51,113	30,525	2,181	1,994	181,035	79,567	109,603	2,965	1,837	153,150	95,133	508,885
OLT Max.		19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175	497,902
OLT Min.		10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174	457,260

(5a)

Available Forest:

Term	
T1	572,034
T2	571,330
T3	570,787
T4	570,787
T5	570,787
T6	570,787
T7	570,759
T8	570,626
T9	570,552
T10	570,462
T11	570,405
T12	570,352
T13	570,352
T14	570,352
T15	570,352
T16	570,352





(3f)

(3a) Caribou Habitat Through Time:

Term	Cr	Cwu	Cwp	% Con in CarSUs
T1	101,492	45,035	18,032	89%
T2	94,300	40,986	14,155	90%
T3	113,565	78,185	13,150	90%
T4	129,568	88,343	17,847	90%
T5	138,180	101,396	51,175	90%
T6	153,590	117,059	58,167	91%
T7	155,107	117,606	55,317	91%
T8	151,954	111,302	52,745	92%
T9	150,067	106,087	50,046	92%
T10	147,605	100,508	44,303	93%
T11	147,605	98,081	40,802	94%
T12	147,605	104,759	39,369	94%
T13	151,579	114,657	36,912	95%
T14	147,605	113,981	38,153	95%
T15	150,243	121,341	36,912	95%
T16	154,825	126,904	38,265	95%
OLT Max.	161,804	47,453	68,169	maint or
OLT Min.	147,605	26,809	36,912	increase.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 05_BENCH **Input File:** 05_BENCH.inp **Date:** July 27, 2010.

HARVEST AREA and VOLUME RESULTS:

Implications on Wood Supply - PWR, SPF and BW OFAAB Benchmark volume targets met in all terms. PO met all terms except T4-T6. Benchmark levels based on harvest levels in the late 1990's (when previous CMU).

Available Harvest Area by Term Data (hectares harvested annually)

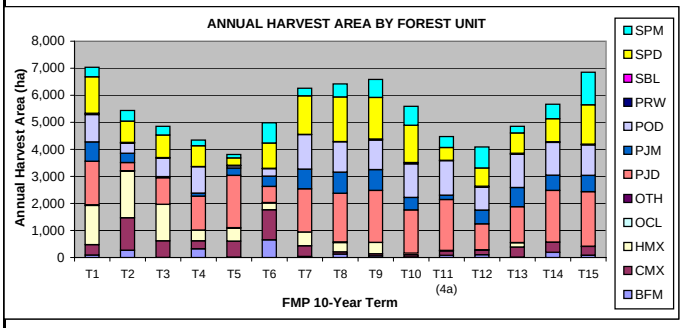
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	7,036	91	385	1,448	22	0	1,609	720	1,008	32	19	1,345	357
T2	5,438	264	1,203	1,730	12	0	300	344	373	25	1	788	398
T3	4,849	0	614	1,351	0	0	984	36	690	6	10	832	325
T4	4,341	317	297	398	0	1	1,253	114	976	6	0	769	211
T5	3,811	14	589	482	0	14	1,938	270	84	6	12	273	130
T6	4,985	648	1,115	252	0	16	598	375	281	7	6	934	753
T7	6,262	34	399	511	0	0	1,594	729	1,280	5	0	1,427	284
T8	6,419	123	86	339	0	24	1,799	785	1,121	7	1	1,651	484
T9	6,584	60	79	415	1	0	1,927	770	1,093	6	26	1,539	669
T10	5,592	16	86	60	0	0	1,597	459	1,240	45	6	1,378	703
T11 (4a)	4,473	80	163	0	16	0	1,887	154	1,279	12	0	475	408
T12	4,091	100	175	0	9	0	958	507	858	7	18	676	784
T13	4,854	11	375	156	1	7	1,323	712	1,234	17	15	752	252
T14	5,669	192	376	0	1	0	1,908	566	1,213	16	4	856	537
T15	6,850	85	324	0	1	3	2,016	603	1,136	8	11	1,459	1,203

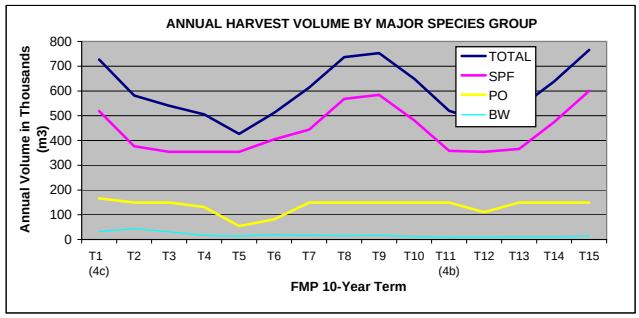
Annual Harvest Volumes by Major Species Groups (1,000s net merchantable cubic metres)

Term	TOTAL	SPF	PO	BW	PRW
T1 (4c)	727.0	518.6	166.4	32.6	3.4
T2	581.6	377.0	149.0	43.7	2.6
T3	540.5	354.0	149.0	31.2	0.6
T4	505.5	354.0	131.0	16.8	0.6
T5	426.4	354.0	54.0	13.4	0.6
T6	511.7	404.5	81.3	20.1	0.6
T7	614.0	443.7	149.0	17.0	0.6
T8	736.8	568.2	149.0	15.4	0.6
T9	752.9	584.2	149.0	16.6	0.9
T10	649.2	481.4	149.0	12.5	4.5
T11 (4b)	519.3	358.3	149.0	8.7	1.1
T12	476.6	354.0	110.6	9.6	0.6
T13	532.0	365.7	149.0	11.7	2.6
T14	638.4	474.4	149.0	11.4	1.5
T15	766.1	600.2	149.0	13.9	0.8
Average	598.5	439.5	135.6	18.3	1.4

Projected Revenues, Expenditures & Renewal Area

Term	Revenue M$	Expend. M$	Unspent M$	Renewal ha	Exten ha	Basc1 ha	Intn1 ha
T1	3,063	2,764	300	**6,966**	3,244	3,261	461
T2	2,288	2,059	229	**5,383**	2,977	2,043	363
T3	2,111	1,994	117	**4,849**	2,309	2,230	311
T4	2,075	1,636	439	**4,341**	2,092	1,969	280
T5	2,021	1,675	346	**3,811**	1,352	2,110	350
T6	2,329	2,450	**-122**	**4,982**	1,880	2,668	434
T7	2,584	2,910	**-325**	**6,249**	2,211	3,575	463
T8	3,261	3,107	154	**6,412**	1,962	3,964	485
T9	3,353	3,224	129	**6,575**	1,945	4,128	502
T10	2,822	2,823	**-1**	**5,586**	1,580	3,574	433
T11	2,108	1,997	110	**4,468**	1,594	2,555	318
T12	2,050	2,059	**-9**	**4,091**	1,172	2,678	241
T13	2,168	2,172	**-4**	**4,854**	1,768	2,824	262
T14	2,752	2,116	636	**5,669**	2,640	2,782	247
T15	3,438	2,821	616	**6,850**	2,967	3,366	516





NOTES:

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 05_BENCH **Input File:** 05_BENCH.inp **Date:** July 27, 2010.

Immature Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	416,005	18,788	57,263	51,501	188	162	133,100	29,828	26,319	635	947	73,007	24,268
T2	425,277	17,116	49,048	36,820	443	191	150,342	36,419	41,386	963	1,126	64,338	27,085
T3	474,966	16,884	48,758	41,904	613	231	157,430	43,809	58,280	1,179	1,123	70,476	34,277
T4	504,190	14,443	48,773	41,525	669	287	158,298	48,660	74,004	1,320	1,247	75,981	38,982
T5	481,411	5,866	45,457	37,071	684	324	132,033	51,956	85,736	1,437	1,093	78,517	41,236
T6	445,233	2,569	38,631	36,178	727	445	113,656	51,480	89,069	1,553	1,069	66,882	42,972
T7	432,688	4,435	32,998	38,140	684	647	116,733	51,733	87,147	1,684	828	58,394	39,264
T8	454,768	4,118	33,802	35,170	721	640	135,674	57,123	86,281	1,589	803	56,595	42,252
T9	453,812	3,665	32,437	27,990	554	863	139,252	54,653	84,990	1,680	641	61,384	45,702
T10	455,888	3,754	30,519	24,384	467	847	145,162	55,113	83,561	1,469	877	64,799	44,937
T11	462,320	2,774	29,638	21,562	464	826	150,377	56,922	83,668	1,637	842	67,753	45,859
T12	465,799	2,901	28,478	18,696	607	703	149,395	57,479	90,469	1,632	834	67,081	47,524
T13	474,563	1,282	26,560	14,561	686	568	152,138	57,936	92,111	1,631	907	73,046	53,136
T14	463,740	1,186	24,377	12,975	688	624	155,932	56,682	89,767	1,754	993	70,916	47,845
T15	453,921	1,519	25,439	12,625	688	426	152,296	58,520	88,664	1,650	1,011	63,141	47,943
T16	457,380	1,706	27,105	12,021	687	456	153,102	62,465	86,625	1,652	1,091	58,304	52,165
	Max OLT	3,260	31,472	42,688	1,328	1,063	292,834	96,487	30,987	115,789	10,363	18,903	44,874
	Min OLT	1,948	11,696	21,591	465	448	106,124	36,541	12,670	45,886	3,667	6,479	17,441

Mature+ Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	309,386	8,361	31,227	55,738	2,029	1,833	49,734	32,017	47,659	2,678	860	55,582	21,669
T2	299,409	8,605	38,470	60,286	1,760	1,803	37,730	26,958	42,409	2,339	690	56,372	21,989
T3	249,177	6,753	32,007	44,662	1,582	1,763	31,576	21,051	35,271	2,166	700	52,076	19,569
T4	219,953	8,932	31,180	35,053	1,527	1,707	27,042	20,584	23,887	2,058	576	48,009	19,398
T5	242,732	15,378	34,609	36,404	1,512	1,670	49,828	19,553	13,325	1,937	730	46,529	21,258
T6	278,910	18,696	38,903	31,324	1,468	1,549	64,902	20,023	11,314	1,815	753	62,627	25,535
T7	291,428	12,860	37,807	26,736	1,512	1,347	62,562	21,624	14,937	1,722	995	77,712	31,612
T8	269,214	13,103	33,564	23,705	1,474	1,354	47,587	14,504	17,962	1,830	1,020	77,727	35,383
T9	270,096	13,147	30,777	25,695	1,641	1,132	45,697	16,071	21,420	1,695	1,181	72,036	39,604
T10	267,929	12,616	32,981	23,461	1,728	1,148	39,643	16,546	25,383	1,875	946	68,672	42,930
T11	261,441	13,566	33,349	23,495	1,731	1,169	30,999	20,879	25,521	1,604	981	64,952	43,196
T12	257,910	13,071	31,571	23,079	1,580	1,292	26,498	25,853	18,650	1,552	996	69,321	44,447
T13	249,146	14,215	29,253	24,757	1,496	1,426	23,383	23,741	16,838	1,494	928	71,066	40,548
T14	259,969	14,467	29,040	21,935	1,494	1,370	20,983	20,238	20,085	1,345	842	79,917	48,252
T15	269,787	13,203	26,773	20,326	1,494	1,568	25,689	18,235	21,127	1,344	826	90,544	48,658
T16	266,328	12,899	24,008	18,504	1,494	1,539	27,933	17,102	22,978	1,312	746	94,846	42,968
	Max OLT	15,933	42,682	39,118	2,219	1,962	99,173	46,652	27,723	1,131	15,367	58,117	40,301
	Min OLT	8,361	24,197	19,993	1,499	1,240	52,493	27,435	12,933	452	10,078	34,643	21,733
	Mature Onset Age:	60	70	60	70	60	70	70	60	80	70	70	70

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name:	**06-Flat-PWR**	**Input File:**	06-Flat-PWR.inp	**Date:** July 27, 2010.
	07-Flat-SPF		07-Flat-SPF.inp	
	08-Flat-PO		08-Flat-PO.inp	
	09-Flat-BW		09-Flat-BW.inp	

All runs based on OLT_50 so achievement of landscape class area, caribou habitat and old forest area is similar (or higher than 05_OLT_50).

Results	**Even Flow Volumes (m3 /year)**	**Non-declining volumes: (Info point only, not saved cases.)**
06-Flat-PWR	1,290 m3	1,290 increases to 1,431 in T9 and then 2,178 in T13 and 2,200 in T15.
07-Flat-SPF	392,370 m3	389,174 then increases to 474,804 T7 to end.
08-Flat-PO	110,507 m3	110,051 limited to T6, then incr to 117,878 in T7. Incr to 134,591 in T15.
09-Flat-BW	17,467 m3	Same as even flow, so limited by last term.
09-Flat-TOTAL	551,399 m3	546,319 m3 to T6, then incr to 616,460 m3 in T7-T14, then incr to 705,091 m3 for T15.

WHISKEY JACK FOREST 2012 FMP — **SUMMARY of SFMM INVESTIGATION**

Case Name: 10_MS **Input File:** 10_MS.inp **Date:** July 27, 2010.

Purpose: Start of MS development with harvest volume targets and OLT minimum SNRV targets.

Specific Inputs: 02_OLT_50 inputs plus lower volume targets by species group as below. Non-binding. Balanced budget.

Group:		thousands of m3 per year.
PWR	1.5	T1 only
SPF	390.0	all terms
PO	200.0	T1 only
BW	20.0	T1 only
Total	600.0	all terms

Added non-constraining deferral for WC2 as LLP_00 for future investigations.

(Lower than 2004 FMP (265), but higher than even flow (110)).

RESULTS: Where projections in the following tables fall below the min. target, the data is shaded yellow; where projections exceed max. targets, the data is shaded green.

Where projections do not relate to OLT projections, font is coloured red and results are not expected to correlate to OLT SNRV.

FOREST CONDITION RESULTS

Implications on Forest Condition -

OLT forest condition projections good due to constraints included in model (except MLI, SLo as per NATURE).
Total forest unit area underachievement of PRW and SBL. Underachievment of PJD and PJM mature+ area (no age constraints included).
HMX total low in later terms but is controllable with added constraint if needed. POD increases significantly.
Caribou habitat projections good.

(2a) Productive Area by Landscape Class

Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional: Balsam	Lowland	Hardwood	Conifer
T1	200,327	152,744	62,934	8,361	2,889	105,229	192,907
T2	176,068	189,737	48,922	9,138	2,703	103,317	194,913
T3	154,104	240,797	73,589	8,497	2,284	77,549	167,410
T4	168,297	247,959	89,716	9,184	2,106	56,665	150,303
T5	162,021	219,900	101,414	15,702	2,242	49,275	173,677
T6	156,938	184,164	108,563	18,781	2,248	43,021	210,514
T7	166,268	162,016	104,488	12,860	2,507	43,021	233,042
T8	200,244	169,396	90,516	11,690	2,483	45,209	204,520
T9	197,471	178,010	86,121	12,644	2,615	48,982	198,151
T10	198,608	177,663	81,513	12,742	2,885	45,753	204,743
T11	172,385	194,770	88,313	13,727	2,881	43,021	208,755
T12	173,044	193,219	93,852	13,464	2,716	43,021	204,476
T13	186,519	202,853	87,871	14,279	2,361	43,021	186,888
T14	193,849	195,456	77,597	14,836	2,323	43,021	196,711
T15	188,809	190,812	75,979	13,196	2,327	43,021	209,648
T16	193,850	193,087	70,312	12,662	2,266	43,021	208,594
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

(2c) Area of Old Forest Area by Grouping of Productive Forest (ha)

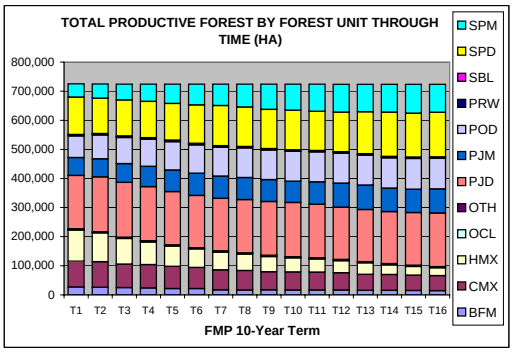
	Lower Old Forest Age (Years): 80	100	100	100	90	100	160	110-120
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo
T1	3,707	1,851	8,811	17,199	1,251	23,309	97	18,431
T2	4,506	1,919	14,552	18,006	1,575	33,740	182	17,877
T3	6,101	1,558	14,761	15,864	1,700	35,284	224	18,536
T4	5,675	1,520	18,714	11,996	1,496	32,559	241	19,763
T5	3,469	1,477	22,602	19,411	1,097	29,942	292	24,626
T6	5,315	1,428	25,097	16,979	1,042	23,763	290	32,671
T7	9,452	1,381	24,416	10,878	1,010	20,800	233	40,400
T8	9,619	1,367	20,729	7,597	999	24,054	219	29,938
T9	10,137	1,328	21,065	8,903	1,026	39,480	234	33,953
T10	9,824	1,362	21,912	7,470	992	36,199	234	38,267
T11	10,684	1,328	21,107	7,050	992	29,377	177	50,206
T12	10,243	1,328	20,665	7,065	992	32,915	189	57,587
T13	5,905	1,328	20,665	10,078	1,127	28,335	202	67,662
T14	5,889	1,328	20,665	9,084	1,298	21,979	285	69,776
T15	9,909	1,328	20,665	9,155	1,147	20,800	309	75,339
T16	10,264	1,328	20,665	7,050	992	20,800	373	81,093
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840

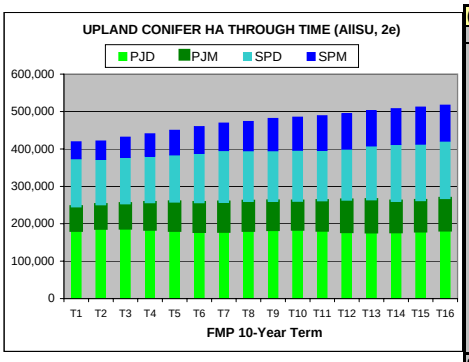
(2b partial) Productive Forest Area Through Time Data (hectares): **(2d)**

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	(2e) Upland Conifer
T1	725,390	27,148	88,490	107,239	2,216	1,995	182,833	61,845	73,978	3,312	1,807	128,589	45,937	419,205
T2	724,797	26,063	87,654	98,970	2,216	1,994	188,459	61,917	81,737	3,318	1,806	121,344	49,318	421,039
T3	724,230	24,751	80,943	87,982	2,196	1,994	188,917	63,970	89,811	3,407	1,822	123,768	54,668	431,324
T4	724,230	23,529	80,223	77,787	2,196	1,994	186,143	69,741	92,975	3,408	1,822	124,678	59,733	440,296
T5	724,230	21,389	76,214	70,013	2,196	1,994	182,844	74,449	97,135	3,450	1,822	126,231	66,492	450,016
T6	724,230	21,258	72,556	63,749	2,196	1,994	179,884	75,997	97,588	3,488	1,822	131,915	71,783	459,578
T7	724,202	17,245	68,707	60,832	2,196	1,994	180,335	76,898	98,962	3,510	1,822	137,943	73,758	468,934
T8	724,059	16,378	67,121	56,459	2,196	1,994	183,242	75,875	101,324	3,490	1,822	135,820	78,339	473,275
T9	723,993	16,795	62,350	52,221	2,196	1,994	185,075	74,998	101,705	3,453	1,822	134,793	86,591	481,456
T10	723,907	16,466	62,382	47,898	2,196	1,994	186,221	73,437	102,556	3,421	1,822	136,273	89,240	485,171
T11	723,853	16,505	61,476	45,092	2,196	1,994	183,674	77,126	102,735	3,357	1,822	134,655	93,220	488,674
T12	723,792	16,247	59,562	41,497	2,195	1,994	179,601	82,859	102,652	3,255	1,823	136,387	95,720	494,567
T13	723,792	15,529	55,100	39,207	2,183	1,994	178,791	84,438	102,549	3,197	1,835	144,394	94,575	502,199
T14	723,792	15,641	54,343	32,905	2,183	1,994	179,103	80,484	104,120	3,167	1,835	151,854	96,163	507,603
T15	723,792	14,729	53,063	29,671	2,182	1,994	181,203	80,141	105,337	3,098	1,836	150,916	99,622	511,882
T16	723,792	14,487	51,363	26,864	2,182	1,994	184,040	82,929	105,104	3,067	1,836	153,618	96,309	516,895
OLT Max.		19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175	497,902
OLT Min.		10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174	457,260

(5a)

Available Forest: Term	
T1	572,034
T2	571,441
T3	570,874
T4	570,874
T5	570,874
T6	570,874
T7	570,846
T8	570,703
T9	570,636
T10	570,551
T11	570,496
T12	570,436
T13	570,436
T14	570,436
T15	570,436
T16	570,436





(3f)

(3a) Caribou Habitat Through Time: Term	Cr	Cwu	Cwp	% Con in CarSUs
T1	101,492	45,035	18,032	89%
T2	94,364	41,030	14,155	89%
T3	113,623	78,227	13,150	90%
T4	129,621	88,383	17,847	90%
T5	138,228	101,435	51,175	90%
T6	153,325	116,929	58,167	91%
T7	154,699	117,445	55,323	91%
T8	150,984	110,105	52,212	91%
T9	149,544	105,702	49,834	92%
T10	147,605	100,794	44,228	93%
T11	147,605	98,525	40,844	94%
T12	147,605	104,790	39,205	94%
T13	151,213	114,177	36,912	95%
T14	147,605	114,761	38,370	95%
T15	150,242	121,638	36,912	95%
T16	155,219	126,829	38,231	95%
OLT Max.	161,804	47,453	68,169	maint or
OLT Min.	147,605	26,809	36,912	increase.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 10_MS **Input File:** 10_MS.inp **Date:** July 27, 2010.

HARVEST AREA and VOLUME RESULTS:

Implications on Wood Supply - SPF >390 all terms. PO met at 200 in Term 1, then avg 160 for T2-T3. Then lower T4-6.
Spike in total and SPF in T7 when LLP deferrals OFF, artificial gain but can control with incr targets or flow control.
AHA had big jump T1 to T2 CMX harvest. T5-6 lower AHA and vol limited by LLP deferrals and SUBMU timing.

Available Harvest Area by Term Data (hectares harvested annually)

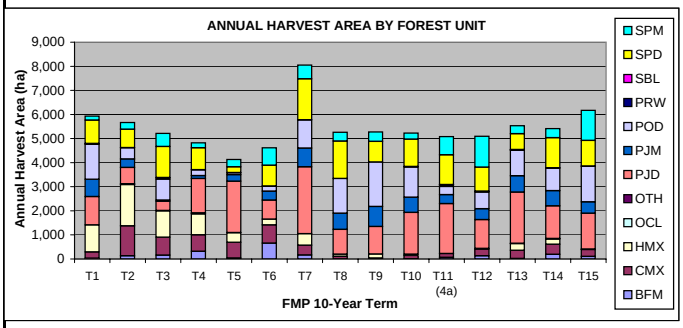
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	5,934	35	258	1,121	0	0	1,179	714	1,458	14	15	972	167
T2	5,668	135	1,241	1,710	34	0	681	349	470	0	5	761	282
T3	5,217	158	747	1,093	0	17	383	45	875	54	10	1,287	549
T4	4,825	316	691	870	0	39	1,428	114	240	6	0	913	208
T5	4,133	38	653	400	0	4	2,132	270	84	0	9	239	304
T6	4,620	657	759	237	0	0	791	375	195	4	8	864	730
T7	8,053	164	408	481	0	0	2,775	777	1,168	9	1	1,695	577
T8	5,259	0	116	87	0	0	1,025	670	1,446	0	1	1,550	365
T9	5,272	40	0	168	1	0	1,136	835	1,844	0	3	852	392
T10	5,228	5	144	47	0	2	1,734	630	1,260	5	10	1,139	252
T11 (4a)	5,079	63	161	0	1	2	2,069	373	341	64	17	1,230	758
T12	5,093	134	281	0	23	0	1,195	455	692	15	22	992	1,284
T13	5,531	20	339	275	1	12	2,130	673	1,059	18	13	658	333
T14	5,413	190	420	223	1	19	1,351	635	934	12	2	1,247	379
T15	6,171	108	285	0	1	17	1,486	474	1,473	7	9	1,065	1,247

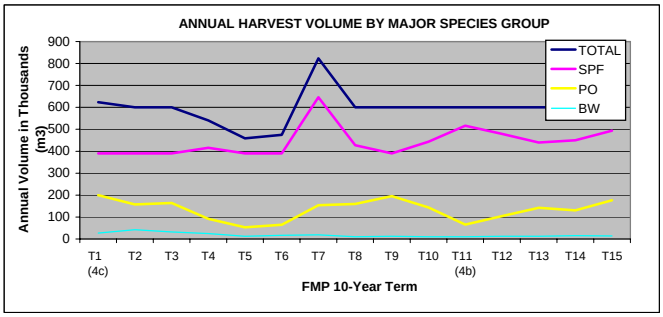
Annual Harvest Volumes by Major Species Groups (1,000s net merchantable cubic metres)

Term	TOTAL	SPF	PO	BW	PRW
T1 (4c)	623.3	390.0	200.0	27.1	1.5
T2	600.0	390.0	157.6	42.3	0.0
T3	600.0	390.0	164.3	32.4	5.8
T4	540.5	416.0	91.5	24.7	0.6
T5	459.1	390.0	52.9	12.5	0.0
T6	475.1	390.0	65.1	17.0	0.3
T7	823.7	645.9	154.1	19.1	0.9
T8	600.0	427.4	160.1	10.5	0.0
T9	600.0	390.0	195.7	12.1	0.1
T10	600.0	443.3	143.9	10.3	0.5
T11 (4b)	600.0	516.4	66.0	9.9	6.7
T12	600.0	479.3	104.4	12.4	1.3
T13	600.0	439.5	142.0	12.7	2.6
T14	600.0	450.1	130.3	15.0	1.0
T15	688.0	494.0	176.4	13.6	0.6
Average	600.6	443.5	133.6	18.1	1.5

Projected Revenues, Expenditures & Renewal Area

Term	Revenue M$	Expend. M$	Unspent M$	Renewal ha	Exten ha	Basc1 ha	Intn1 ha
T1	2,346	2,044	302	**5,874**	3,167	2,366	341
T2	2,341	2,341	0	**5,611**	2,797	2,425	390
T3	2,383	2,383	0	**5,217**	2,307	2,564	346
T4	2,406	2,406	**0**	**4,825**	1,645	2,808	371
T5	2,210	2,210	0	**4,133**	978	2,762	393
T6	2,223	2,223	0	**4,617**	1,709	2,517	390
T7	3,706	3,706	0	**8,039**	2,648	4,804	586
T8	2,483	2,483	0	**5,252**	1,790	3,084	378
T9	2,304	2,093	211	**5,263**	2,301	2,642	321
T10	2,564	2,478	86	**5,223**	1,649	3,176	397
T11	2,975	2,975	0	**5,073**	711	3,962	401
T12	2,749	2,749	**0**	**5,093**	1,134	3,803	157
T13	2,570	2,570	0	**5,531**	1,773	3,424	334
T14	2,605	1,798	806	**5,413**	2,941	2,274	199
T15	2,873	2,448	424	**6,171**	2,873	2,876	422





NOTES:

Review targets - is 200 PO T1 adequate or is 265 from 2004 FMP actual hardwood demand?
Confirm SUBMUs operable for 10 years or open to 20 year window?

Mature+ forest unit area - investigate adding targets for mature+ OCL, PJD and PJM.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 10_MS **Input File:** 10_MS.inp **Date:** July 27, 2010.

Immature Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	416,005	18,788	57,263	51,501	188	162	133,100	29,828	26,319	635	947	73,007	24,268
T2	414,727	16,925	47,963	35,522	243	191	146,567	34,902	43,672	809	1,076	61,363	25,494
T3	468,490	16,253	47,226	41,120	612	231	157,211	42,756	60,887	841	1,122	67,350	32,880
T4	505,973	14,345	47,507	38,979	666	448	158,982	49,158	76,664	1,428	1,246	76,699	39,852
T5	483,334	5,687	44,649	35,206	684	852	129,090	54,896	83,810	1,595	1,092	81,082	44,692
T6	449,665	2,478	35,983	33,176	727	860	114,988	55,975	86,274	1,698	1,042	69,987	46,477
T7	432,772	4,384	30,900	34,677	684	898	117,779	55,268	83,193	1,788	827	60,228	42,146
T8	460,157	4,688	33,643	34,083	722	880	136,168	61,395	79,605	1,691	813	60,680	45,790
T9	461,601	4,151	32,375	26,608	712	863	139,383	59,126	79,468	1,729	691	66,634	49,861
T10	457,784	3,725	29,801	22,452	468	715	146,427	57,112	83,529	1,599	665	64,984	46,308
T11	455,469	2,778	28,473	19,157	467	410	152,454	56,419	87,233	1,561	671	61,904	43,942
T12	460,116	2,783	27,999	17,342	472	395	152,804	57,452	85,386	1,703	830	65,525	47,425
T13	477,243	1,250	27,342	13,883	686	393	155,838	60,281	86,453	1,703	970	74,085	54,358
T14	466,902	806	26,099	11,625	687	512	158,667	59,702	83,861	1,823	1,009	72,680	49,433
T15	455,600	1,533	26,075	12,983	688	691	155,809	61,305	80,306	1,753	1,003	63,004	50,449
T16	457,250	1,824	27,405	12,915	688	847	156,661	65,265	77,181	1,754	1,064	58,280	53,366
	Max OLT	3,260	31,472	42,688	1,328	1,063	292,834	96,487	30,987	115,789	10,363	18,903	44,874
	Min OLT	1,948	11,696	21,591	465	448	106,124	36,541	12,670	45,886	3,667	6,479	17,441

Mature+ Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	309,386	8,361	31,227	55,738	2,029	1,833	49,734	32,017	47,659	2,678	860	55,582	21,669
T2	310,070	9,138	39,691	63,448	1,973	1,803	41,892	27,015	38,065	2,509	730	59,981	23,825
T3	255,740	8,497	33,717	46,862	1,584	1,763	31,706	21,215	28,924	2,566	700	56,419	21,788
T4	218,257	9,184	32,716	38,808	1,530	1,546	27,161	20,584	16,311	1,981	576	47,979	19,882
T5	240,896	15,702	31,565	34,807	1,512	1,143	53,755	19,553	13,325	1,855	730	45,149	21,800
T6	274,565	18,781	36,573	30,572	1,468	1,134	64,896	20,023	11,314	1,789	780	61,928	25,305
T7	291,430	12,860	37,807	26,155	1,512	1,097	62,556	21,630	15,769	1,722	995	77,715	31,612
T8	263,902	11,690	33,477	22,376	1,474	1,114	47,074	14,480	21,719	1,800	1,009	75,140	32,549
T9	262,391	12,644	29,975	25,614	1,483	1,132	45,692	15,871	22,237	1,724	1,131	68,159	36,730
T10	266,123	12,742	32,581	25,446	1,728	1,280	39,794	16,326	19,027	1,822	1,158	71,289	42,932
T11	268,384	13,727	33,003	25,935	1,729	1,584	31,220	20,707	15,502	1,796	1,152	72,751	49,278
T12	263,677	13,464	31,563	24,155	1,723	1,600	26,797	25,407	17,266	1,552	993	70,863	48,296
T13	246,549	14,279	27,758	25,324	1,497	1,601	22,953	24,157	16,096	1,494	864	70,309	40,217
T14	256,890	14,836	28,244	21,280	1,496	1,482	20,436	20,781	20,259	1,345	826	79,174	46,730
T15	268,192	13,196	26,989	16,687	1,494	1,303	25,395	18,836	25,031	1,344	833	87,912	49,173
T16	266,543	12,662	23,958	13,949	1,494	1,148	27,379	17,664	27,924	1,312	772	95,338	42,942
	Max OLT	15,933	42,682	39,118	2,219	1,962	99,173	46,652	27,723	1,131	15,367	58,117	40,301
	Min OLT	8,361	24,197	19,993	1,499	1,240	52,493	27,435	12,933	452	10,078	34,643	21,733
	Mature Onset Age:	60	70	60	70	60	70	70	60	80	70	70	70

Available Harvest Area by Forest Unit and Age Class TERM 1

Forest Unit:

	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
A5													
A15													
A25													
A35													
A45													
A55		5	11			1							
A65	12	26	249			15	2	3				9	
A75	2	19	437			18	15	314			170	18	
A85		22	275			35	74	234			107	23	
A95	4	265	247			76	120	396		1	138	55	
A105	53	249	258			290	176	320			78	19	
A115		3	11	1		3	5				21	97	
A125			2	1							132	4	
A135				1						3	140	22	
A145						4				4	108	4	
A155						30				3	11		
A165											2		
A175													
A185													
A195													
A205													
A215													
A225													
A235													
A245													
A255													TOTAL
	70	590	1,491	2	0	472	392	1,268	0	11	907	250	5,453

WHISKEY JACK FOREST 2012 FMP — **SUMMARY of SFMM INVESTIGATION**

Case Name: 11_MS **Input File:** 11_MS.inp **Date:** July 27, 2010.

Purpose: Start of MS development with harvest volume targets and OLT minimum SNRV targets.

Specific Inputs: 10_MS inputs plus lower volume targets by species group as below. Non-binding. Balanced budget. Forest unit age group constraints to improve results.

Group:		thousands of m3 per year.	10% decr TOTAL between terms.
PWR	1.5	T1 only	
SPF	390.0	all terms	
PO	200.0	T1 only	(Lower than 2004 FMP (265), but higher than even flow (110)).
BW	20.0	T1 only	
Total	550.0	all terms	

RESULTS: Where projections in the following tables fall below the min. target, the data is shaded yellow; where projections exceed max. targets, the data is shaded green.

FOREST CONDITION RESULTS Where projections do not relate to OLT projections, font is coloured red and results are not expected to correlate to OLT SNRV.

Implications on Forest Condition - OLT forest condition projections good due to constraints included in model (except MLI, SLo as per NATURE).
Total forest unit area underachievement of PRW and SBL. Improved forest unit by age group achievement (age constraints included).
POD increases significantly without constraint (as in 10_MS). Trade-off for lower POD area is significantly lower PO harvest vol.
Caribou habitat projections good.

(2a) Productive Area by Landscape Class

Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional: Balsam	Lowland	Hardwood	Conifer
T1	200,327	152,744	62,934	8,361	2,889	105,229	192,907
T2	171,905	189,737	48,922	8,743	2,703	113,287	189,543
T3	149,601	240,919	66,013	7,821	2,212	97,084	160,705
T4	170,111	234,338	70,968	6,920	2,137	80,529	159,353
T5	161,253	225,392	74,478	16,654	2,184	72,694	171,702
T6	165,009	187,701	76,100	18,907	2,224	57,316	217,099
T7	172,504	173,940	76,409	13,028	2,533	46,871	239,043
T8	175,285	184,188	72,578	12,365	2,468	54,339	222,981
T9	182,418	193,081	65,609	13,199	2,582	47,717	219,534
T10	179,219	183,081	67,694	13,518	2,884	43,021	234,658
T11	162,355	198,575	73,456	13,649	2,555	43,021	230,396
T12	164,803	196,388	69,531	13,582	2,564	43,021	234,059
T13	172,807	198,912	62,648	14,806	2,186	43,021	229,569
T14	174,496	195,026	68,540	14,723	2,173	43,021	225,969
T15	181,956	184,743	62,046	12,788	2,152	43,021	237,241
T16	183,560	175,424	62,464	12,663	2,130	43,021	244,686
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

(2c) Area of Old Forest Area by Grouping of Productive Forest (ha)

	Lower Old Forest Age (Years): 80	100	100	100	90	100	160	110-120
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo
T1	3,707	1,851	8,811	17,199	1,251	23,309	97	18,431
T2	4,111	1,919	11,862	26,002	1,575	40,113	182	14,809
T3	5,404	1,589	15,082	22,535	1,515	39,012	224	16,302
T4	3,460	1,550	19,664	20,709	1,236	36,778	241	19,763
T5	4,371	1,509	23,616	35,636	1,223	33,577	292	24,653
T6	5,315	1,459	25,853	32,740	1,200	27,363	290	32,751
T7	9,532	1,407	24,793	18,434	1,163	20,800	233	40,494
T8	9,978	1,393	20,665	12,365	1,135	32,980	229	30,045
T9	10,293	1,349	21,162	10,210	1,026	46,561	245	34,137
T10	9,924	1,373	22,018	8,573	992	42,660	244	38,202
T11	10,929	1,328	20,665	8,888	992	32,172	187	50,995
T12	10,830	1,328	20,665	9,095	997	35,177	199	58,895
T13	5,983	1,334	20,665	9,748	1,094	33,190	211	68,439
T14	5,757	1,331	20,665	10,013	1,084	32,614	198	70,035
T15	9,800	1,331	20,665	8,800	992	34,894	196	75,682
T16	10,204	1,328	20,665	9,406	992	39,649	234	80,986
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840

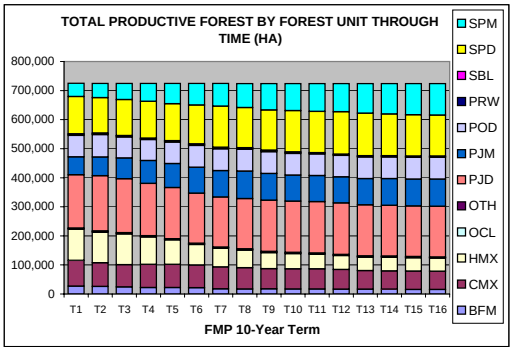
(2b partial) Productive Forest Area Through Time Data (hectares): **(2d)** **(2e) Upland Conifer**

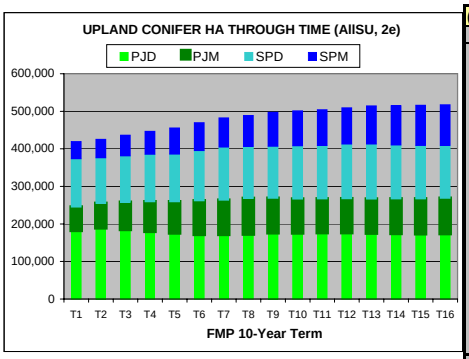
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	(2e) Upland Conifer
T1	725,390	27,148	88,490	107,239	2,216	1,995	182,833	61,845	73,978	3,312	1,807	128,589	45,937	419,205
T2	724,840	25,819	81,380	105,524	2,216	1,994	189,769	64,431	77,321	3,374	1,806	121,675	49,531	425,405
T3	724,356	24,298	76,315	105,912	2,198	1,993	185,485	71,760	72,031	3,415	1,819	123,679	55,452	436,375
T4	724,356	22,104	79,713	94,267	2,198	1,993	180,359	78,319	72,217	3,480	1,819	126,542	61,346	446,566
T5	724,356	22,126	79,850	83,986	2,198	1,993	176,173	82,646	73,267	3,522	1,819	126,968	69,808	455,595
T6	724,356	21,542	77,907	70,946	2,198	1,993	172,093	89,304	74,815	3,575	1,819	133,811	74,355	469,563
T7	724,328	17,613	75,385	64,298	2,198	1,993	172,215	90,830	75,000	3,617	1,820	141,551	77,808	482,404
T8	724,204	17,039	73,526	60,363	2,198	1,993	172,985	94,731	75,000	3,554	1,819	138,261	82,738	488,714
T9	724,139	17,363	69,532	55,406	2,198	1,993	176,216	91,890	75,000	3,506	1,819	138,471	90,746	497,323
T10	724,075	16,862	69,335	52,706	2,197	1,993	176,166	89,618	74,538	3,471	1,820	142,193	93,177	501,154
T11	724,007	16,969	69,305	50,253	2,196	1,993	176,879	89,603	74,455	2,909	1,820	142,085	95,540	504,106
T12	723,948	16,655	67,785	47,483	2,196	1,993	177,027	89,826	73,894	2,791	1,820	145,533	96,946	509,331
T13	723,948	16,340	63,994	46,399	2,185	1,993	175,630	90,275	74,266	2,627	1,830	146,476	101,933	514,314
T14	723,948	16,352	63,046	46,963	2,185	1,993	174,577	91,871	74,376	2,434	1,831	143,511	104,811	514,770
T15	723,948	15,288	63,269	46,015	2,185	1,993	173,932	92,490	75,000	2,364	1,831	142,280	107,303	516,004
T16	723,948	15,241	62,973	45,000	2,184	1,993	174,455	93,483	75,000	2,286	1,832	140,962	108,540	517,441
OLT Max.		19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175	497,902
OLT Min.		10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174	457,260

(5a)

Available Forest:

Term	
T1	572,034
T2	571,484
T3	571,000
T4	571,000
T5	571,000
T6	571,000
T7	570,972
T8	570,848
T9	570,783
T10	570,719
T11	570,651
T12	570,592
T13	570,592
T14	570,592
T15	570,592
T16	570,592





(3f)

(3a) Caribou Habitat Through Time:

Term	Cr	Cwu	Cwp	% Con in CarSUs
T1	101,492	45,035	18,032	89%
T2	94,539	41,030	14,155	89%
T3	114,154	78,253	13,150	89%
T4	130,804	88,412	17,847	90%
T5	139,590	101,562	51,175	90%
T6	153,762	117,195	58,167	91%
T7	155,300	118,081	55,317	91%
T8	152,240	111,773	52,928	92%
T9	150,789	107,089	50,144	92%
T10	147,605	102,650	46,207	93%
T11	147,605	99,118	41,155	94%
T12	147,605	104,963	39,353	95%
T13	151,539	114,712	36,912	95%
T14	147,605	112,671	38,419	95%
T15	150,447	120,852	36,912	95%
T16	155,163	127,364	36,948	96%
OLT Max.	161,804	47,453	68,169	maint or
OLT Min.	147,605	26,809	36,912	increase.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 11_MS **Input File:** 11_MS.inp **Date:** July 27, 2010.

HARVEST AREA and VOLUME RESULTS:

Implications on Wood Supply - SPF >390 all terms. PO only 164 in Term 1, then decreases to T5.

TOTAL relatively even through time. Minor spike in SPF in T7 when LLP deferrals OFF, artificial gain. Big loss in HMX harvest by capping POD mature area.

AHA HMX and PJM no harvest in T2. T4-5 lower AHA and vol limited by LLP deferrals and SUBMU timing.

Available Harvest Area by Term Data (hectares harvested annually)

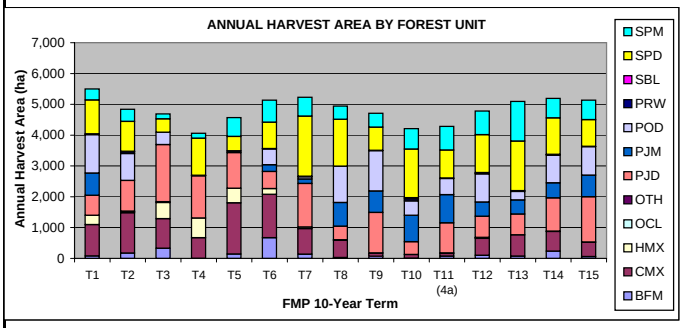
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	5,499	76	1,020	302	0	0	649	720	1,245	14	15	1,099	357
T2	4,841	170	1,312	0	30	19	997	0	874	58	15	967	398
T3	4,687	327	964	520	0	25	1,857	0	400	0	0	433	161
T4	4,060	0	669	638	0	0	1,375	0	0	4	9	1,206	159
T5	4,569	142	1,661	472	0	0	1,154	55	0	1	6	466	611
T6	5,134	670	1,409	182	0	0	556	220	517	3	3	861	713
T7	5,230	136	829	54	0	1	1,412	141	77	9	6	1,953	612
T8	4,945	26	563	0	0	14	439	772	1,176	0	2	1,518	435
T9	4,711	70	102	2	1	0	1,315	696	1,310	0	5	754	454
T10	4,209	5	118	0	1	2	413	858	467	70	34	1,580	661
T11 (4a)	4,282	75	84	0	1	15	979	914	522	9	8	912	765
T12	4,781	98	554	0	21	10	683	464	913	14	25	1,234	765
T13	5,094	75	688	0	1	2	671	460	273	22	6	1,607	1,290
T14	5,194	232	641	0	1	11	1,080	490	904	8	9	1,185	634
T15	5,136	59	468	0	1	2	1,470	703	922	5	7	868	632

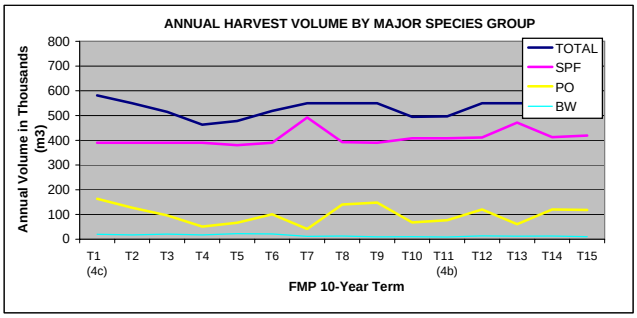
Annual Harvest Volumes by Major Species Groups (1,000s net merchantable cubic metres)

Term	TOTAL	SPF	PO	BW	PRW
T1 (4c)	581.1	390.0	163.7	20.0	1.5
T2	550.0	390.0	127.5	17.4	6.2
T3	514.5	390.0	96.1	20.8	0.0
T4	463.0	390.0	51.2	17.3	0.4
T5	478.0	380.4	66.9	22.7	0.1
T6	518.8	390.0	100.9	21.6	0.3
T7	550.0	492.1	41.2	11.9	0.9
T8	550.0	392.3	140.4	12.7	0.0
T9	550.0	390.0	148.3	9.9	0.1
T10	495.0	408.2	67.9	10.2	7.3
T11 (4b)	496.6	408.0	77.0	8.9	0.8
T12	550.0	411.2	120.1	13.6	1.3
T13	550.0	471.5	60.6	12.4	3.0
T14	550.0	412.8	120.1	12.8	0.7
T15	550.0	418.8	118.0	10.4	0.4
Average	529.8	409.0	100.0	14.8	1.5

Projected Revenues, Expenditures & Renewal Area

Term	Revenue M$	Expend. M$	Unspent M$	Renewal ha	Exten ha	Basc1 ha	Intn1 ha
T1	2,325	2,325	0	**5,444**	2,586	2,425	433
T2	2,360	2,360	0	**4,793**	2,120	2,236	437
T3	2,262	2,262	0	**4,687**	1,732	2,566	390
T4	2,220	2,220	0	**4,060**	1,173	2,512	375
T5	2,202	2,202	0	**4,569**	1,865	2,226	478
T6	2,269	2,269	0	**5,132**	2,378	2,307	447
T7	2,777	2,777	0	**5,217**	1,307	3,499	412
T8	2,288	2,162	127	**4,939**	1,979	2,644	316
T9	2,268	2,035	233	**4,705**	1,761	2,623	321
T10	2,389	2,346	42	**4,202**	902	2,949	351
T11	2,320	2,264	57	**4,277**	992	2,928	356
T12	2,389	1,298	1,091	**4,781**	3,025	1,641	115
T13	2,693	1,008	1,685	**5,094**	3,818	1,163	113
T14	2,390	1,032	1,358	**5,194**	3,829	1,208	157
T15	2,413	1,248	1,165	**5,136**	3,319	1,670	147





NOTES:

Review targets - is 200 PO T1 needed - adjust to binding target if needed.
Max 10% decrease bunds results.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 11_MS **Input File:** 11_MS.inp **Date:** July 27, 2010.

Immature Productive Forest

Forest Unit:

10-Year T	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	416,005	18,788	57,263	51,501	188	162	133,100	29,828	26,319	635	947	73,007	24,268
T2	410,564	17,076	49,059	34,159	243	191	142,752	37,472	37,201	866	1,076	62,926	27,542
T3	456,534	16,477	47,901	34,936	584	414	153,029	46,540	47,502	1,412	1,221	70,658	35,860
T4	475,417	15,184	48,957	32,244	637	707	153,378	53,070	54,996	1,523	1,243	73,686	39,791
T5	461,123	5,472	45,907	27,902	654	724	135,313	58,605	57,925	1,667	1,180	79,878	45,895
T6	428,810	2,635	40,577	28,922	698	700	108,846	61,804	60,815	1,785	1,095	71,814	49,118
T7	422,853	4,585	37,201	32,677	659	743	111,254	62,729	61,000	1,895	825	63,470	45,816
T8	432,051	4,674	40,427	32,526	698	743	119,985	67,231	49,748	1,754	851	64,115	49,300
T9	441,107	4,164	39,821	30,957	693	712	123,216	64,390	53,012	1,781	741	69,628	51,992
T10	429,994	3,344	37,958	27,452	480	501	123,166	62,118	58,263	1,605	652	66,863	47,592
T11	434,385	3,320	36,414	25,054	490	513	123,879	62,103	58,113	1,306	971	72,937	49,287
T12	430,722	3,074	35,304	21,159	497	654	124,027	62,326	58,536	1,240	954	72,252	50,699
T13	434,367	1,534	34,429	18,628	685	743	122,630	62,775	60,266	1,133	1,144	73,184	57,216
T14	438,062	1,628	35,873	19,192	685	743	121,577	64,371	60,376	1,089	1,158	68,924	62,445
T15	428,746	2,501	36,853	20,641	685	728	120,932	64,990	58,618	1,020	1,179	56,834	63,767
T16	421,448	2,578	37,973	22,169	684	731	121,455	65,983	56,071	973	1,201	45,798	65,830
	Max OLT	3,260	31,472	42,688	1,328	1,063	292,834	96,487	30,987	115,789	10,363	18,903	44,874
	Min OLT	1,948	11,696	21,591	465	448	106,124	36,541	12,670	45,886	3,667	6,479	17,441

Mature+ Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	309,386	8,361	31,227	55,738	2,029	1,833	49,734	32,017	47,659	2,678	860	55,582	21,669
T2	314,276	8,743	32,321	71,365	1,973	1,803	47,017	26,958	40,119	2,509	730	58,749	21,989
T3	267,822	7,821	28,414	70,976	1,614	1,579	32,455	25,220	24,529	2,003	598	53,021	19,592
T4	248,939	6,920	30,756	62,023	1,561	1,286	26,981	25,249	17,220	1,957	576	52,856	21,554
T5	263,233	16,654	33,943	56,084	1,544	1,268	40,859	24,041	15,342	1,855	640	47,090	23,913
T6	295,546	18,907	37,329	42,023	1,500	1,293	63,247	27,500	14,000	1,789	724	61,996	25,237
T7	301,475	13,028	38,185	31,621	1,538	1,250	60,962	28,102	14,000	1,722	995	78,080	31,993
T8	292,154	12,365	33,098	27,837	1,500	1,250	53,000	27,500	25,252	1,800	968	74,146	33,438
T9	283,032	13,199	29,711	24,448	1,504	1,281	53,000	27,500	21,988	1,725	1,078	68,844	38,754
T10	294,081	13,518	31,377	25,254	1,717	1,491	53,000	27,500	16,276	1,866	1,167	75,330	45,585
T11	289,621	13,649	32,891	25,199	1,706	1,480	53,000	27,500	16,342	1,604	849	69,148	46,254
T12	293,227	13,582	32,481	26,324	1,699	1,339	53,000	27,500	15,358	1,552	865	73,281	46,246
T13	289,581	14,806	29,565	27,771	1,500	1,250	53,000	27,500	14,000	1,494	686	73,293	44,717
T14	285,886	14,723	27,173	27,771	1,500	1,250	53,000	27,500	14,000	1,345	673	74,586	42,365
T15	295,202	12,788	26,415	25,374	1,500	1,265	53,000	27,500	16,382	1,344	652	85,446	43,536
T16	302,500	12,663	25,000	22,831	1,500	1,261	53,000	27,500	18,929	1,312	630	95,164	42,710
	Max OLT	15,933	42,682	39,118	2,219	1,962	99,173	46,652	27,723	1,131	15,367	58,117	40,301
	Min OLT	8,361	24,197	19,993	1,499	1,240	52,493	27,435	12,933	452	10,078	34,643	21,733
	Mature Onset Age:	60	70	60	70	60	70	70	60	80	70	70	70

WHISKEY JACK FOREST 2012 FMP — **SUMMARY of SFMM INVESTIGATION**

Case Name: 12_medOLT — **Input File:** 12_medOLT.inp — **Date:** July 29, 2010.

Purpose: Investigate borad impact of meeting OLT median values.

Specific Inputs: 10_MS revised with OLT median values for LC, old forest and car hab met T11 onwards (except PSp, MLI, Clo, Slo, and reduced car hab between low and med points)

Group:	
PWR	
SPF	
PO	
BW	
Total	

thousands of m3 per year. TOTAL vol +/- 20% between terms.

RESULTS: Where projections in the following tables fall below the min. target, the data is shaded yellow; where projections exceed max. targets, the data is shaded green.

FOREST CONDITION RESULTS Where projections do not relate to OLT projections, font is coloured red and results are not expected to correlate to OLT SNRV.

Implications on Forest Condition - Most OLT forest condition projections good through long-term but takes longer than MS runs to get higher areas.
Total forest unit area little worse than controlled MNS. Mature+ area not meeting ranges.

(2a) Productive Area by Landscape Class

Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional: Balsam	Lowland	Hardwood	Conifer
T1	200,327	152,744	62,934	8,361	2,889	105,229	192,907
T2	194,685	189,737	48,922	8,605	1,902	98,867	181,884
T3	172,833	240,970	77,686	8,384	1,737	63,808	158,566
T4	171,854	247,547	102,331	8,912	1,459	53,107	138,772
T5	151,991	231,593	105,241	15,330	1,619	46,621	171,589
T6	149,177	193,030	110,805	17,640	1,667	41,066	210,598
T7	155,537	174,238	107,305	12,891	1,925	36,426	235,634
T8	173,716	170,668	91,778	12,760	1,759	50,423	222,717
T9	196,013	165,879	70,858	11,316	2,541	60,124	216,988
T10	196,603	168,395	76,139	11,915	2,654	45,997	221,982
T11	168,186	174,343	86,105	12,851	2,451	51,953	227,785
T12	153,813	192,145	81,518	13,397	2,294	51,953	228,502
T13	156,323	197,971	73,356	15,342	1,702	51,953	226,975
T14	160,347	196,392	70,963	15,466	1,525	51,953	226,975
T15	181,108	182,249	59,192	13,279	1,661	51,953	234,181
T16	205,221	167,795	52,608	12,432	1,612	51,953	232,002
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

(2c) Area of Old Forest Area by Grouping of Productive Forest (ha)

	Lower Old Forest Age (Years): 80	100	100	100	90	100	160	110-120
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo
T1	3,707	1,851	8,811	17,199	1,251	23,309	97	18,431
T2	3,973	1,158	11,033	18,672	701	33,387	182	13,136
T3	5,979	1,011	12,614	16,542	855	34,990	224	16,302
T4	5,693	872	17,595	12,482	841	32,434	241	19,763
T5	3,314	854	22,783	19,591	530	29,942	292	24,626
T6	4,953	826	25,318	17,014	493	23,763	290	32,686
T7	9,472	799	24,544	10,870	455	18,380	233	40,416
T8	10,537	632	21,583	8,643	448	25,146	229	34,687
T9	8,873	617	19,462	10,319	493	41,376	245	36,503
T10	9,115	660	26,548	8,477	477	39,515	244	40,663
T11	9,747	562	27,174	9,550	1,149	33,569	187	53,846
T12	9,989	926	27,174	9,618	1,160	37,047	199	62,158
T13	7,416	589	27,174	12,228	1,170	31,270	211	72,239
T14	7,416	506	27,174	10,329	1,149	28,494	285	72,823
T15	9,154	509	27,174	9,992	1,149	28,494	323	78,250
T16	9,612	511	27,174	9,550	1,149	28,494	395	83,541
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840

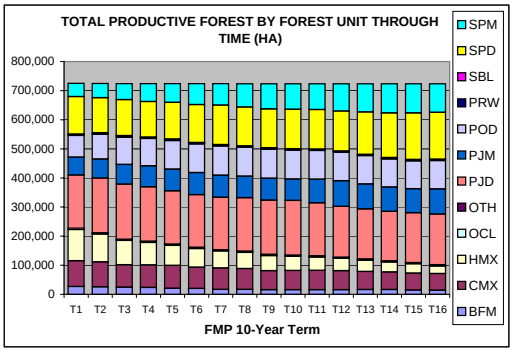
(2b partial) Productive Forest Area Through Time Data (hectares): **(2d)** **(2e) Upland Conifer**

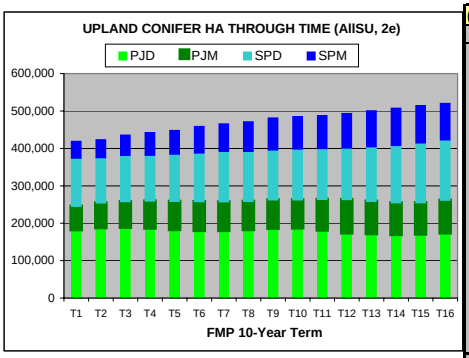
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	(2e) Upland Conifer
T1	725,390	27,148	88,490	107,239	2,216	1,995	182,833	61,845	73,978	3,312	1,807	128,589	45,937	419,205
T2	724,602	25,733	85,749	95,568	2,169	1,985	188,616	65,148	84,935	3,347	1,844	120,715	48,792	423,271
T3	723,983	24,668	77,020	83,561	2,161	1,985	189,318	67,877	93,545	3,440	1,851	123,738	54,819	435,752
T4	723,983	23,374	78,000	77,027	2,155	1,985	187,185	71,746	93,852	3,145	1,857	122,261	61,396	442,587
T5	723,983	21,133	78,547	68,784	2,155	1,985	183,286	74,430	98,290	3,158	1,857	126,137	64,219	448,073
T6	723,983	20,520	73,114	63,666	2,155	1,985	181,008	75,890	98,662	3,177	1,857	130,236	71,712	458,846
T7	723,955	17,174	73,614	58,094	2,155	1,985	180,908	75,773	99,995	3,170	1,857	135,724	73,506	465,912
T8	723,820	16,884	71,620	55,700	2,145	1,985	183,643	74,418	99,084	3,131	1,866	133,590	79,752	471,403
T9	723,719	15,824	65,506	51,970	2,145	1,985	186,681	74,894	99,628	3,112	1,866	133,717	86,390	481,681
T10	723,685	15,785	66,239	48,792	2,144	1,985	187,768	73,932	98,852	3,080	1,867	135,934	87,306	484,939
T11	723,674	15,856	66,564	45,890	2,140	1,985	182,160	81,018	98,637	2,974	1,872	135,842	88,738	487,757
T12	723,622	15,985	65,462	42,253	2,130	1,985	174,590	87,985	97,641	2,905	1,881	137,540	93,264	493,379
T13	723,622	16,388	62,219	38,548	2,107	1,985	172,422	85,833	97,060	2,836	1,904	145,369	96,949	500,574
T14	723,622	16,506	60,565	33,972	2,097	1,985	170,249	83,616	96,388	2,669	1,914	153,394	100,266	507,525
T15	723,622	14,835	58,247	31,720	2,095	1,985	171,334	82,636	95,902	2,657	1,916	160,168	100,126	514,265
T16	723,622	14,552	56,658	26,229	2,094	1,985	174,543	86,479	97,287	2,628	1,918	161,256	97,994	520,272
OLT Max.		19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175	497,902
OLT Min.		10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174	457,260

(5a)

Available Forest:

Term	
T1	572,034
T2	571,246
T3	570,627
T4	570,627
T5	570,627
T6	570,627
T7	570,599
T8	570,464
T9	570,363
T10	570,329
T11	570,318
T12	570,266
T13	570,266
T14	570,266
T15	570,266
T16	570,266





(3f)

(3a) Caribou Habitat Through Time:

Term	Cr	Cwu	Cwp	% Con in CarSUs
T1	101,492	45,035	18,032	89%
T2	94,559	40,986	14,155	90%
T3	113,862	78,211	13,150	90%
T4	130,044	88,371	17,847	90%
T5	138,686	101,423	51,175	91%
T6	153,875	117,569	58,167	91%
T7	155,420	118,208	55,317	91%
T8	151,461	112,633	53,817	92%
T9	146,978	107,107	51,233	92%
T10	147,349	105,395	47,189	93%
T11	150,000	107,039	45,694	94%
T12	150,447	113,147	43,517	95%
T13	156,293	123,277	40,000	95%
T14	150,000	121,418	41,024	95%
T15	151,139	126,774	40,000	96%
T16	156,123	129,914	40,000	96%
OLT Max.	161,804	47,453	68,169	maint or
OLT Min.	147,605	26,809	36,912	increase.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 12_medOLT **Input File:** 12_medOLT.inp **Date:** July 29, 2010.

HARVEST AREA and VOLUME RESULTS:

Implications on Wood Supply - Harvest more erratic with only +/-20% control (more harvest in short-term)

Available Harvest Area by Term Data (hectares harvested annually)

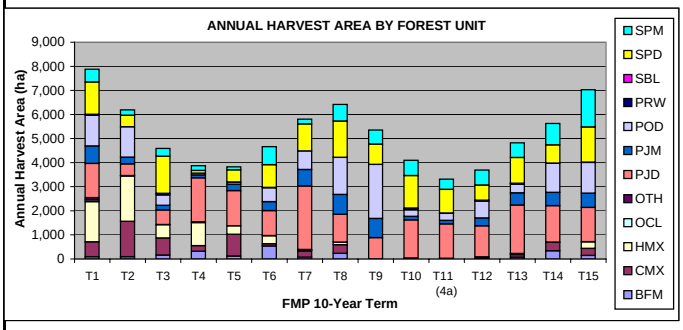
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	7,879	91	622	1,662	79	90	1,423	720	1,286	12	19	1,345	530
T2	6,193	93	1,466	1,889	14	0	480	282	1,260	3	1	474	231
T3	4,592	158	714	546	12	0	603	190	435	56	10	1,541	325
T4	3,875	316	235	955	0	32	1,832	114	78	0	0	108	204
T5	3,828	120	903	350	0	4	1,456	270	84	4	7	500	130
T6	4,663	540	89	337	0	4	1,033	375	579	4	11	939	753
T7	5,807	74	257	41	18	0	2,639	682	770	6	0	1,123	198
T8	6,414	230	365	103	0	0	1,153	825	1,540	0	1	1,510	688
T9	5,351	0	0	0	2	0	882	797	2,242	1	0	843	584
T10	4,099	29	0	0	9	0	1,581	146	272	42	32	1,348	639
T11 (4a)	3,316	9	0	0	19	0	1,426	150	293	12	0	982	427
T12	3,692	6	31	0	46	0	1,292	325	705	7	23	630	627
T13	4,825	71	106	0	20	27	2,015	503	369	19	11	1,070	613
T14	5,628	338	350	0	3	4	1,515	551	1,210	3	3	761	891
T15	7,027	149	288	275	3	4	1,421	589	1,278	5	7	1,460	1,547

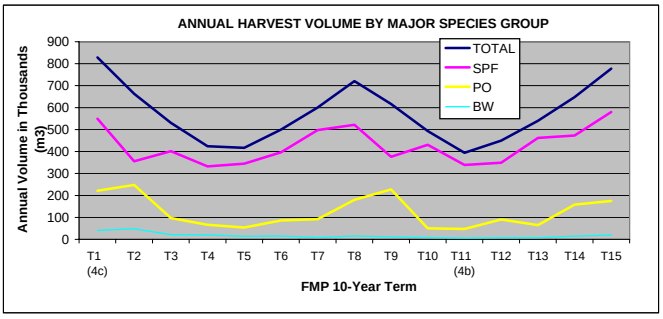
Annual Harvest Volumes by Major Species Groups (1,000s net merchantable cubic metres)

Term	TOTAL	SPF	PO	BW	PRW
T1 (4c)	828.9	549.8	221.7	40.5	1.2
T2	663.1	355.7	247.9	48.0	0.3
T3	530.5	401.2	96.8	21.3	6.0
T4	424.4	331.9	66.3	20.7	0.0
T5	416.9	344.9	54.0	13.5	0.4
T6	500.3	396.8	86.0	14.9	0.3
T7	600.3	497.8	91.6	7.9	0.7
T8	720.4	522.1	179.7	15.4	0.0
T9	616.4	375.8	227.5	10.9	0.1
T10	493.2	430.5	49.9	7.7	4.1
T11 (4b)	394.5	339.0	47.3	6.2	1.2
T12	450.0	349.3	90.4	7.1	0.6
T13	540.0	461.7	64.9	7.1	2.8
T14	648.0	472.7	158.2	14.5	0.3
T15	777.6	579.7	174.6	19.9	0.4
Average	573.6	427.3	123.8	17.0	1.2

Projected Revenues, Expenditures & Renewal Area

Term	Revenue M$	Expend. M$	Unspent M$	Renewal ha	Exten ha	Basc1 ha	Intn1 ha
T1	3,280	2,923	357	**7,800**	4,055	3,253	492
T2	2,229	2,229	0	**6,131**	3,647	2,121	363
T3	2,386	2,386	0	**4,592**	1,529	2,681	381
T4	1,905	1,674	231	**3,875**	1,488	2,125	261
T5	1,971	1,971	0	**3,828**	1,157	2,300	372
T6	2,269	2,269	0	**4,661**	1,553	2,784	324
T7	2,829	2,829	0	**5,794**	1,589	3,747	458
T8	3,028	2,995	33	**6,404**	2,349	3,584	471
T9	2,248	2,049	199	**5,348**	2,499	2,538	310
T10	2,460	2,460	0	**4,098**	523	3,197	378
T11	1,922	1,922	0	**3,311**	488	2,523	300
T12	2,012	1,848	164	**3,692**	975	2,487	230
T13	2,632	2,632	0	**4,825**	845	3,728	252
T14	2,738	2,191	548	**5,628**	2,553	2,868	207
T15	3,347	2,793	554	**7,027**	3,318	3,222	486





NOTES:

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 12_medOLT **Input File:** 12_medOLT.inp **Date:** July 29, 2010.

Immature Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	416,005	18,788	57,263	51,501	188	162	133,100	29,828	26,319	635	947	73,007	24,268
T2	433,344	17,129	49,576	37,355	957	1,056	149,083	38,190	45,211	814	1,154	64,344	28,476
T3	491,489	16,284	48,813	43,152	1,124	1,067	157,741	46,229	71,064	874	1,151	68,673	35,316
T4	521,733	14,462	49,332	39,709	1,272	1,095	161,912	52,068	78,954	1,188	1,282	78,397	42,062
T5	488,824	5,802	45,463	36,118	1,265	1,410	135,498	55,753	84,911	1,265	1,128	77,248	42,961
T6	453,012	2,881	37,444	34,513	1,288	1,400	115,340	56,715	87,335	1,387	1,057	67,514	46,138
T7	437,079	4,283	30,886	34,267	1,225	1,458	119,946	54,968	87,923	1,448	862	57,959	41,853
T8	436,162	4,124	31,435	29,791	1,406	715	135,511	58,846	75,840	1,307	846	52,900	43,439
T9	432,750	4,508	30,071	22,944	808	703	139,993	57,583	69,811	1,364	663	57,375	46,925
T10	441,137	3,871	27,400	19,804	713	692	145,523	56,095	83,137	1,232	644	57,890	44,137
T11	428,635	3,004	25,886	16,312	698	427	145,182	55,806	77,820	1,370	863	58,275	42,990
T12	427,476	2,588	24,944	13,929	860	395	141,087	55,256	75,603	1,353	857	62,915	47,688
T13	427,650	1,046	22,809	11,498	1,271	362	142,998	54,388	73,781	1,342	1,038	66,490	50,628
T14	427,702	1,040	23,167	10,849	1,428	622	144,388	55,689	68,921	1,325	1,058	69,440	49,775
T15	422,548	1,556	23,920	10,858	1,295	651	141,675	58,155	66,145	1,313	1,056	65,535	50,390
T16	425,623	2,120	25,307	12,231	1,296	681	143,340	62,305	60,636	1,304	1,104	61,096	54,204
	Max OLT	3,260	31,472	42,688	1,328	1,063	292,834	96,487	30,987	115,789	10,363	18,903	44,874
	Min OLT	1,948	11,696	21,591	465	448	106,124	36,541	12,670	45,886	3,667	6,479	17,441

Mature+ Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	309,386	8,361	31,227	55,738	2,029	1,833	49,734	32,017	47,659	2,678	860	55,582	21,669
T2	291,258	8,605	36,173	58,213	1,212	930	39,533	26,958	39,724	2,533	690	56,372	20,316
T3	232,494	8,384	28,208	40,409	1,037	918	31,576	21,648	22,480	2,566	700	55,065	19,503
T4	202,250	8,912	28,667	37,318	883	891	25,273	19,678	14,899	1,957	576	43,864	19,334
T5	235,159	15,330	33,083	32,666	889	576	47,788	18,677	13,380	1,893	730	48,889	21,258
T6	270,971	17,640	35,670	29,153	866	586	65,668	19,176	11,327	1,789	801	62,722	25,573
T7	286,876	12,891	42,727	23,827	930	527	60,962	20,805	12,072	1,722	995	77,765	31,653
T8	287,659	12,760	40,185	25,909	739	1,270	48,132	15,572	23,244	1,825	1,020	80,690	36,314
T9	290,969	11,316	35,435	29,026	1,337	1,282	46,688	17,311	29,816	1,748	1,203	76,342	39,465
T10	282,548	11,915	38,839	28,989	1,431	1,293	42,245	17,836	15,715	1,849	1,223	78,044	43,169
T11	295,040	12,851	40,678	29,578	1,442	1,558	36,977	25,211	20,817	1,604	1,009	77,567	45,748
T12	296,146	13,397	40,518	28,324	1,270	1,591	33,503	32,729	22,038	1,552	1,024	74,625	45,576
T13	295,973	15,342	39,410	27,050	836	1,624	29,425	31,446	23,279	1,494	866	78,879	46,322
T14	295,920	15,466	37,398	23,123	669	1,363	25,861	27,927	27,467	1,345	856	83,954	50,490
T15	301,074	13,279	34,327	20,862	800	1,334	29,659	24,481	29,757	1,344	860	94,632	49,737
T16	297,999	12,432	31,351	13,998	798	1,304	31,204	24,174	36,651	1,324	814	100,160	43,789
	Max OLT	15,933	42,682	39,118	2,219	1,962	99,173	46,652	27,723	1,131	15,367	58,117	40,301
	Min OLT	8,361	24,197	19,993	1,499	1,240	52,493	27,435	12,933	452	10,078	34,643	21,733
	Mature Onset Age:	60	70	60	70	60	70	70	60	80	70	70	70

Available Harvest Area by Forest Unit and Age Class TERM 1

Forest Unit:

	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
A5													
A15													
A25													
A35													
A45													
A55		5	11			0							
A65	12	26	557			15	2					9	
A75	2	22	453			18	15	265			172	18	
A85		21	299		8	239	228	254			105	18	
A95	4	276	275		44	762	90	416		1	148	58	
A105	59	268	53		27	314	382	351			329	189	
A115	14	3	11	1	5	40	4		4		150	176	
A125			2	14	6				7	5	148	32	
A135				23						4	156	26	
A145				15		5				5	123	4	
A155				9		30				5	12		
A165				16							2		
A175													
A185													
A195									1				
A205													
A215													
A225													
A235													
A245													
A255													TOTAL
	91	622	1,662	79	90	1,423	720	1,286	12	19	1,345	530	7,879

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 14_OLT50+ **Input File:** 14_OLT50+.inp **Date:** July 29, 2010.

Purpose: OLT indicator investigation with min SNRV targets increased towards median.

Specific Inputs: OLT_50 raised above lower SNRV. No volume targets, flow TOTAL volume of -10% decr and 20% incr between terms. Infinite budget.

Group:	
PWR	
SPF	
PO	
BW	
Total	

thousands of m3 per year.

RESULTS: Where projections in the following tables fall below the min. target, the data is shaded yellow; where projections exceed max. targets, the data is shaded green.

FOREST CONDITION RESULTS Where projections do not relate to OLT projections, font is coloured red and results are not expected to correlate to OLT SNRV.

Implications on Forest Condition - OLT forest condition projections good due to increased constraints included in model (except MLI, SLo as per NATURE).
Total forest unit area underachievement of PRW and SBL. Underachievement of PJD and PJM mature+ area (no age constraints included).
HMX total low in later terms.
Upland conifer and Caribou habitat projections good.

(2a) Productive Area by Landscape Class

Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional: Balsam	Lowland	Hardwood	Conifer
T1	200,327	152,744	62,934	8,361	2,889	105,229	192,907
T2	176,659	189,737	48,922	8,743	2,685	103,770	194,274
T3	150,609	240,949	72,885	6,951	2,636	59,427	190,814
T4	143,469	251,208	104,181	9,181	2,420	53,256	160,557
T5	149,601	221,416	102,221	18,761	2,255	56,425	173,594
T6	180,000	163,088	98,541	18,829	2,272	48,684	212,859
T7	180,000	152,595	95,706	12,891	2,584	46,000	234,468
T8	184,219	177,315	82,443	12,733	2,569	50,628	214,212
T9	196,901	183,215	59,421	12,197	2,711	64,714	204,872
T10	198,333	192,702	68,640	11,965	2,638	46,000	203,713
T11	180,000	189,470	87,528	11,277	2,543	46,000	207,138
T12	180,000	196,601	80,265	12,478	2,646	46,000	205,917
T13	183,208	202,933	74,542	14,546	2,678	46,000	200,000
T14	180,000	209,406	67,576	13,226	2,586	46,000	205,113
T15	183,690	205,827	59,782	12,743	2,368	46,000	213,497
T16	199,803	192,731	51,966	12,300	2,316	46,000	218,792
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

(2c) Area of Old Forest Area by Grouping of Productive Forest (ha)

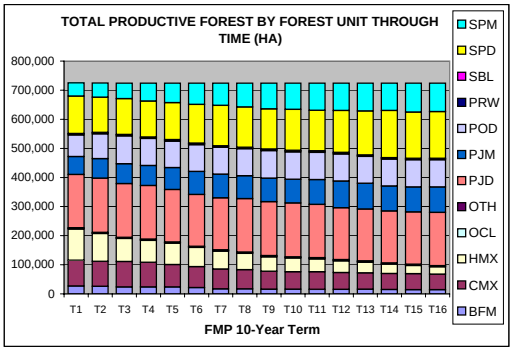
	Lower Old Forest Age (Years): 80	100	100	100	90	100	160	110-120
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo
T1	3,707	1,851	8,811	17,199	1,251	23,309	97	18,431
T2	4,111	1,876	11,862	20,951	1,575	37,175	222	15,829
T3	4,521	1,840	16,899	17,423	1,280	46,181	262	19,523
T4	5,738	1,794	18,883	13,334	1,251	32,869	278	20,717
T5	6,518	1,559	22,783	19,727	1,238	29,942	292	25,549
T6	6,000	1,508	25,318	17,067	1,051	23,877	290	32,686
T7	9,472	1,458	24,544	11,843	1,018	22,000	233	40,416
T8	10,546	1,442	22,000	9,206	1,008	24,054	229	31,020
T9	9,290	1,400	22,000	9,788	1,034	40,297	245	35,263
T10	9,219	1,436	22,000	8,380	1,000	38,497	244	40,034
T11	9,401	1,400	22,000	8,044	1,016	33,529	187	55,432
T12	9,313	1,400	22,000	9,341	1,338	37,046	199	63,580
T13	6,000	1,400	22,000	12,392	1,343	31,267	211	73,358
T14	6,000	1,400	22,000	9,518	1,000	22,907	285	74,949
T15	9,105	1,400	22,000	8,189	1,000	22,000	323	80,271
T16	9,481	1,400	22,000	8,000	1,000	22,000	395	85,889
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840

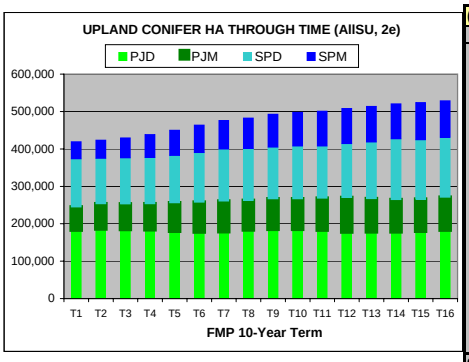
(2b partial) Productive Forest Area Through Time Data (hectares): **(2d)**

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	(2e) Upland Conifer
T1	725,390	27,148	88,490	107,239	2,216	1,995	182,833	61,845	73,978	3,312	1,807	128,589	45,937	419,205
T2	724,791	25,826	85,870	95,484	2,213	1,994	186,229	66,988	84,949	3,346	1,808	121,284	48,800	423,300
T3	724,272	23,714	87,261	79,179	2,213	1,990	184,575	68,313	95,454	3,306	1,808	123,055	53,404	429,346
T4	724,272	23,520	85,063	75,301	2,213	1,990	183,985	69,088	92,601	3,367	1,808	123,601	61,735	438,409
T5	724,272	23,417	77,421	73,193	2,204	1,990	180,123	75,446	90,998	3,450	1,818	126,863	67,350	449,782
T6	724,272	21,265	71,949	66,133	2,204	1,990	178,040	79,234	91,815	3,509	1,818	132,945	73,372	463,591
T7	724,244	17,087	67,926	61,749	2,204	1,990	178,949	81,424	92,057	3,546	1,818	138,848	76,647	475,868
T8	724,118	16,779	66,338	56,030	2,204	1,990	183,544	78,799	92,799	3,551	1,818	138,363	81,902	482,608
T9	724,031	16,012	61,371	49,788	2,204	1,990	185,213	81,135	94,442	3,537	1,818	138,069	88,452	492,870
T10	723,991	15,778	60,165	47,092	2,204	1,990	185,010	81,618	93,851	3,506	1,818	141,111	89,848	497,588
T11	723,956	15,293	60,775	43,946	2,204	1,990	183,171	85,085	93,639	3,384	1,818	139,315	93,334	500,905
T12	723,907	15,487	57,867	40,033	2,202	1,990	178,028	91,975	93,144	3,348	1,820	144,142	93,872	508,016
T13	723,907	15,716	56,361	36,819	2,202	1,990	178,307	88,514	92,298	3,271	1,820	151,248	95,362	513,431
T14	723,907	14,801	55,250	32,096	2,201	1,990	178,230	86,104	92,216	3,243	1,820	162,362	93,593	520,289
T15	723,907	14,404	54,982	28,153	2,194	1,990	179,880	85,483	93,516	3,152	1,827	158,951	99,376	523,690
T16	723,907	14,242	53,170	25,377	2,194	1,990	182,989	87,576	93,400	3,119	1,828	160,444	97,580	528,588
OLT Max.		19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175	497,902
OLT Min.		10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174	457,260

(5a)

Available Forest: Term	
T1	572,034
T2	571,434
T3	570,916
T4	570,916
T5	570,916
T6	570,916
T7	570,888
T8	570,762
T9	570,675
T10	570,635
T11	570,599
T12	570,551
T13	570,551
T14	570,551
T15	570,551
T16	570,551





(3f)

(3a) Caribou Habitat Through Time: Term	Cr	Cwu	Cwp	% Con in CarSUs
T1	101,492	45,035	18,032	89%
T2	94,595	40,986	14,155	90%
T3	113,897	78,211	13,150	90%
T4	130,079	88,371	17,847	90%
T5	138,720	101,423	51,175	91%
T6	153,908	117,569	58,167	91%
T7	155,439	118,208	55,317	91%
T8	152,786	114,279	53,792	92%
T9	150,000	110,795	51,209	93%
T10	150,000	108,862	47,190	94%
T11	150,000	107,947	45,650	94%
T12	150,000	114,291	43,514	95%
T13	154,566	123,880	40,000	95%
T14	150,000	121,777	40,408	95%
T15	152,886	126,525	40,000	95%
T16	157,348	129,676	40,000	96%
OLT Max.	161,804	47,453	68,169	maint or
OLT Min.	147,605	26,809	36,912	increase.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 14_OLT50+ **Input File:** 14_OLT50+.inp **Date:** July 29, 2010.

HARVEST AREA and VOLUME RESULTS:

Implications on Wood Supply - SPF varies 228-519. PO T1 170, then 273 in T2. Need to regulate short-term flow better.
TOTAL varies 471 to 737 with very broad flow control. (overall average of 577 Mm3 per year)

Available Harvest Area by Term Data (hectares harvested annually)

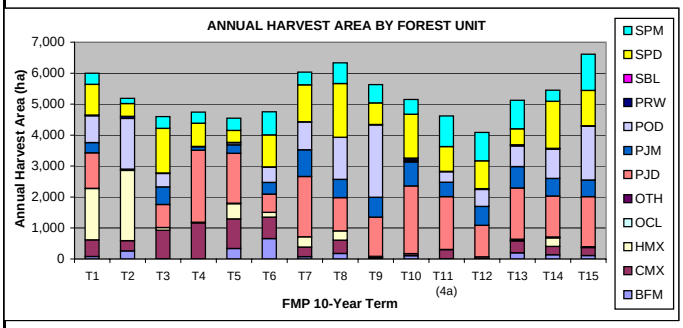
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	5,996	76	536	1,662	5	0	1,145	332	869	7	12	994	357
T2	5,185	257	333	2,265	0	43	0	0	1,640	64	0	416	167
T3	4,597	4	919	90	0	0	741	569	435	0	13	1,441	384
T4	4,741	0	1,164	0	19	0	2,325	114	0	0	11	749	360
T5	4,544	335	957	490	0	17	1,613	270	69	4	8	385	398
T6	4,754	658	689	154	0	0	590	377	493	5	3	1,035	751
T7	6,036	74	307	333	0	0	1,946	864	898	6	0	1,192	416
T8	6,331	178	428	300	0	0	1,073	588	1,360	0	1	1,735	668
T9	5,631	42	39	0	0	0	1,268	639	2,339	3	9	700	592
T10	5,153	101	71	0	0	0	2,184	773	37	65	22	1,416	483
T11 (4a)	4,619	4	298	0	4	0	1,706	465	338	0	12	801	991
T12	4,085	5	63	0	1	0	1,018	609	548	19	4	900	918
T13	5,124	197	385	15	1	36	1,655	693	668	20	13	520	922
T14	5,450	137	266	277	14	14	1,321	573	943	13	11	1,522	360
T15	6,613	106	261	24	1	2	1,615	540	1,734	6	8	1,142	1,175

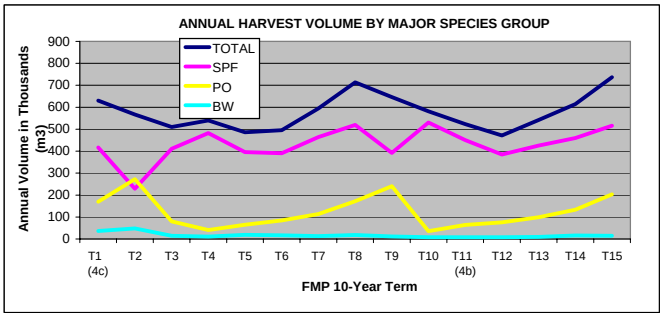
Annual Harvest Volumes by Major Species Groups (1,000s net merchantable cubic metres)

Term	TOTAL	SPF	PO	BW	PRW
T1 (4c)	630.1	416.7	170.0	36.2	0.7
T2	567.1	228.7	272.7	48.1	6.8
T3	510.4	411.0	79.9	14.8	0.0
T4	539.7	482.4	40.9	11.2	0.0
T5	485.7	395.8	65.0	18.9	0.4
T6	495.7	390.8	84.9	16.7	0.5
T7	594.8	464.3	113.7	13.4	0.7
T8	713.8	519.5	172.3	18.4	0.0
T9	646.4	392.0	240.2	11.4	0.3
T10	581.7	530.8	35.8	8.0	6.6
T11 (4b)	523.6	450.1	64.0	8.3	0.0
T12	471.2	384.9	76.1	7.7	1.7
T13	542.0	425.8	99.4	9.7	2.8
T14	614.2	460.0	133.2	16.2	1.2
T15	737.0	516.3	203.0	14.7	0.5
Average	576.9	431.3	123.4	16.9	1.5

Projected Revenues, Expenditures & Renewal Area

Term	Revenue M$	Expend. M$	Unspent M$	Renewal ha	Exten ha	Basc1 ha	Intn1 ha
T1	2,478	2,091	388	**5,936**	3,342	2,233	361
T2	1,601	1,063	537	**5,133**	4,118	899	117
T3	2,355	2,773	-418	**4,597**	947	3,199	451
T4	2,721	3,028	-306	**4,741**	574	3,638	529
T5	2,267	2,556	-289	**4,544**	1,155	2,979	411
T6	2,243	2,660	-416	**4,752**	1,359	3,014	379
T7	2,666	3,021	-355	**6,023**	1,710	3,825	488
T8	3,013	3,167	-155	**6,323**	2,065	3,788	470
T9	2,351	2,144	206	**5,627**	2,631	2,671	326
T10	3,028	3,137	-109	**5,149**	496	4,147	506
T11	2,534	2,732	-197	**4,614**	691	3,482	440
T12	2,201	2,262	-62	**4,085**	793	3,026	265
T13	2,463	2,700	-236	**5,124**	1,227	3,601	295
T14	2,665	1,650	1,015	**5,450**	3,185	2,075	189
T15	3,014	2,502	512	**6,613**	3,234	2,947	432





NOTES:

add constraints for mature+ forest unit area.
revise wood flow to allow only -5 and +10%% TOTAL decrease between terms.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 14_OLT50+ **Input File:** 14_OLT50+.inp **Date:** July 29, 2010.

Immature Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	416,005	18,788	57,263	51,501	188	162	133,100	29,828	26,319	635	947	73,007	24,268
T2	415,318	17,082	48,868	37,271	284	191	144,006	36,276	41,195	766	1,053	61,514	26,811
T3	464,443	16,763	45,902	43,575	347	647	145,964	40,144	72,974	1,291	1,038	64,104	31,694
T4	498,858	14,339	46,443	38,244	409	689	155,803	47,856	77,702	1,399	1,193	74,607	40,174
T5	473,238	4,655	44,325	32,188	610	707	132,950	55,265	76,862	1,546	1,157	78,567	44,405
T6	441,629	2,436	36,279	30,729	656	847	112,480	58,605	79,678	1,706	1,094	69,295	47,824
T7	428,301	4,196	29,991	30,468	615	884	115,773	59,213	78,444	1,824	823	61,076	44,994
T8	443,977	4,047	30,893	26,737	655	867	135,437	64,319	72,587	1,727	798	58,258	47,652
T9	439,537	3,815	29,619	19,915	616	510	138,520	64,908	61,080	1,789	695	66,575	51,494
T10	459,675	3,814	28,855	18,430	611	505	142,755	64,812	77,997	1,716	772	67,989	51,418
T11	456,998	4,017	28,152	17,064	606	501	147,686	63,859	76,011	1,781	873	66,939	49,511
T12	456,866	3,009	26,801	14,731	495	362	148,998	63,523	74,075	1,758	880	69,592	52,642
T13	460,684	1,170	25,255	12,444	499	362	153,213	62,194	72,300	1,777	844	74,902	55,721
T14	456,982	1,575	25,111	11,341	504	709	156,750	63,611	68,252	1,898	932	74,710	51,588
T15	449,299	1,661	26,626	11,912	628	835	153,993	64,602	64,912	1,807	1,026	67,332	53,965
T16	444,500	1,942	27,297	12,281	627	835	154,841	66,849	61,651	1,793	1,079	59,818	55,488
	Max OLT	3,260	31,472	42,688	1,328	1,063	292,834	96,487	30,987	115,789	10,363	18,903	44,874
	Min OLT	1,948	11,696	21,591	465	448	106,124	36,541	12,670	45,886	3,667	6,479	17,441

Mature+ Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	309,386	8,361	31,227	55,738	2,029	1,833	49,734	32,017	47,659	2,678	860	55,582	21,669
T2	309,473	8,743	37,002	58,213	1,930	1,803	42,223	30,712	43,754	2,580	755	59,769	21,989
T3	259,829	6,951	41,359	35,604	1,866	1,343	38,610	28,169	22,480	2,015	770	58,951	21,710
T4	225,414	9,181	38,620	37,057	1,805	1,301	28,182	21,232	14,899	1,968	615	48,994	21,561
T5	251,035	18,761	33,096	41,005	1,594	1,283	47,173	20,180	14,137	1,904	661	48,296	22,945
T6	282,644	18,829	35,670	35,404	1,548	1,143	65,561	20,629	12,136	1,802	724	63,650	25,547
T7	295,943	12,891	37,935	31,281	1,589	1,106	63,176	22,211	13,613	1,722	995	77,772	31,653
T8	280,141	12,733	35,445	29,293	1,549	1,123	48,107	14,480	20,212	1,825	1,020	80,106	34,250
T9	284,494	12,197	31,752	29,873	1,588	1,480	46,692	16,227	33,362	1,748	1,123	71,494	36,959
T10	264,316	11,965	31,309	28,662	1,593	1,485	42,255	16,806	15,854	1,790	1,046	73,122	38,431
T11	266,957	11,277	32,623	26,882	1,598	1,489	35,485	21,226	17,628	1,604	945	72,376	43,824
T12	267,041	12,478	31,067	25,303	1,707	1,628	29,029	28,451	19,070	1,590	939	74,550	41,229
T13	263,224	14,546	31,107	24,375	1,702	1,628	25,093	26,320	19,997	1,494	976	76,346	39,640
T14	266,925	13,226	30,140	20,755	1,698	1,281	21,480	22,492	23,964	1,345	888	87,652	42,005
T15	274,608	12,743	28,355	16,240	1,567	1,156	25,887	20,881	28,604	1,344	801	91,618	45,411
T16	279,408	12,300	25,873	13,096	1,567	1,156	28,147	20,727	31,749	1,326	749	100,627	42,092
	Max OLT	15,933	42,682	39,118	2,219	1,962	99,173	46,652	27,723	1,131	15,367	58,117	40,301
	Min OLT	8,361	24,197	19,993	1,499	1,240	52,493	27,435	12,933	452	10,078	34,643	21,733
	Mature Onset Age:	60	70	60	70	60	70	70	60	80	70	70	70

Available Harvest Area by Forest Unit and Age Class TERM 1

Forest Unit:

	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
A5													
A15													
A25													
A35													
A45													
A55		5	11			1		0					
A65	12	26	793			15	2	0	0			9	
A75	2	22	453		0	18	15	0	0		172	18	
A85	0	21	299		0	31	160	102	0		105	18	
A95	4	420	40	0	0	762	90	416	0	1	148	58	
A105	59	38	53	0	0	314	61	351	0	0	83	16	
A115	0	3	11	1	0	3	4	0	0	0	150	176	
A125	0	0	2	1	0	0	0	0	7	2	148	32	
A135	0	0		3	0				0	4	156	26	
A145		0		1	0	0			0	5	18	4	
A155				0		0			0	1	12		
A165				0					0	0	2		
A175													
A185													
A195									0				
A205													
A215													
A225									0				
A235									0				
A245													
A255									0				TOTAL
	76	536	1,662	5	0	1,145	332	869	7	12	994	357	5,996

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 15_MS **Input File:** 15_MS.inp **Date:** July 28, 2010.

Purpose: Start of MS development with harvest volume targets and OLT minimum SNRV targets.

Specific Inputs: 02_OLT_50 inputs plus lower volume targets by species group as below. Non-binding. Balanced budget. Mature+ FU constraints added for PJD and PJM.

Group:		thousands of m3 per year.	10% decr TOTAL between terms.
PWR	1.5	T1 only	
SPF	390.0	all terms	
PO	200.0	T1 only	
BW	20.0	T1 only	
Total	550.0	all terms	

RESULTS: Where projections in the following tables fall below the min. target, the data is shaded yellow; where projections exceed max. targets, the data is shaded green.

FOREST CONDITION RESULTS Where projections do not relate to OLT projections, font is coloured red and results are not expected to correlate to OLT SNRV.

Implications on Forest Condition - OLT forest condition projections good due to constraints included in model (except MLI, SLo as per NATURE).
Total forest unit area underachievement of PRW and SBL. Underachievment of PJD and PJM mature+ area (no age constraints included).
HMX total low in later terms but is controllable with added constraint if needed. POD increases significantly.
Caribou habitat projections good.

(2a) Productive Area by Landscape Class

Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional: Balsam	Lowland	Hardwood	Conifer
T1	200,327	152,744	62,934	8,361	2,889	105,229	192,907
T2	175,810	189,737	48,922	8,743	2,703	100,528	198,357
T3	145,979	240,924	75,775	7,775	2,182	82,511	169,146
T4	164,450	234,888	83,602	9,267	2,110	67,568	162,406
T5	166,804	219,027	89,472	16,643	2,173	52,978	177,195
T6	158,630	182,391	101,125	18,811	2,193	43,021	218,120
T7	160,649	166,029	100,866	12,866	2,507	43,021	238,326
T8	170,657	178,601	85,608	12,344	2,443	47,984	226,492
T9	169,110	185,738	86,108	13,082	2,561	45,177	222,290
T10	167,513	172,117	86,492	12,576	2,934	43,021	239,334
T11	163,400	181,882	84,267	13,378	2,576	43,314	235,117
T12	163,654	177,463	87,331	13,304	2,507	43,021	236,575
T13	169,620	185,822	84,495	14,571	2,183	43,021	224,142
T14	177,922	183,130	76,849	14,462	2,172	43,021	226,297
T15	176,794	178,440	75,032	12,582	2,161	43,021	235,825
T16	177,430	172,445	74,693	12,567	2,124	43,021	241,575
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

(2c) Area of Old Forest Area by Grouping of Productive Forest (ha)

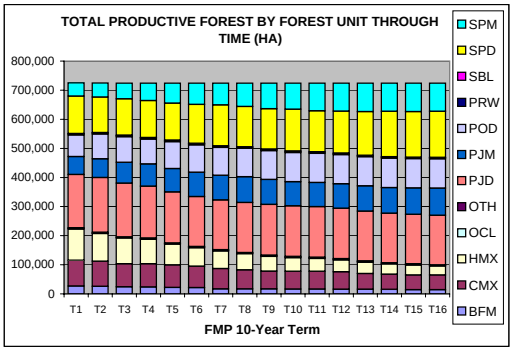
	Lower Old Forest Age (Years): 80	100	100	100	90	100	160	110-120
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo
T1	3,707	1,851	8,811	17,199	1,251	23,309	97	18,431
T2	4,111	1,919	12,779	20,380	1,575	40,467	182	14,809
T3	5,356	1,558	14,761	16,858	1,584	42,167	224	16,302
T4	5,718	1,521	18,738	12,932	1,523	36,521	241	19,763
T5	4,369	1,477	22,632	19,466	1,330	33,207	292	24,626
T6	5,315	1,428	25,133	17,004	1,129	27,210	290	32,673
T7	9,456	1,381	24,444	10,870	1,061	20,800	233	40,403
T8	10,164	1,367	20,665	7,050	999	32,562	229	29,923
T9	10,390	1,328	20,927	8,621	1,026	46,578	245	33,959
T10	9,778	1,367	21,641	7,332	992	42,608	244	37,915
T11	10,758	1,328	20,754	7,050	992	33,727	187	51,241
T12	10,055	1,328	20,665	7,050	992	35,064	199	59,645
T13	5,888	1,328	20,665	8,855	992	34,827	211	68,724
T14	5,657	1,328	20,665	7,331	992	33,109	198	71,992
T15	9,679	1,328	20,665	8,874	1,088	32,689	196	77,461
T16	10,078	1,328	20,665	7,050	992	41,813	234	82,453
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840

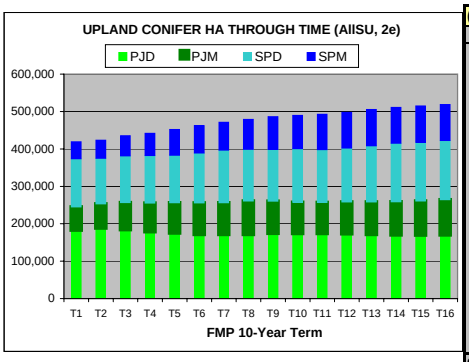
(2b partial) Productive Forest Area Through Time Data (hectares): **(2d)** **(2e) Upland Conifer**

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
T1	725,390	27,148	88,490	107,239	2,216	1,995	182,833	61,845	73,978	3,312	1,807	128,589	45,937	419,205
T2	724,800	25,799	86,183	95,286	2,216	1,994	188,420	64,418	84,893	3,332	1,806	121,782	48,671	423,290
T3	724,291	24,267	79,010	88,378	2,196	1,993	184,362	71,881	88,055	3,393	1,821	124,801	54,133	435,177
T4	724,291	23,603	80,031	83,806	2,196	1,993	178,572	76,180	85,469	3,426	1,821	127,181	60,012	441,945
T5	724,291	22,046	77,698	71,135	2,196	1,993	175,387	80,314	92,056	3,467	1,821	127,210	68,967	451,879
T6	724,291	21,335	73,723	63,400	2,196	1,993	171,500	83,702	94,203	3,505	1,821	133,407	73,506	462,114
T7	724,263	17,304	69,410	60,611	2,196	1,993	171,451	84,333	96,011	3,522	1,821	140,674	74,937	471,395
T8	724,129	16,809	65,514	55,497	2,196	1,993	171,698	88,628	97,861	3,531	1,821	138,158	80,421	478,906
T9	724,066	17,021	61,188	50,569	2,196	1,993	174,587	85,421	99,393	3,483	1,820	138,471	87,924	486,403
T10	723,986	16,443	61,045	46,760	2,196	1,993	173,893	82,980	100,399	3,451	1,820	143,262	89,745	489,879
T11	723,935	16,504	60,959	44,243	2,196	1,993	174,007	82,792	100,266	3,375	1,820	140,836	94,945	492,580
T12	723,855	16,183	59,510	40,885	2,195	1,993	173,413	84,285	100,154	3,269	1,820	144,094	96,053	497,845
T13	723,855	15,768	54,251	38,909	2,183	1,993	171,334	86,468	100,136	3,208	1,832	149,998	97,776	505,575
T14	723,855	15,569	52,073	35,100	2,183	1,993	170,054	88,338	100,824	3,047	1,832	156,292	96,551	511,234
T15	723,855	14,398	50,657	34,038	2,182	1,993	169,986	90,493	100,813	2,997	1,833	157,064	97,399	514,942
T16	723,855	14,380	50,773	30,449	2,182	1,993	170,266	93,497	100,613	2,967	1,833	158,362	96,540	518,665
OLT Max.		19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175	497,902
OLT Min.		10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174	457,260

(5a)

Available Forest: Term	
T1	572,034
T2	571,443
T3	570,935
T4	570,935
T5	570,935
T6	570,935
T7	570,907
T8	570,772
T9	570,710
T10	570,630
T11	570,579
T12	570,498
T13	570,498
T14	570,498
T15	570,498
T16	570,498





(3f)

(3a) Caribou Habitat Through Time: Term	Cr	Cwu	Cwp	% Con in CarSUs
T1	101,492	45,035	18,032	89%
T2	94,539	41,030	14,155	90%
T3	113,809	78,231	13,150	90%
T4	129,839	88,388	17,847	90%
T5	138,459	101,440	51,175	91%
T6	153,922	117,300	58,167	91%
T7	155,416	117,826	55,317	91%
T8	152,218	111,968	53,300	92%
T9	151,255	107,886	50,512	92%
T10	147,605	103,096	46,592	93%
T11	147,605	101,120	43,133	94%
T12	147,605	105,257	38,617	94%
T13	150,638	114,752	36,912	95%
T14	147,605	111,926	37,446	95%
T15	150,400	118,148	37,274	95%
T16	154,840	126,695	37,439	95%
OLT Max.	161,804	47,453	68,169	maint or
OLT Min.	147,605	26,809	36,912	increase.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 15_MS **Input File:** 15_MS.inp **Date:** July 28, 2010.

HARVEST AREA and VOLUME RESULTS:

Implications on Wood Supply - SPF >390 all terms. PO met at 200 in Term 1, then avg 160 for T2-T3. Then lower T4-6.
Spike in total and SPF in T7 when LLP deferrals OFF, artificial gain but can control with incr targets or flow control.
AHA had big jump T1 to T2 CMX harvest. T5-6 lower AHA and vol limited by LLP deferrals and SUBMU timing.

Available Harvest Area by Term Data (hectares harvested annually)

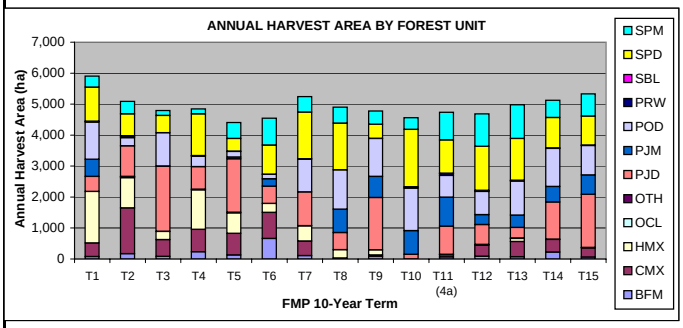
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	5,907	76	442	1,662	0	0	483	553	1,204	14	15	1,099	357
T2	5,086	172	1,478	972	34	12	987	0	259	48	15	712	398
T3	4,793	84	542	264	0	2	2,104	8	1,073	0	0	555	161
T4	4,845	231	724	1,278	0	18	728	0	342	10	7	1,348	159
T5	4,407	129	699	660	0	18	1,729	55	180	5	8	406	519
T6	4,547	659	847	285	0	3	556	241	144	3	3	940	866
T7	5,245	108	472	487	0	5	1,090	0	1,061	6	6	1,506	504
T8	4,905	27	6	266	0	0	556	754	1,269	0	2	1,507	518
T9	4,780	80	47	168	0	0	1,689	679	1,227	0	2	456	430
T10	4,559	0	0	0	1	2	148	766	1,369	7	37	1,855	373
T11 (4a)	4,737	70	68	0	1	10	910	937	701	60	14	1,070	895
T12	4,688	90	353	0	23	3	639	323	749	20	19	1,418	1,051
T13	4,978	72	493	97	1	15	342	397	1,099	22	6	1,348	1,087
T14	5,125	220	412	0	1	5	1,200	500	1,230	9	8	985	556
T15	5,332	62	295	0	1	14	1,715	627	951	6	8	933	720

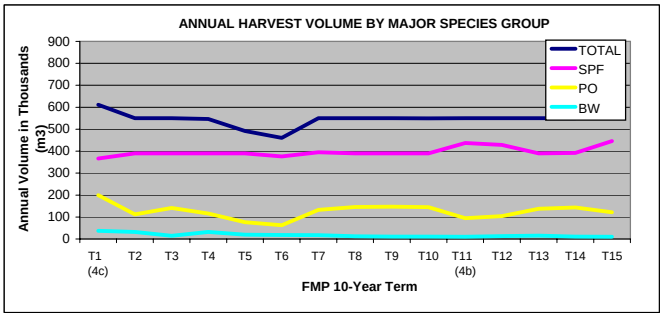
Annual Harvest Volumes by Major Species Groups (1,000s net merchantable cubic metres)

Term	TOTAL	SPF	PO	BW	PRW
T1 (4c)	611.1	366.4	200.0	37.0	1.5
T2	550.0	390.0	112.5	32.0	5.1
T3	550.0	390.0	141.3	14.7	0.0
T4	546.8	390.0	116.2	32.3	1.1
T5	492.1	390.0	76.5	19.7	0.4
T6	460.7	376.3	62.6	18.2	0.3
T7	550.0	394.9	132.9	17.4	0.7
T8	550.0	390.0	145.6	12.6	0.0
T9	550.0	390.0	147.2	11.0	0.1
T10	549.2	390.0	145.3	11.2	0.8
T11 (4b)	550.0	437.0	94.6	10.1	6.5
T12	550.0	428.2	104.1	13.2	1.8
T13	550.0	390.0	138.1	15.1	3.0
T14	550.0	391.8	143.5	11.2	0.8
T15	581.2	446.2	121.6	10.0	0.6
Average	546.1	397.4	125.5	17.7	1.5

Projected Revenues, Expenditures & Renewal Area

Term	Revenue M$	Expend. M$	Unspent M$	Renewal ha	Exten ha	Basc1 ha	Intn1 ha
T1	2,231	2,042	189	**5,848**	3,364	2,169	314
T2	2,357	2,357	0	**5,036**	2,363	2,239	434
T3	2,277	2,205	72	**4,793**	1,729	2,700	364
T4	2,295	2,269	25	**4,845**	2,013	2,499	334
T5	2,243	2,243	0	**4,407**	1,352	2,679	376
T6	2,148	2,148	0	**4,544**	1,801	2,356	387
T7	2,307	2,307	0	**5,232**	2,224	2,628	380
T8	2,267	2,267	0	**4,899**	1,767	2,798	334
T9	2,267	1,996	271	**4,772**	1,825	2,622	325
T10	2,275	2,193	81	**4,554**	1,569	2,670	315
T11	2,557	2,557	0	**4,729**	1,053	3,344	331
T12	2,473	2,473	0	**4,688**	1,193	3,428	67
T13	2,304	2,304	0	**4,978**	1,843	3,061	74
T14	2,287	1,752	535	**5,125**	2,730	2,225	170
T15	2,565	2,180	385	**5,332**	2,276	2,675	381





NOTES:

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 15_MS **Input File:** 15_MS.inp **Date:** July 28, 2010.

Immature Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	416,005	18,788	57,263	51,501	188	162	133,100	29,828	26,319	635	947	73,007	24,268
T2	414,469	17,056	48,265	37,073	243	191	139,802	35,845	44,381	821	1,076	63,033	26,682
T3	462,678	16,492	47,766	40,592	612	346	150,477	44,936	54,977	1,285	1,223	69,470	34,500
T4	482,940	14,336	47,625	35,857	665	421	152,860	49,756	67,423	1,368	1,243	72,993	38,393
T5	475,302	5,403	44,752	33,363	684	617	129,618	55,137	78,226	1,574	1,160	80,043	44,725
T6	442,147	2,524	37,114	32,413	727	771	108,252	56,202	83,391	1,716	1,097	70,709	47,230
T7	427,544	4,438	31,575	34,517	684	845	110,489	56,132	80,232	1,800	826	62,687	43,318
T8	434,866	4,465	32,694	31,958	722	879	119,198	61,128	74,530	1,707	852	59,971	46,763
T9	440,956	3,939	31,010	26,729	712	768	122,087	57,921	79,281	1,734	742	65,551	50,481
T10	426,121	3,867	28,652	25,045	463	736	121,393	55,480	80,350	1,596	619	62,413	45,507
T11	429,549	3,126	27,369	20,502	468	601	121,507	55,292	82,085	1,234	972	68,830	47,565
T12	428,448	2,879	26,186	17,744	472	551	120,913	56,785	81,716	1,718	1,036	68,867	49,581
T13	439,938	1,196	25,559	13,917	686	551	118,834	58,968	83,550	1,714	1,146	77,445	56,372
T14	437,902	1,107	24,489	12,440	686	645	117,554	60,838	81,811	1,702	1,157	79,710	55,764
T15	430,266	1,816	25,236	12,743	688	684	117,486	62,993	80,396	1,652	1,166	70,299	55,105
T16	424,568	1,813	26,609	12,318	688	807	117,766	65,997	76,909	1,654	1,203	63,614	55,189
	Max OLT	3,260	31,472	42,688	1,328	1,063	292,834	96,487	30,987	115,789	10,363	18,903	44,874
	Min OLT	1,948	11,696	21,591	465	448	106,124	36,541	12,670	45,886	3,667	6,479	17,441

Mature+ Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	309,386	8,361	31,227	55,738	2,029	1,833	49,734	32,017	47,659	2,678	860	55,582	21,669
T2	310,331	8,743	37,918	58,213	1,973	1,803	48,618	28,572	40,512	2,511	730	58,749	21,989
T3	261,613	7,775	31,244	47,786	1,584	1,647	33,885	26,945	33,078	2,108	598	55,331	19,633
T4	241,351	9,267	32,406	47,949	1,531	1,572	25,712	26,424	18,047	2,058	578	54,188	21,619
T5	248,989	16,643	32,945	37,772	1,512	1,376	45,769	25,177	13,831	1,893	661	47,168	24,243
T6	282,144	18,811	36,609	30,987	1,468	1,222	63,247	27,500	10,812	1,789	724	62,698	26,275
T7	296,719	12,866	37,835	26,093	1,512	1,149	60,962	28,201	15,779	1,722	995	77,986	31,619
T8	289,262	12,344	32,821	23,539	1,474	1,114	52,500	27,500	23,330	1,825	968	78,187	33,659
T9	283,109	13,082	30,178	23,840	1,483	1,225	52,500	27,500	20,112	1,749	1,078	72,920	37,443
T10	297,865	12,576	32,392	21,715	1,733	1,257	52,500	27,500	20,049	1,855	1,201	80,849	44,238
T11	294,386	13,378	33,590	23,741	1,728	1,393	52,500	27,500	18,180	2,141	848	72,006	47,380
T12	295,407	13,304	33,324	23,141	1,723	1,442	52,500	27,500	18,438	1,552	784	75,227	46,472
T13	283,917	14,571	28,691	24,992	1,497	1,443	52,500	27,500	16,586	1,494	686	72,552	41,404
T14	285,952	14,462	27,585	22,660	1,497	1,348	52,500	27,500	19,013	1,345	675	76,581	40,787
T15	293,589	12,582	25,421	21,295	1,494	1,309	52,500	27,500	20,417	1,344	667	86,765	42,294
T16	299,287	12,567	24,163	18,131	1,494	1,186	52,500	27,500	23,704	1,313	630	94,748	41,351
	Max OLT	15,933	42,682	39,118	2,219	1,962	99,173	46,652	27,723	1,131	15,367	58,117	40,301
	Min OLT	8,361	24,197	19,993	1,499	1,240	52,493	27,435	12,933	452	10,078	34,643	21,733
	Mature Onset Age:	60	70	60	70	60	70	70	60	80	70	70	70

Available Harvest Area by Forest Unit and Age Class TERM 1

Forest Unit:

	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
A5													
A15													
A25													
A35													
A45													
A55		5	11			0							
A65	12	26	793			15	2					9	
A75	2	22	453			18	15	120			172	18	
A85		21	299			31	61	258			105	18	
A95	4	325	40			67	90	475		1	148	58	
A105	59	38	53	0	0	314	382	351	0		83	16	
A115		3	11	0		3	4		4		150	176	
A125			2	0					7	1	148	32	
A135				0					0	4	156	26	
A145				0		5			0	5	123	4	
A155						30			0	5	12		
A165									3		2		
A175													
A185													
A195									0				
A205													
A215													
A225													
A235													
A245													
A255													TOTAL
	76	442	1,662	0	0	483	553	1,204	14	15	1,099	357	5,907

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 16_MS **Input File:** 16_MS.inp **Date:** July 28, 2010.

Purpose: MS development with harvest volume targets, OLT minimum SNRV targets, some forest unit/age improvements.

Specific Inputs: 15_MS with minor additions for mature+ forest unit area in long-term. Min for total HMX long-term.

Group:		thousands of m3 per year.	10% decr TOTAL between terms.
PWR	1.5	T1 only	
SPF	390.0	all terms	
PO	200.0	T1 only	
BW	20.0	T1 only	
Total	550.0	all terms	

RESULTS: Where projections in the following tables fall below the min. target, the data is shaded yellow; where projections exceed max. targets, the data is shaded green.

FOREST CONDITION RESULTS Where projections do not relate to OLT projections, font is coloured red and results are not expected to correlate to OLT SNRV.

Implications on Forest Condition - OLT forest condition projections good due to constraints included in model (except MLI, SLo as per NATURE).
Total forest unit area underachievement of PRW and SBL. Mature+ forest unit area good due to constraints.
HMX total improved in later terms due to constraints. POD increases.
Caribou habitat projections good.

(2a) Productive Area by Landscape Class

Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional: Balsam	Lowland	Hardwood	Conifer
T1	200,327	152,744	62,934	8,361	2,889	105,229	192,907
T2	175,979	189,737	48,922	8,743	2,703	100,609	198,104
T3	143,934	240,924	75,744	7,776	2,220	86,844	166,870
T4	166,911	236,673	81,774	9,235	2,141	68,069	159,511
T5	166,450	219,199	89,507	18,851	2,205	52,902	175,197
T6	158,484	181,923	101,226	18,820	2,224	43,021	218,614
T7	158,613	166,432	102,541	12,860	2,533	43,021	238,283
T8	167,319	178,423	88,229	12,818	2,468	50,333	224,570
T9	170,842	183,013	88,783	13,097	2,582	45,608	220,170
T10	167,908	171,820	88,434	12,728	2,924	43,583	236,627
T11	162,473	181,171	86,637	12,735	2,552	44,468	233,918
T12	161,063	181,858	88,251	12,677	2,547	43,021	234,472
T13	164,345	184,574	88,528	14,598	2,186	43,021	226,637
T14	170,486	182,735	84,286	13,752	2,173	43,089	227,367
T15	172,977	173,315	84,250	12,093	2,167	43,021	236,065
T16	169,982	167,339	85,161	12,049	2,130	43,021	244,206
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

(2c) Area of Old Forest Area by Grouping of Productive Forest (ha)

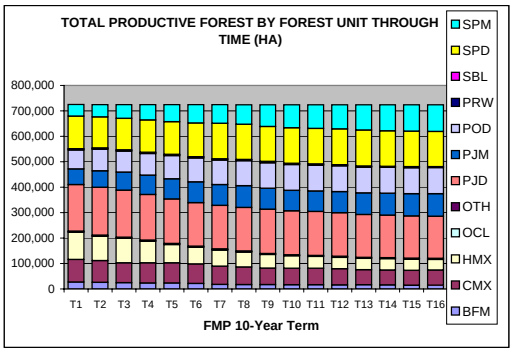
	Lower Old Forest Age (Years): 80	100	100	100	90	100	160	110-120
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo
T1	3,707	1,851	8,811	17,199	1,251	23,309	97	18,431
T2	4,111	1,919	12,228	20,284	1,575	40,467	182	15,107
T3	5,355	1,597	14,761	18,134	1,576	43,089	224	16,302
T4	5,732	1,554	18,714	13,386	1,529	36,280	241	19,763
T5	6,571	1,509	22,602	19,930	1,261	32,973	292	24,626
T6	5,315	1,459	25,097	16,979	1,200	27,102	290	32,671
T7	9,452	1,407	24,416	10,863	1,163	20,800	233	40,400
T8	10,641	1,393	20,665	8,142	1,135	32,367	229	29,355
T9	10,389	1,349	21,044	9,737	1,044	46,887	245	33,407
T10	9,929	1,387	21,929	7,961	992	42,959	244	37,880
T11	10,736	1,328	21,191	7,050	992	33,162	187	50,624
T12	9,499	1,328	20,665	7,050	1,002	35,296	199	59,046
T13	5,776	1,328	20,665	7,050	992	29,879	211	68,465
T14	5,569	1,328	20,665	8,166	1,056	30,886	198	71,204
T15	9,181	1,331	20,665	8,673	992	33,199	196	76,870
T16	9,596	1,328	20,665	9,231	992	42,165	234	82,112
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840

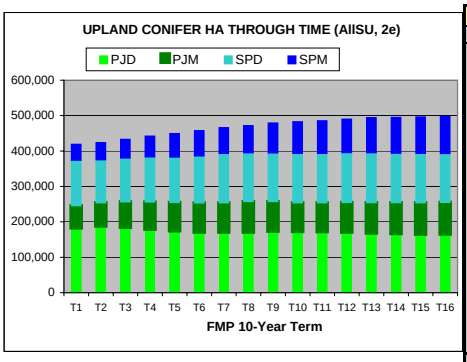
(2b partial) Productive Forest Area Through Time Data (hectares): **(2d)** **(2e) Upland Conifer**

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
T1	725,390	27,148	88,490	107,239	2,216	1,995	182,833	61,845	73,978	3,312	1,807	128,589	45,937	419,205
T2	724,798	25,799	85,727	95,321	2,216	1,994	188,450	64,525	84,908	3,336	1,806	121,727	48,989	423,690
T3	724,313	24,279	78,488	96,367	2,199	1,993	184,858	70,762	82,509	3,360	1,819	123,741	53,938	433,299
T4	724,313	23,581	79,012	84,796	2,198	1,993	179,207	76,136	85,059	3,412	1,819	127,226	59,874	442,442
T5	724,313	23,514	78,740	72,089	2,198	1,993	175,049	78,919	91,101	3,437	1,819	128,229	67,224	449,421
T6	724,313	21,369	76,796	65,468	2,198	1,993	171,430	81,354	93,856	3,439	1,819	132,614	71,975	457,373
T7	724,285	17,328	72,120	63,357	2,198	1,993	171,213	81,877	95,958	3,443	1,820	139,849	73,129	466,068
T8	724,161	17,117	69,117	58,537	2,198	1,993	171,103	85,503	98,331	3,380	1,819	137,884	77,179	471,668
T9	724,095	17,031	64,535	53,397	2,198	1,993	173,994	82,407	100,269	3,332	1,819	137,586	85,534	479,521
T10	724,024	16,537	64,590	48,910	2,198	1,993	172,953	79,984	101,579	3,297	1,819	139,533	90,631	483,101
T11	723,955	16,489	64,448	46,554	2,196	1,993	172,813	80,348	101,356	3,205	1,820	139,460	93,273	485,894
T12	723,889	15,926	63,019	45,024	2,196	1,993	171,392	82,678	101,116	2,767	1,820	140,810	95,149	490,029
T13	723,889	16,109	59,630	44,212	2,186	1,993	168,313	85,202	101,208	2,534	1,830	141,057	99,615	494,187
T14	723,889	15,726	58,398	44,452	2,185	1,993	167,127	86,144	101,649	2,368	1,831	139,669	102,348	495,287
T15	723,889	14,726	57,933	44,198	2,185	1,993	165,465	87,454	102,235	2,313	1,831	139,555	104,002	496,476
T16	723,889	14,748	59,171	42,000	2,184	1,993	165,641	88,614	102,376	2,238	1,832	137,931	105,161	497,347
OLT Max.		19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175	497,902
OLT Min.		10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174	457,260

(5a) Available Forest:

Term	
T1	572,034
T2	571,442
T3	570,956
T4	570,956
T5	570,956
T6	570,956
T7	570,928
T8	570,804
T9	570,739
T10	570,668
T11	570,599
T12	570,533
T13	570,533
T14	570,533
T15	570,533
T16	570,533





(3a) Caribou Habitat Through Time:

Term	Cr	Cwu	Cwp	(3f) % Con in CarSUs
T1	101,492	45,035	18,032	89%
T2	94,539	41,030	14,155	90%
T3	113,804	78,227	13,150	90%
T4	129,808	88,383	17,847	90%
T5	138,420	101,435	51,175	90%
T6	153,866	117,285	58,167	91%
T7	155,352	117,796	55,317	91%
T8	152,233	112,109	53,479	92%
T9	150,702	107,596	50,917	92%
T10	147,605	103,189	46,961	93%
T11	147,605	99,582	41,689	94%
T12	147,605	105,228	39,087	94%
T13	151,298	114,712	36,912	95%
T14	147,605	112,863	38,344	95%
T15	150,187	121,049	36,912	95%
T16	153,996	128,184	36,933	95%
OLT Max.	161,804	47,453	68,169	maint or
OLT Min.	147,605	26,809	36,912	increase.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 16_MS **Input File:** 16_MS.inp **Date:** July 28, 2010.

HARVEST AREA and VOLUME RESULTS:

Implications on Wood Supply - SPF >390 all terms. PO met at 200 in Term 1, then avg 160 for T2-T3. Then lower T4-6.
Spike in total and SPF in T7 when LLP deferrals OFF, artificial gain but can control with incr targets or flow control.
AHA had big jump T1 to T2 CMX harvest. T5-6 lower AHA and vol limited by LLP deferrals and SUBMU timing.

Available Harvest Area by Term Data (hectares harvested annually)

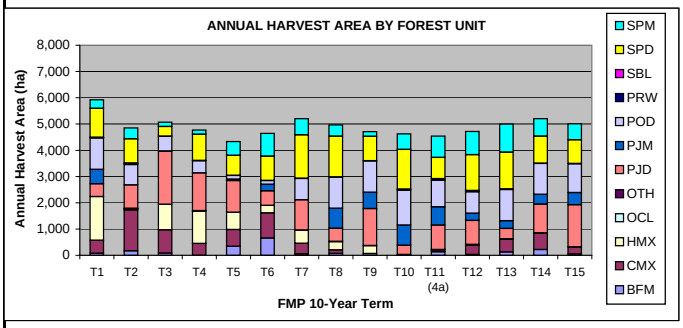
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	5,925	76	499	1,662	0	0	483	553	1,196	14	15	1,099	326
T2	4,852	170	1,558	18	30	13	892	0	772	50	15	919	415
T3	5,068	84	884	975	0	1	2,019	8	560	7	0	367	161
T4	4,770	0	454	1,222	0	25	1,437	0	461	5	7	999	159
T5	4,330	341	639	658	0	4	1,206	55	137	1	8	763	520
T6	4,642	660	953	289	0	0	556	244	143	3	3	925	866
T7	5,202	58	400	501	0	1	1,155	0	807	8	6	1,654	612
T8	4,968	74	133	311	0	12	500	759	1,192	0	2	1,557	428
T9	4,710	65	0	303	0	2	1,409	621	1,197	0	2	937	174
T10	4,624	19	6	0	3	2	356	763	1,331	3	37	1,511	593
T11 (4a)	4,539	135	72	0	1	10	937	693	1,008	54	8	809	812
T12	4,717	28	362	0	21	3	915	274	818	24	25	1,361	886
T13	4,996	129	483	0	1	14	400	291	1,189	18	6	1,401	1,064
T14	5,201	218	622	0	1	11	1,098	373	1,174	6	8	1,029	661
T15	5,010	53	267	0	1	2	1,605	461	1,098	4	8	898	613

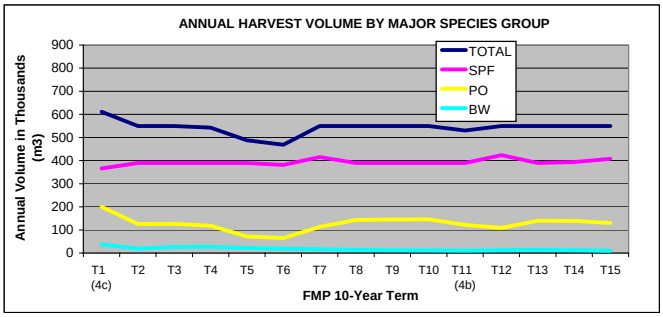
Annual Harvest Volumes by Major Species Groups (1,000s net merchantable cubic metres)

Term	TOTAL	SPF	PO	BW	PRW
T1 (4c)	611.1	366.1	200.0	37.1	1.5
T2	550.0	390.0	125.9	19.4	5.3
T3	550.0	390.0	126.9	26.2	0.8
T4	542.7	390.0	118.5	27.2	0.5
T5	488.4	390.0	71.9	21.9	0.1
T6	468.9	381.1	65.1	18.9	0.3
T7	550.0	415.6	113.4	16.6	0.9
T8	550.0	390.0	143.1	13.8	0.0
T9	550.0	390.0	145.5	12.6	0.1
T10	550.0	390.0	146.1	11.6	0.3
T11 (4b)	530.3	390.0	121.7	10.2	6.1
T12	550.0	423.9	108.6	12.4	2.4
T13	550.0	390.0	140.0	13.7	2.7
T14	550.0	393.9	139.2	12.5	0.5
T15	550.0	407.8	130.3	9.5	0.4
Average	542.8	393.2	126.4	17.6	1.5

Projected Revenues, Expenditures & Renewal Area

Term	Revenue M$	Expend. M$	Unspent M$	Renewal ha	Exten ha	Basc1 ha	Intn1 ha
T1	2,230	2,061	169	**5,865**	3,370	2,175	320
T2	2,356	2,356	0	**4,804**	1,912	2,433	459
T3	2,295	2,295	0	**5,068**	2,004	2,675	389
T4	2,279	2,083	197	**4,770**	1,972	2,469	328
T5	2,236	1,882	354	**4,330**	1,791	2,189	350
T6	2,179	2,040	139	**4,640**	2,041	2,196	402
T7	2,406	2,406	0	**5,190**	1,886	2,962	342
T8	2,269	2,213	56	**4,961**	1,920	2,717	324
T9	2,267	1,984	284	**4,703**	1,829	2,560	313
T10	2,271	2,206	65	**4,617**	1,581	2,714	322
T11	2,316	1,654	661	**4,533**	2,243	1,965	325
T12	2,459	1,403	1,056	**4,717**	2,784	1,815	119
T13	2,299	809	1,490	**4,996**	4,078	849	69
T14	2,299	990	1,309	**5,201**	3,913	1,141	147
T15	2,357	1,223	1,134	**5,010**	3,241	1,608	160





NOTES:

WHISKEY JACK FOREST 2012 FMP — **SUMMARY of SFMM INVESTIGATION**

Case Name: 16_MS **Input File:** 16_MS.inp **Date:** July 28, 2010.

Immature Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	416,005	18,788	57,263	51,501	188	162	133,100	29,828	26,319	635	947	73,007	24,268
T2	414,638	17,056	48,359	37,108	243	191	139,832	35,953	44,314	825	1,076	62,978	26,702
T3	460,602	16,503	48,520	39,389	576	354	150,052	43,816	54,282	1,271	1,221	70,296	34,321
T4	485,357	14,347	49,226	37,048	634	415	153,736	49,596	66,316	1,444	1,243	73,100	38,253
T5	475,157	4,663	45,824	33,819	654	687	134,656	53,630	77,775	1,582	1,158	77,729	42,979
T6	441,633	2,549	39,520	34,541	698	701	108,183	53,854	83,055	1,650	1,095	70,073	45,714
T7	427,587	4,467	34,313	37,363	660	743	110,251	53,659	80,182	1,721	825	61,888	41,516
T8	433,971	4,299	35,618	35,193	698	743	118,603	58,003	72,593	1,579	851	61,171	44,622
T9	442,638	3,934	34,345	31,613	693	743	121,494	54,907	77,695	1,606	741	66,603	48,264
T10	428,161	3,809	31,159	28,422	473	741	120,453	52,484	79,736	1,461	620	64,532	44,271
T11	430,282	3,753	29,212	24,191	493	544	120,313	52,848	80,700	1,059	971	70,301	45,896
T12	431,171	3,249	29,320	21,018	497	604	118,892	55,178	83,490	1,090	971	67,706	49,157
T13	437,448	1,511	29,756	17,769	686	629	115,813	57,702	85,995	1,040	1,144	68,744	56,658
T14	437,507	1,973	30,298	17,688	685	743	114,627	58,644	86,574	1,024	1,158	64,103	59,990
T15	430,542	2,632	32,646	19,308	685	743	112,965	59,954	85,354	968	1,164	52,810	61,314
T16	422,483	2,699	34,171	19,547	684	732	113,141	61,114	83,069	925	1,201	42,046	63,152
	Max OLT	3,260	31,472	42,688	1,328	1,063	292,834	96,487	30,987	115,789	10,363	18,903	44,874
	Min OLT	1,948	11,696	21,591	465	448	106,124	36,541	12,670	45,886	3,667	6,479	17,441

Mature+ Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	309,386	8,361	31,227	55,738	2,029	1,833	49,734	32,017	47,659	2,678	860	55,582	21,669
T2	310,160	8,743	37,367	58,213	1,973	1,803	48,618	28,572	40,593	2,511	730	58,749	22,287
T3	263,710	7,776	29,967	56,978	1,622	1,639	34,807	26,945	28,227	2,089	598	53,446	19,617
T4	238,955	9,235	29,786	47,747	1,565	1,578	25,471	26,540	18,743	1,968	576	54,126	21,621
T5	249,156	18,851	32,916	38,270	1,544	1,307	40,393	25,289	13,325	1,855	661	50,500	24,245
T6	282,679	18,820	37,276	30,927	1,500	1,293	63,247	27,500	10,801	1,789	724	62,541	26,261
T7	296,698	12,860	37,807	25,995	1,538	1,250	60,962	28,219	15,776	1,722	995	77,961	31,612
T8	290,190	12,818	33,499	23,345	1,500	1,250	52,500	27,500	25,738	1,801	968	76,713	32,557
T9	281,457	13,097	30,191	21,783	1,504	1,250	52,500	27,500	22,575	1,726	1,078	70,983	37,270
T10	295,862	12,728	33,430	20,488	1,725	1,252	52,500	27,500	21,843	1,836	1,199	75,000	46,360
T11	293,674	12,735	35,237	22,363	1,703	1,449	52,500	27,500	20,656	2,145	848	69,160	47,376
T12	292,717	12,677	33,699	24,007	1,699	1,389	52,500	27,500	17,625	1,677	848	73,104	45,992
T13	286,441	14,598	29,873	26,443	1,500	1,364	52,500	27,500	15,214	1,494	686	72,312	42,957
T14	286,382	13,752	28,099	26,764	1,500	1,250	52,500	27,500	15,076	1,345	673	75,565	42,358
T15	293,346	12,093	25,287	24,890	1,500	1,250	52,500	27,500	16,881	1,344	667	86,745	42,688
T16	301,406	12,049	25,000	22,453	1,500	1,261	52,500	27,500	19,307	1,312	630	95,884	42,009
	Max OLT	15,933	42,682	39,118	2,219	1,962	99,173	46,652	27,723	1,131	15,367	58,117	40,301
	Min OLT	8,361	24,197	19,993	1,499	1,240	52,493	27,435	12,933	452	10,078	34,643	21,733
Mature Onset Age:		60	70	60	70	60	70	70	60	80	70	70	70

Available Harvest Area by Forest Unit and Age Class TERM 1

Forest Unit:

	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
A5													
A15													
A25													
A35													
A45													
A55		5	11			0							
A65	12	26	942			15	2	3				9	
A75	2	22	453			18	15	97			172	18	
A85	0	21	151			31	61	261			105	18	
A95	4	382	40		0	67	90	485	0	1	148	58	
A105	59	38	53	0	0	314	382	351	0		83	16	
A115	0	3	11	0	0	3	4		4		150	145	
A125			2	0					7	1	148	32	
A135				0					0	4	156	26	
A145				0		5			0	5	123	4	
A155				0		30			0	5	12		
A165									1		2		
A175													
A185													
A195									1				
A205													
A215													
A225									1				
A235									0				
A245													
A255									0				TOTAL
	76	499	1,662	0	0	483	553	1,196	14	15	1,099	326	5,925

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 17_MS **Input File:** 17_MS.inp **Date:** July 28, 2010.

Purpose: MS development with harvest volume targets, OLT min SNRV, some forest unit/age improvements, balanced wood supply.

Specific Inputs: 16_MS with added non-binding volume targets for more reliable and even projections as noted below with improved PO projections.

Group:		thousands of m3 per year.
PWR	1.5	T1-T2 only
SPF	350.0	T1-T2 only
PO	200.0	T1-T2 only then T3-T15 at 100.00
BW	20.0	T1-T2 only
Total	500.0	all terms

RESULTS: Where projections in the following tables fall below the min. target, the data is shaded yellow; where projections exceed max. targets, the data is shaded green.

FOREST CONDITION RESULTS Where projections do not relate to OLT projections, font is coloured red and results are not expected to correlate to OLT SNRV.

Implications on Forest Condition - OLT forest condition projections good due to constraints included in model (except MLI, SLo as per NATURE).
Total forest unit area underachievement of PRW and SBL. Mature+ forest unit area good due to constraints.
HMX total improved in later terms due to constraints. POD increases.
Caribou habitat projections good.

(2a) Productive Area by Landscape Class

Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional: Balsam	Lowland	Hardwood	Conifer
T1	200,327	152,744	62,934	8,361	2,889	105,229	192,907
T2	179,086	189,737	48,922	8,743	2,662	100,770	194,846
T3	149,386	240,900	75,696	8,524	2,568	77,908	169,273
T4	160,123	248,156	89,960	8,979	2,143	59,805	155,090
T5	150,542	220,470	99,370	18,492	2,278	52,382	180,721
T6	153,913	179,754	105,588	18,696	2,224	43,418	220,662
T7	163,056	158,325	106,332	12,860	2,533	43,021	238,101
T8	185,547	165,504	93,235	11,797	2,441	50,860	214,707
T9	183,097	174,607	86,427	12,110	2,567	54,668	210,548
T10	176,490	177,824	83,492	12,551	2,568	43,021	228,017
T11	143,268	198,327	96,762	12,362	2,485	43,021	227,676
T12	146,693	194,405	95,354	12,396	2,441	43,021	229,518
T13	160,878	183,967	92,263	14,467	2,419	43,021	226,814
T14	163,368	175,820	87,512	13,991	2,161	43,021	237,957
T15	159,174	162,863	87,609	12,601	2,225	43,021	256,335
T16	183,243	160,112	77,172	11,838	2,155	43,021	246,288
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

(2c) Area of Old Forest Area by Grouping of Productive Forest (ha)

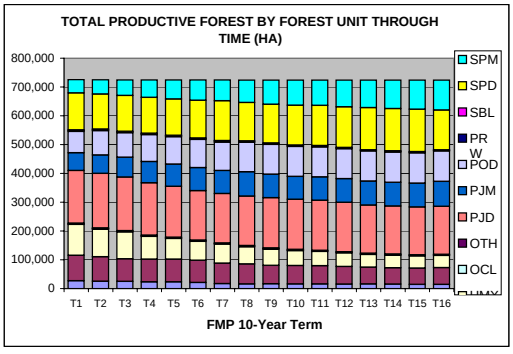
	Lower Old Forest Age (Years): 80	100	100	100	90	100	160	110-120
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo
T1	3,707	1,851	8,811	17,199	1,251	23,309	97	18,431
T2	4,111	1,878	11,089	15,845	1,504	40,113	182	14,957
T3	6,101	1,843	12,614	13,775	1,631	41,936	224	16,302
T4	5,700	1,554	17,426	11,996	1,502	36,012	241	19,763
T5	6,382	1,513	22,602	19,411	1,261	32,836	292	24,626
T6	5,315	1,459	25,097	16,979	1,200	27,019	290	32,671
T7	9,452	1,407	24,416	10,931	1,163	20,800	233	40,400
T8	9,619	1,393	20,665	8,190	1,077	31,597	202	29,916
T9	9,732	1,328	21,122	9,733	1,089	46,213	224	33,897
T10	9,783	1,362	22,030	7,956	992	42,212	226	38,062
T11	10,154	1,328	20,665	7,050	992	33,656	163	49,714
T12	9,283	1,328	20,665	8,469	992	35,912	175	56,993
T13	5,760	1,328	20,665	8,431	992	30,065	196	67,151
T14	5,584	1,328	20,665	10,038	1,009	24,118	192	69,440
T15	9,187	1,328	20,665	7,762	1,028	28,871	183	75,298
T16	9,587	1,328	20,665	8,824	992	39,772	221	81,298
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840

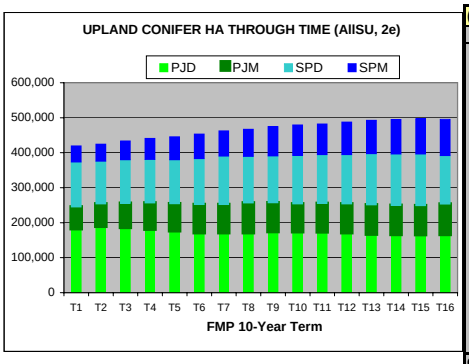
(2b partial) Productive Forest Area Through Time Data (hectares): **(2d)** **(2e) Upland Conifer**

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
T1	725,390	27,148	88,490	107,239	2,216	1,995	182,833	61,845	73,978	3,312	1,807	128,589	45,937	419,205
T2	724,765	25,799	84,916	95,402	2,214	1,994	189,622	63,692	84,938	3,344	1,808	122,057	48,978	424,350
T3	724,255	24,759	78,354	93,623	2,214	1,994	186,360	68,900	84,782	3,402	1,807	124,457	53,604	433,321
T4	724,255	23,306	79,039	78,825	2,201	1,994	181,667	74,303	92,964	3,408	1,820	124,415	60,313	440,699
T5	724,255	23,136	78,861	71,963	2,201	1,994	177,067	76,809	95,217	3,427	1,820	125,759	66,002	445,636
T6	724,255	21,143	77,024	65,976	2,201	1,994	171,516	80,110	97,665	3,422	1,820	131,260	70,124	453,009
T7	724,229	17,176	70,898	66,268	2,201	1,994	171,521	80,127	98,182	3,429	1,820	138,560	72,053	462,261
T8	724,091	16,326	69,071	59,722	2,201	1,994	171,588	84,480	102,444	3,366	1,820	133,243	77,836	467,148
T9	724,024	16,413	64,269	55,966	2,199	1,994	174,636	81,939	103,344	3,240	1,821	134,041	84,162	474,778
T10	723,964	16,320	63,509	52,007	2,199	1,994	174,111	79,435	103,862	3,206	1,821	138,202	87,298	479,046
T11	723,901	16,171	63,189	49,383	2,199	1,994	173,904	80,845	104,080	2,983	1,820	139,500	87,834	482,083
T12	723,829	15,619	61,031	47,166	2,197	1,994	171,540	81,951	103,945	2,717	1,822	140,919	92,929	487,339
T13	723,829	15,860	58,347	44,195	2,197	1,994	167,419	83,131	104,359	2,553	1,822	146,427	95,527	492,503
T14	723,829	15,409	56,595	43,801	2,188	1,994	166,501	82,591	104,812	2,378	1,831	146,837	98,893	494,821
T15	723,829	14,632	56,584	42,086	2,187	1,994	165,969	82,442	105,288	2,320	1,832	147,400	101,096	496,907
T16	723,829	14,470	58,299	42,000	2,187	1,994	166,470	86,646	105,599	2,237	1,832	138,204	103,891	495,212
OLT Max.		19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175	497,902
OLT Min.		10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174	457,260

(5a)

Available Forest: Term	
T1	572,034
T2	571,409
T3	570,899
T4	570,899
T5	570,899
T6	570,899
T7	570,872
T8	570,735
T9	570,668
T10	570,607
T11	570,545
T12	570,473
T13	570,473
T14	570,473
T15	570,473
T16	570,473





(3f)

(3a) Caribou Habitat Through Time: Term	Cr	Cwu	Cwp	% Con in CarSUs
T1	101,492	45,035	18,032	89%
T2	94,462	41,030	14,155	90%
T3	113,728	78,227	13,150	90%
T4	129,733	88,383	17,847	90%
T5	138,346	101,435	51,175	90%
T6	153,838	117,263	58,167	91%
T7	155,352	117,774	55,317	91%
T8	151,010	110,789	53,441	92%
T9	149,395	106,017	50,732	92%
T10	147,605	102,860	46,732	93%
T11	147,605	99,696	42,134	94%
T12	147,605	105,035	39,900	94%
T13	151,392	114,837	36,912	95%
T14	147,605	114,863	38,846	95%
T15	150,305	122,570	36,912	95%
T16	155,235	128,279	36,912	95%
OLT Max.	161,804	47,453	68,169	maint or
OLT Min.	147,605	26,809	36,912	increase.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 17_MS **Input File:** 17_MS.inp **Date:** July 28, 2010.

HARVEST AREA and VOLUME RESULTS:

Implications on Wood Supply - SPF >350 all terms. PO met at 200 in Term 1-2, then T3 is at 100. Below 100 for T4-6.
Spike in total and SPF in T7 when LLP deferrals OFF, artificial gain but can control with incr targets or flow control.
AHA had jump T1 to T2 CMX harvest. T4-5 lower AHA. T9 vol has more PO and less SPF if not constrained.

Available Harvest Area by Term Data (hectares harvested annually)

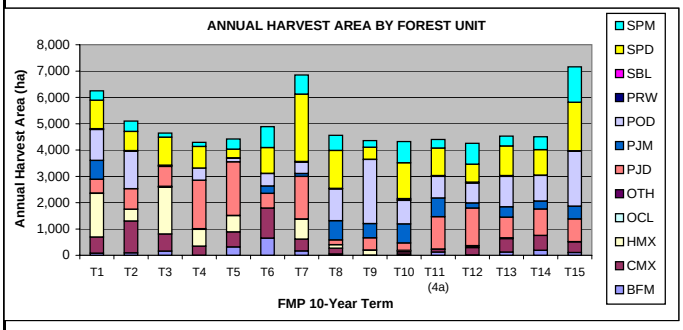
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	6,249	76	616	1,662	4	7	520	720	1,172	14	15	1,084	357
T2	5,103	93	1,210	450	0	0	776	0	1,430	15	5	727	398
T3	4,646	158	650	1,776	25	9	753	0	0	40	10	1,064	161
T4	4,293	0	348	640	0	23	1,840	0	461	2	0	820	159
T5	4,421	317	574	617	0	4	2,038	0	137	4	15	323	394
T6	4,886	648	1,146	0	0	0	556	285	472	4	3	981	792
T7	6,848	164	448	761	0	7	1,618	106	443	8	8	2,560	725
T8	4,557	50	218	130	3	1	182	726	1,215	11	2	1,442	576
T9	4,357	8	0	185	1	6	464	540	2,440	0	5	452	256
T10	4,324	41	95	47	0	7	276	728	892	26	39	1,364	811
T11 (4a)	4,403	120	106	4	4	2	1,226	717	815	30	3	1,046	330
T12	4,258	11	278	64	1	8	1,431	197	756	14	16	686	796
T13	4,531	120	510	0	18	17	784	394	1,153	19	14	1,121	381
T14	4,502	189	563	0	1	2	1,001	303	975	6	3	967	492
T15	7,164	105	407	0	1	5	865	484	2,086	5	13	1,839	1,354

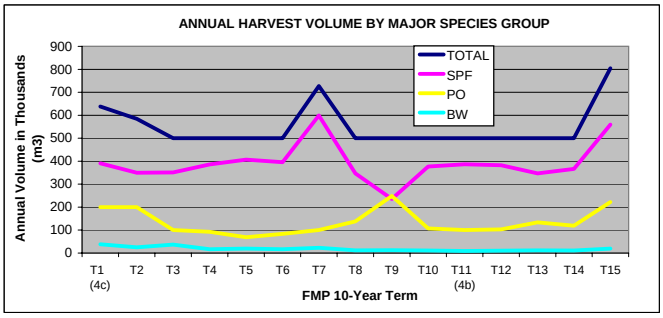
Annual Harvest Volumes by Major Species Groups (1,000s net merchantable cubic metres)

Term	TOTAL	SPF	PO	BW	PRW
T1 (4c)	638.0	390.8	200.0	38.1	1.5
T2	584.1	350.0	200.0	25.4	1.5
T3	500.0	350.8	100.0	37.2	4.3
T4	500.0	386.1	92.4	16.6	0.3
T5	500.0	406.8	69.1	19.5	0.4
T6	500.0	395.6	83.6	16.6	0.3
T7	727.2	599.4	100.0	22.7	0.9
T8	500.0	347.0	137.9	11.7	1.0
T9	500.0	235.3	248.7	12.7	0.1
T10	500.0	376.7	107.4	11.1	2.6
T11 (4b)	500.0	386.9	100.0	8.8	2.8
T12	500.0	382.3	103.4	10.4	1.6
T13	500.0	347.0	134.1	11.8	2.8
T14	500.0	366.5	118.9	11.0	0.6
T15	804.6	559.4	221.9	19.3	0.4
Average	550.3	392.0	134.5	18.2	1.4

Projected Revenues, Expenditures & Renewal Area

Term	Revenue M$	Expend. M$	Unspent M$	Renewal ha	Exten ha	Basc1 ha	Intn1 ha
T1	2,372	2,262	110	**6,187**	3,424	2,404	359
T2	2,142	2,114	28	**5,052**	2,516	2,166	370
T3	2,111	2,017	94	**4,646**	2,135	2,210	301
T4	2,221	2,055	166	**4,293**	1,395	2,564	334
T5	2,327	1,849	477	**4,421**	1,778	2,282	362
T6	2,274	2,141	133	**4,883**	2,166	2,284	433
T7	3,414	3,414	0	**6,834**	2,091	4,243	501
T8	2,039	2,039	0	**4,550**	1,793	2,465	292
T9	1,495	1,194	300	**4,350**	2,789	1,391	171
T10	2,195	2,189	6	**4,318**	1,306	2,691	321
T11	2,244	2,098	146	**4,396**	1,348	2,716	331
T12	2,212	1,538	674	**4,258**	2,013	2,082	163
T13	2,062	1,054	1,008	**4,531**	3,127	1,287	118
T14	2,131	872	1,258	**4,502**	3,358	1,013	130
T15	3,271	987	2,284	**7,164**	6,044	1,033	87





NOTES:

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 17_MS **Input File:** 17_MS.inp **Date:** July 28, 2010.

Immature Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	416,005	18,788	57,263	51,501	188	162	133,100	29,828	26,319	635	947	73,007	24,268
T2	417,745	17,056	48,687	37,189	281	262	141,358	36,734	44,113	836	1,078	63,160	26,990
T3	465,982	16,235	47,494	39,478	345	299	150,568	43,680	62,713	976	1,108	69,115	33,970
T4	498,238	14,327	47,859	39,315	637	442	155,453	48,687	74,221	1,427	1,242	75,470	39,159
T5	470,381	4,644	44,120	34,212	653	687	127,830	52,413	81,892	1,535	1,090	78,757	42,549
T6	439,254	2,446	37,817	34,652	701	701	108,269	52,610	86,864	1,633	1,096	68,162	44,304
T7	427,713	4,316	33,091	37,094	662	744	110,559	51,971	85,585	1,707	825	60,719	40,441
T8	444,286	4,529	35,649	36,138	701	744	119,088	56,980	76,418	1,565	879	65,337	46,259
T9	444,131	4,303	34,178	32,242	685	744	122,136	54,439	73,651	1,547	768	70,363	49,076
T10	437,806	3,769	31,216	26,782	683	720	121,611	51,935	87,340	1,465	769	66,669	44,847
T11	438,357	3,809	29,974	24,627	493	596	121,404	53,345	87,212	1,380	1,041	69,356	45,119
T12	436,452	3,223	29,388	21,278	526	574	119,040	54,451	88,231	1,121	1,051	70,076	47,492
T13	437,108	1,393	29,027	17,894	529	649	114,919	55,631	88,984	1,059	1,071	72,309	53,644
T14	426,699	1,418	28,522	16,324	688	744	114,001	55,091	90,518	1,033	1,170	66,402	50,788
T15	409,647	2,031	29,341	17,802	687	744	113,469	54,942	87,802	975	1,107	51,530	49,218
T16	420,528	2,632	33,299	19,836	671	733	113,970	59,146	86,003	924	1,193	41,962	60,158
	Max OLT	3,260	31,472	42,688	1,328	1,063	292,834	96,487	30,987	115,789	10,363	18,903	44,874
	Min OLT	1,948	11,696	21,591	465	448	106,124	36,541	12,670	45,886	3,667	6,479	17,441

Mature+ Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	309,386	8,361	31,227	55,738	2,029	1,833	49,734	32,017	47,659	2,678	860	55,582	21,669
T2	307,021	8,743	36,229	58,213	1,932	1,732	48,264	26,958	40,825	2,509	730	58,897	21,989
T3	258,273	8,524	30,860	54,145	1,868	1,694	35,791	25,220	22,068	2,426	700	55,342	19,634
T4	226,017	8,979	31,180	39,510	1,564	1,552	26,215	25,617	18,743	1,981	578	48,945	21,153
T5	253,874	18,492	34,741	37,750	1,548	1,307	49,237	24,396	13,325	1,893	730	47,002	23,453
T6	285,001	18,696	39,207	31,324	1,500	1,293	63,247	27,500	10,801	1,789	724	63,098	25,820
T7	296,516	12,860	37,807	29,174	1,538	1,250	60,962	28,156	12,597	1,722	995	77,842	31,612
T8	279,805	11,797	33,422	23,584	1,500	1,250	52,500	27,500	26,026	1,801	941	67,906	31,578
T9	279,893	12,110	30,091	23,724	1,514	1,250	52,500	27,500	29,693	1,693	1,053	63,678	35,086
T10	286,158	12,551	32,293	25,225	1,517	1,274	52,500	27,500	16,522	1,741	1,052	71,533	42,450
T11	285,544	12,362	33,214	24,755	1,706	1,398	52,500	27,500	16,868	1,604	779	70,144	42,714
T12	287,377	12,396	31,642	25,887	1,671	1,420	52,500	27,500	15,714	1,596	770	70,842	45,437
T13	286,721	14,467	29,320	26,301	1,668	1,345	52,500	27,500	15,375	1,494	751	74,117	41,883
T14	297,130	13,991	28,073	27,477	1,500	1,250	52,500	27,500	14,294	1,345	661	80,435	48,105
T15	314,183	12,601	27,243	24,285	1,500	1,250	52,500	27,500	17,486	1,344	725	95,870	51,878
T16	303,302	11,838	25,000	22,164	1,516	1,261	52,500	27,500	19,596	1,312	639	96,242	43,733
	Max OLT	15,933	42,682	39,118	2,219	1,962	99,173	46,652	27,723	1,131	15,367	58,117	40,301
	Min OLT	8,361	24,197	19,993	1,499	1,240	52,493	27,435	12,933	452	10,078	34,643	21,733
	Mature Onset Age:	60	70	60	70	60	70	70	60	80	70	70	70

Available Harvest Area by Forest Unit and Age Class TERM 1

Forest Unit:

	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
A5													
A15													
A25													
A35													
A45													
A55		5	11			0							
A65	12	26	334			15	2	3				9	
A75	2	22	453			18	15	73			172	18	
A85		21	299			31	228	261			105	18	
A95	4	270	275			67	90	485		1	148	58	
A105	59	268	276		7	314	382	351	2		83	16	
A115		3	11			40	4	0	4		134	176	
A125			2	4					7	1	148	32	
A135				0					0	4	156	26	
A145						5			0	5	123	4	
A155						30			0	5	12		
A165									0		2		
A175													
A185													
A195									1				
A205													
A215													
A225									0				
A235													
A245													
A255													TOTAL
	76	616	1,662	4	7	520	720	1,172	14	15	1,084	357	6,249

WHISKEY JACK FOREST 2012 FMP — **SUMMARY of SFMM INVESTIGATION**

Case Name: 19_OLTFU — **Input File:** 19_OLTFU.inp — **Date:** July 29, 2010.

Purpose: OLT indicator investigation with min SNRV targets increased towards median and improvements on forest unit achievement.

Specific Inputs: OLT_50 raised above lower SNRV (some reductions within SNRV from Run 15 to allow solve). Some mat+ FUgroup constraints PJD, PJM, OTH, HMX. No volume targets, flow TOTAL volume of -10% and +15% between terms. Balanced budget.

Group:	
PWR	
SPF	
PO	
BW	
Total	

thousands of m3 per year.

RESULTS: Where projections in the following tables fall below the min. target, the data is shaded yellow; where projections exceed max. targets, the data is shaded green.

FOREST CONDITION RESULTS Where projections do not relate to OLT projections, font is coloured red and results are not expected to correlate to OLT SNRV.

Implications on Forest Condition - OLT forest condition projections good due to increased constraints included in model (except MLI, SLo as per NATURE).
Total forest unit area underachievement of PRW and SBL.
Upland conifer and Caribou habitat projections good.

(2a) Productive Area by Landscape Class

Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional: Balsam	Lowland	Hardwood	Conifer
T1	200,327	152,744	62,934	8,361	2,889	105,229	192,907
T2	180,098	189,737	48,922	8,743	2,619	104,829	189,807
T3	155,903	240,753	72,233	7,791	2,573	77,421	167,547
T4	165,779	243,172	91,656	9,101	2,117	56,224	156,173
T5	150,877	224,434	97,527	18,603	2,255	59,340	171,186
T6	160,000	182,182	95,145	19,417	2,272	47,230	217,976
T7	160,000	164,852	97,292	12,891	2,584	46,000	240,576
T8	161,141	179,994	86,712	11,682	2,569	50,647	231,310
T9	176,608	176,980	75,379	11,746	2,762	53,451	227,056
T10	176,446	172,676	75,729	12,150	2,776	46,000	238,173
T11	160,000	180,940	91,024	11,552	2,738	46,000	231,661
T12	160,000	186,116	82,003	12,475	2,609	46,000	234,658
T13	160,000	187,674	79,178	14,773	2,633	47,845	231,758
T14	160,000	189,012	74,922	13,825	2,369	46,000	237,733
T15	164,340	181,802	73,428	12,303	2,368	46,000	243,620
T16	178,946	164,262	69,477	11,928	2,316	46,000	250,932
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

(2c) Area of Old Forest Area by Grouping of Productive Forest (ha)

	Lower Old Forest Age (Years): 80	100	100	100	90	100	160	110-120
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo
T1	3,707	1,851	8,811	17,199	1,251	23,309	97	18,431
T2	4,111	1,876	9,642	23,521	1,528	39,543	182	13,870
T3	5,361	1,840	12,614	19,908	1,564	42,639	224	16,512
T4	5,738	1,601	17,595	13,334	1,476	36,005	241	19,763
T5	6,441	1,559	22,783	21,808	1,261	33,230	292	24,626
T6	6,000	1,508	25,318	17,872	1,200	27,287	290	32,686
T7	9,472	1,458	24,544	11,707	1,163	22,000	233	40,416
T8	9,479	1,442	22,000	8,000	1,097	31,575	229	31,020
T9	9,093	1,400	22,000	9,172	1,034	45,877	245	35,263
T10	9,349	1,437	22,000	8,000	1,000	41,815	244	39,538
T11	9,564	1,400	22,000	8,177	1,000	35,172	187	54,992
T12	9,530	1,400	22,000	8,336	1,082	38,398	199	62,872
T13	6,000	1,400	22,000	11,305	1,017	31,985	211	72,708
T14	6,000	1,400	22,000	11,765	1,025	26,209	285	74,986
T15	9,136	1,400	22,000	8,839	1,000	32,422	323	80,206
T16	9,567	1,400	22,000	9,324	1,000	37,158	395	85,487
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840

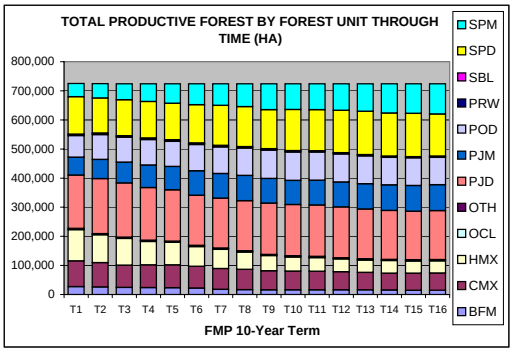
(2b partial) Productive Forest Area Through Time Data (hectares): (2d) (2e) Upland Conifer

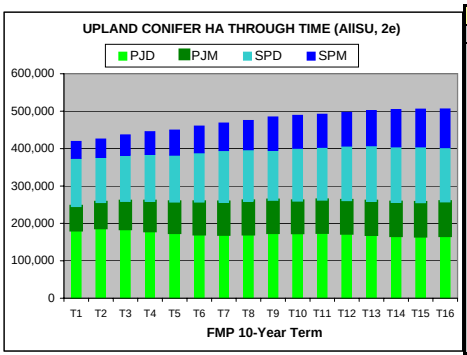
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	(2e) Upland Conifer
T1	725,390	27,148	88,490	107,239	2,216	1,995	182,833	61,845	73,978	3,312	1,807	128,589	45,937	419,205
T2	724,755	25,836	83,402	95,761	2,213	1,994	189,111	65,992	85,057	3,333	1,808	120,613	49,635	425,352
T3	724,222	24,327	76,463	91,589	2,213	1,993	186,470	71,625	85,724	3,399	1,808	123,805	54,807	436,707
T4	724,222	23,506	78,017	80,493	2,203	1,993	181,067	77,355	87,803	3,404	1,818	125,702	60,861	444,985
T5	724,222	23,322	78,587	77,193	2,203	1,993	176,198	80,551	86,399	3,421	1,818	125,265	67,273	449,287
T6	724,222	21,725	74,903	68,012	2,203	1,993	172,203	84,205	90,119	3,449	1,818	131,739	71,854	460,000
T7	724,194	17,320	71,503	66,382	2,203	1,993	171,333	84,991	91,265	3,449	1,818	137,832	74,105	468,261
T8	724,055	16,369	70,145	59,210	2,203	1,993	172,205	87,111	93,666	3,396	1,818	137,221	78,719	475,255
T9	723,982	16,143	65,498	51,763	2,203	1,993	176,144	84,947	97,018	3,210	1,818	134,054	89,192	484,336
T10	723,951	16,163	64,133	48,471	2,203	1,993	175,772	83,427	97,081	3,178	1,818	141,146	88,567	488,912
T11	723,916	15,790	64,176	46,595	2,203	1,993	176,521	85,098	96,875	2,784	1,818	141,385	88,677	491,681
T12	723,861	15,891	62,046	44,008	2,202	1,993	174,451	86,181	96,034	2,725	1,819	145,704	90,807	497,143
T13	723,861	16,157	59,601	42,529	2,201	1,993	170,876	87,240	95,542	2,583	1,820	148,905	94,414	501,436
T14	723,861	15,462	57,622	43,278	2,194	1,993	168,008	87,933	94,961	2,379	1,827	148,068	100,134	504,143
T15	723,861	14,556	58,454	42,000	2,194	1,993	166,756	88,254	95,121	2,325	1,827	149,005	101,376	505,391
T16	723,861	14,551	58,986	42,000	2,194	1,993	168,250	88,960	94,368	2,235	1,827	144,788	103,708	505,707
OLT Max.		19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175	497,902
OLT Min.		10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174	457,260

(5a)

Available Forest:

Term	
T1	572,034
T2	571,399
T3	570,866
T4	570,866
T5	570,866
T6	570,866
T7	570,838
T8	570,699
T9	570,626
T10	570,595
T11	570,560
T12	570,505
T13	570,505
T14	570,505
T15	570,505
T16	570,505





(3f)

(3a) Caribou Habitat Through Time:

Term	Cr	Cwu	Cwp	% Con in CarSUs
T1	101,492	45,035	18,032	89%
T2	94,564	40,986	14,155	90%
T3	113,867	78,211	13,150	90%
T4	130,049	88,371	17,847	90%
T5	138,691	101,423	51,175	91%
T6	153,879	117,569	58,167	91%
T7	155,411	118,208	55,317	91%
T8	152,030	112,992	53,161	92%
T9	150,000	109,979	51,174	93%
T10	150,000	108,330	47,240	94%
T11	150,000	107,555	45,673	94%
T12	150,000	114,252	43,539	95%
T13	154,396	123,361	40,000	95%
T14	150,000	122,572	41,810	95%
T15	152,818	127,247	40,000	96%
T16	157,693	130,502	40,000	96%
OLT Max.	161,804	47,453	68,169	maint or
OLT Min.	147,605	26,809	36,912	increase.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 19_OLTFU **Input File:** 19_OLTFU.inp **Date:** July 29, 2010.

HARVEST AREA and VOLUME RESULTS:

Implications on Wood Supply - SPF varies 325-464. PO T1 172, then 222 in T2. Consider need to regulate short-term flow better.
TOTAL varies T1 659 to T5 432 with broad flow control. (overall average of 534 Mm3 per year)

Available Harvest Area by Term Data (hectares harvested annually)

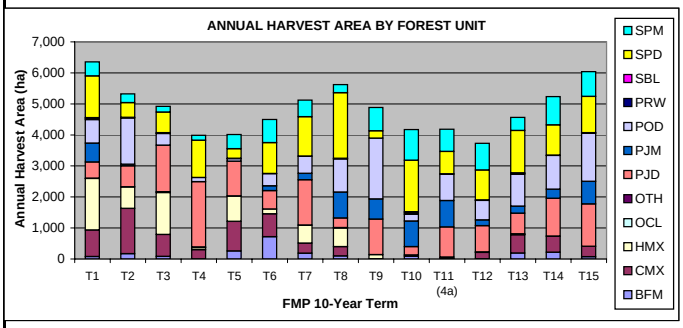
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	6,355	76	857	1,662	5	5	520	612	755	44	19	1,345	454
T2	5,324	170	1,459	691	0	9	674	51	1,493	21	0	474	283
T3	4,919	84	704	1,351	20	5	1,506	0	374	7	19	668	182
T4	3,987	0	297	70	0	20	2,106	0	132	1	0	1,201	159
T5	4,015	257	956	817	0	4	1,118	0	84	4	8	308	460
T6	4,498	716	740	154	0	0	590	157	392	4	3	995	747
T7	5,122	184	325	579	0	5	1,462	202	553	8	0	1,267	536
T8	5,623	99	297	607	0	9	309	836	1,065	23	1	2,112	265
T9	4,884	1	5	131	0	0	1,145	652	1,960	0	0	236	753
T10	4,175	87	37	0	0	5	269	823	217	46	36	1,663	991
T11 (4a)	4,182	15	45	0	4	0	965	853	851	0	11	722	716
T12	3,729	6	207	0	1	12	847	183	633	11	5	961	863
T13	4,564	190	589	0	14	16	668	227	1,029	23	17	1,367	424
T14	5,236	216	516	0	1	7	1,216	294	1,089	6	2	975	915
T15	6,042	70	335	0	1	2	1,367	727	1,553	6	8	1,174	800

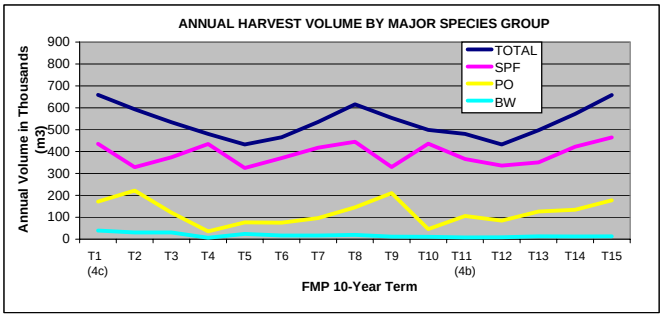
Annual Harvest Volumes by Major Species Groups (1,000s net merchantable cubic metres)

Term	TOTAL	SPF	PO	BW	PRW
T1 (4c)	659.3	435.2	171.5	39.6	4.8
T2	593.3	328.8	222.1	30.9	2.2
T3	534.0	374.0	121.2	31.0	0.7
T4	480.6	434.8	36.1	6.7	0.1
T5	432.5	325.2	76.9	24.3	0.4
T6	465.5	370.3	75.5	16.8	0.3
T7	535.3	417.7	96.3	17.1	0.9
T8	615.6	444.5	145.4	19.7	2.1
T9	554.1	329.4	210.5	11.9	0.1
T10	498.7	435.8	46.3	10.8	4.8
T11 (4b)	480.6	365.9	105.6	8.0	0.0
T12	432.6	335.9	84.8	8.7	1.0
T13	497.5	350.4	126.7	13.0	3.2
T14	572.1	422.1	134.2	12.1	0.5
T15	657.9	464.3	177.8	12.8	0.5
Average	534.0	388.9	122.0	17.6	1.4

Projected Revenues, Expenditures & Renewal Area

Term	Revenue M$	Expend. M$	Unspent M$	Renewal ha	Exten ha	Basc1 ha	Intn1 ha
T1	2,637	2,467	171	**6,291**	3,332	2,535	424
T2	2,060	2,060	0	**5,271**	2,923	1,981	366
T3	2,209	2,209	0	**4,919**	2,046	2,530	342
T4	2,433	2,400	33	**3,987**	500	3,096	391
T5	1,895	1,712	184	**4,015**	1,823	1,859	333
T6	2,122	1,937	185	**4,495**	2,015	2,120	360
T7	2,404	2,404	0	**5,108**	1,788	2,975	345
T8	2,602	2,602	0	**5,616**	2,122	3,225	268
T9	1,981	1,803	178	**4,881**	2,333	2,269	278
T10	2,495	2,495	0	**4,171**	688	3,109	374
T11	2,100	2,061	39	**4,176**	1,191	2,660	325
T12	1,934	1,258	676	**3,729**	1,956	1,670	103
T13	2,080	829	1,251	**4,564**	3,546	928	89
T14	2,447	1,014	1,433	**5,236**	3,906	1,179	151
T15	2,708	1,255	1,453	**6,042**	4,302	1,604	137





NOTES:

Consider PO volume in short-term for Weyerhaeuser mill. Perhaps even out volume between T1 and T2 at approx 200 per year.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 19_OLTFU **Input File:** 19_OLTFU.inp **Date:** July 29, 2010.

Immature Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	416,005	18,788	57,263	51,501	188	162	133,100	29,828	26,319	635	947	73,007	24,268
T2	418,757	17,093	49,500	37,548	284	237	140,846	37,990	40,198	1,117	1,118	64,242	28,586
T3	468,889	16,535	48,875	40,759	347	366	149,686	45,701	60,759	1,316	1,101	68,438	35,005
T4	500,608	14,405	49,350	41,284	591	467	155,042	51,557	72,314	1,436	1,313	72,994	39,855
T5	472,839	4,719	45,491	32,540	609	687	135,646	55,578	73,019	1,528	1,156	78,195	43,670
T6	437,328	2,308	38,110	33,402	655	700	108,688	56,705	78,792	1,659	1,093	68,472	46,743
T7	422,144	4,429	33,386	35,511	615	743	110,112	55,185	77,387	1,727	823	59,774	42,452
T8	427,847	4,687	34,419	32,796	655	743	119,705	59,611	70,683	1,595	798	56,955	45,203
T9	428,967	4,397	32,647	29,176	616	743	123,644	57,447	67,405	1,517	643	63,244	47,489
T10	424,851	4,012	29,945	24,817	610	690	123,272	55,927	76,037	1,330	635	62,132	45,443
T11	431,964	4,238	28,535	23,963	461	570	124,021	57,598	74,931	1,180	821	68,559	47,087
T12	428,119	3,416	28,092	19,693	495	533	121,951	58,681	75,809	1,131	917	67,814	49,587
T13	426,852	1,383	27,189	16,252	499	643	118,376	59,740	75,325	1,089	889	69,937	55,529
T14	423,934	1,638	28,480	16,751	628	743	115,508	60,433	76,739	1,035	1,025	65,866	55,090
T15	419,570	2,253	30,924	17,825	627	727	114,256	60,754	74,562	980	1,026	57,389	58,245
T16	412,685	2,623	32,956	19,720	627	730	115,750	61,460	71,911	908	1,079	43,587	61,334
	Max OLT	3,260	31,472	42,688	1,328	1,063	292,834	96,487	30,987	115,789	10,363	18,903	44,874
	Min OLT	1,948	11,696	21,591	465	448	106,124	36,541	12,670	45,886	3,667	6,479	17,441

Mature+ Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	309,386	8,361	31,227	55,738	2,029	1,833	49,734	32,017	47,659	2,678	860	55,582	21,669
T2	305,998	8,743	33,902	58,213	1,930	1,757	48,264	28,002	44,859	2,216	690	56,372	21,050
T3	255,333	7,791	27,588	50,830	1,866	1,627	36,784	25,923	24,965	2,083	707	55,367	19,802
T4	223,615	9,101	28,667	39,209	1,612	1,526	26,025	25,798	15,489	1,968	505	52,708	21,006
T5	251,384	18,603	33,096	44,653	1,594	1,307	40,552	24,973	13,380	1,893	661	47,070	23,603
T6	286,895	19,417	36,794	34,610	1,548	1,293	63,515	27,500	11,327	1,789	724	63,267	25,111
T7	302,051	12,891	38,117	30,871	1,589	1,250	61,220	29,806	13,879	1,722	995	78,058	31,653
T8	296,207	11,682	35,727	26,414	1,549	1,250	52,500	27,500	22,983	1,801	1,020	80,266	33,516
T9	295,015	11,746	32,851	22,587	1,588	1,250	52,500	27,500	29,614	1,693	1,174	70,809	41,703
T10	299,099	12,150	34,188	23,654	1,593	1,303	52,500	27,500	21,043	1,848	1,183	79,013	43,123
T11	291,952	11,552	35,641	22,632	1,742	1,423	52,500	27,500	21,945	1,604	996	72,826	41,590
T12	295,743	12,475	33,954	24,315	1,707	1,460	52,500	27,500	20,225	1,595	902	77,889	41,220
T13	297,009	14,773	32,411	26,277	1,702	1,350	52,500	27,500	20,217	1,494	931	78,968	38,885
T14	299,927	13,825	29,142	26,528	1,567	1,250	52,500	27,500	18,222	1,345	802	82,203	45,044
T15	304,291	12,303	27,530	24,175	1,567	1,266	52,500	27,500	20,559	1,344	801	91,615	43,131
T16	311,176	11,928	26,030	22,280	1,567	1,263	52,500	27,500	22,458	1,326	749	101,201	42,374
	Max OLT	15,933	42,682	39,118	2,219	1,962	99,173	46,652	27,723	1,131	15,367	58,117	40,301
	Min OLT	8,361	24,197	19,993	1,499	1,240	52,493	27,435	12,933	452	10,078	34,643	21,733
	Mature Onset Age:	60	70	60	70	60	70	70	60	80	70	70	70

Available Harvest Area by Forest Unit and Age Class TERM 1

Forest Unit:

	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
A5													
A15													
A25													
A35													
A45													
A55		5	11			0							
A65	12	26	793			15	2					9	
A75	2	22	453			18	15				172	18	
A85		112	299			31	61	254			105	18	
A95	4	420	40			67	148	416		1	148	58	
A105	59	268	53		5	314	382	85	3		329	113	
A115		3	11	1		40	4		4		150	176	
A125			2	1					7	5	148	32	
A135				3					14	4	156	26	
A145				1		5			0	5	123	4	
A155						30			8	5	12		
A165									6		2		
A175													
A185													
A195									1				
A205													
A215													
A225									1				
A235									1				
A245													
A255													TOTAL
	76	857	1,662	5	5	520	612	755	44	19	1,345	454	6,355

WHISKEY JACK FOREST 2012 FMP — **SUMMARY of SFMM INVESTIGATION**

Case Name: 20_OLTPO **Input File:** 20_OLTPO.inp **Date:** July 30, 2010.

Purpose: OLT indicator investigation with min SNRV targets increased towards median and improvements on forest unit achievement, PO T1-2 and TOTAL in lowest terms.

Specific Inputs: Start with 19_OLTFU (OLT_50 raised above lower SNRV, some reductions within SNRV from Run 15 to allow solve, Some mat+ FUgroup constraints PJD, PJM, OTH, HMX.) Add Binding volume targets for PO at T1 200, T2 150, T3-6 90 and TOTAL at 520 all terms. Balanced budget.

Group:		thousands of m3 per year.
PWR		
SPF		
PO	200.0	T1 only, then T2 150, T3-6 90.
BW		
Total	520.0	all terms to raise harvest in lowest terms

RESULTS: Where projections in the following tables fall below the min. target, the data is shaded yellow; where projections exceed max. targets, the data is shaded green.

FOREST CONDITION RESULTS Where projections do not relate to OLT projections, font is coloured red and results are not expected to correlate to OLT SNRV.

Implications on Forest Condition - OLT forest condition projections good except MLI and SLo.
Total forest unit area underachievement of PRW and SBL.
Upland conifer and Caribou habitat projections good.

(2a) Productive Area by Landscape Class

Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional: Balsam	Lowland	Hardwood	Conifer
T1	200,327	152,744	62,934	8,361	2,889	105,229	192,907
T2	169,555	189,737	48,922	9,138	2,699	100,661	204,152
T3	135,809	240,822	75,936	8,521	2,371	84,779	176,159
T4	155,037	243,741	84,134	9,836	2,194	68,346	161,111
T5	160,017	211,346	90,815	18,538	2,255	59,184	182,243
T6	163,919	173,492	96,728	19,400	2,272	49,406	219,182
T7	168,787	156,374	97,336	12,891	2,584	46,000	240,399
T8	170,442	174,369	85,159	11,787	2,569	49,862	230,042
T9	167,483	182,413	84,687	11,370	2,700	48,370	227,137
T10	164,006	180,388	82,976	11,775	2,901	46,000	236,082
T11	160,000	182,930	85,112	11,526	2,676	46,000	235,849
T12	160,658	181,324	84,230	11,782	2,637	46,000	237,407
T13	166,055	184,317	79,663	14,111	2,488	46,000	231,404
T14	167,326	184,288	76,454	13,992	2,424	46,000	233,555
T15	165,437	176,828	78,126	11,671	2,368	46,000	243,609
T16	166,881	169,075	77,117	11,354	2,315	46,000	251,295
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

(2c) Area of Old Forest Area by Grouping of Productive Forest (ha)

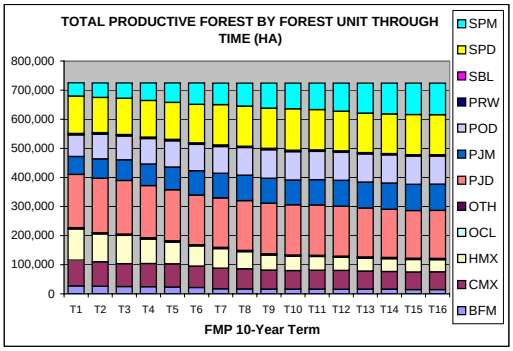
	Lower Old Forest Age (Years): 80	100	100	100	90	100	160	110-120
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo
T1	3,707	1,851	8,811	17,199	1,251	23,309	97	18,431
T2	4,506	1,876	10,058	17,354	1,575	44,894	182	18,763
T3	6,107	1,646	12,614	15,267	1,586	45,002	224	16,302
T4	6,514	1,605	17,595	12,482	1,525	36,131	241	19,763
T5	6,402	1,559	22,783	19,591	1,360	33,230	292	24,626
T6	6,000	1,508	25,318	17,014	1,288	27,287	290	32,686
T7	9,472	1,458	24,544	13,246	1,202	22,000	233	40,416
T8	9,710	1,442	22,000	8,897	1,135	32,327	229	31,020
T9	8,905	1,400	22,000	9,686	1,052	47,106	245	35,263
T10	9,097	1,436	22,000	8,425	1,000	42,832	244	39,849
T11	9,388	1,400	22,000	8,297	1,000	35,711	187	55,538
T12	8,657	1,400	22,000	8,000	1,000	39,013	199	64,325
T13	6,000	1,400	22,000	8,078	1,000	33,961	211	73,963
T14	6,000	1,400	22,000	9,598	1,000	32,252	285	77,299
T15	8,447	1,400	22,000	10,163	1,000	35,000	323	82,318
T16	8,909	1,400	22,000	9,322	1,000	40,017	395	86,583
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840

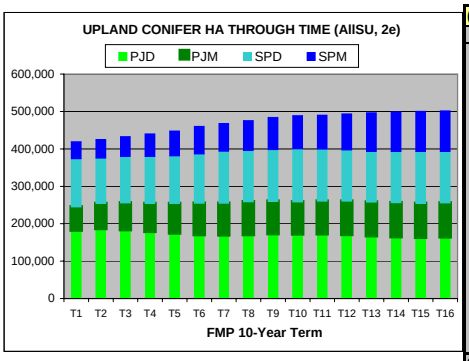
(2b partial) Productive Forest Area Through Time Data (hectares): **(2d)** **(2e) Upland Conifer**

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	(2e) Upland Conifer
T1	725,390	27,148	88,490	107,239	2,216	1,995	182,833	61,845	73,978	3,312	1,807	128,589	45,937	419,205
T2	724,865	26,089	83,830	95,537	2,213	1,994	187,360	66,434	84,942	3,366	1,808	121,138	50,152	425,084
T3	724,399	24,837	78,675	97,360	2,201	1,993	184,263	70,850	81,893	3,039	1,818	124,693	52,776	432,583
T4	724,399	23,969	80,190	83,851	2,201	1,993	179,605	74,077	87,344	3,081	1,818	126,287	59,985	439,953
T5	724,399	23,248	79,334	75,119	2,201	1,993	175,304	78,473	89,954	3,118	1,818	127,267	66,570	447,614
T6	724,399	21,678	73,183	69,391	2,201	1,993	171,052	83,203	90,962	3,172	1,818	132,114	73,631	460,000
T7	724,371	17,284	70,702	67,209	2,201	1,993	170,125	84,520	92,072	3,172	1,818	138,799	74,476	467,920
T8	724,230	16,469	69,260	58,998	2,201	1,993	171,148	87,193	95,011	3,106	1,818	137,767	79,267	475,374
T9	724,160	15,933	65,197	52,060	2,201	1,993	173,617	86,233	97,688	3,064	1,818	137,893	86,461	484,204
T10	724,127	15,996	63,883	49,100	2,201	1,993	172,696	85,219	97,401	3,033	1,818	142,089	88,698	488,702
T11	724,092	15,816	64,884	47,211	2,201	1,993	173,158	86,985	97,260	2,742	1,818	138,888	91,136	490,167
T12	724,038	15,599	64,446	45,203	2,199	1,993	171,585	88,607	96,685	2,610	1,820	136,868	96,422	493,482
T13	724,038	15,994	62,277	44,007	2,192	1,993	168,119	89,340	96,737	2,466	1,827	135,728	103,359	496,545
T14	724,038	15,920	60,732	43,847	2,192	1,993	165,621	90,246	96,775	2,282	1,827	136,695	105,908	498,470
T15	724,038	14,413	60,576	42,934	2,192	1,993	163,825	90,260	97,343	2,231	1,827	138,466	107,979	500,530
T16	724,038	14,392	60,934	42,000	2,191	1,993	165,144	90,249	96,766	2,161	1,828	137,413	108,966	501,772
OLT Max.		19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175	497,902
OLT Min.		10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174	457,260

(5a) Available Forest:

Term	
T1	572,034
T2	571,509
T3	571,042
T4	571,042
T5	571,042
T6	571,042
T7	571,015
T8	570,874
T9	570,804
T10	570,771
T11	570,736
T12	570,682
T13	570,682
T14	570,682
T15	570,682
T16	570,682





(3a) Caribou Habitat Through Time:

Term	Cr	Cwu	Cwp	(3f) % Con in CarSUs
T1	101,492	45,035	18,032	89%
T2	94,551	40,986	14,155	90%
T3	113,853	78,211	13,150	90%
T4	130,036	88,371	17,847	90%
T5	138,678	101,423	51,175	91%
T6	153,866	117,569	58,167	91%
T7	155,404	118,208	55,317	91%
T8	152,274	112,925	52,785	92%
T9	150,000	110,343	51,187	93%
T10	150,000	108,560	47,236	94%
T11	150,000	107,745	45,674	94%
T12	150,000	115,254	43,539	95%
T13	154,423	124,011	40,000	95%
T14	150,000	123,068	42,079	95%
T15	152,758	127,860	40,000	95%
T16	156,776	131,425	40,000	95%
OLT Max.	161,804	47,453	68,169	maint or
OLT Min.	147,605	26,809	36,912	increase.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 20_OLTPO **Input File:** 20_OLTPO.inp **Date:** July 30, 2010.

HARVEST AREA and VOLUME RESULTS:

Implications on Wood Supply - SPF varies 291-413. PO T1 200,T2 150, then 95 T3-6.
TOTAL varies T1 536 decr to min 520. (overall average of 521 Mm3 per year).

Available Harvest Area by Term Data (hectares harvested annually)

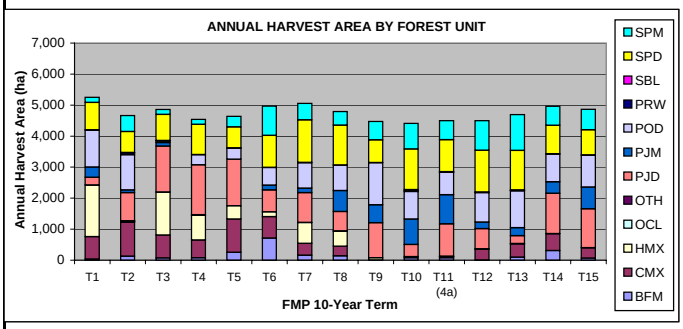
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	5,253	35	723	1,662	5	0	247	332	1,191	0	11	880	167
T2	4,662	131	1,094	14	20	12	907	89	1,131	63	9	679	513
T3	4,858	74	738	1,380	0	2	1,483	112	51	7	10	839	161
T4	4,537	78	570	803	0	15	1,607	0	324	1	7	972	159
T5	4,636	251	1,073	428	0	5	1,499	0	352	4	8	678	339
T6	4,967	714	687	154	0	5	704	157	564	4	3	1,034	941
T7	5,057	162	382	666	0	5	959	145	823	10	0	1,369	536
T8	4,792	138	313	485	0	11	620	680	819	2	1	1,288	437
T9	4,471	1	5	69	0	2	1,130	579	1,358	0	3	732	592
T10	4,408	76	37	0	0	2	389	823	885	32	32	1,309	823
T11 (4a)	4,496	79	36	0	4	10	1,041	941	721	10	8	1,033	613
T12	4,496	7	342	0	14	3	650	209	950	11	9	1,349	950
T13	4,695	99	426	0	1	13	250	259	1,184	21	11	1,275	1,158
T14	4,962	310	539	0	1	5	1,301	370	892	5	8	918	614
T15	4,866	68	328	0	1	5	1,253	702	1,028	3	8	807	663

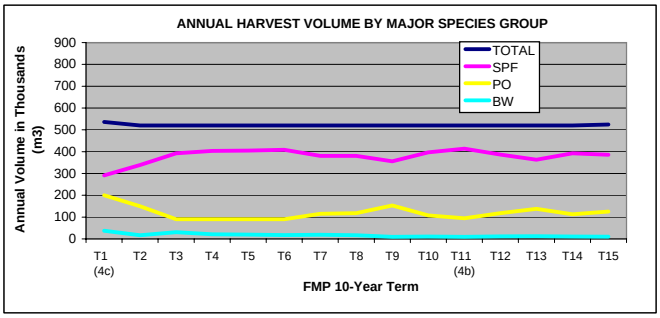
Annual Harvest Volumes by Major Species Groups (1,000s net merchantable cubic metres)

Term	TOTAL	SPF	PO	BW	PRW
T1 (4c)	535.9	291.2	200.0	37.3	0.0
T2	520.0	339.2	150.0	16.8	6.8
T3	520.0	392.8	90.0	30.6	0.8
T4	520.0	403.4	90.0	21.2	0.1
T5	520.0	404.6	90.0	19.6	0.4
T6	520.0	408.9	90.0	17.6	0.3
T7	520.0	380.6	115.2	19.3	1.0
T8	520.0	380.9	118.3	16.9	0.2
T9	520.0	355.7	152.9	9.7	0.1
T10	520.0	397.0	107.6	10.7	3.3
T11 (4b)	520.0	413.5	94.3	9.3	1.0
T12	520.0	386.5	118.3	11.7	1.0
T13	520.0	362.9	138.1	12.8	2.9
T14	520.0	392.6	112.8	11.2	0.4
T15	524.2	386.0	125.3	10.2	0.3
Average	521.3	379.7	119.5	17.0	1.2

Projected Revenues, Expenditures & Renewal Area

Term	Revenue M$	Expend. M$	Unspent M$	Renewal ha	Exten ha	Basc1 ha	Intn1 ha
T1	1,808	1,516	293	**5,201**	3,596	1,336	268
T2	2,096	2,096	0	**4,615**	1,991	2,236	388
T3	2,284	2,284	0	**4,858**	1,834	2,653	371
T4	2,322	2,319	3	**4,537**	1,410	2,768	360
T5	2,337	2,337	0	**4,636**	1,585	2,637	413
T6	2,346	2,168	179	**4,964**	2,156	2,421	387
T7	2,219	2,219	0	**5,043**	2,050	2,761	232
T8	2,210	2,210	0	**4,785**	1,695	2,972	119
T9	2,081	1,938	143	**4,468**	1,668	2,556	244
T10	2,312	1,498	813	**4,405**	2,438	1,633	334
T11	2,367	1,568	799	**4,491**	2,188	2,104	198
T12	2,242	857	1,385	**4,496**	3,436	975	86
T13	2,150	692	1,458	**4,695**	3,957	688	51
T14	2,268	1,075	1,193	**4,962**	3,494	1,301	167
T15	2,234	1,126	1,108	**4,866**	3,245	1,495	125





NOTES:

WHISKEY JACK FOREST 2012 FMP — **SUMMARY of SFMM INVESTIGATION**

Case Name: 20_OLTPO **Input File:** 20_OLTPO.inp **Date:** July 30, 2010.

Immature Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	416,005	18,788	57,263	51,501	188	162	133,100	29,828	26,319	635	947	73,007	24,268
T2	408,214	16,951	48,633	37,324	284	191	136,455	35,722	44,297	720	1,039	60,271	26,327
T3	452,568	16,316	47,616	38,762	530	344	147,397	42,693	57,360	951	1,118	66,322	33,158
T4	482,913	14,133	48,252	37,502	586	419	153,454	48,278	66,921	1,113	1,239	72,169	38,847
T5	462,178	4,709	45,027	33,316	607	588	129,759	53,500	73,978	1,225	1,157	76,119	42,192
T6	434,139	2,277	37,513	32,544	653	613	107,537	55,703	79,783	1,383	1,094	68,463	46,573
T7	422,497	4,393	32,761	34,569	613	704	108,905	54,714	80,000	1,450	823	60,742	42,823
T8	429,970	4,682	33,809	32,370	653	743	118,648	59,693	73,027	1,306	798	58,490	45,751
T9	434,583	4,563	32,716	29,958	613	743	121,117	58,733	72,671	1,372	706	63,200	48,190
T10	427,369	4,221	30,210	25,063	464	730	120,196	57,719	76,702	1,309	654	62,791	47,310
T11	428,042	4,290	29,582	22,861	463	617	120,658	59,485	76,987	1,138	880	61,573	49,508
T12	426,213	3,817	30,106	20,643	494	670	119,085	61,107	76,569	1,059	888	58,202	53,574
T13	430,035	1,883	30,587	18,129	623	656	115,619	61,840	77,952	972	908	58,115	62,752
T14	428,068	1,928	31,342	17,877	623	726	113,121	62,746	78,013	937	972	53,844	65,938
T15	420,391	2,742	33,615	19,034	625	677	111,325	62,760	76,558	887	1,026	44,882	66,260
T16	413,074	3,038	35,000	20,194	625	702	112,644	62,749	73,863	835	1,079	34,607	67,737
	Max OLT	3,260	31,472	42,688	1,328	1,063	292,834	96,487	30,987	115,789	10,363	18,903	44,874
	Min OLT	1,948	11,696	21,591	465	448	106,124	36,541	12,670	45,886	3,667	6,479	17,441

Mature+ Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	309,386	8,361	31,227	55,738	2,029	1,833	49,734	32,017	47,659	2,678	860	55,582	21,669
T2	316,651	9,138	35,197	58,213	1,930	1,803	50,905	30,712	40,645	2,646	770	60,868	23,825
T3	271,831	8,521	31,058	58,597	1,672	1,650	36,866	28,157	24,532	2,089	700	58,372	19,618
T4	241,486	9,836	31,938	46,349	1,615	1,574	26,151	25,798	20,423	1,968	578	54,118	21,138
T5	262,220	18,538	34,307	41,803	1,594	1,405	45,544	24,973	15,976	1,893	661	51,148	24,377
T6	290,260	19,400	35,670	36,847	1,548	1,380	63,515	27,500	11,179	1,789	724	63,651	27,057
T7	301,873	12,891	37,941	32,639	1,589	1,289	61,220	29,806	12,072	1,722	995	78,057	31,653
T8	294,260	11,787	35,450	26,628	1,549	1,250	52,500	27,500	21,984	1,800	1,020	79,276	33,516
T9	289,577	11,370	32,482	22,102	1,588	1,250	52,500	27,500	25,018	1,693	1,112	74,692	38,270
T10	296,758	11,775	33,673	24,037	1,737	1,264	52,500	27,500	20,700	1,724	1,164	79,297	41,388
T11	296,050	11,526	35,302	24,350	1,738	1,377	52,500	27,500	20,273	1,604	938	77,315	41,628
T12	297,825	11,782	34,340	24,560	1,705	1,323	52,500	27,500	20,117	1,552	932	78,666	42,849
T13	294,003	14,111	31,690	25,878	1,570	1,338	52,500	27,500	18,785	1,494	919	77,613	40,607
T14	295,970	13,992	29,390	25,971	1,569	1,267	52,500	27,500	18,762	1,345	855	82,850	39,970
T15	303,647	11,671	26,961	23,899	1,566	1,316	52,500	27,500	20,785	1,344	801	93,584	41,719
T16	310,965	11,354	25,934	21,806	1,566	1,291	52,500	27,500	22,903	1,326	749	102,806	41,229
	Max OLT	15,933	42,682	39,118	2,219	1,962	99,173	46,652	27,723	1,131	15,367	58,117	40,301
	Min OLT	8,361	24,197	19,993	1,499	1,240	52,493	27,435	12,933	452	10,078	34,643	21,733
	Mature Onset Age:	60	70	60	70	60	70	70	60	80	70	70	70

Available Harvest Area by Forest Unit and Age Class TERM 1

Forest Unit:

	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
A5													
A15													
A25													
A35													
A45													
A55		5	11			0							
A65	12	26	421			15	2					9	
A75	2	22	453			18	15	170			172	18	
A85	0	21	299			31	61	254			105	18	
A95	4	377	275	0	0	67	90	416		1	148	58	
A105	18	268	189	0	0	78	161	351			83	16	
A115		3	11	1		3	4		0		22	14	
A125			2	1					0	1	57	4	
A135		0		3						0	156	26	
A145				1		5				5	123	4	
A155				0		30				5	12		
A165				0							2		
A175													
A185													
A195													
A205													
A215													
A225													
A235													
A245													
A255													TOTAL
	35	723	1,662	5	0	247	332	1,191	0	11	880	167	5,253

WHISKEY JACK FOREST 2012 FMP — **SUMMARY of SFMM INVESTIGATION**

Case Name: 22_OLTPO **Input File:** 22_OLTPO.inp **Date:** Aug. 5, 2010.

Purpose: Revise caribou subunits and deferrals to align with marten cores and add operational deferrals for 40 years. Other LLPs deferred only 30 years, not 60.

Specific Inputs: Run 20 with a revised land base (BMIv7), deferrals, and deferral timing. All other targets the same as Run 20.

Group:		thousands of m3 per year.
PWR		
SPF		
PO	200.0	T1 only, then T2 150, T3-6 90.
BW		
Total	520.0	all terms to raise harvest in lowest terms

RESULTS: Where projections in the following tables fall below the min. target, the data is shaded yellow; where projections exceed max. targets, the data is shaded green.

FOREST CONDITION RESULTS Where projections do not relate to OLT projections, font is coloured red and results are not expected to correlate to OLT SNRV.

Implications on Forest Condition - OLT forest condition projections good except MLI and SLo.
Total forest unit area underachievement of PRW and SBL.
Upland conifer and Caribou habitat projections good.
Similar to Run 20 achievement.

(2a) Productive Area by Landscape Class

Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional: Balsam	Lowland	Hardwood	Conifer
T1	200,328	152,743	62,934	8,361	2,890	105,229	192,908
T2	171,466	189,737	48,922	8,801	2,727	101,573	201,621
T3	137,137	240,829	75,233	8,597	2,446	85,978	174,175
T4	157,677	239,909	83,129	9,925	2,268	68,178	163,308
T5	159,625	213,781	89,390	18,516	2,297	60,463	180,322
T6	166,214	174,878	94,173	19,383	2,305	48,824	218,617
T7	169,214	158,966	96,575	12,669	2,616	46,000	238,325
T8	169,500	177,157	85,343	11,643	2,584	49,708	228,278
T9	166,635	185,974	84,672	11,583	2,693	49,563	223,034
T10	165,185	177,762	81,684	11,927	2,857	46,000	238,706
T11	160,000	183,989	86,033	11,698	2,630	46,000	233,736
T12	160,994	182,115	82,553	12,040	2,660	46,000	237,663
T13	164,740	185,184	79,137	14,319	2,515	46,000	232,129
T14	165,159	184,839	76,249	14,358	2,451	46,000	234,968
T15	164,960	176,466	78,954	11,841	2,386	46,000	243,417
T16	172,784	165,283	75,402	11,519	2,327	46,000	250,709
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

(2c) Area of Old Forest Area by Grouping of Productive Forest (ha)

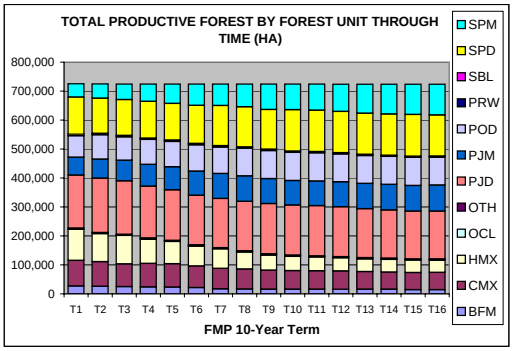
	Lower Old Forest Age (Years): 80	100	100	100	90	100	160	110-120
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo
T1	3,707	1,851	8,811	17,199	1,252	23,309	97	18,431
T2	4,169	1,899	11,323	17,447	1,575	42,305	203	17,579
T3	6,196	1,684	13,472	15,600	1,700	45,231	252	17,264
T4	6,620	1,638	18,851	13,175	1,658	36,176	270	21,053
T5	6,342	1,559	23,546	20,244	1,546	33,088	326	24,961
T6	6,000	1,508	25,058	17,446	1,476	27,285	323	31,347
T7	9,368	1,458	24,333	12,916	1,429	22,000	265	38,894
T8	9,504	1,442	22,000	8,120	1,135	31,957	244	31,019
T9	9,131	1,400	22,000	9,346	1,144	46,444	251	35,152
T10	9,308	1,436	22,000	8,000	1,094	42,171	250	39,583
T11	9,617	1,400	22,000	8,000	1,025	35,176	194	54,872
T12	8,906	1,400	22,000	8,301	1,000	38,523	206	62,684
T13	6,000	1,400	22,000	8,089	1,000	33,964	222	72,093
T14	6,000	1,400	22,000	9,767	1,000	31,141	295	75,757
T15	8,652	1,400	22,000	9,461	1,010	33,390	332	80,844
T16	9,148	1,400	22,000	9,635	1,000	39,459	404	85,505
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840

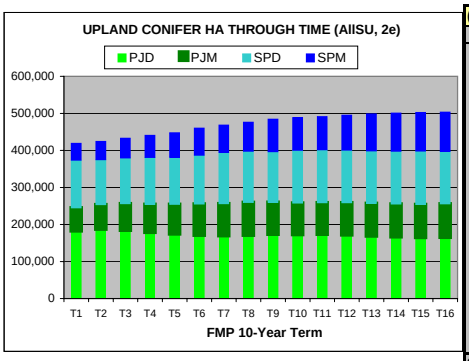
(2b partial) Productive Forest Area Through Time Data (hectares): **(2d)** **(2e) Upland Conifer**

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
T1	725,394	27,150	88,492	107,239	2,217	1,995	182,832	61,845	73,977	3,312	1,808	128,589	45,937	419,204
T2	724,848	25,862	84,966	96,715	2,215	1,995	187,425	65,832	83,949	3,356	1,808	121,361	49,364	423,982
T3	724,394	24,878	78,358	98,280	2,204	1,995	184,419	71,093	80,862	3,055	1,817	123,947	53,487	432,945
T4	724,394	24,029	80,858	83,501	2,204	1,995	178,993	75,120	86,226	3,088	1,817	126,614	59,951	440,677
T5	724,394	23,246	80,533	76,666	2,202	1,995	174,680	79,312	87,152	3,116	1,819	126,874	66,800	447,666
T6	724,394	21,678	74,576	68,641	2,202	1,995	171,020	83,838	90,316	3,167	1,819	131,666	73,475	460,000
T7	724,366	17,151	70,830	67,164	2,202	1,995	169,910	85,952	91,590	3,169	1,819	138,346	74,237	468,446
T8	724,213	16,326	69,520	58,306	2,202	1,995	171,259	87,805	95,115	3,112	1,819	138,504	78,251	475,819
T9	724,155	16,124	65,412	52,290	2,202	1,995	173,708	85,866	97,066	3,058	1,819	136,656	87,959	484,189
T10	724,120	16,125	64,015	49,398	2,202	1,995	172,810	84,511	97,115	3,028	1,819	142,837	88,264	488,422
T11	724,086	15,793	63,920	47,250	2,202	1,995	173,526	84,981	96,962	2,786	1,819	142,762	90,090	491,360
T12	724,025	15,617	63,403	45,197	2,201	1,995	172,031	86,076	96,345	2,619	1,820	142,505	94,217	494,829
T13	724,025	15,898	60,985	43,682	2,195	1,995	168,975	87,498	96,329	2,463	1,826	141,668	100,512	498,652
T14	724,025	15,928	59,237	43,721	2,194	1,995	166,619	88,335	96,375	2,272	1,827	142,564	102,958	500,476
T15	724,025	14,390	59,313	42,734	2,193	1,995	164,906	88,617	96,921	2,222	1,828	144,241	104,665	502,429
T16	724,025	14,373	59,881	42,000	2,192	1,995	165,351	89,732	96,434	2,153	1,829	141,908	106,177	503,168
OLT Max.		19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175	497,902
OLT Min.		10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174	457,260

(5a)

Available Forest: Term	
T1	572,035
T2	571,490
T3	571,035
T4	571,035
T5	571,035
T6	571,035
T7	571,008
T8	570,854
T9	570,796
T10	570,761
T11	570,727
T12	570,666
T13	570,666
T14	570,666
T15	570,666
T16	570,666





(3f)

(3a) Caribou Habitat Through Time: Term	Cr	Cwu	Cwp	% Con in CarSUs
T1	101,502	45,037	18,033	89%
T2	94,853	40,783	13,650	90%
T3	114,179	78,020	12,769	90%
T4	130,397	88,190	17,504	90%
T5	139,048	101,285	50,950	91%
T6	153,838	117,687	58,004	91%
T7	155,357	118,344	55,273	91%
T8	151,396	111,540	52,707	92%
T9	150,252	108,623	50,995	93%
T10	150,000	106,966	47,061	94%
T11	150,000	106,246	45,529	94%
T12	150,000	113,694	43,469	95%
T13	153,532	122,466	40,000	95%
T14	150,000	123,068	42,583	95%
T15	152,905	127,389	40,000	95%
T16	157,296	131,155	40,000	95%
OLT Max.	161,804	47,453	68,169	maint or
OLT Min.	147,605	26,809	36,912	increase.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 22_OLTPO **Input File:** 22_OLTPO.inp **Date:** Aug. 5, 2010.

HARVEST AREA and VOLUME RESULTS:

Implications on Wood Supply - SPF varies 321 (T1) to 425 (T15). More available with revised deferrals. PO T1 200,T2 150, then 95 T3-6 as per targets.
TOTAL varies T1 563 decr to min 520. (overall slightly increased average of 527 Mm3 per year with revised deferrals).

Available Harvest Area by Term Data (hectares harvested annually)

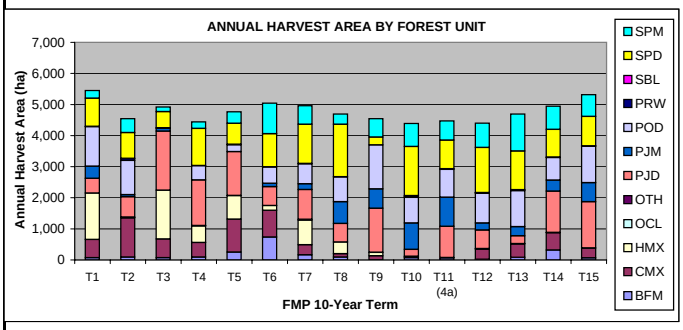
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	5,453	70	590	1,491	2	0	472	392	1,268	0	11	907	250
T2	4,545	90	1,264	5	19	0	653	67	1,104	62	5	827	450
T3	4,923	71	605	1,566	0	0	1,899	96	0	6	10	517	153
T4	4,442	93	467	534	4	9	1,466	1	456	3	7	1,189	214
T5	4,768	250	1,061	758	0	4	1,410	0	225	7	9	671	374
T6	5,044	735	861	154	0	0	608	105	527	4	3	1,064	983
T7	4,964	164	327	790	0	28	958	183	644	9	2	1,263	597
T8	4,692	94	105	377	0	1	595	700	801	2	1	1,690	326
T9	4,547	1	135	109	0	1	1,417	620	1,415	0	3	250	596
T10	4,392	74	37	0	0	8	220	851	820	25	32	1,584	741
T11 (4a)	4,472	68	3	0	2	4	1,003	939	893	16	5	922	617
T12	4,399	18	333	0	13	2	596	228	955	13	11	1,449	781
T13	4,692	81	436	0	1	8	253	291	1,160	22	10	1,241	1,189
T14	4,948	319	558	0	3	3	1,327	356	729	5	8	893	746
T15	5,316	65	318	0	1	3	1,485	615	1,172	3	9	948	698

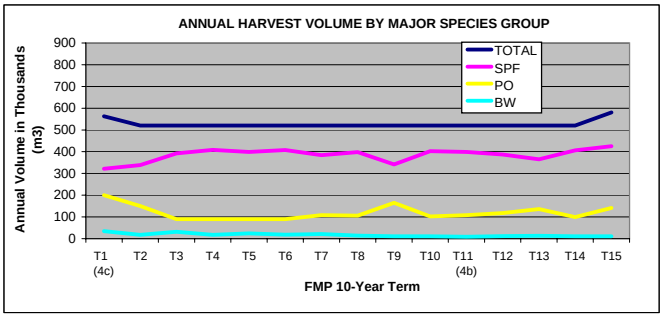
Annual Harvest Volumes by Major Species Groups (1,000s net merchantable cubic metres)

Term	TOTAL	SPF	PO	BW	PRW
T1 (4c)	563.0	321.8	200.0	34.7	0.0
T2	520.0	338.9	150.0	17.6	6.6
T3	520.0	392.3	90.0	31.6	0.6
T4	520.0	408.1	90.0	17.4	0.3
T5	520.0	398.7	90.0	24.4	0.7
T6	520.0	407.7	90.0	18.7	0.3
T7	520.0	384.4	108.2	21.1	0.8
T8	520.0	397.8	106.3	13.7	0.2
T9	520.0	341.5	165.1	11.0	0.1
T10	520.0	402.5	102.4	11.1	2.2
T11 (4b)	520.0	399.2	108.4	9.0	2.0
T12	520.0	386.9	117.7	11.9	1.2
T13	520.0	364.7	136.3	12.9	3.0
T14	520.0	406.4	99.2	11.1	0.4
T15	580.3	425.2	141.5	11.1	0.3
Average	526.9	385.1	119.7	17.2	1.2

Projected Revenues, Expenditures & Renewal Area

Term	Revenue M$	Expend. M$	Unspent M$	Renewal ha	Exten ha	Basc1 ha	Intn1 ha
T1	1,970	1,664	307	**5,398**	3,504	1,606	288
T2	2,096	2,096	0	**4,500**	2,010	2,095	394
T3	2,278	2,278	0	**4,923**	1,843	2,722	358
T4	2,344	2,342	2	**4,442**	1,265	2,820	358
T5	2,315	2,315	0	**4,768**	1,774	2,589	406
T6	2,342	2,185	158	**5,041**	2,264	2,372	405
T7	2,236	2,236	0	**4,949**	1,951	2,699	299
T8	2,285	2,285	0	**4,686**	1,485	2,977	223
T9	2,016	1,799	217	**4,544**	1,936	2,320	288
T10	2,326	2,318	8	**4,389**	1,182	2,868	339
T11	2,308	1,670	638	**4,466**	2,104	2,015	348
T12	2,246	1,140	1,106	**4,399**	2,897	1,420	82
T13	2,160	702	1,458	**4,692**	3,935	703	54
T14	2,334	1,081	1,253	**4,948**	3,467	1,312	168
T15	2,462	1,235	1,227	**5,316**	3,547	1,620	149





NOTES:

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 22_OLTPO **Input File:** 22_OLTPO.inp **Date:** Aug. 5, 2010.

Immature Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	416,005	18,788	57,264	51,502	187	162	133,098	29,828	26,318	635	947	73,006	24,269
T2	410,126	17,061	48,482	36,847	262	192	138,701	35,697	44,047	711	1,034	60,751	26,342
T3	453,198	16,282	47,585	38,170	495	232	147,180	43,195	56,757	952	1,080	67,566	33,706
T4	480,716	14,104	48,169	37,258	556	287	152,977	49,157	65,998	1,091	1,198	71,304	38,617
T5	462,796	4,730	44,676	32,183	608	403	131,566	54,138	72,763	1,213	1,116	76,730	42,669
T6	435,265	2,295	38,065	32,298	654	426	107,498	56,338	79,404	1,395	1,061	68,960	46,870
T7	424,756	4,482	33,113	34,850	613	478	108,705	55,652	79,421	1,463	792	61,869	43,317
T8	432,001	4,683	33,992	33,355	654	745	118,759	60,305	71,608	1,312	784	59,630	46,173
T9	437,282	4,540	32,546	30,342	632	745	121,208	58,366	70,702	1,365	696	65,828	50,311
T10	424,630	4,198	30,417	25,817	493	745	120,310	57,011	75,947	1,312	671	61,836	45,874
T11	430,022	4,095	28,627	23,580	488	745	121,026	57,481	75,882	1,114	902	68,209	47,872
T12	425,662	3,577	28,935	20,331	480	741	119,531	58,576	76,464	1,068	882	64,431	50,646
T13	429,062	1,579	29,053	17,208	599	745	116,475	59,998	78,053	970	907	65,635	57,841
T14	426,247	1,570	29,426	16,775	603	589	114,119	60,835	78,726	928	967	60,659	61,050
T15	420,381	2,549	32,085	18,628	626	605	112,406	61,117	76,417	878	1,009	51,666	62,395
T16	413,469	2,854	34,142	19,436	626	612	112,851	62,232	74,381	829	1,068	40,021	64,418
	Max OLT	3,260	31,472	42,688	1,328	1,063	292,834	96,487	30,987	115,789	10,363	18,903	44,874
	Min OLT	1,948	11,696	21,591	465	448	106,124	36,541	12,670	45,886	3,667	6,479	17,441

Mature+ Productive Forest

Forest Unit:

10-Year Te	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	309,388	8,361	31,228	55,738	2,029	1,833	49,734	32,018	47,659	2,677	860	55,582	21,669
T2	314,723	8,801	36,484	59,869	1,954	1,803	48,724	30,135	39,901	2,646	774	60,610	23,022
T3	271,196	8,597	30,773	60,110	1,709	1,763	37,239	27,898	24,105	2,103	736	56,381	19,781
T4	243,678	9,925	32,689	46,242	1,649	1,707	26,016	25,962	20,228	1,997	619	55,310	21,334
T5	261,598	18,516	35,856	44,483	1,594	1,591	43,114	25,175	14,389	1,903	703	50,143	24,130
T6	289,129	19,383	36,511	36,343	1,548	1,568	63,522	27,500	10,913	1,772	757	62,706	26,605
T7	299,610	12,669	37,717	32,315	1,589	1,517	61,205	30,300	12,169	1,706	1,027	76,477	30,920
T8	292,212	11,643	35,527	24,951	1,549	1,250	52,500	27,500	23,507	1,800	1,035	78,873	32,078
T9	286,873	11,583	32,866	21,948	1,570	1,250	52,500	27,500	26,365	1,693	1,123	70,828	37,648
T10	299,490	11,927	33,599	23,582	1,709	1,250	52,500	27,500	21,168	1,717	1,147	81,001	42,389
T11	294,064	11,698	35,293	23,670	1,714	1,250	52,500	27,500	21,080	1,672	916	74,554	42,218
T12	298,363	12,040	34,468	24,866	1,722	1,253	52,500	27,500	19,881	1,551	938	78,074	43,571
T13	294,963	14,319	31,931	26,474	1,596	1,250	52,500	27,500	18,276	1,493	920	76,033	42,671
T14	297,778	14,358	29,811	26,946	1,591	1,405	52,500	27,500	17,649	1,344	860	81,905	41,907
T15	303,644	11,841	27,228	24,106	1,567	1,390	52,500	27,500	20,504	1,344	819	92,575	42,270
T16	310,556	11,519	25,738	22,564	1,567	1,383	52,500	27,500	22,053	1,324	761	101,888	41,759
	Max OLT	15,933	42,682	39,118	2,219	1,962	99,173	46,652	27,723	1,131	15,367	58,117	40,301
	Min OLT	8,361	24,197	19,993	1,499	1,240	52,493	27,435	12,933	452	10,078	34,643	21,733
	Mature Onset Age:	60	70	60	70	60	70	70	60	80	70	70	70

Available Harvest Area by Forest Unit and Age Class TERM 1

Forest Unit:

	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
A5													
A15													
A25													
A35													
A45													
A55		5	11			1							
A65	12	26	249			15	2	3				9	
A75	2	19	437			18	15	314			170	18	
A85		22	275			35	74	234			107	23	
A95	4	265	247			76	120	396		1	138	55	
A105	53	249	258			290	176	320			78	19	
A115		3	11	1		3	5				21	97	
A125			2	1							132	4	
A135				1						3	140	22	
A145						4				4	108	4	
A155						30				3	11		
A165											2		
A175													
A185													
A195													
A205													
A215													
A225													
A235													
A245													
A255													TOTAL
	70	590	1,491	2	0	472	392	1,268	0	11	907	250	5,453

WHISKEY JACK FOREST 2012 FMP — **SUMMARY of SFMM INVESTIGATION**

Case Name: 23_OLTMS **Input File:** 23_OLTMS.inp **Date:** Aug. 5, 2010.

Purpose: Revise caribou subunits and deferrals to align with marten cores and add operational deferrals for 40 years. Other LLPs deferred only 30 years, not 60.

Specific Inputs: Run 22 with deferral for LLP_26 ON for 60. TOTAL T6-7 reduced to 500. All other targets the same as Run 22.

Group:		thousands of m3 per year.
PWR		
SPF		
PO	200.0	T1 only, then T2 150, T3-6 90.
BW		
Total	520.0	all terms to raise harvest in lowest terms, except T6-7 at 500.

RESULTS: Where projections in the following tables fall below the min. target, the data is shaded yellow; where projections exceed max. targets, the data is shaded green.

FOREST CONDITION RESULTS Where projections do not relate to OLT projections, font is coloured red and results are not expected to correlate to OLT SNRV.

Implications on Forest Condition - OLT forest condition projections good except MLI and SLo.
Total forest unit area underachievement of PRW and SBL.
Upland conifer and Caribou habitat projections good.
Similar to Run 20 and 23 achievement.

(2a) Productive Area by Landscape Class (ha)

Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional: Balsam	Lowland	Hardwood	Conifer
T1	200,328	152,743	62,934	8,361	2,890	105,229	192,908
T2	169,422	189,737	48,922	8,801	2,830	101,287	203,870
T3	138,094	240,891	74,618	8,512	2,567	84,442	175,253
T4	155,369	241,737	85,989	9,832	2,391	65,527	163,531
T5	160,027	211,148	92,321	18,429	2,389	58,667	181,395
T6	164,052	174,484	97,474	19,387	2,444	49,319	217,216
T7	168,164	157,108	97,364	12,680	2,773	46,000	240,259
T8	167,938	174,324	85,427	11,815	2,736	49,813	232,159
T9	164,629	183,208	83,228	11,263	2,703	48,420	230,686
T10	162,413	178,995	83,085	11,610	2,806	46,000	239,197
T11	160,000	181,434	85,693	11,504	2,543	46,000	236,896
T12	161,404	177,300	84,998	11,748	2,625	46,000	239,943
T13	166,384	181,420	79,447	14,147	2,492	46,000	234,127
T14	167,900	183,106	76,803	13,146	2,415	46,000	234,648
T15	165,696	177,624	76,625	11,541	2,331	46,000	244,200
T16	166,462	169,275	77,082	11,257	2,355	46,000	251,586
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

(2c) Area of Old Forest Area by Grouping of Productive Forest (ha)

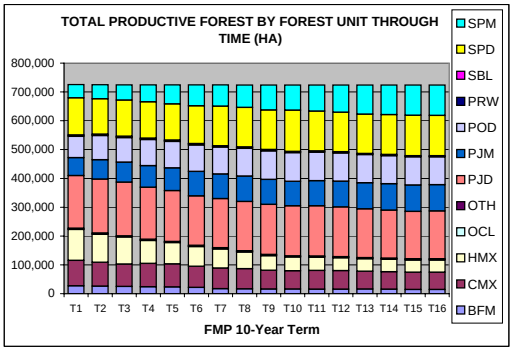
	Lower Old Forest Age (Years): 80	100	100	100	90	100	160	110-120
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo
T1	3,707	1,851	8,811	17,199	1,252	23,309	97	18,431
T2	4,169	1,899	9,033	15,522	1,575	45,532	227	18,555
T3	6,197	1,745	12,778	15,753	1,700	42,422	268	17,374
T4	6,554	1,700	18,784	13,300	1,658	36,210	321	21,280
T5	6,293	1,616	23,490	20,330	1,516	33,045	375	25,252
T6	6,000	1,562	25,408	17,481	1,447	27,628	371	31,632
T7	9,374	1,511	24,657	13,748	1,401	22,000	335	39,174
T8	9,703	1,493	22,411	8,831	1,135	32,465	314	31,329
T9	8,881	1,450	22,000	9,469	1,144	47,427	288	35,502
T10	9,118	1,471	22,000	8,207	1,094	43,032	259	40,491
T11	9,358	1,400	22,000	8,742	1,000	35,904	203	56,542
T12	8,628	1,400	22,000	8,000	1,000	38,786	215	65,709
T13	6,000	1,400	22,000	8,901	1,000	34,867	230	75,175
T14	6,000	1,400	22,000	9,414	1,000	32,903	298	78,101
T15	8,363	1,400	22,000	11,353	1,010	33,484	335	83,126
T16	8,817	1,400	22,000	9,362	1,000	39,662	409	87,501
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840

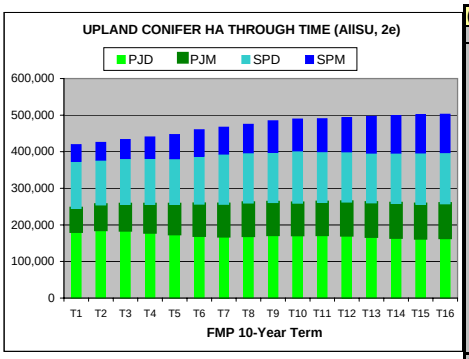
(2b partial) Productive Forest Area Through Time Data (hectares): **(2d)**

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	(2e) Upland Conifer
T1	725,394	27,150	88,492	107,239	2,217	1,995	182,832	61,845	73,977	3,312	1,808	128,589	45,937	419,204
T2	724,870	25,871	83,110	97,113	2,215	1,995	187,396	66,783	84,075	3,290	1,809	122,448	48,765	425,392
T3	724,376	24,771	77,917	93,761	2,208	1,995	186,373	69,056	85,404	2,991	1,814	125,384	52,702	433,515
T4	724,376	23,900	81,017	79,472	2,208	1,995	180,493	75,070	90,594	3,022	1,814	126,074	58,719	440,356
T5	724,376	23,124	79,960	73,922	2,206	1,995	176,277	78,995	91,525	3,043	1,816	125,340	66,173	446,785
T6	724,376	21,627	73,404	68,273	2,206	1,995	171,670	84,774	92,020	3,035	1,816	131,147	72,410	460,000
T7	724,349	17,107	71,683	66,371	2,206	1,995	170,173	85,701	93,147	3,025	1,816	137,206	73,918	466,998
T8	724,211	16,381	70,178	57,927	2,206	1,995	171,350	88,087	95,955	2,971	1,816	137,213	78,133	474,783
T9	724,137	15,849	64,953	50,900	2,206	1,995	173,908	86,681	98,872	2,940	1,816	137,197	86,821	484,606
T10	724,106	15,863	63,440	47,692	2,205	1,995	173,671	85,131	98,889	2,912	1,817	142,942	87,550	489,294
T11	724,071	15,759	64,797	45,979	2,204	1,995	174,049	87,229	98,680	2,655	1,819	138,552	90,354	490,184
T12	724,017	15,543	64,551	44,057	2,203	1,995	172,580	89,199	97,783	2,569	1,820	137,286	94,432	493,497
T13	724,017	15,895	62,098	42,800	2,198	1,995	169,359	90,229	97,789	2,419	1,824	136,314	101,099	497,000
T14	724,017	15,305	60,950	43,044	2,198	1,995	166,402	91,458	97,455	2,235	1,824	138,105	103,046	499,011
T15	724,017	14,242	60,244	42,231	2,196	1,995	164,538	91,249	97,942	2,193	1,826	140,508	104,854	501,148
T16	724,017	14,249	60,405	42,000	2,196	1,995	165,945	91,033	96,582	2,127	1,826	140,012	105,647	502,637
OLT Max.		19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175	497,902
OLT Min.		10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174	457,260

(5a)

Available Forest: Term	
T1	572,035
T2	571,511
T3	571,018
T4	571,018
T5	571,018
T6	571,018
T7	570,990
T8	570,853
T9	570,779
T10	570,747
T11	570,712
T12	570,659
T13	570,659
T14	570,659
T15	570,659
T16	570,659





(3f)

(3a) Caribou Habitat Through Time: Term	Cr	Cwu	Cwp	% Con in CarSUs
T1	101,502	45,037	18,033	89%
T2	95,246	41,723	14,305	90%
T3	114,557	78,932	13,282	90%
T4	130,783	89,074	17,951	90%
T5	139,432	102,146	51,265	91%
T6	153,963	117,926	58,243	91%
T7	155,496	118,601	55,372	91%
T8	152,487	113,550	52,809	92%
T9	150,000	111,416	51,233	93%
T10	150,000	110,053	47,290	94%
T11	150,000	109,118	45,736	94%
T12	150,000	116,241	43,546	95%
T13	154,614	124,846	40,000	95%
T14	150,000	123,511	41,803	95%
T15	152,707	128,174	40,000	95%
T16	156,729	131,541	40,000	96%
OLT Max.	161,804	47,453	68,169	maint or
OLT Min.	147,605	26,809	36,912	increase.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 23_OLTMS **Input File:** 23_OLTMS.inp **Date:** Aug. 5, 2010.

HARVEST AREA and VOLUME RESULTS:

Implications on Wood Supply - SPF varies 288 (T1) to 421 (T11). PO T1 200,T2 150, then 90 T3-6 as per targets.
TOTAL varies T1 563 decr to min 500. (overall slightly increased average of 527 Mm3 per year with revised deferrals).
Better balance of CMX and HMX AHA T1-2. Looks to be operationally implementable.

Available Harvest Area by Term Data (hectares harvested annually)

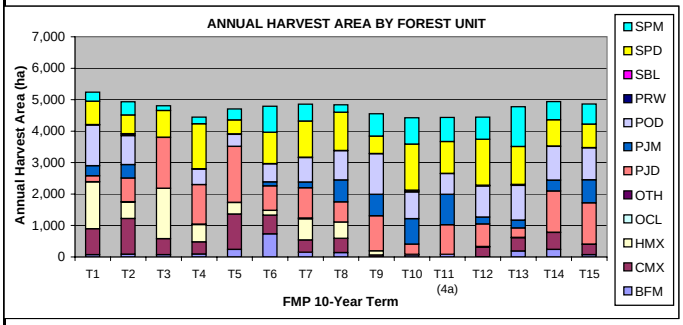
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	5,239	70	825	1,491	2	0	192	319	1,297	11	0	740	292
T2	4,934	88	1,133	524	12	0	751	429	920	51	9	593	424
T3	4,807	71	510	1,604	0	0	1,613	0	0	0	9	849	151
T4	4,445	93	383	553	4	12	1,257	1	491	3	10	1,427	213
T5	4,705	241	1,120	369	0	4	1,782	0	381	12	4	443	349
T6	4,793	734	591	154	0	0	779	125	579	3	0	999	828
T7	4,860	149	392	669	0	25	964	183	777	9	2	1,150	541
T8	4,836	137	453	520	0	1	640	697	927	2	7	1,216	235
T9	4,552	2	58	131	1	1	1,112	682	1,294	0	7	552	713
T10	4,425	66	0	0	3	11	325	810	847	27	32	1,464	839
T11 (4a)	4,437	79	0	0	2	2	941	966	660	4	2	1,012	768
T12	4,448	6	312	0	9	2	721	215	994	12	10	1,458	710
T13	4,777	189	420	0	1	10	299	253	1,102	21	10	1,204	1,268
T14	4,941	237	539	0	3	3	1,313	345	1,073	4	9	830	583
T15	4,865	70	334	0	1	3	1,313	731	1,017	3	5	747	643

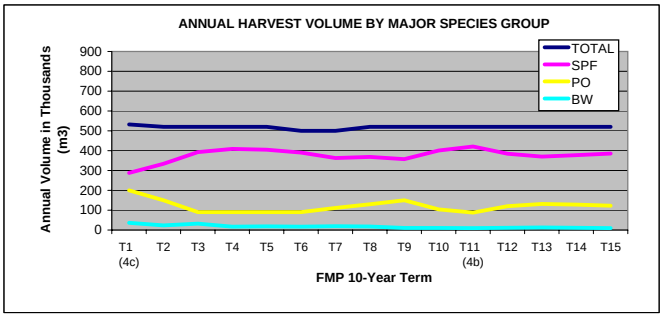
Annual Harvest Volumes by Major Species Groups (1,000s net merchantable cubic metres)

Term	TOTAL	SPF	PO	BW	PRW
T1 (4c)	532.2	287.7	200.0	36.1	1.1
T2	520.0	334.2	150.0	23.5	5.4
T3	520.0	392.6	90.0	32.3	0.0
T4	520.0	408.5	90.0	17.0	0.3
T5	520.0	405.0	90.0	18.4	1.2
T6	500.0	390.4	90.0	16.7	0.2
T7	500.0	363.3	111.5	19.2	0.9
T8	520.0	368.7	129.7	17.6	0.2
T9	520.0	357.5	149.6	10.8	0.1
T10	520.0	400.7	104.4	10.5	2.4
T11 (4b)	520.0	421.2	88.1	9.4	0.4
T12	520.0	384.9	120.3	11.5	1.1
T13	520.0	369.9	131.2	12.8	2.9
T14	520.0	377.6	127.9	11.0	0.3
T15	520.0	385.6	122.2	9.8	0.2
Average	518.1	376.5	119.7	17.1	1.1

Projected Revenues, Expenditures & Renewal Area

Term	Revenue M$	Expend. M$	Unspent M$	Renewal ha	Exten ha	Basc1 ha	Intn1 ha
T1	1,802	1,512	290	**5,187**	3,606	1,305	275
T2	2,059	2,059	0	**4,885**	2,429	2,070	386
T3	2,272	2,272	0	**4,807**	1,775	2,694	338
T4	2,345	2,345	0	**4,445**	1,280	2,818	348
T5	2,347	2,347	**0**	**4,705**	1,702	2,576	427
T6	2,241	1,945	296	**4,790**	2,193	2,323	273
T7	2,121	2,121	0	**4,847**	1,976	2,660	211
T8	2,154	2,154	**0**	**4,829**	1,856	2,839	134
T9	2,091	2,002	89	**4,549**	1,691	2,552	305
T10	2,320	1,489	831	**4,422**	2,491	1,587	343
T11	2,395	1,626	769	**4,432**	2,045	2,196	191
T12	2,235	1,150	1,084	**4,448**	2,917	1,437	94
T13	2,184	719	1,465	**4,777**	3,997	724	55
T14	2,196	1,069	1,127	**4,941**	3,481	1,294	166
T15	2,229	1,165	1,064	**4,865**	3,171	1,563	131





NOTES:

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 23_OLTMS **Input File:** 23_OLTMS.inp **Date:** Aug. 5, 2010.

Immature Productive Forest

Forest Unit:

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	416,005	18,788	57,264	51,502	187	162	133,098	29,828	26,318	635	947	73,006	24,269
T2	408,082	17,070	48,899	37,244	262	192	135,960	35,944	44,460	749	933	60,222	26,148
T3	453,603	16,259	48,110	38,190	438	232	147,486	44,076	58,297	888	1,017	65,522	33,088
T4	483,096	14,068	48,395	38,500	497	287	153,840	49,692	67,745	969	1,134	70,489	37,479
T5	463,497	4,695	44,717	33,355	555	433	126,983	54,426	74,987	1,086	1,078	77,872	43,310
T6	436,010	2,240	37,386	31,931	603	456	107,799	57,274	80,582	1,263	975	68,734	46,768
T7	422,636	4,427	32,368	34,039	564	506	108,777	55,785	80,968	1,319	685	60,456	42,742
T8	427,689	4,566	33,265	31,923	606	745	118,850	60,587	73,396	1,171	680	56,759	45,140
T9	431,065	4,586	32,021	28,888	586	745	121,408	59,181	73,714	1,248	733	60,766	47,190
T10	424,493	4,253	29,679	24,276	507	745	121,171	57,631	77,555	1,165	710	60,750	46,052
T11	427,128	4,255	29,668	22,651	536	745	121,549	59,729	77,259	1,052	943	60,118	48,623
T12	423,702	3,796	30,013	20,742	523	718	120,080	61,699	76,375	1,018	875	55,357	52,506
T13	427,251	1,748	30,161	17,843	602	722	116,859	62,729	78,019	925	928	57,482	59,235
T14	427,809	2,159	31,077	18,149	604	612	113,902	63,958	77,733	891	1,004	54,084	63,637
T15	419,945	2,701	33,192	18,639	629	626	112,038	63,749	76,902	850	1,062	45,826	63,731
T16	412,819	2,993	34,375	19,669	629	632	113,445	63,533	74,275	800	1,038	36,144	65,285
	Max OLT	3,260	31,472	42,688	1,328	1,063	292,834	96,487	30,987	115,789	10,363	18,903	44,874
	Min OLT	1,948	11,696	21,591	465	448	106,124	36,541	12,670	45,886	3,667	6,479	17,441

Mature+ Productive Forest

Forest Unit:

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	309,388	8,361	31,228	55,738	2,029	1,833	49,734	32,018	47,659	2,677	860	55,582	21,669
T2	316,788	8,801	34,211	59,869	1,954	1,803	51,436	30,839	39,615	2,541	876	62,226	22,617
T3	270,773	8,512	29,807	55,571	1,770	1,763	38,888	24,980	27,107	2,103	797	59,861	19,614
T4	241,281	9,832	32,622	40,971	1,711	1,707	26,653	25,378	22,848	2,053	680	55,585	21,240
T5	260,880	18,429	35,243	40,567	1,651	1,561	49,294	24,569	16,539	1,957	738	47,468	22,864
T6	288,366	19,387	36,018	36,342	1,603	1,539	63,870	27,500	11,438	1,772	841	62,413	25,642
T7	301,712	12,680	39,315	32,333	1,642	1,488	61,396	29,916	12,179	1,706	1,132	76,750	31,176
T8	296,522	11,815	36,913	26,003	1,600	1,250	52,500	27,500	22,559	1,800	1,136	80,454	32,993
T9	293,072	11,263	32,933	22,012	1,620	1,250	52,500	27,500	25,158	1,693	1,083	76,431	39,631
T10	299,613	11,610	33,761	23,416	1,699	1,250	52,500	27,500	21,334	1,746	1,107	82,192	41,498
T11	296,943	11,504	35,129	23,329	1,668	1,250	52,500	27,500	21,421	1,603	875	78,433	41,731
T12	300,315	11,748	34,538	23,315	1,680	1,277	52,500	27,500	21,408	1,551	945	81,928	41,925
T13	296,766	14,147	31,937	24,957	1,596	1,273	52,500	27,500	19,770	1,493	897	78,832	41,865
T14	296,208	13,146	29,873	24,895	1,594	1,383	52,500	27,500	19,722	1,344	821	84,021	39,409
T15	304,072	11,541	27,052	23,592	1,567	1,369	52,500	27,500	21,039	1,344	764	94,681	41,123
T16	311,198	11,257	26,029	22,331	1,567	1,362	52,500	27,500	22,307	1,327	789	103,868	40,362
	Max OLT	15,933	42,682	39,118	2,219	1,962	99,173	46,652	27,723	1,131	15,367	58,117	40,301
	Min OLT	8,361	24,197	19,993	1,499	1,240	52,493	27,435	12,933	452	10,078	34,643	21,733
Mature Onset Age:		60	70	60	70	60	70	70	60	80	70	70	70

Available Harvest Area by Forest Unit and Age Class TERM 1

Forest Unit:

	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
A5													
A15													
A25													
A35													
A45													
A55		5	11			1							
A65	12	26	198			15	2					9	
A75	2	19	437			18	15	404			170	18	
A85		20	275			31	59	29			100	18	
A95	4	384	247			65	86	387			132	55	
A105	53	249	258			25	154	320			72	14	
A115		107	63	1		3	4	157	4		21	153	
A125			2	1					7		50	4	
A135		15		1							74	22	
A145						4					108		
A155						30				0	11		
A165										0	2		
A175													
A185													
A195													
A205													
A215													
A225													
A235													
A245													
A255													TOTAL
	70	825	1,491	2	0	192	319	1,297	11	0	740	292	5,239

WHISKEY JACK FOREST 2012 FMP — **SUMMARY of SFMM INVESTIGATION**

Case Name: 27_OLTMS **Input File:** 27_OLTMS.inp **Date:** Aug. 18, 2010.

Purpose: Run 23 with non-declining PRW forest unit area.

Specific Inputs: Run 23 with non-declining PRW forest unit productive area. Reduced CMo old forest achievement target (21,000 ha), but still above lower SRNV.

Group:		thousands of m3 per year.
PWR		
SPF		
PO	200.0	T1 only, then T2 150, T3-6 90.
BW		
Total	520.0	all terms to raise harvest in lowest terms.

RESULTS: Where projections in the following tables fall below the min. target, the data is shaded yellow; where projections exceed max. targets, the data is shaded green.

FOREST CONDITION RESULTS Where projections do not relate to OLT projections, font is coloured red and results are not expected to correlate to OLT SNRV.

Implications on Forest Condition -
OLT forest condition projections good except MLI and SLo.
Total forest unit area underachievement of PRW and SBL. PRW forest unit productive area maintained through time.
Upland conifer and Caribou habitat projections good.
Similar to Run 23 achievement.

(2a) Productive Area by Landscape Class (ha)

Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional: Balsam	Lowland	Hardwood	Conifer
T1	200,328	152,743	62,934	8,361	2,890	105,229	192,908
T2	170,338	189,737	48,922	8,801	2,758	101,764	202,539
T3	138,115	240,943	75,374	8,598	2,509	79,740	179,104
T4	154,038	242,861	87,435	9,964	2,274	63,068	164,743
T5	155,995	212,970	93,736	18,555	2,297	59,484	181,344
T6	166,946	170,829	96,374	19,387	2,305	49,150	219,392
T7	170,928	156,078	98,030	12,680	2,616	46,000	238,023
T8	171,108	173,535	86,378	11,621	2,584	48,199	230,791
T9	167,043	182,605	83,590	11,433	2,669	49,079	227,726
T10	163,017	180,456	83,187	11,752	2,807	46,000	236,893
T11	160,000	182,584	88,365	11,686	2,626	46,000	232,816
T12	163,758	178,743	84,223	11,945	2,646	46,000	236,707
T13	167,890	184,595	80,184	14,272	2,560	46,000	228,521
T14	167,403	184,624	76,425	14,273	2,455	46,000	232,841
T15	165,650	178,194	77,269	11,561	2,386	46,000	242,963
T16	165,137	171,600	77,236	11,306	2,327	46,000	250,417
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

(2c) Area of Old Forest Area by Grouping of Productive Forest (ha)

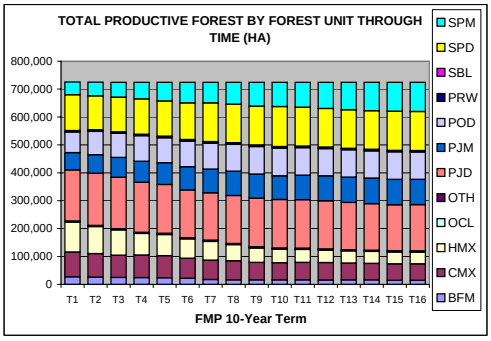
	Lower Old Forest Age (Years): 80	100	100	100	90	100	160	110-120	140
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo	PRW
T1	3,707	1,851	8,811	17,199	1,252	23,309	97	18,431	457
T2	4,169	1,899	10,175	17,543	1,575	42,970	203	18,577	798
T3	6,197	1,747	13,514	15,753	1,700	45,072	252	17,374	711
T4	6,623	1,641	18,916	13,300	1,573	36,189	270	21,280	966
T5	6,380	1,559	23,617	20,330	1,505	32,780	326	25,252	1,221
T6	6,000	1,508	25,116	17,481	1,371	27,043	323	34,000	1,429
T7	9,374	1,458	24,375	13,083	1,328	21,000	265	39,174	1,544
T8	9,515	1,442	21,759	8,626	1,135	31,734	244	34,000	1,474
T9	9,064	1,400	21,000	9,500	1,144	46,865	251	36,824	1,475
T10	9,286	1,436	21,000	8,168	1,025	42,742	250	41,769	1,406
T11	9,523	1,400	21,000	8,660	1,000	35,736	194	56,536	1,293
T12	8,778	1,400	21,000	8,000	1,000	40,399	206	65,679	1,197
T13	6,000	1,400	21,000	9,101	1,000	35,768	222	75,040	1,093
T14	6,000	1,400	21,000	9,450	1,000	33,732	295	78,018	1,086
T15	8,497	1,400	21,000	9,413	1,000	34,927	332	83,024	1,036
T16	8,940	1,400	21,000	9,303	1,000	40,600	404	87,302	1,005
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427	inf
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840	457

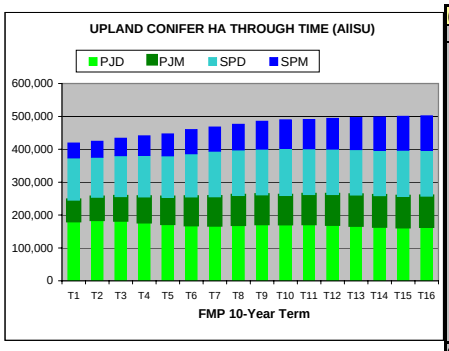
(2b partial) Productive Forest Area Through Time Data (hectares): **(2d)** **(2e) Upland Conifer**

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
T1	725,394	27,150	88,492	107,239	2,217	1,995	182,832	61,845	73,977	3,312	1,808	128,589	45,937	419,204
T2	724,860	25,864	83,975	96,965	2,215	1,995	186,979	66,471	84,036	3,450	1,808	121,807	49,296	424,553
T3	724,383	24,837	79,409	90,622	2,208	1,995	184,680	70,819	86,734	3,379	1,813	124,721	53,166	433,385
T4	724,383	24,012	81,115	77,277	2,205	1,995	179,416	74,860	91,792	3,489	1,817	126,524	59,879	440,680
T5	724,383	23,232	79,649	75,578	2,203	1,995	174,921	78,424	89,549	3,589	1,819	126,360	67,065	446,770
T6	724,383	21,643	72,093	69,181	2,203	1,995	170,961	83,482	91,632	3,816	1,819	131,385	74,173	460,000
T7	724,355	17,124	69,601	67,193	2,203	1,995	170,064	84,948	92,747	3,861	1,819	138,524	74,277	467,812
T8	724,216	16,270	67,847	58,129	2,203	1,995	171,560	87,384	96,319	3,848	1,819	138,410	78,434	475,787
T9	724,144	15,985	62,410	51,973	2,203	1,995	174,294	86,376	98,578	3,883	1,819	139,263	85,366	485,298
T10	724,112	15,970	61,625	48,256	2,203	1,995	173,713	85,293	98,928	3,860	1,819	143,392	87,059	489,457
T11	724,077	15,867	62,739	46,609	2,203	1,995	174,079	87,549	98,762	3,741	1,819	139,348	89,366	490,342
T12	724,022	15,623	62,637	44,461	2,202	1,995	172,402	89,316	97,937	3,673	1,820	138,167	93,789	493,674
T13	724,022	15,908	60,493	43,300	2,198	1,995	169,441	90,694	97,983	3,581	1,824	138,270	98,336	496,741
T14	724,022	15,886	59,237	43,095	2,195	1,995	166,618	91,628	97,820	3,449	1,826	138,484	101,788	498,518
T15	724,022	14,172	59,454	42,406	2,193	1,995	164,541	91,478	98,393	3,387	1,828	140,644	103,530	500,193
T16	724,022	14,180	59,307	42,000	2,193	1,995	165,774	91,006	97,614	3,312	1,828	140,271	104,542	501,593
OLT Max.		19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175	497,902
OLT Min.		10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174	457,260

(5a)

Available Forest: Term	
T1	572,035
T2	571,502
T3	571,024
T4	571,024
T5	571,024
T6	571,024
T7	570,996
T8	570,857
T9	570,785
T10	570,753
T11	570,719
T12	570,664
T13	570,664
T14	570,664
T15	570,664
T16	570,664





(3f)

(3a) Caribou Habitat Through Time: Term	Cr	Cwu	Cwp	% Con in CarSUs
T1	101,502	45,037	18,033	89%
T2	95,259	41,711	14,293	90%
T3	114,569	78,920	13,270	90%
T4	130,796	89,063	17,939	90%
T5	139,444	102,135	51,254	91%
T6	153,975	117,926	58,232	91%
T7	155,499	118,600	55,361	91%
T8	152,489	113,524	52,763	92%
T9	150,000	111,335	51,193	93%
T10	150,000	109,929	47,305	94%
T11	150,000	109,025	45,733	94%
T12	150,000	116,101	43,554	95%
T13	154,446	124,645	40,000	95%
T14	150,000	123,394	41,907	95%
T15	152,573	128,002	40,000	95%
T16	156,672	131,434	40,000	96%
OLT Max.	161,804	47,453	68,169	maint or
OLT Min.	147,605	26,809	36,912	increase.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 27_OLTMS **Input File:** 27_OLTMS.inp **Date:** Aug. 18, 2010.

HARVEST AREA and VOLUME RESULTS:

Implications on Wood Supply - SPF varies 306 (T1, improved) to 417 (T4). PO T1 200,T2 150, then 90 T3-6 as per targets.
TOTAL varies T1 549, decr to min 520 for rest of terms.
Looks to be operationally implementable. More PJD T1 than Run 23. Includes minor SBL AHA area. Improved balance of HMX T1-3.

Available Harvest Area by Term Data (hectares harvested annually)

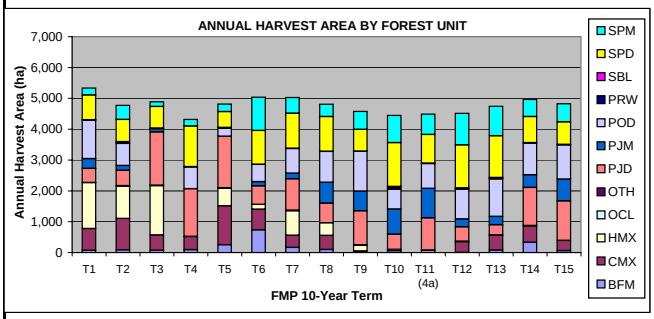
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	5,335	70	707	1,491	2	0	457	319	1,248	4	7	806	224
T2	4,776	88	1,018	1,052	12	0	495	155	721	45	8	723	459
T3	4,888	71	499	1,600	6	9	1,727	106	0	11	9	700	151
T4	4,320	93	423	1	4	5	1,545	1	703	5	7	1,319	213
T5	4,815	254	1,260	577	0	11	1,670	0	266	12	9	512	245
T6	5,036	735	671	154	0	0	604	135	560	3	3	1,097	1,075
T7	5,027	167	392	797	0	18	1,018	183	797	9	2	1,137	506
T8	4,811	99	458	407	0	1	636	677	1,003	1	1	1,127	401
T9	4,578	1	52	186	0	8	1,105	640	1,293	1	3	709	581
T10	4,446	63	37	0	0	4	492	813	644	56	32	1,421	882
T11 (4a)	4,488	77	4	0	2	2	1,041	956	803	10	7	928	658
T12	4,517	7	345	0	9	8	468	255	964	31	9	1,396	1,026
T13	4,745	85	477	0	5	5	333	266	1,217	35	10	1,352	960
T14	4,966	333	532	0	3	9	1,236	406	1,029	8	8	848	553
T15	4,827	62	331	0	1	2	1,282	702	1,114	5	9	733	587

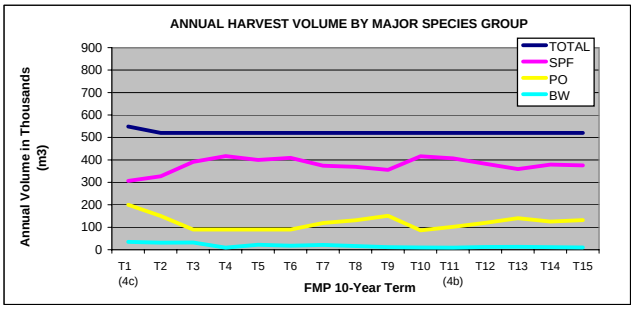
Annual Harvest Volumes by Major Species Groups (1,000s net merchantable cubic metres)

Term	TOTAL	SPF	PO	BW	PRW
T1 (4c)	548.9	306.3	200.0	35.2	0.4
T2	520.0	326.9	150.0	31.0	4.8
T3	520.0	391.0	90.0	31.9	1.1
T4	520.0	417.1	90.0	9.5	0.5
T5	520.0	400.1	90.0	22.0	1.2
T6	520.0	409.0	90.0	18.0	0.3
T7	520.0	374.0	118.9	21.3	0.8
T8	520.0	368.9	131.4	16.1	0.1
T9	520.0	355.2	151.0	11.2	0.1
T10	520.0	416.5	86.5	10.2	5.5
T11 (4b)	520.0	406.9	101.8	9.2	1.0
T12	520.0	382.5	119.9	12.2	2.7
T13	520.0	359.4	140.3	12.8	4.3
T14	520.0	379.1	125.4	11.3	0.7
T15	520.0	375.7	131.8	10.0	0.4
Average	521.9	377.9	121.1	17.5	1.6

Projected Revenues, Expenditures & Renewal Area

Term	Revenue M$	Expend. M$	Unspent M$	Renewal ha	Exten ha	Basc1 ha	Intn1 ha
T1	1,893	1,577	316	**5,282**	3,537	1,460	284
T2	2,019	2,019	0	**4,728**	2,351	2,038	339
T3	2,277	2,277	0	**4,888**	1,817	2,727	345
T4	2,386	2,386	0	**4,320**	1,026	2,922	372
T5	2,327	2,327	0	**4,815**	1,795	2,586	433
T6	2,345	2,243	102	**5,033**	2,140	2,501	392
T7	2,187	2,187	0	**5,013**	2,082	2,666	265
T8	2,153	2,153	0	**4,803**	1,816	2,871	116
T9	2,081	1,978	103	**4,575**	1,731	2,599	245
T10	2,427	1,641	786	**4,443**	2,264	1,810	369
T11	2,334	1,610	724	**4,482**	2,113	2,168	201
T12	2,241	1,169	1,072	**4,517**	2,999	1,441	77
T13	2,149	754	1,395	**4,745**	3,908	772	65
T14	2,206	1,061	1,146	**4,966**	3,526	1,275	165
T15	2,183	1,140	1,043	**4,827**	3,179	1,519	129





NOTES:

Discuss and see if allocations reasonable.

Reviewed and supported by Strategic Task team, Planning Team and LCC.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 27_OLTMS **Input File:** 27_OLTMS.inp **Date:** Aug. 18, 2010.

Immature Productive Forest

Forest Unit:

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	416,005	18,788	57,264	51,502	187	162	133,098	29,828	26,318	635	947	73,006	24,269
T2	408,997	17,062	48,622	37,096	262	192	138,104	35,632	43,944	842	1,003	60,220	26,018
T3	454,432	16,239	47,287	40,594	435	232	145,792	43,189	58,785	1,152	1,077	66,330	33,319
T4	484,334	14,048	47,536	39,421	553	372	153,289	48,977	68,204	1,418	1,195	70,907	38,414
T5	462,701	4,676	43,720	32,844	609	444	129,474	53,610	74,349	1,631	1,115	77,282	42,947
T6	434,148	2,256	36,645	32,750	655	531	107,675	55,982	80,376	2,044	1,061	67,989	46,182
T7	425,036	4,444	31,839	34,788	614	579	109,085	55,266	80,568	2,155	792	61,806	43,100
T8	431,021	4,648	32,726	33,120	654	745	119,060	59,884	74,379	2,048	784	57,774	45,199
T9	433,237	4,552	31,422	28,775	633	745	121,794	58,876	73,947	2,175	720	62,115	47,485
T10	426,660	4,218	29,742	24,339	541	745	121,213	57,793	78,095	2,036	674	61,569	45,696
T11	430,950	4,181	29,491	23,890	491	736	121,579	60,049	76,740	2,123	904	61,712	49,052
T12	426,724	3,677	30,188	20,810	480	656	119,902	61,816	76,927	2,108	896	56,738	52,526
T13	432,669	1,636	30,060	18,083	559	725	116,941	63,194	78,470	2,073	902	59,523	60,502
T14	428,453	1,613	30,994	17,813	601	619	114,118	64,128	78,477	2,101	965	54,516	62,507
T15	421,112	2,611	33,230	18,883	627	692	112,041	63,978	77,220	2,035	1,009	46,135	62,653
T16	413,972	2,874	34,370	19,686	627	630	113,274	63,506	75,292	1,946	1,068	36,410	64,290
	Max OLT	3,260	31,472	42,688	1,328	1,063	292,834	96,487	30,987	115,789	10,363	18,903	44,874
	Min OLT	1,948	11,696	21,591	465	448	106,124	36,541	12,670	45,886	3,667	6,479	17,441

Mature+ Productive Forest

Forest Unit:

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	309,388	8,361	31,228	55,738	2,029	1,833	49,734	32,018	47,659	2,677	860	55,582	21,669
T2	315,863	8,801	35,353	59,869	1,954	1,803	48,874	30,839	40,092	2,608	805	61,587	23,278
T3	269,951	8,598	32,121	50,028	1,773	1,763	38,888	27,630	27,949	2,227	736	58,391	19,847
T4	240,049	9,964	33,580	37,857	1,652	1,623	26,127	25,883	23,589	2,071	622	55,617	21,465
T5	261,681	18,555	35,930	42,733	1,594	1,551	45,447	24,814	15,200	1,957	703	49,078	24,119
T6	290,234	19,387	35,448	36,430	1,548	1,464	63,285	27,500	11,256	1,772	757	63,395	27,991
T7	299,318	12,680	37,763	32,405	1,589	1,415	60,979	29,682	12,179	1,706	1,027	76,717	31,176
T8	293,195	11,621	35,121	25,009	1,549	1,250	52,500	27,500	21,940	1,800	1,035	80,635	33,235
T9	290,906	11,433	30,988	23,198	1,570	1,250	52,500	27,500	24,631	1,709	1,098	77,148	37,882
T10	297,452	11,752	31,883	23,917	1,662	1,250	52,500	27,500	20,833	1,824	1,145	81,823	41,363
T11	293,127	11,686	33,248	22,720	1,712	1,258	52,500	27,500	22,022	1,617	914	77,636	40,314
T12	297,298	11,945	32,449	23,651	1,722	1,339	52,500	27,500	21,010	1,566	924	81,429	41,262
T13	291,353	14,272	30,432	25,216	1,639	1,270	52,500	27,500	19,513	1,508	922	78,747	37,834
T14	295,569	14,273	28,243	25,282	1,594	1,375	52,500	27,500	19,343	1,349	862	83,968	39,281
T15	302,910	11,561	26,225	23,524	1,567	1,303	52,500	27,500	21,173	1,352	819	94,509	40,877
T16	310,050	11,306	24,937	22,314	1,567	1,365	52,500	27,500	22,322	1,367	761	103,861	40,252
	Max OLT	15,933	42,682	39,118	2,219	1,962	99,173	46,652	27,723	1,131	15,367	58,117	40,301
	Min OLT	8,361	24,197	19,993	1,499	1,240	52,493	27,435	12,933	452	10,078	34,643	21,733
Mature Onset Age:		60	70	60	70	60	70	70	60	80	70	70	70

Available Harvest Area by Forest Unit and Age Class TERM 1

Forest Unit:

	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
A5													
A15													
A25													
A35													
A45													
A55		5	11			1							
A65	12	26	249			15	2					9	
A75	2	19	437			18	15	314			170	18	
A85		20	275			31	59	227			100	18	
A95	4	384	247			65	86	387		1	132	55	
A105	53	249	258	0		290	154	320			72	14	
A115		3	11	1		3	4	0	4		21	81	
A125			2	1					0		50	4	
A135		0		1							140	22	
A145				0		4			0	4	108	4	
A155						30				3	11		
A165											2		
A175													
A185													
A195													
A205													
A215													
A225													
A235													
A245													
A255													TOTAL
	70	707	1,491	2	0	457	319	1,248	4	7	806	224	5,335

WHISKEY JACK FOREST 2012 FMP — **SUMMARY of SFMM INVESTIGATION**

Case Name: 27a_OLTMS **Input File:** 27a_OLTMS.inp **Date:** Sept. 25, 2010.

Purpose: Run 27 with initial land base adjustment for SBL PLANFU area and added min PRW AHA and max SBL harvest area.

Specific Inputs: Run 27 with adjusted SPD to SBL initial land base and deferrals, min T1 PRW AHA 10 ha, max SBL AHA T1-3 80 ha. Delayed Upland Conifer achievement from T6 to T7 (still 460,000 ha). Other contraints same as Run 27. Add min target to maintain mature/late SBL, M/L Lowland and SLo forest.

Group:		thousands of m3 per year.
PWR		
SPF		
PO	200.0	T1 only, then T2 150, T3-6 90.
BW		
Total	520.0	all terms to raise harvest in lowest terms.

RESULTS: Where projections in the following tables fall below the min. target, the data is shaded yellow; where projections exceed max. targets, the data is shaded green.

FOREST CONDITION RESULTS Where projections do not relate to OLT projections, font is coloured red and results are not expected to correlate to OLT SNRV.

Implications on Forest Condition -
OLT forest condition projections good - improved (MLI and Slo) with increased SBL area.
Total forest unit area underachievement of PRW. PRW forest unit productive area maintained through time.
Upland conifer met T7 (Run 27 in T6) due to less SPD at plan start with SBL adjustment. Caribou habitat projections still good.
Similar to Run 27 achievement - improved lowland OLT achievement in this run.

(2a) Productive Area by Landscape Class (ha)

Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional: Balsam	Lowland	Hardwood	Conifer
T1	200,328	152,743	62,934	8,361	12,695	105,229	183,102
T2	168,280	189,737	48,922	9,142	12,075	102,225	194,500
T3	136,475	240,780	74,601	8,926	11,034	86,520	166,075
T4	157,260	237,859	81,370	10,188	10,027	69,869	157,837
T5	162,425	211,275	86,294	18,708	10,388	60,941	174,379
T6	166,252	175,138	92,013	19,579	10,874	48,059	212,495
T7	169,180	160,489	93,969	12,569	12,653	46,000	229,525
T8	172,389	177,137	81,339	11,405	12,850	52,361	216,782
T9	168,523	187,206	81,149	12,209	12,850	50,888	211,374
T10	163,383	183,748	79,907	12,271	13,192	46,000	225,643
T11	160,000	184,946	83,555	12,215	12,850	46,000	224,500
T12	161,036	180,040	81,242	12,537	12,850	46,000	230,310
T13	167,209	182,917	78,890	14,789	12,850	46,000	221,361
T14	169,199	183,266	74,164	14,387	12,850	46,000	224,149
T15	168,864	175,030	75,812	11,636	12,850	46,000	233,825
T16	168,329	171,623	73,001	11,407	12,850	46,000	240,804
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

(2c) Area of Old Forest Area by Grouping of Productive Forest (ha)

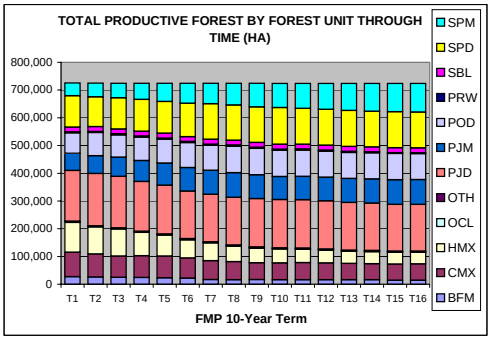
	Lower Old Forest Age (Years): 80	100	100	100	90	100	160	110-120	140
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo	PRW
T1	3,707	1,851	8,811	17,199	1,252	23,309	2,007	10,207	457
T2	4,510	1,920	10,034	17,330	1,575	43,168	3,780	11,692	798
T3	6,520	1,883	13,461	15,426	1,700	42,356	5,098	10,769	914
T4	6,922	1,638	18,709	12,850	1,658	35,635	5,945	15,461	1,208
T5	6,342	1,559	23,435	20,158	1,536	32,782	6,495	20,531	1,167
T6	6,000	1,508	24,912	17,536	1,480	27,166	6,499	30,000	1,429
T7	9,316	1,458	24,255	11,302	1,433	21,000	4,785	35,348	1,544
T8	9,586	1,442	21,000	8,387	1,315	31,266	3,691	30,000	1,474
T9	9,891	1,400	21,165	9,798	1,144	45,746	3,400	32,879	1,475
T10	9,759	1,437	22,044	8,127	1,094	42,020	3,563	37,004	1,406
T11	10,076	1,401	21,126	8,000	1,016	31,514	3,400	48,319	1,293
T12	9,305	1,407	21,000	9,411	1,000	35,513	3,805	56,636	1,197
T13	6,000	1,413	21,000	8,919	1,003	33,896	4,103	65,723	1,093
T14	6,000	1,552	21,000	9,984	1,000	36,760	4,389	69,472	1,086
T15	8,796	1,577	21,000	11,224	1,000	36,213	4,359	75,174	1,036
T16	9,249	1,577	21,000	10,057	1,000	41,660	4,310	80,595	1,005
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427	inf
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840	457

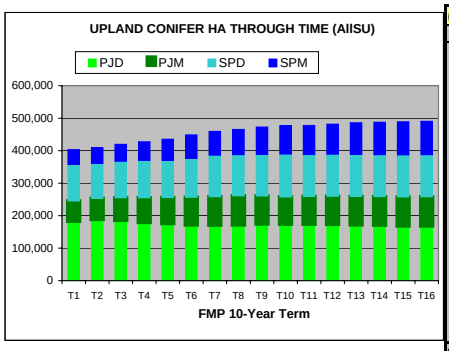
(2b partial) Productive Forest Area Through Time Data (hectares): **(2d)** **(2e) Upland Conifer**

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
T1	725,394	27,150	88,492	107,239	2,217	1,995	182,832	61,845	73,977	3,312	17,611	112,785	45,937	403,400
T2	724,882	26,058	83,180	97,221	2,217	1,995	188,663	64,074	83,441	3,485	17,608	107,747	49,195	409,679
T3	724,410	25,000	76,472	97,579	2,217	1,995	185,717	69,107	80,285	3,686	17,600	112,240	52,513	419,577
T4	724,410	24,077	78,554	84,205	2,206	1,995	179,496	75,208	84,235	3,843	17,610	114,940	58,041	427,685
T5	724,410	23,230	78,329	75,396	2,205	1,995	175,679	79,554	86,449	3,927	17,612	114,216	65,818	435,268
T6	724,410	21,660	72,678	65,647	2,205	1,995	171,388	84,761	89,850	4,159	17,612	120,179	72,277	448,605
T7	724,385	16,941	67,761	64,139	2,205	1,995	171,097	86,323	89,921	4,312	17,612	128,254	73,826	459,500
T8	724,262	16,079	65,164	56,155	2,205	1,995	171,455	88,943	95,272	4,296	17,612	126,617	78,470	465,485
T9	724,198	16,488	60,762	52,757	2,205	1,995	174,247	85,935	95,056	4,245	17,612	127,889	85,008	473,079
T10	724,144	16,291	60,522	50,089	2,205	1,995	174,089	83,082	94,411	4,210	17,612	132,201	87,437	476,810
T11	724,066	16,161	61,802	48,119	2,205	1,995	174,056	84,551	94,282	4,090	17,612	128,938	90,255	477,801
T12	724,015	15,960	60,906	45,762	2,205	1,995	173,563	85,385	93,761	4,016	17,612	129,523	93,328	481,799
T13	724,015	16,161	58,837	43,532	2,205	1,995	171,749	86,671	93,827	3,788	17,612	129,888	97,751	486,059
T14	724,015	15,899	57,910	43,532	2,205	1,995	170,786	87,291	93,872	3,520	17,612	129,004	100,390	487,471
T15	724,015	14,364	58,407	42,433	2,205	1,995	168,497	88,555	94,496	3,405	17,612	129,762	102,285	489,099
T16	724,015	14,338	58,810	42,000	2,205	1,995	168,318	89,492	93,331	3,312	17,612	129,311	103,292	490,413
OLT Max.		19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175	497,902
OLT Min.		10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174	457,260

(5a)

Available Forest: Term	
T1	572,035
T2	571,523
T3	571,052
T4	571,052
T5	571,052
T6	571,052
T7	571,027
T8	570,904
T9	570,839
T10	570,785
T11	570,708
T12	570,656
T13	570,656
T14	570,656
T15	570,656
T16	570,656





(3f)

(3a) Caribou Habitat Through Time: Term	Cr	Cwu	Cwp	% Con in CarSUs
T1	103,969	45,055	20,581	89%
T2	97,903	42,818	16,811	90%
T3	116,219	81,082	15,821	90%
T4	131,841	91,157	20,436	90%
T5	140,495	103,227	53,668	91%
T6	154,692	118,365	60,582	91%
T7	156,356	119,113	57,634	91%
T8	153,652	112,703	55,298	92%
T9	151,954	108,319	53,761	92%
T10	150,000	105,204	50,156	93%
T11	150,000	100,615	43,555	94%
T12	150,000	108,006	42,415	94%
T13	153,694	117,186	40,000	95%
T14	150,000	115,955	42,022	95%
T15	152,209	125,157	40,330	95%
T16	155,804	130,415	40,064	95%
OLT Max.	161,804	47,453	68,169	maint or
OLT Min.	147,605	26,809	36,912	increase.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 27a_OLTMS **Input File:** 27a_OLTMS.inp **Date:** Sept. 25, 2010.

HARVEST AREA and VOLUME RESULTS:

Implications on Wood Supply - SPF varies 280 (T1) to 408 (T6). PO T1 200,T2 150, then 90 T3-6 as per targets.
TOTAL steady at 520 Mm3per year all terms (521 T1).
Looks to be operationally implementable. Includes minor SBL and PRW AHA area. Drop in harvest of HMX T2, but PO harvested from POD.

Available Harvest Area by Term Data (hectares harvested annually)

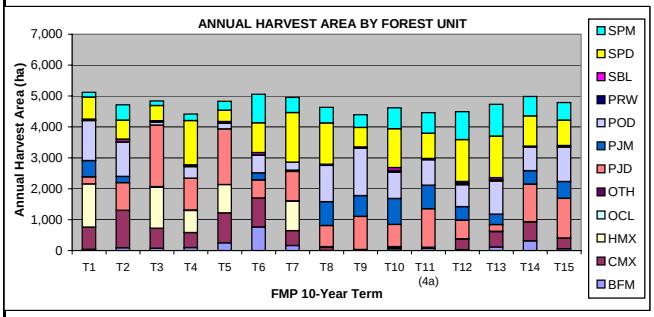
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	5,120	35	722	1,399	0	0	224	531	1,292	10	36	713	157
T2	4,717	88	1,213	0	0	0	892	202	1,111	18	80	617	495
T3	4,842	71	647	1,328	20	0	1,994	0	94	0	46	492	151
T4	4,414	93	485	717	4	10	1,032	1	373	40	17	1,430	213
T5	4,828	246	972	914	0	2	1,798	0	183	7	48	367	290
T6	5,058	762	937	0	0	0	582	232	574	4	77	964	926
T7	4,957	161	480	953	0	10	957	37	259	4	0	1,602	495
T8	4,636	0	107	0	0	19	684	767	1,177	1	38	1,332	512
T9	4,394	20	10	0	0	1	1,070	675	1,532	3	37	634	412
T10	4,617	55	60	0	0	9	719	841	845	58	97	1,258	675
T11 (4a)	4,465	69	34	0	0	3	1,248	756	826	17	26	817	669
T12	4,494	26	349	0	0	1	607	433	712	54	48	1,358	906
T13	4,730	116	495	0	0	9	216	340	1,073	38	70	1,344	1,028
T14	4,984	312	614	0	0	3	1,218	438	765	14	10	981	628
T15	4,791	58	343	0	0	2	1,284	545	1,118	7	40	825	570

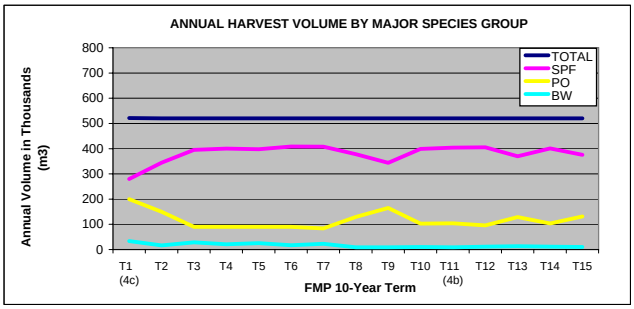
Annual Harvest Volumes by Major Species Groups (1,000s net merchantable cubic metres)

Term	TOTAL	SPF	PO	BW	PRW
T1 (4c)	521.3	279.6	200.0	33.5	1.1
T2	520.0	344.6	150.0	16.8	1.9
T3	520.0	395.2	90.0	28.4	0.0
T4	520.0	400.0	90.0	20.9	4.4
T5	520.0	397.6	90.0	25.2	0.7
T6	520.0	408.3	90.0	17.1	0.3
T7	520.0	407.7	84.0	23.1	0.5
T8	520.0	378.0	129.7	8.8	0.1
T9	520.0	343.6	164.9	9.2	0.3
T10	520.0	398.9	102.8	9.8	5.7
T11 (4b)	520.0	404.2	103.8	8.9	1.7
T12	520.0	405.6	95.7	11.5	5.0
T13	520.0	370.1	128.5	13.2	4.5
T14	520.0	401.0	103.3	11.5	1.3
T15	520.0	375.5	131.5	9.9	0.6
Average	520.1	380.7	116.9	16.5	1.9

Projected Revenues, Expenditures & Renewal Area

Term	Revenue M$	Expend. M$	Unspent M$	Renewal ha	Exten ha	Basc1 ha	Intn1 ha
T1	1,753	1,674	79	**5,069**	3,166	1,633	270
T2	2,073	2,073	0	**4,670**	2,357	1,912	401
T3	2,291	2,291	0	**4,842**	1,743	2,739	361
T4	2,349	2,349	0	**4,414**	1,317	2,751	346
T5	2,311	2,311	0	**4,828**	1,838	2,598	392
T6	2,350	2,350	0	**5,056**	2,165	2,480	411
T7	2,345	2,194	152	**4,945**	1,960	2,676	309
T8	2,191	2,191	0	**4,630**	1,556	2,746	329
T9	2,028	1,783	245	**4,389**	1,834	2,276	279
T10	2,349	1,619	730	**4,609**	2,418	1,835	357
T11	2,329	1,722	607	**4,460**	1,960	2,215	284
T12	2,375	1,352	1,023	**4,494**	2,651	1,731	112
T13	2,204	729	1,475	**4,730**	3,935	734	61
T14	2,317	1,066	1,252	**4,984**	3,535	1,283	166
T15	2,186	1,086	1,100	**4,791**	3,246	1,417	128

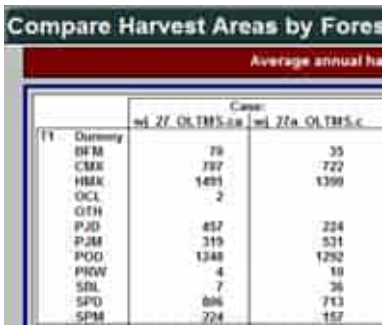




NOTES:

Revision of SBL area does not change projected forest condition or socio-economic results of Run 27 significantly.
Good to allocate and assess spatially.

Addition of lowland OLT SRNV targets causes shift in some projected available harvest areas by forest unit, compared to Run 27:



WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 27a_OLTMS **Input File:** 27a_OLTMS.inp **Date:** Sept. 25, 2010.

Immature Productive Forest

Forest Unit:

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	416,005	18,788	57,264	51,502	187	162	133,098	29,828	26,318	635	6,945	67,009	24,269
T2	406,939	16,916	47,967	36,466	243	192	137,542	35,284	43,775	936	7,506	54,841	25,272
T3	451,855	16,074	46,298	36,860	308	232	148,312	44,062	56,248	1,256	8,475	61,053	32,679
T4	476,489	13,889	46,624	35,281	558	287	153,482	49,769	64,997	1,474	9,232	64,308	36,588
T5	459,994	4,522	43,008	30,494	611	413	129,049	54,741	71,992	2,024	8,817	72,014	42,310
T6	433,402	2,080	36,310	30,538	657	423	107,982	57,261	78,472	2,386	8,286	63,640	45,367
T7	423,638	4,372	30,119	31,829	616	474	110,119	57,587	77,752	2,606	6,547	59,277	42,340
T8	430,864	4,674	32,000	32,233	656	564	118,955	61,443	68,264	2,472	6,311	58,403	44,890
T9	436,877	4,278	30,750	29,035	649	745	121,747	58,435	69,140	2,496	6,317	64,425	48,859
T10	427,037	4,020	28,717	24,546	643	745	121,589	55,582	75,204	2,298	5,981	62,794	44,919
T11	428,502	3,946	28,337	22,487	488	745	121,556	57,051	75,164	2,472	6,478	62,526	47,251
T12	422,318	3,423	28,681	19,553	461	745	121,063	57,885	75,219	2,451	6,506	57,157	49,174
T13	429,016	1,372	29,341	17,544	461	745	119,249	59,171	75,065	2,280	6,506	60,328	56,955
T14	426,629	1,512	30,606	16,062	461	745	118,286	59,791	76,592	2,171	6,506	54,945	58,952
T15	419,705	2,729	32,655	18,854	461	612	115,997	61,055	73,458	2,053	6,506	45,099	60,228
T16	412,954	2,931	34,528	20,091	461	609	115,818	61,992	70,626	1,992	6,506	35,346	62,056
	Max OLT	3,260	31,472	42,688	1,328	1,063	292,834	96,487	30,987	115,789	10,363	18,903	44,874
	Min OLT	1,948	11,696	21,591	465	448	106,124	36,541	12,670	45,886	3,667	6,479	17,441

Mature+ Productive Forest

Forest Unit:

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	309,388	8,361	31,228	55,738	2,029	1,833	49,734	32,018	47,659	2,677	10,666	45,776	21,669
T2	317,942	9,142	35,212	60,756	1,974	1,803	51,121	28,790	39,666	2,549	10,102	52,906	23,923
T3	272,555	8,926	30,174	60,720	1,909	1,763	37,405	25,046	24,037	2,430	9,125	51,187	19,834
T4	247,921	10,188	31,930	48,924	1,649	1,707	26,014	25,439	19,238	2,369	8,378	50,632	21,452
T5	264,416	18,708	35,321	44,902	1,594	1,581	46,630	24,814	14,457	1,903	8,794	42,203	23,508
T6	291,008	19,579	36,369	35,109	1,548	1,572	63,406	27,500	11,378	1,772	9,326	56,538	26,909
T7	300,747	12,569	37,642	32,311	1,589	1,520	60,978	28,735	12,169	1,706	11,064	68,977	31,486
T8	293,398	11,405	33,164	23,922	1,549	1,431	52,500	27,500	27,008	1,824	11,301	68,214	33,580
T9	287,321	12,209	30,012	23,722	1,555	1,250	52,500	27,500	25,916	1,749	11,295	63,464	36,149
T10	297,106	12,271	31,805	25,543	1,562	1,250	52,500	27,500	19,207	1,913	11,630	69,407	42,519
T11	295,565	12,215	33,465	25,633	1,716	1,250	52,500	27,500	19,117	1,617	11,134	66,413	43,005
T12	301,697	12,537	32,225	26,209	1,744	1,250	52,500	27,500	18,541	1,566	11,106	72,365	44,154
T13	294,999	14,789	29,496	25,988	1,744	1,250	52,500	27,500	18,762	1,508	11,106	69,560	40,796
T14	297,386	14,387	27,304	27,470	1,744	1,250	52,500	27,500	17,280	1,349	11,106	74,059	41,438
T15	304,310	11,636	25,752	23,579	1,744	1,383	52,500	27,500	21,038	1,352	11,106	84,664	42,057
T16	311,061	11,407	24,281	21,909	1,744	1,386	52,500	27,500	22,705	1,321	11,106	93,965	41,236
	Max OLT	15,933	42,682	39,118	2,219	1,962	99,173	46,652	27,723	1,131	15,367	58,117	40,301
	Min OLT	8,361	24,197	19,993	1,499	1,240	52,493	27,435	12,933	452	10,078	34,643	21,733
Mature Onset Age:		60	70	60	70	60	70	70	60	80	70	70	70

Available Harvest Area by Forest Unit and Age Class TERM 1

Forest Unit:

	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
A5													
A15													
A25													
A35													
A45													
A55		5	11			1							
A65	12	26	199			15	2	3				9	
A75	2	19	437			18	15	285			169	18	
A85		20	275			31	59	234			95	18	
A95	4	384	247			65	86	450			122	55	
A105	18	249	226			25	366	320			71	14	
A115		3	2			36	4		4		13	14	
A125			2						6	10	86	4	
A135		15									76	22	
A145						4				26	40	4	
A155						30					41		
A165											0		
A175													
A185													
A195													
A205													
A215													
A225													
A235													
A245													
A255													TOTAL
	35	722	1,399	0	0	224	531	1,292	10	36	713	157	5,120

WHISKEY JACK FOREST 2012 FMP — **SUMMARY of SFMM INVESTIGATION**

Case Name: 27d_OLTMS **Input File:** 27d_OLTMS.inp **Date:** Dec. 16, 2010.

Purpose: Run 27a with initial land base adjustment for additional operational reserves and deferrals.

Specific Inputs: Run 27a with adjusted available, reserve and deferrals as per BMIv11 Dec. 11, 2010. Volume targets adjusted to include SPF and PO targets. OLT targets similar to Run 27a with minor reduction of MLI, BFo and PJo (still within SRNV box).

Group:	
PWR	
SPF	
PO	
BW	
Total	

RESULTS: Where projections in the following tables fall below the min. target, the data is shaded yellow; where projections exceed max. targets, the data is shaded green.

FOREST CONDITION RESULTS Where projections do not relate to OLT projections, font is coloured red and results are not expected to correlate to OLT SRNV.

Implications on Forest Condition -

Good projections for forest composition and age due to targets included in the modelling.

(2a) Productive Area by Landscape Class (ha)

Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional: Balsam	Lowland	Hardwood	Conifer
T1	201,015	152,743	62,934	8,361	12,695	104,760	182,885
T2	171,969	189,752	49,376	8,119	12,135	104,326	189,168
T3	138,737	241,002	71,996	7,427	11,865	81,752	171,623
T4	146,918	242,746	85,555	9,531	10,701	65,542	163,411
T5	149,715	216,333	89,065	19,031	9,608	60,325	180,326
T6	160,000	174,648	92,415	18,367	10,306	46,191	222,475
T7	160,000	154,174	95,307	13,704	12,653	43,100	245,438
T8	160,000	167,839	84,745	12,869	12,850	49,794	236,161
T9	160,484	174,591	77,674	13,725	12,850	54,135	230,730
T10	160,000	172,977	75,700	13,855	12,884	51,090	237,633
T11	160,000	177,997	77,266	13,212	12,850	49,208	233,558
T12	160,000	177,323	73,300	14,617	12,850	48,631	237,310
T13	160,000	180,100	71,180	16,350	12,948	47,318	236,136
T14	160,000	181,572	69,777	15,794	12,850	45,228	238,812
T15	160,000	174,065	70,528	14,287	12,850	43,100	249,202
T16	160,000	167,768	69,660	13,731	12,850	43,100	256,923
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

(2c) Area of Old Forest Area by Grouping of Productive Forest (ha)

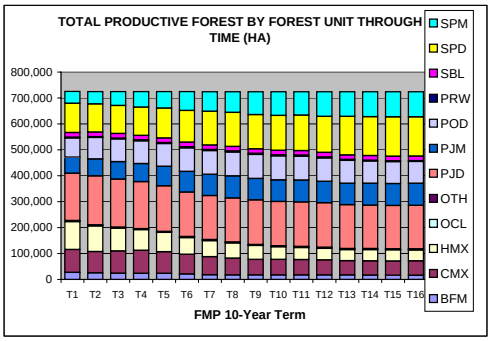
	Lower Old Forest Age (Years): 80	100	100	100	90	100	160	110-120	140
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo	PRW
T1	3,707	1,851	8,730	16,931	1,252	23,267	2,007	10,155	457
T2	3,371	1,920	10,699	18,716	1,575	43,275	3,780	9,032	688
T3	5,091	1,883	15,779	18,952	1,700	42,449	5,459	13,810	808
T4	6,232	1,835	23,526	15,403	1,658	38,602	6,416	19,703	1,123
T5	6,870	1,581	28,705	23,966	1,631	34,808	5,962	25,622	1,373
T6	4,698	1,516	29,306	20,002	1,500	26,997	5,883	33,178	1,600
T7	10,049	1,466	27,528	12,867	1,452	21,000	4,630	41,072	1,654
T8	10,436	1,450	22,721	9,223	1,135	31,626	3,893	34,094	1,582
T9	10,545	1,402	21,962	10,737	1,144	44,420	3,562	39,700	1,579
T10	10,999	1,438	22,518	9,172	1,094	40,879	3,402	45,082	1,506
T11	11,206	1,400	21,000	12,341	1,094	32,809	3,413	58,659	1,387
T12	10,855	1,406	21,570	15,667	1,017	33,812	3,950	68,510	1,287
T13	6,885	1,412	21,000	17,089	1,019	29,179	4,290	78,789	1,174
T14	6,735	1,418	21,000	13,784	1,000	23,000	4,558	79,911	1,162
T15	10,699	1,562	21,000	9,996	1,086	28,120	4,418	86,796	1,102
T16	11,146	1,518	21,000	9,410	1,045	35,290	4,417	93,429	1,067
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427	inf
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840	457

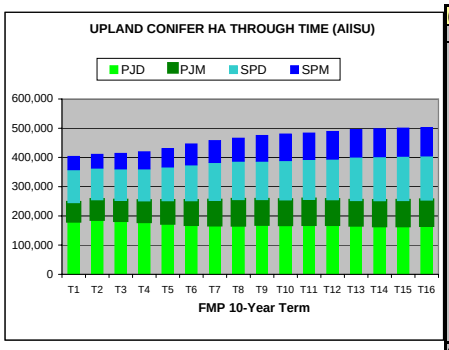
(2b partial) Productive Forest Area Through Time Data (hectares):

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	(2d) PRW	SBL	SPD	SPM	(2e) Upland Conifer
T1	725,394	27,150	88,492	107,239	2,217	1,995	182,832	61,845	73,977	3,312	17,611	112,785	45,937	403,400
T2	724,845	25,386	82,082	98,940	2,217	1,995	188,825	65,504	82,443	3,500	17,608	108,690	47,655	410,674
T3	724,402	23,995	85,690	88,214	2,217	1,995	184,830	67,437	87,357	3,495	17,608	108,183	53,381	413,831
T4	724,402	23,668	88,901	79,157	2,217	1,995	181,147	69,629	87,839	3,576	17,608	109,235	59,431	419,442
T5	724,402	23,519	83,176	74,535	2,206	1,995	175,692	75,470	87,420	3,806	17,619	115,640	63,325	430,127
T6	724,402	21,040	75,658	64,365	2,205	1,995	171,596	79,755	91,086	4,043	17,620	122,579	72,460	446,390
T7	724,375	17,886	69,829	61,551	2,205	1,995	169,902	82,237	91,395	4,126	17,620	130,005	75,625	457,770
T8	724,257	17,101	65,255	58,192	2,205	1,995	169,262	85,635	91,647	4,121	17,620	131,457	79,768	466,121
T9	724,189	17,496	59,915	53,168	2,205	1,995	171,776	83,128	92,501	4,071	17,620	131,715	88,599	475,219
T10	724,139	17,502	59,414	48,795	2,205	1,995	170,647	83,169	92,560	4,048	17,620	134,995	91,189	480,000
T11	724,091	17,056	59,516	46,480	2,205	1,995	171,417	84,655	92,120	3,923	17,620	136,698	90,406	483,176
T12	724,032	17,166	57,895	44,796	2,205	1,995	171,351	83,284	89,761	3,848	17,620	139,005	95,105	488,745
T13	724,032	17,308	55,051	42,736	2,205	1,995	169,102	82,638	87,961	3,765	17,620	148,726	94,925	495,391
T14	724,032	16,875	54,572	43,614	2,205	1,995	167,005	84,508	85,764	3,438	17,620	150,165	96,272	497,951
T15	724,032	16,079	54,778	43,057	2,205	1,995	166,910	84,722	84,569	3,395	17,620	151,573	97,129	500,334
T16	724,032	15,888	55,613	42,000	2,202	1,995	167,952	85,433	83,637	3,312	17,623	151,340	97,039	501,764
OLT Max.		19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175	497,902
OLT Min.		10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174	457,260

(5a) Available Forest:

Term	
T1	538,619
T2	538,070
T3	537,627
T4	537,627
T5	537,627
T6	537,627
T7	537,600
T8	537,482
T9	537,414
T10	537,364
T11	537,316
T12	537,257
T13	537,257
T14	537,257
T15	537,257
T16	537,257





(3a) Caribou Habitat Through Time:

Term	Cr	Cwu	Cwp	(3f) % Con in CarSUs
T1	103,969	45,055	20,581	86%
T2	100,503	45,782	17,975	86%
T3	118,856	83,974	16,824	86%
T4	134,757	94,007	21,230	87%
T5	143,406	106,123	54,271	87%
T6	154,830	119,609	60,933	88%
T7	156,352	120,501	57,788	88%
T8	153,900	113,803	54,020	89%
T9	151,766	109,010	52,131	89%
T10	150,000	105,966	48,294	90%
T11	150,000	104,075	44,972	91%
T12	150,000	109,674	42,243	91%
T13	154,070	118,882	40,000	92%
T14	150,000	116,052	40,619	92%
T15	152,438	122,894	40,000	92%
T16	156,614	128,719	40,000	92%
OLT Max.	161,804	47,453	68,169	maint or
OLT Min.	147,605	26,809	36,912	increase.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 27d_OLTMS **Input File:** 27d_OLTMS.inp **Date:** Dec. 16, 2010.

HARVEST AREA and VOLUME RESULTS:

Implications on Wood Supply - Projected SPF more even in this scenario (due to binding targets, regional request), though TOTAL varies more through time.
Poplar volume reduced slightly in T1-2 as compared to previous runs, but still within acceptable range.
Added reserves and deferrals resulted in harvest areas that are able to be operationally allocated.

Available Harvest Area by Term Data (hectares harvested annually)

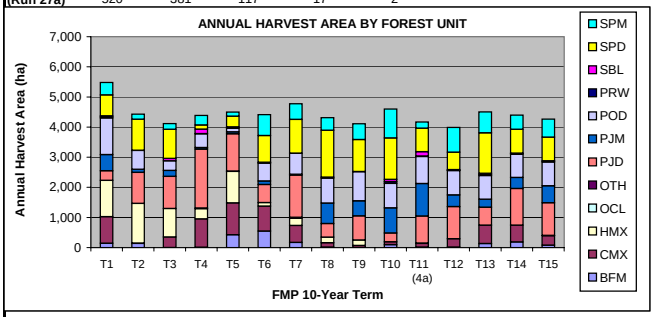
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	5,483	141	885	1,206	0	0	315	537	1,221	36	30	693	419
T2	4,431	141	9	1,314	0	0	1,034	100	628	6	0	1,027	174
T3	4,117	0	348	949	0	0	1,066	199	319	0	80	965	191
T4	4,388	9	942	342	21	0	1,951	57	455	6	147	135	323
T5	4,498	426	1,057	1,044	1	10	1,239	64	129	7	27	355	139
T6	4,415	544	834	116	0	0	596	119	593	8	20	886	698
T7	4,775	168	566	238	0	30	1,404	29	696	4	0	1,118	522
T8	4,311	14	145	184	1	1	453	680	824	0	33	1,559	416
T9	4,111	0	70	177	0	1	803	500	964	1	6	1,063	526
T10	4,601	94	95	0	0	1	292	835	809	59	76	1,377	961
T11 (4a)	4,168	14	126	0	0	9	899	1,076	896	18	143	778	208
T12	3,991	14	279	0	0	1	1,063	388	809	13	22	576	826
T13	4,505	132	609	0	0	4	593	264	787	41	35	1,342	698
T14	4,399	189	556	0	0	0	1,214	365	774	24	10	792	475
T15	4,264	80	315	0	5	5	1,081	564	790	6	31	789	599

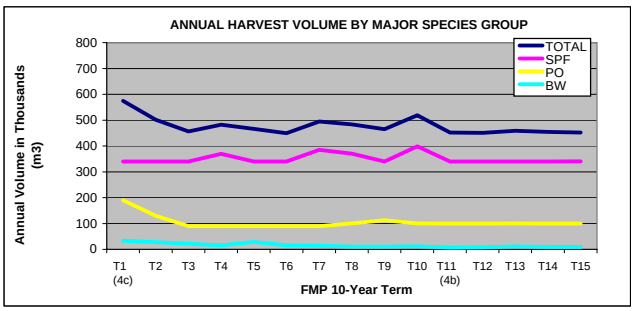
Annual Harvest Volumes by Major Species Groups (1,000s net merchantable cubic metres)

Term	TOTAL	SPF	PO	BW	PRW
T1 (4c)	574.6	340.0	190.0	33.6	3.8
T2	501.6	340.0	130.0	27.8	0.6
T3	456.2	340.0	90.0	21.8	0.0
T4	482.5	369.9	90.0	15.4	0.6
T5	466.5	340.0	90.0	28.4	0.7
T6	449.4	340.0	90.0	15.2	0.8
T7	494.5	385.1	90.0	13.6	0.5
T8	483.3	370.4	100.0	10.7	0.0
T9	464.7	340.0	112.6	10.4	0.1
T10	518.8	399.0	100.0	11.5	6.2
T11 (4b)	451.9	340.0	100.0	7.0	1.5
T12	450.9	340.0	100.0	8.0	1.2
T13	459.1	340.0	100.0	11.0	4.9
T14	454.3	340.0	100.0	9.5	2.1
T15	452.2	340.3	100.0	9.1	0.5
Average	477.4	351.0	105.5	15.5	1.6
(Run 27a)	520	381	117	17	2

Projected Revenues, Expenditures & Renewal Area

Term	Revenue M$	Expend. M$	Unspent M$	Renewal ha	Exten ha	Basc1 ha	Intn1 ha
T1	2,110	1,996	113	**5,429**	3,126	1,971	331
T2	2,004	1,787	217	**4,387**	1,986	2,167	233
T3	1,972	1,965	7	**4,117**	1,470	2,352	294
T4	2,153	2,153	0	**4,388**	1,538	2,468	382
T5	1,999	1,999	**0**	**4,498**	1,990	2,250	258
T6	1,973	1,973	0	**4,412**	1,857	2,337	218
T7	2,217	2,217	0	**4,763**	1,708	2,709	347
T8	2,128	2,128	0	**4,304**	1,358	2,636	310
T9	1,967	1,967	0	**4,106**	1,357	2,451	299
T10	2,354	2,354	**0**	**4,596**	1,351	2,891	355
T11	1,979	1,843	136	**4,162**	1,465	2,399	298
T12	1,969	1,851	119	**3,991**	1,305	2,481	205
T13	2,019	1,112	908	**4,505**	3,052	1,368	86
T14	1,986	1,017	969	**4,399**	2,988	1,249	161
T15	1,966	964	1,003	**4,264**	2,890	1,265	109





NOTES:
Chosen by Planning Team as revised LTMD.

Investigate impact of 10% intensive treatment biological limit for PJD, PJM, SPD, SPM (see Run 27e_INTEN).
Run 27d_OLTMS has unspent funding in T1-2 therefore increased intensive renewal can be planned during plan implementation, IF APPROPRIATE SITES can be found.
Precautionary principle applied in 27d to not over estimate success by intensity where SEM data does not support the assumptions on WJF sites.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 27d_OLTMS **Input File:** 27d_OLTMS.inp **Date:** Dec. 16, 2010.

Immature Productive Forest

Forest Unit:

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	416,693	18,788	57,387	51,632	187	162	133,098	29,870	26,658	635	6,945	67,038	24,292
T2	411,097	17,267	48,579	36,443	243	192	138,579	36,813	42,418	1,207	7,447	55,619	26,291
T3	451,735	16,568	45,195	38,054	308	232	149,888	41,223	57,528	1,193	7,652	61,424	32,471
T4	475,218	14,137	44,672	36,870	371	287	151,681	45,986	66,291	1,330	8,753	67,407	37,432
T5	455,113	4,488	41,760	31,265	590	318	132,221	52,186	72,041	1,690	9,628	68,780	40,146
T6	427,063	2,674	35,303	31,896	649	402	106,784	54,776	78,957	2,075	8,870	60,495	44,183
T7	409,481	4,181	28,810	32,741	608	455	108,167	53,968	78,644	2,296	6,564	53,196	39,849
T8	412,583	4,232	30,350	31,257	649	745	116,762	58,135	70,038	2,185	6,326	50,567	41,338
T9	412,750	3,771	28,955	26,444	648	745	119,276	55,628	66,339	2,219	6,327	56,983	45,414
T10	408,677	3,647	28,531	23,608	641	745	118,147	55,669	67,907	1,800	6,300	58,458	43,225
T11	415,263	3,844	27,966	21,905	637	745	118,917	57,155	68,737	2,214	6,338	62,178	44,628
T12	410,623	2,549	26,915	17,947	478	745	118,851	55,784	69,229	2,191	6,497	63,060	46,378
T13	411,280	958	25,890	15,259	468	745	116,602	55,138	69,370	2,171	6,409	68,198	50,072
T14	411,348	1,081	27,741	17,056	468	527	114,505	57,008	68,562	1,985	6,507	66,128	49,781
T15	404,594	1,792	29,265	18,754	468	511	114,410	57,222	67,255	1,960	6,507	56,251	50,198
T16	397,428	2,157	30,954	19,124	513	549	115,452	57,933	64,858	1,893	6,462	45,515	52,019
	Max OLT	3,260	31,472	42,688	1,328	1,063	292,834	96,487	30,987	115,789	10,363	18,903	44,874
	Min OLT	1,948	11,696	21,591	465	448	106,124	36,541	12,670	45,886	3,667	6,479	17,441

Mature+ Productive Forest

Forest Unit:

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	308,701	8,361	31,106	55,608	2,029	1,833	49,734	31,975	47,319	2,677	10,666	45,748	21,645
T2	313,748	8,119	33,502	62,497	1,974	1,803	50,246	28,691	40,026	2,293	10,161	53,072	21,364
T3	272,667	7,427	40,495	50,160	1,909	1,763	34,942	26,214	29,829	2,302	9,957	46,759	20,910
T4	249,184	9,531	44,229	42,287	1,846	1,707	29,465	23,644	21,547	2,246	8,855	41,828	21,999
T5	269,290	19,031	41,416	43,270	1,616	1,676	43,471	23,284	15,379	2,116	7,991	46,860	23,179
T6	297,339	18,367	40,355	32,470	1,557	1,592	64,812	24,979	12,129	1,968	8,750	62,085	28,277
T7	314,895	13,704	41,019	28,809	1,597	1,540	61,735	28,270	12,751	1,830	11,056	76,809	35,776
T8	311,673	12,869	34,905	26,935	1,557	1,250	52,500	27,500	21,609	1,935	11,293	80,890	38,430
T9	311,439	13,725	30,960	26,723	1,557	1,250	52,500	27,500	26,162	1,852	11,293	74,733	43,185
T10	315,462	13,855	30,883	25,187	1,564	1,250	52,500	27,500	24,653	2,248	11,320	76,537	47,964
T11	308,828	13,212	31,550	24,575	1,568	1,250	52,500	27,500	23,383	1,709	11,282	74,520	45,778
T12	313,409	14,617	30,980	26,849	1,727	1,250	52,500	27,500	20,532	1,658	11,123	75,945	48,727
T13	312,753	16,350	29,161	27,477	1,737	1,250	52,500	27,500	18,591	1,594	11,211	80,528	44,854
T14	312,684	15,794	26,831	26,558	1,737	1,468	52,500	27,500	17,202	1,453	11,113	84,037	46,491
T15	319,439	14,287	25,513	24,303	1,737	1,484	52,500	27,500	17,314	1,435	11,113	95,322	46,932
T16	326,604	13,731	24,659	22,876	1,689	1,446	52,500	27,500	18,778	1,419	11,161	105,825	45,020
	Max OLT	15,933	42,682	39,118	2,219	1,962	99,173	46,652	27,723	1,131	15,367	58,117	40,301
	Min OLT	8,361	24,197	19,993	1,499	1,240	52,493	27,435	12,933	452	10,078	34,643	21,733
Mature Onset Age:		60	70	60	70	60	70	70	60	80	70	70	70

Available Harvest Area by Forest Unit and Age Class TERM 1

	Forest Unit: BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
A5													
A15													
A25													
A35													
A45													
A55		4	10			1		0					
A65	0	16	208			9		1				7	
A75	2	16	389			17	11	346			148	10	
A85		278	224			24	191	187			76	9	
A95	88	291	163			40	108	307	14	7	89	24	
A105	51	205	163			224	224	243	3		165	162	
A115		75	49			1	3	136	2	6	91	158	
A125									7	8	70	26	
A135									11	10	52	20	
A145											1	3	
A155											1		
A165													
A175													
A185													
A195													
A205													
A215													
A225													
A235													
A245													
A255													TOTAL
	141	885	1,206	0	0	315	537	1,221	36	30	693	419	5,483

WHISKEY JACK FOREST 2012 FMP — **SUMMARY of SFMM INVESTIGATION**

Case Name: 27e_INTEN — **Input File:** 27e_INTEN.inp — **Date:** Jan. 4, 2011.

Purpose: Run 27d with increased biological limit for Pj, Sb intensive renewal.

Specific Inputs: Run 27d with maximum intensive renewal for PJD, PJM, SPD and SPM at 75%.
No other changes to inputs including no change to PRFS transitions or costs or resulting volume yields.

Group:	
PWR	
SPF	
PO	
BW	
Total	

75% suggested by region to show if a significant difference in biological limits would change the solution (comparative run).
It is expected that the successful regeneration of 75% of PJ or SP to intensive density regulated status would be significantly more expensive than is already included in the modelling and that the forest unit transitions and balance of Basic vs Intensive treatments would have to be adjusted (to not over estimate suitable sites or success).

RESULTS: Where projections in the following tables fall below the min. target, the data is shaded yellow; where projections exceed max. targets, the data is shaded green.

FOREST CONDITION RESULTS Where projections do not relate to OLT projections, font is coloured red and results are not expected to correlate to OLT SRNV.

Implications on Forest Condition -

Similar OLT forest composition achievement as same targets were incorporated.
SPD overachieves at a slightly higher level than 27d with increased intensive renewal allowed.

(2a) Productive Area by Landscape Class (ha)

Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional: Balsam	Lowland	Hardwood	Conifer
T1	201,015	152,743	62,934	8,361	12,695	104,760	182,885
T2	171,831	189,752	49,376	8,119	12,100	104,284	189,384
T3	138,751	241,170	72,034	7,427	11,832	81,750	171,439
T4	147,518	237,748	85,562	9,531	10,489	65,494	168,060
T5	149,918	216,131	89,127	19,031	9,502	60,303	180,390
T6	160,000	174,707	92,434	17,651	10,248	46,165	223,196
T7	160,000	154,805	94,689	13,704	12,653	43,100	245,424
T8	160,917	167,892	84,048	12,869	12,850	49,692	235,984
T9	160,572	174,383	77,734	13,554	12,850	53,649	231,444
T10	160,000	172,204	76,117	13,685	12,850	49,474	239,802
T11	160,000	179,314	79,077	13,278	12,850	47,694	231,865
T12	160,000	178,164	75,743	14,719	12,850	46,613	235,940
T13	160,000	179,479	73,744	16,325	13,049	44,743	236,689
T14	160,000	180,454	71,745	15,614	12,850	44,125	239,241
T15	160,000	173,467	71,057	14,142	12,850	43,100	249,412
T16	160,000	166,793	70,913	13,781	12,850	43,100	256,591
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

(2c) Area of Old Forest Area by Grouping of Productive Forest (ha)

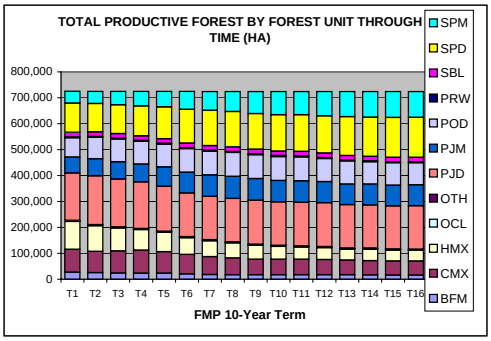
	Lower Old Forest Age (Years): 80	100	100	100	90	100	160	110-120	140
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo	PRW
T1	3,707	1,851	8,730	16,931	1,252	23,267	2,007	10,155	457
T2	3,371	1,920	10,699	18,716	1,575	43,801	3,780	9,032	688
T3	5,091	1,883	15,779	18,952	1,700	42,449	5,432	13,810	808
T4	6,232	1,656	23,526	15,403	1,658	38,602	6,390	19,703	1,123
T5	6,870	1,572	28,705	23,966	1,631	34,808	5,865	25,622	1,373
T6	3,982	1,508	29,306	20,002	1,500	26,997	5,833	33,178	1,600
T7	10,049	1,458	27,528	12,867	1,452	21,000	4,638	41,072	1,654
T8	10,436	1,442	23,052	9,197	1,135	31,724	3,886	35,033	1,582
T9	10,551	1,400	22,629	10,872	1,144	45,195	3,587	40,310	1,579
T10	10,824	1,437	23,139	8,995	1,094	40,959	3,416	45,671	1,506
T11	11,198	1,400	21,299	12,309	1,094	32,579	3,406	57,783	1,387
T12	10,805	1,400	21,684	13,502	1,017	33,851	3,944	67,590	1,287
T13	6,904	1,406	21,000	15,756	1,019	30,183	4,283	77,912	1,174
T14	6,729	1,498	21,000	13,178	1,000	26,672	4,552	79,058	1,162
T15	10,713	1,527	21,000	10,123	1,084	28,459	4,412	85,956	1,102
T16	11,181	1,537	21,000	9,263	1,045	36,439	4,386	92,662	1,067
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427	inf
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840	457

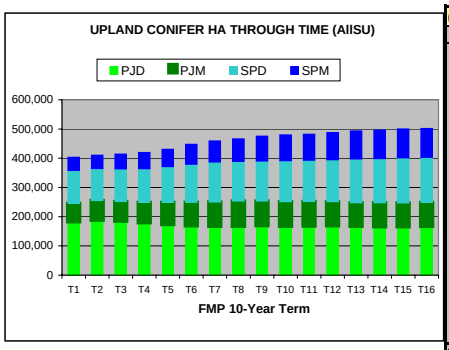
(2b partial) Productive Forest Area Through Time Data (hectares): — **(2d)** — **(2e) Upland Conifer**

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	(2e) Upland Conifer
T1	725,394	27,150	88,492	107,239	2,217	1,995	182,832	61,845	73,977	3,312	17,611	112,785	45,937	403,400
T2	724,847	25,386	81,921	98,913	2,217	1,995	188,532	65,954	82,468	3,500	17,608	109,294	47,060	410,839
T3	724,402	23,995	85,271	88,220	2,217	1,995	184,851	66,640	87,357	3,500	17,608	111,258	51,489	414,239
T4	724,402	23,673	88,442	79,159	2,207	1,995	179,760	68,936	87,853	3,542	17,617	115,051	56,164	419,912
T5	724,402	23,524	82,704	74,518	2,205	1,995	173,637	74,715	87,437	3,772	17,619	122,503	59,774	430,628
T6	724,402	20,474	75,420	63,870	2,205	1,995	168,895	79,861	90,916	4,001	17,620	130,070	69,076	447,901
T7	724,375	17,793	69,407	61,054	2,205	1,995	167,306	82,562	91,205	4,030	17,620	136,673	72,527	459,067
T8	724,253	17,036	65,001	58,037	2,205	1,995	167,629	85,305	91,738	3,947	17,620	136,629	77,110	466,674
T9	724,186	17,327	59,983	53,839	2,205	1,995	169,842	83,294	91,822	3,897	17,620	136,854	85,509	475,498
T10	724,132	17,381	59,521	49,585	2,205	1,995	167,630	82,834	91,990	3,836	17,620	140,238	89,298	480,000
T11	724,078	17,168	59,876	47,246	2,205	1,995	168,259	83,030	91,809	3,721	17,620	141,463	89,685	482,438
T12	724,029	17,291	58,333	45,800	2,204	1,995	169,236	81,484	89,332	3,646	17,620	143,450	93,638	487,807
T13	724,029	17,533	56,526	42,000	2,204	1,995	167,643	79,330	88,778	3,550	17,620	149,824	97,027	493,824
T14	724,029	16,949	54,777	44,207	2,202	1,995	166,053	80,793	86,169	3,396	17,622	151,066	98,798	496,711
T15	724,029	16,141	54,010	42,237	2,202	1,995	166,051	80,211	86,312	3,365	17,622	154,216	99,667	500,145
T16	724,029	16,012	54,054	42,000	2,202	1,995	167,184	80,991	84,935	3,312	17,622	154,463	99,258	501,895
OLT Max.		19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175	497,902
OLT Min.		10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174	457,260

(5a) Available Forest:

Term	
T1	538,619
T2	538,072
T3	537,627
T4	537,627
T5	537,627
T6	537,627
T7	537,600
T8	537,478
T9	537,411
T10	537,357
T11	537,303
T12	537,254
T13	537,254
T14	537,254
T15	537,254
T16	537,254





(3a) Caribou Habitat Through Time:

Term	Cr	Cwu	Cwp	(3f) % Con in CarSUs
T1	103,969	45,055	20,581	86%
T2	100,503	45,754	17,947	86%
T3	118,855	83,947	16,797	86%
T4	134,756	93,981	21,204	87%
T5	143,405	106,097	54,246	87%
T6	154,830	119,609	60,908	88%
T7	156,365	120,500	57,765	88%
T8	153,945	112,750	53,898	89%
T9	151,793	107,954	52,024	89%
T10	150,000	104,591	47,838	90%
T11	150,000	102,309	44,041	91%
T12	150,000	109,197	42,590	91%
T13	153,995	118,654	40,000	92%
T14	150,000	116,280	40,971	92%
T15	152,285	123,478	40,000	92%
T16	156,096	129,102	40,000	92%
OLT Max.	161,804	47,453	68,169	maint or
OLT Min.	147,605	26,809	36,912	increase.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 27e_INTEN **Input File:** 27e_INTEN.inp **Date:** Jan. 4, 2011.

HARVEST AREA and VOLUME RESULTS:

Implications on Wood Supply - Similar results as Run 27d_OLTMS. Same average total harvest volume T1-4 with increased bio limits for intensive.
Marginally more SPF volume in T7-10 with increased intensive renewal treatments (assuming results are achievable).
Intensive treatment approx 300 ha more in T1, and 800 ha more T2-4 with increased biological limits. Avg cost increase of $84,000/yr T1-4.

Available Harvest Area by Term Data (hectares harvested annually)

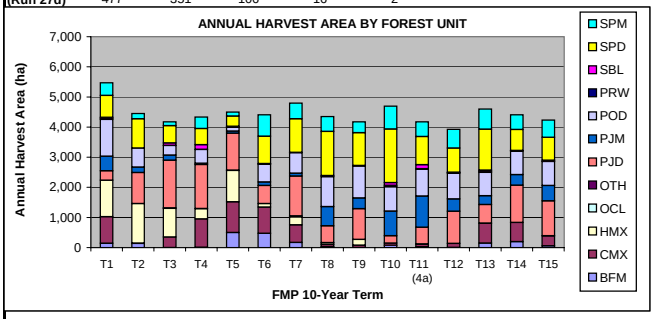
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	5,469	141	885	1,211	0	0	315	482	1,221	36	34	725	419
T2	4,450	141	9	1,309	0	0	1,034	181	628	0	0	974	174
T3	4,174	0	348	951	19	0	1,583	169	321	6	80	569	130
T4	4,334	9	942	342	4	0	1,461	43	453	6	154	539	382
T5	4,500	500	1,018	1,042	1	10	1,229	64	131	7	23	342	132
T6	4,408	474	871	116	0	0	596	119	590	8	14	905	714
T7	4,794	168	587	264	0	30	1,325	94	683	9	0	1,115	518
T8	4,349	32	73	59	0	1	557	636	994	0	36	1,467	493
T9	4,176	2	79	189	0	1	1,021	353	1,066	5	10	1,085	365
T10	4,698	73	77	0	0	1	244	815	809	48	88	1,779	764
T11 (4a)	4,173	26	86	0	1	9	553	1,036	890	19	134	934	486
T12	3,925	6	132	0	0	1	1,063	413	849	28	8	803	621
T13	4,600	149	656	0	4	4	617	292	775	35	37	1,359	672
T14	4,409	194	639	0	0	0	1,235	356	780	10	10	695	490
T15	4,233	60	327	0	0	5	1,162	506	798	5	38	757	576

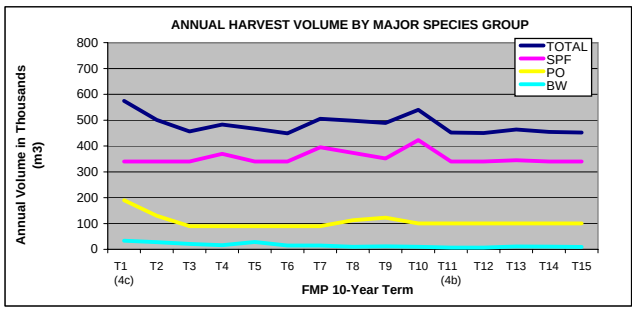
Annual Harvest Volumes by Major Species Groups (1,000s net merchantable cubic metres)

Term	TOTAL	SPF	PO	BW	PRW
T1 (4c)	574.7	340.0	190.0	33.7	3.8
T2	500.9	340.0	130.0	27.6	0.0
T3	456.5	340.0	90.0	21.0	0.6
T4	482.8	369.7	90.0	16.4	0.6
T5	466.8	340.0	90.0	28.7	0.7
T6	449.0	340.0	90.0	15.0	0.8
T7	505.6	394.8	90.0	14.6	0.9
T8	498.0	373.7	112.6	9.8	0.0
T9	489.2	351.9	122.7	11.9	0.7
T10	539.9	423.1	100.0	10.0	4.7
T11 (4b)	451.9	340.0	100.0	7.1	1.6
T12	450.3	340.0	100.0	6.5	2.4
T13	464.0	345.2	100.0	11.4	4.2
T14	454.6	340.0	100.0	10.8	0.8
T15	451.7	340.0	100.0	9.0	0.4
Average	482.4	354.6	107.0	15.6	1.5
(Run 27d)	477	351	106	16	2

Projected Revenues, Expenditures & Renewal Area

Term	Revenue M$	Expend. M$	Unspent M$	Renewal ha	Exten ha	Basc1 ha	Intn1 ha	
T1	2,110	2,110	0	**5,414**	3,159	1,605	650	319
T2	1,997	1,997	0	**4,406**	2,240	1,121	1,045	812
T3	1,981	1,981	0	**4,174**	2,137	858	1,180	885
T4	2,150	2,150	0	**4,334**	2,269	901	1,165	782
T5	1,999	1,999	0	**4,500**	2,235	1,856	409	151
T6	1,972	1,972	0	**4,406**	1,785	2,486	135	- 83
T7	2,276	2,276	0	**4,782**	1,939	1,999	844	497
T8	2,153	2,153	0	**4,342**	1,310	2,768	264	- 46
T9	2,049	2,049	0	**4,170**	1,745	1,323	1,102	803
T10	2,469	2,469	0	**4,692**	2,130	879	1,683	1,328
T11	1,978	1,978	0	**4,168**	1,775	1,390	1,003	704
T12	1,980	1,980	0	**3,925**	1,611	1,202	1,113	909
T13	2,041	1,405	636	**4,600**	2,990	1,054	556	470
T14	1,975	1,503	472	**4,409**	2,806	568	1,035	873
T15	1,963	1,382	581	**4,233**	2,705	656	872	763





NOTES:

Achievement of increased biological limits for same forest unit transitions, treatment costs and projected density-regulated growth and yield not supported by local SEM data.
Run 27d_OLTMS has unspent funding in T1-2 therefore increased intensive renewal can be planned during plan implementation, IF APPROPRIATE SITES are identified.
Precautionary principle was applied in the Base Model to not over estimate success by intensity where SEM data does not support higher assumptions on WJF sites.

Impact of not spending the extra $84,000/year T1-4 is a loss of total harvest volume of 5,000 m3/year for the next 150 years (Run 27d_OLTMS). If intensive treatment will actually result in a density regulated condition, then a slightly lower proportion of large sawlogs will also result if the additional intensive treatments are not conducted (as per 27e_INTEN).
SFMM does not project an increase in PJM and SPM intensive treatments even if biological limits are increased - change occurs in SPD and PJD.

The biological limit proportions of Basic and Intensive renewal treatments must consider that successful intensive results are limited to certain ecosites, species compositions, site classes and site related management conditions. SEM data for the forest also is considered to correlate intensive treatments to actual density regulated successes (as defined in the silvicultural intensity and as considered consistently in the post-renewal forest unit transitions and growth and yield assumptions).

BASIC intensity stands: All areas renewed with seeding or low density plantation/natural regeneration combination resulting in a non-density regulated stand. Tending will occur on some basically treated sites. (Also intensively treated stands that do not achieve well stocked, density-regulated intensive SI results are classified as basic stands.)

INTENSIVE stands: All stands identified as well stocked, density-regulated plantations. These areas include planted areas as well as spaced, seeded areas> Most Intensive stands will have received some tending for forest composition or competition control (and potentially multiple tending treatments).

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 27e_INTEN **Input File:** 27e_INTEN.inp **Date:** Jan. 4, 2011.

Immature Productive Forest

Forest Unit:

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	416,693	18,788	57,387	51,632	187	162	133,098	29,870	26,658	635	6,945	67,038	24,292
T2	410,960	17,267	48,419	36,458	243	192	138,286	36,736	42,442	1,207	7,482	56,533	25,695
T3	451,955	16,568	44,776	38,060	308	232	149,909	40,874	57,531	1,142	7,685	64,292	30,579
T4	470,828	14,143	44,213	36,897	541	287	150,295	45,432	66,329	1,297	8,795	69,124	33,477
T5	455,176	4,493	41,289	31,270	598	318	130,259	51,430	72,057	1,656	9,725	75,581	36,499
T6	427,142	2,823	34,688	31,400	657	402	104,083	54,882	78,814	2,033	8,920	67,799	40,641
T7	409,494	4,089	28,388	32,245	616	455	105,571	54,292	78,454	2,200	6,556	59,877	36,751
T8	412,858	4,167	30,299	31,348	656	745	115,129	57,805	69,984	2,037	6,319	55,726	38,644
T9	412,689	3,773	28,734	26,083	649	745	117,342	55,794	67,180	2,085	6,325	60,492	43,488
T10	408,321	3,696	28,590	23,581	643	745	115,130	55,334	69,771	1,666	6,332	60,819	42,015
T11	418,391	3,891	28,231	22,105	503	745	115,759	55,530	70,507	2,011	6,472	68,729	43,909
T12	413,907	2,572	27,138	18,785	477	745	116,736	53,984	70,984	1,988	6,498	66,589	47,411
T13	413,223	1,208	26,040	15,915	467	745	115,143	51,830	71,369	1,955	6,309	69,731	52,511
T14	412,198	1,335	27,354	17,375	501	527	113,553	53,293	70,344	1,957	6,474	67,686	51,799
T15	404,524	1,998	28,300	18,483	500	512	113,551	52,711	68,448	1,930	6,475	59,649	51,966
T16	397,707	2,231	29,772	20,040	498	549	114,684	53,491	65,241	1,910	6,476	49,491	53,322
	Max OLT	3,260	31,472	42,688	1,328	1,063	292,834	96,487	30,987	115,789	10,363	18,903	44,874
	Min OLT	1,948	11,696	21,591	465	448	106,124	36,541	12,670	45,886	3,667	6,479	17,441

Mature+ Productive Forest

Forest Unit:

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	308,701	8,361	31,106	55,608	2,029	1,833	49,734	31,975	47,319	2,677	10,666	45,748	21,645
T2	313,887	8,119	33,502	62,455	1,974	1,803	50,246	29,217	40,026	2,293	10,127	52,761	21,364
T3	272,447	7,427	40,495	50,160	1,909	1,763	34,942	25,766	29,827	2,358	9,923	46,966	20,910
T4	253,574	9,531	44,229	42,262	1,667	1,707	29,465	23,505	21,524	2,246	8,822	45,927	22,688
T5	269,225	19,031	41,416	43,248	1,607	1,676	43,378	23,284	15,379	2,116	7,894	46,921	23,275
T6	297,260	17,651	40,732	32,470	1,548	1,592	64,812	24,979	12,103	1,968	8,700	62,271	28,435
T7	314,881	13,704	41,019	28,809	1,589	1,540	61,735	28,270	12,751	1,830	11,064	76,795	35,776
T8	311,395	12,869	34,703	26,689	1,549	1,250	52,500	27,500	21,754	1,911	11,301	80,904	38,467
T9	311,497	13,554	31,249	27,757	1,555	1,250	52,500	27,500	24,642	1,812	11,295	76,362	42,021
T10	315,810	13,685	30,931	26,004	1,562	1,250	52,500	27,500	22,220	2,170	11,288	79,419	47,283
T11	305,687	13,278	31,645	25,142	1,702	1,250	52,500	27,500	21,303	1,709	11,148	72,735	45,776
T12	310,122	14,719	31,195	27,015	1,727	1,250	52,500	27,500	18,348	1,658	11,123	76,861	46,226
T13	310,806	16,325	30,486	26,085	1,737	1,250	52,500	27,500	17,409	1,594	11,312	80,092	44,516
T14	311,831	15,614	27,423	26,833	1,701	1,468	52,500	27,500	15,825	1,439	11,149	83,381	46,998
T15	319,504	14,142	25,710	23,754	1,703	1,482	52,500	27,500	17,863	1,435	11,147	94,567	47,700
T16	326,322	13,781	24,282	21,960	1,704	1,446	52,500	27,500	19,695	1,402	11,146	104,971	45,936
	Max OLT	15,933	42,682	39,118	2,219	1,962	99,173	46,652	27,723	1,131	15,367	58,117	40,301
	Min OLT	8,361	24,197	19,993	1,499	1,240	52,493	27,435	12,933	452	10,078	34,643	21,733
Mature Onset Age:		60	70	60	70	60	70	70	60	80	70	70	70

Available Harvest Area by Forest Unit and Age Class TERM 1

	Forest Unit: BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
A5													
A15													
A25													
A35													
A45													
A55		4	10			1		0					
A65	0	16	213			9	0	1				7	
A75	2	16	389		0	17	11	346			148	10	
A85	0	278	224		0	24	191	187	0		76	9	
A95	88	291	163	0	0	40	54	307	14	7	89	24	
A105	51	205	163	0	0	224	224	243	3	0	197	162	
A115	0	75	49	0		1	3	136	2	6	91	158	
A125		0		0		0	0		7	8	70	26	
A135		0		0			0		11	11	52	20	
A145				0		0			0	3	1	3	
A155				0		0	0		0	0	1		
A165				0						0	0		
A175													
A185													
A195									0				
A205													
A215													
A225									0				
A235													
A245													
A255													TOTAL
	141	885	1,211	0	0	315	482	1,221	36	34	725	419	5,469

Appendix 3

Summary of Long-term Management Direction Results

WHISKEY JACK FOREST 2012 FMP — **SUMMARY of SFMM INVESTIGATION**

Case Name: 27d_OLTMS **Input File:** 27d_OLTMS.inp **Date:** Dec. 16, 2010.

Purpose: Run 27a with initial land base adjustment for additional operational reserves and deferrals.

Specific Inputs: Run 27a with adjusted available, reserve and deferrals as per BMIv11 Dec. 11, 2010. Volume targets adjusted to include SPF and PO targets. OLT targets similar to Run 27a with minor reduction of MLI, BFo and PJo (still within SRNV box).

Group:	
PWR	
SPF	
PO	
BW	
Total	

RESULTS: Where projections in the following tables fall below the min. target, the data is shaded yellow; where projections exceed max. targets, the data is shaded green.

FOREST CONDITION RESULTS Where projections do not relate to OLT projections, font is coloured red and results are not expected to correlate to OLT SRNV.

Implications on Forest Condition -

Good projections for forest composition and age due to targets included in the modelling.

(2a) Productive Area by Landscape Class (ha)

Ha	PreSap +Sap	Imm Conifer	Imm Hwd	Mature and Late Successional: Balsam	Lowland	Hardwood	Conifer
T1	201,015	152,743	62,934	8,361	12,695	104,760	182,885
T2	171,969	189,752	49,376	8,119	12,135	104,326	189,168
T3	138,737	241,002	71,996	7,427	11,865	81,752	171,623
T4	146,918	242,746	85,555	9,531	10,701	65,542	163,411
T5	149,715	216,333	89,065	19,031	9,608	60,325	180,326
T6	160,000	174,648	92,415	18,367	10,306	46,191	222,475
T7	160,000	154,174	95,307	13,704	12,653	43,100	245,438
T8	160,000	167,839	84,745	12,869	12,850	49,794	236,161
T9	160,484	174,591	77,674	13,725	12,850	54,135	230,730
T10	160,000	172,977	75,700	13,855	12,884	51,090	237,633
T11	160,000	177,997	77,266	13,212	12,850	49,208	233,558
T12	160,000	177,323	73,300	14,617	12,850	48,631	237,310
T13	160,000	180,100	71,180	16,350	12,948	47,318	236,136
T14	160,000	181,572	69,777	15,794	12,850	45,228	238,812
T15	160,000	174,065	70,528	14,287	12,850	43,100	249,202
T16	160,000	167,768	69,660	13,731	12,850	43,100	256,923
OLT Max.	263,084	228,782	63,469	16,237	16,276	65,739	269,185
OLT Min.	143,268	103,333	36,052	8,706	12,845	43,021	178,461

(2c) Area of Old Forest Area by Grouping of Productive Forest (ha)

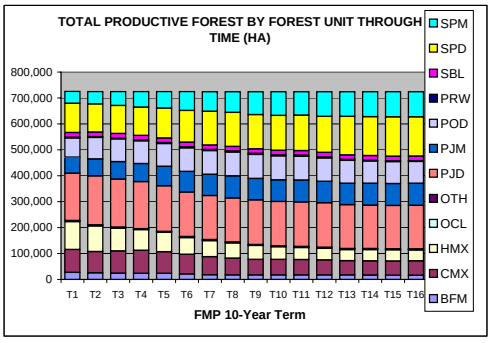
	Lower Old Forest Age (Years): 80	100	100	100	90	100	160	110-120	140
Term:	BFo	CLo	CMo	HWo	OHo	PJo	SLo	SPo	PRW
T1	3,707	1,851	8,730	16,931	1,252	23,267	2,007	10,155	457
T2	3,371	1,920	10,699	18,716	1,575	43,275	3,780	9,032	688
T3	5,091	1,883	15,779	18,952	1,700	42,449	5,459	13,810	808
T4	6,232	1,835	23,526	15,403	1,658	38,602	6,416	19,703	1,123
T5	6,870	1,581	28,705	23,966	1,631	34,808	5,962	25,622	1,373
T6	4,698	1,516	29,306	20,002	1,500	26,997	5,883	33,178	1,600
T7	10,049	1,466	27,528	12,867	1,452	21,000	4,630	41,072	1,654
T8	10,436	1,450	22,721	9,223	1,135	31,626	3,893	34,094	1,582
T9	10,545	1,402	21,962	10,737	1,144	44,420	3,562	39,700	1,579
T10	10,999	1,438	22,518	9,172	1,094	40,879	3,402	45,082	1,506
T11	11,206	1,400	21,000	12,341	1,094	32,809	3,413	58,659	1,387
T12	10,855	1,406	21,570	15,667	1,017	33,812	3,950	68,510	1,287
T13	6,885	1,412	21,000	17,089	1,019	29,179	4,290	78,789	1,174
T14	6,735	1,418	21,000	13,784	1,000	23,000	4,558	79,911	1,162
T15	10,699	1,562	21,000	9,996	1,086	28,120	4,418	86,796	1,102
T16	11,146	1,518	21,000	9,410	1,045	35,290	4,417	93,429	1,067
OLT Max.	10,216	1,731	33,990	12,796	1,374	38,654	5,472	48,427	inf
OLT Min.	5,315	1,328	20,665	7,050	992	20,800	3,319	25,840	457

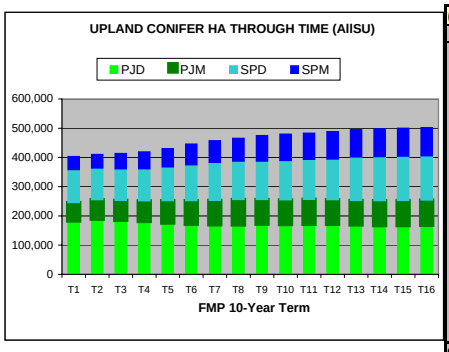
(2b partial) Productive Forest Area Through Time Data (hectares):

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	(2d) PRW	SBL	SPD	SPM	(2e) Upland Conifer
T1	725,394	27,150	88,492	107,239	2,217	1,995	182,832	61,845	73,977	3,312	17,611	112,785	45,937	403,400
T2	724,845	25,386	82,082	98,940	2,217	1,995	188,825	65,504	82,443	3,500	17,608	108,690	47,655	410,674
T3	724,402	23,995	85,690	88,214	2,217	1,995	184,830	67,437	87,357	3,495	17,608	108,183	53,381	413,831
T4	724,402	23,668	88,901	79,157	2,217	1,995	181,147	69,629	87,839	3,576	17,608	109,235	59,431	419,442
T5	724,402	23,519	83,176	74,535	2,206	1,995	175,692	75,470	87,420	3,806	17,619	115,640	63,325	430,127
T6	724,402	21,040	75,658	64,365	2,205	1,995	171,596	79,755	91,086	4,043	17,620	122,579	72,460	446,390
T7	724,375	17,886	69,829	61,551	2,205	1,995	169,902	82,237	91,395	4,126	17,620	130,005	75,625	457,770
T8	724,257	17,101	65,255	58,192	2,205	1,995	169,262	85,635	91,647	4,121	17,620	131,457	79,768	466,121
T9	724,189	17,496	59,915	53,168	2,205	1,995	171,776	83,128	92,501	4,071	17,620	131,715	88,599	475,219
T10	724,139	17,502	59,414	48,795	2,205	1,995	170,647	83,169	92,560	4,048	17,620	134,995	91,189	480,000
T11	724,091	17,056	59,516	46,480	2,205	1,995	171,417	84,655	92,120	3,923	17,620	136,698	90,406	483,176
T12	724,032	17,166	57,895	44,796	2,205	1,995	171,351	83,284	89,761	3,848	17,620	139,005	95,105	488,745
T13	724,032	17,308	55,051	42,736	2,205	1,995	169,102	82,638	87,961	3,765	17,620	148,726	94,925	495,391
T14	724,032	16,875	54,572	43,614	2,205	1,995	167,005	84,508	85,764	3,438	17,620	150,165	96,272	497,951
T15	724,032	16,079	54,778	43,057	2,205	1,995	166,910	84,722	84,569	3,395	17,620	151,573	97,129	500,334
T16	724,032	15,888	55,613	42,000	2,202	1,995	167,952	85,433	83,637	3,312	17,623	151,340	97,039	501,764
OLT Max.		19,193	74,154	81,806	3,547	3,025	392,007	143,139	58,710	116,920	25,730	77,019	85,175	497,902
OLT Min.		10,308	35,893	41,584	1,964	1,688	158,617	63,975	25,603	46,338	13,745	41,121	39,174	457,260

(5a) Available Forest:

Term	
T1	538,619
T2	538,070
T3	537,627
T4	537,627
T5	537,627
T6	537,627
T7	537,600
T8	537,482
T9	537,414
T10	537,364
T11	537,316
T12	537,257
T13	537,257
T14	537,257
T15	537,257
T16	537,257





(3a) Caribou Habitat Through Time:

Term	Cr	Cwu	Cwp	(3f) % Con in CarSUs
T1	103,969	45,055	20,581	86%
T2	100,503	45,782	17,975	86%
T3	118,856	83,974	16,824	86%
T4	134,757	94,007	21,230	87%
T5	143,406	106,123	54,271	87%
T6	154,830	119,609	60,933	88%
T7	156,352	120,501	57,788	88%
T8	153,900	113,803	54,020	89%
T9	151,766	109,010	52,131	89%
T10	150,000	105,966	48,294	90%
T11	150,000	104,075	44,972	91%
T12	150,000	109,674	42,243	91%
T13	154,070	118,882	40,000	92%
T14	150,000	116,052	40,619	92%
T15	152,438	122,894	40,000	92%
T16	156,614	128,719	40,000	92%
OLT Max.	161,804	47,453	68,169	maint or
OLT Min.	147,605	26,809	36,912	increase.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 27d_OLTMS **Input File:** 27d_OLTMS.inp **Date:** Dec. 16, 2010.

HARVEST AREA and VOLUME RESULTS:

Implications on Wood Supply - Projected SPF more even in this scenario (due to binding targets, regional request), though TOTAL varies more through time.
Poplar volume reduced slightly in T1-2 as compared to previous runs, but still within acceptable range.
Added reserves and deferrals resulted in harvest areas that are able to be operationally allocated.

Available Harvest Area by Term Data (hectares harvested annually)

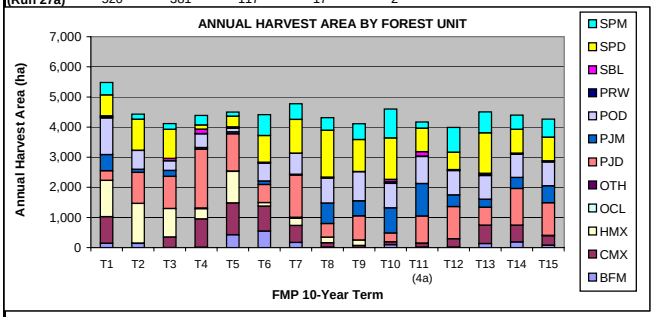
Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	5,483	141	885	1,206	0	0	315	537	1,221	36	30	693	419
T2	4,431	141	9	1,314	0	0	1,034	100	628	6	0	1,027	174
T3	4,117	0	348	949	0	0	1,066	199	319	0	80	965	191
T4	4,388	9	942	342	21	0	1,951	57	455	6	147	135	323
T5	4,498	426	1,057	1,044	1	10	1,239	64	129	7	27	355	139
T6	4,415	544	834	116	0	0	596	119	593	8	20	886	698
T7	4,775	168	566	238	0	30	1,404	29	696	4	0	1,118	522
T8	4,311	14	145	184	1	1	453	680	824	0	33	1,559	416
T9	4,111	0	70	177	0	1	803	500	964	1	6	1,063	526
T10	4,601	94	95	0	0	1	292	835	809	59	76	1,377	961
T11 (4a)	4,168	14	126	0	0	9	899	1,076	896	18	143	778	208
T12	3,991	14	279	0	0	1	1,063	388	809	13	22	576	826
T13	4,505	132	609	0	0	4	593	264	787	41	35	1,342	698
T14	4,399	189	556	0	0	0	1,214	365	774	24	10	792	475
T15	4,264	80	315	0	5	5	1,081	564	790	6	31	789	599

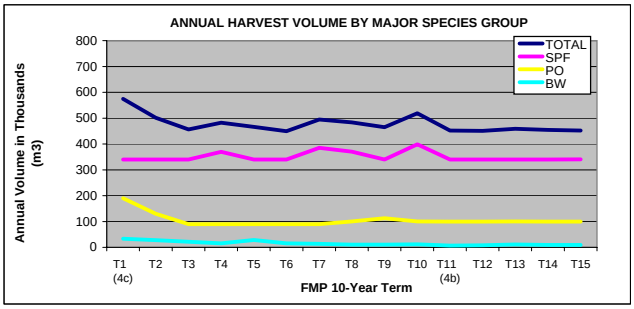
Annual Harvest Volumes by Major Species Groups (1,000s net merchantable cubic metres)

Term	TOTAL	SPF	PO	BW	PRW
T1 (4c)	574.6	340.0	190.0	33.6	3.8
T2	501.6	340.0	130.0	27.8	0.6
T3	456.2	340.0	90.0	21.8	0.0
T4	482.5	369.9	90.0	15.4	0.6
T5	466.5	340.0	90.0	28.4	0.7
T6	449.4	340.0	90.0	15.2	0.8
T7	494.5	385.1	90.0	13.6	0.5
T8	483.3	370.4	100.0	10.7	0.0
T9	464.7	340.0	112.6	10.4	0.1
T10	518.8	399.0	100.0	11.5	6.2
T11 (4b)	451.9	340.0	100.0	7.0	1.5
T12	450.9	340.0	100.0	8.0	1.2
T13	459.1	340.0	100.0	11.0	4.9
T14	454.3	340.0	100.0	9.5	2.1
T15	452.2	340.3	100.0	9.1	0.5
Average	477.4	351.0	105.5	15.5	1.6
(Run 27a)	520	381	117	17	2

Projected Revenues, Expenditures & Renewal Area

Term	Revenue M$	Expend. M$	Unspent M$	Renewal ha	Exten ha	Basc1 ha	Intn1 ha
T1	2,110	1,996	113	**5,429**	3,126	1,971	331
T2	2,004	1,787	217	**4,387**	1,986	2,167	233
T3	1,972	1,965	7	**4,117**	1,470	2,352	294
T4	2,153	2,153	0	**4,388**	1,538	2,468	382
T5	1,999	1,999	**0**	**4,498**	1,990	2,250	258
T6	1,973	1,973	0	**4,412**	1,857	2,337	218
T7	2,217	2,217	0	**4,763**	1,708	2,709	347
T8	2,128	2,128	0	**4,304**	1,358	2,636	310
T9	1,967	1,967	0	**4,106**	1,357	2,451	299
T10	2,354	2,354	**0**	**4,596**	1,351	2,891	355
T11	1,979	1,843	136	**4,162**	1,465	2,399	298
T12	1,969	1,851	119	**3,991**	1,305	2,481	205
T13	2,019	1,112	908	**4,505**	3,052	1,368	86
T14	1,986	1,017	969	**4,399**	2,988	1,249	161
T15	1,966	964	1,003	**4,264**	2,890	1,265	109





NOTES:
Chosen by Planning Team as revised LTMD.

Investigate impact of 10% intensive treatment biological limit for PJD, PJM, SPD, SPM (see Run 27e_INTEN).
Run 27d_OLTMS has unspent funding in T1-2 therefore increased intensive renewal can be planned during plan implementation, IF APPROPRIATE SITES can be found.
Precautionary principle applied in 27d to not over estimate success by intensity where SEM data does not support the assumptions on WJF sites.

WHISKEY JACK FOREST 2012 FMP **SUMMARY of SFMM INVESTIGATION**

Case Name: 27d_OLTMS **Input File:** 27d_OLTMS.inp **Date:** Dec. 16, 2010.

Immature Productive Forest

Forest Unit:

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	416,693	18,788	57,387	51,632	187	162	133,098	29,870	26,658	635	6,945	67,038	24,292
T2	411,097	17,267	48,579	36,443	243	192	138,579	36,813	42,418	1,207	7,447	55,619	26,291
T3	451,735	16,568	45,195	38,054	308	232	149,888	41,223	57,528	1,193	7,652	61,424	32,471
T4	475,218	14,137	44,672	36,870	371	287	151,681	45,986	66,291	1,330	8,753	67,407	37,432
T5	455,113	4,488	41,760	31,265	590	318	132,221	52,186	72,041	1,690	9,628	68,780	40,146
T6	427,063	2,674	35,303	31,896	649	402	106,784	54,776	78,957	2,075	8,870	60,495	44,183
T7	409,481	4,181	28,810	32,741	608	455	108,167	53,968	78,644	2,296	6,564	53,196	39,849
T8	412,583	4,232	30,350	31,257	649	745	116,762	58,135	70,038	2,185	6,326	50,567	41,338
T9	412,750	3,771	28,955	26,444	648	745	119,276	55,628	66,339	2,219	6,327	56,983	45,414
T10	408,677	3,647	28,531	23,608	641	745	118,147	55,669	67,907	1,800	6,300	58,458	43,225
T11	415,263	3,844	27,966	21,905	637	745	118,917	57,155	68,737	2,214	6,338	62,178	44,628
T12	410,623	2,549	26,915	17,947	478	745	118,851	55,784	69,229	2,191	6,497	63,060	46,378
T13	411,280	958	25,890	15,259	468	745	116,602	55,138	69,370	2,171	6,409	68,198	50,072
T14	411,348	1,081	27,741	17,056	468	527	114,505	57,008	68,562	1,985	6,507	66,128	49,781
T15	404,594	1,792	29,265	18,754	468	511	114,410	57,222	67,255	1,960	6,507	56,251	50,198
T16	397,428	2,157	30,954	19,124	513	549	115,452	57,933	64,858	1,893	6,462	45,515	52,019
	Max OLT	3,260	31,472	42,688	1,328	1,063	292,834	96,487	30,987	115,789	10,363	18,903	44,874
	Min OLT	1,948	11,696	21,591	465	448	106,124	36,541	12,670	45,886	3,667	6,479	17,441

Mature+ Productive Forest

Forest Unit:

Term	Total	BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM
T1	308,701	8,361	31,106	55,608	2,029	1,833	49,734	31,975	47,319	2,677	10,666	45,748	21,645
T2	313,748	8,119	33,502	62,497	1,974	1,803	50,246	28,691	40,026	2,293	10,161	53,072	21,364
T3	272,667	7,427	40,495	50,160	1,909	1,763	34,942	26,214	29,829	2,302	9,957	46,759	20,910
T4	249,184	9,531	44,229	42,287	1,846	1,707	29,465	23,644	21,547	2,246	8,855	41,828	21,999
T5	269,290	19,031	41,416	43,270	1,616	1,676	43,471	23,284	15,379	2,116	7,991	46,860	23,179
T6	297,339	18,367	40,355	32,470	1,557	1,592	64,812	24,979	12,129	1,968	8,750	62,085	28,277
T7	314,895	13,704	41,019	28,809	1,597	1,540	61,735	28,270	12,751	1,830	11,056	76,809	35,776
T8	311,673	12,869	34,905	26,935	1,557	1,250	52,500	27,500	21,609	1,935	11,293	80,890	38,430
T9	311,439	13,725	30,960	26,723	1,557	1,250	52,500	27,500	26,162	1,852	11,293	74,733	43,185
T10	315,462	13,855	30,883	25,187	1,564	1,250	52,500	27,500	24,653	2,248	11,320	76,537	47,964
T11	308,828	13,212	31,550	24,575	1,568	1,250	52,500	27,500	23,383	1,709	11,282	74,520	45,778
T12	313,409	14,617	30,980	26,849	1,727	1,250	52,500	27,500	20,532	1,658	11,123	75,945	48,727
T13	312,753	16,350	29,161	27,477	1,737	1,250	52,500	27,500	18,591	1,594	11,211	80,528	44,854
T14	312,684	15,794	26,831	26,558	1,737	1,468	52,500	27,500	17,202	1,453	11,113	84,037	46,491
T15	319,439	14,287	25,513	24,303	1,737	1,484	52,500	27,500	17,314	1,435	11,113	95,322	46,932
T16	326,604	13,731	24,659	22,876	1,689	1,446	52,500	27,500	18,778	1,419	11,161	105,825	45,020
	Max OLT	15,933	42,682	39,118	2,219	1,962	99,173	46,652	27,723	1,131	15,367	58,117	40,301
	Min OLT	8,361	24,197	19,993	1,499	1,240	52,493	27,435	12,933	452	10,078	34,643	21,733
Mature Onset Age:		60	70	60	70	60	70	70	60	80	70	70	70

Available Harvest Area by Forest Unit and Age Class TERM 1

	Forest Unit: BFM	CMX	HMX	OCL	OTH	PJD	PJM	POD	PRW	SBL	SPD	SPM	
A5													
A15													
A25													
A35													
A45													
A55		4	10			1		0					
A65	0	16	208			9		1				7	
A75	2	16	389			17	11	346			148	10	
A85		278	224			24	191	187			76	9	
A95	88	291	163			40	108	307	14	7	89	24	
A105	51	205	163			224	224	243	3		165	162	
A115		75	49			1	3	136	2	6	91	158	
A125									7	8	70	26	
A135									11	10	52	20	
A145											1	3	
A155											1		
A165													
A175													
A185													
A195													
A205													
A215													
A225													
A235													
A245													
A255													TOTAL
	141	885	1,206	0	0	315	537	1,221	36	30	693	419	5,483

1260
001228

2012 - 2022
Forest Management Plan
for the
Whiskey Jack Forest

Summary Text

Summary of the 2012 to 2022 Whiskey Jack Forest Management Plan

Location

The Whiskey Jack Forest Management Unit (MU) is located within the Kenora District and the Northwest Region of the Ministry of Natural Resources (MNR).

Public Contacts

The public contacts for the plan are:

Kurt Pochailo, R.P.F.	Plan Author	(807) 468-2597
Deb Weedon	MNR District Manager	(807) 468-2501
Wayne Bruce	Kenora LCC representative	
Dutchie Loman	Red Lake LCC Representative	

Management Responsibility

The Whiskey Jack Forest (Management Unit #490) has been a Crown Management Unit since Abitibi Company of Canada surrendered the Sustainable Forest Licence in August 2009. The Kenora District MNR administers its forest management planning activities and operations from the MNR District office located in Kenora, Ontario. More details about the administration of the forest can be found in section 1 of the plan. The management unit description is included in section 2 of the plan.

Local Citizen's Committee Participation

A member of the local citizen's committee (LCC) has participated in the preparation of the forest management plan as a planning team member and attended all information sessions. The proposed management strategy, long-term management direction and draft forest management plan were presented to the committee and input was requested on these products as well as the background information.

The LCC has prepared a brief statement of agreement or disagreement with the draft plan. This statement and the full LCC report can be found in the plan electronic submission.

Long-term Management Direction Summary

The Long-term Management Direction (LTMD) for the forest provides guidance for the levels of access, harvest, renewal and tending activities required to achieve the desired future forest and benefits. In the development of the LTMD, management objectives and indicators are identified and analytical methodologies, models and tools regarding forest regulation, social and economic assessment, wildlife habitat supply and landscape management are used. This is discussed in section 3 of the FMP which references supporting details found in the supplementary documentation to the plan.

The long-term management direction provides a means of assessing the sustainability of the management strategy through the measurement and monitoring of indicators that have been developed for each management objective. It is expected that a balanced achievement of the

quantitative and qualitative biological, social and economic objectives, will result in the desired long-term future forest condition and benefits.

Plan Objectives and Indicators

As required by the *Crown Forest Sustainability Act*, management objectives for the Whiskey Jack Forest must be compatible with the sustainability of the Crown forest, and indicators of objective achievement must be identified. In addition, the *Crown Forest Sustainability Act* requires that each FMP contain management objectives relating to:

(a) Crown forest diversity, including consideration for the conservation of natural landscape patterns, forest structure and composition, habitat for animal life and the abundance and distribution of forest ecosystems;

(b) Social and economic factors, including harvest levels and a recognition that healthy forest ecosystems are vital to the well-being of Ontario communities;

(c) The provision of forest cover for those values that are dependent on the Crown forest; and

(d) Silviculture for the harvest, renewal and maintenance of the Crown forest.

Table FMP-9 (located in Section 9.0) summarizes management objectives, indicators, desirable levels and associated targets and presents an assessment of achievement of desirable levels for each objective, for those which can be assessed at this time. The management objectives, indicators, desirable levels and targets were developed with input from the Kenora Local Citizens Committee (through the Desired Forest and Benefits meetings), the planning team, and MNR advisors. Sources of information considered in their development included, but were not limited to: the current FMP; background information; forest management guides and policies; Reports of Past Forest Operations; MNR forest management planning direction and training, and scoping investigations for the 2012 to 2022 FMP.

For each management objective, at least one indicator of objective achievement was developed, along with an associated desirable level(s) and target(s). Some objectives have multiple indicators to measure achievement. A desirable level is a specific number, a range or a trend for an indicator, to be achieved and maintained over time. As with desirable levels, targets are specific numbers, ranges, or trends, with a timeframe for achievement. The establishment of targets for each objective reflected a balancing of objective achievement and considered:

(a) Social, economic and environmental considerations;
(b) The associated indicator and its desirable level;
(c) The current forest condition; and,
(d) The short-term (10 years), medium-term (20 years) and long-term (80-100 years).

The rationale used in setting desirable levels and targets is summarized in section 3.5 of the plan. Modelling with the Strategic Forest Management Model (SFMM) assisted in quantitative scoping investigations and the development of the long-term management strategy (see section 3.6) that balances the achievement of management objectives over time. There are a total of 11 objectives and 30 indicators in this FMP.

The Long-term Management Direction

The Long-term Management Direction (LTMD) is represented by the types and levels of access, harvest, renewal and tending activities required to manage forest cover in a manner that balances the achievement of management objectives over time. The MNR approved Strategic Forest Management Model (SFMM) is used to develop the Long-term Management Direction.

The development of the Long-term Management Direction is an iterative process whereby results are examined and SFMM inputs adjusted as required to improve the model's ability to meet management objectives. This process commonly involves adjusting volume targets, harvest flow policies and targets for the forest diversity indicators – forest unit area, old forest area, mature forest and wildlife habitat. As each investigation is run, the resulting harvest volume, forest diversity indicators, silvicultural expenditures and the silvicultural treatment program are examined. The process continues until the planning team is satisfied that no further significant improvements can be made, that on balance objectives have been achieved, and that the solution is practical and can be implemented. The modelling process that led to the Long-term Management Direction is described in section 3.6 of the plan and the Analysis Package in Supplementary Documentation A.

The outputs of forest modelling for the Long-term Management Direction provide the source for the long-term (100-year) projections of quantifiable objectives and are documented within the plan in the following tables:

(a) Projected Forest Condition for the Crown Productive Forest (Table FMP-5);
(b) Projected Habitat for Selected Wildlife Species (Table FMP-6);
(c) Projected Available Harvest Area by Forest Unit (Table FMP-7); and
(d) Projected Available Harvest Volume by Species Group (Table FMP-8);

These tables can be found in section 9.0 of the FMP.

Planned Forest Operations for the 10-year Plan Period

Silvicultural Systems, Forest Units and Silvicultural Ground Rules

In order to describe the planned forest operations, it is necessary to first explain some forestry terminology:

The harvesting on the Whiskey Jack will be conducted using a silvicultural system wherein the mature trees are removed in one operation. This silvicultural system still involves the removal of the majority of the mature trees, however, the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* (MNR, 2010) require the retention of residual trees to be left after the harvest and often residual patches of uncut areas are to be left as well. This method of harvesting is an appropriate management system in the Boreal Forest for many mixedwood stands and stands to be managed for tree species that are intolerant of shade (e.g. poplar, white birch, jack pine).

Each stand is assigned to a forest unit based on species composition, stocking and history. All stands within a forest unit are managed under the same silvicultural system but may be managed with different treatments (e.g. planting, site preparation, tending) and may have different objectives in terms of different future forest conditions. The management strategy is indicated through the Silvicultural Ground Rule.

Each stand to be harvested is assigned a Silvicultural Ground Rule. Each Silvicultural Ground Rule (SGR) describes the components that make up an individual SGR, including a description of the current and future stand conditions, renewal treatment options and the regeneration standards that are to be met. Each SGR is intended to describe the harvest, renewal and tending activities that will be carried out on a given stand to allow the current Forest Unit, following harvest, to succeed to the Future Forest Unit, whether it is similar to the pre-harvest stand or a different Forest Unit.

Planned Harvest Operations

Results of the long-term strategic planning were used to plan operations for the ten-year period of this plan. The following table summarizes the harvest operations that are planned (i.e. in detail) for the first five-year term (2012-2017), and those which are proposed (i.e. less detail) for the second five-year term (2017-2022) of the FMP. The planned harvest area and percentage of the total 10-year planned harvest area for each of the three major silvicultural systems is listed below, however as reported, only the clearcut silvicultural system is being implemented on the Whiskey Jack Forest during this plan period (See section 4.3 of the FMP for more details):

Silvicultural System (i.e. Harvest System)	10-year Planned Harvest Area (ha)	% of 10-year Planned Harvest Area
Clearcut	51,941	100 %
Shelterwood	0	0 %
Selection	0	0 %
Total	**51,941**	**100%**

Harvest Area and Volume by Forest Unit and Species Group

The estimated available harvest areas for the 10-year plan period summarized by principal forest units and the harvest volumes (m3) associated with the harvest areas by the principal species groups are listed below:

Forest Unit	Planned Harvest Area (ha)
BFM	1,353
CMX	8,622
HMX	11,039
OCL	-
OTH	-
PJD	3,100
PJM	5,097
POD	11,349
PRW	204
SBL	297
SPD	6,791
SPM	4,118
Total	**51,941**

Species Group	Planned Harvest Volume (m3)
White Pine - Red Pine	20,106
Spruce-Pine-Fir	3,310,286
*** Other Conifer (Cedar, Larch)**	61,959
Poplar	1,833,791
White Birch	403,201
*** Tolerant Hardwood (Black Ash)**	20,346
Total	**5,549,689**

(Net merchantable volumes)

* Volumes for Other Conifer (Larch, Cedar) and Tolerant Hardwood (Black Ash) are reported but are not considered major species groups on the Whiskey Jack Forest.

Planned Road Access

The planned (10 year) road construction summarized for two road classes (primary and branch roads) that are needed to access all harvest and renewal operations over the 10-year period are listed below. Operational (i.e. tertiary) roads are not listed. (See section 4.5 of the FMP for more details).

Road Classification	Planned Road Construction (km)
Primary	37
Branch	19
Total	**56**

The Road Use Management Strategies for each Primary Road are located within FMP Supplementary Documentation G. The proposed Primary Road corridors associated with the 2012 FMP are illustrated on the FMP Summary Map and Composite Map (electronic version of FMP).

The management strategies for each road are consistent with those indicated in the Crown Land Use Policy Atlas.

Planned Forest Renewal and Tending Operations

The planned (10 year) renewal and maintenance activities that are required to meet the plan objectives are listed below by renewal activity type. These renewal activities will be carried out on the current planned harvest areas as well as areas harvested during past plan terms.

Artificial regeneration refers to tree planting and seeding. Supplemental treatment usually refers to an area that is regenerating naturally that needs some supplemental (usually tree planting) treatment to meet the regeneration standards. (See section 4.4. of the FMP for more details).

Renewal Activities	Planned Treatment Area (ha)
Natural Regeneration	25,631
Artificial Regeneration	27,839
Total Regeneration	53,470
Retreatment	0
Supplemental	0
Total Tending	8,065

Area of Concern Prescriptions

The forest provides for many forest values. Some values have the potential to be negatively impacted by forest management. The areas around these values are termed *Areas of Concern*.

An area of concern may be a social value such as an authorized hiking trail or an archaeological site or it may be an ecological or environmental value such as a stream or significant wildlife habitat feature (e.g. a great blue heronry, a hawk nest, deer wintering area, mineral licks or a provincially significant wetland).

The FMP includes Area of Concern prescriptions for many different values. These prescriptions may include a no-cut buffer zone, an area with access restrictions and/or a modified

management area wherein there may be restrictions on timing of harvest or silvicultural activity, method of harvest or types of trees that can be harvested. Some prescriptions are developed from the direction in a forest management guide and others are developed at the planning team level. A few examples of the many Area of Concern prescriptions follow to give the reader a sense of Area of Concern prescriptions:

> ***Example 1 (N01)**. A primary bald eagle nest receives a 200 m radius no cut reserve with no new access roads allowed. Outside this 200 m radius is a further 200 m wide zone in which harvesting may occur (subject to conditions on whether or not nest is occupied and relative potential impact of operations) and it must occur outside the critical breeding period to avoid disturbing the young birds.*
>
> ***Example 2 (M01)**. Mineral licks will receive a 120 m no cut reserve measured from the edge of woody vegetation averaging at least 2 m tall and with ≥25% canopy cover. This reserve is in excess of what is required for water quality and protection of fish habitat, but will provide additional protection and habitat cover for animals using the mineral lick.*
>
> ***Example 3 (TV01)**. Large tourism lakes will receive a 90 m no cut reserve. This prescription may be in excess to what is required to protect the water quality and fish habitat but it will provide a visual buffer from users of the lake.*

Operational prescriptions for areas of concern and silvicultural ground rules for regular operations have been prepared in accordance with the applicable forest management guides. There are no area of concern prescriptions and one silvicultural prescription that are exceptions to the guides. Full tree logging on NWO Ecosites 11 and 12, where total organic matter plus soil depth is less than 20 cm, is designated as a 'not recommended' practice in the *Silvicultural Guide to Managing for Black Spruce, Jack Pine, and Aspen on Boreal Forest Ecosites in Ontario* (MNR, 1997). The shallow soil sites on the Whiskey Jack Forest are, for the most part, productive and, it is felt, that using full tree logging in a careful manner will preserve the sites nutrient capacity. The forest industry is contributing to a comprehensive, region wide initiative to monitor the impacts of this treatment on these site conditions. Operational prescriptions for areas of concern have been prepared consistent with the Endangered Species Act to protect habitat related to species at risk known to exist on the forest (See section 4.2.1 of the FMP for more detail).

Issues

There are two issues affecting the 2012-2022 Whiskey Jack Forest Management Plan that have the potential to affect the implementation of the plan:

1. The August 2011 Court decision regarding the "Keewatin Lands" (north of the English River system) – Note that as per the stay ordered on consent of the parties, there will be no harvesting of trees for subsequent sale or other commercial purposes other than for firewood within the area of the Whiskey Jack Forest north of the English River, without the consent of Grassy Narrows First Nation.
2. More generally, Grassy Narrows has concerns with the Whiskey Jack Forest that are currently being addressed through the Process Agreement that was signed between ANA and MNR.

Ontario will continue to consult with Grassy Narrows First Nation, Naotkamegwanning First Nation (Whitefish Bay), Ochiichagwe'babigo'inning First Nation (Dalles), Wabaseemoong Independent First Nations (Whitedog), Wabauskang First Nation and Kenora Métis Council and respect any existing obligations in relation to their rights. The Planning Team and LCC will receive public and Aboriginal input via the consultation phases of the forest management plan.

Public Consultation

There is one remaining formal consultation opportunity for the Whiskey Jack Forest Management Plan. Public inspection of the MNR approved Forest Management Plan is tentatively scheduled from December 2013 to January 2014. There is an opportunity during the 30-day period for public inspection of the MNR approved forest management plan for any person to make a written request to the Director, Environmental Assessment and Approvals Branch, Ministry of the Environment for an individual environmental assessment of specific proposed forest management activities in the forest management plan (in accordance with the process described in Part A, Section 3.4.2).

Following the implementation of the Whiskey Jack Forest Management Plan, the Kenora District MNR will continue to work with local First Nation communities to ensure that new values are protected as they are identified.

A comment form is attached as Appendix 1.

Summary Map

Proposed harvest, renewal and tending operations, locations of existing and new primary and branch road construction corridors for the 10-year term are shown on the summary map labelled MU490_2012_FMP_P1_MAP_Sum. The map also contains an index/grid for identifying specific operational maps.

Appendix 1: Comment Form

WHISKEY JACK FOREST
2012-2022 FOREST MANAGEMENT PLAN

NAME DATE

ADDRESS (Please include full mailing address)

COMMENTS

The Ministry of Natural Resources is collecting comments and information regarding the forest management plan under the authority of the Crown Forest Sustainability Act to assist in making decisions and determining further public consultation needs. Your comments will be forwarded to the Plan Author and shared with the Kenora Local Citizens Committee (LCC) so that they may consider your concerns. Comments and opinions will be kept on file for use during the forest management plan period and may be included in study documentation which is made available for public review.

Under the Freedom of Information and Protection of Privacy Act (1987) personal information will remain confidential unless prior consent is obtained. However, this information may be used by the Ministry of Natural Resources to seek public input on other resource management surveys and projects. For further information regarding this Act, please contact Stephen Duda, MNR at (807) 468-2543.

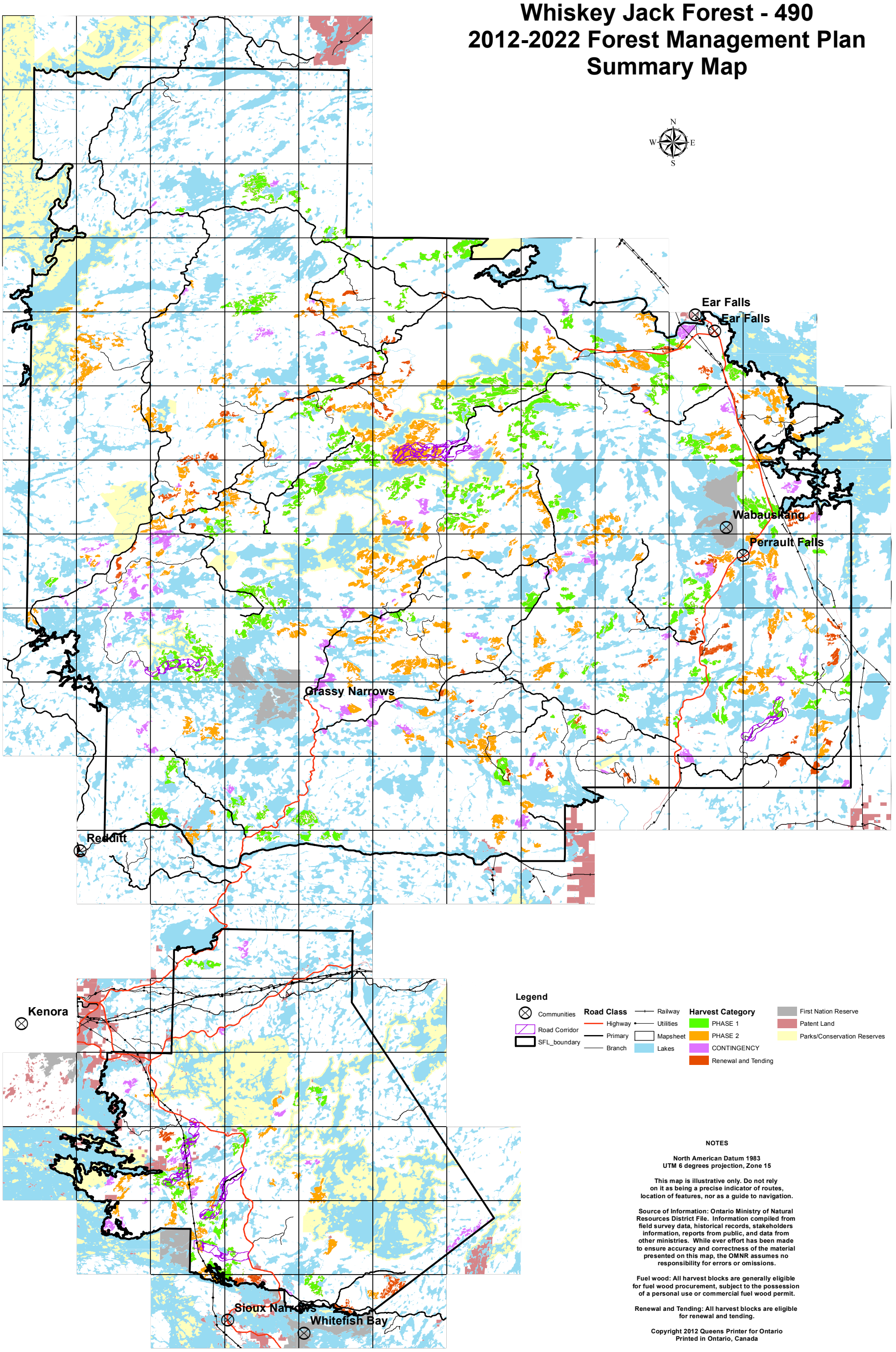
There is one remaining formal consultation opportunity for the Whiskey Jack Forest Management Plan. Public inspection of the MNR approved Forest Management Plan is tentatively scheduled from December 2013 to January 2014. There is an opportunity during the 30-day period for public inspection of the MNR approved forest management plan for any person to make a written request to the Director, Environmental Assessment and Approvals Branch, Ministry of the Environment for an individual environmental assessment of specific proposed forest management activities in the forest management plan (in accordance with the process described in Part A, Section 3.4.2).

Comments may be forwarded to the Kenora District Office, Ministry of Natural Resources, 808 Robertson Street, Box 5080, Kenora, ON, P9N 3X9.

2012 - 2022
Forest Management Plan
for the
Whiskey Jack Forest

Summary Map

Whiskey Jack Forest - 490
2012-2022 Forest Management Plan
Summary Map



NOTES

North American Datum 1983
UTM 6 degrees projection, Zone 15

This map is illustrative only. Do not rely on it as being a precise indicator of routes, location of features, nor as a guide to navigation.

Source of Information: Ontario Ministry of Natural Resources District File. Information compiled from field survey data, historical records, stakeholders information, reports from public, and data from other ministries. While ever effort has been made to ensure accuracy and correctness of the material presented on this map, the OMNR assumes no responsibility for errors or omissions.

Fuel wood: All harvest blocks are generally eligible for fuel wood procurement, subject to the possession of a personal use or commercial fuel wood permit.

Renewal and Tending: All harvest blocks are eligible for renewal and tending.

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0 4.5 9 18 27 36 Kilometers

Ontario

December, 2013

2012 - 2022
Forest Management Plan
for the
Whiskey Jack Forest

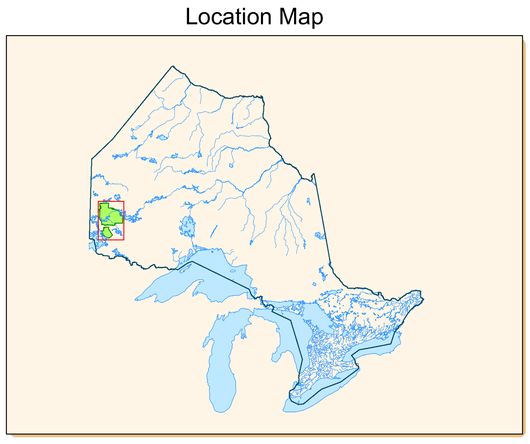
Other Maps: Fisheries and Wetlands

Ontario

Map: Fisheries & Wetlands

Management Unit: Whiskey Jack Forest
Term of Plan: 2012 - 2022

Location Map



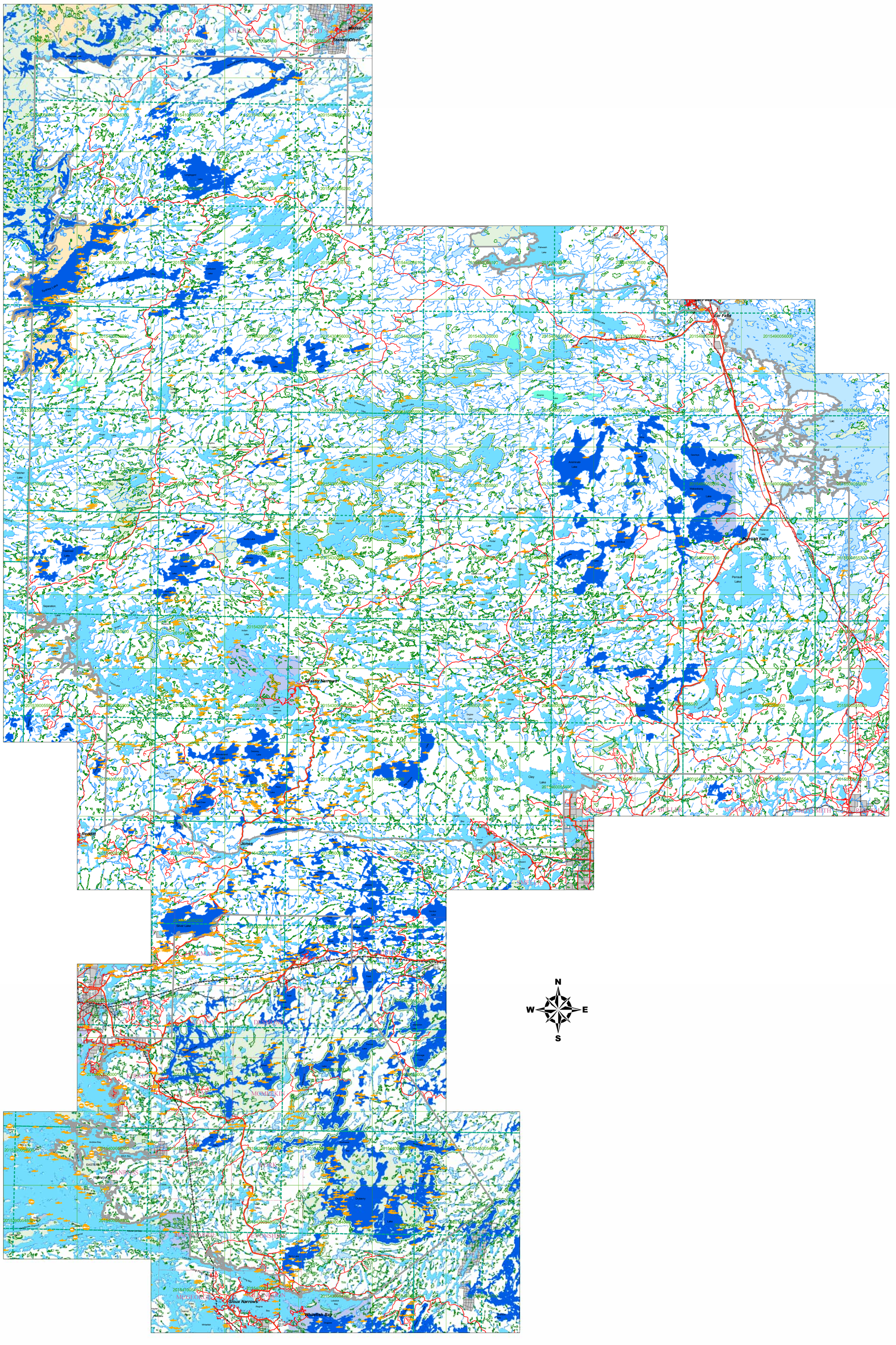
Legend

Base Data

- Airport
- Highways
- Primary Roads
- Other Roads
- Railway
- Pipeline
- Transmission Line
- Stream
- Lake
- OBM Index
- Geographic Township
- Enhanced Management Area
- Regulated Park/Reserve
- Patent Land
- Federal Land
- FMU Area

Fisheries And Wetlands Data

- Spawning Area
- Spawning Area
- Fish Nursery Area
- Bait Harvest Area
- Cold Water Lake
- Cool Water Lake
- Warm Water Lake
- Cold Water Stream
- Cool Water Stream
- Warm Water Stream
- Wetlands



Notes

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Source of Information - Ontario Ministry of Natural Resources District Files - compiled from field survey data, historical records, stakeholder information, reports from the public, and data from other Ministries.

Universal Transverse Mercator
North American Datum 1983

1:200,000

Kilometers
2 1 0 2 4 6 8 10 12 14

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Printed in Ontario, Canada
Published: December 2013

For Further Information Contact:

Asubpeeschoseewagong
Netum Anishinabek
GRASSY NARROWS, ONTARIO P0X 1B0 • PHONE: (807) 925-2261 • FAX: (807) 925-2619

EARTHROOTS

This is Exhibit "C" referred to in the affidavit of AMBER ELLIS AND DAVID SONE sworn before me, this 21st day of AUGUST 20 15

Joseph Castrilli
A COMMISSIONER FOR TAKING AFFIDAVITS
JOSEPH CASTRILLI

January 22, 2014

Ian Parrott
Director of Environmental Assessment and Approvals Branch
Ontario Ministry of Environment
2 St Clair Ave W, Floor 12A
Toronto ON M4V1L5

Dear Mr. Parrott,

Re: Request for Individual Environmental Assessment of Whiskey Jack Forest Management Plan (EBR Registry No. 010-9240)

We are writing on behalf of Grassy Narrows First Nation (Grassy Narrows) and Earthroots to request an Individual Environmental Assessment of the Whiskey Jack Forest Management Plan 2012-2022 (the logging plan) that was approved on December 23, 2013 by the Ministry of Natural Resources.

Earthroots is a grassroots environmental organization dedicated to protecting Ontario's wilderness, wildlife and watersheds through research, education and action.

Asubpeeschoseewagong Netum Anishinabek (ANA) or Grassy Narrows First Nation is an indigenous Anishinabe community located within the Treaty 3 area.

The logging plan fails to adequately deal with the impacts of logging on mercury levels in boreal water and fish. As a result the logging plan fails to protect the environment and to ensure sustainability. In particular the logging plan will harm water quality, fish habitat, wildlife, and the health of people who eat the fish. The logging plan will also impact the inherent Aboriginal and Treaty rights to fish to an extent that precludes the meaningful exercise of those rights.

These shortcomings of the logging plan are in spite of the fact that peer reviewed scientific literature has demonstrated a clear link between clearcut logging and unsafe mercury levels in fish in boreal forest watersheds. While the research in support of this literature generally was not carried out in the Whiskey Jack Forest, the boreal forest conditions examined and logging activities considered in these studies are similar, if not identical, to the conditions and activities expected in Whiskey Jack if the logging plan proceeds as approved.

This failure of the logging plan is particularly grave because of the well-known existing mercury contamination problem in the English and Wabigoon River watersheds, and the well-documented prevalence of methylmercury poisoning arising from the consumption of contaminated fish (Minamata Disease) in Asubpeeschoseewagong (Grassy Narrows) and Wabaseemoong (White Dog).

The history of local mercury contamination, and its ongoing impacts, dictates that the highest level of caution and duty of care must be applied in any action that may deepen and prolong this problem by increasing the levels of mercury in the local food chain. Failure to do so would be a failure to protect the health of the environment and the sustainability of our forests, as well as a failure to uphold the honour of the Crown.

Grassy Narrows has a number of concerns with respect to the Ministry of Natural Resources' decision to approve the Forest Management Plan. These concerns include the failure to discharge the duty to consult, the failure to properly account for treaty rights and traditional use of the land, the failure to ensure that a proper forest inventory has been used to inform the Crown's decision making process, and a concern that the level of logging is unsustainable and unjustifiably infringes our aboriginal and treaty rights. The fact that we do not raise these issues below in relation to our bump-up request should not be taken as in any way suggesting that these concerns are unimportant or will not be raised in other fora.

Grassy Narrows and Earthroots submit that the logging plan warrants a review under an Individual Environmental Assessment because:

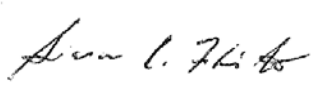
- the outstanding mercury issues (i.e., impacts upon human and ecosystem health) have not been addressed adequately, or at all, under the *Crown Forest Sustainability Act*, or in the forest management planning process, to date;
- similarly, they will not be adequately addressed in any other current or future regulatory or approvals process regarding the logging activities in Whiskey Jack Forest (e.g., in the *Lakes and Rivers Improvement Act* regarding water-crossings);
- these public interest issues raise matters of profound importance both to Grassy Narrows First Nation, and to other stakeholders and the public at large;
- to effectively and thoroughly address these issues it is necessary, as a preliminary step, for the proponent of the logging plan to prepare an Individual Environmental Assessment that fully examines (with public input) all matters listed in section 6.1(2) of the *Environmental Assessment Act*, especially in relation to:
    - the alleged purpose of, or rationale for, allowing clearcutting/logging activities to occur in Grassy Narrows Territory;
    - the alleged purpose of, or rationale for, allowing clearcutting/logging activities in close proximity to fish-bearing waterbodies within the Whiskey Jack Forest despite the risk of additional mercury contamination;
    - alternative sources of wood for the real wood supply needs of local mills;
    - alternatives to the proposed forestry activities and alternative methods of carrying out such activities;
    - the environment affected, and the environmental effects (direct, indirect, and cumulative) of the logging activities;
    - proven mitigation actions to prevent the risk of mercury contamination from logging activities; and
    - systematic evaluation of the advantages and disadvantages of the proposed activities and the alternatives.

The precise nature and scope of the foregoing factors can be developed (with public input) in the Terms of Reference which precede the preparation of the Individual Environmental Assessment. In summary, the potential mercury impacts are significant, adverse, long-lasting, and are

unresolved to date in the forest management planning process. These impacts are best addressed through a process that includes, but is not necessarily limited to, a robust Individual Environmental Assessment.

We go into more detail about the concerns of Grassy Narrows and Earthroots in the appended text. Where possible, we quote directly from peer-reviewed scientific journal articles to avoid misinterpretation of the available facts.

Sincerely,



Simon Fobister,
Grassy Narrows Chief

Amber Ellis,
Earthroots Executive Director

Enclosure: Bump-up Request for an Individual Environmental Assessment (IEA) submitted to the Ontario Ministry of the Environment regarding the Forest Management Plan for the Whiskey Jack Forest for the 10-year period April 1, 2012 to March 31, 2022 - Final Plan Inspection Approved by the Ministry of Natural Resources, December 23, 2013 - EBR Registry No. 010-9240

cc: Premier of Ontario
Ontario Minister of the Environment
Ontario Minister of Natural Resources
Ontario Minister of Aboriginal Affairs
Ontario Minister of Health and Long Term Care
Minister of the Environment - Canada
Minister of Health – Canada
Minister of Aboriginal Affairs and Northern Development - Canada
Grand Chief, Grand Council of Treaty Three
Regional Chief, Chiefs of Ontario
National Chief, Assembly of First Nations

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EARTHROOTS

Bump-up Request for an Individual Environmental Assessment (IEA) submitted to the Ontario Ministry of the Environment regarding the Forest Management Plan for the Whiskey Jack Forest for the 10-year period April 1, 2012 to March 31, 2022 - Final Plan Inspection Approved by the Ministry of Natural Resources, December 23, 2013 - EBR Registry No. 010-9240

Submitted by

Grassy Narrows First Nation and Earthroots

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1. Clearcutting Impacts Water Quality Through Mercury Contamination

SUMMARY

Logging has been found to dramatically raise mercury (Hg or Hg_{tot}) levels in boreal lakes and rivers. It has also been found to raise the levels of methyl mercury (MeHg), the form of mercury that bio-accumulates in the food chain and acts as a neurotoxin in humans who eat fish.

EVIDENCE

"Boreal Canadian Shield forest watersheds serve as large reservoirs of Hg that shed their metal load when the soil and the land hydrology are disrupted by timber harvesting." (Desrosier et al., 2006)

"Clearcut logging increases the export of dissolved organic carbon [DOC] and Hg and can stimulate the bacterial production of methyl mercury (MeHg)." (Garcia and Carignan, 2005)

"Several subsequent studies have indicated that harvesting and other forest operations in boreal and nemoral climactic zones increase the loading of methyl mercury (MeHg) exported from catchments (12)" (Bishop et al., 2009)

"Harvesting of a 7 ha stand increased Hg_{tot} fluxes by a factor of four and MeHg by a factor of six." (Povari et al., 2003 as cited in Bishop et al., 2009)

"In Sweden, a temporary logging track inadvertently placed across a small brook in the long-term Gardsjon reference catchment increased outputs of MeHg by a factor of over five (18) for more than half a decade." (Munthe et al., 2004 as cited in Bishop et al., 2009)

"There is fairly compelling evidence that timber harvest (and wildfire) (sic) results in an increase in the movement of mercury from terrestrial to aquatic environments where it may be converted to MeHg (see above). Associated with this, there is a growing concern about the associated potential risk to wildlife and human health." (Stand and Site Guide Rationale)

CONCLUSION

Clearcutting on Grassy Narrows Territory will cause the discharge of mercury into the aquatic environment. Mercury is a contaminant which causes an adverse effect on water

quality.

2. Clearcutting Elevates Mercury Levels in Fish

SUMMARY

Logging has been found to increase the level of mercury in fish, often above the safe level for human consumption. This effect is most pronounced in fish at the top of the food chain like walleye and pike, the primary fish eaten by people in Grassy Narrows.

EVIDENCE

"Watershed manipulations can result in an increase of downstream MeHg concentrations (18) and fish Hg levels by an order of magnitude, without any additional input of Hg (19)." (Bishop et al., 2009)

"In the environment, particularly lakes, waterways and wetlands, mercury can be converted to a highly toxic, organic compound called methylmercury through biogeochemical interactions." (Environment Canada, website http://www.ec.gc.ca/mercure-mercury/default.asp?lang=En&n=D721AC1F-1 accessed Jan. 14, 2014)

"[T]here is a clear indication that forest harvesting leads to increases in Hg_{tot} and MeHg loading, as well as increased bioaccumulation in downstream aquatic biota." (Bishop et al., 2009)

"Several subsequent studies have indicated that harvesting and other forest operations in boreal and nemoral climactic zones increase the loading of methyl mercury (MeHg) exported from catchments (12) and the amount of Hg found in downstream fish as well as other organisms (13)." (Povari et al., 2003, and Garcia and Carignan, 2000, as cited in Bishop et al., 2009)

"[T]his soil [Hg] pool and its mobilization due to forest management activities are definitely a threat to fish… the factors that promote methylation… are of particular concern." (Bishop et al., 2009)

"Hg concentrations exceeded the advisory limit for human consumption (0.5 ug/g wet wt) from the World Health Organization in all top predatory species (northern pike, walleye, and burbot) found in cut and two partially burnt lakes." (Garcia and Carignan, 2005)

"This limit was surpassed in only 18% of piscivorous species populations found in reference lakes and in no species from completely burned lakes." (Garcia and Carignan, 2005)

CONCLUSION

Clearcutting in Grassy Narrows Territory will result in the harmful alteration of fish habitat by causing levels of methyl mercury in the fish's environment and food chain to be elevated. This in turn leads to higher levels of methyl mercury in the fish.

3. Elevated Mercury Levels Impact Wildlife

SUMMARY

Elevated mercury levels impact wildlife, especially those species at the top of the food chain. Mercury impacted wildlife include species that are important to the exercise of Grassy Narrows' trapping rights including mink and river otter.

EVIDENCE

Mercury impacts have been identified in mink, river otter, loons, osprey, and bald eagles that eat contaminated fish. (Environmental Commissioner of Ontario. 2004)

"Mercury toxicity for fish, birds and mammals can lead to reduced reproductive success, impaired growth and development, behavioral abnormalities, and death." (Environmental Commissioner of Ontario, 2004)

"Although the long-term effects of mercury on whole ecosystems are unclear, the survival of some affected populations and overall biodiversity are at risk." (Environment Canada website, http://www.ec.gc.ca/mercure-mercury/default.asp?lang=En&n=D721AC1F-1, accsessed Jan. 14, 2014)

"High levels of mercury are suspected to impair the loon's reproductive success as well as cause growth related problems. These problems inevitably lead to an increased death rate and a decreased birth rate, resulting in a reduction in the abundance of natural populations." (Environment Canada website, http://www.ec.gc.ca/mercure-mercury/default.asp?lang=En&n=D721AC1F-1, accessed Jan 14, 2014)

"It is thought that elevated mercury levels in otters may cause early mortality due to toxicity and behavioral changes." (Environment Canada website, http://www.ec.gc.ca/mercure-mercury/default.asp?lang=En&n=D721AC1F-1, accessed Jan. 14, 2014)

"In the past, mercury risk reduction strategies focused on restricting human consumption of heavily contaminated fish in order to protect human health. Such a strategy is clearly not adequate for the protection of wildlife. Species such as otter and mink cannot heed warning notices or fish consumption advisories. Since mercury is so widely distributed in the Canadian environment, their risk is real and immediate, especially when effects such as impaired growth and reproduction, neurological damage, kidney damage, and weight loss, which occur at relatively low concentrations, are considered." (Environment Canada website, http://www.ec.gc.ca/mercure-mercury/default.asp?lang=En&n=D721AC1F-1, accessed Jan. 14, 2014)

"The U.S. Environmental Protection Agency's Great Lakes Initiative mercury water quality criterion for the protection of wildlife is 1.3 ng/L." (Environmental Commissioner of Ontario. 2009)

Levels of Hg_{tot} as high as 12 ng/L have been found in downstream water bodies after logging. (Bishop et al., 2009).

CONCLUSION

Increasing mercury levels in fish are likely to increase the impacts on local wildlife. These impacts may cause a decline in abundance, and may even put the local survival of some species at risk. The species likely to be impacted include animals that are important to the exercise by Grassy Narrows people of the right to trap.

4. Fish in Grassy Narrows Have Critical Levels of Mercury

SUMMARY

Food fish in Grassy Narrows Territory currently have mercury levels above, or near, the limit for safe human consumption.

EVIDENCE

Between 1962 and 1970, approximately 10 tonnes of mercury was dumped into English-Wabigoon river system by Dryden Chemicals, a subsidiary of Reed Paper. (Hutchison, 1977)

"Mercury is a toxic element and serves no beneficial physiological function in man." (Health Canada website, http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/mercury-mercure/index-eng.php#a1, accessed Jan. 14, 2014)

In 2007 a Grassy Narrows fisherman pled guilty in a Kenora court to one count of unlawfully selling fish tainted by mercury contamination, contrary to the Ontario *Fish Inspection Act*. The fish were caught in Grassy Narrows Lake. Forensic tests on the fish, done at the Canadian Food Inspection Agency in Winnipeg, revealed mercury levels of 1.0 parts per million, twice the acceptable level of 0.5 parts per million. (Kenora Daily Miner and News, 2007)

A 2010 study by Grassy Narrows for the First Nations Environmental Contaminants Program found that 100% of fish flesh samples from the English-Wabigoon river area had mercury levels above the level at which Health Canada recommends against consumption by people who consume a lot of fish (0.2mg/kg). The study found 25% of samples were above the legal limit for commercially sold fish (0.5 mg/kg). (Sellers, 2010)

An earlier study found levels as high as 140% over the legal limit in a Grassy Narrows fish (Sellers, 2005). A wild foods study conducted by Hollow Water First Nation in nearby Manitoba found that concentrations of mercury in pickerel [a.k.a. walleye] flesh there was far lower, and ranged from 0.12 – 0.30 mg/kg. (Sellers and Scott, 2006)

The MOE *Guide to Eating Ontario Sport Fish* entry for Grassy Narrows Lake recommends that people in the 'General Population' not eat any walleye longer than 45 cm, and eat only 2 meals per month of walleye shorter than 45 cm. It recommends that women of childbearing age and children under age 15 eat no walleye and no northern pike. In safe lakes the guide recommends as many as 8 meals of walleye per month. (MOE online interactive Guide to Eating Ontario Sport Fish, accessed Jan. 14, 2014)

Many other lakes in Grassy Narrows territory are subject to similar warnings.

While mercury levels in fish in the area appear to have declined since the 1970's "there is evidence that this decline is either slowing or levelling off." Also, "current mercury levels are mostly higher than those in other regional water bodies." (Neff et al., 2012) Data in some lakes show an increase in mercury levels in walleye and pike since around 1995.

"Concentrations in the English-Wabigoon fish are elevated, and may still present a potential health risk to humans consuming fish from this system." (Neff et al., 2012)

CONCLUSION

Mercury levels in fish in many parts of Grassy Narrows territory are at critical levels and

despite some reductions have not returned to safe levels. Clearcutting and road building under the logging plan will further elevate these mercury levels. This will prolong and deepen the mercury problem.

5. Mercury Impacts Human Health in Grassy Narrows

SUMMARY

35 Years of study by renowned mercury expert Dr. Harada and his team have confirmed that people in Grassy Narrows are suffering from Minamata Disease as a result of methyl mercury ingested by eating local fish.

EVIDENCE

Doctor Harada's teams of researchers have studied mercury health impacts in Grassy Narrows for over 35 years starting in 1975.

"[I]t is an undoubtable fact that Minamata Disease occurred in [Grassy Narrows and White Dog], based on our long-term investigation result." (Harada et al., 2011)

Grassy Narrows people "were poisoned by eating fish contaminated with mercury." (Harada et al., 2011)

Findings by Harada et al., 2011

- 59% of the 160 people tested in GN and White Dog were affected by mercury.
- 34% were diagnosed with Minamata Disease (MD) using current Japanese diagnostic criteria (41% in GN --> 30 cases)
- 25% were diagnosed with suspected Minamata Disease (SMD)
- 44% of people aged 21-40 had MD or SMD. All these people were born after the mercury dumping was curtailed in 1971.

"[T]he possibility of congenital Minamata Disease occurrence is very high in these two communities. We examined 7 cases of cerebral palsy and 7 cases of mental deficiency…. Further epidemiological research on stillbirths and miscarriages needs to be done." (Harada et al., 2005)

All of Dr. Harada's patients who indicated mercury levels higher than the safety guideline of 50 ppm in 1975 were deceased by 2004. (Harada et al., 2005)

People in Grassy Narrows continue to eat fish as part of their sustenance, culture, and the exercise of their Aboriginal and Treaty rights.

"Methyl mercury is absorbed through the digestive tract and distributed throughout the body. It readily enters the brain, where it may remain for a long period of time. In a pregnant woman, it can also cross the placenta into the fetus, building up in the fetal brain and other tissues. Methyl mercury can also be passed to the infant through breast milk.

A child's developing nervous system is particularly sensitive to methyl mercury. Depending on the level of exposure, the effects can include a decrease in I.Q., delays in walking and talking, lack of coordination, blindness and seizures. In adults, extreme exposure can lead to health effects such as personality changes, tremors, changes in vision, deafness, loss of muscle coordination and sensation, memory loss, intellectual impairment, and even death." (Health Canada website, http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/environ/merc-eng.php, accessed January 14, 2014)

"Today, the main effects of mercury exposure to humans are understood to be neurological, renal (kidney), cardiovascular and immunological impacts. Chronic exposure to mercury can cause damage to the brain, spinal cord, kidneys, liver and developing fetus. Exposure to mercury while in the womb can lead to neurodevelopmental problems in children. Mercury can impair the ability to feel, see, move and taste, and can cause numbness and tunnel vision. Long-term exposure can lead to progressively worse symptoms and ultimately personality changes, stupor, and in extreme cases, coma or death. Recent findings have described adverse cardiovascular and immune system effects at very low levels." (Environment Canada website, http://www.ec.gc.ca/mercure-mercury/default.asp?lang=En&n=0EB35C98-1, accessed January 14, 2014)

"In addition, methylmercury has been classified as a possible human carcinogen by the U.S. Environmental Protection Agency. More recently, additional findings have described adverse cardiovascular and immune system effects at very low exposure levels." (Environment Canada website, http://www.ec.gc.ca/mercure-mercury/default.asp?lang=En&n=0EB35C98-1#TE, accessed January 14, 2014)

CONCLUSION

Clearcutting in Grassy Narrows Territory will cause the release of mercury, a deleterious substance. This mercury forms part of a process of degradation of water quality so that it is rendered deleterious to use by people of fish that frequent that water.

There are reasonable and probable grounds to conclude that the amount of mercury that will be released into the environment as a consequence of the logging plan constitutes an immediate, and long term, danger to the health of people in Grassy Narrows.

6. Efforts to Raise the Mercury Issue

Grassy Narrows has consistently objected to the planning process that MNR used for this logging plan and for Forest Management Plans generally. This process does not approach us within a government to government relationship with mutual respect. Instead, it treats us as a stakeholder, asking merely for our input that can be (and in our experience, has been) easily ignored. Only MNR or a proponent holds the pen. It does not provide adequate resources for First Nation community participation or the studies required to gather crucial environmental and traditional knowledge. It sets the wood supply as the highest objective, and compromises other objectives, those that are most important to Grassy Narrows to meet the wood supply targets.

However, when resources allow we have communicated our position, in a limited way, in the Forest Management Planning process for fear of being run over by it. We do so under duress and our limited input in no way indicates our agreement with the legitimacy of the process itself, or its outcomes.

When we do not participate, our absence is used as justification to ignore our concerns. When we do participate, our input is similarly ignored, and our presence is used to justify the process. After well over a decade of engagement we see little, if any, of our concerns reflected in the current logging plan.

Grassy Narrows has raised concerns about logging plans for our territory in the Whiskey Jack Forest through at least 3 cycles of the forest management planning process, with a written record dating back at least to 1997, and likely longer. Notably, this will be at least the 3rd request for an Individual Environmental Assessment of a logging plan from Grassy Narrows following those in 1999 and 2005. The first two requests were rejected, and so two early opportunities were neglected for the MOE and the EA process to catch the omission by the planning team of the logging-mercury problem after it was identified in the scientific literature.

Grassy Narrows has always asserted that the logging problem is connected to the mercury problem, and to the legacy of racism, residential schools, relocation, and hydro damming. We have also asserted our knowledge that everything in the environment is connected

and that the impacts of clearcutting will be felt throughout the ecosystem and eventually, in our bodies.

The scientific evidence on the impact of clearcutting on the mercury problem has come to our attention relatively recently, due to our lack of access to scientific resources. We have brought this information forward since 2010 (at least) with direct reference to the key scientific literature cited in this request. Our efforts have been heard and commented on publicly by Premier Wynne (then minister of Aboriginal Affairs), former Premier Dalton McGuinty, then-Minister of the Environment John Gerretsen, Minister of Natural Resources David Orazietti, MP Greg Rickford, then-federal Health Minister Leona Aglukkaq, among others. Our concerns about logging and mercury have also been widely reported in the news media both nationally, and locally. Therefore, our specific concerns about logging and mercury have been known by the planning team since the earliest stages of the development of the FMP, and even during the development of the Long Term Management Direction (LTMD).

A partial record of some of the instances where we have raised explicit concerns about the logging-mercury problem citing the scientific literature is recorded here:

a) Chief Fobister's letter to Premier Wynne, copied to the plan author, dated October 24, 2013.
b) Earthroots' comments sent to the plan author as submission re: EBR Registry Number 010-9240 – Forest Management Plan for the Whiskey Jack Forest for the 10-year period April 1, 2012 to March 31, 2022 – Review of Draft Forest Management Plan. No response received.
c) Approximately 2,000 submissions by members of the public to the plan author and the Premier before, during, and after the official public comment period for the logging plan. No response received.
d) Thursday August 22nd, public release of Joint letter (see next item). No response received.
e) Joint letter to Premier Wynne, copied to MNR District Manager and MNR Regional Director, June 25, 2013. No response received. Signatories represent over 1 million Ontario residents as members of: Amnesty International Canada, Canadian Friends Service Committee, Christian Peacemaker Teams – the Aboriginal Justice Team, Council of Canadians, Earthroots, Greenpeace Canada, KAIROS: Canadian Ecumenical Justice Initiatives, Ontario Federation of Labour, Ontario Secondary School Teachers' Federation, National Indigenous Anglican Bishop.
f) River Run 2012. A press conference, public speaking event, fish fry, march, and rally in Toronto. Then minister of Aboriginal Affairs Kathleen Wynne comments on the logging-mercury problem on CBC The Current and commits to renew relationship with Grassy Narrows to "get it right."

g) River Run 2010. A press conference, public speaking event, march and rally in Toronto. Then premier Dalton McGuinty tells the Toronto Star that he has "a heavy responsibility" to get to the bottom of the scientific reports on the mercury problem in Grassy Narrows.

A partial list of instances in which we have raised broad concerns about clearcutting, sustainability, and threats posed by logging to our way of life and health is included (and in most cases hyperlinked) below:

i) Letter from Chief Simon Fobister to MNR Minister Gravelle, and MNR Regional Director, re: LTMD – December 19, 2011.

ii) Grassy Narrows letters to Minister Jeffery about the LTMD – March 17, 2010, August 17, 2011, and October 31, 2011.

iii) Grassy Narrows letters to MNR Minister Cansfield about the contingency plan – October 27, 2008, and January 2009.

iv) Ontario Minister of Environment to Ontario Minister of Natural Resources re: decision to reject Grassy Narrows' request for an individual environmental assessment of the Whiskey Jack Forest Management Plan 2002-2023 – August 31, 2005

v) Grassy Narrows trappers letter to Ontario Ministry of Natural Resources unanimously stating their concerns on logging practices on Grassy Narrows' land – March 15, 2002

vi) Joseph B. Fobister to Ontario Ministry of Natural Resources re: concerns with the Whiskey Jack Forest Management Plan 2004-2025 – March 21, 2002

vii) Joseph B. Fobister to Ministry of Natural Resources re: Abitibi has made no efforts to discuss their plans with the First Nation – March 8, 2000

viii) Joseph B. Fobister to Minsitry of Natural Resources re: I ask that your government stop violating the Treaty rights of the Grassy Narrows First Nation – March 7, 2000

ix) Grassy Narrows First Nation Environmental Committee to Ontario Ministry of the Environment expressing concerns with clearcut logging on their traditional land – June 17, 1999

x) Ontario Ministry of the Environment to Ms. Roberta Keesick and Ms. Judy DaSilva re: rejection of requested individual environmental assessment on the Whiskey Jack Forest Management Plan. May 19, 1999.

xi) Letter from Chief William Fobister Sr. Grassy Narrows First Nation to Honorable Robert Nault Member of Parliament, Kenora-Rainy River. Re: lack of meaningful response to letter to Minister of Indian Affairs, Minister of Natural Resources, and Minister of Environment regarding concerns about logging on Grassy Narrows' land – April 15, 1999.

xii) Grassy Narrows First Nation Chief and Councillors to Minister of Natural Resources and Minister of the Environment – January 8, 1999.

xiii) Grassy Narrows First Nations Member, Chrissy Swain, letter to Abitibi, criticizing how their logging has impacted her life. Date unknown.

7. Measures in the Logging Plan to Deal with the Mercury Problem

The logging plan text does not contain the word 'mercury.' The supporting documents for the logging plan also do not contain the word 'mercury.' There is no discussion of the context of elevated mercury levels and human health impacts in the planning area. There is no discussion of the known impacts of clearcutting on water quality, fish, and on human health. There is no discussion of measures to prevent the release of mercury into the local water and food chain. There is no discussion of how measures will be adapted to the unique local context of elevated mercury levels and consequent human health impacts.

There is no evidence that mercury issues were identified, evaluated, and addressed anywhere in the FMP. Harvesting methods, volumes, Area of Concern prescriptions, and other operational prescriptions appear to be largely the same as those used in other parts of the boreal forest in Ontario (see later sections for a discussion on their content and shortcomings).

In particular, the approved logging plan allows for activities that are likely to raise mercury levels including the following:

- use of clearcutting (for 100% of harvesting)
- extraction of large volumes of wood
- road building and creation of machine tracks
- extensive use of heavy machinery
- logging in close proximity to the shoreline and shoreline wetlands
- logging in close proximity to wetlands
- logging in close proximity to fish spawning areas and wetlands which drain into fish spawning areas
- logging in close proximity to moose aquatic feeding areas
- heavy machine operation in close proximity to the shoreline and wetlands
- extensive cutting close to the English and Wabigoon Rivers and their catchments
- cutting in the catchments of lakes, rivers, and streams used for fishing and trapping, and bodies of water that flow into them
- extensive cutting close to the reserve

The *Crown Forest Sustainability Act* and the *Forest Management Planning Manual* also

do not contain the word ‘mercury.’

The *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scale* (Stand and Site Guide) contains no measures specifically designed to avoid mercury impacts from logging. It only mentions mercury in relation to logging in the section titled “What to evaluate - identifying key uncertainties” (Section 7.2 p.165, 166) [see appendix I for a full excerpt of the relevant text]

Here it asks the question of whether or not current forest practices “retain sufficient residual forest within catchments to ensure that hydrological effects resulting from forest management operations: i) do not exceed those observed in naturally disturbed catchments and ii) do not exceed acceptable levels for specific parameters (e.g. methyl mercury)?”

The Stand and Site Guide goes on to name a few current studies on the impacts of harvesting on water quality, nutrients, and flow in streams. However, it concludes by noting that the MNR considers these studies to be inadequate because “their ability to assess effectiveness of direction relative to emulation of natural disturbances is limited and this question should be a high priority for consideration within MNR’s effectiveness monitoring program.”

Thus, the Stand and Site Guide acknowledges that the MNR does not know whether current logging practices will elevate methyl mercury levels.

8. Stand and Site Guide Rationale on Mercury

The *Stand and Site Guide Background and Rationale for Direction* document (the rationale) contains a general discussion of the mercury impacts associated with logging under the heading of “Mercury and catchment-scale effects.” (p. 21-25) [see appendix II for a full excerpt of the relevant text]

The rationale can be summarized in three key points:

1. Logging is essentially equivalent to fire so attempts to emulate fire will eliminate Hg impacts.
2. Existing measures in the Stand and Site Guide implement sufficient mitigation measures. No additional mercury specific measures are required.
3. The MNR will monitor to see later if 1 and 2 above are not true.

We will summarize at greater length below.

After a discussion of some mercury sources and methylation processes the rationale states:

> Studies in Finland have shown that forest management activities can lead to an increase in the concentration of total mercury and MeHg in groundwater and surface waters (Munthe et al. 2007a, Povari et al. 2003, Povari and Verta 2003). Recent research conducted in Quebec has shown that mercury levels in periphyton, plankton, and fish in lakes within watersheds that have been disturbed by forest management activities or fire (sic) are higher than in undisturbed lakes (Garcia and Carignan 1999, 2000, 2005; Desrosiers et al. 2006).
>
> These results have raised concerns over the impact of forest management activities on mercury levels in aquatic systems and the potential risk this may pose to wildlife and humans consuming fish.

A following section is titled "Implications for direction in this guide." The statements in this section are summarized here, and then discussed in further sections.

The general mitigation approach is based on the concept of natural disturbance emulation and is summarized in the first sentence. "Removal of trees from catchments by timber harvest or wildfire is associated with generally similar changes in the hydrology, chemistry, and biota of lakes and streams."

The rationale argues that the cumulative effect of logging operations "will result in a level of catchment-scale disturbance that is within the range of that associated with natural disturbances. Thus, there is no additional fine filter direction prescribed to mitigate the general catchment-scale effects of timber harvest."

This conclusion was reached by comparing the size and shape of planned logging footprints to the size and shape of the pre-suppression natural disturbance footprint.

The potential for difference between the impacts of fire and logging is dealt with by pointing to the high priority research question noted earlier in Section 7.2 of the Stand and Site Guide.

Next the rationale states:

> There is fairly compelling evidence that timber harvest (and wildfire) results in an increase in the movement of mercury from

> terrestrial to aquatic environments where it may be converted to MeHg. Associated with this, there is a growing concern about the associated potential risk to wildlife and human health.

The rationale goes on to argue that mercury is transported bound to particulate organic matter and may be methylated in 'hotspots.'

It then claims that while there are no specific measures for mercury in the Stand and Site Guide, existing measures regulating site disturbance, hydrological disturbance, sedimentation, and buffers are sufficient to mitigate mercury impacts.

It concludes with a section justifying the elimination of catchment level disturbance thresholds that were in previous guides.

9. Fundamental Problems with MNR Rationale

A. Natural Disturbance Emulation Not Appropriate for Mercury Safety

SUMMARY

The first pillar of the MNR rationale is that boreal logging is designed to emulate natural disturbance, and in particular forest fire. Since logging is designed to emulate fire, it is claimed that the impacts will be similar to those that occur naturally in this ecosystem, and therefore they are acceptable.

However, when it comes to mercury, this argument is not borne out by the scientific evidence.

Logging and forest fire have nearly opposite impacts on mercury. While large fires remove mercury to the atmosphere, logging mobilizes mercury into local water bodies and increases the bio-accumulation of mercury in the aquatic food chain. Natural disturbance emulation does not prevent mercury impacts.

EVIDENCE

Forest removal by fire and harvesting has different effects on the physical and chemical properties of watersheds and lakes [11,19]. (Carignan et al., 2000, and Bormann and Likens, 1979, as cited in Garcia and Carignan, 2005)

"Concentrations of DOC, and light extinction coefficient tended to be highest in the forest harvested lakes, whereas concentrations of chlorophyll a, SO^{2-}_4, total P, and total N generally were the highest in the fire-impacted group. (Garcia et al., 2007)

The different physical and chemical effects of fire and logging on lakes have different impacts on fish habitat and lead to different impacts on mercury levels in fish.

"Contrary to forest fires, clear-cut logging results in increased MeHg accumulation in aquatic organisms." (Garcia et al., 2007)

In summary, "fish from lakes with harvested catchments tended to show higher total mercury (Hg) levels relative to fire-impacted and undisturbed lakes. (Garcia and Carignan, 2000, 2005, as cited in Garcia et. al., 2007)

Two studies "compared effects of wildfire and clear-cut logging on MeHg in zooplankton and on total Hg in northern pike (*Esox lucius*), a top predatory fish [8.9]. Those results showed that high MeHg and total Hg were associated with clear-cut logging but not with wildfires." (Garcia and Carignan, 1999, 2000, as cited in Garcia and Carignan, 2005)

In a third study "Hg concentrations exceeded the advisory limit for human consumption (0.5 ug/g wet wt) from the World Health Organization in all top predatory species (northern pike, walleye, and burbot) found in cut and two partially burnt lakes." (Garcia and Carignan, 2005)

"This limit was surpassed in only 18% of piscivorous species populations found in reference lakes and in no species from completely burned lakes." (Garcia and Carignan, 2005)

A similar trend has been documented lower in the food chain in zooplankton. (Garcia and Carignan, 1999)

"High MeHg and total Hg were associated with clear-cut logging, but not with wildfires." (Garcia and Carignan, 1999, 2000, as cited in Garcia and Carignan, 2005)

While one study found that fish had elevated mercury levels in two lakes that experienced small fires, this finding is of limited relevance. The large majority of the area impacted by fire in Ontario in a natural fire regime is impacted by large fires, which have been found not to significantly raise mercury levels in fish compared to undisturbed reference lakes.

"Fires greater than 200 ha represent 97% of the area burned." (NOAA National Severe

Storms Laboratory, as cited in MNR FireSmart Questions and Facts – Fire Ecology Facts on www.mnr.gov.on.ca/en/Business accessed on January 8, 2014)

There are plausible theories that explain the observed difference in mercury impacts between logging and large forest fires. They include:

"In clear-cut areas, the organic soil is preserved, whereas intense fires tend to mineralize this layer. Therefore, higher DOC concentrations in cut lakes could explain the higher Hg levels observed in fish sampled in these lakes." (Garcia and Carignan, 2005)

"[D]uring high-intensity fires, most of the inorganic Hg pool in the soils could be reduced to Hg^0 and emitted to the atmosphere [7]." (Sigler et al. 2003, as cited in Garcia and Carignan, 2005)

"Alternatively, the high phytoplankton biomass observed in the studied burnt lakes (Planas et al., 2000) may have caused a biological dilution of the available Hg (Pickhard et al., 2002)." (Garcia et al., 2007)

The scientific evidence clearly shows that clearcutting and natural fire disturbance have dramatically different impacts on mercury in fish. Clearcutting increases mercury levels in fish, often above the level for safe human consumption.

On the other hand, 97% of the fire impacted landscape is subject to large fires which have been found not to increase mercury levels in fish significantly. In fact, intense fire may be a major pathway for mercury out of boreal watersheds and back into the atmosphere.

Current fire suppression has altered the fire interval from a historical range between 20 and 100 years to a current interval estimated at over 560 years. (MNR FireSmart Qustions and Facts- Fire Management Facts, www.mnr.gov.on.ca/en/Business/AFF accessed on January 8, 2014). Logging and fire suppression is planned for approximately 95% of the productive Crown forest in the Whiskey Jack.

The MNR may argue that while clear-cutting does not effectively emulate large natural fires when examining mercury impacts on fish, natural disturbance emulation remains the best approach due to its other claimed desirable benefits. The larger question of the ecological efficacy of natural disturbance emulation is beyond the scope of this request. The ECO calls natural disturbance emulation "a massive experiment on public lands." (Environmental Commissioner of Ontario. 2002)

Regardless of how this question is answered for other parts of the Province, in Grassy Narrows, where fish are known to currently have critical levels of mercury that are impacting human health, the mercury impacts of logging must take precedence over other perceived benefits/considerations.

CONCLUSION

Replacing fire with clear-cutting on the landscape will dramatically increase mercury levels in fish. It will also likely eliminate an important natural pathway for mercury out of the watershed.

B. Mitigation Science is Not Sufficiently Developed

SUMMARY

The second pillar of the MNR rationale is the claim that pre-existing measures, which were not designed with mercury issues in mind, happen to constitute effective mitigation measures. While there are no forestry regulations that explicitly deal with mercury, the MNR rationale claims that "there are many pieces of direction in the guide that will address these [mercury] concerns… Thus, there is no [measure] prescribed to mitigate the catchment-scale effects of timber harvest on mercury export."

EVIDENCE

Most fundamentally, this argument depends on the existence and implementation of proven mitigation measures to prevent mercury export and bioaccumulation. However, the science behind mercury mitigation is undeveloped. We know of no peer reviewed scientific journal articles that experimentally test and evaluate mitigation measures for mercury and logging.

There is one journal article exploring best practices. Due to the lack of studies on these processes in forest soils the article engages in a theoretical discussion based on findings from sediments and wetland soils. It notes that "[t]hese theoretical discussions, however, need to be verified by experiments both in the field and in the laboratory." (Bishop et al., 2009)

The article makes a number of other cautionary statements about mitigation measures:

"An understanding of the process controlling the output of Hg from catchments to surface waters, and subsequent bioaccumulation, is not sufficiently developed to confidently recommend ameliorative measures for forestry." (Bishop et al., 2009)

"[T]here is an urgent need to advance our understanding of the way in which forestry influences the cycling of Hg, and its bioaccumulation in aquatic ecosystems." (Bishop et al., 2009)

While there is clear experimental evidence that logging elevates mercury levels in fish above safe levels, there are no experimentally tested or proven mitigation methods. Therefore there is no experimental scientific evidence supporting the MNR claim that their mitigation measures will work.

To the contrary, studies in Quebec which identified the logging-mercury problem examined clear-cuts which included many of the measures that the MNR is currently claiming as mitigation measures. Those clear-cuts "were of the CPRS type (cut with protection of regeneration and soils). Cut block size generally ranged from 5 to 50 ha but occasionally reached 200 ha, with 20-m buffer strips fringing permanent streams, lakes and wetlands." (Garcia et al., 2007) This suggests that measures similar to those in the logging plan, which are intended to avoid site disturbance, hydrological disruption, and sedimentation are not sufficient to avoid mercury impacts.

While the existence of the mercury problem is relatively straightforward to identify, understanding the mechanisms that underlie it is a far more complex, and relatively unstudied, problem. Once the mechanisms are understood, developing and testing effective methods to mitigate against those impacts is a further complex problem that has received no published scientific experimental attention.

Given the multi-variate complexity of forest and aquatic ecosystems, and the added complexity of their interactions, our predictive capabilities in this system are currently limited to non-existent. The claim that current mitigation methods will work is an educated guess at best.

CONCLUSION

The MNR claims to be mitigating the dangerous bioaccumulation of mercury using measures for which there is no experimental evidence. This approach does not meet the standard that requires the Minister to be reasonably "satisfied that the plan provides for the sustainability of the Crown forest, having regard to the plant life, animal life, water, soil, air and social and economic values, including recreational values and heritage values, of the Crown forest. (CFSA 1994, c. 25, s. 9 (2))"

The question of whether the measures are consistent with the limited theoretical conjecture on mitigation best practices will be discussed later.

C. Log Now, Test Later Approach.

SUMMARY

The third pillar of the MNR rationale is that mercury export is specifically identified in Section 7.2 of the Stand and Site Guide as a priority for effectiveness monitoring. The MNR contends that if the current measures (natural disturbance emulation and mitigation through existing practices) do not work sufficiently, this will be determined by effectiveness monitoring.

DISCUSSION

There are a number of problems with this approach:

1. Mitigating a scientifically known problem with untested measures does not solve the problem with any reasonable degree of confidence (See section 9B above re: Mitigation Science is Not Sufficiently Developed). This is not an acceptable approach when dealing with a neurotoxin in an area with a history of contamination and ongoing human health impacts.
2. The planned mitigation measures do not comply with theoretical best practices, and there are clear deficiencies in the planned mitigation measures that indicate that they are unlikely to succeed. (see Section 9A above re: Natural Disturbance Emulation Not Appropriate for Mercury Safety and Sections 12, 13 below).
3. The MNR presents no details about the monitoring effort. When will it be done? Where will it be done? How will it be done? Who will do it? When will the results be peer reviewed and published? How will the results influence logging practices and how will this be determined? If the monitoring identifies that the current measures are insufficient, when will new measures come into effect?
4. The monitoring of mercury impacts was given a high priority by the MNR in the Stand and Site Guide in 2010. And yet there is no discussion of the preliminary results of this monitoring in the logging plan. It appears that this monitoring program has not informed the logging plan in any way. We ask for a report on the current status of this high priority monitoring program now, 3.5 years after the MNR identified it as a priority.
5. The mercury impacts of clearcutting need to be studied over time in order to be understood. The scientific process of study design, implementation, analysis, review, and reporting also takes time. It could easily take a number of years for monitoring to determine whether current mitigation measures are effective. Throughout that time more mercury will likely continue to be added into the food chain in Grassy Narrows through clearcutting. The health impacts of this neurotoxin are irreversible and can have life-long impacts on fetuses and children.
6. If monitoring reveals that current measures are insufficient, then new mitigation measures would presumably be introduced. Those mitigation measures may also be untested and unproven, but the MNR would identify monitoring of those measures as a high priority. Another long, but unspecified, amount of time may pass before it becomes apparent whether those measures are effective. Mercury could be added to

> the food chain by logging for another long period of time, and this could be repeated indefinitely through multiple iterations of the log now and test later rationale.

This approach is particularly unacceptable in the specific circumstances of Grassy Narrows and methyl mercury poisoning.

CONCLUSION

The MNR provides no scientific experimental evidence that their mercury mitigation measures are effective. Instead, they say that they will monitor to test this, while providing no details about this monitoring program. This "log now, test later" approach is likely to lead to increased bioaccumulation of mercury in Grassy Narrows' food chain with serious and long-lasting impacts (see section 11 below re: Duration and Intensity of Impacts).

10. Delay and Hardship

The MNR and the logging industry may argue that they cannot afford to wait for proven mitigation methods. The argument that honouring Grassy Narrows' human rights would cause the logging industry to suffer hardship has been used to trump Grassy Narrows' concerns repeatedly, including in the rejection of the 1999 request for IEA.

The long term trend of prioritizing industrial interests at the expense of Grassy Narrows has had devastating consequences. It has led to a compounding series of harmful actions imposed on Grassy Narrows including the damming of their river to supply power for the logging and mining industries, the dumping of 20,000 pounds of mercury into their river by a paper mill, and the clearcutting of their forests. The cumulative impact of these decisions has placed the health, culture, livelihood, and rights of Grassy Narrows in a degraded and precarious position where the impacts of further harm are likely to be magnified, intense, and long lasting.

Beyond this, we argue that all regional mills could have their real wood supply needs met without the use of wood from Grassy Narrows Territory. This has largely been the case since June 2008, so granting our request would preserve the *status quo*, not upset it.

Rainforest Action Network and the Wildlands League have prepared two reports that support our assertion on the existence of a long-term alternative wood supply by analyzing the MNR's own public wood supply data. The Kenora Daily Miner and News reported in 2008 that:

> [while] forest industry liaison for Thunder Bay Region, Pat Corbett, agreed with the general thrust of a report from environmentalists about area wood supplies, he didn't necessarily agree with their conclusions. "I've seen the RAN report," he said, of the Rainforest Action Network

> report that asserts there is enough wood to supply Kenora mills without infringing on the Grassy narrows traditional lands. “Essentially, the theme is correct. It’s just a matter of can Weyerhaeuser afford to transport the wood (to its iLevel plant in Kenora).”

The report only examined wood supplies that are within a hauling radius from Kenora that is similar to hauling distances from within the Whiskey Jack Forest. These hauling distances are significantly shorter than the distance from the Whiskey Jack Forest to Fort Frances, a hauling route that was previously in heavy use. Therefore, utilization of alternative supplies should result in only minor increases in hauling costs, if any, that are within the range commonly used in the region.

The impacts of incremental increases in hauling costs pale in comparison to the multi-generational impacts of mercury poisoning in Grassy Narrows. If the question of comparative impacts and alternative wood supply is taken up by the MOE we have further information to supply on this matter.

On the issue of delay the MNR and the logging industry are the authors of their own misfortune because they have chosen not to deal meaningfully with this problem for 17 years.

“The potential role that forest management has in the Hg problem throughout [the boreal] region was identified over a decade ago, particularly the need to define and evaluate the prospective management alternatives, such as riparian buffer zones, that might mitigate the enduring threat posed by Hg output from catchment soils to surface waters (11).” (Bishop et al., 1997 as cited in Bishop et al., 2006).

Given that the problem was identified, and published, in 1997, the MNR and the logging industry have had ample time to study the problem and to test mitigation measures experimentally. The Government of Ontario and the logging industry have ample resources at hand to support academic research on this question if they choose to.

Instead, discussion of mercury first appeared in forestry guidelines in Ontario in 2010, 13 years after the problem was identified. This discussion introduces no new measures to mitigate mercury impacts, but rather mandates the use of pre-existing forest practices. To make matters worse, the new guidelines are likely to be even less effective at mitigating mercury impacts than previous guidelines because they weaken protections by allowing logging to the shoreline and by removing catchment disturbance thresholds (see Sections 12A and 12B below). Given that the MNR's claimed mitigation practices were pre-existing, there is no reason that their efficacy could not have been tested previously.

In addition, Grassy Narrows has requested for many years that the government of Ontario fund the establishment of a permanent environmental health monitoring station in Grassy Narrows. This would have allowed Grassy Narrows to collaborate with academic experts

to engage in monitoring and study that could have shed light on these questions. However, those requests have never been answered.

Ontario, the MNR, and the logging industry chose not to monitor the impacts of logging practices on mercury for over a decade after the problem was identified. So they have only themselves to blame for the current lack of experimental evidence supporting their claim that Ontario's forest practices prevent mercury impacts. Grassy Narrows should not pay with their health for Ontario's failure to study solutions to this problem.

11. Duration and Intensity of Impacts

SUMMARY

If further clearcutting is allowed without proven mitigation measures, and methyl mercury levels in local fish are elevated as a result, the impacts would likely be grave and long lasting.

EVIDENCE

Clear-cutting has been found to increase MeHg bioaccumulation in boreal lakes by two- to four fold, and sometimes as much as eight fold. (Bishop et al., 2009)

Scientists estimate that as much as 37% of the Hg in fish across a managed forest landscape would result from the increased Hg outputs associated with felling and thinning. (Bishop et al., 2009)

The MNR claims that "the transitory effects of both fire and harvesting on water quality appear to have limited impact on fish assemblages (St. Onge and Magnan 2000; Steedman 2003; Tonn et al. 2003, 2004)." (Stand and Site Guide Rationale, p.104)

This conclusion appears to be false when it comes to mercury.

The impacts of clearcutting on mercury have been found to persist for at least five years, with no known end point.

"The Hg in fish higher in the food chain continued to increase several years after the harvest." (Garcia and Carignan, 2000, 2005, as cited in Bishop et al., 2009)

"The increased Hg loading effect has also been observed to persist up to at least 5y, and

there are no examples so far of the logging effect having dissipated." (Bishop et al., 2009)

For the purposes of extrapolation Bishop et al., 2009 estimate that logging impacts on mercury will last a decade.

It has been found that the effects of clearcutting alone are often sufficient to raise mercury levels in fish above the limit for safe human consumption. (see Section 2 above re: Logging Elevates Mercury Levels in Fish) It is also known that mercury levels in lakes and rivers in Grassy Narrows Territory are already at, or near the safety limit. (see Section 4 above re: Fish in Grassy Narrows Have Critical Levels of Mercury)

Therefore logging is likely to:

i) Further elevate the mercury level in fish in previously contaminated lakes.

ii) Prolong the length of time for which fish in previously contaminated lakes remain unsafe to eat.

iii) Elevate the mercury levels in fish in marginally safe lakes above the safety limit.

iv) Elevate mercury levels in fish in currently safe lakes above the safety limit.

Clearcutting leads to higher Dissolved Organic Carbon (DOC) compared to reference lakes and burned lakes. (Garcia and Carignan, 2005) In addition to acting as a vector of Hg from terrestrial to aquatic ecosystems (Kalbitz et al., 1998), DOC also:

a) stimulates bacterial methlyation of Hg; (Matilainen, 1995)

b) decreases MeHg photodegradation; and (Sellers et al.,1996)

c) possibly decreases the photoreduction of Hg (II) to Hg(0) in lakes. (Haines et al., 1994)

(all as cited in Garcia and Carignan, 2005)

Effects b) and c) are likely due to lower light penetration associated with higher DOC.

This means that clearcutting in Grassy Narrows' English-Wabigoon River watershed may have even greater impacts on fish mercury levels than in areas previously studied, which have no historical point source of contamination.

Approximately 20,000 lbs of mercury were dumped into the Wabigoon River by a paper mill at Dryden between 1962 and 1970. (Hutchison, 1977) This dumping occurred with the permission of the government of Ontario. No clean-up has been attempted. (Neff et al., 2012)

Sediment studies show that the English-Wabigoon river system continues to have mercury levels in sediment that exceed background levels, and in some locations, continue to increase. (Sellers, 2011) If logging exports DOC into these water bodies it will not only transport new mercury and methyl mercury into the water, it may also intensify the impact of pre-existing mercury contamination by increasing the rate at which it is methylated, decreasing the rate at which existing MeHg is photodegraded, and decreasing the rate at which existing Hg(II) it is photoreduced.

It is well known that people in Grassy Narrows continue to eat the fish in their territory, with a focus on walleye, as part of their subsistence, culture, and the exercise of their inherent, Aboriginal and Treaty rights. (Comments by Wynne on CBC radio 2012, Scars of Mercury movie, CBC The National 2010)

There is clinical evidence that Minamata Disesase is impacting people born long after the historic point source contamination was terminated. And there are indications that congenital Minamata Disease may continue to afflict children born in Grassy Narrows today. (Harada et al., 2005, 2011) (see Section 5 above re: Mercury Health Impacts in Grassy Narrows)

Therefore it is likely that mercury released, or methylated, through the impacts of clearcutting in Grassy Narrows will:

i) bio-accumulate in fish which are eaten by people in Grassy Narrows;

ii) intensify health impacts in people already suffering from mercury-related health problems in Grassy Narrows;

iii) contribute to causing new health impacts in currently health people in Grassy Narrows;

iv) contribute to causing congenital mercury poisoning in fetuses; and

v) reduce the number and/or proximity of lakes with safe fish which some Grassy Narrows people can access.

As previously discussed, methyl mercury is a potent neurotoxin, and may also impact the cardiovascular system, the immune system, the kidneys, (Environmental Commissioner, 2009) mental health, and other aspects of human health.

The human health impacts of mercury are mostly permanent, cumulative, and irreversible.

CONCLUSION

The impacts of releasing mercury into the environment in Grassy Narrows through clearcut logging are likely to last at least a decade in fish, and at least one human lifespan beyond that in people.

12. Changes to Guidelines Are Likely to Make Mercury Problem Worse.

A. Logging to the Shoreline

SUMMARY

Current Areas of Concern prescriptions for lakes are weaker than the previous prescriptions and allow logging to the shoreline. These Areas of Concern prescriptions are likely to allow impacts including transport of DOC, as well as increased wind exposure. These contribute to MeHg bioaccumulation.

EVIDENCE

Riparian buffers are one measure that is hypothesized to help mitigate mercury impacts. (Bishop et al, 2009)

Previously, Areas of Concern for lakes required that vegetation on shorelands be maintained, leading to no-cut reserves generally between 30m and 90m in width (and sometimes greater to reduce the risk of blowdown). (Timber Management Guide for the Protection of Fish Habitat (TMGPFH), 1988 P.10) These reserve widths were based on recommendations to prevent watercourses from input of sediment. (TMGPFH, 1988 P.10)

This Area of Concern design preceded identification of mercury problems and did not take into account a number of relevant factors that we now know are likely important for preventing unacceptable levels of mercury transport and methylation. These include:

i) The buffer widths are based on preventing the flow of sediment into watercourses. However, dissolved organic carbon (DOC) is a primary vector for mercury export and catalyst for methlyation due to clearcutting. DOC does not appear as particulate matter. It is generated through different processes, and travels differently. In particular DOC can be carried in sub-surface flows.

ii) The buffers are narrowest for low slopes, and widest for steep slopes. Mercury research would suggest the opposite. Mercury impacts are inversely correlated with catchment slope. (Desrosiers et al., 2006)

iii) There is no evidence that these buffer widths are sufficient for mitigating MeHg bioaccumulation.

Point ii) above is contrary to specific recommendations made in the scientific literature. Desrosiers et al., 2006 write:

> Before government permits are issued to forestry companies, authorities should seriously scrutinize the watershed morphometric characteristics, particularly its slope. Our study suggests that lakes within watersheds that have a mean slope under 7.0% are much more sensitive to logging, even if a small relative area of the watershed is cut."

Rather than updating these Areas of Concern prescriptions to reflect the current state of mercury science, the changes in the new Stand and Site Guide introduced in 2010 make them even weaker, and less likely to sufficiently mitigate mercury impacts. These counter-effective changes include:

i) allowing logging within shoreline Areas of Concern, including logging up to the shoreline. This approach is likely to increase both sediment and DOC flows. It is also likely to increase wind exposure which effects thermal stratification, dissolved oxygen concentrations, and ultimately fish habitat (Garcia et al., 2007);

ii) allowing road building and machine tracks within shoreline Areas of Concern. Machine tracks have been found to dramatically increase mercury export (Munthe et al., 2004);

iii) weak, aspirational conditions on identifying and protecting hydrological connections, including ephemeral streams, seeps, and springs (see Section 13 below re: Specific Deficiencies in MNR Mitigation Measures);

iv) weak conditions on protection for likely methylation hotspots including wetlands, and logging the entire shoreline of some woodland pools and ponds;

v) retention of the direct correlation between slope and Area of Concern width.

These changes are justified using the logic of natural disturbance emulation, which does not work for mercury mitigation (see Section 9A above re: Natural Disturbance Emulation Not Appropriate for Mercury Safety).

The changes are likely to make mercury impacts from logging more intense than under the previous guidelines.

"Forest removal, for example, may increase wind exposure, alter water clarity and decrease light penetration in lakes, therefore affecting thermal stratification, dissolved oxygen concentrations, and ultimately fish habitat." (Steedman & Kushneriuk, 2000; Scully, Leavitt, & Carpenter 2000, as cited in Garcia, Carignon, & Lean 2007)

It appears that the purpose of the Areas of Concern has been turned on its head. Instead of being designed to confidently protect water quality and fish habitat it is now designed to emulate natural disturbance on the false assumption that habitat protection will flow from this.

It appears that any references to the Areas of Concern in the mercury rationale are after the fact attempts to dress up measures that were developed without mercury mitigation in mind.

CONCLUSION

A number of important Areas of Concern prescriptions for water bodies are less likely to sufficiently mitigate mercury impacts on water quality and fish than previous prescriptions that were designed without any consideration for mercury.

B. Catchment Disturbance Thresholds Removed

SUMMARY

The *Forest Management Guide for the Protection of the Physical Environment* (OMNR 1997) included a general rule that no more than 50% of a second order watershed be harvested in a 10 year period. This direction was not included in the new Stand and Site Guide. The MNR rationale explains that it was dropped because it was deemed arbitrary, ineffective, unnecessary, and conflicting with principle of natural disturbance emulation.

EVIDENCE

Earthroots agrees that the 50% figure for catchment disturbance threshold is arbitrary, but we generally reach opposite conclusions from the MNR based on the scientific literature on MeHg bioaccumulation. We argue that the disturbance threshold likely needs to be made much stronger.

The MNR rationale notes that "changes in the communities of some biota, such as benthic invertebrates, have been detected in streams associated with <25% catchment disturbance (Martel et al., 2007, Kreutzweiser et al., 2008a)."

One study suggested that "lakes with watersheds that have mean slopes less than 7.0% are much more sensitive to logging, even if a small relative area of watershed is cut. For example, the MeHg concentration in periphyton of [lake] K3 increased 9.5- fold when only 26% of the watershed was logged." (Desrosiers et al., 2006)

Another study found "a significant correlation between MeHg in zooplankton and deforested catchment area (DEF) normalized to lake volume (VOL) in forest harvested lakes…" (Garcia et al., 2007)

The DEF:VOL ratio has been shown in turn to explain 86% of the variability of DOC in forest harvested lakes (Carignan et al., 2000)." (Garcia et al., 2007)

We briefly discuss each of the MNR's key points in the rationale below:

a) **MNR:** It is difficult to determine what the appropriate geographic response unit is.

Earthroots: For headwater lakes it is easy to determine the appropriate geographic response unit. Clearly, it is their catchment area.

For other bodies of water the answer to this question can be determined experimentally through the use of methods including isotope tracking and/or or pre and post-logging monitoring experiments.

b) **MNR:** Different catchments show hydrological responses at different levels of disturbance.

Earthroots: This may be true, but it does not justify the removal of any threshold whatsoever. The complexity of this question should give rise to caution, not the abandonment of the duty to sustainability.

The DEF:VOL ratio appears to be key to explaining the extent of mercury impacts in logged lakes (including DOC export and MeHg in zooplankton).

This implies that catchment disturbance level thresholds may be important to preventing mercury impacts.

There is also evidence that mean watershed slope plays an important role.

c) **MNR:** A hydrological response is not necessarily negative as the response (e.g., increased water yield) is often consistent with a naturally disturbed system.

Earthroots: As discussed earlier hydrological responses in logged catchments lead to mercury levels in fish above the limit for safe human consumption. This is clearly negative.

This is not consistent with natural disturbance due to fire (see section on Natural Disturbance).

d) **MNR:** Current logging guidelines are expected to produce a natural pattern of disturbance (and retention) at multiple scales.

Earthroots: Natural disturbance emulation is not a valid approach to mitigating MeHg bioaccumulation. (see Section 9A above re: Natural Disturbance Emulation Not Appropriate for Mercury Safety)

e) **MNR:** The 2nd order catchment rule has the potential to be contradictory to the CFSA's principle of emulating natural disturbances and landscape patterns.

Earthroots: The CFSA's primary principle is sustainability including regard to water quality and fish. Natural disturbance emulation is only valid insofar as it achieves sustainability.

CONCLUSION

The scientific literature supports the common sense inference that logging a larger portion of a catchment will have a larger impact on the mercury problem. The removal of this threshold is likely to lead to mercury impacts of a greater magnitude than before. Rather than removing the threshold, the threshold should be strengthened to a level that can be experimentally proven to prevent MeHg bioaccumulation with a high degree of confidence.

13. Specific Deficiencies in MNR Mitigation Measures

SUMMARY

The measures identified in the Stand and Site Guide Rationale for mercury mitigation are inadequate and do not even meet theoretical best practices. The Stand and Site Guide:

i) contains no measures designed to mitigate mercury impacts, it simply points to existing measures that were designed for other purposes;

ii) only points to measures that address a small subset of the mechanisms theorized to underlie the mercury problem;

iii) contains measures that are weak, open to wide discretion, and often lack numerical limits;

v) iv) offers no experimental evidence that these measures work for mercury (see section 9B above re: Mitigation Science Not Sufficiently Developed); and significantly weakens key measures from previous guides (see sections 12A and 12B above re: Logging to the Shoreline, and Catchment Disturbance Thresholds Removed, respectively).

DISCUSSION

The MNR rationale claims that no specific mercury related measures are needed because existing pieces of direction happen to deal with mercury concerns.

The Rationale section on "Implications for direction in this guide" identifies two potential mechanisms of the mercury problem:

a. Mercury export bound to particulate organic matter; and
b. the creation of methylation 'hotspots'.

However, these two potential mechanisms are only a small subset of the mechanisms that

mercury mitigation theory identifies. Notably, the mercury rationale "Implications for direction" makes no mention of the role of dissolved organic matter (DOM) and raised groundwater tables which are thought to be key to the transport and methylation of mercury after logging.

Bishop et al, 2009 summarize that "the key processes by which clear-cutting and thinning operations may enhance mobilization of Hg/MeHg and production of MeHg are:

i) raising the groundwater table to surface horizons with a high potential for MeHg production;
ii) increasing output of easily degradable plant debris;
iii) increasing DOM concentrations in soils and runoff;
iv) increasing inorganic sulfide concentrations in soils; and
v) changing the biogeochemical input lakes, which has complex limnological implications including changes in the biomagnification of Hg.

Next, the Rationale "Implications for direction" names broad sections of the Stand Site Guide that the MNR claims will mitigate the two mercury mechanisms that they list. Those measures are:

i) reduce the creation/mobilization and transport of particulate matter (S5.2, S4.1, S45.1;
ii) maintain hydrological function and connectivity (S5.2, S3.2, S4.1); and
iii) minimize disturbance of potential methylation 'hotspots' (S.32, S4.1).

However, these measures were not designed with mercury mitigation in mind. Most are based on previous measures that were developed to prevent sedimentation before the identification of the logging mercury problem. Where the measures have been updated they have generally been weakened in order to emulate natural disturbance (see sections 12A and 12B above re: Logging to the Shoreline, and Catchment Disturbance Thresholds Removed, respectively).

No experimental evidence is presented to support the assertion that these measures will effectively prevent mercury impacts.

While some of the measures partially address some activities that may contribute to the mercury problem (like soil rutting, compaction, hydrological disruption), they are often weak, not compulsory, lack quantitative measures, and leave large amounts of discretion in their application. When dealing with some practices that are likely to have significant impacts (eg. building roads through organic soils) the guide only requires that loggers

"explore alternative options" or "take reasonable precautions." These provide no assurance that mercury impacts will be avoided, even in activities that the MNR acknowledges are likely to contribute to the mercury problem.

A non-exhaustive list of problematic examples includes:

i) S5.1 Allows for road building in water bodies and in wetlands.

ii) S5.1 Provides direction for roads to "avoid recognizable ephemeral streams, springs, seeps, and other groundwater discharge areas" many of which are unmapped. However, the rationale acknowledges that "not all springs, seeps, etc. will be recognizable in all operating conditions (e.g. deep snow)." Further, logging greatly increases water fluxes and so areas that may not be recognizable as hydrologically important during low-flow operating periods may become important post-logging.

iii) S5.2 allows for up to 10% of a cutblock to be rutted by machines. Only ruts deeper than 30 cm and longer than 4 m are counted.

iv) S5.2 places no numerical limits on mineral soil exposure and erosion in cutblocks.

v) S4.1 allows logging to the shoreline of lakes.

vi) S4.1 allows for logging of the entire shoreline of some ponds.

vii) There are no thresholds for catchment level disturbance.

viii) The widths of buffers on water bodies are directly proportional to shoreline slope, while mercury impacts appear to be inversely proportional.

The Stand and Site guide acknowledges that these measures may not be sufficient in some circumstances and leaves room for the planning team to develop protective measures to deal specifically with local conditions.

For example:
"Roads may also have an effect on other values, features, or resources that may require the implementation of specific mitigation techniques not provided by this section of the guide… In some situations, appropriate mitigative measures may have to be developed by the planning team." (Stand and Site Guide Rationale section 5.1 p. 493)

However, the logging plan contains no discussion about whether additional mitigation measures are required for roads and machine tracks in the Whiskey Jack area due to the mercury problem and the known impacts of machine tracks on mercury export. It appears that no additional measures are included in the logging plan.

The Rationale also admits that the "choice of harvesting and logging system will affect the degree of risk of erosion. Generally speaking, clearcutting and full tree harvesting

present a greater risk than does partial harvest and cut-to-length logging... The removal of competing vegetation can also prolong the time period during which the site is at an elevated risk."

However, the logging plan makes exclusive use of the clearcutting harvest method and explores no silvicultural options other than clearcutting.

CONCLUSION

The mercury mitigation measures in the FMP, if any, appear to be based on those identified in the Stand and Site Guide Rationale's "Implications for this guide." Those measures are incomplete, weak, and unproven. They cannot be relied upon to prevent elevated mercury levels in fish with any reasonable degree of certainty.

14. Need for an Individual Environmental Assessment

Grassy Narrows and Earthroots submit that an IEA is necessary for a number of reasons. The *Environmental Assessment Act* has a broader mandate than the *Crown Forest Sustainability Act*.

The purpose of the *Environmental Assessment Act* is the betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management in Ontario of the environment. R.S.O. 1990, c. E.18, s. 2. Environment is defined broadly under the Act to include the natural environment, plant and animal life, as well as "human life". The *Crown Forest Sustainability Act* is principally focused on sustaining the Crown forests to meet social, economic and environmental needs of present and future generations. Its focus, and what it requires of forest management plans, is protection of "Crown forest health", not on preventing potential adverse human health impacts.

This request raises substantive evidence that the Whiskey Forest Management Plan 2012-2022 does not protect, conserve, and wisely manage the environment in that part of Ontario. Most gravely, the implementation of the plan is likely to have irreversible neurological impacts on people in Grassy Narrows by prolonging and deepening the mercury problem.

The original mercury tragedy in Grassy Narrows was one of the crises that gave rise to the *Environmental Assessment Act*. The local history of contamination, and its ongoing impacts, requires that the highest duty of care be exercised in decisions that may harm the health of the environment and the people in Grassy Narrows.

The oversight provided by an Individual Environmental Assessment (IEA) is necessary as part of the process of ensuring that mistakes of the past are not repeated at the expense of the environment and people in Grassy Narrows.

An IEA is also necessary because a number of conditions in the Declaration Order have not been complied with. These include:

a) Public consultation. (Dec. Order section 63, p.9)

This condition requires that the MNR respond to all public comments with an explanation of the results of consideration of the comments.

No response to Earthroots' comments has been received, and many of Grassy Narrows' comments have received no response. No response has been given to the nearly 2,000 members of the public who commented in opposition to the logging plan.

b) S18. Areas of Concern. (Declaration Order section 18, p. 20-22)

This condition requires that Areas of Concern be developed for values that may be impacted by forest management. Where standard Areas of Concern are not sufficient this condition provides for the development of new, science based, Areas of Concern to deal with local conditions.

The measures in the standard Areas of Concern are not sufficient to prevent the elevation of mercury levels in fish. The logging plan fails to develop new Areas of Concern that recognize the local context of the mercury problem.

The Areas of Concern prescriptions fail to protect the values of water quality, fish habitat, wildlife health, and fishing for recreation, subsistence, commerce, and the exercise of Aboriginal and Treaty rights.

c) Monitoring program

i) Provisions for monitoring operations shall be prepared and documented, and shall include specific provisions for monitoring operations in Areas of Concern. (Declaration order Section 31 a) i))

The plan contains no provisions for monitoring whether operations in Areas of Concern will elevate mercury levels in fish.

> ii) Scientific monitoring program to assess effectiveness of guides. Progress should be reported on in annual report. (Declaration Order section 31, p.31)

The most recent annual report that is publicly available is for 2009/2010. It makes no mention of the mercury problem.

> iii) Annual report should include summary of significant advances in scientific research

(Declaration Order, section 32 b) xi))

The most recent annual report that is publicly available is for 2009/2010. It makes no mention of the mercury problem.

> iv) State of the Forest report should include summary of significant advances in forest research, and a discussion of how the results are being incorporated into forest management. (Declaration Order section 33 b) ii))

The most recent State of the Forest report that is publicly available covers the period April 1, 2004 to March 31, 2009. The report, and its supporting documents, contains no instances of the word 'mercury'. Thus it fails to summarize and discuss the incorporation of significant advances in forest research on mercury including Garcia et al., 2007, Desrosiers et al., 2006, and Bishop et al., 2009.

The State of the Forest report section on Criterion 3 "Protecting and Conserving Ontario's Forest Soil and Water Resources" which includes "Guidelines for Protecting Water Quality" and "Guidelines for Protecting Fish Habitat" notes that:

> The data for most of the indicators were assessed as inadequate. Data quality limited the evaluation of many of the indicators, all of which are indirect or proxy indicators. Direct monitoring methods are too intensive and costly for operational-level monitoring. During the reporting period, no province-wide standards existed for evaluating soil and water conservation. Standards are now included in the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* (2010). (State of Ontario's Forests, 2012, p. 54)

Since there are no provincial Annual Reports or State of the Forest reports since the new Stand and Site Guide was released in 2010, there appears to be no public discussion of new science, new monitoring efforts, or how their results are being incorporated into forest management since 2010. There appears to be no public information available on the monitoring outlined in section 7.2 of the Stand and Site Guide.

The logging plan itself also fails to discuss advances in mercury science, monitoring efforts, and how their results are being incorporated into the plan.

"MNR says that if monitoring or feedback from those using the Guide suggests that there are significant and unmanageable economic, ecological or social impacts, consideration will be given to a review and possible revision of the Guide before the normal five-year review." (Environmental Commissioner of Ontario, 2002)

However, feedback from Grassy Narrows and Earthroots suggesting that there are significant and unmanageable ecological and social impacts associated with the logging-mercury problem has not led to revision of the guide.

The spirit of the Declaration Order clearly requires that forest managers actively report on how they are making use of new scientific advances to ensure sustainability and environmental protection. The science on mercury impacts has not been meaningfully incorporated into the logging plan.

In summary, Grassy Narrows and Earthroots submit that the logging plan warrants a review under an Individual Environmental Assessment because:

- the outstanding mercury issues (i.e. impacts upon human and ecosystem health) have not been addressed adequately, or at all, under the *Crown Forest Sustainability Act*, or in the forest management planning process, to date;
- similarly, they will not be adequately addressed in any other current or future regulatory or approvals process regarding the logging activities in Whiskey Jack Forest (e.g., in the *Lakes and Rivers Improvement Act* regarding water-crossings);
- these public interest issues raise matters of profound importance both to Grassy Narrows First Nation, and to other stakeholders and the public at large;
- to effectively and thoroughly address these issues it is necessary, as a preliminary step, for the proponent of the logging plan to prepare an Individual Environmental Assessment that fully examines (with public input) all matters listed in section 6.1(2) of the *Environmental Assessment Act*, especially in relation to:
    - the alleged purpose of, or rationale for, allowing clearcutting/logging

activities to occur in Grassy Narrows Territory
- the alleged purpose of, or rationale for, allowing clearcutting/logging activities in close proximity to fish-bearing waterbodies within the Whiskey Jack Forest despite the risk of additional mercury contamination;
- alternative sources of wood for the real wood supply needs of local mills;
- alternatives to the proposed forestry activities and alternative methods of carrying out such activities;
- the environment affected, and the environmental effects (direct, indirect, and cumulative) of the logging activities;
- proven mitigation actions to prevent the risk of mercury contamination from logging activities; and
- systematic evaluation of the advantages and disadvantages of the proposed activities and the alternatives.

The precise nature and scope of the foregoing factors can be developed (with public input) in the Terms of Reference which precede the preparation of the Individual Environmental Assessment.

In summary, the potential mercury impacts are significant, adverse, long-lasting, and are unresolved to date in the forest management planning process. These impacts are best addressed through a process that includes, but is not necessarily limited to, a robust Individual Environmental Assessment.

15. Remedy Requested

Grassy Narrows and Earthroots are requesting the following:

- an order under section 16(1) of the *Environmental Assessment Act* from the Minister of the Environment requiring the proponent/MNR to comply with Part II of the *Environmental Assessment Act* (i.e. prepare and submit an Individual Environmental Assessment (IEA) of the logging plan for the Whiskey Jack Forest and not proceed to implement the logging plan until the IEA has been completed, and approval to proceed granted by the Minister, or the Environmental Review Tribunal);
- an order that forest management operations including harvest, tending, and new road building be suspended on the Whiskey Jack Forest until such time as:

    a. Experimentally proven measures are developed that prevent logging from elevating mercury; and

    b. the free, prior, and informed consent of the Grassy Narrows First

Nation is given; and

- participant funding is provided to Grassy Narrows and Earthroots so that they may participate meaningfully in the IEA process

The request for such an order is warranted under section 16(4) of the *Environmental Assessment Act* because (1) as noted above, the purpose of the *Environmental Assessment Act* is broader than that of the *Crown Forest Sustainability Act* under which the logging plan was prepared, (2) the logging plan differs from other undertakings in this class of undertakings covered by the class environmental assessment because of the mercury threats posed to the environment and human health in this geographic area that has long been susceptible to harm from this substance, (3) the significance of the factors that have been raised earlier in this document, and (4) the reasons that Grassy Narrows and Earthroots have provided in this request.

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APPENDIX I – Stand and Site Guide Section 7.2

(Excerpted from MNR, 2010a, pp. 165-168)

7.2 What to Evaluate – Identifying Key Uncertainties

Many individual pieces of coarse and fine filter direction in this guide do not require rigorous testing because they are based on an extensive body of scientific evidence, or may already have been tested within the context of Ontario's forest management practices (see Background and Rationale for Direction).

Conversely, there are many pieces of direction in the guide for which there is uncertainty associated with the outcome of their application. Unfortunately, there are insufficient resources to address all of these uncertainties. Consequently, a list of ten key effectiveness monitoring questions was identified based on the degree of uncertainty, the potential impact of applying incorrect direction, and the interest expressed by stakeholders. Some of these questions are being addressed by ongoing research projects. Others are not and are high priorities for consideration within MNR's effectiveness monitoring program.

Direction contained within this guide for many species at risk is associated with a high degree of uncertainty. Direction with the highest degree of uncertainty tends to be associated with species with few known sites (e.g., flooded jellyskin habitat, wolverine dens). While further research on these species is desirable, specific questions have not been identified as a high priority for consideration within MNR's effectiveness monitoring program because too few sites are typically known to permit a scientifically rigorous evaluation.

Q1. Within the context provided by direction in the Landscape Guide, will the coarse filter direction in Section 3.2.2, in concert with the fine filter direction in Section 4, produce a pattern of harvested and residual forest at stand and multi-stand scales that supports wildlife communities similar to those found in habitats disturbed by natural events?

Direction in the Stand and Site Guide is intended to provide levels of residual forest cover similar to those prescribed by the *Forest Management Guide for Natural Disturbance Pattern Emulation (NDPEG)*. Direction in the *NDPEG* was based on the amount of residual forest observed in a sample of wildfires in Ontario. While additional study has been conducted by researchers at MNR's Ontario Forest Research Institute (OFRI) to document the amount and pattern of residual forest in wildfires, the response of wildlife communities to this direction has not been rigorously tested. Thus, this question should be a high priority for consideration within MNR's effectiveness monitoring program.

Evaluating the effectiveness of the Landscape Guide will involve comparison of wildlife communities across small landscapes (10,000-20,000 ha) arising from forest management operations following the guide and from natural disturbance (see MNR's *Effectiveness Monitoring of Forest Management Guidelines: Strategic Direction (In prep.)*). Analysis of these data at the stand and multi-stand scale will address this question.

Q2. Within the context provided by direction in the Landscape Guide, will the coarse filter direction in Section 3.2.2, in concert with the fine filter direction in Section 4, retain sufficient residual forest within catchments to ensure that hydrological effects resulting from forest management operations: i) do not exceed those observed in naturally disturbed catchments and ii) do not exceed acceptable levels for specific parameters (e.g., methyl mercury)?

A number of ongoing studies in Ontario are evaluating hydrological catchment-scale effects of forest management activities. For example,

o The Comparative Aquatic Effects Program at MNR's Centre for Northern Forest Ecosystem Research (CNFER) is evaluating the catchment-scale effects of harvesting on water quality in small streams in northwestern Ontario.

o The Forest Watershed and Riparian Disturbance Project, conducted by researchers at Lakehead University, is evaluating how watershed disturbance influences the movement of water and nutrients into forest streams in northwestern Ontario.

o The Scalable Indicators of Disturbance Project, conducted by researchers from the universities of Trent, Guelph, and Western Ontario, is attempting to predict the cumulative impacts of harvesting on streamflow across a range of spatial scales.

Models developed by these research projects may help define the appropriate scale to assess catchment-scale effects and the amount of residual forest required to maintain acceptable export levels of specific parameters such as methyl mercury. However, none of these studies includes naturally disturbed catchments as controls. Thus, their ability to assess effectiveness of direction relative to emulation of natural disturbances is limited and this question should be a high priority for consideration within MNR's effectiveness monitoring program.

Q3. Will the direction in Section 3.2.3 retain a sufficient number and variety of wildlife trees in harvested areas to support cavity-using wildlife communities similar to those found in habitats arising from natural events?

The literature suggests that differences in cavity-using wildlife communities (especially bird communities) is one of the major differences between recently harvested and naturally disturbed habitats. Direction on wildlife trees has been designed to better address the needs of cavity-using wildlife species in harvested forest (e.g., more emphasis on stubbing to create habitat for species such as the black-backed woodpecker) to minimize these differences, but is still largely based on previous direction (e.g., 25 trees/ha prescribed by the *NDPEG*) which, in some cases, does not have a strong scientific basis and has not been rigorously tested.

Ongoing research in the Great Lakes–St. Lawrence forest by MNR's Southern Science and Information Section (SSIS) is evaluating the relationship between abundance of various cavityusing birds and the density and characteristics of live cavity trees and dead standing trees in partial harvests. However, this question, as it pertains to application of the Stand and Site Guide in the boreal forest, should be a high priority for consideration within MNR's effectiveness monitoring program.

Q4. Will the direction for AOCs (around water features and other site-specific values), small residual patches, wildlife trees, and downed woody material in Section 3.2.3 maintain or produce sufficient downed woody material through time in habitat arising from harvesting to support DWMdependent wildlife communities and ecological processes (e.g., nutrient cycling) similar to those found in habitats arising from natural events?

Direction in the guide is a working hypothesis due to the limited scientific information available to define thresholds. Thus, this question should be a high priority for consideration within MNR's effectiveness monitoring program. However, analysis at the stand and multi-stand scales of data collected to evaluate the effectiveness of the Landscape Guide (see Q1 above) will address this question.

Q5. Will the fine filter direction for moose in Section 3.3.4 create habitat that sustains a higher

density of moose (or a higher harvest of moose) than that produced by general coarse filter direction in the Landscape and Stand and Site Guides?

Direction is based largely on preliminary results from the Moose Guidelines Effectiveness Monitoring Project conducted by MNR's CNFER. Habitat suitability and population dynamics models developed by this project will be valuable in predicting the effects of applying this direction. However, effectiveness can only be fully evaluated by comparing moose response (controlling for hunter harvest) inside and outside areas identified for application of this fine filter direction. Thus, this question should be a high priority for consideration within MNR's effectiveness monitoring program.

Q6. Will the forest management activities permitted within shoreline AOCs (Section 4.1.1 and 4.1.2) have undesirable effects (e.g., cause a HADD) on water quality or aquatic biota?

The available evidence suggests that forest management operations permitted within shoreline AOCs will not have adverse effects on water quality and aquatic biota if thoughtfully planned and carefully implemented (see Background and Rationale for Direction). Much of this evidence comes from research that has been conducted in Ontario (e.g., MNR Coldwater Lakes Study, CNFER – Forest Ecosystem Science Co-op Shoreline Forestry Study, Canadian Forest Service (CFS) Turkey Lakes Watershed Study). However, some components of the shoreline AOC direction are based largely on expert advice or inductive inference. Moreover, given public perception about harvesting adjacent to aquatic systems, further research on the effectiveness of this direction is warranted.

However, this question is a low priority for consideration within MNR's effectiveness monitoring program because a variety of studies investigating the effects of forest management activities on aquatic systems is currently ongoing in Ontario, and will ultimately address many of the uncertainties associated with direction in the guide. For example,

o The Comparative Aquatic Effects Program at MNR's CNFER is evaluating the effects of harvesting and the effectiveness of the *Timber Management Guidelines for the Protection of Fish Habitat* on water quality and aquatic biota in small streams in northwestern Ontario.

o The White River Riparian Harvesting Impacts Project conducted by the CFS is evaluating the effects of partial harvesting within AOCs adjacent to permanent streams on water quality and aquatic biota in northeastern Ontario.

o The Turkey Lakes Watershed Study led by the CFS is evaluating the effects of partial and clearcut harvesting on various aspects of water quality and aquatic biota in lakes and streams in the Great Lakes–St. Lawrence forest.

o The Esker Lakes Research Project conducted by researchers from the University of Guelph is evaluating the effectiveness of riparian buffers of various widths for the protection of water quality and aquatic biota in lakes in northeastern Ontario.

o A project conducted by MNR's OFRI is modelling the supply and recruitment of large downed wood in the littoral zone of lakes in the Great Lakes–St. Lawrence forest.

Q7. Will the forest management operations permitted within shoreline AOCs result in undesirable effects on hydrological linkages between upland forest and aquatic habitats?
Hydrological linkages between upland forest and aquatic habitats (e.g., springs, seeps, ephemeral streams) are considered to be important components of fish habitat. However,

relatively little is known about the effects of forest management activities within shoreline areas on hydrological linkages and direction is precautionary. Thus, additional research is warranted. This question is a low priority for consideration within MNR's effectiveness monitoring program because research is currently being conducted by the Comparative Aquatic Effects Program at MNR's CNFER to develop methods to predict and map hydrological linkages and evaluate the effects of forest management operations on associated brook trout habitat.

Q8. Will forest management operations permitted within shoreline AOCs (Sections 4.1.1 and 4.1.2) create a diversity of ages of shoreline forest that maintains a riparian wildlife community (including beavers) similar to that found in habitats arising from natural events?

Direction involving retention of shoreline forest in Section 4.1 is predicated on the assumption that creating a mix of age classes of shoreline forest will maintain a diverse riparian wildlife community (including keystone species such as beavers) that is similar to that found in habitats arising from natural events. While there is some empirical support for this assumption and some evidence that past practices may have been too conservative, and may have had a negative effect on some species requiring early to mid-successional shoreline forest (see Background and Rationale for Direction), the evidence in the literature is not conclusive and requires further research.

However, this question is a low priority for consideration within MNR's effectiveness monitoring program, because relevant research has been conducted as part of the White River Riparian Harvesting Impacts Project conducted by the CFS. Moreover, researchers at the University of Guelph have (in collaboration with MNR, Canadian Wildlife Service, and others) initiated a study to compare waterbird communities (and the supply of beaver habitat) in managed and naturally disturbed landscapes.

Q9. Will seasonal restrictions on forest management operations around occupied bird nests (Section 4.2.2) result in reproductive output comparable to nests in undisturbed situations?
Seasonal buffers for most species in Section 4.2.2 are based on a model relating body size to flushing distance (see Background and Rationale for Direction). Empirical evidence from other jurisdictions for a few species suggests that direction should be effective. However, the direction needs to be tested in Ontario, especially for those species for which the direction has changed substantially from previous guides (i.e., bald eagles, ospreys, great blue herons). Thus, this question should be a high priority for consideration within MNR's effectiveness monitoring program.

Q10. Will restrictions on rutting and skid trail coverage in Section 5.2.1 result in acceptable growth of residual trees (partial harvests) and regeneration success (all harvests)?

The Forest Engineering Research Institute of Canada, MNR's SSIS, and MNR's CNFER have conducted a number of studies in Ontario to document typical levels of site disturbance in the Great Lakes–St. Lawrence forest and boreal forest. Some of these studies have examined the link between site disturbance and silvicultural objectives on specific sites over relatively short time frames (site damage occurs when site disturbance affects silvicultural objectives).

Direction in Section 5.2 was based largely on expert opinion, as informed by results from these studies. There is an ongoing debate among stakeholders about the appropriateness of the thresholds identified in the guide. Thus, this question should be a high priority for consideration within MNR's effectiveness monitoring program.

APPENDIX II – Stand and Site Guide Rationale

(Excerpted from MNR, 2010b, 23-25).

Mercury and catchment-scale effects
Mercury is a natural element occurring in air, water, soil, and biota in the boreal forest. Mercury, which exists in several inorganic or elemental forms and as organic methylmercury (MeHg), alternates between forms and cycles among different components of the ecosystem as part of a complex biogeochemical process. Natural levels of mercury are spatially variable depending ongeology, soil, and forest characteristics. However, the global atmospheric pool of mercury has increased 2 to 5 fold over pre-industrial times (Lindberg et al. 2007). Mercury derived fromindustrial activity, primarily the burning of fossil fuels, may increase mercury levels in the immediate area of such activities, but increased mercury levels in remote areas, such as the Arctic, indicate the importance of the global atmospheric mercury pool as a source of contamination. Although mercury emissions in North America and Europe have been dramatically reduced in the last few decades, the global atmospheric pool of mercury has not decreased, partly due to increases in emissions from developing countries (Lindberg et al. 2007). Current estimates are that approximately half of the mercury deposition in the boreal forest comes from anthropogenic sources, although such estimates are highly uncertain (Grigal 2002, Lindberg et al. 2007).

In the boreal forest, existing mercury, and mercury deposited from the atmosphere, is primarily stored bound to humic particles in the upper few centimetres of the soil profile (Grigal 2002, Povari and Verta 2003). The soil mercury pool is relatively stable and experimental additions of mercury indicate that most newly deposited mercury is held in the soil (Hintelmann et al. 2002). Hintelmann et al. (2002) further suggest that their observations indicate that the primary source of mercury in aquatic systems away from point source discharges is direct deposition from the atmosphere with terrestrial runoff contributing relatively less mercury. However, disturbance to forest areas, including forest management activities (Povari et al. 2003) and natural disturbances including fire (Kelly et al. 2006), severe storm events (Munthe et al. 2007b), and drought (Grigal 2002), can result in the release of mercury from the soil pool and subsequent volatilization to the atmosphere or entrance into surface runoff or groundwater, bound to dissolved or particulate organic carbon (Grigal 2000). Waterborne mercury moving into aquatic systems may then be methylated, primarily by sulphur-reducing bacteria in low oxygen environments within wetlands and lake sediments (Morel et al. 1998). The capacity of aquatic systems to form MeHg depends on a number of factors, including the proportion of wetlands associated with lakes or streams (Grigal 2002). However, methylation in aquatic systems is the principal mechanism by which mercury is made available for incorporation and biomagnification in aquatic ecosystems.
There is a developed body of research on the process by which water impoundment releases mercury stored in the soil and may accelerate the production and bioaccumulation of MeHg in flooded areas, particularly those with high proportions of flooded organic material such as wetlands (Bodaly et al. 2004, Hall et al. 2005). There has been much less research on the impacts of other types of disturbance. Studies in Finland have shown that forest management activities can lead to an increase in the concentration of total mercury and MeHg in groundwater and surface waters (Munthe et al. 2007a, Povari et al. 2003, Povari and Verta 2003). Recent research conducted in Quebec has shown that mercury levels in periphyton, plankton, and fish in

lakes within watersheds that have been disturbed by forest management activities or fire are higher than in undisturbed lakes (Garcia and Carignan 1999, 2000, 2005; Desrosiers et al. 2006).

These results have raised concerns over the impact of forest management activities on mercury levels in aquatic systems and the potential risk this may pose to wildlife and humans consuming fish.

Implications for direction in this guide
Removal of trees from catchments by timber harvest or wildfire is associated with generally similar changes in the hydrology, chemistry, and biota of lakes and streams. Moreover, effects are generally transitory and most do not appear to translate to higher biotic levels (but see discussion on *Mercury and catchment-scale effects*).

It is anticipated that the cumulative effect of applying the coarse and fine filter direction in the Landscape Guide and Stand & Site Guide will result in a level of catchment-scale disturbance that is within the range of that associated with natural disturbances. Thus, there is no additional fine filter direction prescribed to mitigate the general catchment-scale effects of timber harvest. However, since the response of some variables may differ between harvested and burned catchments, catchment-scale effects are identified as one of the high priority questions for evaluation during effectiveness monitoring of the guide (see Section 7.0).

This conclusion was reached after undertaking a comparison of the extent of disturbance incatchments resulting from the actual harvest pattern from the previous 25 years of harvesting, the expected future harvest pattern directed by forest management guides, and the estimated pattern resulting from a natural disturbance regime. This comparison demonstrated that past and expected future harvests result in catchment level disturbance patterns within the range expected on a naturally disturbed landscape.

There is fairly compelling evidence that timber harvest (and wildfire) results in an increase in the movement of mercury from terrestrial to aquatic environments where it may be converted to MeHg (see above). Associated with this, there is a growing concern about the associated potential risk to wildlife and human health. Kolka et al. (1999, 2001) suggest that most terrestrial mercury is transported bound to particulate organic matter and thus recommend management practices that limit site disturbance and particulate transport to aquatic features, such as use of buffer strips and erosion control devices. There is also growing evidence that specific locations within catchments may be ‘hotspots’ for mercury methylation (Branfireun and Roulet 2002, Mitchell et al. 2008). These sites may be associated with areas of flow accumulation that focus movements of water, mercury, and sulfates from surrounding uplands into areas of saturated soils (anoxic conditions), thus facilitating increased levels of methylation by sulfate-reducing bacteria. Operations that result in disturbance of these ‘hotspots’ or disrupt the hydrologic flow to them could potentially affect the rate of methylation or the subsequent transport of methylated mercury to aquatic features (Porvari et al. 2003, Munthe and Hultberg 2004).

While there is no direction explicitly labeled as ‘catchment-scale’ in the guide, there are many pieces of direction in the guide that will address these concerns. Section 5.2 provides general direction to minimize site disturbance within upland areas which will reduce the creation/mobilization of particulate matter as well as maintain hydrological function. Sections 4.1 and 5.1 provide comprehensive direction to minimize the subsequent risk of particulate matter transport to aquatic features. Sections 3.2 and 4.1 also provide direction to specifically minimize site disturbance, and preferentially retain residual forest, in areas that are hydrologically connected to aquatic features and that may be linked to or function as potential methylation ‘hotspots’ (i.e., ephemeral streams, springs, seeps, and other areas of groundwater discharge). Thus, there is no additional fine filter direction prescribed to mitigate the catchment-scale effects of timber harvest on mercury export. However, given the growing concern expressed by stakeholders, mercury export is specifically identified in Section 7.0 as a priority for effectiveness monitoring.

Previous direction
The *Forest Management Guide for the Protection of the Physical Environment* (OMNR 1997) included a rule of thumb that no more than 50% of a second order watershed be harvested in a 10 year period. Second order watersheds typically range from 10s to 100s of hectares but can be several thousand hectares with significant variation in average size between management units. This direction was considered for inclusion in the Stand and Site Guide but deemed ineffective, and more importantly unnecessary.

Second order watersheds are an arbitrary response unit for assessing catchment scale effects with limited scientific basis. By varying the definition of catchment/watershed, a single township could have anywhere from a few to dozens or even hundreds of catchments. Devito et al. (2005) argue that response units are not the same everywhere and there are many factors at many spatial scales that influence what an appropriate unit might be. There does not appear to be a defensible method of deriving an appropriate geographic response unit.

There is limited scientific basis for setting a threshold of percent disturbed in a geographic response unit. While 50% is a reasonable generalization of how much of a catchment can be disturbed before seeing a measurable hydrologic response, some studies show a response at levels as low as 15% while others show no response at 100% (e.g., Stednick 1996). Further, a hydrological response is not necessarily negative as the response (e.g., increased water yield) is often consistent with a naturally disturbed system.

In addition to being ineffective, the second order watershed direction is no longer necessary. Landscape level pattern direction, coupled with stand level retention requirements, is expected to produce a natural pattern of disturbance (and retention) at multiple scales. This level of sophistication in pattern direction did not exist at the time the *Forest Management Guide for the Protection of the Physical Environment* (OMNR 1997) was developed. The 2nd order watershed direction was originally included without the benefit of this context and is now considered unnecessary and further has the potential to be contradictory to the CFSA's principle of emulating natural disturbances and landscape patterns.

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ATTACHMENT

The following map material was developed at the request of the Ministry of the Environment and Climate Change ("MOECC") in early February 2014 following the filing by Grassy Narrows and Earthroots of their bump-up request in January 2014. The MOECC request and the Grassy Narrows – Earthroots response resulted in the submission of three maps by the groups. The Ministry of Natural Resources and Forestry ("MNRF") reduced this material to a single composite map (the last page of this attachment) that was used to outline the geographic location of the affected areas of concern in the bump-up request. The MOECC request and responses have been included as part of this attachment to Exhibit "C".

---------- Forwarded message ----------
From: **Joseph Fobister** <jbfobister@gmail.com>
Date: Thu, Feb 20, 2014 at 10:25 AM
Subject: Re: Whiskey Jack Forest Management Plan request for IEA
To: "Wills, Devon (ENE)" <Devon.Wills@ontario.ca>
Cc: David Sone <david@earthroots.org>

Good Morning,

As David described, the map accurately depicts the area of concern.

Thank you.
JB

On Feb 20, 2014, at 9:05 AM, Wills, Devon (ENE) <Devon.Wills@ontario.ca> wrote:

> Hello David,
>
> Due to the nature of the joint Part II Order request (Grassy Narrows and Earthroots), I will need Mr. J.B. Fobister's opinion of the map, before the review can continue.
>
> Thanks,
>
> ***Devon Wills***
> Project Evaluator
> Ministry of the Environment
> Environmental Assessment Services

Phone: (416) 314-8259
Fax: (416) 314-2376

From: david.sone@gmail.com [mailto:david.sone@gmail.com] **On Behalf Of** David Sone
Sent: February-20-14 9:52 AM
To: Wills, Devon (ENE)
Cc: jbfobister@gmail.com
Subject: Re: Whiskey Jack Forest Management Plan request for IEA

Hi Devon,

This map appears to accurately depict the area affected by the IEA request (assuming that the bodies of water are included in the IEA area and that the eastern boundary is based on the Grassy Narrows traplines). This is without prejudice to a proper determination of the extent of Grassy Narrows Territory.

Thanks to you and the MNR for making this map.

Please go ahead with your review.

Take care,

David

On Wed, Feb 19, 2014 at 4:09 PM, Wills, Devon (ENE) <Devon.Wills@ontario.ca> wrote:
Hello,

I have been in contact with the MNR in regards to the three maps you have provided which illustrates your understanding of Grassy Narrows Territory within the Whiskey Jack Forest. The MNR has overlaid the three maps into one map which is an approximation of the area you have outlined. Can you please confirm that the attached map is an accurate depiction of the area affected by the IEA request?

Due to the strict timelines of MNR's Forest Management Class Environmental Assessment, it is important that you provide a response for the above question as soon as possible so that we may move forward with our review. I look forward to hearing your reply.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5

Phone: (416) 314-8259
Fax: (416) 314-2376

From: david.sone@gmail.com [mailto:david.sone@gmail.com] **On Behalf Of** David Sone
Sent: February-06-14 11:47 AM
To: Wills, Devon (ENE)
Cc: jbfobister@gmail.com
Subject: Re: Whiskey Jack Forest Management Plan request for IEA

Hi Devon,

It is good to meet you. Thank you for your work reviewing our request.

Our request applies to Grassy Narrows Territory within the Whiskey Jack Forest. I do not know of any definitive map of this area. As part of the Iaccobucci Process, Ontario was to fund Grassy Narrows to complete a thorough land use and occupancy study which could have shed light on this question. However, funding was cut off before the completion of that study.

As a provisional measure you may consider the request to apply to the overlay sum of the following three mapped areas:
i) Grassy Narrows MNR trapline areas (first attachmet);
ii) MNR Grassy Narrows Study Area (second attachement);
iii) The area avoided during the creation of the recent Whiskey Jack Contingency Plan (orange, pink, and green areas on the third attachment).

This is without prejudice to any future determination that Grassy Narrows may make about the extent of their Territory.

I believe that the MNR has GIS shapefiles that should make this overlay to visualize.

The specific proposed forest management activities of concern are:
a) harvesting;
b) tending;
c) new road building; and
d) any other activities that may elevate mercury levels in water and fish.

I hope that this provides you with the information that you require.

The best way to contact Earthroots is by contacting me using this email address.

Joseph Fobister is the contact for Grassy Narrows and can be reached by email at jbfobister@gmail.com.

Please copy both Joseph, and me, on any communications regarding our joint request.

If you have any further questions, please do not hesitate to contact us.

Take care,

David Sone
Earthroots

On Tue, Feb 4, 2014 at 4:59 PM, Wills, Devon (ENE) <Devon.Wills@ontario.ca> wrote:
Hello,

I am the Project Evaluator assigned to the Whiskey Jack Forest Management Plan's request for an Individual Environmental Assessment (IEA). In reviewing your joint request, it has come to my attention that your concerns to not outline a specific area within the Whiskey Jack Forest. IEA Requests must include a description of the specific proposed forest management activities of concern, and a description and/ or map that identifies the geographic location of the affected areas. Please provide a map(s) that identify the specific area of concern within the Whiskey Jack Forest that your request for an IEA is related to.

Due to the strict timelines of MNR's Forest Management Class Environmental Assessment, it is important that you provide the required documentation as soon as possible so that we may move forward with our review. Please inform me of the best methods of contacting your organization that will expedite the information gathering process. I look forward to hearing from you shortly.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

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2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
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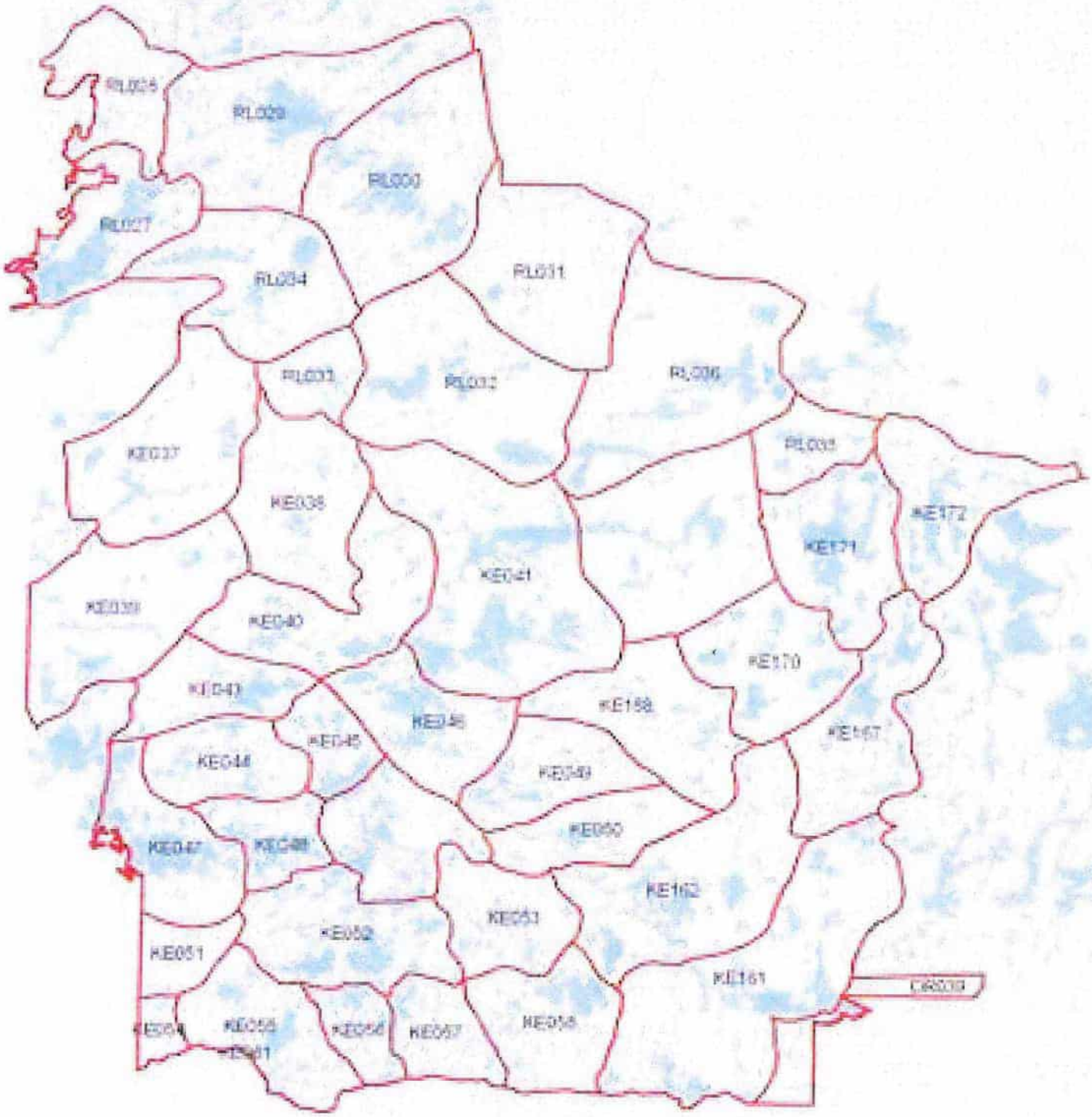
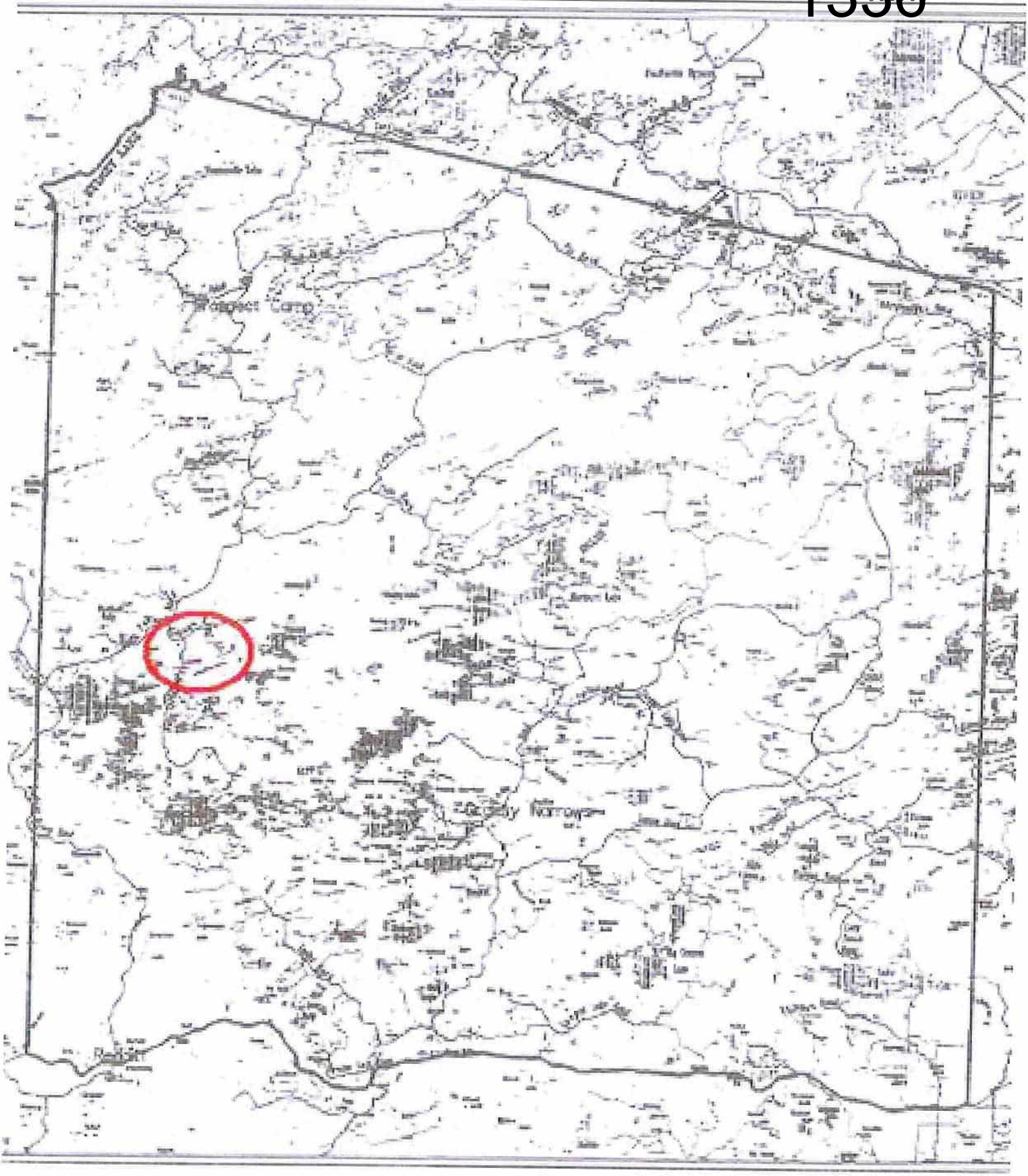
ANA Traplines in Whiskey Jack Forest

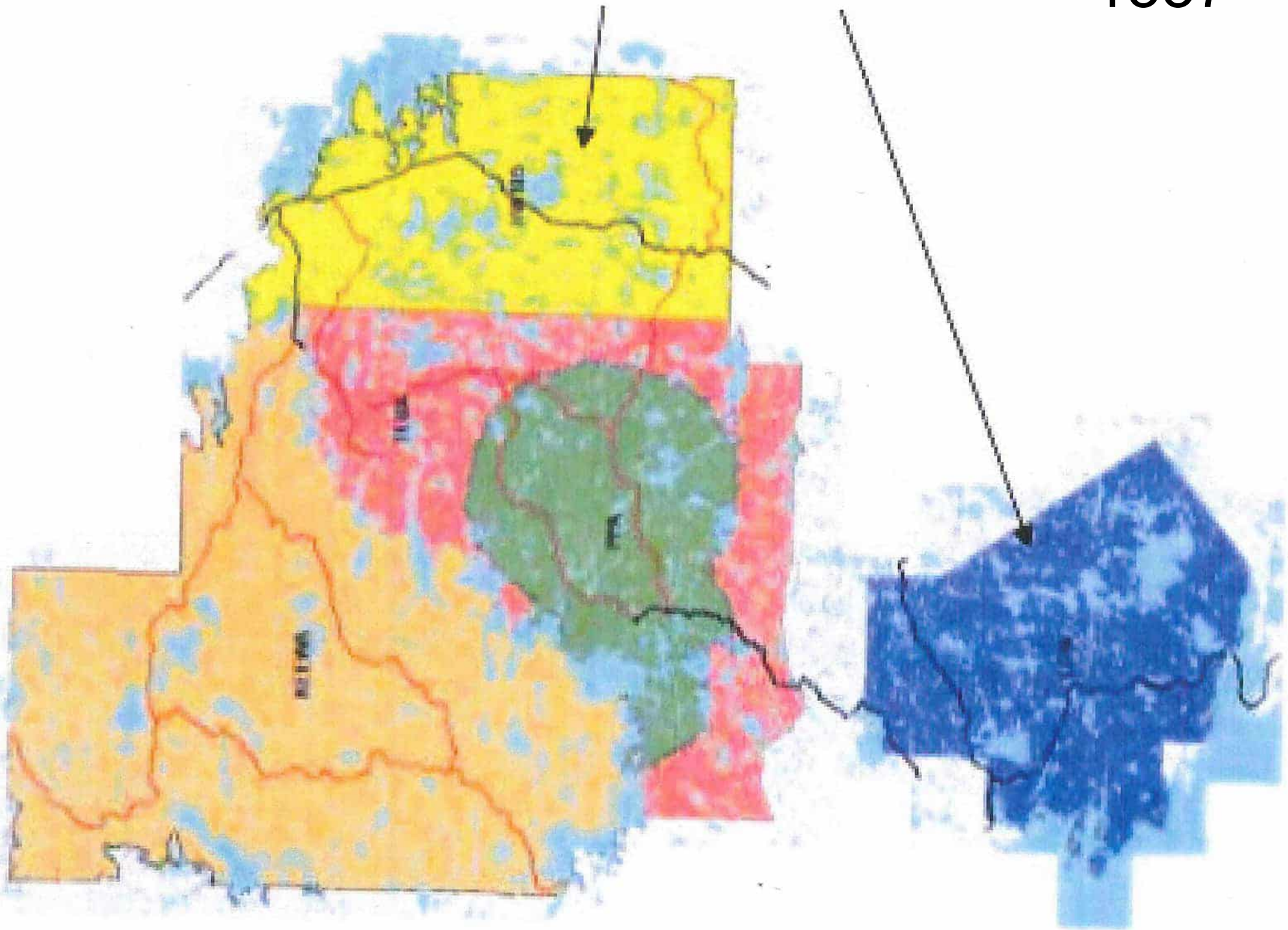


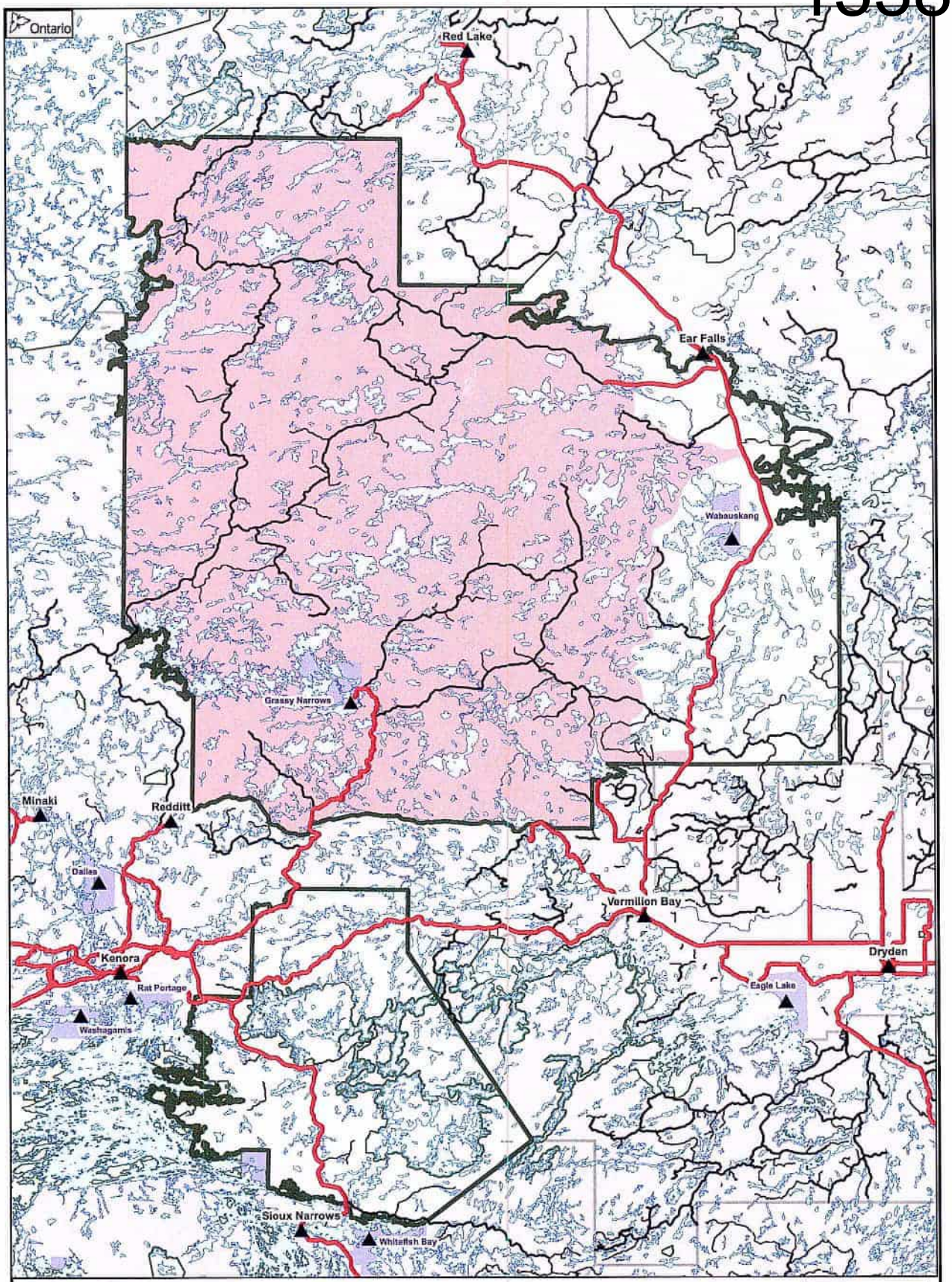


Ministry of Natural Resources

Map of Grassy Narrows Study Area

2000 Grassy Narrows EA





This map is illustrative only. Do not rely on it as being a precise indicator of routes, locations of features, nor as a guide to navigation. This map was submitted by Grassy Narrows First Nation/Earthroots as supporting documentation for an IEA request. Ontario makes no representations or warranties of any kind, express or implied about the completeness and/or accuracy of the information contained in this map. Further, this map does not represent or reflect an Ontario position, policy or opinion and Ontario accepts no responsibility for any errors, inaccuracies or omissions contained in this map.

Published February 13, 2014
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Whiskey Jack Forest IEA Request
Area of Requestors IEA Request

1:550,000

N
W E
S

Legend
- Communities
- Highways
- Primary Roads
- Branch Roads
- Whiskey Jack Forest
- Large Lakes and Rivers
- Federal Land
- IEA Request - WJ
- Provincial Park / Conservation Reserve
- Other Forest Management Units

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Ontario

Kenora District
P.O. Box 5080
808 Robertson Street
Kenora, Ontario P9N 3X9

Ministry of
Natural Resources

Ministère des
Richesses naturelles

Tel: (807) 468-2501
Fax: (807) 468-2736

April 7, 2014

This is Exhibit "D" referred to in the affidavit of AMBER ELLIS AND DAVID SCOTT sworn before me, this 21st day of AUGUST 20 15

Joseph Castrilli
A COMMISSIONER FOR TAKING AFFIDAVITS
JOSEPH CASTRILLI

Earthroots
401 Richmond Street West, Suite 410
Toronto, ON M5V 3A8

Attention: Amber Ellis

SUBJECT: EBR Registry Number 010-9240 – Forest Management Plan for the Whiskey Jack Forest for the 10-year period April 1, 2012 to March 31, 2022 – Review of Draft Forest Management Plan

Thank you for the comments provided by Earthroots in your letter dated October 31st, 2013 regarding the 2012-2022 Draft Whiskey Jack Forest Management Plan (FMP). This letter stated concern with three primary topics; Grassy Narrows First Nation consultation, the 2009 Whiskey Jack Independent Forest Audit (IFA), and the impact of harvesting on the land. All of these concerns will be discussed below.

The development of the 2012-2022 Whiskey Jack FMP has consciously worked to respect the on-going discussions between Grassy Narrows First Nation and the Ministry of Natural Resources (MNR) within the context of the Process Agreement and other efforts currently in progress. This has been accomplished through application of some fundamental principles that have been applied in the FMP.

a. The MNR has undertaken considerable effort to involve Grassy Narrows First Nation in the preparation of the 2012-2022 Whiskey Jack FMP. These efforts included written and direct invitations to join the planning team, phone calls and offers for information centres in the community to discuss proposed harvest areas. During development of the long-term management direction for the FMP, the objectives, strategies and targets for the FMP were developed by the planning team along with the Local Citizen Committee, and were broadly made available for review and input, including efforts by MNR to have open houses in the community of Grassy Narrows.

b. Planned harvest operations nearest to Grassy Narrows First Nation have been deferred to the 2nd phase of planning (2017-2022) to allow for ongoing discussions to continue with the community.

... 2

c. The FMP includes planned harvest opportunities closer to Grassy Narrows should the community, or a community member, wish to pursue forest harvesting as an economic development opportunity.

It is Grassy Narrows First Nation's right to object to the FMP process and choose not to participate. However, that position does not remove our responsibilities to the many other individuals and communities, including other First Nations that rely on the Whiskey Jack Forest, nor the responsibility to have an approved forest management operating plan.

The current legal framework outlining the Crown's duty to consult with Aboriginal peoples does not include the language of free, prior and informed consent. In most cases, Aboriginal peoples do not have a veto over proposed activities or developments. Consent may be required only in rare cases, where the Crown's action or decision will result in serious impacts on established rights.

To see how the recommendations from the 2009 Whiskey Jack Independent Forest Audit were addressed, please refer to the associated Action Plan and the Action Plan Status Report. These documents may be found on the following website: http://www.mnr.gov.on.ca/en/Business/Forests/1ColumnSubPage/STEL02_167055.html

In your letter, Earthroots lists a number of concerns with the Long Term Management Direction (LTMD) and the Draft FMP. Please see the list below for responses.

a. *Loss of the few remaining roadless areas in the forest through new road building;*

The Whiskey Jack Forest is a well accessed management unit with numbered highways, primary and branch forest access roads. These existing roads are essential for accessing the planned harvest area and minimizing the construction of new permanent road systems. Of the planned 55.9 km of primary and branch road construction in the FMP, approximately 39.4 km is actually reconstruction of previously abandoned roads. The remaining 16.5 km of planned new road construction are extensions of existing roads. Environmental guidelines are in place to maintain, construct and decommission these roads once they are no longer required.

b. *Logging targets what little mature forest that remains after decades of intensive logging, insect infestations, blow down and fire;*

The FMP was produced in accordance to the direction provided in *the Crown Forest Sustainability Act* (1994) and the subsequent four regulated manuals. In addition, this FMP was developed using the latest scientific information in the form of the science package for the draft *Forest Management Guide for Boreal Landscapes.*

The plan proposes to harvest up to 51,947 hectares over the 10 year period of the plan. These harvest areas were selected from a total of 196,425 hectares of eligible wood which does not include provincial parks, conservations reserves, and large landscape patches which have been set aside to satisfy wildlife habitat objectives.

c. *Near extirpation of caribou and now moose from the forest. The complete loss of winter caribou habitat and long term failure of to meet martin(sp.) core objectives;*

During this plan period (2012-2022), there is final harvesting planned to occur in 4 caribou "A" blocks. This small amount of planned harvesting is intended to reduce forest fragmentation and accounts for the short-term reduction in refuge and preferred winter habitat that is noted in the FMP. An increase in the refuge and preferred winter habitat is then projected from term 3 to term 6. This increase in habitat levels will achieve target levels within the 30-year target timeframe. Caribou habitat generally increases from the beginning of the plan to exceed the minimum desirable levels by term 6 and onwards. The caribou strategy for this plan was developed utilizing principles outlined in the Caribou Conservation Plan (2009).

The decline in moose populations in some parts of northwestern Ontario and in neighbouring Manitoba and Minnesota are due in part to a combination of environmental and biological factors that are not impacted by forest management activities. For example, warmer than average climatic conditions, expansion of deer populations, higher deer densities and associated parasite caused moose mortality. Moose have not been extirpated from the Whiskey Jack Forest. Moose still roam the Whiskey Jack Forest, though not in the numbers previously experienced.

Marten cores were developed to meet habitat requirements in the short, medium and long term ranges and to incorporate the best concentrations of suitable habitat, spatially distributed across the forest. The Whiskey Jack Forest has lots of conifer stands that meet the requirements of suitable habitat but they are not currently spatially concentrated enough to achieve the desirable level in the short term. The target level is expected to be achieved in 60-80 years based on the assessment of projected spatially suitable marten habitat.

d. *Extremely low levels of protected areas (approximately 4%);*

During the calculation of the sustainable harvest level, approximately 35% of the forested land base on the Whiskey Jack Forest was calculated to be unavailable. This area is located in parks, conservation reserves and areas of concern (e.g. eagles nests). This information can be found in the 2012-2022 FMP tables - Reconciliation of SFMM Initial Land Base to Tables FMP-1 and FMP-3.

e. *Return to extensive use of aerial spraying of herbicides in spite of scientific evidence on impacts to amphibians and biodiversity:*

Tending, as discussed in the 2012-2022 FMP, includes more methods than aerial application of herbicides. Tending also includes; manual cleaning with brush-saws, ground application of herbicide and pre-commercial thinning. All herbicides intended for use on the forest are legally licensed for use on forested lands by the federal government and their use in Ontario is regulated by the Ministry of the Environment Ontario.

The total amount of tending proposed in the 2012-2022 FMP is 8,065 hectares. When compared to the total amount of regeneration that is proposed (53,470 hectares), tending is planned to occur on only 15% of the harvested area.

f. *High volumes of wood for low job intensity products.*

Currently, there are only three relatively small forest companies seeking to harvest on the Whiskey Jack Forest. These three companies are all owned by Aboriginal people from neighbouring First Nations communities also located within the same forest. Harvesting is limited to areas away from those areas of greatest concern to Grassy Narrows First Nation. The FMP makes a sustainable level of wood fibre from the Whiskey Jack Forest available for harvest in order to provide social and economic benefits to the people of Ontario. The wood from the Whiskey Jack may be utilized to make products such as pulp, paper, dimensional lumber, utility poles and wooden utensils.

g. *Failure to account in any way for the scientifically established impact of clearcutting on mercury levels in the piscivorous fish in local lakes and rivers already known to contain dangerous levels of mercury;*

MNR has determined that there is a sufficient legal, regulatory and policy framework, including guidelines, to ensure that current information and knowledge about mercury dynamics in the Boreal Forest is considered in land-use and resource management decisions. Further, as part of its adaptive management framework MNR is currently reviewing, updating and developing new policies and monitoring protocols for forest management activities and waterpower projects based on current, scientifically sound information on the environmental impacts of these activities. To support the implementation of these policies and protocols, MNR is actively involved in research that seeks to improve the understanding of the dynamics of mercury in the Boreal forest and directly contribute to the development of land-use practices which minimize the risk of altering these dynamics.

h. *Prioritizing logging over all other landuse and values.*

Ontario's Crown forests are managed to meet the social, economic and environmental needs of a broad range of users of present and future generations. The Forest Management Plan is prepared by a diverse group of individuals who include, but are not limited to, trappers, cottagers, aboriginal peoples, anglers, hunters, naturalists, mining, forest industry and government. The inclusion of such a variety of interest groups is vital in the development of the desired future forest and benefits to be derived from a Forest Management Plan.

If you wish to discuss any of these concerns further or if you require clarification on any matter I would be pleased to meet with you.

Sincerely,

Deb Weedon
District Manager
Kenora District

Ontario

Kenora District
P.O. Box 5080
808 Robertson Street
Kenora, Ontario P9N 3X9

Ministry of
Natural Resources

Ministère des
Richesses naturelles

Tel: (807) 468-2501
Fax: (807) 468-2736

This is Exhibit "E" referred to in the affidavit of AMBER ELLIS AND DAVID SONE sworn before me, this 21st day of AUGUST 20 15

Joseph Castrilli
A COMMISSIONER FOR TAKING AFFIDAVITS
JOSEPH CASTRILLI

April 23, 2014

Agatha Garcia-Wright, Director
Environmental Assessment and Approvals Branch
Ministry of the Environment
2 St. Clair Avenue West
Toronto, ON M4V 1L5

RE: MNR RESPONSE TO MOE REQUEST FOR INFORMATION FOR THE 2012 TO 2022 FOREST MANAGEMENT PLAN FOR THE WHISKEY JACK FOREST

Dear Agatha:

The Ministry of Natural Resources (MNR) has received your request to provide information in relation to issues identified in the Individual Environmental Assessment (IEA) request on the 2012-2022 Forest Management Plan (FMP) for the Whiskey Jack Forest.

MNR has completed the response to the Ministry of the Environment (MOE) request and is pleased to provide it to you at this time. I have attached the response, containing the information requested.

If you have any questions regarding this response, please feel free to contact the MNR District Contact, Kurt Pochailo at (807) 468-2597 or kurt.pochailo@ontario.ca.

Sincerely,

Deb Weedon

Deb Weedon, District Manager
Kenora District
Ministry of Natural resources

Attachment

C: Devon Wills, MOE Project Evaluator
Neil Peterson, MNR Regional Contact
Paul Glassford, MNR Senior Advisor, Forest EA, FMPS
IEA Requesters

MNR Response to 2012-2022 Whiskey Jack FMP IEA Request

Introduction

The Director, Environmental Approvals Branch (EAB), Ministry of the Environment (MOE), has requested MNR provide specific documentation for consideration in its review of a joint request for an Individual Environmental Assessment on the 2012-2022 Whiskey Jack Forest Management Plan (FMP). This joint request was submitted by former Chief Simon Fobister, previous Chief of Grassy Narrows First Nation (GNFN), on behalf of Grassy Narrows First Nation, and Amber Ellis, Earthroots Executive Director, on behalf of Earthroots.

Documentation requested by MOE includes:

1. A detailed description of the involvement of the IEA requesters in the planning process;
2. A detailed description, with supporting documentation, of how the issues raised in the IEA requests;
    a. Were addressed in the planning process;
    b. Will be addressed in the implementation of forest operations and/or through additional commitments; and
3. A summary of Aboriginal involvement in the preparation of the FMP.

Potential mercury contamination appears to be the focus of the IEA requester's issues with the FMP. As this issue was raised late in the FMP process by the requesters, there is very little documentation of the issue in the FMP process as is explained in the following responses to MOE's questions. As a result, MNR has included an additional component in this response from MNR's forest science experts that should help MOE understand how MNR has been and will continue to investigate mercury issues through science and whether MNR is providing current science perspectives in the guides used to support the development of FMPs.

Further, MNR has a long standing relationship with Grassy Narrows First Nation and has been in ongoing discussions /negotiations on many topics, including forest management topics, for many years. MNR has included a brief summary of those topics and discussions to illustrate to MOE that MNR is making every attempt to address the first nation's interests and concerns.

Response to MOE's Questions

The MNR's response is structured to follow the information requested and is linked to the stages of consultation associated with the preparation of a FMP. For each stage of consultation, the response provides a brief overview of the requester's involvement in the planning process (Tables 1 and 2), and how the issues raised in the IEA request were addressed in the planning process

1. **A detailed description of the involvement of the IEA requestors in the planning process.**

Public consultation for the 2012-2022 Whiskey Jack FMP (Phase I) was developed in accordance with the requirements outlined in the 2009 Forest Management Planning Manual (FMPM).

The MNR's response is structured to follow the information requested and is linked to the following five stages of consultation for the development of the FMP; recognizing the preparation of the 2012-2022 Whiskey Jack FMP was interrupted by the preparation of a two year Contingency Plan (CP). The 2012-2014 CP was initiated during the planning process mainly to provide additional time to work with GNFN. The CP encompassed the first two years of operations developed for the 2012-2022 FMP. The endorsed CP Proposal can be found in Appendix A.

The resulting consultation stages for the 2012-2022 Whiskey Jack FMP are outlined as follows and include the stages of consultation for the preparation of the CP:

- Phase I: Stage One – Invitation to Participate
- Phase I: Stage Two – Review of Proposed Long-Term Management Direction

- Contingency Plan – Information Centre: Review of Proposed Operations
- Contingency Plan – Inspection of MNR-approved Contingency Plan

- Phase I: Stage Three – Information Centre: Review of Proposed Operations
- Phase I: Stage Four – Information Centre: Review of Draft Forest Management Plan
- Phase I: Stage Five – Inspection of MNR-approved Forest Management Plan

Prior to the commencement of the formal public consultation process for the preparation of the 2012-202 Whiskey Jack FMP, the Kenora District Manager, in accordance with

Part A, Section 4.4 of the FMPM, invited GNFN to discuss the development of a consultation approach for forest management planning with the community (i.e., customized consultation approach). GNFN indicated verbally to the Kenora District Manager that they did not want to discuss the preparation of the 2012-2022 Whiskey Jack FMP.

GNFN and Earthroots representatives received written notices for all stages of the consultation process in the preparation of the 2012-2014 CP and the 2012-2022 FMP, as required by the FMPM. In addition, at each stage of consultation, direct written notices were provided to some members of GNFN (e.g., trappers), public notices were placed in local newspapers, and an Information Notice was placed on the Environmental Registry website. Tables 1 and 2 provide a brief overview of the requester's involvement in the planning process for the 2012-2014 CP and the 2012-2022 FMP. The correspondence identified in Tables 1 and 2 can be found in Appendix A.

Table 1: Timeline and Correspondence Summary of Grassy Narrows First Nation in the FMP Process.

Date (dd/mm/yy)	Stage of Consultation and Contact
Stage One: Invitation to Participate	
20-Apr-09	Letter to Chief (6 months prior to Invitation to Participate) notifying of 2012-2022 FMP planning starting in November 2009.
3-Feb-10	Notification letter sent regarding the commencement of forest management planning process on the Whiskey Jack Forest (WJF)
2-Feb-10	Media Notice 2012-2022 FMP - Kenora Daily Miner
3-Feb-10	Media Notice 2012-2022 FMP - Red Lake Northern Sun News
6-Feb-10	Media Notice 2012-2022 FMP - Lake of the Woods Enterprise
10-Feb-10	Media Notice 2012-2022 FMP - Dryden Observer
18-Feb-10	Media Notice 2012-2022 FMP - Wawatay News
Stage Two: Long Term Management Direction	
14-Dec-11	Notification letter to review and comment on LTMD for the 2012-2022 FMP for the WJF
14-Dec-11	Media Notice 2012-2022 FMP - Kenora Daily Miner
17-Dec-11	Media Notice 2012-2022 FMP - Lake of the Woods Enterprise
19-Dec-11	Requested maps of LTMD were picked up by consultant and GNFN band member.
21-Dec-11	Media Notice 2012-2022 FMP - Dryden Observer
22-Dec-11	Media Notice 2012-2022 FMP - Wawatay News
2012-2014 Contingency Plan Development	

31-May-12	Registered letter sent to the Chief to bring GNFN up to date on the preparation of the 2012-2022 Whiskey Jack FMP. Notification of planning for Contingency Plan.
31-May-12	Media Notice 2012-2014 CP – Draft Plan Review – Kenora Lake of the Woods Enterprise
31-May-12	Media Notice 2012-2014 CP – Draft Plan Review – Wawatay News
1-Jun-12	Media Notice 2012-2014 CP – Draft Plan Review – Daily Miner
6-Jun-12	Media Notice 2012-2014 CP – Draft Plan Review – Northern Sun News
6-Jun-12	Media Notice 2012-2014 CP – Draft Plan Review – Dryden Observer
13-Jun-12	GNFN letter about the 2012-2022 FMP, presented at the CP planning team meeting on June 14th.
18-Jun-12	2012-2014 CP – Information Centre - Kenora
19-Jun-12	2012-2014 CP – Information Centre – Sioux Narrows
20-Jun-12	2012-2014 CP – Information Centre – Red Lake
21-Jun-12	2012-2014 CP – Information Centre – Ear Falls
30-Jul-12	Emails between District Manager and GNFN representative regarding planning of Aug 3rd meeting with GNFN.
3-Aug-12	Meeting with GNFN to discuss Whiskey Jack CP – GNFN would not discuss CP and left meeting – notes attached.
30-Aug-12	Letter to GNFN thanking them for their letter of June 13/2012 submitted to the planning team. This letter was in response to the 2012-2014 Draft CP.
18-Sep-12	Media Notice 2012-2014 CP – Notice of Approval – Daily Miner
19-Sep-12	Media Notice 2012-2014 CP – Notice of Approval – Northern Sun News
19-Sep-12	Media Notice 2012-2014 CP – Notice of Approval – Dryden Observer
20-Sep-12	Media Notice 2012-2014 CP – Notice of Approval – Kenora Lake of the Woods Enterprise
20-Sep-12	Media Notice 2012-2014 CP – Notice of Approval – Wawatay News
25-Sep-12	Letter to Chief – Invitation to inspect Approved CP
Stage Three: Review of Proposed Operations	
31-Jan-13	Registered letter to GNFN providing notification of upcoming Public Information Centres – offer in letter to have an information centre held at the community. No response received.
28-Jan-13	Media Notice 2012-2022 FMP Stage 3 - Lake of the Woods Enterprise
29-Jan-13	Media Notice 2012-2022 FMP Stage 3 - Kenora Daily Miner
2-Feb-13	Media Notice 2012-2022 FMP Stage 3 - Dryden Observer
2-Feb-13	Media Notice 2012-2022 FMP Stage 3 - Red Lake Northern Sun News
14-Feb-13	Media notice 2012-2022 FMP Stage 3 - Wawatay News
26-Feb-13	Letter sent to GNFN Chief reminding them of the upcoming Information Centres.
4-Mar-13	Information Centre 2012-2022 FMP Stage 3 - Kenora

5-Mar-13	Information Centre 2012-2022 FMP Stage 3 - Sioux Narrows
6-Mar-13	Information Centre 2012-2022 FMP Stage 3 - Red Lake
7-Mar-13	Information Centre 2012-2022 FMP Stage 3 - Ear Falls
3-Apr-13	Letter sent to GNFN Chief with CD containing maps and information on Stage 3 – Proposed Operations. Letter extended offer to hold an Information Centre in the community.
Stage Four: Review of Draft Plan	
30-Jul-13	Letter sent to GNFN inviting them to the upcoming Information Centres and provided a copy of GNFN Report on the Protection of Identified Aboriginal Values for review and comment. No comments were received from GNFN.
1-Aug-13	Media Notice 2012-2022 FMP Stage 4 - Lake of the Woods Enterprise
1-Aug-13	Media notice 2012-2022 FMP Stage 4 - Wawatay News
2-Aug-13	Media Notice 2012-2022 FMP Stage 4 - Kenora Daily Miner
7-Aug-13	Media Notice 2012-2022 FMP Stage 4 - Red Lake Northern Sun News
7-Aug-13	Media Notice 2012-2022 FMP Stage 4 - Dryden Observer
3-Sep-13	Information Centre 2012-2022 FMP Stage 4 - Sioux Narrows
4-Sep-13	Information Centre 2012-2022 FMP Stage 4 - Red Lake
5-Sep-13	Information Centre 2012-2022 FMP Stage 4 - Ear Falls
6-Sep-13	Information Centre 2012-2022 FMP Stage 4 - Kenora
24-Oct-13	Premier received letter regarding Draft Plan from GNFN
28-Oct-13	Received comments from GNFN on Draft Plan - Sent to Regional Director
Stage 5: Inspection of MNR Approved Plan	
19-Dec-13	Media notice 2012-2022 FMP Stage 5 - Wawatay News
	Notification of MNR-approved FMP and 30 day Plan Inspection period
23-Dec-13	Media Notice 2012-2022 FMP Stage 5 - Kenora Daily Miner
24-Dec-13	Media Notice 2012-2022 FMP Stage 5 - Dryden Observer
25-Dec-13	Media Notice 2012-2022 FMP Stage 5 - Red Lake Northern Sun News
27-Dec-13	Media Notice 2012-2022 FMP Stage 5 - Lake of the Woods Enterprise

Table 2: Timeline and Correspondence Summary of Earthroots in the FMP Process.

Date	Stage of Consultation and Contact
Stage One: Invitation to Participate	
No correspondence received	
Stage Two: Long Term Management Direction	
22-Mar-12	Email from Earthroots requesting GIS files and past harvest information for the Whiskey Jack Forest
05-Apr-12	MNR responded to March 22, 2012 email requesting information – provided a list of requested materials and inquired if this would fulfill the requestors needs

05-Apr-12	Earthroots requested additional planning information in subsequent email
10-Apr-12	MNR response to April 5, 2012 email from Earthroots and directed them to the information requested.
2012-2014 Contingency Plan Development	
21-Jun-12	Received email from Earthroots requesting a specific individual is added to the Whiskey Jack Forest mailing list as well as a map and digital information of the plan.
Stage Three: Review of Proposed Operations	
No correspondence received	
Stage Four: Review of Draft Plan	
31-Oct-13	Received Earthroots comments on the 2012-2022 Whiskey Jack Draft FMP
1-Nov-13	Received email from Earthroots requesting data for the Draft Plan and the LTMD
05-Nov-13	Received email posing question regarding the Planned Wood Utilization by Mill (FMP-15) table from the Draft FMP
05-Nov-13	Email sent to Earthroots responding to request for large amounts of information on the 2012 Draft FMP
06-Nov-13	MNR responded to Earthroots November 5, 2013 request for digital information on the 2012-2022 FMP
26-Nov-13	Email from Earthroots regarding public input received during draft plan review and other questions related to planning
23-Dec-13	Responded to Earthroots email of November 26, 2013 providing all of the requested information.

2. **A detailed description, with supporting documentation, of how the issues raised in the IEA request:**
    a. **were addressed in the planning process; and**
    b. **will be addressed in the implementation of forest operations and/or through additional commitments.**

MOE determined that the following issues raised in the IEA request would be reviewed:

Issue 1 Harvest – Application of the clear cut silvicultural system on the area affected by the IEA request will disturb the soil causing naturally occurring mercury to become in flux and travel through the water system collecting in catchment areas already stressed with mercury, further exaggerating the existing mercury contamination issue in local waterways which may potentially affect human and ecosystem health and adversely impact Aboriginal and Treaty rights.

Issue 2 Harvest – MNR doesn't have the science and information base to support the development of prescriptions to mitigate the effect of mercury on terrestrial or aquatic ecosystems.

Issue 3 Harvest – FMP contains no requirements for ongoing monitoring of mercury levels in the area affected by the IEA request to determine if in fact approved forest operations once implemented would (further) elevate mercury levels in catchment areas.

Issue 4 Access – The construction of forest access roads on area affected by the IEA request will disturb the soil causing naturally occurring mercury to become in flux and travel through the water system collecting in downstream areas already stressed with mercury, further exaggerating the existing mercury contamination issue.

Issue 5 Consultation – MNR did not respond to comments submitted by the requestors on the mercury issue during the preparation of the FMP and the requestors have raised concerns about the failure to discharge the duty to consult in the development of this forest management plan.

Issues 1 to 4 deal with content of the FMP versus issue 5 which deals with the forest management planning process requirements. Therefore, issues 1 to 4 will be dealt with together and issue 5 will be dealt with separately.

Issues 1 to 4

During stages 1 through 3 of the planning process, issues 1 through 4 were not raised by the requesters. During Stage 4, the impact of clearcutting on mercury levels in piscivorous fish in local lakes and rivers was brought forward as one of a number of issues Earthroots had with the FMP. There was no corresponding mention of this issue in the response MNR received on the Draft FMP from GNFN. MNR responded to the issue brought forward by Earthroots indicating that MNR complied with the legislative, regulatory and policy requirements, including the approved forest management guides, which mitigate potential adverse effects on the environment. Through the implementation of the FMP, including the application of Area of Concern prescriptions, silvicultural ground rules, and best management practices for road construction activities, MNR will be further mitigating potential adverse effects on the environment. MNR has made no further commitments in the FMP to address the issues raised by the requesters.

Issue 5

In regards to the claim that MNR did not discharge its duty to consult during the development of the forest management plan, MNR followed the public and Aboriginal

consultation requirements outlined in the Forest EA approval and the FMPM as outlined below.

Aboriginal consultation for the 20012-2014 Whiskey Jack CP and the 2012-2022 Whiskey Jack FMP (Phase I) was undertaken in accordance with the requirements outlined in the 2009 Forest Management Planning Manual (FMPM):

1. Prior to the commencement of the formal public consultation process for the preparation of the 2012-202 Whiskey Jack FMP, the Kenora District Manager, in accordance with Part A, Section 4.4 of the FMPM, invited GNFN to discuss the development of a consultation approach for forest management planning with the community (i.e., customized consultation approach). GNFN declined the opportunity to develop a customized consultation approach.
2. The Kenora District Manager offered GNFN an opportunity to have a community representative sit on the FMP planning team and Local Citizens Committee (LCC). GNFN did not take the opportunity to become a member of the planning team or the LCC.
3. At each stage in the development of the CP and FMP notification letters were sent to GNFN to invite participation in the FMP process.
4. During the preparation of the 2012-2014 CP and the 2012-2022 FMP:
    a. the Kenora District Manager sought the involvement of GNFN to review and update the existing Aboriginal Background Information Report (ABIR), including the Aboriginal values maps; and
    b. The planning team produced a Report on Protection of Identified Aboriginal Values during the planning of operations as per the requirements of Part A, Section 4.6 of the FMPM

MNR responded to all comments submitted to the planning team during the preparation of the 2012-2014 CP and the 2012-2022 FMP in accordance with the requirements of the FMPM (Part A, Section 3.3.2.3). MNR did not receive any correspondence from GNFN, throughout the planning process, that there was a concern with the impact of clearcutting on mercury levels in piscivorous fish in local lakes and rivers. MNR did receive correspondence from Earthroots during Stage 4 of the planning process (i.e., Draft Plan Review) that they were concerned with, amongst many other concerns, with the impact of clearcutting on mercury levels in piscivorous fish in local lakes and rivers (Appendix A). MNR responded to these concern identified by Earthroots, indicating that MNR applied the direction in the approved forest management guides to mitigate potential adverse effects of forest management activities on the environment. (Appendix A).

In regards to the claim that MNR did not discharge its duty to consult during the development of these forest management plans, MNR followed the public and Aboriginal consultation requirements outlined in the Forest EA approval and the FMPM. Further, MNR has made substantial efforts to consult with GNFN on the specifics of the development of the 2012-2022 Whiskey Jack FMP and previous FMP plans (e.g., 2009 CP, 2012 CP). These efforts have been substantially rejected by GNFN. The duty to consult requirement is mandated under the Constitution Act, 1982 and as directed by case law, principally decisions rendered by the Supreme Court of Canada. It is also taken from this case law that First Nations cannot thwart the Crown's efforts to consult, such as refusing to participate in real and sincere efforts to consult. In regards to GNFN's assertion that "MNR did not discharge its duty to consult", with respect, the Ministry of the Environment has not been mandated to make a determination as to whether the MNR has met the burden of the Government's duty to consult.

In conclusion, the 2012-2014 CP and the 2012-2022 FMP for the Whiskey Jack Forest were prepared in accordance with the requirements of the FMPM.

3. Provide the web link to where a summary of Aboriginal involvement in the preparation of the FMP can be found.

The 2012-2022 Whiskey Jack FMP can be found on the Electronic FMP site at the following link:

http://www.efmp.lrc.gov.on.ca/eFMP/home.do

The summary of Aboriginal involvement has been retained at the Kenora District MNR office and its location is identified in Appendix C of the Supplementary Documentation. A copy of the summary can be found in the attachments to this letter.

Summary

GNFN, is the appropriate silvicultural system for the boreal forest, and ecosystem dominated by forest disturbance (eg. wildfire) and the planned harvest levels are in support of balanced objectives.

The issue of methylmercury was raised by GNFN for the first and only time, prior to the IEA request, in an October 24th, 2013 letter to the Premier, coincident with the Stage 4 – Review of Draft Plan. Earthroots also identified methylmercury as a potential issue for the first time in a letter dated October 31st, 2013 during Stage 4 – Review of Draft Plan.

The planning process contemplated the issue of methylmercury through the application of the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* 2010 (SSG). The accompanying Background and Rationale document for the SSG clearly acknowledges the potential for forest management activities to mobilize mercury, it provides a comprehensive summary of available scientific literature on the topic, provides a clear rationale for guide direction and acknowledges the uncertainty associated with this direction. There are no claims that SSG direction and application of the SSG will mitigate or eliminate Hg mobilization.

The summary of Aboriginal involvement identifies how MNR followed the requirements identified within the FMPM pertaining to Aboriginal consultation.

In addition to the information requested by MOE, MNR has provided some additional information with regard to the additional efforts to work with GNFN on many aspects of forestry and forest management planning on the Whiskey Jack Forest.

MNR Science Review

As part of MNR's review of the IEA request submitted by Grassy Narrows First Nation and Earthroots, MNR sought input from MNR forest scientists. They reviewed the submission, and in particular the many scientific references throughout, to ensure they were valid and pertinent to the discussion. Subsequently, MNR's forest scientists prepared the following response to the IEA requester's submission.

Introduction:

The IEA requestors contend that the Whiskey Jack forest management plan "fails to adequately deal with the impacts of logging on mercury levels in boreal water and fish" and that the plan will "harm water quality, fish habitat, wildlife and the health of people who eat the fish". To support their concern the requestors present as evidence a number of research studies that have shown that forest disturbance (both forest management and fire) result in changes to mercury dynamics within watersheds which may increase the movement of terrestrial bound mercury into aquatic systems and may be associated with higher levels of mercury in aquatic organisms.

The requestors also argue that the forest management guidelines, provided in the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* (the Stand and Site Guide or SSG), do not adequately address the issue of forest management impacts on mercury dynamics.

The IEA request is presented in 15 sections which address various related concerns. In the MNR science team's attempt to evaluate the scientific basis of the request and provide comments on current forest management policies and guidelines related to the issue, we have divided the sections into 4 general themes and we will address the scientific evidence and the interpretation of this evidence that is presented in themes A and B:

A) Concerns arising from research on mercury and forest management

1. Clearcutting Impacts Water Quality Through Mercury Contamination
2. Clearcutting Elevates Mercury Levels in Fish
3. Elevated Mercury Levels Impact Wildlife
11. Duration and Intensity of Impacts

B) Concerns associated with forest management policy (SSG)

7. Measures in the Logging Plan to Deal with the Mercury Problem
8. Stand and Site Guide Rationale on Mercury
   - (i) Natural Disturbance Emulation Not Appropriate for Mercury Safety
   - (ii) Mitigation Science is Not Sufficiently Developed
   - (iii) Log Now, Test Later Approach.
12. Changes to Guidelines Are Likely to Make Mercury Problem Worse
   - (i) A. Logging to the Shoreline
   - (ii) Catchment Disturbance Thresholds Removed
13. Specific Deficiencies in MNR Mitigation Measures

C) Concerns arising from historical contamination

4. Fish in Grassy Narrows Have Critical Levels of Mercury
5. Mercury Impacts Human Health in Grassy Narrows

D) Concerns arising from the planning process (not directly linked to science/research)

6. Efforts to Raise the Mercury Issue
10. Delay and Hardship
14. Need for an Individual Environmental Assessment
15. Remedy Requested

A) Concerns arising from research on mercury and forest management

Mercury is a natural element that occurs in air, water, soil and biota in the boreal forest. Mercury, which exists in several inorganic, or elemental, forms (Hg) and as organic methylmercury (MeHg), alternates between forms and cycles among different components of the ecosystem as part of a complex biogeochemical process. Natural levels of mercury are spatially variable depending on geology, soil and forest characteristics; however, the global atmospheric pool of mercury has increased two to five fold over pre-industrial times (Linberg *et al.* 2007). There is clear evidence from a number of studies that forest management is one of a large number of factors that influence mercury dynamics within watersheds. In sections 1, 2, 3 and 11 the IEA requestors provide quotations from some of these studies to support their conclusions regarding the risk of mercury increases associated with forest management. The following is a review of these sections:

1. Clearcutting Impacts Water Quality Through Mercury Contamination

The requestors contend that forest management activities will result in an increase in Hg and MeHg in waterbodies in the area. As evidence to support this conclusion they present results from several studies conducted in Quebec, Sweden and Finland, much of which is summarized in a review paper by Bishop et al (2009).

MNR review:

- Increased mobilization of mercury within watersheds following forest disturbance has been documented in several studies done in Canada, Sweden and Finland.
- Disturbance impacts include increases in the concentration of Hg and MeHg in surface runoff (increased concentration) and increases in runoff, thereby increasing the movement of Hg even without concentration changes (transport or flux).
- Changes in Hg dynamics are highly variable among watersheds depending on a large number of factors, including watershed characteristics and the extent of disturbance. For example, Bishop et al (2009) show post-harvest Hg concentration response ranging from a 4 fold increase in a Finnish study to no increase found in a study done in Northwestern Ontario.
- Very little work is available which directly compares Hg mobilization between harvested and burned watersheds. Studies done in Quebec measured increases in dissolved organic carbon (DOC), to which Hg is bound in surface water runoff, following harvest under some conditions (large disturbance area within the watershed and a large watershed to lake area ratio) but not consistently (Carignan et al 2000).
- No research has been conducted to test the effectiveness of specific forest management planning or operational measures at mitigating increases in Hg

mobilization. Bishop et al (2009) provide some recommended practices which are similar to direction provided in the SSG (see discussion in theme B below).

Conclusion: There is strong evidence, based on a number of studies, that the rate of movement of Hg and MeHg from terrestrial to aquatic areas will increase following forest disturbance. There is not sufficient evidence to conclude that the magnitude of Hg response to forest management disturbance differs significantly from natural disturbance events in all cases; however, the mechanism of response is likely different. There is also no research available which tests the effectiveness of guidelines to mitigate changes in watershed Hg dynamics arising from forest disturbance.

2. Clearcutting Elevates Mercury Levels in Fish

The IEA requestors state that forest management activities in the Whiskey Jack forest will increase Hg inputs into aquatic systems which will harmfully alter fish habitat and result in an increase in MeHg levels in fish and other aquatic organisms. As evidence they present a number of quotes from Bishop et al (2009) as well as from Garcia and Carignan (2005). It should be noted that the Bishop et al (2009) paper is a review of previous research and all information presented on fish Hg levels come from a study by Garcia and Carignan (2000, 2005) so the evidence comes from a single study.

MNR review

- Fish in disturbed watersheds (cut and burned) had higher mercury levels than fish in undisturbed reference lakes
- Fish mercury levels were highly variable and were strongly positively correlated with fish size (fig 1) and fish trophic position (fig 4) (Garcia and Carignan 2005)
- Based on fig 4 (Garcia and Carignan 2005) more than 3 times more variability in fish mercury is associated with trophic position than with watershed disturbance and there is very little difference between fish mercury levels in cut and burned lakes when trophic position is controlled for.
- ‘The highest Hg concentrations were observed in fish from two partially burnt lakes’ (pg 690, Garcia and Carignan 2005). It appears that fire intensity (proportion of the watershed burned and the amount of organic layer burned) has a substantial impact on mercury dynamics in the watershed and the potential response of aquatic organisms.
- Through elevating DOC export from soils, an enhanced vector of Hg export to aquatic ecosystems occurs.

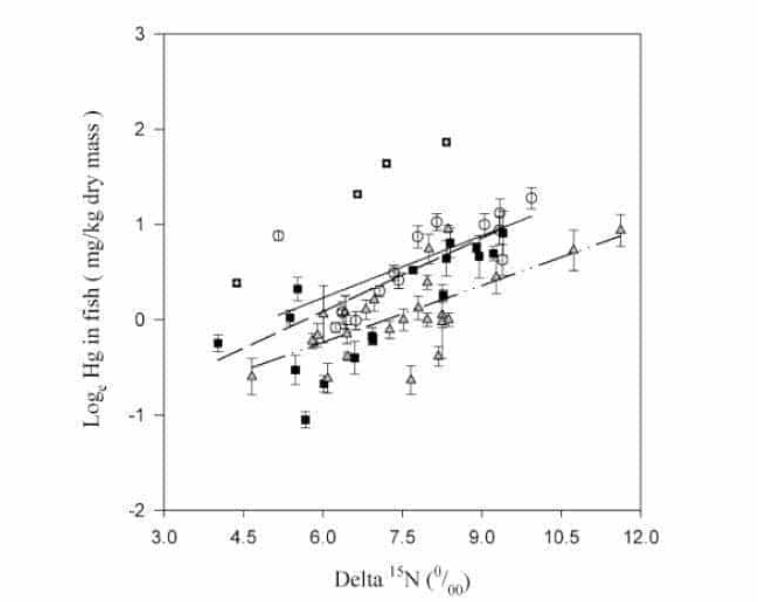

Fig. 4. Relationships between mercury (Hg) concentrations and fish $\delta^{15}N$ for reference lakes (triangles and dash-dot-dot line), and for lakes with cut (open circles and solid line) and burnt catchments (black and dotted squares for completely and partially burnt catchments, respectively, and dashed lines). Points represent fish of a standardized length from 62 populations. The $\delta^{15}N$ values are corrected for baseline variations. Error bars correspond to standard deviation.

From: Garcia and Carignan 2005

Conclusion: The comprehensive study of Quebec lakes provides evidence that fish in disturbed watersheds tend to have higher Hg concentrations than those in undisturbed watersheds. The study does not provide strong evidence that fish Hg concentrations consistently differ between burned and harvested watersheds. When trophic position is included in the analysis, fish Hg levels in harvested watersheds fall within the broader range of fish Hg levels in burned watersheds (fig 4, Garcia and Carignan 2005). This single study, despite being a very comprehensive, does not provide sufficient information to understand all the factors that influence fish Hg levels or how these factors may interact. Given the complexity of how disturbance impacts Hg dynamics and how aquatic systems may respond, it is unlikely that identical results would be seen in other regions of the boreal zone.

3. Elevated Mercury Levels Impact Wildlife

The IEA requestors express a concern that the mercury levels in a number of wildlife species, presumably those that consume fish, may increase if fish mercury levels increase. They provide evidence, primarily citing Environment Canada websites, which explains that mercury contamination can have negative impacts on the growth, development, behaviour and reproduction of wildlife species.

MNR review

- There is strong evidence that high body burdens of mercury may have toxic effects on certain wildlife species and lead to a number of health issues.
- Elemental mercury (Hg) in water and plants is not toxic to animals and is not stored in animal tissue; however, methylmercury (MeHg) is toxic and is stored and bioaccumulated in muscle and fat tissue. The main source of MeHg for terrestrial animals is the consumption of fish.
- We are unaware of any studies that directly examine the relationship between forest disturbance and wildlife Hg levels.

Conclusion: While it may be reasonable to assume that increases in fish Hg levels could lead to Hg increases in piscivorous wildlife species, the relationship between forest disturbance and fish Hg is not well understood (see section 2) and the further connection to wildlife is likely very complex and associated with a large number of interacting factors.

11. Duration and Intensity of Impacts

The requesters state on page 24 that “if further clearcutting is allowed without proven mitigation measures, and methyl mercury levels in local fish are elevated as a result, the impacts would likely be grave and long lasting.” They further contend that “the impacts of releasing mercury into the environment in Grassy Narrows through clearcut logging are likely to last at least a decade in fish, and at least one human lifespan beyond that in people”. They base their conclusions on data from studies conducted in (1) Ontario, Québec, Finland, and Sweden, much of which are summarized in studies by Bishop et al. (2009) and Garcia and Carignan (2005).

MNR review:

- The proponents state that “clearcutting has been found to increase MeHg bioaccumulation in boreal lakes by two to four fold, and sometimes as much as eight fold (Bishop et al., 2009)” (Page, 24). The further state that “As much as 37% of Hg in fish across a managed landscape would result from the increased Hg outputs associated with felling and thinning”. Bishop et al. (2009) actually calculated that forest harvesting may contribute 9 to 23% of MeHg fluxes from the soil following harvesting. They also made the point that many uncertainties existed in the calculations (e.g., small number of samples and a large range of impacts across studies).

- Few studies have been published regarding the effects of clearcut harvesting on fish MeHg concentrations. Those studies suggest that although MeHg concentrations in fish may increase following clearcut operations, it is generally limited to cases when soils are disturbed, and not to the harvesting of trees. This

was alluded to by Bishop et al. (2009), as well as reported in findings and discussions of other studies (Povari et al., 2003, Sørensen et al., 2009, Eklöf et al., 2012, 2013). Soil disturbance contributes to elevated fish concentrations in upland catchments via particulate matter (organic and mineral) transport from forest soils to streams and lakes. Whereas, soil disturbance of lowland (e.g., wetlands and riparian zones) catchments increase MeHg runoff to streams and lakes via enhanced dissolved organic carbon (DOC) transport. Therefore, no evidence exists contrary to the protection of soils from disturbance as described in the Stand and Site Guide as a mitigation measure minimizing forest harvesting operation effects on fish MeHg concentrations.

- The requesters further contend on pages 24 – 25 that “impacts of clearcutting on mercury have been found to persist for at least five years, with no known endpoint” and “the increased in Hg loading effect has also been observed to persist up to at least 5 years, and there are no examples so far of the logging effect having dissipated (Bishop et al., 2009)”. In fact, Skyllberg et al. (2009) assessed stream MeHg concentration in Sweden by comparing 47 clearcut stands dominated by Norway spruce to 10 mature Norway spruce-dominated stands. They showed stream MeHg concentrations were elevated in stands 0 to 4 years after harvested, but no differences occurred in MeHg concentration in streams 4 to 10 years after harvested. Skyllberg et al. (2009) suggested these results were attributed to increased organic matter added by logging residue stimulating Hg methylating bacteria in the soil, and by 4 to 10 years, this effect dissipated.

- The Hg in fish higher in the food chain continued to increase several years after harvest (Garcia and Carignan 2000, 2005, as cited in Bishop et al., 2009 (Page 24).
  See response to section 2 for discussion of fish Hg response.

- The requesters contend on pages 25 – 26 that logging is likely to (1) further elevate mercury in fish in previously contaminated lakes due to increasing methylation rates of newly added mercury and stored mercury in lake sediments, (2) prolong the length of time for which fish in previously contaminated lakes remain unsafe to eat, (3) elevate mercury levels in fish in marginally safe lakes above safety limit, and (4) elevate mercury levels in fish in currently safe lakes above the safety limit.

trends in mercury in walleye, northern pike, and lake-whitefish in 4 lakes along a chain of lakes occurring from closest to furthest locations from a paper mill source (approximately 10 tonnes Hg input between 1962 and 1970); Clay, Ball, Separation, and Tetu Lakes, respectively. Neff et al. (2012) found that for all lakes and fish species, mercury declined by 35 to 94% through time, although walleye and northern pike mercury concentrations were above (Clay Lake) or near (Ball and Separation Lakes) the human consumption guideline of 0.5 µg g-1 of fish tissue. Additionally, the authors summarized mercury concentrations of walleye (45 cm length) and northern pike (50 cm length) based on 143 and 123 locations in northwestern Ontario. Neff et al., (2012) reported median values near the 0.5 µg g-1 guideline for walleye (25th – 75th percentiles = 0.38 and 0.75 µg g-1, respectively) and median of 0.38 (25th – 75th percentiles = 0.25 and 0.60 µg g-1, respectively) for northern pike.

Most rapid declines in fish mercury concentrations occurred between 1970 and 1985; however declines slowed from the late 1980s to 2010. Contributions to the slower declines are many and include (1) the lakes approaching baseline values prior to mercury contamination, (2) climate change enhancement of (a) area burned and severity of soil organic matter and mercury combustion or (b) extended drought followed by intense precipitation events, (3) catchment cover types and the wetland-to-lake ratio, and (4) connectivity of wetlands, streams, rivers, and lakes in a drainage basin.

- The proponents also suggest on pages 25 – 26 that “clearcutting leads to higher DOC compared to reference lakes and burned lakes (Garcia and Carignan, 2005), stimulating bacterial methylation, decreasing photo-oxidation of MeHg to Hg^{2+}, and possibly decreasing photo-reduction of Hg^{2+} to gaseous mercury. Those processes were suggested to elevate mercury levels in fish.

  Research has shown in the temperate and boreal regions of North America (Couture et al., 2012) and Europe (Laudon et al., 2013) that climate change is the primary cause of elevated DOC concentrations in lakes. Moreover, although studies (e.g., Haines et al., 1994; Sellers et al., 1996) suggest elevated DOC concentrations may inhibit photo-oxidation of MeHg and reduction of Hg^{2+} to gaseous mercury these results are far from universal. For example, although DOC is an important transport vector for Hg^{2+} and MeHg, this DOC is highly recalcitrant (e.g., low bacterial degradability). Whereas bacterial methylation is dependent upon the presence of easily degradable DOC concentrations (as well as electron acceptors such as sulphate); thus increasing DOC-Hg transport from soil to lakes does not necessarily translate into greater rates of mercury-methylation.

Conclusion: For forest harvesting to further exacerbate walleye and northern pike mercury concentrations in lakes situated in the English-Wabigoon River System, any mercury input to upstream catchments will need to traverse a myriad of interconnected

wetlands, streams, and lakes within the river system. However, we are aware of no published studies addressing potentially elevated long-range mercury transport in large drainage basins. In terms of MeHg (and assuming it is elevated in headwater catchments), some of it would be removed from the water column of lakes through (1) MeHg photo-oxidation to Hg^{2+} and its subsequent reduction to gaseous mercury and loss to the atmosphere or (2) settling of DOC- and particulate matter-bonded mercury from the water column to the sediments as water moves downstream. While much variation occurs in the photo-oxidation rates of MeHg to Hg^{2+} and its reduction to gaseous mercury, the current scientific evidence indicates that protecting soils from disturbance during harvesting operations as spelled out in the Stand and Site Guide will minimize total and methyl mercury loading from soils to streams and lakes in a catchment. Furthermore, it can be reasonably argued that any MeHg-containing water resulting from harvesting in headwater catchments will be diluted prior to reaching the English and Wabigoon Rivers and their connected lakes, thereby contributing little to mercury concentrations in the river system's lakes.

B) Concerns associated with forest management policy (SSG)

Direction in the SSG was based on a thorough review of existing literature, and discussions with and review by ecological researchers, practitioners, policy makers, stakeholders, and members of the public to ensure that direction would be effective in meeting ecological objectives, while also being feasible to implement and socially palatable. *'In all cases, the direction in the Stand and Site Guide represents a series of predictions or hypotheses. Those with a high degree of uncertainty have been identified as a high priority for testing through an effectiveness monitoring program (see Section 7). The results of this monitoring program, along with other sources of information, will be used during periodic reviews of the Stand and Site Guide to help determine when the guide needs to be revised'* (SSG section 1.3.5, pg 5). The SSG therefore represents a summary of the best available direction to meet MNR's objectives and legislative requirements for sustainable forest management and incorporates an adaptive management approach to evaluate and improve direction in areas of uncertainty.

Section 1.3 of the SSG summarizes the guide's approach to conserving forest biodiversity using guidance characterized as coarse and fine filters. This direction is based on the principles of the *Crown Forest Sustainability Act, 1994* (CFSA) which a key piece of legislation regulating forest management. Specifically the CFSA states:

> *The long term health and vigor of Crown forests should be provided for by using forest practices that, within the limits of silvicultural requirements, emulate natural disturbances and landscape patterns* [coarse filter] *while minimizing adverse effects on plant life, animal life, water, soil, air and social and economic values, including recreational values and heritage values* [fine filters] (CFSA s. 2(3)2).

The coarse filter approach to the emulation of natural disturbance and landscape patterns is intended to maintain the natural diversity of forest condition and ecological processes in order to conserve forest biodiversity and is a legal requirement under the CFSA. The coarse filter is not intended as a specific mitigation measure but rather an approach to maintain the state of all elements of the forest ecosystem within a natural range. Fine filter direction is included when there is evidence that additional mitigation measures will improve the protection of specific values.

During the development of the SSG, MNR did an extensive review of the body of scientific literature examining the relationship between forest disturbance and mercury dynamics. A summary of this review and the resulting decision on guide direction are provided in the SSG Background and Rationale document (pg 23-25) which is included as an appendix in the IEA request. The key points from the review were:

- The potential for forest management activities to result in mobilization of terrestrial mercury into aquatic systems is well documented and a serious concern.
- The nature and magnitude of changes in mercury dynamics within a watershed following disturbance are complex and related to a number of interacting factors including area disturbed, changes to hydrology, the amount and type of wetland in the area and soil disturbance.
- There is limited information on the potential for fish Hg levels to be influenced by harvest disturbance but the best available evidence shows that fish in lakes with disturbed watersheds had higher mercury levels than those in undisturbed watersheds and that the range of Hg levels in fish in harvested watersheds was within the range of those in burned watersheds (Garcia and Carignan 2000, 2005).
- There is a high degree of uncertainty regarding Hg response to forest management and the issue should be a high priority area for guide effectiveness monitoring.

Because there are no studies which identify or evaluate mitigation measures to minimize mercury mobilization following disturbance there are no mitigation measures specific to mercury in the SSG. The guide does provide direction to minimize site disturbance, sediment transport and hydrologic disruption (listed on pg 24 of the SSG Background and Rationale) all of which may be associated with increased mercury mobilization. In a review paper published following the release of the SSG, Bishop et al (2009) conclude that “An understanding of the processes controlling the output of Hg from catchments to surface waters, and subsequent bioaccumulation, is not sufficiently developed to confidently recommend ameliorative measures for forestry” (pg 378). They do offer some suggested practices, which include minimizing site disturbance and hydrological disruption and protecting wetlands. Direction in the SSG is entirely consistent with the recommendations of Bishop et al (2009).

The IEA request raises a few specific concerns about the SSG which suggest that they have misinterpreted the direction in the guide:

- In section 8 the requestors interpret the SSG rationale on mercury as stating "1. Logging is essentially equivalent to fire so attempts to emulate fire will eliminate Hg impacts". The SSG does not suggest that emulation of natural disturbance patterns will eliminate Hg impacts. The emulation of natural disturbance patterns within watersheds is expected to result in watershed scale hydrologic changes that are within the range that would occur as a result of natural disturbance processes. The SSG provides additional direction to minimize site disturbance associated with harvest and road construction, particularly in areas that are expected to have higher soil moisture levels. The SSG acknowledges that Hg dynamics will likely change within the watershed as a result of any type of forest disturbance and that further research and monitoring is required to refine direction in the guide.

- In section 9 the requestors state that "logging and forest fire have nearly opposite impacts on mercury" (pg. 16). This statement is demonstrably false as all the literature they cite as evidence shows that Hg is mobilized and/or bioaccumulated following both fire and harvest disturbance. The mechanism and magnitude of Hg response almost certainly differs between burned and harvested watersheds but all of the studies cited found some level of Hg response following disturbance by fire. Fire intensity is likely an important factor that influences Hg response with high intensity fires volatilizing Hg bound in the organic soil layer and low intensity fires leaving this layer undisturbed and Hg subsequently being mobilized as water tables rise and surface runoff increases. In their study of fish Hg levels, Garcia and Carignan (2000, 2005) found the highest Hg levels in fish from watersheds impacted by low intensity fires and lower Hg levels in fish from watersheds with high intensity fires. Fish Hg levels in harvested watersheds fell within this range (Garcia and Carignan, 2000, 2005). (Note that the requestors appear to use fire size and fire intensity interchangeably when in fact these measure different things)

Conclusion: The Stand and Site Guide and accompanying Background and Rationale document clearly acknowledge the potential for forest management activities to mobilize mercury, provide a comprehensive summary of available scientific literature on the topic, provide a clear rationale for guide direction and acknowledge the uncertainty associated with this direction. There are no claims that SSG direction will mitigate or eliminate Hg mobilization.

Outline of recently completed, ongoing, and proposed MNR research activities addressing identified science gaps with respect to total and methyl-mercury dynamics in forested watersheds.

As noted in section B (Concerns associated with forest management policy – SSG) of MNR's response to the current IEA request, and highlighted in the SSG Background and Rationale document there remains a high degree of uncertainty regarding Hg response to forest management activities. As such, MNR views this as a high priority area for guide effectiveness monitoring and research. It is anticipated that results from MNR's ongoing research efforts will be a valuable source of new scientific knowledge that will be used during the required periodic reviews of the SSG as part of the adaptive management approach to evaluate and improve direction in the guide with respect to minimizing the adverse effects of Hg mobilization and subsequent bioaccumulation.

As has been clearly highlighted in MNR's response to the IEA request of the Whiskey Jack FMP, total and methyl mercury export from terrestrial to aquatic ecosystems, and their accumulation through trophic levels in the latter are controlled by a myriad of interacting processes, including disturbance type and intensity, inherent site conditions, atmospheric mercury deposition, and climate change. These interacting factors contribute further to the high variability in mercury dynamics within forested watersheds. As such, MNR is supporting a number of research projects that are well-positioned to address critical science gaps associated with terrestrial and aquatic mercury dynamics, many of which have been part of multi-institutional (provincial ministries, federal , and academic) partnerships. The summary below provides brief overviews of research projects that are: (1) examining patterns in fish mercury bioaccumulation, (2) evaluating the levels of mercury runoff from forest and wetland soils to aquatic systems, (3) mercury research conducted by other provincial and federal agencies, some of which include MNR as partners, and (4) a proposed synthesis of land use effects (e.g., mining, hydroelectric, and forest management activites) on watershed Hg cycling and export..

1. **Fish mercury bioaccumulation**
   A. MNR research lead: Dr. Tom Johnston, Research Scientist, Aquatic Research and Monitoring Section
      1) Ongoing efforts to update fish mercury information, both in the near north and far north, to improve consumption guidelines and assist with community-based land-use planning.
      2) Determine temporal changes in fish mercury bioaccumulation, 1970s to present. These efforts are largely focused in the near north but does include some work in the far north as well. This project was the basis for Rex Tang's MSc thesis and has already been published (Tang et al. 2013. Sci. Tot. Environ.). Additional work is targeting additional lakes to provide

better geographic coverage for the analysis, and considering to repeat the analysis over shorter (more recent) timeframes.

3) Assess the relative importance of food web position and growth rate in shaping interspecific variability in piscivore mercury concentrations. This project is targeting lakes that have co-habiting populations of lake trout, burbot, walleye, and northern pike. This will allow us to control, to some extent, the between-lake variability when making interspecific comparisons.
4) Determine the spatial variation in fish mercury concentrations from headwaters to James Bay in the Attawapiskat River drainage basin (Lescord PhD project, started 2013). This project is restricted to the far north and looks at mercury dynamics following a river continuum framework. The PhD candiate will compare how mercury moves through the food web at various points along the continuum from the headwater lakes of the shield, to the main stem river of the lowlands.
5) Determine the roles of physical-chemical limnology and food web structure in shaping fish mercury patterns in lakes across a climatic gradient (Sumner MSc project, started 2013). The MSc student will examine lakes across the near north and far north, comparing the role of climate (inferred from latitude or GDD) with the role of other factors. She may include some landscape factors (e.g., area or vegetation cover of drainage basin) in the analysis.

B. MNR research lead: Dr. Rob Mackereth, Research Scientist, Centre for Northern Forest Ecosystem Research
   1) Ongoing monitoring of mercury in small stream biota to evaluate the association between the rate of bioaccumulation and biomagnification of mercury and stream characteristics, including catchment disturbance. Sampling of periphyton, benthic invertebrates and fish have been conducted in watersheds having different forest management histories. Results to date show that mercury is present in all stream biota and tends to be higher in small streams compared to large. We have found no differences in fish mercury levels based on forest management activities in the watershed. Fish and invertebrate mercury concentrations tend to be associated with local conditions including pH, conductivity, stream gradient and temperature. Future work will focus on measuring fish and invertebrate mercury levels in streams within burned watersheds.

2. Mercury runoff from forest and wetland soils to aquatic systems

A. MNR research lead: Dr. Rob Mackereth, Research Scientist, Centre for Northern Forest Ecosystem Research
   1) The Escape Lake experimental watershed study was initiated to evaluate the impacts of forest management activity on the hydrologic connectivity between terrestrial and aquatic habitats and to observe the catchment scale hydrologic (groundwater levels, surface water flow, water chemistry)

and soil chemistry response. Beginning in March 2003, the watershed was surveyed (high resolution DEM, vegetation plots, soil pits) instrumented (wells and pizometers in wetland and along 3 experimental and 1 reference hillslope transect, resin bag transects) and monitored for 1.5 years. Experimental clearcut harvesting was carried out in June 2004, and included harvesting merchantable trees within the prescribed 30m buffer. Water quality constituents examined include major cations (Ca^{2+}, Mg^{2+}, K^{+}, Na^{+}) and anions (SO_4^{2-}, Cl^{-}), nutrients (NO^{3-}, NH^{4+}, TN, ortho-P, TP), TSS, turbidity, DOC, SRSI and metals (Al, Fe, Mn, Cu, Cd, Pb, Zn, Ni and MeHg and THg). Mercury concentration in ground and surface waters did not increase; however, following harvest, catchment water yield approximately doubled relative to pre-h
Hg flux.

2) The associations between watershed and lake scale characteristics with THg in piscivorous fish were examined as part of an MSc research project (Victoria Danco). ArcGIS was used to delineate the waterbody catchment area and extract waterbody catchment characteristics for 243 of northern Ontario's lakes. Walleye (*Sander vitreus,* n= 121 lakes), lake trout (*Salvelinus namaycush,* n= 60 lakes), brook trout (*Salvelinus fontinalis*, n= 18 lakes), northern pike (*Esox lucius,* n =107 lakes), smallmouth bass (*Micropterus dolomieu*, n = 37 lakes), and burbot (*Lota lota,* n= 4 lakes) populations were standardized to the mean length of the populations by using power-series regressions. Multivariate analysis (non-metric multidimensional scaling) and univariate analysis were used to determine the associations between total mercury concentrations in fish and watershed scale and lake scale variables. Watershed and lake chemistry characteristics poorly described the variability in THg concentrations. Forest harvesting and natural disturbance were not associated with fish mercury concentrations.

B. MNR research lead: Dr. Jim McLaughlin, Research Scientist, Forest Research and Monitoring Section

1) Climate change effects on total and methyl mercury runoff from peatlands. Intact peat monoliths were collected in 2012 from peatland located near White River and transported to the University of Western Ontario BIOTON, where we are exposing the cores to varying atmospheric-CO_2 concentrations, air temperature, and water table levels in a replicated experiment. Preliminary results point to low water table followed by rewetting of the peat through precipitation significantly elevated MeHg in runoff water compared to other treatments. Our PhD student (Catherine Dielman, started in 2013) is currently testing the relationships among climate change, plant vegetation, peat decomposition, Hg release, and its transport in conjunction with DOC flux.
2) On April 4 2014, the NSERC-Research Tools and Infrastructure funding program awarded us (University of Western Ontario, lead institute) a grant

to establish a field-based experimental system for the evaluation of the effects of elevated temperature and elevated atmospheric carbon dioxide (CO_2) on total and methyl mercury runoff peatlands.

3) Establishing baseline conditions for Far North peat total mercury storage. This project is ongoing, where peat samples are collected and analyzed for total mercury concentration, bulk density, and peat depth to mineral sediment recorded. The data will then be used to scale peat mercury levels to peatland area of the Far North.
4) Establishing baseline conditions for forest soil mercury storage. This project is also currently ongoing, where organic (e.g., forest floor) and mineral soil samples collected at selected locations are analyzed for total mercury and bulk density, and soil horizon thickness. These will then be used to scale total mercury levels by forest cover types in the Far North and Managed forest.

3. Other provincial and federal mercury research and monitoring studies

A. Ontario Ministry of the Environment
   1) Monitoring Results for Mercury in Ontario's Water in the Great Lakes, northern Ontario lakes, and the English-Wabigoon River System.
   2) Ontario Ministry of Environment commitment to fund the Experimental Lakes Area (ELA), which is one of the world's premier watershed-based studies on forest, wetland, and aquatic mercury cycling and transport research in the boreal forest. Past research has involved the Department of Fisheries and Oceans.

B. Canadian Network for Aquatic Ecosystem Services
   1) This national research network supported by NSERC's Strategic Network Grants program, which encourages large-scale, multidisciplinary, collaborative research projects that could improve Canada's economy, society and environment within the next decade. The network is a consortium of approximately 30 researchers from 11 universities, government, and industrial partners. The Attawapiskat River Basin is one of the intensive study locations.
   2) Provincial (MOE and MNR) and federal (Department of Fisheries and Oceans and Canadian Forest Service) are network partners, whose research and monitoring staff are working with Ontario universities (University of Western Ontario, University of Toronto, and Laurentian University), and those across Canada, to establish baseline conditions of aquatic mercury levels and understanding mercury transport (and methylation) mechanisms from terrestrial to aquatic ecosystems.

C. Environment Canada
   1) Canadian Environmental Sustainability Indicators tracks the emissions of mercury to the air. The data used to calculate these indicators are taken from the Air Pollutant Emission Summaries and Trends and the National

Pollutant Release Inventory (NPRI), Canada's legislated, publicly accessible inventory of pollutant releases. National and regional emissions of mercury are provided, with emissions broken down by source.

4. Synthesis of land use (e.g., mining, hydroelectric, forest harvesting and regeneration) effects on watershed total and methyl mercury cycling and export

A. Draft outline for synthesis
   1. Mercury atmospheric deposition amounts and trends.
   2. Forest and peatland mercury cycling and runoff to aquatic ecosystems.
   3. Mercury methylation and demethylation processes.
   4. Mercury turnover rates in litter and soil.
   5. Watershed hydrology and mercury fluxes.
   6. Aquatic mercury cycling and fluxes.
   7. Land use activities (e.g., forest harvesting, hydroelectric, mining activities) and their cumulative effects on aquatic mercury levels.

It is anticipated that this synthesis effort will be a key science product that will help guide the development of future research efforts to continue targeting important science/knowledge gaps with respect to Hg dynamics and response to land use activities.

Additional Forestry Discussions with Grassy Narrows First Nation

It is very important to note, that in addition to the consultation requirements addressed during the preparation of the 2012-2014 Whiskey Jack CP, and the 2012-2022 Whiskey Jack FMP, MNR has been actively involved in improving the relationship with GNFN for many years. Various representatives of MNR including the local District Manager, Regional Director and Assistant Deputy Minister's, have engaged in direct face-to-face efforts to hear and understand Grassy Narrows's community leadership and its members' views on forestry. Preparation of the 2009-2019 ten (10) year Forest Management Plan was delayed numerous times using interim FMPs called contingency plans (CP). These plans, the 2009-2012 CP and the 2012-2014 CP, were used to demonstrate MNR's commitment to the relationship by enabling ongoing discussions with GNFN. The result was that the development of a full and complete forest management plan, as per the Crown Forest Sustainability Act, was delayed for 5 years.

The following is a brief summary of the additional discussions undertaken by MNR with GNFN that are outside of the forest management planning process, that demonstrate MNR's ongoing commitment to build a sound relationship with GNFN:

- Grassy Narrows First Nation (GNFN), MNR, Abitibi and Indian and Northern Affairs Canada (INAC) have been in forestry discussions, individually or as a group, at various times, since at least 2004. In March 2004, focused discussions were initiated in response to road blockades organized by members of GNFN and their sympathizers. These discussions sought to understand and respond to GNFN grievances around forestry activities on the Whiskey Jack Forest.
- MNR, Abitibi and INAC indicated throughout the talks that they were prepared to discuss GNFN grievances on a practical basis, i.e., measures to address concerns

about how forestry was conducted, not rewriting the provincial forestry legislation or considering assertions for jurisdictional control of the GNFN traditional lands. The parties met on numerous occasions throughout 2004 and 2005 and exchanged a series of Interim Measures documents including a final joint offer that responded substantively to GNFN demands for enhanced consultation and involvement in forest management planning and increased economic benefits from forestry activities.

- The Interim Measures included annual funding for three years for capacity, infrastructure and community support as well as economic benefits in the form of preferential contracting and employment and annual wood allocation valued at approximately $2.5 million. Grassy Narrows First Nation has not responded or accepted these interim measures to date.
- Grassy Narrows has repeatedly rejected recent offers and has indicated that all future land use activities on their "homeland" will be directed by a culturally and ecosystem-based plan to be prepared independently by GNFN.
- GNFN has indicated that they will no longer react to "clearcut plans" of others nor are they able to remove existing blockades, release downed wood behind the blockades or enter into any agreement that would guarantee no further disruption of forestry operations.
- In 2008 Grassy Narrows First Nation and MNR signed a Memorandum of Understanding, which is referred to as the “Process Agreement”, to explore numerous aspects of forestry in the Whiskey Jack Forest as part of a multi-year process. The Honorable Justice Frank Iacobucci mediated the discussions between GNFN and MNR that led to the development and signing of the Process Agreement.
- During that time Grassy Narrows has received significant provincial funding and has worked with MNR on various working groups on matters related to forestry practices (i.e. new area of concern prescriptions, harvest block design, harvesting systems, etc.) and traditional values and use studies. These forestry practices were to be tested in the 115,000 hectare Pilot Project Area that was identified and agreed to by GNFN as part of the Process Agreement.Between 2009 and 2014 MNR deferred the completion of a new forest management plan to allow for Grassy Narrows to apply these practices; unfortunately little progress has been made during that time.
- This Process Agreement was twice mediated by the Honorable Justice Frank Iacobucci without resolving the lack of commitment by GNFN to achieving the practical measures identified in the agreement (e.g., traditional use study, forest management prescriptions to protect identified aboriginal values, etc.) or those identified in the mediated settlements (e.g., concurrent limited harvesting and concurrent forest management planning).

- In 2012, MNR initiated detailed discussions with Grassy Narrows on the basis of their potential involvement in establishing a new forest tenure arrangement for the Whiskey Jack Forest.

- In 2013, MNR begun discussions with nine First Nation communities, including Grassy Narrows First Nation, to explore transition to an enhanced sustainable forest licence (ESFL) for the Whiskey Jack Forest and give First Nations communities a greater say in the resource management.
- Since 2004, Kenora District MNR staff have engaged the communities leadership, Chief and Council, on matters relating to economic development opportunities for the community and the opportunities to be afforded to the community by participating in the forest economy (e.g., tree planting, brush saw tending contracts, slash pile burning, etc.) and forest management planning.
- Since 2004 the issue of mercury or methyl mercury release through forest practises was not brought up as an issue critical to the community, until the IEA Request was filed by GNFN/ Earthroots.

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Summary of Aboriginal Involvement for the Whiskey Jack Forest 2012-22 FMP

Aboriginal Communities

- Asubpeeschoseewagong Netum Anishnabek First Nation (Grassy Narrows)
- Naotkamegwanning First Nation (Whitefish Bay)
- Wabaseemoong Independent Nations (Whitedog)
- Wabauskang First Nation
- Ochiichagwe'babigo'inning First Nation (Dalles)
- Kenora Metis Council

Planning Team Representatives

- Doug Riffel - Wabauskang First Nation
- Alex Tom - Naotkamegwanning First Nation (Whitefish Bay)
- Joel Henley – Kenora Metis Council
- TBA - Wabaseemoong Independent Nations (Whitedog)
- TBA - Ochiichagwe'babigo'inning First Nation (Dalles)

Communications

Invitation to Participate
Letters were sent on February 2, 2010 from the District Manager to the current Chief of each First Nations Community in both the Whiskey Jack and the Kenora Forest Management Units as an Invitation to Participate in the 2012-2022 Plans. The letter mentions the possibility of combining forest units as well as the need for an Aboriginal Task Team.

Only one response was received through the Minister's Office. A response from the Ministers Office was sent out June 22, 2010

LTMD
Registered Letter was sent to communities and Metis Council on December 14, 2011 inviting review and comment on the Long Term Management Direction for the Whiskey Jack Forest. One community requested an open house in early 2012.

(See Contingency Plan Consultation for communications during hiatus)

Stage 3
Letters were sent January 14, 2013 from the District Manager to the Chiefs of each First Nation Community identified above, to inform that Planning is starting for the WJ FMP 2012-2022. Please advise if Chief and Council would like a session brought to their community.

On January 31, 2013, a follow-up letter was sent from the District Manager to Chiefs within the WJF and the Metis Council announcing the MNR et al intentions to hold public information centres on the progress to date in the preparation of the FMP for the WJF.

Draft Plan
On July 30, 2013, a detailed information package and letter was sent to Chiefs within the WJF and to the Kenora Metis Council regarding the upcoming information centres for the Draft Plan. This letter invited the communities to Information Centres for the 2012-2022 Whiskey Jack Forest Draft Management Plan to be held September 3 to 6th in Kenora, Sioux Narrows, Red Lake and Ear Falls. The option to have an information centre at individual communities was presented.

Final Plan
On December 23, 2013 letters were sent from the District Manager to the Chiefs of each First Nation Community identified above, to invite them to inspect the Approved 2012-2022 Whiskey Jack FMP. The Final Plan was available for inspection between December 23rd, 2013 and January 22nd, 2014.

Newspaper Communications
Invitation to Participate
Newspapers advertisements were placed in the following editions with the dates provided:

Kenora Daily Miner and News	February 2, 2010
Sioux Lookout Wawatay News	February 18, 2010
Lake of the Woods Enterprise	February 6, 2010
Dryden Observer	February 10, 2010
Red Lake Northern Sun News	February 3, 2010

LTMD
EBR Posting Approved November 22, 2011 (Withdrawn)
EBR Posting Approved December 24, 2011

Notices were published in local newspapers

Kenora Daily Miner and News	December 14, 2011
Lake of the Woods Enterprise	December 17, 2011
Dryden Observer	December 21, 2011
Sioux Lookout Wawatay News	December 22, 2011

Stage 3
Newspaper advertisements were placed in the following editions:

Kenora Daily Miner and News	January 29, 2013
Kenora Lake of the Woods Enterprise	January 28, 2013
Northern Sun News	February 2, 2013
Dryden Observer	February 2, 2013
Sioux Lookout Wawatay News	February 14, 2013

Stage 4 - Draft Plan

Newspaper Advertisements were placed in the following informing of dates of the Information Centres.

Kenora Daily Miner and News	August 2, 2013
Kenora Lake of the Woods Enterprise	August 1, 2013
Northern Sun News	August 7, 2013
Dryden Observer	August 7, 2013
Sioux Lookout Wawatay News	August 1, 2013

And follow-up advertisements sponsored by the Kenora Local Citizens Committee were placed in the Kenora Daily Miner and News, August 30, 2013 and in the Lake of the Woods Enterprise on August 29, 2013.

EBR posting was in place by July 30, 2013.

Information Centres were held as follows:

Sioux Narrows – September 4, 2013 – 0 members of public attended

Red Lake - September 4, 2013- 6 members of public attended

Kenora – September 6, 2013 – 4 members of public attended.

Stage 5 – Final Plan

Newspaper Advertisements were placed in the following informing of dates of the Inspection of the Final Plan.

Kenora Daily Miner and News	December 23, 2013
Kenora Lake of the Woods Enterprise	December 27, 2013
Northern Sun News	December 25, 2013
Dryden Observer	December 24, 2013
Sioux Lookout Wawatay News	December 19, 2013

Asubpeeschoseewagong
Netum Anishinabek

EARTHROOTS

This is Exhibit "F" referred to in the affidavit of AMBER ELLIS AND DAVID SOUE sworn before me, this 21st day of AUGUST 20 15

Joseph Castrilli
A COMMISSIONER FOR TAKING AFFIDAVITS
JOSEPH CASTRILLI

May 22, 2014

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services
2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5

RE: Reply of Grassy Narrows and Earthroots to Ministry of Natural Resources' Response to Request for an Individual Environmental Assessment on Whiskey Jack Forest Management Plan 2012-2022

Dear Mr. Wills,

This letter and the attached document are the reply to the Ministry of Natural Resources (MNR) response to the request of Grassy Narrows and Earthroots for an Individual Environmental Assessment (IEA) of the Whiskey Jack Forest Management Plan (FMP).

We expected the MNR to argue that their mitigation measures will work, that mercury will not be released by logging, and that human and environmental health will not be harmed by the implementation of the Whiskey Jack FMP 2012-2022. They did not.

The MNR's overall argument appears to be about process, not outcome. They claim they have followed the letter of the law on forest management planning (regardless of whether the FMP will lead to the release of mercury).

This reply responds to MNR's characterization of the science and of the input from Earthroots and Grassy Narrows, points out relevant scientific issues that they have ignored, and argues (along with the original IEA request) that they have not met the specific requirements of the their own Stand and Site Guide (SSG) and FMP Manual (FMPM) (see section on Page by Page Comments below for a partial list).

More fundamentally, this matter is about protecting the health of people in Grassy Narrows and the health of the environment.

The FMP activities are likely to release mercury into the environment causing harm to human and environmental health. The MNR does not deny this. Therefore, the FMP is flawed, should not be implemented, and should be subjected to an IEA.

If the Crown Forest Sustainability Act (CFSA), FMPM and SSG can be complied with while causing harm to human health and the environment, then they are flawed.
The MNR does not challenge our assertion that the FMP will cause harm through the release of mercury into the environment. Rather the MNR seems to be arguing that they don't have a duty to prevent harm because they have followed the SSG requirements (i.e. that there are no proven measures to mitigate the harm, and that the harm is within the range of that caused by fire).

It is not acceptable for the MNR to knowingly cause harm simply because they don't know how to mitigate it, and because acts of god also cause harm.

The damming of Grassy Narrows' river, the dumping of 9,000 kg of mercury by a Dryden mill into the river, and now clearcutting, have had severe and compounding impacts on Grassy Narrows' health and way of life. Each of these successive actions "followed the rules" at the time but did not apply the precautionary principle, and did not have Grassy Narrows' free, prior, and informed consent. All of these past activities are now known to be harmful.

In this case, there is already sufficient scientific evidence to know that clearcutting will likely cause harm through the release of mercury. There is also sufficient discretion and existing legislation for the MOE to act now to prevent this avoidable harm.

There is one proven measure to prevent this harm – don't permit logging in Grassy Narrows Territory until there are proven ways to avoid harm, and until Grassy Narrows has given their free, prior, and informed consent.

Will Ontario start on a new path towards respect, healing, and reconciliation with Grassy Narrows by requiring an IEA of this logging plan? Or will Ontario repeat the mistakes of the past at the expense of another generation of Grassy Narrows' children?

Thank you for considering our request and for taking these comments (see following document) into consideration.

If you have any questions, or would like elaboration on any points, please do not hesitate to contact us.

Sincerely,

Amber Ellis
Earthroots
Executive Director

Chief Roger Fobister
Grassy Narrows First Nation

Grassy Narrows and Earthroots
Reply
to
MNR Response to
Grassy Narrows and Earthroots'
Request for an Individual Environmental Assessment
of the
Whiskey Jack Forest Management Plan 2012-2022

May 2014

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A. MNR APPARENT ARGUMENT

The MNR's overall argument appears to be that it concedes that:

I. "The potential for forest management activities to result in mobilization of terrestrial mercury into aquatic systems is well documented and a serious concern." (p.19 ph3)
II. "There are no claims that SSG direction and application of the SSG will mitigate or eliminate Hg mobilization." (p. 10 ph 3) "MNR has made no further commitments in the FMP to address the issues raised by the requesters. (p.7)

But we have complied with the law because the law requires us only to comply with the SSG and FMPM. The CFSA (s. 2(3)2) requires us to apply coarse filters (natural disturbance emulation) and fine filters (specific mitigation measures), and this is implemented through the SSG.

1. **Mercury release from logging is allowed by the coarse filter requirements**

   "The coarse filter is not intended as a specific mitigation measure but rather an approach to maintain the state of all elements of the forest ecosystem within a natural range." (p.19 1st ph)

   "The range of Hg levels in fish in harvested watersheds was within the range of those in burned watersheds (Garcia and Carignan 2000, 2005)." (MNR p. 19)

   "There is not sufficient evidence to conclude that the magnitude of Hg response to forest management disturbance differs significantly from natural disturbance events in all cases; however, the mechanism of response is likely different." (p. 13 2nd ph)

   Therefore, the legal requirements of the coarse filter have been met.

2. **Specific mitigation measures for mercury are not required**

   "Fine filter direction is included in the SSG when there is evidence that additional mitigation measures will improve the protection of specific values." (p.19 first ph)

   "No research has been conducted to test the effectiveness of specific forest management planning or operational measures at mitigating increases in Hg mobilization." (p.12 last ph)

   "Because there are no studies which identify or evaluate mitigation measures to minimize mercury mobilization following disturbance there are not mitigation measures specific to mercury in the SSG. (p.19 last ph)

   Therefore the legal requirements of the fine filter direction are met.

3. **We are studying the problem.**

"Those [SSG directions] with a high degree of uncertainty have been identified as a high priority for testing through an effectiveness monitoring program (see Section 7). The results of this monitoring program, along with other sources of information, will be used during periodic reviews of the Stand and Site Guide to help determine when the guide needs to be revised." (p. 5, SSG)

The measures in the SSG for mercury are highly uncertain and so we have identified them as a high priority for monitoring and study. We are supporting a number of studies on mercury.

Therefore the legal requirement to have up to date science, use adaptive management, and monitor are met.

4. **The complaints about mercury came late in the process**

Earthroots and Grassy Narrows raised the mercury issue late in the process so it was not given special consideration in the FMP. We followed the letter of the planning process.

B. GENERAL COMMENTS (corresponding to points above)

I., II., These statements alone should be sufficient to justify an Individual Environmental Assessment (IEA). The MNR does not state a position on whether or not an IEA should be required. But given the nature of their other comments we assume that they oppose an IEA.

1. **MNR Position**: The mercury impacts of logging are within the range of those from fire. The coarse filter is intended to "maintain the state of all elements of the forest ecosystem within a natural range." (p.19)

GRASSY NARROW/EARTHROOTS Reply:

a. Act of god vs. act of man:

-Fires create environmental conditions (including heat, smoke, and lack of oxygen) that kill people and wildlife, destroy property, and cause other harm. That does not mean that it is acceptable for logging to do so;

-If lightening starts a fire it is an act of god; If a person starts a fire it is a crime (arson). Both fires may have the exact same impacts, but one is illegal and the other is not;

-Un-preventable acts of god are not sufficient bounds for the impacts of planned and deliberate human activities;

-Analogy: Earthquakes are natural and can destroy entire cities. Therefore, it is allowable for blasting to destroy a city.

b. MNR ignores the fact that most area burned by fires in the boreal forest is burned by intense fires:

-Garcia and Carignan indicate that intense fires do not significantly raise mercury levels in fish (logging did);

-Intense fires may form a pathway for mercury out of the total forest mercury pool (terrestrial + aquatic) (logging does not);

-"Most area burned in N American boreal forests is by high intensity crown fires, and this is likely to continue in the future" (de Groot et al., 2003, p.363);

-Therefore, the total mercury pool in a logging dominated landscape may be higher than a fire dominated landscape. (i.e. not within the natural range for the landscape);

-The total aquatic mercury pool in a logging dominated landscape may also be higher than in a fire dominated landscape;

-When looking at the statistical trend line (rather than the data points) Fig. 4 of Garcia and Carignan shows that logging generally led to higher levels of mercury in fish than fire did.

2. **MNR Position:** There has been no testing of mitigation measures. Proven mitigation measures do not exist, so we don't need to mitigate.

GRASSY NARROW/EARTHROOTS Reply:

a. Lack of proven mitigation does not justify authorizing activities that release poisons that are harmful to humans and the environment;

b. There is one proven mitigation measure – not logging until mitigation measures (e.g. selective logging with large buffers) are tested and proven;

c. The MNR ignores the fact that the Quebec study conducted by Garcia and Carignan tested logging using the Clearcut with Protection for Regeneration and Soils method. This method includes mitigation measures that are generally equivalent to, or stronger than, those in the SSG (buffers, relatively small clearcuts, limiting soil disturbance, and hydrological disruption). So the Quebec study is a de-facto test of those mitigation methods. Those clearcuts raised mercury levels above safety limits in all cut lakes in that study. So there is evidence that the non-mercury specific mitigation measures in the SSG do not work for mercury;

d. The MNR does not account for the fact that scarification and thinning may release and methylate mercury as well as harvesting in some circumstances through possible mechanisms including soil disturbance, increased availability of fresh and decaying

e. The SSG claims that "Where information was incomplete and/or ambiguous, a conservative approach was taken through judicious application of the precautionary principle." (SSG p. 5) The SSG and FMP do not use a precautionary approach for mercury:

In the MNR response they quote the final paragraph of SSG section 1.3.5, page 5 but notably omit the first sentence that states:

"This could be considered as following the precautionary principle. In all cases, the direction in the Stand and Site Guide represents a series of predictions or hypotheses. Those with a high degree of uncertainty have been identified as a high priority for testing through an effectiveness monitoring program (see Section 7). The results of this monitoring program, along with other sources of information, will be used during periodic reviews of the Stand and Site Guide to help determine when the guide needs to be revised."

The MNR is not following a precautionary approach. What MNR has provided is proof that mercury will likely be released and that it has no mitigation answer. The MNR also has little or no baseline information for mercury levels in many Grassy Narrows lakes, no program to monitor the impacts of logging on mercury levels in Grassy Narrows Territory, and no program anywhere to directly test and evaluate the mercury impacts of various logging methods and mitigation measures.

f. The SSG measures are not "entirely consistent with the recommendations of Bishop et al. 2009." They are also not consistent with recommendations made by others. This is discussed in our original IEA request and below in the section titled Page by Page Comments.

3. **MNR Position:** We are supporting science that will inform an adaptive management approach to update the SSG during the required periodic review (referring to studies being undertaken or supervised by MNR)(referred to below as "MNR study" or "MNR studies").

GRASSY NARROW/EARTHROOTS Reply:

a. None of the MNR studies monitor the impacts of logging on mercury in the IEA area;

b. None of the MNR studies look at systems with known historic mercury point source contamination;

c. None of the MNR studies directly test mitigation measures in the SSG;

d. None of the MNR studies directly test alternative mitigation measures to those in the SSG;

e. One MNR study looks at logging impacts on small streams but no peer reviewed articles are provided. Streams have substantially different dynamics compared to lakes including dramatically lower water residence time;

f. Another MNR study (MSc project) looks at mercury levels in fish in lakes and considers, but does not seem to have been designed to test, logging impacts. No peer reviewed articles for this MNR study are provided so data, methodology, and results cannot be examined or relied on;

g. None of the MNR studies appear to use the solid, peer reviewed methodologies used by Garcia and Carignan, or by Desrosiers;

h. The MNR does not state when they will conduct the next periodic review of the SSG, nor when the findings of the review will be implemented;

i. The MNR does not state how the unique issues related to the IEA area will be examined at that time (i.e. considerations arising from the history of mercury pollution and mercury health impacts in Grassy Narrows);

j. The MNR makes no mention of whether special mitigation measures, monitoring, or caution is required for mercury releases in Grassy Narrows Territory relative to the rest of the Province;

k. With no monitoring of logging impacts on mercury in the IEA area, and no testing of SSG mercury mitigation measures, how will the SSG be improved at the next review in a way that protects Grassy Narrows? And what will happen to the health of the people of Grassy Narrows in the interim?

4. **MNR Position:** Earthroots and Grassy Narrows raised the mercury issue late in the process.

GRASSY NARROW/EARTHROOTS Reply:

a. It is the proponent's (MNR's) and the reviewer's (MOE's) responsibility to ensure that the FMP is sustainable, and does not harm ecosystem and human health. It is not the responsibility of Grassy Narrows or Earthroots;

b. Grassy Narrows and Earthroots have very limited resources available to them and will not benefit from the implementation of the FMP. The proponent has relatively extensive resources and will receive stumpage fees and taxes. The burden is, and should be, on the proponent to identify potential harms, and propose robust measures to prevent harm;

c. The MNR vetoed Grassy Narrows' chosen forest ecology advisor in the Iaccobucci process (Herb Hammond), did not fund the completion of Grassy's environmental study, and did not grant Grassy Narrows' request for participant funding for the FMP process;

d. If Grassy Narrows and Earthroots made no comments at all, it would still not be acceptable to poison people and the environment;

e.

clearcutting that are inclusive of all its negative impacts, including mercury;

f. Grassy Narrows has raised the mercury logging issue, and cited Carignan, as early as 2003 (Toronto Star, 07/28/2003) and repeatedly since June 2012. (see partial list in our request);

g. The MNR states in their April 7, 2014 letter to Earthroots that "Consent may be required only in rare cases, where the Crown's action or decision will result in serious impacts on established rights." Grassy Narrows and Earthroots say this appears to be such a case;

h. Grassy Narrows did submit lengthy letters explaining their concerns about the forest management planning process (see the correspondence from Grassy Narrows in the MNR response);

i. The Whiskey Jack Forest Independent Audit 2004-2009 Final Report (IFA) wrote that "There are fundamental differences in the viewpoints between GNFN and MNR regarding forest management principles and practices. It is the audit team's opinion that these differences cannot be resolved without the Province setting aside many of the requirements to manage the Whiskey Jack Forest under the CFSA and the FMPM, and relinquishing significant authority to the First Nation to manage portions of the Whiskey Jack Forest according to the desires of the GNFN community. The audit team further believes that the forest management planning process did not anticipate, nor was it designed to resolve the type of dispute currently being experienced on the Whiskey Jack Forest." (p.7)

j. The independent forestry experts who prepared the IFA substantiate Grassy Narrows' concerns that the forest management planning process is not fit for the circumstances;

k. In spite of Grassy Narrows' objections, and despite the above statement in the IFA, the MNR used the standard process to prepare the FMP. It is no surprise that this process has led to dispute again.

l. This is at least the third forest management planning process in which Grassy Narrows has participated without any satisfaction that their interests and concerns are being meaningfully integrated into the final plan.

In summary, it is not sufficient to follow the process, the outcomes must be good.

The outcome of this FMP process is likely harm to human health and the environment through mercury contamination. That is not acceptable.

It is also important to note that the MNR also makes some claims that their mitigation measures are consistent with current science. This is of limited relevance since they acknowledge that none of the measures are tested, and the MNR makes no claims that they will work. But it is discussed in our initial request and touched on below.

Finally, Grassy Narrows and Earthroots also note that the MOE questions to the MNR have a number

of deficiencies. Most importantly, they limit the mechanisms of mercury flux from logging to soil disturbance when there are many other likely mechanisms. Some of these other mechanisms are discussed below.

C. PAGE BY PAGE COMMENTS

(page heading references **in boldface** are to MNR Response Appendix 6)

Page 1

MNR response statement, p. 1: "As this issue was raised late in the FMP process by the requesters, there is very little documentation of the issue in the FMP process as is explained in the following responses to MOE's questions."

Grassy Narrows/Earthroots reply: The proponent (MNR) is responsible for ensuring that FMPs are sustainable, and the MOE is responsible for providing oversight to ensure that the health of the environment, including people, is protected, regardless of whether stakeholders raise specific concerns. The unique mercury issue in the planning area was known to the MNR and should have been considered.

The issue was actually raised far earlier, and as early as 2003 (see reply to point 4 above) (see also reply to MNR, pages 2-5, below).

Pages 2-5

MNR response statement, pp. 2-5 is to the effect that Grassy Narrows and Earthroots were given lots of opportunities by MNR to participate in the FMP process in accordance with the requirements of the FMPM to raise their concerns but largely chose not to participate.

Grassy Narrows/Earthroots reply: We recommend that MOE read Grassy Narrows' extensive correspondence to MNR explaining their concerns with the FMP process, requesting participant funding, objecting to clearcutting, etc. There are legitimate reasons why Grassy participated in a limited way in the FMP process. These are discussed more fully in reply to MNR comments at page 9 of the MNR response document, set out below.

- Many communications are left out of the tables including the joint letter by Earthroots and others to the Premier (cc'd to MNR Minister) June 25, 2013 (raises mercury–logging issue, no response), Grassy Narrows River Run press releases and many prominent news articles June 2012 (directly raise mercury-logging issue, response from Wynne on CBC), Grassy Narrows letter rejecting LTMD, Grassy Narrows briefing note to MNR Minister in late 2013.

-MNR refused to fund completion of Grassy Narrows' environmental information gathering see letters), and vetoed Grassy Narrows' choice of ecologist (Herb Hammond).

-Grassy Narrows very publicly raised the mercury logging issue, and cited Carignan, as early as 2003 (Toronto Star)

Page 6

We note that the MNR Response from the District Manager to the Oct. 31, 2013 comments of Earthroots on the Draft FMP has been left off the list. We note that it was sent on April 7, 2014, long after the final plan was released (Dec. 23, 2013) and after our IEA request was submitted. As a result, we were not able to include any concerns with this document's statements in our IEA request. The District Manager does not respond to our concerns about mercury beyond a boilerplate statement that the relevant laws, policies, and procedures are being followed.

We note further that with respect to the MOE determined issues, there is a concern with how the first issue has been characterized by MOE:

"Issue 1 Harvest – Application of the clear cut silvicultural system on the area affected by the IEA request will disturb the soil causing naturally occurring mercury to become in flux and travel through the water system…"

Grassy Narrows and Earthroots say that:

-the concern is with both increased mercury flux, and increased methylation and bioaccumulation;

-It is understandable that the MOE focuses on soil disturbance since our response to the concurrence request focused on that.

-As describe in our IEA request, soil disturbance is only one mechanism causing mercury flux and methylation. Other likely mechanisms include raised water levels (due to reduced evapotranspiration), increase in fresh decaying organic matter, increased organic sulfide concentrations in soils, increasing dissolved organic matter, changing biogeochemical inputs, changes in water temperature and cycling. (Bishop et al., 2009);

-in general, the mechanisms are poorly understood and relatively unstudied, but the outcome is clear (mercury flux and bioaccumulation). Therefore, we would focus the issue on the outcome, not the mechanism.

-mercury in flux due to logging includes both naturally occurring mercury and a substantial proportion of mercury atmospherically deposited from anthropogenic sources (e.g. coal power plants, incinerators).

-mercury will impact areas already stressed with mercury, as well as areas currently not stressed. Both are of concern.

-Issue 1 could be more accurately summarized as "Issue 1 Harvest – Application of the clear cut silvicultural system on the area affected by the IEA request will cause mercury to become in flux, and will cause mercury to be methylated, further exaggerating the existing mercury contamination issues in local waterways which is likely to affect human and ecosystem health and adversely impact Aboriginal and Treaty rights."

Page 7

With respect to the second issue listed by MOE: "Issue 2 Harvest – MNR doesn't have the science and information base to support the development of prescriptions to mitigate the effect of mercury on terrestrial or aquatic ecosystems", Grassy Narrows and Earthroots note that:

-this statement seems to be uncontested by the MNR;

-the core issue is not about supporting development of prescriptions in the future;

-the core issue is that current prescriptions are not scientifically tested and found to be effective;

-in fact, there are indications that current prescriptions are not effective (as demonstrated in the Garcia and Carignan studies)

With respect to the fourth issue listed by MOE: "Issue 4 Access – The construction of forest access roads on area affected by the IEA request will disturb the soil causing naturally occurring mercury to become in flux and travel through the water system collecting in downstream areas already stressed with mercury, further exaggerating the existing mercury contamination issue", Grassy Narrows and Earthroots note that:

-mercury released by road building will impact areas already stressed with mercury, as well as areas not currently stressed (those upstream from the English-Wabigoon River). Both are of concern; and

-the activity of construction of forest access roads also likely has more mechanisms for mercury release and methylation than soil disturbance (e.g. disrupting water flow)

MNR response statement: "During stages 1 through 3 of the planning process, issues 1 through 4 were not raised by the requesters. During Stage 4, the impact of clearcutting on mercury levels in piscivorous fish in local lakes and rivers was brought forward as one of a number of issues Earthroots had with the FMP. There was no corresponding mention of this issue in the response MNR received on the Draft FMP from GNFN. MNR responded to the issue brought forward by Earthroots indicating that MNR complied with the legislative, regulatory and policy requirements, including the approved forest management guides, which mitigate potential adverse effects on the environment."

(and repeated similar comments throughout the response including p.8 last paragraph, p.10 paragraph 2)

Grassy Narrows/Earthroots reply:

-see comments on pp. 1-5 in Page by Page Comments and on point 4 in General Comments;

-Grassy Narrows did raise the mercury-logging issue clearly in Chief Simon Fobister's Oct. 24, 2013 open letter to Premier Wynne that also ran in the Toronto Star on Nov. 3, 2013. "New clearcut logging will bring even more mercury into our river and our food chain, further prolonging and exacerbating this avoidable tragedy";

-Grassy Narrows' repeated statements generally opposing the practice of clearcutting over many years (including their comments on the draft FMP) are overarching and stand against all the negative impacts of clearcutting including issues 1 through 4. It is not Grassy Narrows' responsibility to be experts on the specific ecological and chemical impacts of clearcutting;

-MNR did not respond to Earthroots' comments on mercury until long after the FMP was made final, and made no changes to the plan as a result of the comments;

-Earthroots and Grassy Narrows raised this issue many times in the past through letters to Premier, Minister, press releases, media articles, website etc (see above).

Page 9

MNR response statement: "In conclusion, the 2012-2014 CP and the 2012-2022 FMP for the Whiskey Jack Forest were prepared in accordance with the requirements of the FMPM".

Under the "Summary" heading on page 9 MNR states further that: "The above documentation requested by MOE shows how MNR followed the *Forest Management Planning Manual* – 2009 (FMPM) and engaged GNFN and Earthroots throughout the planning process. GNFN chose to remain on the periphery of forest management planning for the Whiskey Jack Forest by not participating on the planning team and rejecting offers to hold information centres at the community or engaging in face-to-face discussions. GNFN provided comments through the submission of letters at various stages throughout the planning process, and MNR responded to the concerns identified…"

Grassy Narrows/Earthroots reply:

-The core issue is about outcomes not process. Will the application of the FMP harm the environment and human health? Likely it will;

- But even at a process level, the MNR response lacks merit because: (1) there are legitimate reasons why Grassy Narrows only participated in a limited way in MNR's FMP planning process: (a) Grassy Narrows was – and still is – in litigation with MNR over the legal authority of MNR to issue forest licences allowing clear-cutting in the territory of Grassy Narrows, and would not have wanted to prejudice its legal position in that litigation by participating in, and possibly being seen to legitimize, the very process it was objecting to; (b) Grassy Narrows was simultaneously involved in the Iaccobucci negotiation process, which was designed to resolve the overarching conflict between MNR and Grassy Narrows regarding forest management activities on Grassy Narrows' territory, and which Grassy Narrows hoped would also address the issue of clear-cutting; and (c) MNR refused to fund the environmental information-gathering proposed by Grassy Narrows and vetoed its choice of ecologist – Herb Hammond – who would have raised the mercury issue, and (d) Grassy Narrows and the IFA auditors both believe that the planning process is not designed to resolve the issues at hand; and (e) Previous iterations of the planning process have not brought any satisfaction and have not dealt with the mercury logging issue; and (f) Grassy Narrows has few resources available to engage in the FMP process and to obtain technical support and advice for this process. The MNR did not grant Grassy Narrows' request for participant funding; and (2) many early communications to the government and to the media on the mercury issue (e.g. as early as 2003) are left out of the

Page 10

MNR response statement: "The issue of methylmercury was raised by GNFN for the first and only time, prior to the IEA request, in an October 24th, 2013 letter to the Premier, coincident with the Stage 4 – Review of Draft Plan. Earthroots also identified methylmercury as a potential issue for the first time in a letter dated October 31st, 2013 during Stage 4 – Review of Draft Plan."

GRASSY NARROWS/EARTHROOTS reply:

-The MNR statement ignores the methylmercury logging issue being raised by Grassy including in 2003 in the Toronto Star, in 2012 in the River Run events and associated news, in parliament (by the NDP), and in 2013 in the joint letter copied to the Minister.

-see earlier comments respecting p. 7 of MNR response, pp. 1-5, and point 4 under General Comments of this Grassy Narrows/Earthroots reply.

Page 12

MNR response statement: "For example, Bishop et al (2009) show post-harvest Hg concentration response ranging from a 4 fold increase in a Finnish study to no increase found in a study done in Northwestern Ontario."

GRASSY NARROWS/EARTHROOTS reply:

-This MNR statement is accurate, but potentially misleading. The Northwestern Ontario study found a doubling of mercury flux/export (there was no significant increase in concentration, but a doubling of flow). Export = flow x concentration. The total amount of mercury exported is the important measure here (along with the proportion of methyl mercury).

Page 13

The MNR review and conclusions in point 2 contains many flaws.

Most importantly, it fails to note the important difference that the study found between partially burnt lakes (n=2) and completely burnt lakes (n=7).

MNR response statement: "Fish in disturbed watersheds (cut and burned) had higher mercury levels than fish in undisturbed reference lakes".

Study Authors: "No significant augmentation of Hg levels was observed in fish from lakes with completely burned catchments compared to those from reference lakes." (Garcia and Carignan, 2005, p.690 Discussion, paragraph 1)

Fish mercury levels were significantly augmented in clearcut lakes and in two partially burnt lakes.

MNR response statement: "When trophic position is included in the analysis, fish Hg levels in harvested watersheds fall within the broader range of fish Hg levels in burned watersheds (fig 4, Garcia and Carignan 2005)."

Grassy Narrows/Earthroots reply:

-the MNR is focusing on the scatter of the individual data points;

-when looking at the statistical trend line (far more meaningful) we see that the trend line for logging is higher than that for fire for nearly the entire range of trophic levels, and never below;

The MNR review does not discuss Garcia and Carignan, 1999, 2000: "Those results showed that high MeHg [in zooplankton] and total Hg [in northern pike] were associated with clear-cut logging but not with wildfires" (Garcia and Carignan 1999, 2000 as cited in Garcia and Carignan 2005).

The MNR review also does not consider Garcia, Carignan and Lean, 2007 which looks at zooplankton, a key part of the food chain for fish: "MeHg concentrations observed in mid-summer zooplankton from forest harvested lakes were significantly higher than in reference and fire-impacted lakes" (Garcia, Carignan and Lean, 2007).

-Later on p.17 the MNR attempts to cast doubt on Garcia and Carignan's 2005 discussion of DOC's key role in the mercury cycle. As we have said before, the mechanisms are relatively poorly understood and unstudied. There appear to be studies with different results with respect to the mechanisms of mercury flux and methylation. These studies may be conflicting, or may reflect a different relative importance of various mechanisms under different circumstances (eg. different slopes, moisture levels, wetland prevalence, soil types, temperatures, etc.). The Garcia and Carignan study provides compelling evidence that DOC plays an important role under some common circumstances that appear similar to those in Grassy Narrows.

But the MNR ignore the fact that Garcia and Carignan 2005 also discuss the effect of variables other than DOC that are not discussed by MNR in their response: "Variations in other environmental variables related watershed disturbances could effect Hg concentrations in fish from cut and burnt lakes. For example, the increase in nutrient loading (total P and total N) following fire resulted in significantly higher algal biomass in burnt lakes compared to that in reference lakes [27]. High phytoplankton biomass may cause a biological dilution of the available Hg pool, thereby reducing Hg concentrations in organism, including those occupying higher tropic levels [28]. Alternatively, lower light penetration may account for the lower algal biomass in cut lakes as compared with burnt lakes [27]".

The literature also includes discussion of other mechanisms including sulfides, thiols, etc.

Page 15

MNR response statement: "Bishop et al. (2009) actually calculated that forest harvesting may contribute 9 to 23% of MeHg fluxes from the soil following harvesting".

Study Authors: "If there is thinning during the forest rotation that has a similar impact, then … the extra Hg burden in fish will be 17-37%." (Bishop et al., 2009)

Thinning is a common practice in Ontario and is part of the planned activities in the FMP.

"Clear-cutting and Thinning: Both activities reduce the number of trees and thus the evapotranspiration. This means that the water table will move closer to the soil surface (38, 39). Large supplies of fresh carbon from logging slash and decaying roots are also present, and organic rich surface soil horizons (such as…) will be water saturated more frequently. This will result in the mobilization of DOM…[N.B. we did not copy the detailed discussion of other mechanisms here]..

Thus, clear-cutting and thinning generally promote Hgtot and MeHg mobilization and transport from soils to surface waters…" (Bishop et al., 2009)

MNR response statement: "Those studies suggest that although MeHg concentrations in fish may increase following clearcut operations, it is generally limited to cases when soils are disturbed, and not to the harvesting of trees."

Grassy Narrows/Earthroots reply: Bishop 2009 lists a number of mechanisms for mercury export and increased methylation that are not related to soil disturbance (see above, including elevated ground water levels, large supplies of fresh carbon from logging slash and decaying roots, changes in other chemical and physical variables, etc.).

Page 16

MNR response statement: "no evidence exists contrary to the protection of soils from disturbance as described in the Stand and Site Guide as a mitigation measure minimizing forest harvesting operation effects on fish MeHg concentrations."

Grassy Narrows/Earthroots reply:

-more importantly, no evidence exists in favour of this assertion;

-evidence does exist to the contrary and it is ignored by the MNR in both their response and their Stand and Site Guide Rationale.

In the key Quebec study by Garcia and Carignan they say:

"Clearcuts were of the CPRS type (cut with protection of regeneration and soils). Cut block size generally ranged from 5 to 50 ha but occasionally reached 200 ha, with 20-m buffer strips fringing permanent streams, lakes, and wetlands" (Garcia, Carignan, and Lean, 2007);

CPRS type clearcuts generally include measures to protect soils from disturbance that are equal to, or greater than, those in the SSG. (e.g. no-cut riparian buffers of 20m vs. 3m, much smaller clearcuts in study area than in the FMP, protection for young trees in CPRS cut blocks vs. no protection for young trees in the FMP, similar or greater measures to reduce soil and hydrological disruption from machine operation, road building, etc.). And yet these clearcuts were found to raise mercury levels in fish above safe levels for human consumption in all clearcut watersheds.

-The site preparation practice of scarification is common, and planned in the Whiskey Jack FMP, and entails extreme soil disturbance. This negates the soil protection measures used during harvest;

-The soil protection measures in the FMP are actually not very restrictive. The definition of rutting includes only severe disturbance, and rutting is allowed to cover a substantial portion of the area (see discussion in original IEA request). There is no indication that the thresholds for soil disturbance by the SSG are effective at preventing mercury impacts.

Page 16, paragraph 2

MNR claims that Skyllberg et al. 2009 found an end to the effect of logging on MeHg in streams after 4 years.

There are a number of issues here:

1. A number of other studies did not find an end after 5 years: "The increased loading effect has also been observed to persist up to at least 5 y[ears] and there are no examples so far of the logging effect having dissipated" (Bishop et al., 2009). (N.B. Skyllberg is a co-author on Bishop et al., 2009. The Skyllberg et al., 2009 paper was accepted one month before Bishop et al., 2009 was published);

2. The Skyllberg study is on streams, not on lakes. Streams have a much shorter water residence time than lakes so would be expected to have a shorter-lived effect from any contaminant;

3. The study looks at mercury in water, not in fish, which are likely to have a longer-lived effect from mercury exposure;

4. Skyllberg et al., actually found that "the 4-10 year-old clear-cuts showed intermediate concentrations [between reference and 0-4 yr old clear-cuts] with non-significant differences as compared to references." The fact that the difference (intermediate elevated levels) was not statistically significant at 4-10 years may reflect a physical reality in the studies streams, or may be an artifact of the level of statistical power provided by the study design;

5. The Skyllberg study looked at stands where "No site had any significant contribution from wetlands." Wetlands are thought to play an important role in the mercury cycle, and are generally present in Grassy Narrows Territory.

Page 16, last paragraph

MNR response statement: "Skyllberg et al. (2009) reported that 17% of MeHg in streams came from methylation of stored mercury, while 73% arose from methylation of newly added mercury from logging debris and that TOC (total organic carbon in non-filtered water samples) and its structure did not differ between streams draining clearcut and mature forest catchments."

The MNR attempts to say that this refutes our point that the amount of methyl mercury in Grassy Narrows lakes is likely to rise as a result of logging.

Grassy Narrows/Earthroots reply: This summary does not refute our point. It talks about proportion, not rate or magnitude. So it says nothing about whether or not logging increases methylation rates of new and stored mercury. For example, methyl mercury from stored mercury could stay at 17% of total methyl mercury while the rate of methylation for both sources of mercury doubled;

- It is a stream study, not a lake study, and a water study, not a fish study;

-Various studies seem to find conflicting results on the importance of various mechanisms. This shows that the mechanisms and relevant variables are not fully understood.

Page 17

-It is not clear what the MNR is trying to establish with their characterization of Neff et.al.

"Concentrations in the English-Wabigoon fish are elevated, and may still present a potential health risk to humans consuming fish from this system" (Neff et al., 2012);

-MNR seems to claim that Neff et al., found walleye and pike mercury levels to be within within the 25th-75th percentile range.

Neff et al. actually say that mercury levels for all three fish species were above the 75th percentile for all three lakes studied in Grassy Territory (Clay, Ball, Separation) for all sizes except WE60cm

"It appears, then, that potential factors such as the introduction of invasive species, changes to fish condition and climate change do not individually provide adequate explanations for the patterns in mercury decline observed in this system. It is possible that instead, dynamics in mercury concentrations are more related to changes in rates of methylation and demethylation" (Neff et al., 2012).

.

"data from the most recent decade indicate that mercury concentrations in sport fish may still pose a risk to human consumers" (Neff et al., 2012).

The causes of slowed decline in Neff et al., are hypothetical, with no evidence or testing in this system. Logging is conspicuously absent in the discussion by Neff et al. 2012. It is also worth noting that Neff et al., look at only 4 lakes. One lake is outside of Grassy Narrows Territory (Tetu), and another (Ball Lake North Basin) is upstream from the confluence with the Wabigoon River and therefore relatively un-influenced by the Dryden dumping (see Sellers' work). A third of the four lakes (Separation) is near the most distant point on the English River in Grassy Narrows Territory from the point source contamination in Dryden, and therefore likely less impacted than other parts of the Territory.

Equally, if not more importantly, Neff may be authority for the proposition that in an already mercury-contaminated ecosystem, such as the English-Wabigoon, MNR has an obligation to understand, address, and prevent the cumulative impact of introducing new sources of mercury into the system.

MNR response statement: "climate change is the primary cause of elevated DOC concentrations in lakes."

Grassy Narrows/Earthroots reply:

-this is beside the point. Garcia and Carignan looked at logged and unlogged lakes that are subject to the same climate. They wrote that "the positive correlations between Hg in fish and the extent of the catchment area logged when normalized to lake area or volume seem to reflect the influence of organic matter in Hg loading to lakes. Indeed, these two impact rations showed significant correlations with DOC in the cut group" (Garcia and Carignan, 2005).

The deforested catchment area short form is DEF. "DEF:VOL ratio has been shown in turn to explain up to 86% of the of the variability of DOC in forest harvested lakes" (Carignan et al., 2000).

The current SSG has removed the limits on the portion of a catchment that can be harvested that were present in earlier guides.

Pages 17-18 (conclusion)

MNR response statement: Mercury inputted into upstream catchments will mostly be photo oxidated, reduced to gaseous mercury, settled, and diluted before reaching the English-Wabigoon River.

Grassy Narrows/Earthroots reply:

-there is extensive logging planned directly adjacent to the English-Wabigoon River System. Water flows from those cutblocks directly to the English Wabigoon River system, not through a circuitous route;

-headwater lakes are also of concern, not just those on the English Wabigoon River system. People eat the fish in those lakes, and so do wildlife.

Page 18

MNR response statement: "the current scientific evidence indicates that protecting soils from disturbance during harvesting operations as spelled out in the Stand and Site Guide will minimize total and methyl mercury loading from soils to streams and lakes in a catchment".

Grassy Narrows/Earthroots reply:

-as discussed earlier, the Quebec study looked at clearcuts with similar or greater protection for soil during harvesting and found significantly elevated mercury in fish;

-scarification post-harvest, and thinning may contribute to mercury release in some circumstances, even if soil was protected during harvest; and

-the MNR response itself says that there is no evidence on the effectiveness of mitigation efforts.

Page 19

MNR response statement: "Fine filter direction is included when there is evidence that additional mitigation measures will improve the protection of specific values."

MNR response statement: "Because there are no studies which identify or evaluate mitigation measures to minimize mercury mobilization following disturbance there are no mitigation measures specific to mercury in the SSG."

Grassy Narrows/Earthroots reply:

-This is unacceptable. Where there is a possible harm to health of the environment and humans it must be prevented. Not having evidence of how to mitigate the harm is not justification for allowing the harm to occur.

"the range of Hg levels in fish in harvested watersheds was within the range of those in burned watersheds (Garcia and Carignan 2000, 2005)."

-also "within the range" of the impacts of natural disturbance are:
- death to humans and wildlife (including endangered species);
- destruction of human property including homes, fish and hunt camps, etc.
- killing of millions of ha. of forest due to pine beetle kill

-that does not mean that human activities should be allowed to do these things. There is a difference between an act of god that is unpreventable, and an act of human which is planned and deliberate. There is also a difference between a natural disturbance process with which the ecosystem has evolved for millenia, and a human process that includes heavy machinery, herbicides, and other forces new to the ecosystem;

-as long as MNR views clear-cutting as the only acceptable harvesting method in the Whiskey Jack it will be incapable of conceiving of, let alone executing, effective mitigation measures. The FMP mentions that there are other harvest method alternatives, such as shelterwood and selective cutting, but MNR only proposes clear-cutting for all 50,000 plus hectares of the Whiskey Jack proposed for harvesting in the period 2012-2022. That too is something the IEA could look at.

Page 19, last paragraph

MNR response statement: "They do offer some suggested practices, which include minimizing site disturbance and hydrological disruption and protecting wetlands. Direction in the SSG is entirely consistent with the recommendations of Bishop et al (2009)."

Grassy Narrows/Earthroots reply:

The direction in the SSG is often not consistent with Bishop recommendations.
Bishop recommendations that are not in the SSG include:

-minimizing disturbance in riparian zones (SSG: no-cut zones of only 3 m on lakes. Cutting the entire shoreline of some woodland pools allowed);

-avoid creation of large clear-felled areas in connection with moist areas (MNR plans clearcuts an order of magnitude larger than those studied by Carignan, allows the entire shoreline of some woodland pools to be logged);

-avoid clear-felling in moist areas (exclusive use of clearcutting);

- that mercury impacts were greater in watersheds with lesser slopes. The SSG directs buffers to be directly proportional to slope.

-etc. (see IEA request)

Page 20

MNR response statement: "all the literature they cite as evidence shows that Hg is mobilized and/or

bioaccumulated following both fire and harvest disturbance."

Grassy Narrows/Earthroots reply:

-in our IEA request we quote directly from the authors of the peer reviewed studies in the IEA request;

-in general, Garcia and Carignan found that completely burned watersheds (7) did not show a statistically significant rise in mercury bioaccumulation following fire. Two (2) partially burned watersheds did.

MNR response statement: "(Note that the requestors appear to use fire size and fire intensity interchangeably when in fact these measure different things)"

Grassy Narrows/Earthroots reply:

We follow the convention of the paper authors (Garcia and Carignan) who usually refer to the size of the fire as a portion of watershed area burned (partially vs. completely burned, or % of catchment). They don't give much information on fire intensity but it does appear that the partial fires were also less intense (see statement in their 2007 paper).

We agree that intensity of the fire is likely important (and severity probably even more important)

The general point holds:

"Most area burned in N American boreal forests is by high intensity crown fires, and this is likely to continue in the future." (de Groot et al., 2003, p.363)

Article: Simulating the effects of future fire regimes on western Canadian boreal forests
de Groot, W.J.1*; Bothwell, P.M.1; Carlsson, D.H.1 & Logan, K.A.2 Journal of Vegetation Science 14: 355-364, 2003 © IAVS; Opulus Press Uppsala.

"As a result of climate change in the Canadian boreal forest region, a general increase in fire intensity, fire severity (depth of burn) and fire season length (Flannigan & Van Wagner 1991; Wotton & Flannigan 1993; Stocks et al. 1998; Flannigan et al. 2001) is expected." (in de Groot et al., 2003)

A more complete summary would be:
1. Low intensity fires appear to bioaccumulate mercury.
2. High intensity fires were not found to bioaccumulate mercury (not statistically significant).
3. High intensity fires may form a pathway for mercury out of the watershed.
4. Most area burned by fires in the N American boreal forest is by high intensity fires.
5. Climate change is likely to increase the intensity and severity of fire in the Canadian boreal forest.

	Low intensity fire	**Clearcut Logging**	**High intensity fire**
Bioaccumulates mercury?	Yes.	Yes.	No
Path for mercury into atmosphere?	No/small.	No.	Yes. (likely)
% of productive forest landscape impacted over 100 years	Low (natural and managed)	Most (managed)	Most (natural)
Will increase due to climate change?	No	No	Yes.

Most area burned by fires in the boreal forest experience intesne fires that have mercury impacts that are very different from logging.

Page 21

-Only 2 MNR studies look at fish and logging. One is in streams, not lakes. Neither has published in peer reviewed scientific journals so they cannot be assessed or relied upon;

-None are in the IEA area;

-None study or monitor impacts of mercury from logging planned in the IEA area;

-None test mitigation measures and alternatives;

-

D. CONCLUSIONS

For all the above reasons, and those in the IEA request, Grassy Narrows and Earthroots say that MNR has provided no justifiable reason why MOE should not order that an IEA be performed on the Whiskey Jack FMP.

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This is Exhibit "G" referred to in the
affidavit of AMBER ELLIS AND DAVID SOUZE
sworn before me, this 21st
day of AUGUST 20 15
Joseph Castrilli
A COMMISSIONER FOR TAKING AFFIDAVITS
JOSEPH CASTRILLI

Tuesday July 22, 2014

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services
2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5

Dear Mr. Wills,

Re: Supplementary Submissions on the Grassy Narrows/Earthroots Request for an Individual Environmental Assessment (IEA) on the Whiskey Jack Forest Management Plan for 2012-2022

These are supplementary submissions to our request with Grassy Narrows First Nation for an IEA on the Whiskey Jack Forest Management Plan (FMP) for the period 2012-2022.

The submissions are prompted by our recent receipt of a document from the MNR through a Freedom of Information and Protection of Privacy Act request. (attached)

The document is listed as an "Excerpt from Stand and Site Guide Comments Wildlife and Fisheries Forum" in the index of records (attached), and it is undated.

We infer that this was a forum held by the MNR to receive comments on the Stand and Site Guide (SSG), presumably while it was in draft form.

In the document Mark Sobchuk and Evan Armstrong make a number of relevant comments.

Both Mr. Sobchuk and Mr. Armstrong appear to have been MNR employees at the time that the SSG was approved. Neither appear to be employed by the MNR today, based on a search of the Government of Ontario online staff directory.

Sobchuk, MNR, NWR is credited in the SSG on page 173 for:

"Significant contributions to the writing of individual sections of the guide"

He appears to have been a senior fisheries biologist for the MNR.

Evan Armstrong appears to have been an MNR Area Biologist and was listed in media reports as recently as 2013 as a contact for the MNR in the Geraldton Area, Nipigon District on fisheries and aquatic issues. (http://www.thetimesstar.ca/broad-scale-monitoring-of-kenogamisis-lake/)

In the comments they say that "The reduction in protection for river, stream, pond and lake shorelines [in the SSG] needs to be reconsidered" for three reasons:

1. Climate change has not been considered.
2. Mercury is finding its way into water courses from cutovers even with the current reserves/AOCs in place. This is likely to be exacerbated if complete removal of shoreline vegetation is permitted.
3. The task team that "developed the latest recommendations for protecting aquatic habitat didn't propose clear cutting entire shorelines so why are we. This task team included some very knowledgeable folks including some of our research scientists".

Mr. Sobchuk and Mr. Armstrong also noted that: "The public and especially First Nations are very sensitive of mercury entering our water systems and they are not going to like the idea that it might be increased".

These observations from MNR staff involved in the drafting of the SSG corroborate a number of the points Earthroots and Grassy Narrows First Nation raised in our IEA request including:

a. That riparian reserves/AOCs prior to the new SSG were not sufficient to prevent mercury export into local water bodies after clearcutting.
b. That the new SSG weakened existing riparian protections (ie. reserves and AOCs).
c. That the amount of mercury entering water bodies is likely to increase as a result of the changes contained in the new SSG.
d. That the SSG is not consistent with the limited current science on preventing mercury releases from clearcuts.

The attached material also reveals that the MNR may not have followed the advice of its own fisheries and aquatic habitat experts in developing the SSG as it relates to key concerns respecting the mercury issue.

We trust that you will take this information into account in considering our request for an IEA of the Whiskey Jack FMP 2012-2022.

Sincerely,

Amber Ellis
Earthroots

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Officer Report
Rapport de l'agent(e)

Request Number / Numéro de la demande : **A-2014-00018**
Total Documents / Nombre de documents : 16
Total Pages / Nombre de pages : 179

Tiff	Pages	Date	To / À	From / De	Subject / Sujet	Disclosure / Divulgation	Exemptions
A0230365	000001 - 000001	2008/12/13		SIDDERS, ROY	SUMMARY OF FOREST MANAGEMENT STRATEGIES AND OPERATIONS PRACTICES	Partial/Partielle	s.21
A0230365	000002 - 000002				FOREST PRACTICES SUBJECTS	Release/Divulguée	
A0230365	000003 - 000004					Release/Divulguée	
A0230365	000005 - 000005					Not Relevant/ Non pertinente	
A0230366	000006 - 000006	2008/12/13		SIDDERS, ROY	FOREST MANAGEMENT WORKING GROUP MEETING DEC 11, 12	Partial/Partielle	s.21
A0230366	000007 - 000007				DRAFT AGENDA - FOREST MANAGEMENT WORKING GROUP MEETING DECEMBER 11, 12 2008	Partial/Partielle	s.21
A0230366	000008 - 000008					Partial/Partielle	s.21
A0230366	000009 - 000009					Release/Divulguée	
A0230367	000010 - 000010	2009/01/06		SIDDERS, ROY	MATERIAL FOR OUR CALL AT 11:00	Release/Divulguée	
A0230367	000011 - 000011				FOREST PRACTICES SUBJECTS	Release/Divulguée	
A0230367	000012 - 000014					Release/Divulguée	
A0230368	000015 - 000015	2009/01/06	MOHAMED, HASSAN	SIDDERS, ROY	FOREST MANAGEMENT WORKING GROUP MEETING DEC 11, 12	Release/Divulguée	
A0230368	000016 - 000016				DRAFT AGENDA - FOREST MANAGEMENT WORKING GROUP MEETING DECEMBER 11, 12 2008	Partial/Partielle	s.21
A0230368	000017 - 000017					Partial/Partielle	s.21
A0230368	000018 - 000018					Release/Divulguée	
A0230369	000019 - 000019	2010/10/14			GRASSY NEDIATION STRATEGY	Release/Divulguée	
A0230369	000020 - 000021					Not Relevant/ Non pertinente	
A0230369	000022 - 000022					Release/Divulguée	

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Officer Report
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Tiff	Pages	Date	To / À	From / De	Subject / Sujet	Disclosure / Divulgation	Exemptions
A0230370	000023 - 000023	2013/08/26	POCHAILO, KURT	NOWAK, MICHELLE	MEDIA AT WHISKEY JACK OPEN HOUSE	Release/Divulguée	
A0230370	000024 - 000024					Release/Divulguée	
A0230370	000025 - 000025	2013/08/23			CONTINUING FIGHT FOR GRASSY	Release/Divulguée	
A0230370	000026 - 000026					Release/Divulguée	
A0234196	000027 - 000027				HOW FOREST DISTURBANCE INFLUENCES MERCURY DYNAMICS IN WATERSHED	Release/Divulguée	
A0234196	000028 - 000063					Release/Divulguée	
A0234197	000064 - 000064				SUMMARY OF THE EFFECTS OF CLIMATE CHANGE ON ONTARIO'S AQUATIC ECOSYSTEMS	Release/Divulguée	
A0234197	000065 - 000071					Release/Divulguée	
A0234199	000072 - 000072				NOTICE OF DECISION - APPLICATION FOR REVIEW - ENVIRONMENTAL BILL OF RIGHTS - FILE NO. R2007028	Release/Divulguée	
A0234199	000073 - 000088					Release/Divulguée	
A0234204	000089 - 000089				EXCERPT FROM CONTINGENCY PLAN FOR THE WHISKEY JACK FOREST	Release/Divulguée	
A0234204	000090 - 000090					Release/Divulguée	
A0234259	000091 - 000091				WHAT ARE THE ENVIRONMENTAL CONSEQUENCES OF USING SILVICULTURALLY EFFECTIVE FOREST VEGETATION MANAGEMENT TREATMENTS?	Release/Divulguée	
A0234259	000092 - 000106					Release/Divulguée	

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Officer Report
Rapport de l'agent(e)

Request Number / Numéro de la demande : **A-2014-00018**
Total Documents / Nombre de documents : 16
Total Pages / Nombre de pages : 179

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A0234260	000107 - 000107	2014/01/28	RIDE, KEVIN	WEEDON, DEB	REQUEST FOR INDIVIDUAL ENVIRONMENTAL ASSESSMENT OF THE WHISKEY JACK FOREST MANAGEMENT PLAN 2012-2011	Partial/Partielle	s.19
A0234260	000108 - 000108					Release/Divulguée	
A0234260	000109 - 000109	2014/01/22	PARROTT, IAN	ELLIS, AMBER	REQUEST FOR INDIVIDUAL ENVIRONMENTAL ASSESSMENT OF WHISKEY JACK FOREST MANAGEMENT PLAN (EBR REGISTRY NO. 010-9240)	Release/Divulguée	
A0234260	000110 - 000165					Release/Divulguée	
A0235553	000166 - 000166				EXCERPT FROM REDEFINING CONSERVATION - ANNUAL REPORT 2009/2010 - ENVIRONMENTAL COMMISSIONER OF ONTARIO	Release/Divulguée	
A0235553	000167 - 000168					Release/Divulguée	
A0235554	000169 - 000169				EXCERPT FROM SUPPLEMENTARY DOCUMENTATION FOR THE WHISKEY JAKE FOREST 2009-2012 CONTINGENCY MANAGEMENT PLAN	Release/Divulguée	
A0235554	000170 - 000171					Release/Divulguée	
A0235556	000172 - 000172				EXCERPT FROM BACKGROUND AND RATIONALE FOR THE NOVEMBER 2008 (ER READY) STAND & SITE GUIDE	Release/Divulguée	
A0235556	000173 - 000178					Release/Divulguée	
A0235557	000179 - 000179				EXCERPT FROM STAND AND SITE GUIDE COMMENTS WILDLIFE AND FISHERIES FORUM	Release/Divulguée	

Draft Stand Site Guide NW Region Wildlife Forum Review Comments

	A	B	C	D	E	F	G
2	Name	Initials	Section #	Pg#	Line #	Comment	Section Title
75	Mark Sobchuk;Evan Armstrong	MS	4.1	30		**Section 4.1 Aquatic & wetland Habitats.** The reduction in protection for river, stream, pond and lake shorelines needs to be reconsidered for 3 reasons. 1/ climate change and its affects have not been considered and we are being asked to consider climate change in our decision making; 2/ a recent paper by Dr. R. Mackereth indicates that mercury is finding its way into water courses from cutovers even with the current reserves/AOC`s in place. This is likely to be exascerbated if complete removal of shoreline vegetation is permitted. The public and especially First Nations are very sensitve ot mercury entering our water systems and they are not going to like the idea that it might be increased!; and 3 the task team that developed the latest recommendations for protecting aquatic habitat didn`t propose clear cutting entire shorelines so why are we. This task team included some very knowledgeable folks including some of our research scientists.	Maintaining Suitability of Aquatic and Wetland Habitats and Shoreline Forest

Court File No. **446 / 15**

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

APPLICATION RECORD

CANADIAN ENVIRONMENTAL LAW ASSOCIATION
130 SPADINA AVE., SUITE 301
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Joseph F. Castrilli (LSUC No. 26123A)
Richard D. Lindgren (LSUC No. 28529E)

Solicitors for the Applicants

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DECEMBER 10, 2021

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	Determination, dated March 29, 2021; 3. ANA Letter to Regional Manager, Ministry of Energy, Northern Development and Mines RE: Trillium Gold Leo Project Drilling Program, dated December 18, 2020 4. ANA Letter to Hon. Greg Rickford, Minister of Energy, Northern Development and Mines RE: Request to Exercise Mining Acts. 35(1) Withdrawal of Lands Power, dated November 13, 2020 5. ANA Letter to Hon. Greg Rickford, Minister of Energy, Northern Development and Mines RE: Request to Exercise Mining Act s. 35(1) Withdrawal of Lands Power, dated October 1, 2020 6. ANA Letter to Hon. Greg Rickfod, Minister of Energy, Northern Development and Mines RE: Request to exercise Mining Acts 35(1) withdrawal of lands power, dated February 26, 2020 7. ANA Open Letter Re: Moratorium on industry in our Traditional Territory, and opposition to MNR Tender Process, dated January 17, 2007 8. ANA Letter to Mr. Holmes, Mr. Brown, Ms. Stuart, Ms. Bjorgan, and Ms. Capling, dated December 20, 2019 9. Email communications from Lara Koerner-Yeo to Mr. Holmes, Mr. Brown, Ms. Stuard, Ms. Bjorgan and Ms. Capling dated February 25, 2020, February 6, 2020, January 28, 2020 and December 23, 2019 10. ANA Letter to Hon. Rod Phillips, Minister of Environment, Conservation and Parks, dated March 25, 2019 11. Email communication from David Sone to Hon. Jeff Yurek and Rod Phillips, dated October 11, 2018 12. ANA Letter to Hon. Jeff Yurek, Minister of Natural Resources and Forestry and The Honourable Rod Phillips Minister of Environment, Conservation and Parks, dated September 18, 2018	
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Tab 4

Court File No. **446 / 15**

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO),
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

APPLICATION UNDER Section 2(1)
of the *Judicial Review Procedure Act*
R.S.O. 1990, c. J.1

APPLICATION RECORD
VOLUME 4 OF 5

CANADIAN ENVIRONMENTAL LAW ASSOCIATION
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Joseph F. Castrilli (26123A)
Richard D. Lindgren (28529E)
Solicitors for the Applicants

Court File No.

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
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on their own behalf and on behalf of all other members of
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APPLICATION RECORD
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Asubpeeschoseewagong
Netum Anishinabek
GRASSY NARROWS, ONTARIO P0X 1B0 • PHONE: (807) 925-2391 • FAX: (807) 925-2649

EARTHROOTS

This is Exhibit "H" referred to in the affidavit of AMBER ELLIS AND DAVID SONE sworn before me, this 21st day of AUGUST 20 15

Joseph Castrilli
A COMMISSIONER FOR TAKING AFFIDAVITS
JOSEPH CASTRILLI

September 8, 2014

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services
2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5

Re: Third Supplementary Submission on the Grassy Narrows/Earthroots Request for an Individual Environmental Assessment (IEA) on the Whiskey Jack Forest Management Plan for 2012-2022

Dear Mr. Wills,

These are supplementary submissions to our request for an IEA on the Whiskey Jack Forest Management Plan (FMP) for the period 2012-2022.

The submissions are prompted by: (1) our attention to a report that was previously not available to the general public regarding human health impacts of mercury on members of the Grassy Narrows community (attached); and (2) various documents, including letters, media coverage, and related materials that underscore what is said in the report and express concerns by members of the Grassy Narrows community about future further exposure to mercury as a result of clear-cutting proposed under the Whiskey Jack FMP. We regard this information as important to your consideration of our request for an IEA of the Whiskey Jack FMP and would ask that the Ministry of the Environment (MOE) consider this material in conjunction with the material that we have previously submitted to your office on this matter.

MERCURY DISABILITY BOARD REPORT

The first document is a review paper commissioned by the Mercury Disability Board. It consists of two main sections, one summarizing new developments in the scientific understanding of the human health impacts of mercury since the 1980's, and the second offering domestic expert opinions on work of Dr. Harada and his team in Grassy Narrows up to their paper released in English in 2010 (N.B. Harada's team has released at least two papers on Grassy Narrows since that time, one in 2011 (referenced in our original request), and another in 2014 (Takaoka et al.)).

Mercury Disability Board, *Literature Review: The Impact of Mercury on Human Health*, prepared by Donna Mergler and Laurie Chan (Kenora, Ont.: MDB, September 2010) .

a. A Review of Current Understanding of Mercury Poisoning - September 21, 2009

b. Opinions on Dr. Masazumi Harada's studies in Ontario based on articles provided by the Mercury Disability Board - October 29, 2009 and updated September 15, 2010.

The report was prepared by Donna Mergler and Laurie Chan, two Canadian academics who are often employed for government work as experts on the impacts of toxics in the environment on human health.

Please consider the full contents of these reports, and in particular, the following points excerpted directly from the reports (headings added):

People in Grassy Narrows were poisoned by mercury

- There is no doubt that there was high mercury exposure in these two communities in the late sixties and early seventies (Part b, p.7).
- There is no doubt that at these levels of exposure many persons were suffering from mercury-related neurologic disorders (Part b, p.7).

People are still sick, and some still have high exposure to mercury

- Dr. Harada's follow-up study indicates that there is probably still a problem due to previous mercury exposure (Part b, p. 7).
- Some individuals may still have high exposure [25 ppm and 60.3 ppm observed in Grassy Narrows and White Dog] (Part b, p. 7).

Health care and support for mercury survivors is substandard

- We also want to highlight the urgent need to improve the general health of these two communities as the health status of the participants was clearly poor (Part b, p.8)
- It is paramount that members of the two communities are receiving the necessary medical care and support. In contrast, residents in Minamata, Japan enjoy superb health care from neurologists and therapists even [if] they had not been classified as victims of Minamata Disease (Part b, p.8).

Government monitoring of health has been inadequate

- There should have been extensive examinations and follow-up of these communities from [the 1970's] forward, and assistance with respect to health and nutrition" (Part b, p.7). "
- Many of the health complaints from the affected population have not been properly diagnosed and documented. (Part a, p.27)
- Dr. Harada's follow-up study shows the "need for a comprehensive epidemiologic study that would include all of the known outcomes of mercury exposure (including cardiovascular disease) and take into account co-morbidity from other diseases, such as diabetes and/or alcohol and test for possible interactions" (Part b, p.8).

Mercury survivors are being denied compensation

- Among the 60 participants diagnosed with Minamata Disease [by Dr. Harada], 21 were acknowledged and 39 were not acknowledged by the [Mercury Disability Board] (Part b, p. 6).

- The approach used by the Mercury Disability Board to assess whether or not an applicant has signs or symptoms consistent with mercury poisoning was designed based on the state of science and knowledge of the impact of mercury on human health in the 1980s (Expert Report Intent, p.1).

- The Japanese government is revising their definition of Minamata Disease victims to be more inclusive and a new round of compensation is expected to release in 2011."(Part b, p.7)

Dr. Harada and his team's work is important

- "[Dr. Harada and his team] have made significant contributions to the understanding of the long-term effects of mercury contamination and the health of residents in the two communities" (Part b, pp. 7-8).

Mercury impacts foetuses and children at much lower levels than others. Some effects are permanent.

- Today there is a wide consensus that even at low levels of mercury, mercury can affect children's intellectual and motor development, which is not immediately obvious in children examined individually, but can be observed in population studies (Part a, p. 19).

- The evidence for mercury developmental neurotoxicity continues to accumulate (Part a, p.15).

- Even a short-term impairment in this cascade [of Central Nervous System development] may cause irreversible neurotoxicity if the tissue cannot compensate for the damage (Part a, p.7).

- The effects on brain function associated with prenatal methylmercury exposure therefore appear to be multi-focal and permanent (Part a, p.14).

- At the sub-clinical and population level, several studies in different parts of the world, have reported poorer neurologic status and slower development in newborns, infants and/or children exposed in utero MeHg and/or during early childhood (xxi,xxxii,xxxiii,xxxiv,xxxv,xxxvi,xxxvii,xxxviii,xxxix,xl,xli,xlii), although some studies did not observe effects (xliii,xliv,xlv). In children, MeHg exposure has been associated with lower performance on tests of language, attention, memory, and/or visuo-spatial and/or motor functions (Part a, p.8)

- Findings suggest that factors often associated with a poorer home environment, such as poorer nutrition and less parental stimulation, may increase vulnerability to toxics (Lxxvi, lxxxvii) (Part a, p.17).

Mercury impacts people at levels far below those previously considered safe

- Recent studies conducted among Minamata residents who suggested that the lowest-observed-effect level for clinical effects is likely to be considerably lower [than 50 ug/g in hair, 200 ug/L in blood] (Part a, p.7).

- These suggest the possibility of clinical effects, perhaps in a sensitive sub-set of the general population, at levels of exposure considerably below those previously associated with clinical effects in poisoning episodes (Part a, p.7).

- Studies of persons from a nearby polluted area, who had been exposed to lower doses of mercury over a twenty year period, still suffered from distal paresthesia of the extremities and lips 30 years after cessation of exposure (part a, p.20).

- This result suggests that neurologic signs, especially perioral sensory loss, was found among residents with hair mercury content below 50 ug/g after exposure was ceased for 11 years. Ninomiya et al reported that sensory loss remained even 30 years after the cessation of methylmercury exposure (Part a, p.10).

- The loss of color vision and contrast sensitivity has been demonstrated in [Amazonian fish-eating] populations, at methyl mercury levels of contamination below 50 ug/g of total hair Hg, which was traditionally considered the threshold for clinical effect (Part a, p.13).

- A Canadian study of fish eaters with levels of blood Hg <20/ug/L, showed a negative association between Hg and monoamine oxidase activities in platelets. Experimental studies have shown that Hg exposure disrupts the function and transmission of the monoaminergic nervous system, inhibiting the enzyme activities of monoamine oxidase (MAO, EC 1.4.3.4)lxi. Biochemical changes may constitute a sensitive, although non-specific, early indication of Hg-induced alterations to the nervous system, but more work is needed in this area (Part a, p.10).

- Current estimates of risk based on MeHg exposure alone could underestimate the population risk. Additional research is clearly needed to address these questions (Part a, p. 26).

- There is a clear need for more studies on the effects of mercury with age (Part a, p.24).

- While exposures throughout the world are lower than those producing the historical epidemics of MeHg poisoning, there is growing evidence that for many populations, exposures are sufficient to alter normal functioning of several systems and constitutes an important public health problem (Part a, p.7).

Mercury has health impacts beyond the classic neurological symptoms including direct and secondary psychological impacts

1. Risk of acute myocardial infarction can double with mercury exposure. (paraphrase)

2. Dietary mercury exposure at levels found relatively commonly in western populations can result a significantly elevated risk of AMI [acute myocardial infarction] (Part a, p.22).

3. This result suggests that exposure to Hg can cause varying degrees of permanent neuropsychological disability (Part a, p.11)

4. These findings suggest that sensory symptoms resulting from Hg exposure could be determined even in the presence of neurological or neurologically related diseases." p.12

The MDB review paper also summarizes the key findings of a report titled "Final Report of the Anishinabek knowledge Component National First Nations Environmental Contaminants Program (NFNECP) Health Canada 2008-2009." The authors wrote:

> The key findings are:
>
> a) The perceived risk of mercury pollution is still high. Scientists and health professionals have not been able to communicate the level of certainty in different findings and recommendations. People are confused with the scientific findings and public health messages and think that scientific information is not reliable.
>
> b) There is a high level of mistrust for the scientific communities and the government. The risk communications including dietary advice have not been effective. The advices were either issued by the government or by scientists in different reports. The scientific studies and public health advice have been perceived to be out of context and did not take into account of the Indigenous perspectives. There is no long-term knowledge base available locally for such information.
>
> c) The overall impact of mercury pollution has been more than just the health effects of mercury poisoning. Many other determinants of health including disruptions of culture, rapid change of diet, decline in jobs and income etc. have not been properly addressed and are clearly still having an impact on the overall health status of the people.

This information, together with that supplied in our earlier submissions, support a number of important points including:

1. **Women and children are disproportionately impacted by mercury contamination for reasons including:**

   -fetuses and children suffer permanent impacts at low mercury levels, and at lower levels than other populations

   -women do a disproportionate amount of childcare and informal health care and therefore the unpaid burden of caring for sick family members and impacted children disproportionately falls on them

-women, on average, earn less than men for equivalent work, and therefore are more likely to be unable to afford diets other than the traditional fish diet . This is especially true for single mothers.

-women are chronically under-represented on Grassy Narrows Chief and Council

-Anishinaabe women are traditionally responsible for protecting the water and therefore the social, psychological, spiritual, and physical burden of dealing with water contamination falls disproportionately on them

-women are disproportionately impacted by sexual assault and domestic violence. The secondary impacts of mercury including unemployment, poverty, despair, violence, substance abuse, and social conflict are associated with increased rates of sexual assault and domestic violence.

-women and children are already disadvantaged relative to other members of society

2. **Mercury has both direct physical, and psychological health impacts, as well as secondary health impacts** due to social disruption arising from unemployment, poverty, loss of culture, changing diet, loss of autonomy, and despair. This too has impacts on the physical and psychological health of people in Grassy Narrows. Anthropologists (including Shkylnik) have documented greatly increased rates of violence, sexual assault, substance abuse, injury, and death coinciding with the compounding impacts of relocation and mercury on Grassy Narrows.

3. **The government and scientists have not succeeded in effectively communicating information about risks and benefits of fish consumption to people in Grassy Narrows.** Grassy Narrows people are not generally aware of the comparative mercury levels of various bodies of water, nor of the differences in mercury levels between fish species and fish sizes. Government fish consumption advisories are not well communicated to Grassy Narrows people, and are not well known or understood.

CONCERNS EXPRESSED BY GRASSY NARROWS COMMUNITY ON MERCURY EXPOSURE FROM CLEAR-CUTTING

The types of findings raised in the MDB report are underscored in the concerns expressed by the Grassy Narrows community to the government for years about the potential for further mercury exposure from proposed clear-cutting of the Whiskey Jack. The following excerpts from various documents are arranged chronologically for MOE's consideration in conjunction with, and as part of, our bump-up request:

Jan. 8, 1999	Grassy Narrows Chief Bill Fobister and Councillors write to MNR Minister John Snobelen expressing "grave concerns with the 1999-2004 Forest Management Plan for the Whiskey Jack Forest, and lack of response to the concerns, by both the Ministry of Natural Resources, and Abitibi Consolidated Corporation"…"We are a community increasingly surrounded by huge clearcut areas of former forest....We intend to pursue our right to use the Grassy Narrows Traditional Land Use Area to sustain our culture and our ties to the land…Our community has already lived through the devastating effects of more than one environmental disaster (mercury pollution, and hydro-electric flooding). We don't intend to sit back and let it happen to our people again".[1]
May 19, 1999	MOE Minister Norman Sterling writes to Grassy Narrows' members Judy Da Silva and Roberta Keesick, copying MNR Minister Snobelen, informing them that their request for an IEA of the 1999-2019 Whiskey Jack Forest Management Plan is not warranted. The letter states that "it is unlikely that an individual EA, under the EAA, would bring to light any adverse environmental effects previously unanticipated by the planning team during the development of the forest management plan. Therefore, an individual EA is not required".[2]
July 28, 2003	Thirty years after a Japanese researcher identified Canada's biggest case of mercury poisoning, he has returned to discover that the problem is far from resolved and may be getting worse. Masazumi Harada's new research raises troubling fresh questions about the sources and effects of mercury contamination present in water and fish in many parts of the country. The results of Harada's study are particularly sobering for aboriginal people who depend on a diet rich in fresh fish. It had been expected that the health of First Nations people on the Grassy Narrows and White Dog reserves near Kenora would improve after a mill stopped dumping mercury in the English and Wabigoon river systems in 1970. But when Harada returned to the area last fall, he found evidence of continuing, pervasive health problems consistent with Minamata disease, a neurological disorder caused by mercury. The results of Harada's study have not been published but were summarized by Steve Fobister Sr., deputy chief of …Grassy Narrows, who has seen them. Of approximately 60 First Nations people who were examined at the Grassy Narrows and White Dog reserves last fall, 70 per cent showed symptoms of neurological disorder, said Fobister. Symptoms included blurred vision, slurred speech, twitching, numbness, shaking, and poor muscle co-ordination. The symptoms of eight people who were part of the study in the 1970s had become more severe.

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[1] <http://freegrassy.net/wp-content/uploads/2010/03/LettersJan99_ToWashingtonPost_ToMinNR_Enviro_WJF99-04.pdf >

[2] < http://freegrassy.net/wp-content/uploads/2010/03/Copy_of_Letter19May99_CAMinEnvr_2Keesick_Dasilva.pdf >.

Fobister says that he himself has serious neurological disease. “I can hardly tie my shoes any more”, he said in an interview. Even children in the community are showing serious problems, including seizures, he said. Fobister blames clear-cut logging in the area for the continuing high levels of mercury contamination – a theory for which there is some scientific support, although debate continues. A University of Montreal researcher reported in 2001 that mercury levels were up to 100 per cent higher in heavily logged watersheds than in lakes where there was no logging nearby. The theory is airborne mercury from sources such as coal-fired power plants and incinerators tends to be held in the soil and foliage of an intact forest, but runs into waterways in areas that have been clear-cut. Health Canada is funding a new study of neurological disease in the Grassy Narrows area in the light of the recent research developments. “It is alarming to see there are so many people still suffering neurological symptoms in this community after 30 years”, said Laurie Chan of McGill University, who is leading the study.[3]

Sept. 4, 2004 — Aboriginal leaders in northwestern Ontario call for a public inquiry after an international health expert says people living in the area are still showing effects of mercury poisoning. Dr. Masazumi Harada, a world-renowned neurologist, says that the conditions of people exposed to mercury three decades ago have stayed the same or worsened.[4]

Feb. 2006 — A Grassy Narrows letter to logging companies states that decades of unsustainable logging have poisoned waters with mercury and other toxins, interfered with economic opportunities and nearly eliminated the ability to practice an aboriginal way of life. Spokesman Joseph Fobister says: “We have participated fully in planning for many years, and our concerns are never properly considered,” he said. “We are never treated as equal partners in the process. What's worse, our attendance at the information sessions and open houses is misconstrued as participation or approval”.[5]

Apr. 5, 2010 — CBC reports on continuing impacts of mercury in Grassy Narrows, including impacts on children. [This is a 5-page transcript – the following excerpts cover just the statements of three people interviewed – Sherry Fobister, a Grassy Narrows resident, Bill Fobister, former Chief of Grassy Narrows, and Steve Fobister, Grassy Narrows Chief in 1983]. “Sherry Fobister: ‘I feel angry knowing that something that happened in the ‘60s, you know…Like, how it affected my

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[3] D. Bueckert, “Mercury poisoning issue back 30 years later, disease signs present in Indians”, The Toronto Star (July 28, 2003).

[4] CBC, “Ontario reserves demand inquiry into mercury poisoning” (September 4, 2004); < http://www.cbc.ca/news/canada/ontario-reserves-demand-inquiry-into-mercury-poisoning-1.515484 >.

[5] “Forestry firms under fire at Grassy Narrows”, February 28, 2006. Globe and Mail (online?); < http://freegrassy.net/2006/02/28/forestry-firms-under-fire-at-grassy-narrows/#sthash.zzdz53a4.dpuf >

family….' . Bill Fobister: 'During the '60s, we were in full bloom, fishing, guiding, everything, that we did and we thought everything was okay. But not until we're seeing some of our fish acting weird and dying off, that's when …there is something wrong.' Bill Fobister: 'My symptoms is my numbness and loss of sensation and my vision. My speech is kind of getting pretty sloppy. My taste, I lost my taste. I lost my smell. I can't smell any more.' Steve Fobister: 'I don't think, you know, it's right to say, look, you know, you don't have to go trapping. You can live on welfare….My whole nervous system is out of whack, you know, I can't barely walk and, you know, I have to hold my jaw to talk because my muscles are practically gone…[As a fishing guide, he] had [to eat what he caught even after the mercury was discovered] We had to do this in order to appease our guests that the fish was ok. The tourist camp owners encouraged us to do it…[Dr. Harada, during his return to Grassy Narrows in March 2010, said to Steve Fobister] 'You know you have some kind of a metal poisoning' And the closest definition to [Harada's] examination…it's got to be mercury'…'I only have one granddaughter. She's the one who kind of possesses violent seizures.' Sherry Fobister: '[Ms Fobister ate fish when she was pregnant]…it's [eating fish] a part of life, you know…I love eating fish. It's a delicacy…it's part of our lifestyle. I don't know, I still eat it to this day. [no one told her not to eat fish when she was pregnant].[6]

Apr.7, 2010 — Grassy Narrows' members and supporters protest in Toronto at the provincial legislature calling for justice for mercury survivors and an end to clearcutting. A Grassy Narrows' press release quotes a Grassy Narrows mother: "When I was pregnant I couldn't afford to buy food at the store, so I ate what my grandfather brought home – mostly fish," explained Sherry Fobister, a young Grassy Narrows mother. "Now both my children are sick with strange illnesses, just like their cousins. I myself have tremors and numbness, but I don't qualify for compensation. Sometimes I can't afford to bring my kids to Winnipeg for treatment. I want everyone in Grassy Narrows tested." "As Chief in the 1970's, when the government first negotiated with us, I said that Grassy Narrows requires the control over our land and resources for our people to recover from the devastating impacts of mercury pollution on our health, our culture, and our economy. This is still true," said Grassy Narrows Chief Simon Fobister.[7]

2010 — Toronto Star reports that "Premier Dalton McGuinty responded to the chief's concerns by saying the province has a 'heavy responsibility' to study Harada's findings, because they conflict with what the federal government claims – that

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[6] CBC Television, The National (Transcript), "Years of mercury poisoning have not been kind to the people of Grassy Narrows" (Toronto: CBC, Apr. 5, 2010).

[7] < http://freegrassy.net/wp-content/uploads/2010/01/River_Run_Press_Release_April_71.pdf >.

	mercury poisoning at Grassy Narrows is under control. 'It seems we have conflicting data and information,' McGuinty told reporters in Peterborough where he was visiting a health clinic. 'We have a report, apparently, which says we have a continuing problem and this contrasts with the federal government which is saying, 'Well, things are under control'." The Toronto Star reports further that: "While the federal and provincial governments say contamination is no longer a problem, Harada's research indicates the possibility of congenital Minamata disease is high," said Ontario Regional Chief Angus Toulouse. Children are being born with neurological symptoms, mental deficiency and cerebral palsy, he said".[8]
July 20, 2010	The Assembly of First Nations passes a resolution calling for a public inquiry into mercury contamination at Grassy Narrows. They also call for an end to logging in the community's traditional territory, as well as permanent monitoring of the long-term effects on residents. The resolution supports Grassy Narrows' demand to "restore Grassy Narrows' control over Grassy Narrows Territory, including putting a stop to clear-cut logging, as this contributes to the leaching of mercury into waterways".[9]
2010	Grassroots Grassy Narrows members and supporters release a public fact sheet on mercury and Dr. Harada's findings.[10]
June 2012	Grassy Narrows' leadership, members, and supporters hold a week of events in Toronto called River Run 2012 to call for justice on mercury issues and an end to clear-cutting. Aboriginal Affairs Minister Wynne says that there is a committee of ADMs from various ministries seeking to deal with the mercury issue. Wynne commits to visiting Grassy Narrows and does so later in the summer. She commits to try to repair the relationship with Grassy Narrows and "getting this right".[11]
June 4, 2012	The Canadian Press reports that Chief Simon Fobister stated: "While our people suffer, Ontario has made plans to continue the destruction of our culture,

[8] Tanya Talaga, "Dalton McGuinty says he'll study report on Grassy Narrows mercury poisoning", The Toronto Star, (April 7, 2010); < http://www.thestar.com/news/ontario/article/791023--dalton-mcguinty-says-he-ll-study-report-on-grassy-narrows-mercury-poisoning?bn=1 >.

[9] Resolution #2/ 2010 AFN Annual General Assembly, July 20-22, 2010, Winnipeg, Manitoba; < http://freegrassy.net/2010/07/23/national-chiefs-assembly-backs-grassy-narrows/#sthash.GmDXCUYq.dpuf >.

[10] Grassroots Grassy Narrows, Fact Sheet: Mercury Poisoning of the Grassy Narrows and White Dog Communities – Dr. Harada's Key Findings (first released in 2010, updated in 2012).

[11] Rick Garrick, "Minister Visits Grassy Narrows", *Wawatay News* (31 July 2012); online: http://www.wawataynews.ca/archive/all/2012/7/31/minister-visits-grassy-narrows_23212 .

livelihood, and health through another decade of logging in our forest against our will".[12]

June 6, 2012 — A Toronto Star Editorial writes that: "the compensation package set up in the 1980s is so inadequate that it now doesn't cover most of those with symptoms of mercury poisoning".[13]

June 7, 2012 — Aboriginal Affairs Minister Wynne answers question about logging and mercury link on CBC's "The Current": "We do believe that there is still contamination... nobody should be eating contaminated fish..."

Q. Tremonti: "They are also calling for an end to logging in the area because they talk about the cutting and the mercury contamination that comes from the soil once the trees are gone, are you about to look into that?"

A. Wynne: "I think that is part of the broad conversation. I am not going to make any commitments on logging or the economic future in terms of that industry, but I think its part of the mix, part of what we need to talk about....There is the adding of mercury as part of that industry, but there is also the cleanup.....What I haven't have heard is a clear kind of plan for how we would do the cleanup. If there were a way to do the cleanup then maybe the conversation about logging would be different".[14]

Minister Wynne also notes that the "fish for food" program is not widely used No applications for fish are made from 2006 to April 2012.[15]

N.B. Grassy Narrows people note that the frozen fish lack cultural compatibility and the social and cultural benefits of fishing, undermine self sufficiency, are inappropriate fish species, are not fresh, and are freezer burned.

June 11, 2012 — The people of Grassy Narrows believe that large-scale clear-cut logging, which has been linked to increased mercury run-off into rivers and streams, is a key factor in the persistent contamination of their territory.[16]

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[12] Michelle McQuigge, "Two Ontario First Nations Show Signs of Ongoing Mercury Poisoning: Report", *Canadian Press* (4 June 2012); online < http://news.nationalpost.com/2012/06/04/two-ontario-first-nations-communities-show-signs-of-ongoing-mercury-poisoning-report/#0_undefined,0 >.

[13] Editorial, "Mercury Dumped in Northern Ontario Decades Ago Still Causes Ill Health" *The Toronto Star* (6 June 2012); online < http://thestar.com/opinion/editorials/article/1206451-mercury-dumped-in-northern-ontario-decades-ago-still-causes-ill-health >.

[14] CBC, The Current "Checking-In" Letters and follow-up to June 4, 2012 program "Mercury Poisoning in Grassy Narrows Reserve" (7 June 2012); online: < http://cbc.ca/thecurrent/episode/2012/06/04/mercury-poisoning-in-grassy-narrows-reserve >.

[15] *Ibid.*

June 25, 2013	In June, a wide range of human rights, faith, labour, and environmental organizations with over one million members in Ontario write to the Premier urging her to call an end to unwanted logging permits on Grassy Narrows' lands as a good faith demonstration of the province's commitment to a forest management approach that respects Aboriginal rights. The letter states in part that: "…large-scale clear cut logging has not only destroyed trap lines and wiped out areas that provided berries and plant medicines, and driven off essential game species, it has almost certainly also contributed to new mercury leaching into their rivers and streams".[17]
Oct. 24, 2013	Letter from Grassy Narrows' Chief Simon Fobister to Ontario Premier Kathleen Wynne objecting to the logging plan and noting past and future concerns respecting mercury poisoning: "You are fully aware that our community continues to struggle with the devastating health impacts from 9,000 kg of mercury that was dumped into our river system in the 1960s with the permission of the government of Ontario. Three generations of our people bear the burden of this degenerative neurological poison. New clearcut logging will bring even more mercury into our river and our food chain, further prolonging and exacerbating this avoidable tragedy. We condemn such processes and plans".[18]
Oct. 30, 2013	Chief Fobister speaks on CBC "As it Happens" objecting to the proposed FMP: "The clearcuts contribute to leaching of mercury into the watershed…there are bacteria that will turn that mercury into methyl mercury. We already have 12 tonnes of methyl mercury in the river sediment…and there has not even been any cleanup by Ontario".[19]
Nov. 7, 2013	Grassy Narrows' media release regarding logging plan asks whether government of Ontario "will…force logging on our community against our will, knowing that logging would release more mercury into our food chain".[20]

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[16] Neve, Barlow, Toulouse, "Mercury contamination is a human rights issue" The Ottawa Citizen (June 11, 2012); < http://freegrassy.net/2012/06/11/grassy-needs-justice/#sthash.cXz5qjE7.dpuf >.

[17] Letter from Amnesty International, Christian Peacemaker Teams, Canadian Friends Service Committee, Council of Canadians, Earthroots, National Indigenous Anglican Bishop, Greenpeace Canada, Ontario Secondary School Teachers' Federation, and Kairos to the Hon. Kathleen Wynne, Premier of Ontario, June 25, 2013; < http://freegrassy.net/2013/09/19/more-than-one-million-ontarians-call-for-an-end-to-unwanted-logging-in-grassy-narrows/#sthash.gZhswKSn.dpuf > (original letter available).

[18] Letter from Chief Simon Fobister, Asubpeeschoseewagong Netum Anishinabek, Grassy Narrows, Ontario to the Hon. Kathleen Wynne, Premier of Ontario, October 24, 2013.

[19] < http://www.cbc.ca/player/Radio/As+It+Happens/ID/2415408181/ >.

[20] Media Release "Minister Makes False Statement on Logging in Grassy Narrows", November 7, 2013.

Dec. 23, 2013	Media release from Grassy Narrows reports on Ontario government approval of the logging plan, which the release says will harm a community already struggling with the long-term health impacts of mercury poisoning. The media release notes that clear-cut logging approved under the plan, in which some cuts will be nearly the size of pre-amalgamation Toronto, will elevate mercury levels in fish, deepening the tragedy caused when 20,000 pounds of mercury were dumped into the river system in the 1960s by a paper mill upstream from Grassy Narrows.[21]
Feb. 3, 2014	Letter from Grassy Narrows' Chief Simon Fobister to Ontario Minister of Natural Resources David Orazietti and Ontario Minister of Aboriginal Affairs David Zimmer restating opposition to logging plan for a variety of reasons including that the "plan is likely to prolong and deepen the tragedy of mercury poisoning in our community" which is "unacceptable".[22]
Feb. 3, 2014	CBC external link report states that "People in Grassy Narrows have been poisoned by mercury for over 40 years. 20,000 pounds of mercury was dumped into the Wabigoon River-English River system by an upstream paper mill, Dryden Chemicals Inc., which had permission from the province to freely dispose of chemicals between 1962 to 1970. People in Grassy Narrows have developed neurological Minamata disease from eating contaminated fish. The disease can cause blurred vision, tremors, lack of motor control, seizures, and children born with cerebral palsy, according to [an unnamed] report. The community is especially concerned that when logging starts, the mercury levels will rise." [A photo of fish frying in a pan accompanying the CBC report contains a caption that reads in part:] "Fish is a staple diet for anishinaabe people. Grassy Narrows people have eaten and still eat fish contaminated with mercury as not everyone can afford food not caught nearby".[23]
Mar. 28, 2014	Kenora news report indicates that MNR Minister David Orazietti is defending the province's new 10-year FMP for the Whiskey Jack Forest which is set to come into force on April 1, 2014. A Grassy Narrows activist, Judy Da Silva, an architect of her community's decade-long blockade against forestry operations, said the forest cannot support more logging industry. She pointed to, among other things, the on-going effects of mercury poisoning. Orazietti said that since 2009 0.075 per cent of the Whiskey Jack's forested areas has been logged each

[21] Grassy Narrows First Nation, Media Release, "Wynne ruins Xmas in Grassy Narrows, logging plan approved" (23 December 2013).
[22] Letter from Chief Simon Fobister, Asubpeeschoseewagong Netum Anishinabek, Grassy Narrows, Ontario to the Hon. David Orazietti, Ontario Minister of Natural Resources and the Hon. David Zimmer, Ontario Minister of Aboriginal Affairs, February 3, 2014.
[23] Crystal Greene, CBC News, "Grassy Narrows First Nation on alert for logging" (Thunder Bay: CBC, February 3, 2014).

year, and under the FMP that would be increased to 0.1 per cent for the year 2014-2015. But he said no trees would be touched during that time within 60 kilometers of Grassy Narrows. Da Silva said "We've already had 9,000 kilograms of mercury spilled in the forest and there is research showing that the logging industry helps contribute to the build-up of mercury. If this is going to continue on, then we are going to have a bleak future in this forest", said Da Silva.[24]

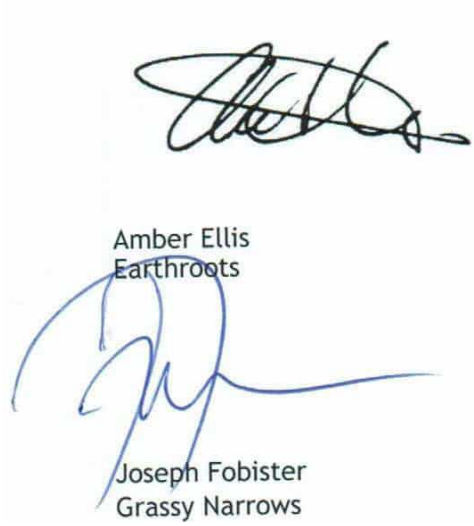
CLOSURE

Finally, please also take into account the recent media reports on this issue during the week of July 28 to August 1 2014 (http://freegrassy.net/news-reports-about-river-run-2014/), including the statements made by Minister Zimmer at his press conference with Steve Fobister Sr. on Tuesday July 29, 2014 and by Premier Wynne on CBC on Wednesday July 30th. In particular:

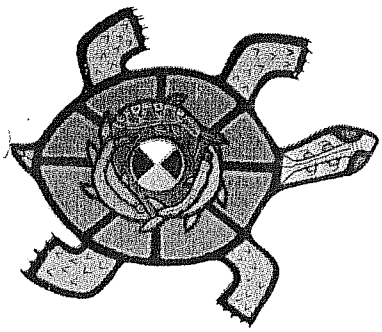
Ontario Premier Kathleen Wynne: "There is no doubt in my mind that there are disabilities that have come about because of the pollution of the water." *July 30, 2014*

We trust that you will take this information into account in considering our request for an IEA of the Whiskey Jack FMP 2012-2022.

Sincerely,



[24] Alan S. Hale, "Orazietti defends Whiskey Jack forestry plan as its implementation looms", Kenora Daily Miner and News (Mar. 28, 2014).



MERCURY
DISABILITY BOARD

Literature Review:

The Impact of Mercury on Human Health

2010

Mercury Disability Board
Literature Review: The Impact of Mercury on Human Health

INTENT

The approach used by the Mercury Disability Board to assess whether or not an applicant has signs or symptoms consistent with mercury poisoning was designed based on the state of science and knowledge of the impact of mercury on human health in the 1980s. In 2009 the Board commissioned a review of the literature to determine if there is new knowledge that might in some way inform the Board's work. Proposals were sought from senior scientists who have published in this field in the scholarly literature. Drs. Laurie Chan and Donna Mergler were engaged in July, 2009 to complete the work, as follows.

The intent of this project was to address the literature since 1985 on mercury contamination in human populations in order for the Board to review its current procedures and tools:

a) The effects of mercury contamination on human health (including the fetus) particularly:
- *the effect of human physiology over the life course including short and long term effects;*
- *disability related to mercury;*
- *mental health or behavioural effects of mercury including psychosis;*
- *any evidence that mercury accelerates the development of chronic diseases related to the thyroid gland, arthritis, diabetes and the nervous system.*

b) Any evidence of an interactive effect of mercury and other contaminants on human health.

c) Methods of measuring past or present mercury exposure in humans.

d) Independent review of literature produced by Dr. Masuzumi Harada.

e) Opinions on environmental contamination reporting in the area.

OUTCOMES

The following reports as provided by Laurie Chan, Ph.D. and Donna Mergler, Ph.D. and bound together in this package are:

A Review of Current Understanding of Mercury Poisoning - September 21, 2009
This provides a review and presentation of literature on mercury exposure and effects in humans building on earlier literature, other reviews and more recent literature (since 1985) highlighting current understanding in the field.

Opinions on Dr. Masazumi Harada's studies in Ontario based on articles provided by the Mercury Disability Board – October 29, 2009 and updated September 15, 2010
This provides a review and opinions on the following articles regarding Dr. Masazumi Harada's studies in Ontario:

1. Harada, M.; Fujino, T.; Akagi, T.; Nighigaki, S. Epidemiological and Clinical Study and Historical Background of Mercury Pollution on Indian Reservations in Northwestern Ontario, Canada. Bull. Inst. Constit. Med. 26 (3-4). 15 pgs. 1975.

2. Harada, S. Harada Report, translated, titled : " Minamata Disease Report – an investigation into Mercury Contamination in the Indian Reserves – A Clinical Study" with advisory note re the translation, 1975 from the Ministry of Health, Ontario.

3. Harada, M.; Fujino, T.; Akagi, T.; Nighigaki, S. Mercury Contaimination in Human Hair at Indian Reserves in Canada. Kumamoto Med. J. Vol. 30, No. 2, 1977, 99: 57-64.

4. Harada, M,; Fujino, T.; Oorui, T.; Nakachi, S.; Nou, T.; Kizaki, T.; Hitomi, Y.; Nakano, N.; Ohno, H.; Followup Study of Mercury Pollution in Indigenous Tribe Reservations in the Province of Ontario, Canada, 1975 - 2002. Bulletin of Environmental Contamination and Toxicology, Vol. 74, No. 4, 2005. 8 pgs.

5. Harada, M,; Fujino, T.; Oorui, T.; Nakati, S.; Ohno, H.; Clinical Follow up Research of Mercury Intoxication in a Reserve (1975 – 2002) (Literal summary translation) Sources Unknown.

6. International Forum on Environmental Pollution and Health Effects. "What are the lessons from 50 years of Minamata disease?" 8-12 Sept. 2006.

- Opening Greetings by Dr. M. Harada
- "Thirty Years of Uncertainty – Mercury Poisoning in Wabaseemoong" by Anthony Henry
- " How to test for Mercury Poisoning Mercury Disability Claims" by Gabriel Fobister

7. "Long-term study on the effects of mercury contamination on two indigenous communities in Canada (1975-2004)" by Masazumi Harada et al. Translation by Tadashi Orui, proofread by Thor Aitkenhead.

PowerPoint Presentation Slides – Donna Mergler, Ph.D., Presentation to Mercury Disability Board – January 27, 2010

This provides all powerpoint slides produced and used by Donna Mergler, Ph.D., in presenting to the Board and Search Committee a summary of text produced for the Literature Review.

Opinions on environmental contaminants studies in Ontario based on reports provided by the Mercury Disability Board – May 16, 2010

This provides a review and opinions on the following articles provided to the Board from Health Canada:

1. Asubpeechoseewagong Netum Anisinaabek and Wabauskang First Nation Contaminants Project, 2004-2005 (Summary) submitted in May 31, 2005
2. Mercury in the sediment and crayfish of lakes supporting Grassy Narrows and Wabauskang First Nations, Ontario submitted in May, 2005
3. Wild Meat Contaminants Study Year 3: Heavy Metals June 2005.
4. Wild Meat Contaminants Study Year 3: Organochlorines December 2005.
5. Report on the Indigenous Knowledge Workshop Asubpeechoseewagong Netum Anishinaabek and Wabauskang First Nation 2005.
6. Final Report of the Anishinabek knowledge Component National First Nations Environmental Contaminants Program (NFNECP) Health Canada 2008-2009

A Review of Current Understanding of Mercury Poisoning

Prepared by Laurie Chan, Ph.D. and Donna Mergler, Ph.D.

September 21, 2009

Introduction

This paper is commissioned by the Mercury Disability Board (MDB) to review literature on the impact of mercury on human health. The paper is not intended to be a comprehensive review and presentation of all the literature on mercury (Hg) exposure and effects in humans, but builds on earlier literature, other reviews, and more recent literature (since 1985) in highlighting current understanding in the field and addresses issues raised by the MDB.

There has been an increasing interest and growing knowledge on Hg toxicity in recent years primarily because of the concern of chronic exposure via fish consumption. A number of critical reviews of the toxicology of Hg and its health effects have been published [i,ii]. Several governments, international agencies, and other organizations have compiled extensive information on the sources, environmental fate and transport, potential health effects, exposure estimates, and potential risks of elemental mercury, inorganic mercury and methylmercury (MeHg). Several useful resources are listed below with their full citations appearing in the reference list at the end of this document.

- Elemental Mercury and Inorganic Mercury Compounds: Human Health Aspects (WHO, 2003)[iii]
- Toxicological Profile for Mercury (Update) (US ATSDR, 1999)[12]
- Toxicological Effects of Methylmercury (NRC, 2000)[119]
- Mercury - Environmental Health Criteria Documents (WHO, 1990)[128]
- Mercury – Guidance for identifying populations at risk from mercury exposure (UNEP/WHO, 2008)[iv]

Humans are exposed to different forms of mercury (Hg), and potential health risks from forms other than MeHg can occur, including mercury vapor from dental amalgams as well as from occupational exposures (e.g. dental offices, chlor-alkali plants, fluorescent lamp factories, mercury mining) and from artesanal and small-scale gold and silver mining operations[v,vi,vii,viii,ix]. The main focus of this paper will be on MeHg as most of the current advance in understanding is on the toxicity of this form of Hg and as it is the form that is found in fish, its toxicity has wider human health implications.

1. The effects of mercury contamination on human health

All humans are exposed to low levels of mercury. Almost all people have at least trace amounts of mercury in their tissues (i.e. MeHg in their hair). Generally, these low exposures are not likely to cause adverse health effects. However, Hg can cause significant effects on human health if exposure levels exceed established safe levels.

The factors that determine the occurrence of adverse health effects and how severe the health effects include:

- chemical form of mercury;
- dose;
- age of the person exposed (developing systems are susceptible);
- duration of exposure;
- route of exposure (inhalation, ingestion or dermal contact); and,
- dietary patterns of fish and seafood consumption.

The primary targets for toxicity of Hg and Hg compounds are the nervous system, the kidneys and the cardiovascular system. It is generally accepted that developing organ systems (such as the fetal nervous system) are the most sensitive to toxic effects of Hg. Fetal brain MeHg levels are higher than in maternal blood [x], and the developing central

nervous system of the fetus is currently regarded as the system of highest concern as it demonstrates the greatest sensitivity[xi]. It should be noted, however, that in humans the nervous system continues to develop through adolescence.

Other systems that may be affected include the respiratory, gastrointestinal, hematologic, immune, and reproductive systems. The health effects caused by elevated exposures to elemental Hg, inorganic Hg compounds, and organic Hg compounds such as MeHg differ [xii].

1.1 Effect on human physiology over the life course including short- and long-term effects

1.1.1 Overview of toxic effects of different forms of mercury

The ingestion of liquid metallic mercury or "quicksilver" does not appear to be toxic in itself. Health hazards from quicksilver are due to its potential to release of mercury vapor. Inhaled mercury vapor can also cause damage to the central nervous system due to its ability to cross the blood–brain barrier[1]. The high mobility of inhaled mercury vapor in the body is assumed to be due to its physical properties as an uncharged, monatomic gas that can readily diffuse through the lipid monolayers of the cell membrane. The mechanisms of transport of mercurous and mercuric cations are not well understood. Neurological and behavioral disorders in humans have been observed following inhalation of Hg vapor. Symptoms include tremors, initially affecting the hands and sometimes spreading to other parts of the body; emotional lability (often referred to as "erethism" and characterized by irritability, excitation, excessive shyness, confidence loss, and nervousness); insomnia; neuromuscular changes (such as weakness, muscle atrophy, or muscle twitching); headaches; polyneuropathy (such as paresthesia, stocking-glove sensory loss, hyperactive tendon reflexes, slowed sensory and motor nerve conduction velocities); and memory loss and performance deficits in tests of cognitive function. At higher concentrations, adverse kidney and thyroid effects, pulmonary dysfunction, changes in vision and deafness may also be observed [xiii,xiv,xv]. Short-term exposure to high concentrations of Hg vapor damages the lining of the mouth, irritates

lungs, cause tightness of chest, coughing, nausea, vomiting, diarrhea, and increased blood pressure[11]. Dental amalgam releases mercury vapor that can be inhaled and presumably behaves toxicologically like mercury vapor inhaled from external sources such as in occupational exposures. However, other than rare cases of contact allergy, no convincing evidence is yet forthcoming that dental amalgam can cause adverse health effects[1].

Mercurous mercury, in the form of mercurous chloride or calomel, has a long history of medicinal uses, especially as a laxative and in infant teething powders. Both mercurous and mercuric compounds are believed to be the causal agents in the childhood disease of acrodynia or "pink disease." Symptoms include profuse sweating, and swollen red feet and hands, which were cold, clammy, desquamating, and painfully sensitive to touch. Sometimes there was a rash on body, legs, and arms. There was progressive weight loss, marked weakness, and apathy. Insomnia and photophobia were also distressing attributes of the disease [xvi].

The mercuric cation, Hg2+, is believed to be the proximate toxic agent for all these inorganic forms of mercury. All species of inorganic mercury have the capacity to elicit idiosyncratic reactions. Such reactions require exposure to mercury, but the prevalence and severity do not appear to be dose related. The nephrotic syndrome and acrodynia are examples[1]. Mercuric mercury is known to exit liver cells into bile as a complex with reduced glutathione. Mercuric mercury has a limited capacity to cross the blood–brain and placental barriers but is accumulated by the kidneys. The most sensitive adverse effect observed following exposure to Hg2+ is the formation of autoimmune glomerulonephritis (inflammation of kidney). Accidental ingestion of mercuric chloride by children resulted in cardiac effects (increased heart rate and blood pressure)[11,12]. Accidental drinking or ingestion of inorganic Hg can cause damage to the digestive tract and kidney. In addition, dermal exposures to ionic mercury can lead to adverse effects to the skin [11].

1.1.2 Toxic Effects of organic mercury on infants and adults

The methyl- and ethylmercury compounds have similar chemical properties and are often referred to as the "short-chain alkyl mercurials." The primary target is the central nervous system. The ethyl compounds differ from their methyl relatives in that they are converted more rapidly to inorganic mercury in the body and produce kidney damage, whereas methylmercury appears to exclusively damage the central nervous system, at least in primates. The intact organomercurial cation is believed to be the proximate toxic agent responsible for damage to the central nervous system, and the mercuric cation released from ethylmercury plays this role in kidney damage. The high mobility of methylmercury in the body is due to the formation of a complex with the amino acid cysteine. The structure of this complex resembles that of a large neutral amino acid, methionine, and thereby gains entry into cells on the large neutral amino acid carrier. Methylmercury exits from cells as a complex with reduced glutathione on the membrane carrier for this peptide. Much more toxicological information is available for methylmercury than for ethylmercury. However, there has been concern about ethylmercury toxicity among children from Thimerosal. Thimerosal is used as a preservative in vaccines (such as DTP, hepatitis B, and Hib), to protect against bacterial contamination; this preservative contains nearly 50 % ethylmercury. Once in the body, thimerosal is transformed into organic (ethyl) mercury. Canada has decreased or eliminated the use of thimerosal from many vaccines[xvii]. However, thimerosal still exists in some vaccines used. Therefore, when assessing exposures to mercury for a population or subpopulation, this possible source of exposure should be considered. The Global Advisory Committee on Vaccine Safety of WHO concluded that there is currently no evidence of mercury toxicity in infants, children, or adults exposed to thimerosal in vaccines and advised continued use of thiomersal-containing vaccines was recommended[xviii].

Other organomercurials include phenylmercury and methoxyethylmercury compounds. This group of mercurials is rapidly converted to inorganic mercury so that their toxic effects are similar to those of mercuric mercury compounds. In general, however, they are more efficiently absorbed into the body than inorganic mercury. Toxic effects of on the nervous system are due to damage to discrete anatomical regions in the brain with sensory and motor coordination functions[xix]. The outcome is usually irreversible as

neuronal cells are destroyed. There is also evidence of peripheral neuropathy that may account for the signs of sensory loss in the extremities[xx]. The appearance of signs and symptoms of poisoning can be preceded by a latent period after exposure has ceased. This latent period can amount to weeks or even months or years. Weiss et al presented three examples of delay (latency) in the appearance of signs and symptoms of poisoning after exposure to methylmercury[xxi]. First, a case was presented of a 150-day delay period before the clinical manifestations of brain damage after a single brief (<1 day) exposure to dimethylmercury. The second example was taken from the Iraq outbreak of methylmercury poisoning in which the victims consumed contaminated bread for several weeks without any ill effects. Indeed, signs of poisoning did not appear until weeks or months after exposure stopped. The last example was drawn from observations on nonhuman primates and from the sequelae of the Minamata, Japan, outbreak in which low chronic doses of methylmercury may not have produced observable behavioral effects for periods of time measured in years.

The toxic effects of methylmercury differ between adult and prenatal exposures. They differ both in terms of the type of damage to the brain and in terms of the lowest toxic doses. They are therefore treated separately here. Distinction between acute and chronic toxicity of methylmercury is not really meaningful. A single dose can elicit the same syndrome of clinical methylmercury poisoning as chronic exposure.

Clinical manifestations of exposure to methylmercury

In 1958, McAlpine and Araki[xxii] linked the unusual neurological disease that had been associated with fish consumption from Minamata Bay to MeHg exposure. This historic recognition of the brain and nervous system as the primary target organ for MeHg poisoning, resulting in marked distal sensory disturbances, constriction of visual fields, ataxia, dysarthria, auditory disturbances and tremor, remains unchanged[xxiii,xxiv]. Based on analysis of the studies of human poisoning, the WHO estimated that 5% of MeHg-exposed adults would experience neurologic effects with a blood Hg level of 200 μg/L

(corresponding to a hair level of approximately 50 μg/g). This estimate has, however, been called into question by a re-analysis of the these studies by Kosastsky and Foran[xxv] and the recent studies conducted among Minamata residents (see Section 1.2 below for detailed discussion) who suggested that the lowest-observed-effect level for clinical effects is likely to be considerably lower. Indeed, anecdotal and case reports of diffuse and subjective neurologic symptoms in adults and older children with moderately elevated MeHg exposures continue to appear[xxvi]. In many cases, cessation or significant curtailing of fish consumption results in improvement of symptoms in conjunction with reduction in biomarker concentrations. These suggest the possibility of clinical effects, perhaps in a sensitive sub-set of the general population, at levels of exposure considerably below those previously associated with clinical effects in poisoning episodes. Currently, there is no formal case description or diagnostic criteria for such effects.

While exposures throughout the world are lower than those producing the historical epidemics of MeHg poisoning, there is growing evidence that for many populations, exposures are sufficient to alter normal functioning of several systems and constitutes an important public health problem.

Effects in neonates, infants and children

Central Nervous System development encompasses a tightly regulated temporal and spatial sequence of events (proliferation, migration, synaptogenesis, selective programmed cell death, myelination). Even a short-term impairment in this cascade may cause irreversible neurotoxicity if the tissue cannot compensate for the damage. The routes of exposure to toxicants during development are rather unique (e.g., transplacental in fetus, *via* breast milk in nursing infants, hand-to-mouth in early childhood) and have no parallel among adults. Moreover, on a body-weight basis children eat and drink more than average adults, and thus they are potentially more heavily exposed to food contaminants than grown-up individuals[xxvii].

The poisoning in Minamata brought attention to the risk from fetal exposure. Exposed to MeHg through the placenta of the exposed mother, infants showed severe cerebral palsy-like symptoms, even when their mothers had mild or no manifestation of the poisoning[xxviii]. Mental retardation, cerebellar ataxia, primitive reflexes, disarthria and hyperkinesias were observed. These symptoms described over 25 years ago[xxix], continue as the clinical hallmark of congenital methylmercury poisoning. Reconstruction of maternal or fetal doses resulting in these symptoms is difficult due to lack of concurrent sampling. An estimate of the mean maternal hair concentration resulting in such symptoms of 41μg/g ppm was proposed[xxx], however, large uncertainty surrounds this estimate. Health effects observed with poisonings should not be confused with the more subtle population effects observed at lower levels of exposure.

At the sub-clinical and population level, several studies in different parts of the world, have reported poorer neurologic status and slower development in newborns, infants and/or children exposed *in utero* MeHg and/or during early childhood[xxxi,xxxii,xxxiii,xxxiv,xxxv,xxxvi,xxxvii,xxxviii,xxxix,xl,xli,xlii], although some studies did not observe effects[xliii,xliv,xlv]. In children, MeHg exposure has been associated with lower performance on tests of language, attention, memory, and/or visuo-spatial and/or motor functions. Detailed review of the recent cohort studies showing evidence of Hg effects on neurodevelopment will be presented in Section 1.3.1.

Effects in adults

Much of the effects of MeHg have been learned from the poisoning cases in Minamata, Japan which is now know as Minamata Disease (MD). MD was first discovered in 1956 around Minamata Bay, Kumamoto Prefecture (KP), Japan. A second epidemic in Japan occurred in 1965 along the Agano River, Niigata Prefecture (NP). The severe contamination by methylmercury continued until 1968, when the plant finally stopped discharging its wastewater into Minamata Bay. According to Japanese government

figures, 2,955 people contracted Minamata disease, and 1,784 people have since died[xlvi]. MD patients showed neurologic signs including sensory loss, ataxia, constriction of visual field, dysarthria, and hearing difficulties. It was recently reported that large amounts of methylmercury were generated by the chemical processes of the Chisso acetaldehyde plant and later dumped directly into Minamata Bay[xlvii]. This has significant implications that MD was likely caused by consumption of MeHg directly released in the environment and accumulated in fish instead of from inorganic Hg methylated and bioaccumulated in the environment[l]. Eto[xlviii] reported that in the cases found in KP, at autopsy, the most conspicuous destructive lesion in the cerebrum was found in the anterior portions of the calcarine cortex. Less severe but similar lesions were found in the post-central, pre-central and temporal transverse cortices. Secondary degeneration from primary lesions was seen in cases with long survival. In the cerebellum, pathological changes occurred deep in the hemisphere. The granule cell population was more affected, compared with Purkinje cells. Among peripheral nerves, sensory nerves were more affected than motor nerves. More recently, Eto et al[xlix] reevaluated 30 autopsy cases related to MD in Niigata Prefecture (NP) and found that the pathological findings leading to the diagnosis of MD in the NP cases were essentially the same as those in KP, including the peripheral nerve lesions. In the most severely affected case of MD in NP, formation of multiple vacuoles of various sizes was observed in the cerebellar cortex, which was never encountered in the KP cases.

The current WHO threshold for adult exposure (hair level: 50 μg/g) was based on evidence from NP, which included only acute and severe cases. Many residents in the area and researchers have questioned the possibility of more subtle effects at lower exposure levels. A recent case control study published in 2009 identified 120 residents from exposed areas who had mercury in hair data measured in 1960 and neurological outcomes measured in 1971, compared to a control of 730 residents from an unexposed area[l]. They found that hair mercury levels were associated with perioral sensory loss in a dose-response relationship. The adjusted prevalence odds ratios and 95% confidence intervals for perioral sensory loss, compared with the lowest exposure category (0–10 μg/g), were 4.5 (0.5–44), 9.1 (1.0–83), and 10 (0.9–110), for the dose categories >10 to

20, >20 to 50, and >50 μg/g, respectively. The prevalence of all neurologic signs was higher in the exposure area than in the control area. This result suggests that neurologic signs, especially perioral sensory loss, was found among residents with hair mercury content below 50 μg/g after exposure was ceased for 11 years. Ninomiya et al reported that sensory loss remained even 30 years after the cessation of methylmercury exposure[li,lii]. The study also reported a weak trend for other neurological symptoms such as bilateral sensory disturbance, ataxia, and dysarthria suggesting that some neurologic functions may have improved due to central nervous system plasticity[liii].

Other than the major accidents and industrial release, few studies have addressed the neurotoxic effects of Hg exposure in adults. Mercury related deficits in motor, psychomotor, visual and/or cognitive functions have been reported for different populations within the Brazilian Amazon[liv,lv,lvi,lvii] and for tuna consumers from the Mediterranean[lviii]. A recent study of older adults (50-70 years old) in the United States, with low blood Hg levels, (mean = 2.1 μg/L), however, showed inconsistent evidence of effect across neurobehavioral tests[lix]. A Canadian study of fish eaters with levels of blood Hg <20μg/L, showed a negative association between Hg and monoamine oxidase activities in platelets[lx]. Experimental studies have shown that Hg exposure disrupts the function and transmission of the monoaminergic nervous system, inhibiting the enzyme activities of monoamine oxidase (MAO, EC 1.4.3.4)[lxi]. Biochemical changes may constitute a sensitive, although non-specific, early indication of Hg-induced alterations to the nervous system, but more work is needed in this area.

Studies of associations between nervous system outcomes and MeHg exposure in adult populations in which frequent and lifetime fish consumption is a cultural norm, generally cannot distinguish between effects due to adult exposure and permanent developmental effects due to gestational and early childhood exposures.

1.2 Disability related to Hg

Classical mercury poisoning is characterized by a triad of signs, namely tremors, erethism and gingivitis. Mercurial erethism, which is characterized by behavioral and personality changes such as extreme shyness, excitability, loss of memory, and insomnia are also observed[lxii]. Recently, the effects of mercury exposure at levels around 0.05 mg/m3 or lower have been of concern and may include minor renal tubular damage, increased complaints of tiredness, memory disturbance and other symptoms, subclinical finger tremor, abnormal EEG by computerized analysis and impaired performance in neurobehavioral or neuropsychological tests. Abnormal gait, dysarthria, ataxia, deafness and constriction of the visual field are typical of the symptoms of methylmercury poisoning observed in Minamata and Iraqi outbreaks, as well as in occupational methylmercury poisoning cases. Disability caused by Hg exposure can be demonstrated from reports for observed effects among patients suffering from occupational exposure. For example, Powell[lxiii] reported neurobehavioural symptoms of mercury poisoning, in a group of Zulu chemical workers (n = 16), employed by a mercury processing plant, exposed to neurotoxic levels of mercury, 5 years after exposure. A group-control design was adopted, where the exposed group was matched for age, sex, race, occupational and educational background. Both groups were administered a specially selected battery of psychometric tests to measure neuropsychological functioning. The exposed group had significantly impaired short term verbal and spatial memory, impaired sustained and divided attention, and impaired motor speed. They also suffered from elevated clinical levels of psychiatric symptomatology, including anxiety, depression and phobic avoidance, and neurological symptoms of tremor, weakness in the limbs, and excessive sweating. This results suggest that exposure to Hg can cause varying degrees of permanent neuropsychological disability.

Paresthesias

Paresthesias are the first symptom that people report following toxic doses of methylmercury. Takaoka et al[lxiv] conducted a psychophysical study of tactile sensation to evaluate the somatosensory abilities of subjects living in a methylmercury-polluted area

around Minamata City, Japan. Acuity of fine-surface-texture discrimination was disturbed not only in subjects with clinical complaints of hand numbness, but also in subjects without hand numbness who lived in the district where methylmercury exposure occurred. In a more recent study, Takaoka et al[76] studied 197 residents from the Minamata area who had a history of fish consumption. They divided the exposed subjects into non-complicated (E) and complicated (E+N) groups based on the absence or presence of other neurological or neurologically related disorders and compared them to residents in control area (C) after matching for age and sex. They quantitatively measured four somatosensory modalities (minimal tactile sense by Semmes-Weinstein monofilaments, vibration sense, position sense, and two-point discrimination) and did psychophysical tests of fine-surface-texture discrimination. Subjective complaints were higher in groups E and E+N than C. Over 90% of E+N and E subjects displayed a sensory disturbance on conventional neurological examination. The prevalence of these neurological findings was significantly higher in exposed subjects than controls. All sensory modalities were impaired in the E and E+N groups. All four quantitatively measured sensory modalities were correlated. The prevalence of complaints, neurological findings, and sensory impairment was similar or a little worse in group E+N than in group E. These findings suggest that sensory symptoms resulting from Hg exposure could be determined even in the presence of neurological or neurologically related diseases.

Ataxia

Takaoka et al studied 197 residents from the Minamata area who had a history of fish consumption during the polluted period and found that about 50% had upper and lower extremity ataxia and about 70% had truncal ataxia[lxv].

Vision

Impairment of visual functions has been studied in patients exposed to mercury. These studies have been shown partial loss of color vision in workers exposed to several

solvents and to metallic mercury[lxvi,lxvii,lxviii]. Amazon gold miners exposed to mercury vapor were found to show visual dysfunction[lxix]. Color vision and contrast sensitivity (CS) impairment were also found in fish-eating Amazonian populations where Hg exposure is today among the highest in the world due to deforestation and gold-mining activities[lxx]. The loss of color vision and CS has been demonstrated in these populations, at methyl mercury levels of contamination below 50 μg/g of total hair Hg, which was traditionally considered the threshold for clinical effect[65,66,78] . In the Minamata study, 28% of the study group reported visual constriction[74]. The measurement of CS in 7-yr old children with prenatal exposure to methylmercury did not show impairment in their CS[lxxi].

Activities of Daily Living

Reports of ill health increased sharply following the 2004 Supreme Court ruling instructing the Japanese government to pay damages to MD patients. Over 13,000 residents came forward to be examined for MD[74]. Ushijima et al examined the distribution of disability in activities of daily living (ADL), and the association between MD status in terms of compensation system and ADL disability among the general population of previously methylmercury-polluted areas[lxxii]. They collected data by two-stage stratified sampling of residents 40–79 years old in 172 postal-code on the endemic area of MD. Questionnaires were distributed to eligible subjects (n = 2100) and collected at a later visit or by mail. Information on demographic factors, basic ADL (BADL), and instrumental ADL (IADL) was obtained using questionnaires. Logistic regression analysis were used to assess the relationship between MD status in terms of compensation system and ADL disability. They classified the 1422 residents who completed the questionnaire in accordance with their MD status in terms of compensation system: *Early* (those who received MD compensation before the Supreme Court decision), *Recent* (those who applied for compensation after the Supreme Court decision), *Not Yet* (those who have not yet applied for compensation, but have health-related anxieties about MD effects), and *Normal* (those who have not applied for compensation, and do not have health-related anxieties about MD effects). Adjusting for

confounding factors, MD status was significantly associated with the disability grades of BADL and IADL with an increasing trend in the order of *Normal*, *Not Yet*, *Recent*, and *Early*. The odds ratios (95% CI) based on *Normal* were 2.08 (1.08–4.01), 3.87 (2.14–7.01), and 4.50 (2.66–7.61) for BADL and 2.41 (1.62–3.61), 3.20 (2.12–4.85) and 3.68 (2.52–5.38) in *Not Yet*, *Recent*, and *Early* for IADL, respectively. The authors concluded that *Early*, *Recent*, and *Not Yet* had lower ADL grades than *Normal*. Moreover, the population with a low ADL grade and health-related anxieties had increased throughout the previously methylmercury-polluted areas.

Learning and Development

Human neurodevelopmental consequences of exposure to methyl-mercury (MeHg) from eating fish remain a question of public health concern. The current knowledge is based on the findings of a number of on-going cohort studies. A cohort of 1022 consecutive singleton births was generated during 1987–1988 in the Faroe Islands, where increased methylmercury exposure occurs from traditional seafood diets that include pilot whale meat[lxxiii]. The prenatal exposure level was determined from mercury analyses of cord blood, cord tissue, and maternal hair. At age 14 years, 878 of 1010 living cohort members underwent detailed neurobehavioral examination. Indicators of prenatal methylmercury exposure were significantly associated with deficits in finger tapping speed, reaction time on a continued performance task, and cued naming. These findings are similar to those obtained at age 7 years. An analysis of the test score difference between results at 7 and 14 years suggested that mercury-associated deficits had not changed between the two examinations. In structural equation model analyses, the neuropsychological tests were separated into five groups; methylmercury exposure was significantly associated with deficits in motor, attention, and verbal tests. These findings are supported by independent assessment of neurophysiological outcomes[lxxiv]. The effects on brain function associated with prenatal methylmercury exposure therefore appear to be multi-focal and permanent.

Axelrad et al[lxxv] estimated a dose-response relationship between maternal mercury body burden and subsequent childhood decrements in intelligence quotient (IQ), using a

Bayesian hierarchical model to integrate data from three epidemiologic studies conducted in the Faroe Islands, New Zealand, and the Seychelles Islands. They found a central estimate of -0.18 IQ points (95% confidence interval, -0.378 to -0.009) for each part per million increase of maternal hair mercury. IQ is a useful end point for estimating neurodevelopmental effects, but may not fully represent cognitive deficits associated with mercury exposure, and does not represent deficits related to attention and motor skills. Nevertheless, the integrated IQ coefficient provides a more robust description of the dose-response relationship for prenatal mercury exposure and cognitive functioning than results of any single study.

1.3 Mental health or behavioural effects of mercury including psychosis

1.3.1. Effects of mercury on children's neurodevelopment

As discussed in Section 1.1.2, infants are at the most susceptible life stage for mercury toxicity. Much effort has been devoted to identify the subtle effects on neurodevelopment due to fetal and childhood low dose chronic exposure. The evidence for mercury developmental neurotoxicity continues to accumulate. Most published information comes from the two major child cohort studies carried out in the Faroe Islands, where mercury exposure is from the consumption of marine fish and pilot whale, and in the Seychelles, where marine fish is the source of exposure.

Several hundred children have now been followed from birth to 14 years of age in the Faroes and 9 years of age in the Seychelles. For many years the results coming from these two studies were contradictory. The study in the Faroes has showed effects of mercury on children's neurobehavioral performance and electrophysiological measures, while up until recently, the study in the Seychelles has not shown associations between mercury exposure and neurobehavioral outcomes.

In the Faroe Islands, where there were relatively high levels of mercury exposure, evidenced by median umbilical cord blood levels of 24μg/L, a cohort of over 1000 newborns were initially enrolled in a study in 1987-88 and most or selected groups have

been periodically tested from birth to 14 years of age. Although in the initial cohort, no effects were observed on developmental milestones in the first year[lxxvi], a later study of 182 Faroese newborns, born in 1994-95, showed lowered neurologic optimality scores associated with increased cord blood mercury[lxxvii] and mercury-related decreased height and weight at 18 months and a lesser relation at 42 months[lxxviii]. When examined at the age of 7 years, the 1987-88 cohort presented neuropsychological dysfunctions which increased with prenatal mercury exposure; the most pronounced were in the domains of language, attention, and memory, and to a lesser extent in visuo-spatial and motor functions. These associations remained after adjustment for covariates and after exclusion of children with maternal hair mercury concentrations above 10 micrograms[33]. Electrophysiological studies of a subgroup of these children showed mercury-related delayed latencies for Auditory Brain Stem Evoked Potentials[lxxix]; similar results had previously been reported for 7 year olds from Madeira, Portugal[lxxx]. At 14 years old, over 80% of the Faroes children were again tested. Indicators of prenatal methylmercury exposure were significantly associated with deficits in finger tapping speed, reaction time on a continued performance task, and cued naming. Mercury-associated deficits did not change between the two examinations; methylmercury exposure was significantly associated with deficits in motor, attention, and verbal tests. The results for electrophysiological measures showed similar delays to those observed at 7 years[lxxxi].

On the other hand, until recently, the birth cohort studies carried out in the Seychelles, consistently have shown no association between prenatal mercury exposure and neuro-outcomes (for review see: Davidson et al, 2006[lxxxii]). A total of 779 newborns, exposed to mercury through maternal fish consumption, were enrolled in this study in 1989-90. Prenatal exposure was measured in maternal hair and recent postnatal exposure in the child's hair. The cohort was examined six times over 11 years using extensive developmental test batteries and only one adverse association was observed at 9 years on a test of fine dexterity, speed and coordination[lxxxiii], while at 66 months, prenatal mercury was associated with improved performance on a language scale, but this was not observed at older ages. Further analyses of the data from the fine dexterity test suggest that the relation between prenatal exposure and this motor performance may be non-

linear, with no effect until exposures were relatively high (maternal hair mercury above 10-12 μg/g)[lxxxiv]. The authors suggest that there may be delayed toxicity and continue to follow-up these children. Further analyses of the 9-year old data[lxxxv] showed that motor proficiency and activity level improved significantly with increasing mercury for 53% of the children who had an average home environment. However, motor proficiency significantly decreased with increasing prenatal exposure in 7% of the children whose home environment was below average. This analysis suggests that effects may be non-homogeneous. This may be similar to what has been shown for lead exposure, where children with lower socio-economic status present deficits in intellectual functioning at lower exposures than children from families with medium or high economic status. These findings suggest that factors often associated with a poorer home environment, such as poorer nutrition and less parental stimulation, may increase vulnerability to toxics[lxxxvi, lxxxvii].

Because of the importance of the nutritional input from fish consumption, in 2001, the researchers in the Seychelles study initiated another birth cohort study, where they examined the maternal nutritional status by measuring a series of indicators including the omega-3 fatty acid, docosahexaenoic acid (DHA)[lxxxviii,lxxxix]. Mothers were enrolled at 14-24 weeks of pregnancy and evaluations took place at 5, 9, 25 and 30 months of age. A total of 229 children completed the 30-month examination. Results from this study showed that when examined separately from nutritional intake, there was, as in previous studies, no relation between mercury exposure and children's performance on the Bayley Scales of Infant Development. However, when both mercury and nutritional intake were taken into account in the analyses, mercury was significantly and negatively related to the Psychomotor Development Index.

More recent cohort studies have similar findings. The risks from mercury exposure and the benefits from fish consumption on infant development were likewise examined in the United States[xc] for 135 mother-infant pairs. The investigators assessed maternal fish intake during pregnancy and maternal hair mercury at delivery with respect to a visual recognition memory test given at 6 months of age. Higher fish intake was associated with

higher infant cognition, but an increase in mercury was associated with lower cognition. In another study[xci], this research group examined 3 year olds who had been enrolled in a birth cohort study of 341 mother-child pairs in Massachusetts. Children's performance was assessed on a picture vocabulary test and a test of a wide range of visual motor abilities. For both these tests, higher fish intake during pregnancy was associated with better child cognitive test performance, and higher mercury levels with poorer test scores. It should be noted that mercury exposure in these groups was particularly low.

While most of the studies on children have examined fetal exposure, the Seychelles study recently published their results with respect to post-natal exposure[xcii]. Although there were some relations between mercury exposure and neurobehavioral performance, the authors conclude that the results were not consistent. In the Amazon region, where freshwater fish are a dietary mainstay, there have been two studies of children. In French Guiana, 156 indigenous children living downstream of gold mines were examined[xciii]. The authors report a dose-dependent association between maternal hair mercury level and increased deep tendon reflexes, poorer coordination of the legs, and decreased performance on a test of visuo-spatial organization. In a region of the Brazilian Amazon, where mercury contamination of the aquatic food chain is from deforestation and subsequent soil erosion, Grandjean and his coworkers[xciv] reported poorer performances on tests of motor function, attention, and visuo-spatial associated with mother's hair-mercury concentrations at the time of testing.

Electrophysiological measures made on 102 Inuit children, with exposure to both Hg and PCBs showed changes in visual evoked potentials; the association with blood mercury levels at the time of testing was much stronger than with fetal exposure measured in cord blood[xcv].

In summary, our knowledge on the developmental effects of mercury following fetal exposure has increased substantially since the tragedy of Minamata where mothers with high mercury exposure gave birth to children with a debilitating, progressive neurological disorder, Fetal Minamata Syndrome, although they themselves were asymptomatic.

Today there is a wide consensus that at even at low levels of mercury, mercury can affect children's intellectual and motor development, which is not immediately obvious in children examined individually, but can be observed in population studies. This is important for society because the reduction of an average of 5 points of the IQ scale means that there are twice as many children with learning difficulties and half as many children "high performers"[xcvi]. Recent studies also reveal that there are nutritional elements in some fish that can offset the effects of mercury, notably omega-3 fatty acids and possibly other nutrients. Current studies are focusing on these factors.

1.3.2 Effects of mercury exposure on the adult nervous system

Neurological effects caused by high dose of Hg occupational exposure were discussed in Section 1.2. There are very few reports on chronic effects of exposure to Hg vapor. Heyer et al[xcvii] reported low dose exposure to elemental mercury among 230 female dental assistants associated with increased self-reported neurological symptoms and mood. The brain-derived neurotrophic factor (BDNF) polymorphism was also associated with increased symptom and mood scores. Moreover, the combined effects of Hg exposure and BDNF polymorphism were additive. No association was found among the 193 male dentists in the same study. More recently[xcviii], the same group reported no association between Hg exposure and symptoms among 183 male dentists and 213 female dental assistants in a follow up study.

Similarly, relatively few studies have been carried out on the neurotoxic effects of low level exposure to methylmercury in adults. As indicated above, the adult victims of mercury poisoning in Minamata and Iraq suffered from a severe neurological disorder with marked distal sensory disturbances, constriction of visual fields, ataxia (loss of coordination), dysarthria (motor speech disturbance), auditory disturbances, and tremor [xcix]. More recently, studies were carried out of persons over 40 who had lived in the mercury-polluted areas surrounding the city of Minamata[c]. Annual medical examinations, performed on about 1,500 persons, showed no difference in the prevalence of disease between those from the polluted area and those from other areas, although those from the

polluted area had more complaints of poor health. Persons with a history of compensated Minamata Disease scored significantly lower on a scale of activities of daily life[ci]. Other studies of persons from a nearby polluted area, who had been exposed to lower doses of mercury over a twenty year period, still suffered from distal paresthesia of the extremities and lips 30 years after cessation of exposure[cii].

The effects of mercury on nervous system function have been examined in fish-eaters in different parts of the world. In the Brazilian Amazon, studies have shown motor, visual and cognitive deficits associated with increasing mercury exposure in communities who consume fresh-water fish almost daily[52,54,55]. A follow-up study was undertaken in the Brazilian Amazon subsequent to a campaign to encourage persons to eat more fish that didn't eat other fish. The findings showed that over a 5-year period, persons continued to eat the same amount of fish, but preferentially consumed non-predators. Their hair mercury concentrations diminished by almost 40% and re-testing of motor and visual functions showed that the former significantly improved while the latter continued to deteriorate in relation to previous exposures (article in preparation). In this same region of the Brazilian Amazon, we recently completed a major study of 450 persons in the Brazilian Amazon that confirms a negative effect of mercury exposure on motor and visual functions (articles in preparation), but selenium (which is high in this region primarily due to the consumption of Brazil nuts[ciii] seems to offset some of the meurbehavioral effects of mercury, notably for motor functions (Lemire et al. article in preparation). In Italy, Carta et al.[120] examined 22 fishers who habitually eat tuna and noted loss of cognitive and motor functions associated with increasing blood organic mercury.

In an urban adult population, a cross-sectional study found no effects between mercury levels in blood on neurobehavioural tests in 474 randomly selected participants in the Baltimore Memory Study, a longitudinal study of cognitive decline involving 1140 Baltimore residents aged 50 to 70 years[civ]. The median blood mercury level was very low at 2.1 microg/L (range, 0-16 microg/L).

1.3.4. Fish consumption, mercury and mental health

To date there is no evidence that Hg exposure from fish consumption directly affects children's mood and behavior. In a recent Korean study of ADHD in relation to blood lead and mercury, Ha and coworkers[cv] reported a positive association between attention deficit and hyperactivity disorders ADHD and blood lead, despite the fact that lead levels were very low, but no relation with blood mercury concentrations. Although there does not seem to be a direct effect of Hg on mood and behavior, the loss of cognitive and motor skills affects children's coping and learning skills for adulthood.

It has been suggested that omega-3 fatty acids and fish consumption may be protective for depression in adults and children[cvi,cvii], however results are inconsistent and few studies consider Hg exposure that may come from fish consumption. In a study of neuropsychiatric symptoms in Quebec fresh-water fish eaters, Philibert et al[cviii] reported a positive association between hair Hg concentrations and symptoms. In men, there was a positive association between omega-3 fatty acids and neuropsychiatric symptoms, particularly on the scales of depression and interpersonal sensitivity; further analyses showed that this relation was strongest among those with higher alcohol intake, suggesting that there may be an interaction between omega-3 and alcohol. On the other hand, in women, there was no association between omega-3 fatty acids and neuropsychiatric symptoms, but there was a positive between hair mercury and scores on the scales for obsessive compulsiveness, interpersonal sensitivity, depression, anxiety, and psychotism, as well as the General Stress Index. Gender differences with respect to omega-3 fatty acids have also been reported by others; one population-based study reports a protective effect of omega-3 fatty acids on depression was observed for men, but not for women[106].

1.4 Evidence that mercury accelerates the development of chronic diseases

1.4.1 Cardiovascular disease

There is growing evidence that fish consumption is protective for cardiovascular disease[cix]. However, mercury exposure may offset some of the benefits. The evidence for causal association of mercury with cardiovascular events has been reviewed by Chan and Egeland[cx] and by Stern[cxi]. The strongest evidence is for acute myocardial infarction (AMI) in adult men. A cohort of men from eastern Finland [cxii,cxiii,cxiv] and a case-control study of men with a first diagnosed myocardial infarction from a European and Israeli multicenter study[cxv] found significant associations between biomarkers of MeHg exposure and acute myocardial infarction (AMI). The relative risk and odds ratios for AMI from these studies showed a doubling in the upper range of exposures and suggest that dietary mercury exposure at levels found relatively commonly in western populations can result in a significantly elevated risk of AMI. In the study by Guallar et al [102], both the positive effects of DHA and the negative effects of mercury were evident.

Other studies have not observed a relation between bioindicators of mercury and coronary heart disease. In a prospective Swedish study of 1462 women, who were 38 to 60 years of age at baseline examination (1968–1969), baseline total serum Hg concentrations were not related to an increased risk of MI, stroke, and many other outcomes within a 20-year follow-up period[cxvi]. In another Swedish study[cxvii], where a new cases of myocardial infarction among persons participating in a very large cohort study, both fatty acids and mercury (measured in erythrocytes) were associated with a lower incidence of myocardial infarction. In this study, men and women were not studied separately and there were many more men (n = 60), compared to women (n = 16). The authors suggest that both of these are indicators of fish consumption; the average mercury concentrations in this cohort were very low. In a cohort of U.S. professionals, no association was observed between mercury exposure and coronary heart disease[cxviii]. It should be noted that in that study, dentists accounted for 63% of controls and had Hg exposure more than twice that of the other groups in the cohort. Presumably, the dentists' exposures were influenced by occupational exposure to elemental mercury from amalgams. A mortality study of Finnish fishermen and their wives showed that they had a reduced rate for many causes, including ischaemic heart diseases[cxix].

The conflicting findings may indicate that high mercury intake may have an effect on cardiovascular health but that the consequences of exposure may vary among populations owing to various modifying factors.[97]

Other cardiovascular endpoints have likewise been examined with respect to mercury exposure, these include hypertension and R-R variability (a measure of function of the autonomic nervous system that innervates the heart). Sorensen et al.[cxx] found an association between gestational exposure to mercury and increased systolic and diastolic blood pressure in the Faroese children at 7 years old and. This association was strongest for those children with decreased birth weight. However, the association did not persist when the cohort was re-examined at 14 years old[cxxi]. Studies of mercury exposure in adults have reported inconsistent associations between blood or hair Hg and blood pressure[cxxii,cxxiii], while a recent study in non-indigenous communities in the Brazilian Amazon indicates a positive relation between hair Hg and blood pressure[cxxiv]. In a recent study of 42 Faroese whaling men, mercury exposure was associated with blood pressure and carotid intima-media thickness[cxxv].

Decreased heart rate variability was observed in the Faroes children's cohort, and appears to result from gestational exposure to MeHg [107]. This effect persisted through 14 years of age. The health significance of this finding, however, is unclear. Decreased heart rate variability is observed in adults following myocardial infarction and is predictive of sudden cardiac death, but there does not appear to be evidence suggesting that decreased heart rate variability, in isolation, in children is either *per se* adverse, or predicative of an adverse outcome.

1.4.2 Other conditions and/or illnesses

There is no evidence of elevated diabetes associated with Hg exposure, although there is a growing literature on increased risk for diabetes in relation to organochlorine pollutants such as PCBs and DDT[cxxvi]. In a recent study that we carried out in collaboration with a Candian First Nation community and Health Canada, we observed an increased risk for

diabetes with certain PCB congeners and DDE (a metabolite of DDT). Consumption of trout and white, but not walleye and pike, were protective for diabetes (submitted for publication).

Animal studies have shown that mercury exposure can affect thyroid function[cxxvii]. In humans, few studies have examined this relation. In a study that we carried out with fresh-water fish-eaters from Quebec, we observed an increase in serum thyroid stimulating hormone (TSH) with hair and blood Hg concentrations in men, but not in women[cxxviii]. The long-term consequences of these changes are not known.

In a recent study of fish-eaters in the Brazilian Amazon, we observed a cataractogenic effect of mercury exposure (Lemire et al, submitted). The prevalence of age-related cataracts increased with increasing mercury exposure. This relation was not present for those with elevated plasma selenium, suggesting that selenium can offset this effect of mercury.

Like for diabetes, no evidence has been found for an association between mercury exposure and arthritis.

There is a clear need for more studies on the effects of mercury with age. In non-human primate studies, visual deficits, that had not been present in the monkeys when they were young, developed with age, in relation to prenatal exposure to Hg[cxxix,cxxx].

2. **Any evidence of an interactive effect of mercury and other contaminants on human health**

Fish tend to accumulate halogenated organics including PCBs, dioxins and related compounds. The neurodevelopmental effects of PCBs and, to a lesser extent, dioxins, share some similarities to those observed for MeHg[cxxxi]. This can potentially present difficulties in determining causality and in constructing MeHg-specific dose-response relationships. Because MeHg tends to associate more with proteins than fats, fish species

with elevated levels of MeHg are not necessarily those with elevated levels of the lipophilic halogenated organics. Thus, for fish consumption where both exposures occur, the influence of the individual contaminants can potentially be separated by statistical techniques if a variety of fish species is consumed and sufficiently precise exposure metrics are collected. In the Faroe Islands studies, both MeHg and PCBs appear to jointly affect some developmental endpoints. However, while MeHg appeared to enhance the PCB-attributable effects, the PCBs appeared to make a relatively minor contribution to the MeHg-specific effects[cxxxii,cxxxiii]. Contradictory findings were observed in a study of cognitive development associated with exposures to MeHg and PCBs in the Lake Oswego area of New York State.[cxxxiv]. In that study, elevated PCB exposure appeared to potentiate MeHg effects. However, both MeHg and PCB levels were considerably lower than in the Faroes study, and no PCB-MeHg association was observed on follow-up testing of the cohort. As yet, the limited epidemiological and experimental data do not support that developmental PCB co-exposure markedly exacerbates MeHg toxicity. In some cases, a competitive rather than synergistic action of PCBs was demonstrated on endpoints related to MeHg neurotoxicity[cxxxv]. The latter finding cannot be considered a neuroprotective action of PCBs. The final outcome may be masked by neuronal compensation or plasticity in young individuals, but may be uncovered with age[cxxxvi]. Humans are exposed to complex mixtures of contaminants through food. This implies that pollutants other than the PCBs may concur to toxicity. PCBs themselves do not behave as a single chemical entity. Distinct congeners possess different intrinsic toxicity and neurotoxic potential. This should be kept in mind when analyzing the biomarkers data of PCB exposure. Indeed, the scant knowledge in this field calls for additional human and animal studies that address these unresolved issues, as well as other metal contaminants that may also be present in fish[cxxxvii].

Elemental Hg continues to be used in dental amalgam for the treatment of dental carries. In populations with significant amalgam use, elemental Hg may account for a proportion of total Hg exposure comparable to or greater than MeHg [cxxxviii]. It is known that elemental Hg vapor can cross the placenta and accumulate in fetal tissue[cxxxix,cxl,cxli] and animal data suggests that elemental Hg has the potential to cause adverse neurologic

developmental effects[cxlii]. Both elemental Hg and MeHg are metabolized in the brain to the inorganic mercuric form[92]. It is not known whether the ultimate neurodevelopmental toxicant of MeHg is MeHg itself, the inorganic mercuric ion, free radicals generated in the conversion to the inorganic species, or some combination of these. If the inorganic form is the ultimate toxicant of MeHg in the developing brain, or if MeHg and inorganic Hg share common neurodevelopmental toxic mechanisms, then current estimates of risk based on MeHg exposure alone could underestimate the population risk. Additional research is clearly needed to address these questions.

3. Methods of measuring past or present mercury exposure in humans.

Hair and blood Hg concentrations are both accepted as valid biomarkers of MeHg exposure, although each provides a somewhat different reflection of exposure[cxliii]. Blood gives an estimate of exposure over the most recent one to two half-lives with the half-life of MeHg in blood being 50-70 days, while hair reflects the average exposure over the growth period of the segment[cxliv]. Hair Hg is predominantly MeHg with MeHg constituting from 80% to 90-98% of hair total Hg [cxlv]. For populations with regular and frequent fish consumption, hair total Hg and blood MeHg are consistently correlated[cxlvi]. Generally, hair is 250 to 300 times more concentrated in mercury than is blood[cxlvii]. However, in populations and individuals with infrequent fish consumption, or where bolus doses of MeHg occur, there can be considerable inter- and intraindividual variability in the relationship between hair and blood Hg levels resulting from temporal differences in the retention of Hg by each biomarker[128,cxlviii]. Segmental analyses of hair Hg can provide a chronology of exposure over time[101,102]. However, information on short term peaks in exposure is not well represented by such analyses[97]. Another consideration is that the growth rate of hair, generally estimated at 1 cm per month, can have both inter- and intra-individual variability[119]. Recent advances in a single hair strand analysis[cxlix], including measurement of Hg at micron resolution using laser ablation[cl] should yield more information on the relationship between Hg uptake and Hg deposition in hair.

Hg levels in toe and fingernails have also been used as biomarkers of Hg exposure, mostly in major studies of the cardiovascular effect of MeHg[cli,clii], but to what extent these reflect organic or inorganic Hg exposures remains to be clarified[cliii]. A recent study of women, with no history of occupational exposure to Hg, showed similar correlations between Hg intake through fish consumption and both toenail and hair Hg concentrations, however only total Hg was assessed[cliv]. In this study, hair, toenail and urinary total Hg were highly correlated. Urinary Hg levels largely reflect exposure to inorganic Hg[100] and are not considered useful bioindicators of MeHg exposure. There are, however, several recent reports of positive correlations between fish consumption and urinary Hg[clv,clvi,clvii] authors of these studies propose that demethylation may account, at least partially, for this observation. The relation of fish consumption and inorganic Hg in different biological tissues, and its consequence for human health still need to be elucidated.

Health effects from low to moderate levels of MeHg exposure have been reported in a variety of systems and domains. Each of these effects may depend on different aspects of exposure (e.g. fish-eating patterns, time of exposure (first, second or third trimester, childhood, adulthood)). Therefore, the different reflections of exposure provided by hair and blood Hg concentrations may provide different information about dose-response for different exposure populations and different exposure scenarios. Few studies have investigated side-by-side dose-response relationships for both biomarkers. In the study in the Faroe Islands, maternal hair and fetal cord blood predicted similar, but not identical patterns of effect across various measures of neurologic performance.[119]

5. Concluding Remarks

Many of the high dose exposure occurred decades ago. It is increasingly difficult to re-establish the dose-response relationship among the exposed population. Moreover, many of the health complains from the affected population have not been properly diagnosed and documented. It is important to have data from comprehensive health surveys in

affected areas to have a better understanding of the health effects. Meanwhile, the issue of mercury poisoning is a global concern. Burning of fossil fuel is the main source of Hg pollution in the atmosphere[clviii] and recent modeling study showed that Hg deposition in the Pacific Ocean would double relative to circa 1995 by 2050[clix]. Fish is an invaluable resources in many countries and about 20% of the world's population derives one-fifth of its animal protein from fish[clx] and it is an important component of traditional food among Aboriginal Peoples in Canada[clxi]. It is our hope that the recent increase of scientific research can generate results that can be used effectively in promoting healthy diet and good health.

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Opinions on Dr. Masazumi Harada's studies in Ontario based on articles provided by the Mercury Disability Board.

Prepared by Donna Mergler, Ph.D. and Laurie Chan, Ph.D.
October 29, 2009 (Updated September 15, 2010)

We have received the following articles from the Mercury Disability Board for review.

1. Harada, M.; Fujino, T.; Akagi, T.; Nighigaki, S. Epidemiological and Clinical Study and Historical Background of Mercury Pollution on Indian Reservations in Northwestern Ontario, Canada. Bull. Inst. Constit. Med. 26 (3-4). 15 pgs. 1975.

2. Harada, S. Harada Report, translated, titled : " Minamata Disease Report – an investigation into Mercury Contamination in the Indian Reserves – A Clinical Study" with advisory note re the translation, 1975 from the Ministry of Health, Ontario.

3. Harada, M.; Fujino, T.; Akagi, T.; Nighigaki, S. Mercury Contaimination in Human Hair at Indian Reserves in Canada. Kumamoto Med. J. Vol. 30, No. 2, 1977, 99: 57-64.

4. Harada, M,; Fujino, T.; Oorui, T.; Nakachi, S.; Nou, T.; Kizaki, T.; Hitomi, Y.; Nakano, N.; Ohno, H.; Followup Study of Mercury Pollution in Indigenous Tribe Reservations in the Province of Ontario, Canada, 1975 - 2002. Bulletin of Environmental Contamination and Toxicology, Vol. 74, No. 4, 2005. 8 pgs.

5. Harada, M,; Fujino, T.; Oorui, T.; Nakati, S.; Ohno, H.; Clincial Follow up Research of Mercury Intoxication in a Reserve (1975 – 2002) (Literal summary translation) Sources Unknown.

6. International Forum on Environmental Pollution and Health Effects. "What are the lessons from 50 years of Minimata disease?" 8-12 Sept. 2006.
- Opening Greetings by Dr. M. Harada
- "Thirty Years of Uncertainty – Mercury Poisoning in Wabaseeemoong" by Anthony Henry
- " How to test for Mercruy Poisoning Mercury Disability Claims" by Gabriel Fobister

7. "Long-term study on the effects of mercury contamination on two indigenous communities in Canada (1975-2004)" by Masazumi Harada et al. Translation by Tadashi Orui, proofread by Thor Aitkenhead.

The seven documents contain information on 3 studies conducted by a team of Japanese researchers led by Dr. M. Harada:

1. Results of neurological examinations conducted on 89 inhabitants of Grassy Narrows and White Dog in March and August of 1975 and 71 hair samples were collected for mercury analysis.
2. Results of neurological examinations conducted on 57 inhabitants of Grassy Narrows in August/September 2002 and 47 hair samples were collected for mercury analysis.
3. Results of clinical examinations including tests on sensation, fingertip movement and sociological research conducted on 87 residents from Grassy Narrows and 69 residents from White Dog.

Dr. M. Harada has 29 publications on mercury poisoning as cited in PubMed with the first one published in 1964. His team of researchers are affiliated with departments of Neuropsychiatry, Psychology and Environmental Medicine at various institutions in Japan. Most of them are from Kumamoto, the Prefecture where Minamata disease occurred. The authors have clinical experience on diagnosing neurological symptoms associated with mercury exposure and recently published (2008-2010) 5 papers on observations from follow up studies on Minamata residences in the journal Epidemiology, Environmental Research and Science of the Total Environment. However, only 1 of the 7 documents supplied reporting results from the studies in Canada was published in an international journal, Bulletin of Environmental Contamination and Toxicology which has a very low impact factor of 0.609 (2008).

Harada et al, 1977. Mercury contamination in human hair at Indian reserves in Canada; Kuamoto Med. J. 30:57-64

This article reports some of the aspects of the study that was performed in 1975. A total of 89 persons from the Grassy Narrows and White Dog Reserves were examined for signs and symptoms of Minamata Disease and 71 hair samples were analysed for mercury.

The presentation of the results for hair sampling would not be accepted by today's standards, but the information presented was important. They show that hair mercury concentrations were high and related to fish consumption patterns based on answers from an interview question of the participants "do eat fish during summer" versus "not eating fish since 1970". Sequential hair mercury analyses revealed that in summer when fish consumption increased, there was a parallel increase in hair mercury.

Among the group that continued to eat fish following 1970: 23/71 (32.4%) had levels above 30 ppm, 20/71 (28.1%) had concentrations above 20 ppm (one assumes between 20 and 29 ppm), and one person had a maximum hair mercury level of 80.3 ppm. For those who had not continued to eat fish since 1970, levels were considerably lower and from Figure 2, one can see that most were below 10 ppm, although at times, this level was exceeded.

The authors indicate that no one presented all of the classical signs and symptoms of Minamata Disease, determined through examination of the Minamata victims, although many persons presented one or more classical signs of the disease. Since this was a clinical study and not an epidemiologic study, the authors based their diagnosis on the combination of clinical signs such as visual field constriction and 'glove an stocking' type sensory disturbance and high mercury levels. In addition, the authors describe what they refer to as a 'correlation' between characteristic signs of Minamata Disease and exposure; indeed there were more persons with

more and more severe signs and symptoms with higher levels of mercury, better confirming a possible causal relation. Results presented in Figure 3 of this paper is the only evidence available showing there is a relationship between body burden of mercury and neurological symptoms among inhabitants in the two First Nation communities. Although there is no true statistical analysis, the results are compelling.

Harada et al, 1976. Epidemiological and clinical study and historical background of mercury pollution on Indian Reservations in Northwestern Ontario, Canada. Bul. Inst. Constitut. Med. 26: 169-184.

In this article, the authors indicate that the situation is more serious than they previously believed. One learns in this article that of the 89 persons reported on above, 33 reported that they had reduced or stopped eating fish, while 14 replied that they continue to eat "just as much as before". They also indicated in this article that bread was being baked with fish roe and concentrations of 0.41 ppm were measured in bread, which was consumed more regularly than fish.

They report on the mercury concentrations in fish, indicating that they were very high and many largely surpassed government agency recommended levels. They also briefly describe the study that was preformed by Takeuchi on a cat from White Dog, where damage, characteristic of methylmercury poisoning, was observed primarily in the brain and to a lesser extent in the peripheral nerves. These results were consistent with studies that had been previously carried out by Health Canada with cats that had eaten fish from Clay Lake. They present a table that show similar concentrations of mercury in the various organs of the cat from White Dog to the cats from Minamata.

With respect to human exposure, they indicate that the Environmental Services Branch (of Health Canada?) had reported in 1970 maximum exposure concentrations of 198 ppm from White Dog and 95.7 ppm from Grassy Narrows. It is not clear how all of the numbers from the 1970 measurements fit together, except to say that exposure was very high. They indicate that in 1975, they measured hair samples (see above) and reproduce a table from the Environmental Health Services Branch that show declining concentrations. We do not know from this table whether it was the same people that were sampled over time and at what time of year the sampling was done since the Harada et al study had shown important seasonal variations, with the highest levels in the summer.

In this article they provide more detailed information on the 89 persons that were examined using the "same methods that were applied in our mass examination for Minamata Disease in Japan". Here we learn that that the age of those examined ranged from 6 – 84 years. It should be noted that sick persons, who were unable to work, were excluded from this study which only included persons who were healthy enough to work. Many worked as guides, but some had sought other work.

They present the results of the neurological signs and symptoms that are characteristic of Minamata Disease, indicating that these were immediately recognized. They describe the details of the results of the neurologic examination, with emphasis on constricted visual fields, eye movement disturbances, sensory disturbances (including 'glove and stocking' paresthesia),

tremor, changes in reflexes and other motor dysfunctions. They conclude that although they observed a fair number of signs of Minamata poisoning, these are mild cases and many may have been caused by other factors. For sensory deficits, they did however report a dose-effect relation (see above).

This was not an epidemiologic study, but a clinical study and no causal relation was established. No data are presented with respect to age, and we have no information in this article whether the persons who presented neurological signs of dysfunction were young or old. Nor do we have any information on other factors, such as diabetes that may affect certain neurological functions. There is also no mentioning of how the participants of the study was chosen and it is not possible to deduce the level of representativeness of the observations to other inhabitants in the 2 First Nation communities.

Harada, S. Harada Report, translated, titled : " Minamata Disease Report – an investigation into Mercury Contamination in the Indian Reserves – A Clinical Study" with advisory note re the translation, 1975 from the Ministry of Health, Ontario.

This translated article appears to be an earlier draft manuscript for the publications discussed above. Many of the tables and figures are the same. However, it provided some raw data such as observations on constriction of visual field of an individual participant and the clinical history of two participants who had 44 ppm and 33 ppm mercury in hair. Both of them worked as fishing guide. One participant showed symptoms of abnormal movement of the eyeball, adiadochokinesis, sensory disturbances in upper lip and the end of limbs, and weakening of muscular strength and the other showed symptoms of audio disturbances, subtle trembling, adiadochokinesis, sensory disturbances in the end of limbs.

Harada et al, 2005. Follow-up study of mercury pollution in indigenous tribe reservations in the province of Ontario, Canada 1975 – 2002. Bull. Environmental Contamination and Toxicology 74. 689-697.

In 2002, Dr. Harada's group went back to Grassy Narrows and examined 57 people, using the same neurological protocol as previously and as was used for Minamata patients in Japan. They also measured visual fields using Förester's perimetry.

Statistical analyses were minimal; they did not report any paired statistics, comparing those who had been examined twice or any multiple regressions that would take into account age or other factors.

No information is provided on the bases for recruitment.

They provide tables of symptoms and signs, and on the basis of clinical criteria for Minamata Disease, they classified the persons examined into 4 categories: those with Minamata Disease (11 persons); those with Minamata Disease with complications (12 persons); those with Light Minamata Disease (22 persons) and others (12 persons). Those with Minamata Disease were the older than those with milder forms, and the group 'others' included 8 children. They seem to indicate there were statistically more men than women in the more severe categories.

They indicate that the rate for Minamata Disease was 78.9%, but we have no idea what is the denominator. It may be 78.9% of this group of persons, most of whom had multiple subjective symptoms. Because there is no mention whether the samples were randomly selected, the results provide no information on whether the same percentage can be applied to other inhabitants in Grassy Narrows. In the discussion, the authors mention compensation and indicate that 21 of he persons examined here had received compensation, 20 were denied and a decision is pending for 3, while 13 did not file claims. Was this the basis for inclusion in the study? The compensation decisions appear to be related to age. The question of foetal mercury poisoning is not discussed.

The authors note that 43.2% of the 44 persons from Grassy Narrows that had been evaluated in 1975, had died, but do not provide any information on those that had been retested.

Harada, M,; Fujino, T.; Oorui, T.; Nakati, S.; Ohno, H.; Clincial Follow up Research of Mercury Intoxication in a Reserve (1975 – 2002) (Literal summary translation) Sources Unknown.

This unpublished report provided many of the critical information missing in the previous article. The same two doctors conducted the examination in both the 1975 and 2002 studies. Nine persons participated in both studies. Hair mercury concentration results presented in Chart 1 show that their mercury body burden has significantly decreased. All nine of them had hair mercury concentration higher than 6 ppm and the maximum concentration was 44.2 ppm in 1975. In 2002, 8 of them were below 6 ppm and only one individual had higher mercury concentration at 18.1 ppm (the same person had 13.1-36.3 ppm in 1975). However, the authors concluded that the nine people only showed mild symptoms in 1975 but seven of the nine people had progressed from mild symptoms to typical or typical with complications in 2002 even though their hair mercury body burden had decreased.

The average of all 47 hair samples collected was quite low at 2.11 ppm (minimum: 0.11 ppm and maximum 18.1 ppm). Based on the results of the repeated participants, the authors predicted that the other examinees in the mild Minamata Disease group will likely progress to Minamata Disease in the future. Without information on the age of the participants, it is not possible to comment on whether this prediction is valid.

"Long-term study on the effects of mercury contamination on two indigenous communities in Canada (1975-2004)" Masazumi Harada, Masanori Hanada, Takashi Miyakita, Tadashi Fujino, Kazuhito Tsuruta, Akira Fukuhara, Tadashi Orui, Shigeharu Nakachi, Chihito Araki, Masami Tajiri, Itsuka Nagano. Translation by Tadashi Orui, proofread by Thor Aitkenhead.

This is a translation of a review paper (source is unknown). It summarized the findings of Dr. Harada's research on the two communities since 1975 including results of the study conducted in 2004 which has not been reported before.

The authors classified participants as having Minamata Disease if they showed more than one symptom, such as sensory disturbances (specifically the loss of sensation in the extremities), ataxia, disturbed ocular movement, imbalance, concentric construction of the visual field (tunnel

vision) and speech impairment. However, in cases when the participants were showing only sensory disturbances, they also classified them as Minamata Disease as long as there was no other disease causing the symptom. If the participants had another disease and also showed symptoms of Minamata Disease (but were not explained by that other disease), they classified the case as Minamata Disease with complications. If Minamata Disease symptoms were observed in case when the participants also reported other complications or were suffering from unstable mental state, or symptoms were inconsistent, they classified them as possible Minamata Disease. If symptoms, caused by another disease, were observed or no symptoms stated above were observed, they either classified them as another disease or normal.

Using the criteria above, they reported 60 cases of Minamata Disease (34.2% of total participants, excluding people 10 years old and younger), 54 cases (30.8%) of Minamata disease with complications and 25 cases (14.2%) of possible Minamata Disease for a total of 139 cases (79.4%). The rest were other diseases or normal.

They also reported 7 cases of cerebral palsy, 7 cases of intellectual developmental delay among toddlers and children. The authors did not specify how they defined the age of children but they reported 12 participants between 1 to 10 years old and 12 participants between 11 to 20 years old. However, they did not relate the cases to mercury poisoning.

The authors also compared their diagnoses with the decisions made by the Mercury Disability Board (MDB). Among the 60 participants diagnosed with Minamata Disease, 21were acknowledged and 39 were not acknowledged by the MDB. Among the 54 participants diagnosed as Minamata disease with complications, 27 were acknowledged and 27 were not by the MDB. In total, the MDB acknowledged 38.1% of the people we diagnosed with Minamata Disease, Minamata Disease with complications and possible Minamata Disease. Among the 75 participants not acknowledged by the MDB, 28 were diagnosed to have Minamata disease, 21 were diagnosed to have Minamata disease with complications and 11 were diagnosed to have possible Minamata disease by the authors, with a total of 60 (80.0%). Most of them had mild Minamata disease with sensory disturbances or sensory disturbances and impaired hearing, or mental symptoms. It is clear that the criteria used by the MDB were relatively more stringent.

The most valuable information reported was the observations of the 27 individuals who participated in both studies in 1975 and the follow up study in 2004. Most of them had moderate elevated level of mercury exposure with hair concentrations ranging between 10 to 20 ppm and the highest at 44.2 ppm in 1975. However, the authors did not report the hair concentrations of these individuals in 2004 but we presumed they were lower as the mean of all the participants were 2.3 ppm with the maximum at 25 ppm. Comparing the symptoms of the 27 residents between 1975 and 2002-04, 2 cases of sensory disturbances (the loss of sensation in extremities and around the mouth) and 6 cases of only sensory disturbances (the loss of sensation in extremities) in 1975 increased to 6 cases and 13 cases respectively in 2002-04. Seven of them also indicated the loss of sensation in whole body (2 cases duplicated with the loss of sensation in extremities). Three of them did not have sensory disturbances. Those with ataxia increased from 2 to 16 cases, concentric constriction of the visual field increased from 3 to 4 cases, speech impairment increased from 3 to 8 cases, imbalance increased from 2 to 7 cases, tremor increased from 5 to 10 cases, walking difficulties increased from 0 to 6 cases and stroke (cerebral

infraction) increased from 0 to 4 cases. According to their diagnosis, 13 of them had Minamata Disease, 11 had Minamata Disease with complications for a total 24 (88.8%). For comparison, the MDB acknowledged 21 applicants (77.7%) out of 27 participants and is providing them a pension. The authors acknowledged the possible effects of aging and complications but the progression of Minamata Disease-like symptoms were evident.

Conclusions:

There is no doubt that there was high mercury exposure in these two communities in the late sixties and early seventies. Although not as high as those that had been observed in Minamata, the concentrations are certainly considerably higher than those reported in the many studies that have conducted since that time, and in which neurological and/or cardiovascular effects have been reported in adults and children.

There is no doubt that at these levels of exposure many persons were suffering from mercury-related neurologic disorders. Following the results of exposure and effects in 1975, as well as earlier mercury in blood monitoring study conducted by Health Canada since 1970, there should have been extensive examinations and follow-up of these communities from that time forward, and assistance with respect to health and nutrition.

Dr. Harada's follow-up study indicates that there is probably still a problem due to previous mercury exposure. This is consistent with findings from animal studies, where effects, which were absent when the animals were young, became evident as they aged[i,ii]. Similar latency period between exposure and neurological symptoms was also observed in humans (see Weiss et al. 2002) for review[iii]. Their study focussed only on neurological clinical outcomes when the scientific literature shows that neurobehavioral performance and cardiovascular functions can be affected through *in utero* and post-natal exposure.

The discrepancies between Dr. Harada's assessment and the MDB are due to different criteria used for evaluations. Similar discrepancies between Dr. Harada's team and the Japanese government are reported in Japan. However, the Japanese government is revising their definition of Minamata Disease victims to be more inclusive and a new round of compensation is expected to release in 2011 (Dr. Hikaru Kobayashi, Vice-Minister of the Environment Ministry of the Environment in Japan, personal communication, April 2010).

Even though the general populations in the two communities have almost background levels of mercury exposure as indicated by the hair mercury concentration. Some individuals may still have high exposure as shown by Dr. Harada's latest report that the maximum was 25 ppm. One of us (Chan) conducted a study with the two communities in 2003 and found similar low level of mercury in hair samples as reported by Dr. Harada in Grassy Narrows. However, higher levels (maximum at 60.3 ppm) were found in some individuals in White Dog suggesting that the problem of mercury exposure still persists in White Dog. Unfortunately, as stated in the latest report from Dr. Harada: "there is hardly a report with data of both hair mercury levels and clinical examinations, together, on each examinee, even in Canada".

We acknowledge Dr. Harada and his team for their effort that spans three decades of research. They have made significant contributions to the understanding of long-term effects of

mercury contamination and the health of the residents in the two communities. However, Dr. Harada's follow-up clinical evaluation should be seen as a preliminary study showing the need for a comprehensive epidemiologic study that would include all of the known outcomes of mercury exposure (including cardiovascular disease) and could take into account co-morbidity from other diseases, such as diabetes and /or alcohol and test for possible interactions. Such a study should also take into account the presence of other contaminants. For this study it would be most useful to have all of the results of hair and blood sampling by Health Canada, Dr. Chan and Dr. Harada, as well as the results of the neurological examinations that were done by Dr. Harada.

We also want to highlight the urgent need to improve the general health of the two communities as the health status of the participants was clearly poor. The rate of residents reporting neurological symptoms was very high for such as small population. There were many other reported diseases including 49 cases (28.0%) of high blood pressure, 42 cases (24.0%) of diabetes, 19 cases (10.8%) of heart disease, 13 cases (7.4%) of stroke, 7 cases (4%) of thyroid problems, 5 cases (2.8%) of Kennedy-Alter-Sung Syndrome (genetic diagnosis). In addition to those, dystrophy, an impaired spinal column in the cervical vertebrae, wounds such as broken bones, cancer, tuberculosis, sniffing, liver disease, kidney disease, Buerger's disease and sarcoidosis were seen. It is paramount that members of the two communities are receiving the necessary medical care and support. In contrast, residents in Minamata, Japan enjoy superb health care from neurologists and therapists even they had not officially been classified as victims of Minamata Disease.

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[i] Rice DC, Hayward S. Comparison of visual function at adulthood and during aging in monkeys exposed to lead or methylmercury. Neurotoxicology. 1999;20:767-84.

[ii] Burbacher TM, Grant KS, Mayfield DB, Gilbert SG, Rice DC. Prenatal methylmercury exposure affects spatial vision in adult monkeys. Toxicol Appl Pharmacol. 2005 Oct 1;208:21-8.

[iii] Weiss B, Clarkson TW, Simon W. 2002. Silent latency periods in methylmercury poisoning and in neurodegenrative disease. Environ Health Perspect 110(S5): 851-4.

Literature Review regarding the Impact of Mercury on Human Health

Summary of a text produced by Drs. Laurie Chan and Donna Mergler for the Mercury Disability Board

presented by
Donna Mergler PhD
Professor Emerita
University of Quebec at Montreal

Cinbiose – Centre d'etude des interactions biologiques entre la santé et l'environnement

PAHO-WHO Collaborating Center for the Prevention of Work and Environment related Illness

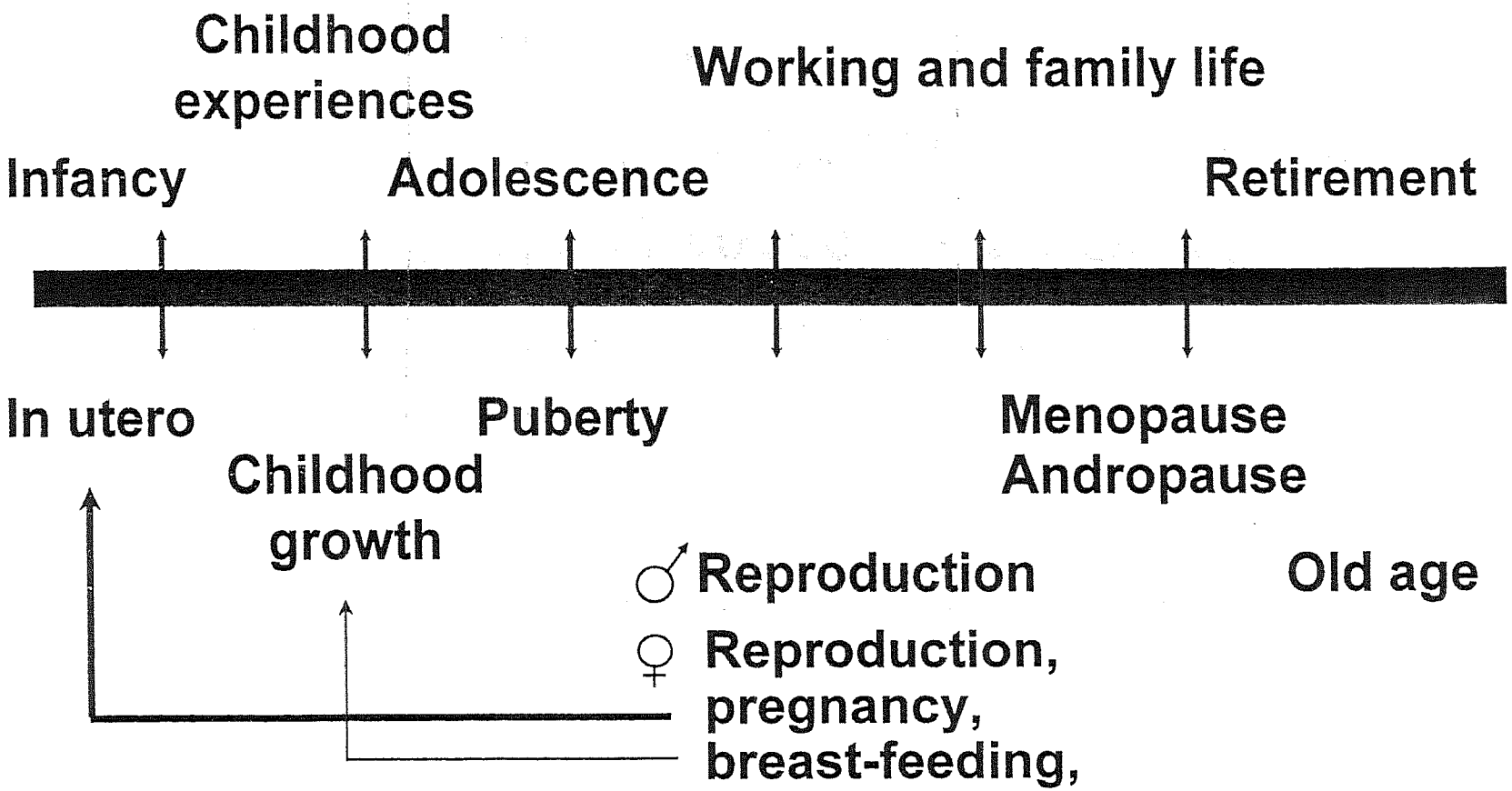
PAHO/WHO

Mandate

1. The effects of mercury contamination on human health, including the fetus particularly:
    - 1.1 Effect on human physiology over the life course including short- and long-term effects;
    - 1.2 Disability related to mercury;
    - 1.3 Mental health or behavioural effects of mercury including psychosis;
    - 1.4 Any evidence that mercury accelerates the development of chronic diseases related to the thyroid gland, arthritis, diabetes and the nervous system.
2. Any evidence of an interactive effect of mercury and other contaminants on human health.
3. Methods of measuring past or present mercury exposure in humans.
4. A review of Dr. Harada's work

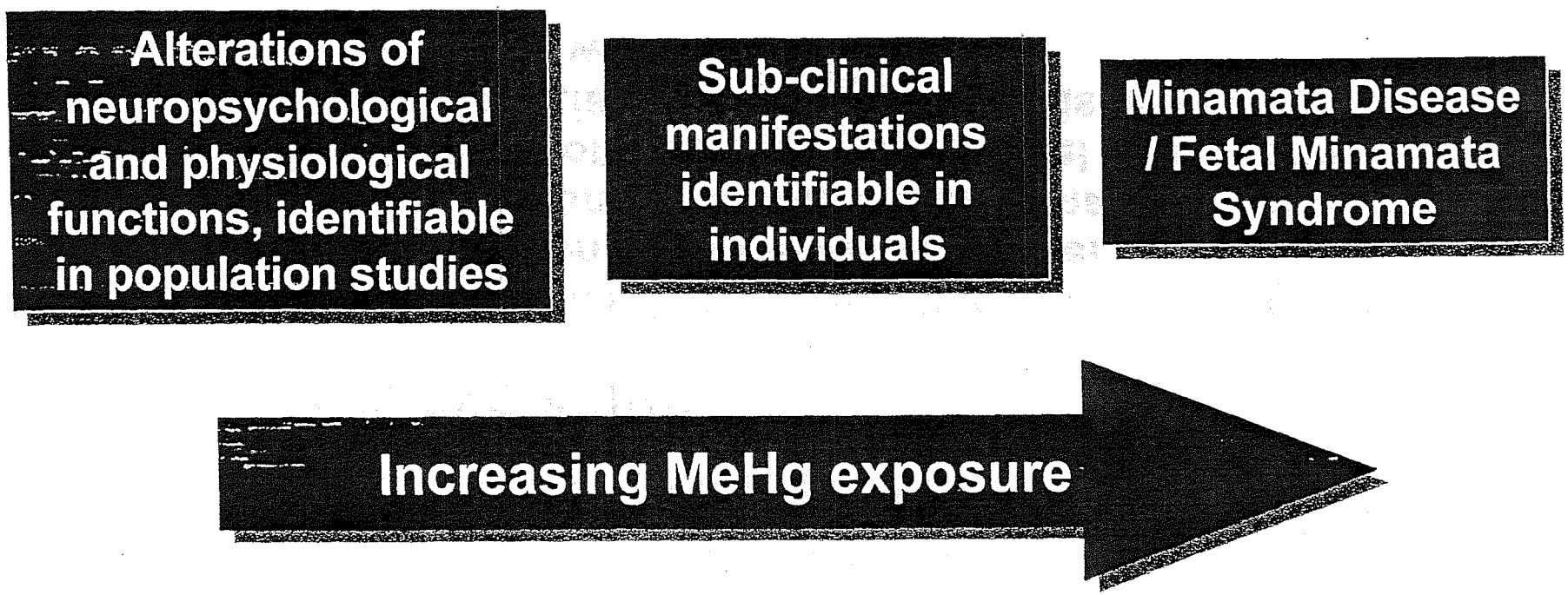
The Board intends to use the literature review to inform a process regarding the value of the current tools used in assessing eligibility for funding

Social and biological life span



Sinbiose
Centre d'étude des interactions biologiques entre la santé et l'environnement

A continuum of severity of effects with increasing exposure



Effects on human physiology throughout the lifespan

- *In utero* exposure:
  - **In Minamata, infants exposed to mercury through the mothers' placenta showed severe cerebral palsy-like symptoms, even when their mothers had mild or no manifestation of the poisoning: mental retardation, cerebellar ataxia, primitive reflexes, disarthria and hyperkinesias were observed.**
  - **At the sub-clinical and population level, several studies in different parts of the world, have reported poorer neurologic status and slower development in newborns, infants and/or children exposed *in utero* MeHg and/or during early childhood.**
  - **Some studies have shown both positive effects of fish consumption and negative effects of mercury**

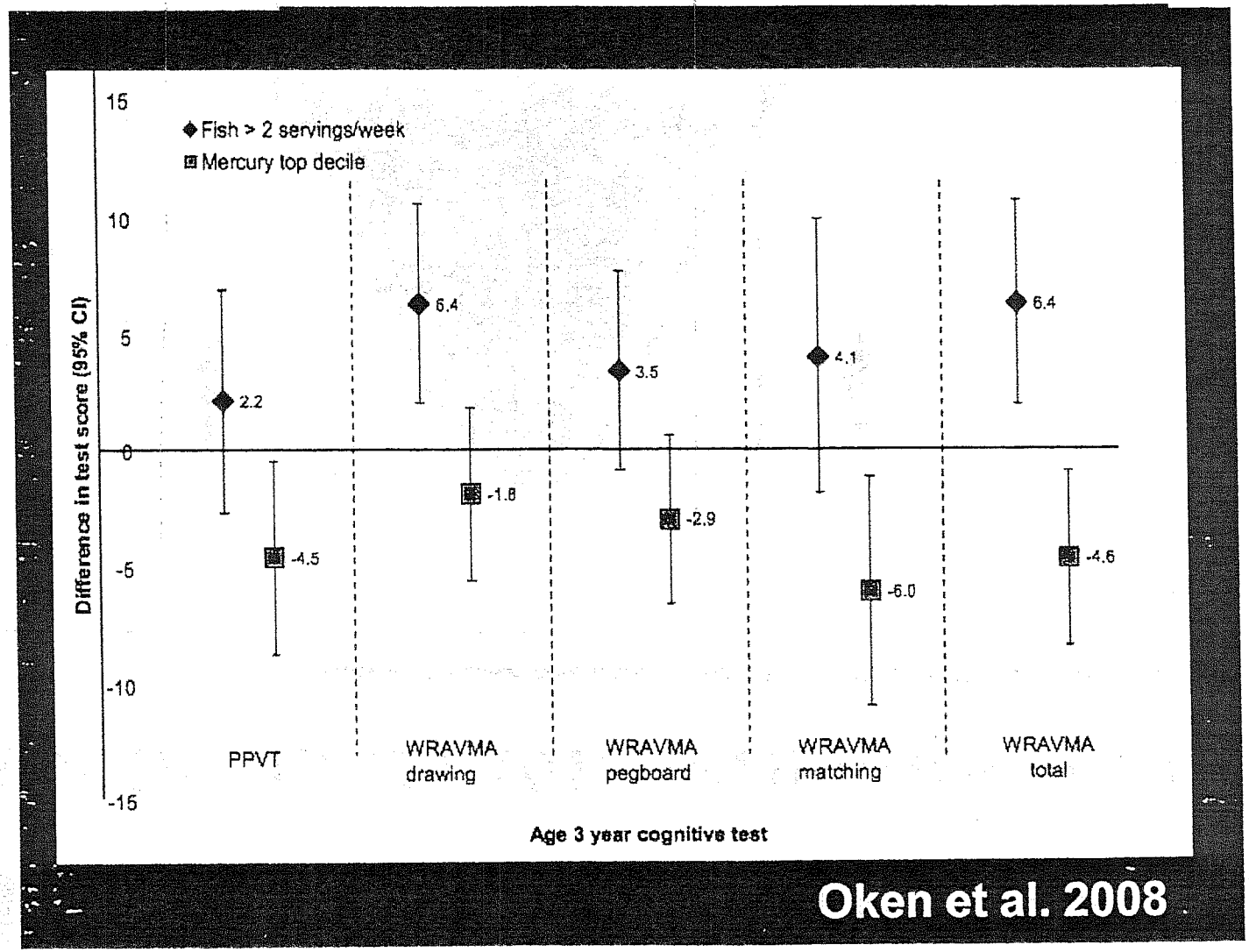
Opposing effects of Hg and fish consumption on neurobehavioral performance in 3 year olds

N = 341 mother/child pairs (Massachusetts)

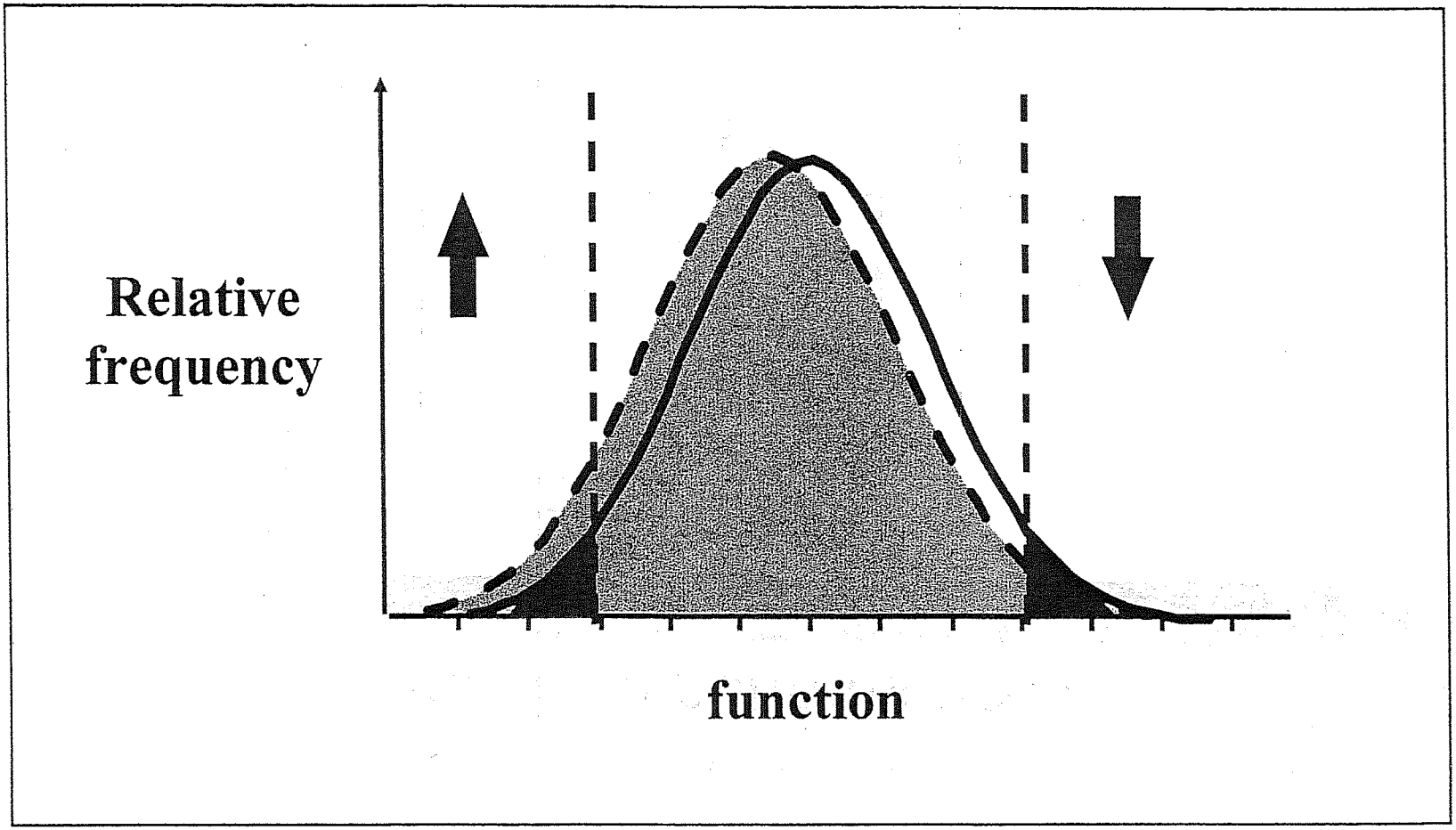
Mean maternal total fish intake :1.5 ± 1.4 servings/week

40 (12%) mothers consumed >2 servings/week

Mean maternal hair mercury level: 3.8 ng/g. Top decile >1.2µg/g



Why subtle alterations are important



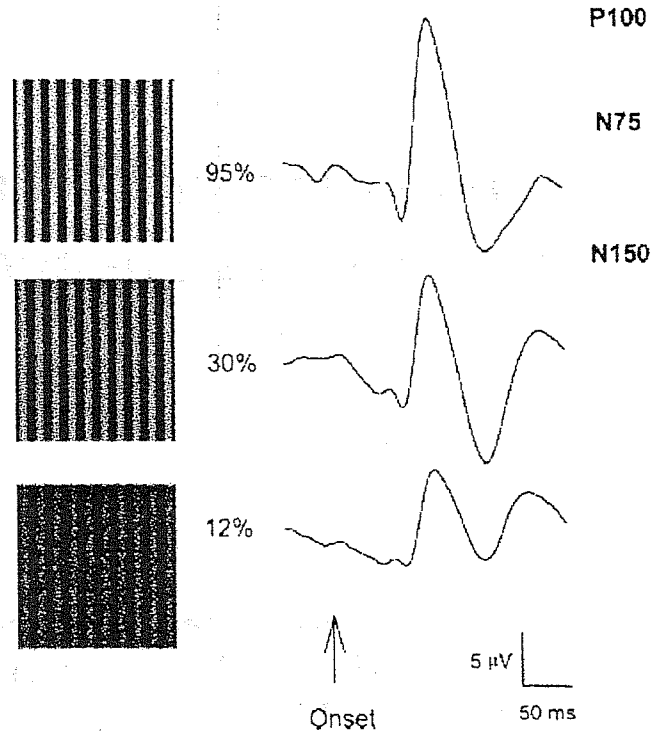
(adapted from Rice, 1998)

Effects on human physiology throughout the lifespan

- **Childhood exposure**
  - **Studies of children exposed to mercury through fish-consumption have shown cognitive and motor deficits.**
  - **Electrophysiological studies of children exposed in relation to mercury have shown changes in evoked potentials**

A study with Inuit children reported Hg-induced electrophysiological changes

- In Canadian Inuit children, prenatal and current Hg exposure were associated with changes in latencies for Visual Evoked Potentials



(St-Amour et al, 2006)

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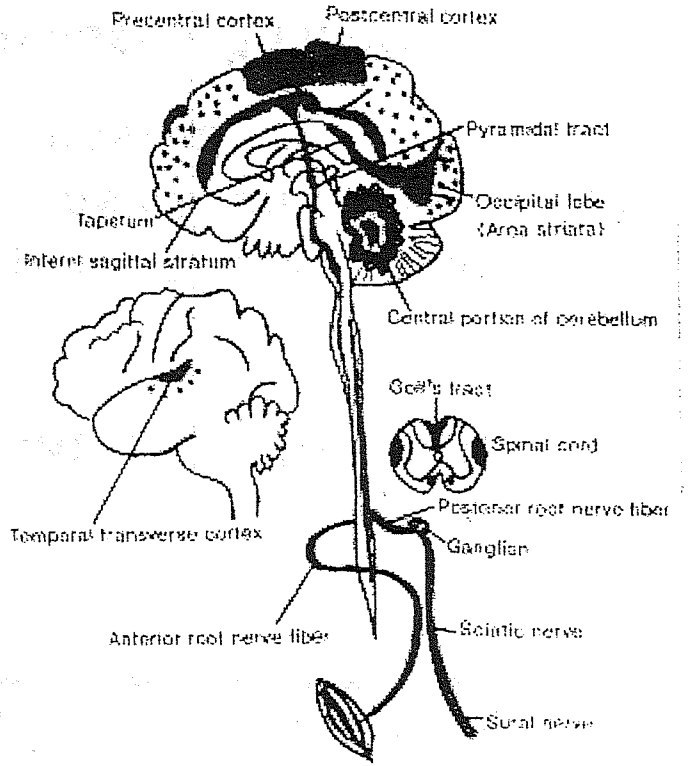
Effects on human physiology throughout the lifespan

- **Reversibility**
  - **In our studies with fish-eaters in the Brazilian Amazon:**
    - **Following reduction of exposure, motor functions improved but visual functions continued to decline in relation to past mercury exposure;**
    - **Age-related cataracts increased with mercury exposure**

Effects on human physiology throughout the lifespan

- Adult exposure
  - MD at very high exposures
  - Lower exposures have been associated with motor, cognitive and visual deficits
  - Inconsistent results at very low exposures



Red: primary lesions
Blue : secondary lesions
(from the Minamata Institute)

Effects on human physiology throughout the lifespan

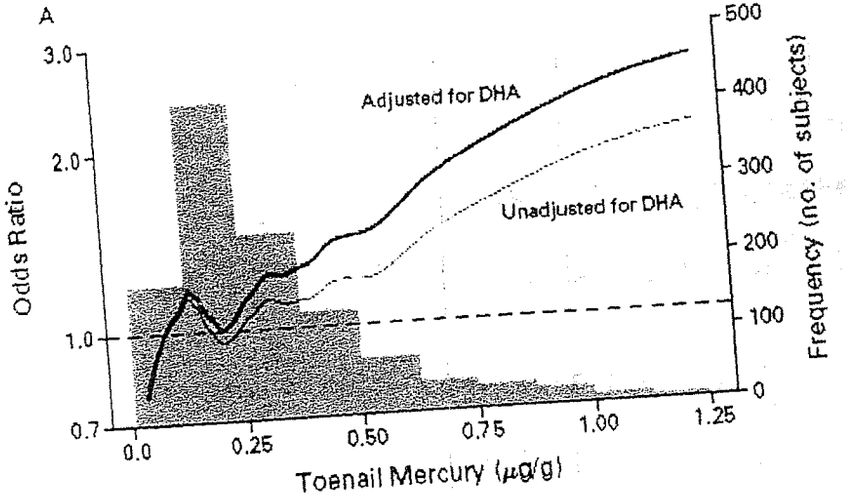
- Aging and past mercury exposure
  - Studies carried out of persons over 40 who had lived in the mercury-polluted areas surrounding the city of Minamata. Annual medical examinations, performed on about 1,500 persons, showed no difference in the prevalence of disease between those from the polluted area and those from other areas, although those from the polluted area had more complaints of poor health.
  - Persons with a history of compensated Minamata Disease scored significantly lower on a scale of activities of daily life.
  - Other studies of persons from a nearby polluted area, who had been exposed to lower doses of mercury over a twenty year period, still suffered from distal paresthesia of the extremities and lips 30 years after cessation of exposure.

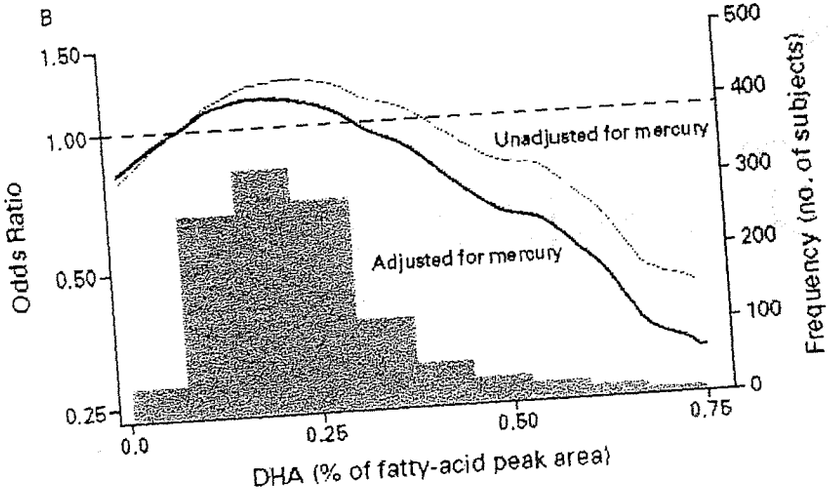
Cardiovascular system in adults

1501 001458

The Panel on Health Risks and Toxicological Effects of Methylmercury:
Donna Mergler, Henry A. Anderson, Laurie Hing Man Chan, Kathryn R. Mahaffey, Michael Murray, Mineshi Sakamoto and Alan H. Stern

Methylmercury Exposure and Health Effects in Humans: A Worldwide Concern





Case control study of 684 men with a first diagnosis of myocardial infarction and 724 controls

(Guallar et al, 2002)

Cardiovascular function

- Blood Hg was associated with changes in heart rate variability (HRV) and increased systolic pressure in Canadian Inuit men and women (Valera et al, 2008)
- In Faroese whalers, Hg exposure was associated with increased blood pressure and common carotid intima-media thickness, but HRV was equivocal (Choi et al, 2009)

Systolic Blood Pressure in a Canadian Inuit Population (n =731)

	Beta estimate	p
Blood Hg (log)	+1.27	0.05
Serum %EPA	- 1.75	0.05
Blood Se	- 2.80	0.03
Blood Hg (log)	+2.14	0.0004

- EPA and Hg did NOT modify the relation between blood Hg and blood pressure (interaction term not significant)
- Not adjusting for these elements could underestimate effect size

Valera et al . 2009

Study of Dr. Harada's team

- Returned to the population-based study of 1971.
- Compared hypertension in exposed group from Minamata (n= 833) with control group (n=755) for the exposed group in relation to hair mercury from 1960
- Prevalence Odd's ratios for the Minamata population compared to controls :
  - Past history of hypertension: 1.6 [95%CI:1.2–2.1]
  - Measured hypertension: 1.4 [95% CI: 1.1–1.9],
- The authors conclude a causal relation

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(Yorifuji et al, 2010)

Other physiological effects

- There is some evidence for effects of mercury on thyroid hormones, but more research needs to be done before this is confirmed
- There is some evidence for effects of mercury on mood states, but more research needs to be done before this is confirmed
- Although some studies suggest that mercury and other pollutants (such as PCBs) may act through different pathways, PCBs have also been shown to be neurotoxic and there is growing evidence linking PCBs with a higher prevalence of Type 2 Diabetes

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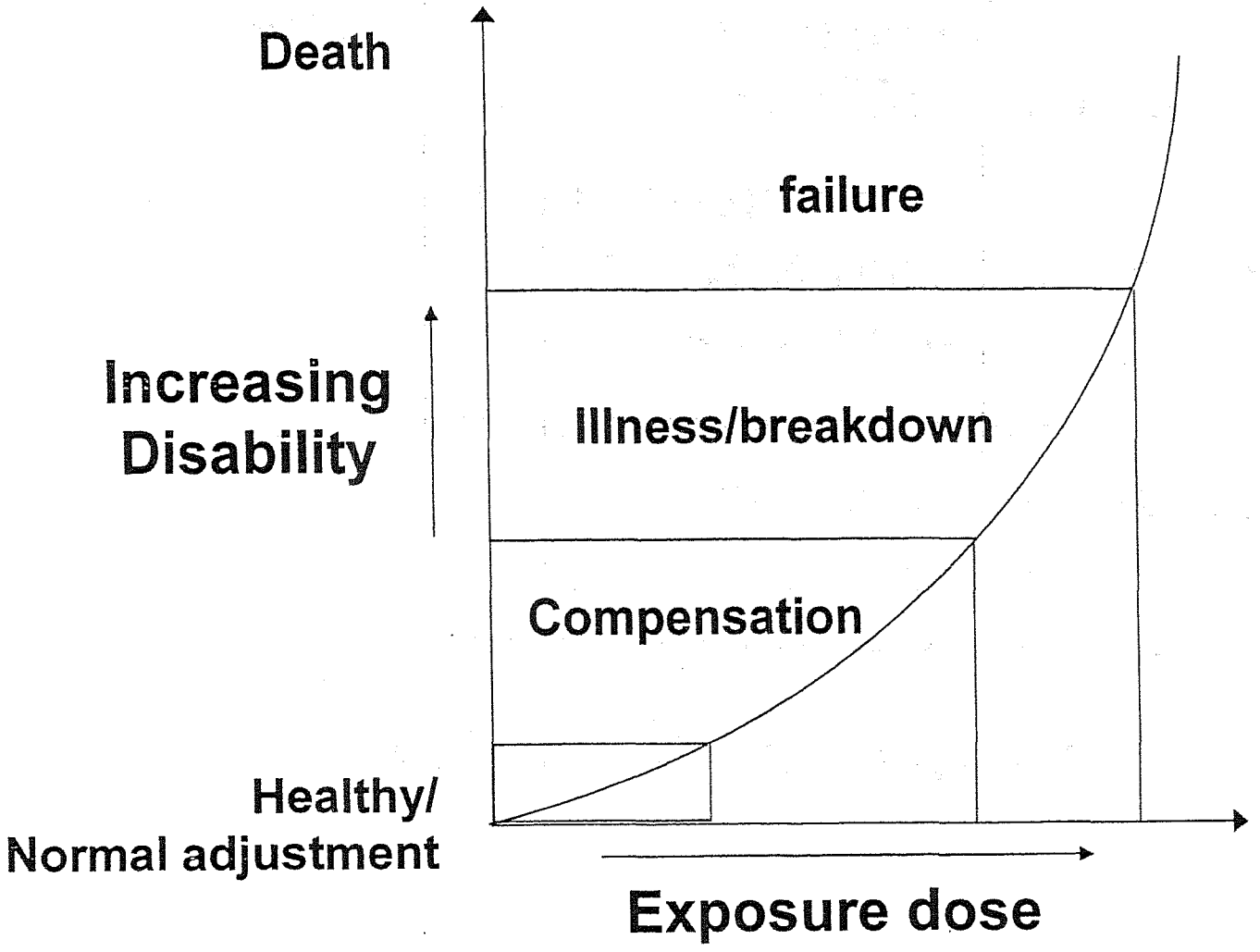
Exposure & Disability



(Hatch, 1962)

Minamata Disease (MD)

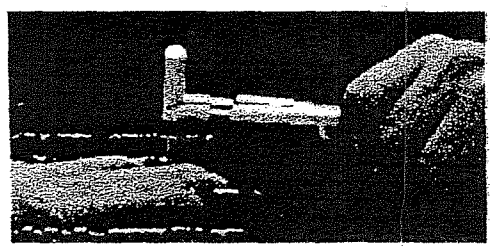
- Sentinal neurologic signs of MD
  - distal sensory disturbances (glove & stocking)
  - constriction of visual fields
  - ataxia (loss of coordination)
  - dysarthria (motor speech disturbance)
  - auditory disturbances
  - tremor

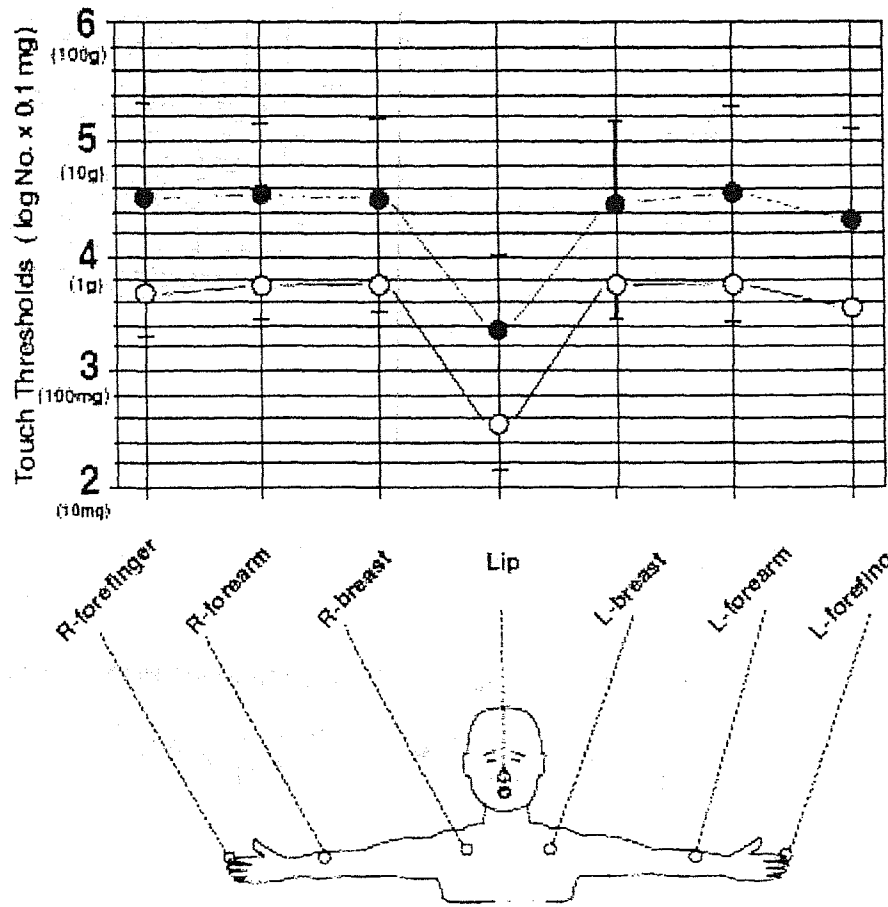
Sensory Testing

- The Minamata Disease diagnosis includes glove and stocking sensory loss, which reflects damage to the peripheral sensory nerves
- In 2001, Uchino et al, wrote about the 2 different theories on MD sensory loss:
  - *"..it is derived from lesions in the peripheral nerves based on clinical observation that most patients present so-called "glove and stocking" like sensory disturbances based on clinical observations"*
  - *"..sensory disturbances are caused by lesions in the sensory cortex based on pathological and electrophysiological findings"*

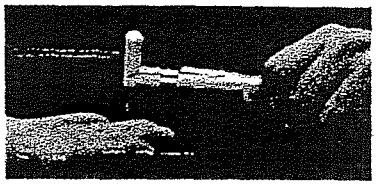
Sensory testing

Touch threshold

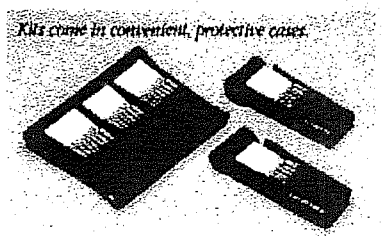




(Ninomiya et al, 2005)



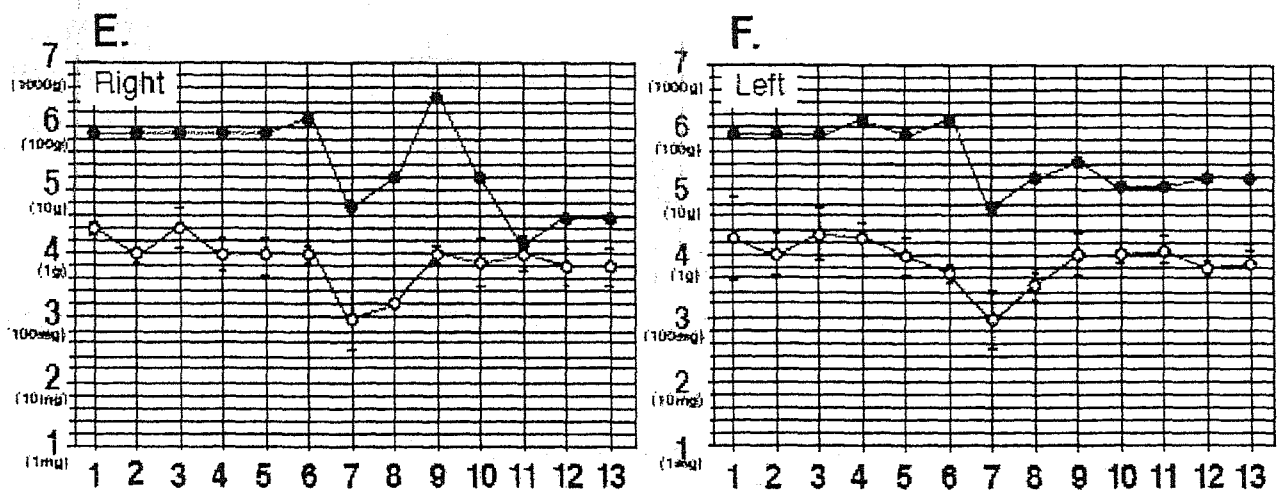
Sensory testing



Touch threshold : Minamata patient

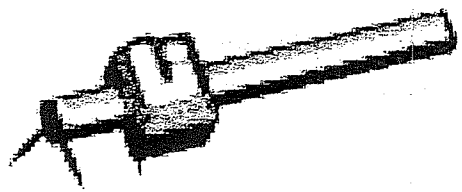
Case 3

Control group
(n= 53)

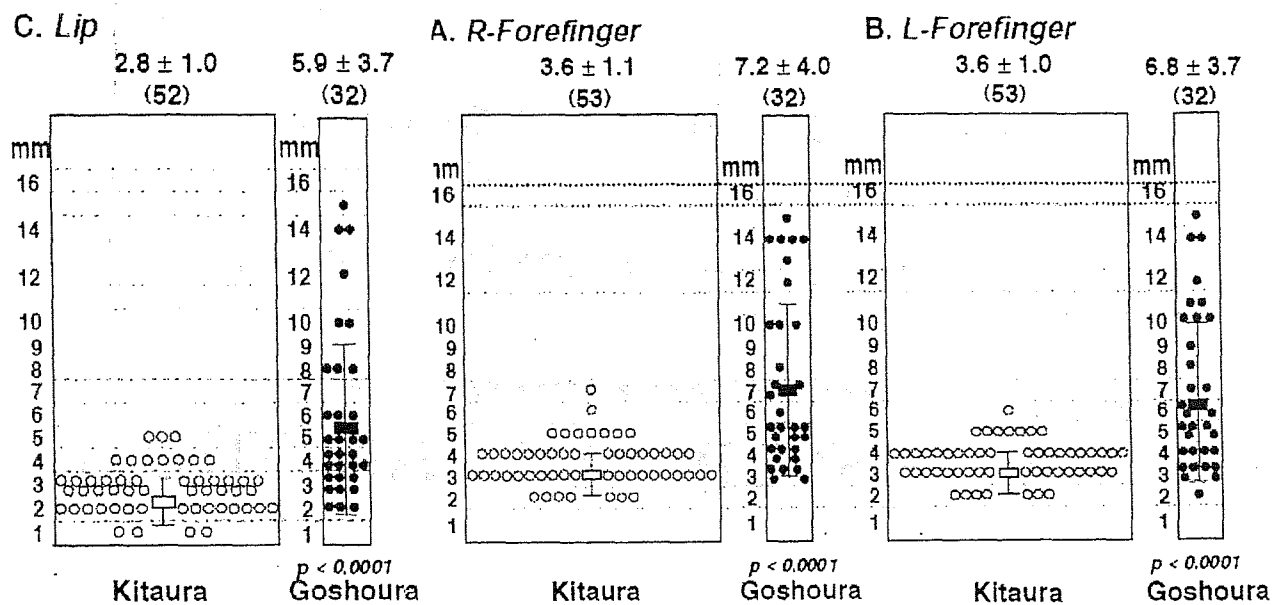


(Ninomiya et al, 2005)

Sensory testing



Two-point discrimination



(Ninomiya et al, 2005)

A recent study on sensory loss

- 197 residents from Minamata with a history of fish consumption during the period of high pollution, compared to 214 controls from non-polluted area.
- Persons from Minamata:
  - Most had never applied for certification for MD
  - Divided into 2 groups:
    - E+N : exposed with complications: diabetes mellitus; cervical spondylosis; lumbar radiculopathy; carpal tunnel disturbance; cerebrovascular disease; and other
    - E: exposed with no complications

(Takaoka et al, 2008)

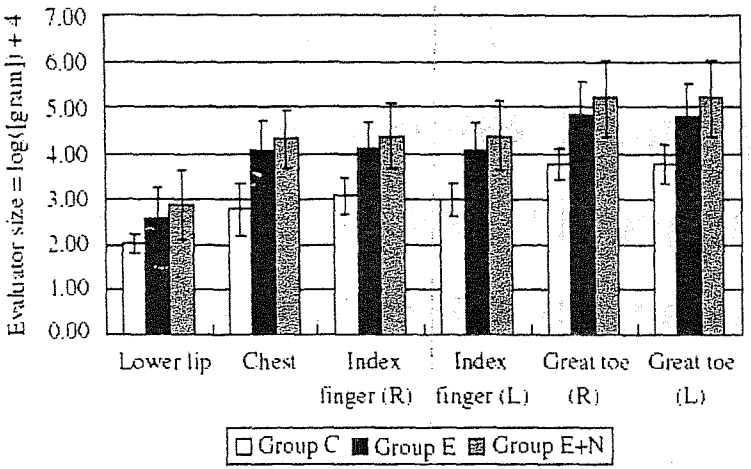
A recent study on sensory loss

- Neurologic examination, questionnaire and 4 quantitative tests of sensory function:
  - Touch (minimal tactile sense)
  - Two-point discrimination
  - Vibration sense (tuning fork)
  - Position sense

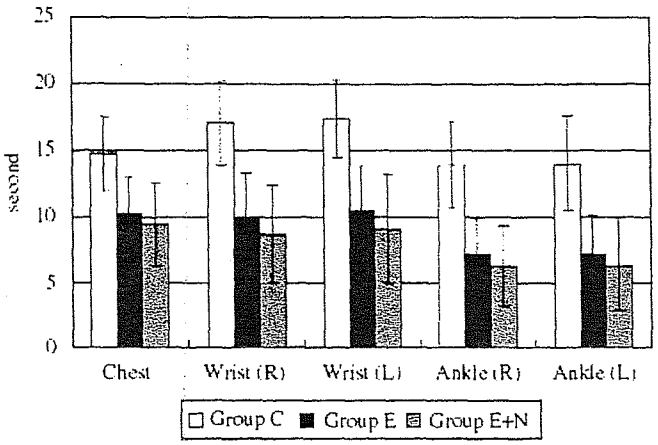
(Takaoka et al, 2008)

Results of sensory loss

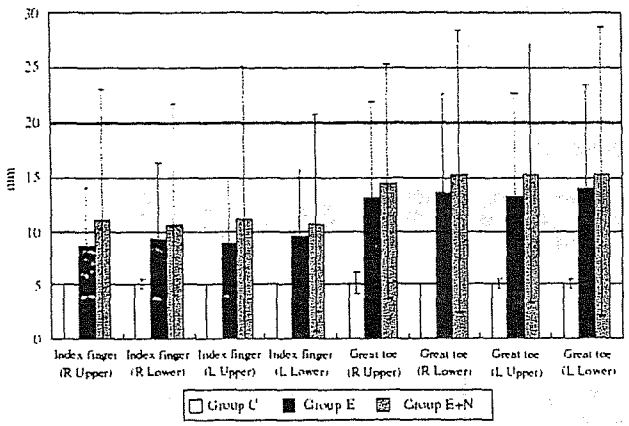
Touch



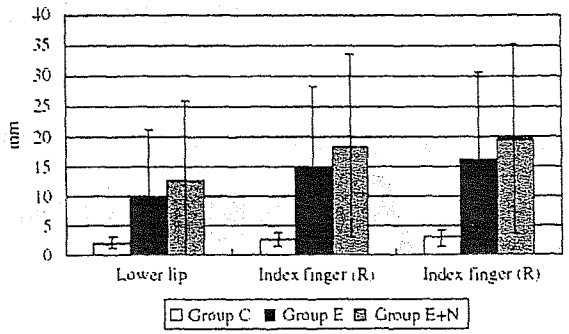
Vibration



Position sense



2-point discrimination



(Takaoka et al, 2008)

A recent study on sensory loss

- Findings:
  - Differences between Controls and Exposed without (E) and with complications (E+N) on all tests
  - No differences between E and E+N on all tests
  - No differences between E and E+N on the large majority of reported MD symptoms
  - Sensory and motor nerve conduction velocities of the right median nerve were similar in group E and controls
  - Sensory nerve conduction velocity was correlated with discrimination of fine-surface-texture, but not with other sensory modalities

(Takaoka et al, 2008)

A recent study on sensory loss

- **Conclusions :**

  "Residents of Goshoura and MD patients have not been aware of the sensory disturbances in their whole body. Thus, it is speculated that paresthesia at the distal parts of the extremities is a subjective complaint of MeHg poisoning patients. The crude clinical tests using a painting brush and pinprick are effective in evaluating gross sensory response. However, they are not quantifiable and their reproducibility is poor. On the other hand, the examinations of threshold of touch and two-point discrimination are semiquantitative, and more reproducible and reliable than the crude clinical tests. Consequently, it could be stated that the quantifiable sensory examinations are more suited to detect the somatosensory disorders caused by damage to the cerebral cortex."

  (Takaoka et al, 2008)

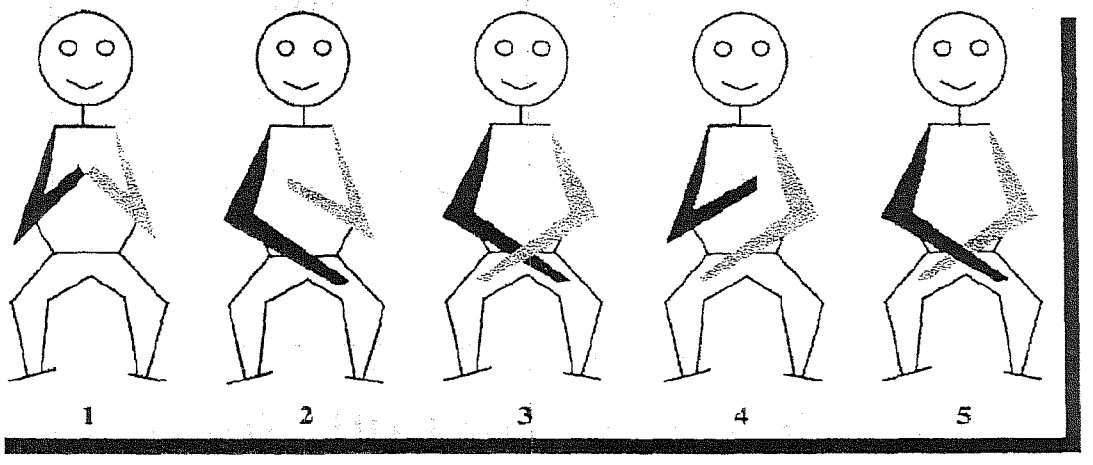
Visual functions

- Different types of visual deficits have been shown with mercury exposure :
  - restricted visual fields,
  - near visual contrast sensitivity loss,
  - color vision loss
  - changes in visual evoked potentials.
- In a recent study in the Amazon, we showed that the prevalence of age-related cataracts increased with mercury exposure

Motor testing

- In the early nineties, Dr. Fernando Branches, the Brazilian physician who first identified neurologic abnormalities in persons exposed to mercury vapours from gold mining activities and in fish-eaters exposed to methylmercury, was invited to Minamata where he learned to apply the neurologic examination for MD.
- His examinations of Brazilian fish-eaters with high mercury exposure showed some abnormalities, but not classical or chronic MD.
- He devised a new motor test that has proven to be very sensitive to methylmercuy exposure.

Branches Alternate Movement Task



- For Amazonian fish-eaters with hair mercury greater than 10µg/g the Odds Ratio for disorganized movements is: 1.88 [CI : 1.22-2.92]
- For those who can do the movement, the number of movements in 30 seconds decreases significantly with increasing hair mercury

Neurobehavioral Testing

- Neurobehaviorat tests which provide quantitative measures of cognitive, sensory and motor functions and emotional state have been used since the 1980's to describe acute and chronic effects of exposure to toxic substances on the nervous system.
- Clinically, they provide a complement to the neurologic examination.
- For mercury exposure, they have been extensively used to show deficits in children subsequent *in utero* exposure; in adults they likewise show mercury-related deficits, but there are fewer studies.

Dr. Harada's studies

- Dr. Harada did pioneering work in Japan, demonstrating neurologic damage of Minamata Disease
- In a recent report, he stated: *"During the early stages of the MD crisis in Minamata, patients, who were diagnosed with MD, seemed to be typical and severe cases of the Hunter-Russell syndrome, including sensory disturbance, concentric constriction of the visual field, ataxia, speech impairment and impaired hearing. However, through more study, it became clear that such severe cases were rather exceptional and many more mild cases were progressing to chronic Minamata Disease. I observed that the symptoms of Minamata Disease became more chronic and atypical in the 1970s. Also I have been proving that sensory disturbances, specifically stronger loss of sensation in the extremities, were seen among patients of methylmercury poisoning at a very high rate, through clinical examinations on family members of patients with sever and typical symptoms or mothers of congenital Minamata Disease patients"*

Dr. Harada's studies

- In the '70s, he showed that persons in Grassy Narrows and White Dog manifested similar signs and symptoms to MD and there appeared to be a dose-relation with mercury exposure
- In 2002 and 2004, he and his team went back. In total they examined 156 people from Grassy Narrows and White Dog.
  - Age ranged from 1-90 years
  - No information was provided on how persons were recruited

Dr. Harada's studies

- Diagnostic criteria:
  - MD: more than one symptom of: sensory disturbances,ataxia, disturbed ocular movement, imbalance, concentric construction of the visual field and speech impairment.
  - In cases where examinees were showing only sensory disturbances, we acknowledged MD as long as there was no other disease causing the symptom.
  - If an examinee had another disease and still showed symptoms of MD that were not explained by that other disease, we defined the case as MD with complications.

Dr. Harada's studies

- **Findings:**
  - 60 cases of MD (34.2% of total examinees, excluding people 10 years old and younger);
  - 54 cases (30.8%) of MD with complications;
  - 25 cases (14.2%) of possible MD for a total of 139 cases (79.4%).
- **They conclude :**
  - It is very high rate of neurological symptoms for a sample of a population, even though examinees came because of other health issues. It is as high as contaminated areas in Minamata. We cannot help but recognize the effects of methylmercury from the symptoms we have seen.

Our conclusions

- Dr Harada and his group did not evaluate the prevalence of MD in this population, but reported on the percentage of MD signs and symptoms within the group that they examined.
- We consider that Dr. Harada's follow-up clinical evaluation should be seen as a preliminary study showing the need for a comprehensive epidemiologic study that would include all of the known outcomes of mercury exposure and could take into account co-morbidity from other diseases, such as diabetes and /or alcohol and test for possible interactions. Such a study should also take into account the presence of other contaminants. For this study it would be most useful to have all of the results of hair and blood sampling by Health Canada, Dr. Chan and Dr. Harada, as well as the results of the neurological examinations that were done by Dr. Harada.

Opinions on environmental contaminants studies in Ontario based on reports provided by the Mercury Disability Board.

Prepared by Laurie Chan, Ph.D.
May 16, 2010

We have received the following 6 reports from the Mercury Disability Board for review.

1. Asubpeechoseewagong Netum Anisinaabek and Wabauskang First Nation Contaminants Project, 2004-2005 (Summary) submitted in May 31, 2005

2. Mercury in the sediment and crayfish of lakes supporting Grassy Narrows and Wabauskang First Nations, Ontario submitted in May, 2005

3. Wild Meat Contaminants Study Year 3: Heavy Metals June 2005.

4. Wild Meat Contaminants Study Year 3: Organochlorines December 2005.

5. Report on the Indigenous Knowledge Workshop Asubpeechoseewagong Nwtum Anishinaabek and Wabauskang First Nation 2005.

6. Final Report of the Anishinabek knowledge Component National First Nations Envrionmental Contaminants Program (NFNECP) Health Canada 2008-2009

1. Asubpeechoseewagong Netum Anisinaabek and Wabauskang First Nation Contaminants Project, 2004-2005 (Summary) submitted in May 31, 2005

2. Mercury in the sediment and crayfish of lakes supporting Grassy Narrows and Wabauskang First Nations, Ontario submitted in May, 2005

These two reports documented results from the same study. Sediment and crayfish samples were collected from 16 sites around the territory of the Asubpeechoseewagong Netum Anisinaabek and Wabauskang First Nations in 2005 and measured for Hg. The results provide insights on whether the chemical pollution in Dryden in the 1960s and 1970s is still having an impact on the English-Wabigoon River system.

The key findings are:

a) Sediment in water bodies that are closed to Dryden like Clay Lake and Ball Lake were still highly contaminated with Hg even though the levels had decreased compared to the 1970s.
b) The decreasing trend will continue as evidenced by the sediment core data.
c) The Hg in the sediment is bioavailable as evidenced by the elevated levels of Hg in crayfish collected in Ball Lake.
d) Sediments and crayfish collected from Grassy Narrow Lakes showed higher levels of Hg but the evidence is less convincing and no statistical tests were performed.
e) Sediment in Wabauskang Lake had background level of Hg.

Significance:

People should be advised not to consume fish collected from Clay Lake and Ball Lake as there are still residual effects of Hg pollution. Lakes around Grassy Narrows may still be affected and monitoring of Hg in fish should be continued.

3. Wild Meat Contaminants Study Year 3: Heavy Metals June 2005.

4. Wild Meat Contaminants Study Year 3: Organochlorines December 2005.

These two reports documented results of heavy metals including arsenic, cadmium, lead and mercury, and organochlorines including dioxins and furans, PCBs, chlorobenzens, hexachlorohexanes, chlordanes and DDTs in 159 wild meat (fish, mammals, and birds) collected by local hunters in 2005. Results help to identify potential chemical hazard as a result of consuming these food items.

The key findings are:

a) All metal and organochlorine concentrations in the wild meat samples were low or comparable to the concentrations found in like samples in Canada.
b) Concentrations of mercury and organochlorines were found in animals a higher trophic level such as otter, walleye, pike etc. as these contaminants are known to bioaccumulate and biomagnify along the food chain.
c) Migratory waterfowls had higher levels of organochlorines as they might have exposed to organochlorines in more polluted areas elsewhere.
d) One otter sample had higher level of mercury from unknown reason. One possible reason is age as mercury is known to accumulate in older animals but age was not determined.

Significance:

Results of this study show that there is no evidence of local pollution. The presence of the contaminants is likely due to either long-range transport or natural sources. There is no particular health concern from the consumption of these food items.

From the public health point of view, there is little value reporting whether Hg is detectable in certain food or comparing the Hg level to the guideline level used for regulation of commercial fisheries (i.e. 0.2 ug/g). The results can even evoke fear of the presence of contaminants in the local food supply. It will be more useful to combine the contaminant concentration data with food use data (in terms of gram per day intake) to estimate daily dose of contaminants. Such food frequency data are available at least for the fish species from an earlier study. See
Chan et al. (2005) "Our waters, our fish, our people" Mercury contamination in fish resources of two Treaty #3 communities.

5. Report on the Indigenous Knowledge Workshop Asubpeechoseewagong Nwtum Anishinaabek and Wabauskang First Nation 2005.

6. Final Report of the Anishinabek knowledge Component National First Nations Envrionmental Contaminants Program (NFNECP) Health Canada 2008-2009

These two reports presented results of two Elders meetings conducted in 2004-5 and 2008-9 on Anishinabek knowledge and perspectives on environmental contaminants. It is important the elders who are the local knowledge holders identify and report what are the main health issues in the communities. The information is also very useful in evaluating the effectiveness of the research activities and public health program as well as using the lessons learned to plan for future programs.

The key findings are:

a) The perceived risk of mercury pollution is still high. Scientists and health professionals have not been able to communicate the level of certainty in different findings and recommendations. People are confused with the scientific findings and public health messages and think that scientific information is not reliable.

b) There is a high level of mistrust for the scientific communities and the government. The risk communications including dietary advice have not been effective. The advices were either issued by the government or by scientists in different reports. The scientific studies and public health advice have been perceived to be out of context and did not take into account of the Indigenous perspectives. There is no long-term knowledge base available locally for such information.

c) The overall impact of mercury pollution has been more than just the health effects of mercury poisoning. Many other determinants of health including disruptions of culture, rapid change of diet, decline in jobs and income etc. have not been properly addressed and are clearly still having an impact on the overall health status of the people.

Significance:

Future studies should ensure local participation/leadership and capacity building. Risk communications need to be done on an ongoing basis with trained local personnel taking the lead. Proper dietary advice should be provided by individuals who have the authority and are trusted by the communities.

Asubpeeschoseewagong
Netum Anishinabek
GRASSY NARROWS, ONTARIO P0X 1B0 • PHONE: (807) 925-2301 • FAX: (807) 925-2649

EARTHROOTS

This is Exhibit.....referred to in the affidavit of.....
sworn before me, this.....
day of.....20.....

.....
A COMMISSIONER FOR TAKING AFFIDAVITS

JOSEPH CASTRILLI

Nov. 14, 2014

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services
2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5

Re: Fourth Supplementary Submission on the Grassy Narrows/Earthroots Request for an Individual Environmental Assessment (IEA) on the Whiskey Jack Forest Management Plan for 2012-2022

Dear Mr. Wills,

These are further supplementary submissions to our request for an IEA on the Whiskey Jack Forest Management Plan (FMP) for the period 2012-2022.

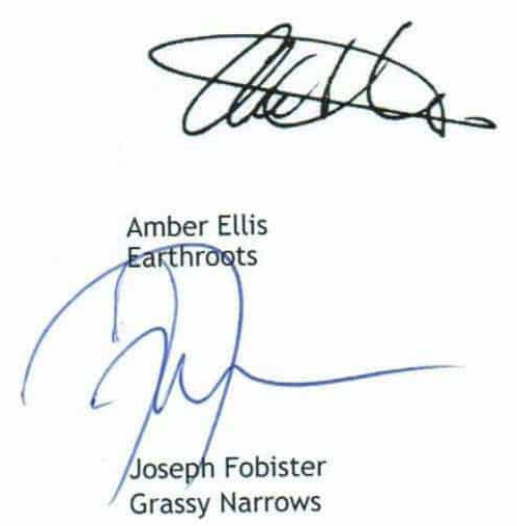
The submissions are prompted by: (1) our recent receipt of a number of government reports previously not in our possession regarding the Grassy Narrows mercury issue and the MNR monitoring program; and (2) various documents, including scientific journals articles and related materials that are relevant to the issues at hand.

The documents include information about:

1. Adequacy of the guide monitoring program
2. Psychological impacts of mercury on Grassy Narrows
3. Differences between logging and fire
4. Ontario Guide to Eating Sport Fish is not appropriate for Grassy Narrows
5. Sport Fish guide does not sufficiently protect fetuses
6. Fishing in Grassy Narrows culture
7. Mercury in Grassy Narrows blood

We regard this information as important to your consideration of our request for an IEA of the Whiskey Jack FMP and would ask that the Ministry of the Environment (MOE) consider this material in conjunction with the material that we have previously submitted to your office on this matter.

Sincerely,



1. ADEQUACY OF GUIDE EFFECTIVENESS MONITORING PROGRAM

SUMMARY: In 2010 the new Stand and Site Guide (SSG) identified as a key uncertainty and monitoring priority the question of whether implementation of the Landscape Guide and Stand and Site Guide will ensure that effects on aquatic ecosystems resulting from forest management activities: i) do not exceed those observed in naturally disturbed catchments and ii) do not exceed acceptable levels for specific parameters (e.g., methylmercury).

Two MNR publications about the monitoring program from 2011 reported that:

a. It was agreed among MNR scientists that current research and monitoring work is not sufficient to address aquatic ecosystem processes uncertainties.

b. Most projects are focused on specific research questions as opposed to monitoring the effectiveness of management actions at mitigating impacts. The projects that do exist are looking at the old rules, not the new rules contained in the Guide.

c. Only through implementation on the ground and through measurement and comparison of expected results versus observed results can the effectiveness of policy options be rigorously evaluated.

d. Information on the effectiveness of guide direction or adaptive modification of guidance should not be expected for several years after guide implementation.

e. Cumulative effects of various projects, other industries, and forestry practices on mercury had not yet been studied, but this is identified as a "next step."

f. Directed new funding from MNR is required to fund the core effectiveness monitories data collection activities.

RELEVANT EXCERPTS:

"Rob Mackereth's work in the Mackenzie watershed ecosystem and Dave Kreutzweiser's work in the White River area are the main contributors to the Aquatic Ecosystem Processes question. The White River study is examining catchment and stream characteristics, aquatic invertebrate communities, and community function (organic matter breakdown) across catchments that are fire-disturbed (about 12 years ago), logging-disturbed (about 5-15 years ago), and not recently disturbed (about 60+ year old stands). The shortcoming of this project is that it is does not directly address the effectiveness of the new guide because the logging was conducted under the old guide. As a result, it was agreed that current work is not sufficient to address Aquatic Ecosystem Processes uncertainties; with monitoring gaps being insufficient fire treatments in their study design and little understanding of the impact of temporal scale disturbances. (Debruyne and Remple, MNR 2011, p.3)

"NEXT STEPS: Find out resulting cumulative effects from various projects, other industries, and forestry practices." (Debruyne and Remple, MNR 2011, p.6)

"A number of ongoing research projects are addressing issues of uncertainty around catchment scale disturbance impacts (Table 2). Most projects are focused on research into harvest impacts on stream and lake systems and focus on biological, chemical and hydrologic responses. Most projects are focused on specific research questions as opposed to monitoring the effectiveness of management actions at mitigating impacts." (Debruyne and Remple, 2011, p.14)

"Effectiveness Monitoring of Guide direction to mitigate hydrologic impacts:
Although a number of past and ongoing research programs may contribute to an effectiveness monitoring program, it was agreed that current work is not sufficient to address Aquatic Ecosystem Processes uncertainties. A comprehensive monitoring program, conducted across a broad spatial and temporal scale is required to evaluate guide effectiveness. The proposed program will incorporate indicators developed by previous studies to characterize stream ecosystems, including aquatic habitat, biota, hydrology water quality and riparian condition. The monitoring program should be long-term and cover all ecosite types within the area of the undertaking. The proposed program will utilize a standardized site survey to collect information and an ongoing research program to analyze survey data and continue to develop, refine and validate indicators." (Debruyne and Remple, 2011, p.15)

"Although the development of a monitoring program to evaluate the effectiveness of guide direction at mitigating catchment scale hydrologic impacts is underway, implementing the program is a long term undertaking. The actual monitoring work cannot begin until forest management activities incorporate the direction of the new guides (2012?) and will take time to refine and evaluate. Information on the effectiveness of guide direction or adaptive modification of guidance should not be expected for several years after guide implementation." (Debruyne and Remple, 2011, p.16)

"Only through implementation on the ground and through measurement and comparison of expected results versus observed results can the effectiveness of policy options be rigorously evaluated." (Remple et al., 2011, p.1)

"There are two situations when direction given in the Guides is not based on the natural disturbance paradigm: when no natural analog exists (eg. soil rutting or specific mercury levels), and when employing the natural disturbance paradigm might result in an effect that society does not condone (eg. violates Migratory Bird Convention Action or Fisheries Act) or does not meet its goals (eg. conservation of species at risk or species of economic or recreational value)." (Remple et al., 2011, p.4)

"Directed new funding from MNR is required to fund the core effectiveness monitoring data collection activities." (Remple et al., 2011, p.9)

2. PSYCHOLOGICAL HEALTH IMPACTS OF MERCURY

A report by the Ministry of Environment in 1986 identified the following facts:

i) The threat of mercury poisoning in Grassy Narrows has serious psychological impacts including fear, anxiety, and mental trauma.

ii) The physical, mental health, and economic impacts of mercury in the English-Wabigoon River have been felt disproportionately by people at Grassy Narrows (and other First Nations people) who practice a traditional Anishinaabe way of life that includes fishing.

iii) A reduction in mercury contamination in fish could lead to a reduced physical and psychological health risk among the Native people at the White Dog and Grassy Narrows Bands.

iv) Health and Welfare Canada recommends that mercury concentrations in fish should be 0.2 ppm or lower before the people at Grassy Narrows and Whitedog communities can safely eat fish.

v) Mercury levels would have to be below 0.5 ppm before the commercial fishery could be revived.

A report by Peter Usher had further relevant findings.

RELEVANT EXCERPTS:

"Of 105 individuals in Ontario who have (blood mercury) levels greater than 100 ppb, 98 (93%) were from the two communities of Whitedog (Islington) and Grassy Narrows, with 39 individuals (37%) from Whitedog and 59 individuals (56%) from Grassy Narrows. (Health and Welfare Canada, December 1979: 71)." (Donnan, MOE 1986, p.28)

"People who live in the Grassy Narrows and Whitedog Indian Settlements have ingested enough mercury contamination to suffer possible health effects (Health and Welfare Canada, December 1979). Health and Welfare Canada (December 1979: 60) recommends that mercury concentrations in fish should be 0.2 ppm or lower before the people at Grassy Narrows and Whitedog communities can safely eat unlimited quantities of fish." (Donnan, MOE 1986, p.28)

"High blood mercury levels contribute to anxiety and possibly to specific illnesses or symptoms which these people have exhibited." (Donnan, MOE 1986, p.28)

"Because sport fishing has remained open after the commercial fishery was banned, some people on the settlements may have been confused about government warnings and continued to eat contaminated fish from the system." (Donnan, MOE 1986, p.28)

"Physical and mental health effects such as anxiety due to mercury contamination in the Wabigoon-English River System have been borne almost entirely by the Native people of the Grassy Narrows and Whitedog Bands." (Donnan, MOE 1986, p.28)

"For Grassy Narrows in particular, the mercury pollution has probably been the most devastating set-back." (Donnan, MOE 1986, p.30)

"Discovery of mercury in fish and in the Native people had several profound adverse consequences… the fear and anxiety from knowing they were contaminated was debilitating to many. The threat of mercury poisoning clearly affected the mental health of these people even if the medical evidence of any effects on their physical health was inconclusive." (Donnan, MOE 1986, p.31)

"The closure of the commercial fishery was a particularly serious blow. It denied the Indians a source of income, an important source of food, economic self sufficiency, a vigorous and healthful occupation and a feeling of self reliance and well-being." (Donnan, MOE 1986, p.31)

"A reduction in mercury contamination in fish could lead to a reduced health risk among the Native people at the White Dog and Grassy Narrows Bands because these people have the most opportunity and inclination to eat fish from contaminated water bodies. Any benefit in terms of reduced health risk to sport fishermen is judged to be slight because anglers eat comparatively little fish and because the sport fish eating guidelines are available. Other non-Native consumers of fish are not at risk because commercial fishing of contaminated fish is banned and the federal fish testing program is intended to prevent contaminated products from reaching consumers." (Donnan, MOE 1986, p.31)

"Potential Benefit Categories: Reduced Physical and Mental Health Risks." (Donnan, MOE 1986, p.33)

"Health and Welfare Canada (1979: 60) recommends that mercury concentrations in fish should be 0.2 ppm or lower before the people at Grassy Narrows and Whitedog can safely eat them." (Donnan, MOE 1986, p.43)

"[A] reduction in fish mercury levels could help to reduce anxiety and mental trauma experienced by these people." (Donnan, MOE 1986, p.44)

"a. reduced physical and mental health risks to the Native people of the Grassy Narrows and Whitedog Reserves;" (Donnan, MOE 1986, p.57)

"We have also concluded that the loss of the fishery played a major part in the disruption of the family as a producing economic unit, and in the consequent ramifications of that for the socio-economic structure. It is these social changes, as well as the loss of income (cash and domestic) and employment, which have led in turn to disproportionately high rates of violent death, suicide attempts, child neglect, emotional distress and crime on both reserves." (Usher 1979, p.368)

"Mercury pollution stands out as a the major event in the history of the two reserves, which eliminated a central economic activity and a major source of income, and endangered health and aroused anxiety in regard to same. " (Usher 1979, p.368)

3. DIFFERENCES BETWEEN LOGGING AND FIRE ON MERCURY

SUMMARY: The MNR claims (in the SSG and in their response to our IEA request) that the impacts of logging emulate the natural disturbance of fire. However, statements from the MNR monitoring scientists and from the peer reviewed scientific literature about mercury contradict this. This issue is discussed in our earlier submissions, but the following additional sources of information are relevant in substantiating our arguments.

RELEVANT EXCERPTS:

"Studies of logging and fire impacts in forest catchments have demonstrated that logging disturbance is not the same as fire disturbance in the short-term (several years at least). " (Debruyne and Remple, MNR 2011, p.16)

“We have a poor understanding of the temporal scale of disturbance impacts on aquatic systems: how long do they take to manifest and how long until recovery?” (Debruyne and Semple, MNR 2011, p.16)

“Recent studies from Canada’s Boreal Shield reported higher MeHg concentrations in zooplankton and fish from lakes with logged watersheds than in undisturbed watersheds (Garcia and Carignan 1999, 2000). The same studies reported no influence of forest fire on MeHg concentrations in aquatic biota. These findings have important implications for the natural disturbance paradigm of forest management, which proposes that timber harvesting can emulate the ecological impacts of natural disturbances such as forest fire (see Seymour et al. 2002).” (Allan et al. 2005)

“Two years after fire, MeHg concentrations in five of six aquatic taxa were similar in burned and reference lakes.” (Allan et al. 2005)

“Three months after fire, biota MeHg concentrations had decreased by 32%–50.” (Allan et al. 2005)

We note that the only paper which reports an overall significant increase in fish mercury levels after fire (Kelly et al. 2006) was done in a different ecosystem (Rocky Mountains), looked at a different fish species (primarily rainbow trout), and only looked at one lake.

“Our research has documented an increased flux of mercury, both elemental and the biologically active methy-mercury, in streams following harvesting.” (Mackereth, MNR 2007)

“Small streams are particularly vulnerable to forest management [partly because of] the large number that are unmapped.” (Mackereth, MNR 2007)

We discuss Garcia and Carignan's findings in our earlier submissions. They found that large/intense fires do not significantly elevate mercury levels in fish.

Large fires are more likely to be intense because fire intensity is a factor contributing to fire growth and also because the conditions that give rise to large fires (eg. drought, lots of fuel), also tend to give rise to intense fires.

Here is further evidence that nearly all the area burned in the boreal is burned by large fires.

"The results from the Red Lake District also indicate that 5.33 percent of fires larger than 1000ha in size are responsible for 96.42 percent of the total area burned from 1976 to 1993. This result is consistent with reports by Stocks (1991) that the 2 or 3 percent of fires that grow larger than 200 ha are responsible for about 98% of the total burned area in Canada. The Red Lake results are also compatible with a theoretical investigation by Strauss et al. (1989)." (Li, NRC 2000, p. 123)

"[A]lthough large fires occur infrequently, they account for most of the disturbance caused by fires. (Turner and Romme 1994, Armstrong 1999, Johnson et al. 1999, Li 2000, Perera and Baldwin 2000)" (OMNR 2001, p.19)

"Eco-region 4S had the most severe fire regime (highest burn rates, largest fire sizes)" (Perera, Cui, 2010, p.1334)

Therefore, the impacts of small fires are not very relevant in seeking to emulate mercury impacts from natural disturbance in the boreal since small fires impact a very small portion of the boreal landscape.

4. MOE SPORT FISHING GUIDES NOT APPROPRIATE FOR FIRST NATIONS

SUMMARY: We have stated earlier that the MOE Guide to Eating Ontario Sport Fish is not appropriate for Grassy Narrows and does not protect Grassy Narrows people from impacts on their health, psychology, culture, and livelihood. The reasons for this include the following:

a) Many Grassy Narrows people are not aware of, do not trust, or do not have access to the guide (see earlier comments and references to report by Simpson summarized by Mergler and Chan).
b) The information in the guide is not culturally appropriate and many people in Grassy Narrows do not understand the information (Simpson).
c) Many people in Grassy Narrows lack the resources (including time, money, equipment, and knowledge) needed to follow the guide. For example fishing on lakes other than those next to the community requires a truck and trailer to move your boat and considerable time, and strength to do so. Fishing for other species requires knowledge of their specific habitat, behavioural patterns, appropriate equipment, timing, and location for catching them, etc.
d) First Nations people have fish consumption patterns that are different from sports fishers.
e) First Nations people have an inherent and Treaty right to fish. Walleye is the preferred and customary fish species for eating in Grassy Narrows.
f) People in Grassy Narrows have cultural rules (eg. Family use areas), and externally imposed rules (eg. Commercial fishing licences, registered trapline areas) that restrict their use to certain areas and prevent them from fishing wherever they choose.
g) The sport fishing guide is not created with cumulative impacts in mind. It assumes that no other sources of mercury are ingested when in fact Grassy Narrows people ingest mercury from a number of sources (eg. ducks, otters, wild rice, store-bought fish, dental fillings, etc.).
h) Many Grassy Narrows people already suffer from mercury poisoning. The sport fishing guide does not consider that people already suffering from mercury poisoning may be more vulnerable to cumulative impacts of additional mercury than people without previous elevated exposure.
i) The sport fishing guide is based on exposure guidelines that are considerably less protective than those used in the US by the Environmental Protection Agency and those recommended by Canadian mercury experts.

RELEVANT EXERPTS:

"The MOE recognizes that fish consumption patterns in First Nations communities would be different than those published in the guide to Eating Ontario Sport Fish." (MOE 2012, p.3)

"A reduction in mercury contamination in fish could lead to a reduced health risk among the Native people at the White Dog and Grassy Narrows Bands because these people have the most opportunity

and inclination to eat fish from contaminated water bodies. Any benefit in terms of reduced health risk to sport fishermen is judged to be slight because anglers eat comparatively little fish and because the sport fish eating guidelines are available. Other non-Native consumers of fish are not at risk because commercial fishing of contaminated fish is banned and the federal fish testing program is intended to prevent contaminated products from reaching consumers." (Donnan, MOE 1986, p.31)

"Because carnivorous fish are the most desirable sport and commercial species, walleyes and northern pike are used as the primary indication species for monitoring mercury levels." (Donnan, MOE 1986, p.16)

"[C]ontaminated fish has certainly not been eliminated from the diet of people of Whitedog and Grassy Narrows, despite the many warnings against consuming fish from the river system." (Usher 1979, p.300)

"A review of reserve residents' perceptions of the problem reveals reasons for this:

1. Fish are part of the Ojibwa heritage, and like other country food, have meaning beyond simply eating. This meaning lies in the skills, knowledge and labour of obtaining food, as well as the social links which are perpetuated by sharing it. Fish are the end product of a way of life.

2. Fish have always been a large part of the diet, and most people, young and old, have a strong preference for fish, particularly walleye, which being a predatory fish, has relatively high mercury levels.

3. Fish is easier to get than big game, or even small game. It can be obtained in good quantity with little effort on short trips. As people increasingly take up full time wage employment, fish becomes the country food resource most easily available to them.

4. Groceries are expensive, but fish is free for the taking, and plentiful.

5. Fish are more nutritious and satisfying than store-bought food. While most public health authorities have stressed the hazards of eating contaminated fish, it is evident that, given the alternatives available to the people, there are also nutritional hazards from not eating fish.

6. Although imported, frozen fish are currently provided under the alternative food programme, many people do not like the taste and cooking qualities of this fish. Nor are the desired species always available, although it is understood that MNR has made some effort to obtain the preferred varieties through the Freshwater Fish Marketing Board. It is not always possible to obtain walleye containing less than 0.2 ppm of mercury, which is the recommended maximum for those already at risk.

7. Some reserve residents do not believe that the fish are really dangerous. Some never believed the "mercury scare," since neither the appearance, taste or observable health and behaviour of fish are affected by mercury contamination. Others, who avoided fish in their diet for a number of years are beginning to think the problem is over. There has been no sudden, horrendous outbreak of Minimata disease, and despite fears and suspicions, nothing has been proved

conclusively one way or another. In any event sport fishermen seem to be getting away with eating fish, and with the apparent blessing of the government.

8. There has, not surprisingly, been a sense of beleagerment among Indian commercial fisherment in the region, due to the provincial government's avowed preference for the sports fishery. Consequently, some reserve residents have viewed the 'mercury scare' as merely a hoax, perpetrated by the government to shut down both their commercial and domestic fishery, and given the fish resource entirely over to the tourist camp operators."
(Usher 1979, p.301-303)

"It would appear that cultural inclinations, economic imperatives, nutritional needs, conflicts in government information and policies toward the problem, and a general mistrust of government intentions, especially with respect to traditional Indian resources, conspire against the elimination of contaminated fish in the diet. The situation is alarmingly similar to that described by Feit and La Rusic (in Berkes et al, 1972: 180-187) in the James Bay area of Quebec, and by Usher (1977b) at Cedar Rapids, Quebec, where local fish supplies have been contaminated by mercury." (Usher 1979, p.303)

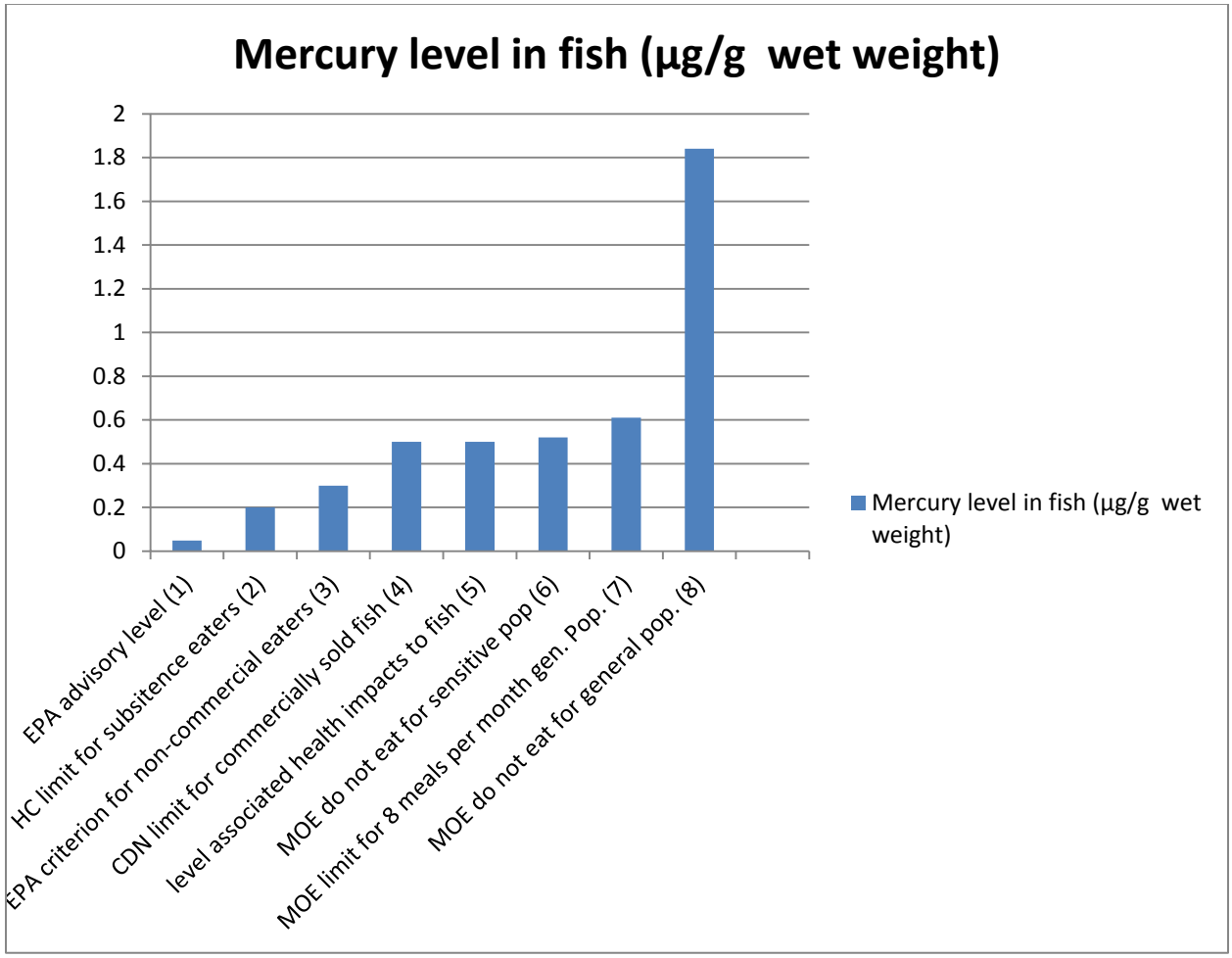
"We believe, however, that although there may have been a very marked decline in fish eating in the early and mid-1970's, consumption of contaminated fish is now on the rise on both reserves. To the degree that commercial fishing and guiding are re-established on the Winnipeg, English or Wabigoon Rivers, historic fish use patterns will probably reassert themselves, and people will retain increasing quantities of fish for domestic consumption as byproducts of these activities.

Consequently, even if there has been no adverse effect on health to date from eating contaminated fish (and this has by no means been proven), the possibility exists that body loadings of mercury in the reserve populations will gradually increase in the future. If that is the case, the medical problem at Grassy Narrows and Whitedog, is far from over. It may be just beginning." (Usher 1979, p.303.304)

"It follows, in our opinion, that the prevention of future medical and nutritional problems will not be achieved by education and information campaigns, or alternative food programmes, unless the fundamental difficulties of the two reserves are also dealt with, and the people no longer have grounds for the fears and suspicions enumerated above." (Usher 1979, p.304)

"Health and Welfare Canada (1979: 60) recommends that mercury concentrations in fish should be 0.2 ppm or lower before the people at Grassy Narrows and Whitedog can safely eat them." (Donnan, MOE 1986, p.43) The MOE sport fish guide does not list a fish as "do not eat" for the general population until its mercury levels are more than nine times that level - above 1.84 ppm (parts per million or micrograms per gram). Even when a fish is listed as "do not eat" there is no requirement that a physical sign be posted at access points to that body of water (or in Grassy Narrows itself) to alert users of that fish. In order to access the information in the guide fishers would need to know about the guide, obtain a current copy, or have internet access, be fluent in English and scientifically literate (eg. Chart reading).

COMPARATIVE MERCURY ADVISORY LEVELS:



(1) 0.049 µg/g - consumption advisory trigger set by the US Environmental Protection Agency (Holloman and Newman 2012)

(2) 0.2 µg/g wet weight - "Health and Welfare Canada (1979: 60) recommends that mercury concentrations in fish should be 0.2 ppm or lower before the people at Grassy Narrows and Whitedog can safely eat them." (Donnan, MOE 1986, p.43)

(3) 0.3 µg/g wet weight - the US Environmental Protection Agency tissue residue criterion for methylmercury (established to protect the health of persons who eat non-commercial fish) (Holloman and Newman 2012)

(4) 0.5 µg/g wet weight – limit above which it is illegal to possess fish for commercial sale in Canada

(5) 0.5 µg/g wet weight - estimated threshold level associated with altered biochemical processes, damage to cells and tissues, and reduced reproduction in fish. (Holloman and Newman, 2012)

(6) 0.52 µg/g – Level above which `do not eat` is recommended in MOE sport fish guide for sensitive population

(7) 0.61 µg/g - MOE sport fishing guidelines maximum level at which 8 meals per month are recommended for the general population

(8) 1.84 µg/g – Level above which `do not eat` is recommended in the MOE sport fish guide for general population

5. The Guide is Not Restrictive Enough to Protect Fetuses

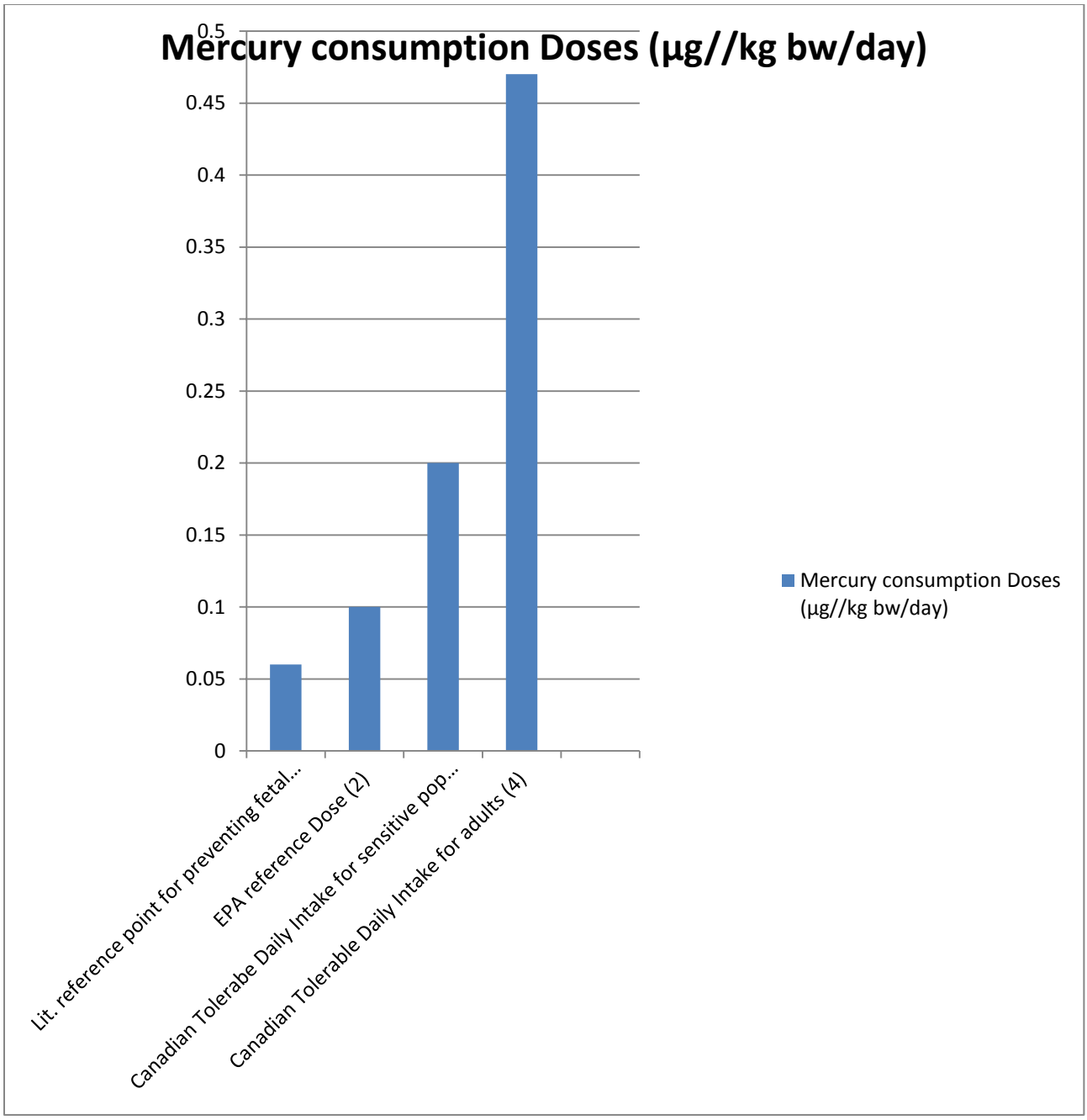
SUMMARY:

-The tolerable daily dose of mercury for pregnant women used by the Guide is double that used by the US EPA to protect against "chronic and developmental mercury toxicity."

-The scientific literature recommends that the allowed dose should be 70% lower than the US EPA reference dose to account for the bio-concentration of mercury across the placenta. That is one third of the dose used for the MOE guide.

-5% of fetuses have mercury blood levels more than three times that found in their mothers blood.

"The fish consumption advice issued by Toronto Public Health 32,42-44 (summarized in a patient handout available from CFPlus*) deserves highlighting for 2 reasons. First, the risk calculations are based on the US EPA RfD, 27 33 a more conservative measure than Health Canada's provisional tolerable daily intake. We consider this caution appropriate in a country with diverse population groups, many of which consume large amounts of fish for cultural reasons." (Ablesohn et al., 2011)



(2) To protect humans against chronic and developmental mercury toxicity, US EPA developed an oral reference does (RfD) of 0.10 ug/kg bw/day, an estimate of a daily oral exposure that is likely to be without an appreciable risk of adverse health effects over a lifetime. (US EPA, 2001a, 2001b) (cited in Holloman and Newman, 2012)

(1) Mergler et al., 2007 point out that in the risk assessment upon which the US EPA's RfD (corresponding to 5.8 µg/L in blood) is based, the US National Research Council used cord blood mercury

measures and did not account for the bioconcentration of methylmercury across the placenta when determining a maternal reference blood mercury level. (Mergler et al., 2007) Mahaffey and colleagues suggest, therefore, that maternal blood mercury levels exceeding the range of values from 3.5 µg/L (15 nmol/L) to 5.8 µg/L (29 nmol/L) should be the reference point for preventing fetal neurotoxicity. (Mahaffey et al., 2008) (cited in http://www.cfp.ca/content/57/1/) Consequently we have divided the EPA reference dose by 1.7 – the average concentration factor suggested by Mergler et al. 2007.

(3) Canadian tolerable daily intake for pregnant women and children (0.20 µg /kg bw/day)

(4) Canadian tolerable daily intake (0.47 µg /kg bw/day) for adults. (Abdelouahab et al. 2008)

"Although maternal and cord blood Hg concentration is highly correlated, cord blood MeHg is consistently higher than the corresponding maternal concentration, with an average ratio of about 1.7 (24, 61, 73, 74). Consequently, biomonitoring adult women's blood MeHg as a surrogate for potential fetal exposure, the corresponding fetal level will be, on average, 70% higher than maternal blood and up to three times higher at the 95th percentile. The maternal body burden of MeHg tends to decrease during gestation consistent with hemodilution and a transfer of a portion of the maternal body burden to the fetus (24)." (Mergler et al., 2007)

Example:

1.0 µg/g mercury is common in 50 cm walleye in the English River near Grassy Narrows

One 250g walleye fillet at 1.0 µg/g gives 250 µg mercury

For a 50 kg woman that is 5 µg mercury per kg body weight in one day

This is 5x the daily intake that has been documented to produce adverse health effects

At CDN limit level of 0.2 µg/kg bw/day that is 25 days worth of doses in one meal

At US EPA limit level of 0.1 µg/kg bw/day that is 50 days worth of doses

At lit level of 0.06 µg/kg bw/day that is approx. 80 days worth of doses

6. FISHING IN GRASSY NARROWS

"Subsistence fishing has long been an important component of the Native peoples lifestyle in this region. Many Native people fished commercially and, prior to an awareness of the mercury pollution, caught fish for home or subsistence consumption." (Donnan MOE 1986, p. 22)

"As indicated in the Ideas program, the Native people regard commercial fishing as a component of their traditional way of life." (Donnan MOE, 1986, p. 47)

"Food or subsistence fishing is another important component of the Indian lifestyle. However, this practice has been severely curtailed as a result of the mercury contamination. According to the recommendations of Health and Welfare Canada, the people on Grassy Narrows and Whitedog could enjoy unrestricted consumption of fish only if the mercury concentrations were reduced to 0.2 ppm." (Donnan MOE, 1986, p.47)

"For Native people, food fishing is part of their culture and has helped to strengthen their social fabric." (Donnan MOE, 1986, p.48)

"Commercial and food fishing are important components of the Indian lifestyle. Mercury contamination and the subsequent loss of these activities coupled with relocation, flooding of wild rice and fishing areas and the lack of clear hunting , trapping, fishing, and forestry rights have all but eliminated opportunities for the Whitedog and Grassy Narrows bands to be self sufficient." (Donnan MOE, 1986, p.51)

"This report has shown that the fishery, and particularly its commercial and domestic aspects, was the keystone of the traditional mode of production at Whitedog and Grasssy Narrows, at the time that mercury pollution was discovered in 1970. Far from being a dying activity the fishery had assumed a growing economic, social and cultural role on the two reserves. It was the single greatest source of food, employment and income. The fishery was the chief means by which children were socialized into the traditional mode of production, and by which traditional socio-economic bonds and obligations were fulfilled. (Usher 1979, p.364)

"[t]he loss of the fishery due to mercury contamination must be viewed as a most serious event in the history of the two reserves; the one which does indeed make their experience unique." (Usher 1979, p.365)

"It is commonly thought that the traditional economy is slowly dying throughout the North, and therefore blows to it are not a serious matter in the long run. We have shown that this is rarely the case…" (Usher 1979, p.366)

"We have shown that the loss of the fishery meant much more to the reserves than the loss of commercial fishing income alone, or even the decline in guiding income. The decline of the domestic fishery, coupled with the decrease in hunting opportunities (because, without the fishery, hunting was no longer as economic), led to an enormous decline in country food production." (Usher 1979, p.367)

"[C]ontaminated fish consumption has not been eliminated, and is in our opinion likely to rise in the coming years. The quality of food that has replaced the traditional harvest of meat and fish is of much poorer nutritional quality." (Usher 1979, p.368)

"We have also concluded that the loss of the fishery played a major part in the disruption of the family as a producing economic unit, and in the consequent ramifications of that for the socio-economic structure. It is these social changes, as well as the loss of income (cash and domestic) and employment, which have led in turn to disproportionately high rates of violent death, suicide attempts, child neglect, emotional distress and crime on both reserves." (Usher 1979, p.368)

"Mercury pollution stands out as a the major event in the history of the two reserves, which eliminated a central economic activity and a major source of income, and endangered health and aroused anxiety in regard to same. " (Usher 1979, p.368)

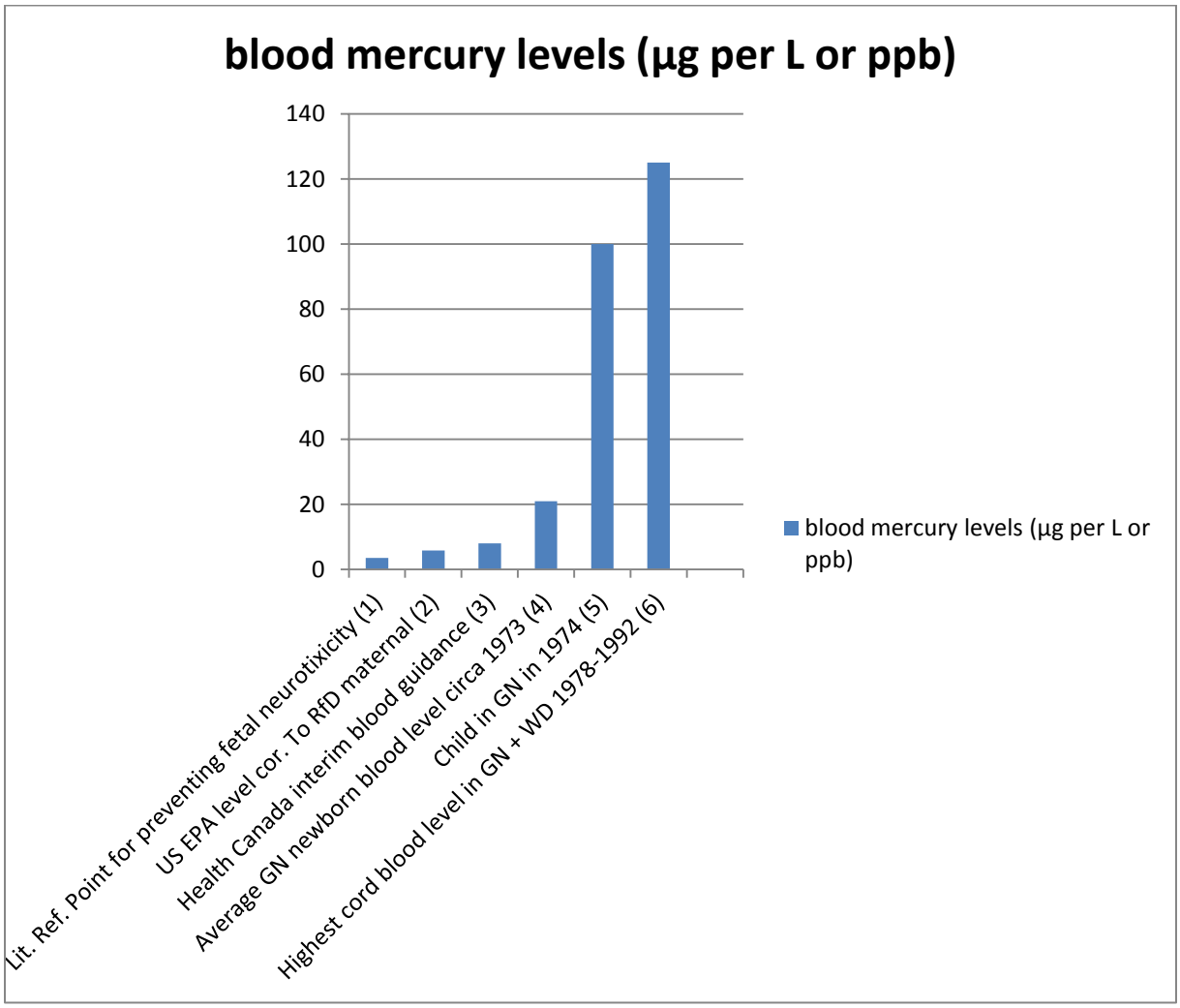
"If these processes [erosion of Indian peoples' use and enjoyment of their traditional resource base, and declining Indian control over reserve life] are not reversed, then in our view, whatever other remedial measures are taken on either reserve will not be of much long term significance. This argues for, among other things, economic reconstruction which incorporates a reliance on the traditional resource base to a large degree, rather than replacing it with industrial wage labour." (Usher 1979, p.369,370)

"The view that somehow northern Indians should be expected to survive economically on their own reserve lands, and that any special access to off-reserve lands and resources is a privilege, to be withdrawn whenever it is no longer convenient to the dominant society, is guaranteed to create social and economic misery on the reserves, ultimately at not small cost to non-native society." (Usher 1979, p.370)

"Troubled and unhappy and demoralized as many individuals may be, they are evidently resolved to build a future with the economic and cultural resources they had in the past, could have in the present, and – they insist – should have in the future. "(Usher 1979, p.363)

7. MERCURY LEVELS IN GRASSY NARROWS BLOOD

a. Mothers, umbilical cords, new borns, children.



(1) Maternal blood mercury levels exceeding the range of values from 3.5 µg/L (15 nmol/L) to 5.8 µg/L (29 nmol/L) should be the reference point for preventing fetal neurotoxicity (Mahaffey et al. 2008)

(2) The US Environmental Protection Agency (US EPA) set the reference dose (RfD) at 0.1 µg/kg daily, equivalent to a maternal blood mercury level of 5.8 µg/L (29 nmol/L). (NRC 2000, US EPA 2001)

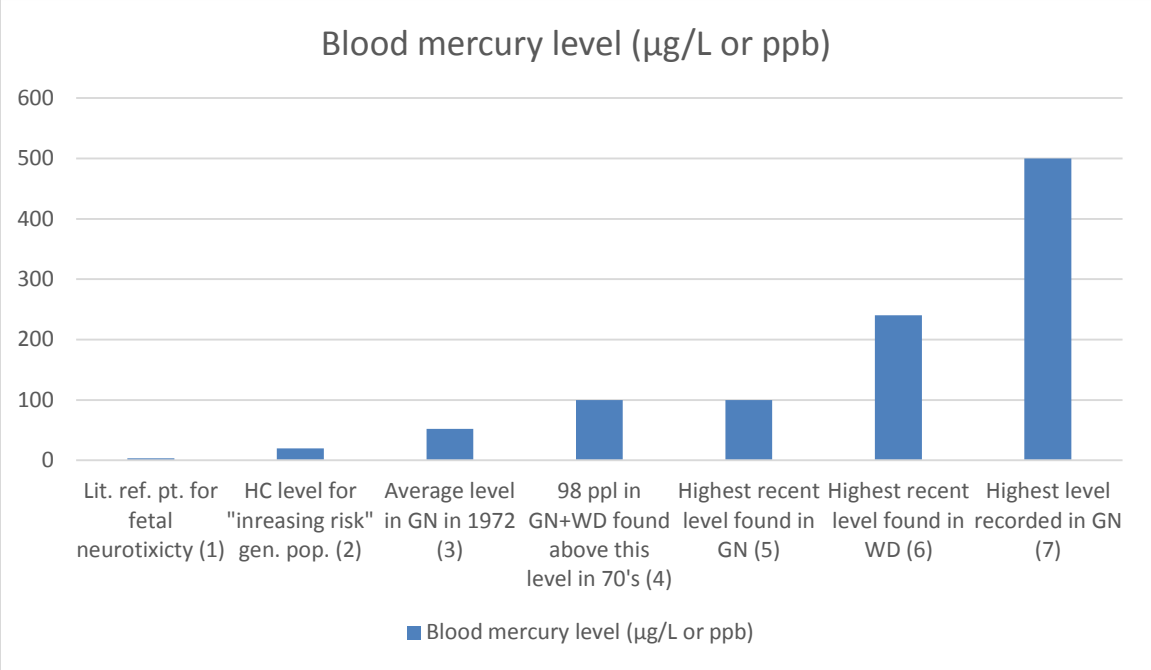
(3) Health Canada has recently developed a provisional interim blood guidance value of 8 µg/L based on the existing provisional tolerable daily intake of 0.2 µg/kg daily for children, pregnant women, and women of childbearing age. (Legrand et al., 2010)

(4) 21 ppm Average GN newborn mercury blood level circa 1973. (Miyamoto, 1980)

(5) 100 ppb – a child in Grassy Narrows was found with blood level higher than 100 ppb in 1974 (Miyamoto, 1980)

(6) Highest cord blood level found in Grassy 1978–1992 was approx. 125 ppb. (Health Canada Medical Services Branch database)

b. Unspecified age and gender.



(1) 3.5 ug/L in blood is the level at which a mother's blood could put her fetus at risk (Mahaffey)
(2) 20 ug/L is the level at which Health Canada considers people exposed to "increasing risk"
(3) 52 ppb average blood level in Grassy in 1972 (Miyamoto, 1980)
(4) 98 ppl in GN +WD were found by Health Canada to have blood levels above 100 in the 70's (Donnan MOE, 1986)
(5) 25 ppm in hair (Mergler and Chan, 2010) corresponds to 100 ppb in blood
(6) 60.3 ppm in hair (Mergler and Chan 2010) corresponds to 241 ppb in blood
(7) 500 ppb highest blood level recorded in GN (Miyamoto 1980, p.11, citing Clarkson)

N.B. Maternal blood level above 100 ppb corresponds to average cord blood levels on average above 170 ppb.
N.B.B. Maternal blood level above 100 ppb corresponds to cord blood level of 300 ppb at 95th percentile.

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Court File No.

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

AFFIDAVIT OF AMBER ELLIS AND DAVID SONE

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Richard D. Lindgren (LSUC No. 28529E)

Solicitors for the Applicants

Court File No.

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

AFFIDAVIT OF ROGER FOBISTER, SENIOR

I, ROGER FOBISTER, SENIOR, of Grassy Narrows, in the District of Kenora, AFFIRM AND SAY AS FOLLOWS:

1. I am one of the applicants in the within application for judicial review, and as such have knowledge of the matters hereinafter deposed to.

2. I am a member of the Grassy Narrows First Nation (hereinafter "Grassy Narrows"). I have been its elected Chief since April 2014.

3. I live on the Grassy Narrows Reserve. I fish in, and eat fish that I catch from, lakes, streams, and waters that form part of the watershed of the English-Wabigoon river system. This system runs through the Whiskey Jack Forest. Both the river system and this forest I have been taught by elders in my community are part of our traditional territory.

4. The members of Grassy Narrows continue to practice our traditional activities in our traditional territory today, just as I was taught and believe to be true our ancestors did in the past. We have used, and continue to use, all lakes and rivers in our traditional territory for fishing, trapping, hunting, gathering, travel and other traditional pursuits, which are central to our culture, our sustenance, and our economy.

APRIL 2014 MNRF RESPONSE TO BUMP-UP REQUEST

5. As mentioned and referred to in the affidavit of Amber Ellis and David Sone, of Earthroots, in April 2014, the Ministry of Natural Resources and Forestry ("MNRF") filed with the Ministry of the Environment and Climate Change ("MOECC") a response to the January 2014 bump-up request submitted by Grassy Narrows and Earthroots. Our request sought the preparation of an Individual Environmental Assessment ("IEA") that would examine the potential mercury impacts to the English-Wabigoon watershed, its fish, and our people, from clearcut logging authorized under a Forest Management Plan for the Whiskey Jack Forest ("Plan") approved by MNRF in December 2013. In its

response to the bump-up request, MNRF raised a number of issues specific to Grassy Narrows.

6. In its April 2014 response, a copy of which is attached as Exhibit "E" to the affidavit of Amber Ellis and David Sone, MNRF stated that (1) Grassy Narrows did not participate in the public participation process MNRF had established for considering the Plan, and (2) Grassy Narrows only raised the issue of mercury impacts from clearcut logging late in that process.

MAY 2014 REPLY TO APRIL 2014 MNRF RESPONSE TO BUMP-UP REQUEST

7. As mentioned and referred to in the affidavit of Amber Ellis and David Sone, in May 2014, Grassy Narrows and Earthroots filed with MOECC a reply to the MNRF response of April 2014. In our reply to the MNRF response that Grassy Narrows failed to participate during the Plan development process where our mercury concerns could have been addressed, we noted that (1) we have very limited resources available to us to participate in the process and will not benefit from implementation of the Plan, whereas MNRF has relatively extensive resources available to it and will receive stumpage fees and taxes from logging allowed under the Plan, (2) MNRF did not grant the request of Grassy Narrows for participant funding so that we could retain technical assistance to help us in any involvement in the Plan development process, and (3) MNRF refused to fund completion of environmental information-gathering proposed by Grassy Narrows and vetoed funding our choice of ecologist who would have raised the mercury issue. These events during the MNRF development of the Plan occurred during the tenure of

my immediate predecessor as Chief, Simon Fobister. A copy of the reply transmittal letter I sent with Amber Ellis is attached as Exhibit “A” to my affidavit. A copy of the full reply is attached as Exhibit “F” to the affidavit of Amber Ellis and David Sone.

8. In our reply to the MNRF response that Grassy Narrows only raised the issue of mercury impacts from clearcut logging late in the Plan development process, we noted that (1) many of our early communications to the government and to the media on the mercury issue going back to the early 2000s were left out of the tables that accompany the MNRF response to MOECC on our bump-up request, and (2) even if Grassy Narrows had made no comments to the government on the issue, which was not the case, it would still be incumbent on MNRF to ensure there would be no new mercury impacts to fish and to our people arising from clearcut logging authorized under the Plan.

SUBSEQUENT SUPPLEMENTARY SUBMISSIONS IN SUPPORT OF JANUARY 2014 BUMP-UP REQUEST

9. In July 2014, Earthroots filed supplementary submissions on our behalf with MOECC in support of our bump-up request for an IEA, based on information Earthroots received around that time from MNRF arising from a request the group made under the *Freedom of Information and Protection of Privacy Act*. The affidavit of Amber Ellis and David Sone filed in connection with this judicial review application summarizes and attaches that submission. I was aware of this submission at the time, and authorized Joseph Fobister, a member of Grassy Narrows who has assisted me on the bump-up issue, to approve its filing with the MOECC.

10. Subsequent to our filing the July 2014 supplementary submission, Grassy Narrows and Earthroots filed supplementary submissions in September and November 2014 with MOECC in support of our initial January 2014 bump-up request. I authorized Joseph Fobister to approve and sign each of these submissions on behalf of Grassy Narrows. These submissions are mentioned and referred to further in the affidavits of Amber Ellis and David Sone, and Joseph Fobister, respectively.

DECISION REFUSING TO GRANT BUMP-UP REQUEST

11. Despite our submissions and material filed, our bump-up request was refused by, or under the authority of, the Respondent Minister of the Environment in December 2014. In doing so, the refusal decision specifically relied on the mitigation measures MNRF had, in its April 2014 response to our bump-up request, disclaimed the effectiveness of in controlling mercury. The refusal decision simply imposed requirements for monitoring such measures during clearcut logging activity authorized under the Plan. The monitoring measures imposed were those already found in the MNRF guidance document, or that might be imposed through it in the future. A copy of the decision document addressed to Simon Fobister, my predecessor as Chief, is attached as Exhibit “B” to my affidavit.

POST-MOECC DECISION EVENTS

12. In late December 2014, Grassy Narrows issued a media release expressing our concern at, and disappointment with, the decision refusing to grant our bump-up request. A copy of the media release is attached as Exhibit “C” to my affidavit.

13. Also in January 2015, as set out in the affidavit of David Sone of Earthroots, he indicates that following a review of MOECC files he obtained a July 2014 MNRF document purporting to respond to our May 2014 reply submissions. Neither I, nor any other member of Grassy Narrows involved in the bump-up request, was aware of, or had ever seen, this July 2014 document before Mr. Sone brought it to our attention in January 2015. A copy of the July 2014 MNRF response document is attached as Exhibit “M” to Mr. Sone’s affidavit.

GRASSY NARROWS BAND COUNCIL RESOLUTION

14. On or about February 20, 2015, the Band Council of Grassy Narrows passed a resolution authorizing initiation of the within application for judicial review. A copy of the resolution is attached as Exhibit “D” to my affidavit.

EVENTS POST COUNCIL RESOLUTION

15. On or about July 31, 2015, Joseph F. Castrilli and Richard D. Lindgren, counsel for Grassy Narrows, sent letters to the Respondent Ministers requesting rescission of both the Plan and the refusal to grant our bump-up request, as well as reconsideration of our request to grant a bump-up and authorize the undertaking of an IEA on the mercury impacts of the Plan. I am advised by counsel, and I verily believe, that the Ministers have either declined to do so or not responded. Copies of counsel’s letters are attached as Exhibits “E” and “F” to my affidavit.

SUMMARY

16. In summary, at all material times I, my predecessors as Chief, and the members of Grassy Narrows, have feared, and expressed opposition to, the potential impacts that clearcut logging authorized under the Plan will have by releasing mercury to our river system, contaminating the fish we, as a people, consume from these waters, and harming our health and well-being. I have read sections 7 and 15(1) of the *Canadian Charter of Rights and Freedoms* and I believe that approving the Plan and not granting our bump-up request violates our legal rights under section 7 and our equality rights under section 15(1).

17. The history of past industrial discharges of mercury to our river system and the resulting, and on-going, health impacts to my people heighten my fear that clearcut logging will trigger new, or intensify existing, mercury-related health problems in the Grassy Narrows community. Our community is particularly vulnerable to these impacts because we are already dealing with past mercury exposure that has impacted our health and our culture and that has brought our community to the breaking point. Despite our expressions of concern over many years and the many government documents and peer-reviewed scientific studies we have pointed to regarding the impacts of mercury on our health, traditional lifestyle, and culture, the Respondents have approved the Plan and refused to examine under an IEA the potential for serious risk of harm and discrimination, implementation of the Plan will unleash in our community. My community and I are deeply concerned, fearful, disturbed, vexed, and anxious about the increase in mercury levels in our fish that is likely to occur if the Plan is implemented.

18. I affirm this affidavit in support of the within application for judicial review, and for no other or improper purpose.

AFFIRMED before me in the District of Kenora, in the Province of Ontario, this 26th day of August, 2015.

A Commissioner, etc.
ERICA STAHL

Roger Fobister, Senior

Asubpeeschoseewagong Netum Anishinabek

EARTHROOTS

May 22, 2014

This is Exhibit A referred to in the affidavit of ROGER FORISTER SR.
ES affirmed sworn before me, this 26th day of AUGUST 20 15
A COMMISSIONER FOR TAKING AFFIDAVITS
ERICA STAHL

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services
2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5

RE: Reply of Grassy Narrows and Earthroots to Ministry of Natural Resources' Response to Request for an Individual Environmental Assessment on Whiskey Jack Forest Management Plan 2012-2022

Dear Mr. Wills,

This letter and the attached document are the reply to the Ministry of Natural Resources (MNR) response to the request of Grassy Narrows and Earthroots for an Individual Environmental Assessment (IEA) of the Whiskey Jack Forest Management Plan (FMP).

We expected the MNR to argue that their mitigation measures will work, that mercury will not be released by logging, and that human and environmental health will not be harmed by the implementation of the Whiskey Jack FMP 2012-2022. They did not.

The MNR's overall argument appears to be about process, not outcome. They claim they have followed the letter of the law on forest management planning (regardless of whether the FMP will lead to the release of mercury).

This reply responds to MNR's characterization of the science and of the input from Earthroots and Grassy Narrows, points out relevant scientific issues that they have ignored, and argues (along with the original IEA request) that they have not met the specific requirements of the their own Stand and Site Guide (SSG) and FMP Manual (FMPM) (see section on Page by Page Comments below for a partial list).

More fundamentally, this matter is about protecting the health of people in Grassy Narrows and the health of the environment.

The FMP activities are likely to release mercury into the environment causing harm to human and environmental health. The MNR does not deny this. Therefore, the FMP is flawed, should not be implemented, and should be subjected to an IEA.

If the Crown Forest Sustainability Act (CFSA), FMPM and SSG can be complied with while causing harm to human health and the environment, then they are flawed.
The MNR does not challenge our assertion that the FMP will cause harm through the release of mercury into the environment. Rather the MNR seems to be arguing that they don't have a duty to prevent harm because they have followed the SSG requirements (i.e. that there are no proven measures to mitigate the harm, and that the harm is within the range of that caused by fire).

It is not acceptable for the MNR to knowingly cause harm simply because they don't know how to mitigate it, and because acts of god also cause harm.

The damming of Grassy Narrows' river, the dumping of 9,000 kg of mercury by a Dryden mill into the river, and now clearcutting, have had severe and compounding impacts on Grassy Narrows' health and way of life. Each of these successive actions "followed the rules" at the time but did not apply the precautionary principle, and did not have Grassy Narrows' free, prior, and informed consent. All of these past activities are now known to be harmful.

In this case, there is already sufficient scientific evidence to know that clearcutting will likely cause harm through the release of mercury. There is also sufficient discretion and existing legislation for the MOE to act now to prevent this avoidable harm.

There is one proven measure to prevent this harm – don't permit logging in Grassy Narrows Territory until there are proven ways to avoid harm, and until Grassy Narrows has given their free, prior, and informed consent.

Will Ontario start on a new path towards respect, healing, and reconciliation with Grassy Narrows by requiring an IEA of this logging plan? Or will Ontario repeat the mistakes of the past at the expense of another generation of Grassy Narrows' children?

Thank you for considering our request and for taking these comments (see following document) into consideration.

If you have any questions, or would like elaboration on any points, please do not hesitate to contact us.

Sincerely,

Amber Ellis
Earthroots
Executive Director

Chief Roger Fobister
Grassy Narrows First Nation

Ministry of the Environment and Climate Change

Environmental Approvals Branch

2 St. Clair Avenue West
Floor 12A
Toronto ON M4V 1L5
Tel.: 416 314-8001
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Ministère de l'Environnement et de l'Action en matière de changement climatique

Direction des autorisations environnementales

2, avenue St. Clair Ouest
Étage 12A
Toronto ON M4V 1L5
Tél : 416 314-8001
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Ontario

This is Exhibit B referred to in the affidavit of ROGER FOBISTER SR. ES affirmed sworn before me, this 26th day of AUGUST 20 15.

A COMMISSIONER FOR TAKING AFFIDAVITS
ERICA STAHL

DEC 22 2014

Mr. Simon Fobister
Grassy Narrows Chief
Grassy Narrows Ontario
P0X 1B0

Dear Mr. Fobister:

Thank you for your interest in the Ministry of Natural Resources and Forestry's (MNRF) proposed Whiskey Jack 2012-2022 Forest Management Plan (Whiskey Jack FMP).

On January 22, 2014, I received your request that MNRF be required to prepare an individual environmental assessment (IEA) for the Whiskey Jack FMP. I am taking this opportunity to inform you that I have decided that an IEA is not required.

Despite my not requiring an IEA be prepared, I understand that concerns were raised in the IEA request with respect to mercury. Therefore, I am imposing conditions on the Whiskey Jack FMP. These conditions will ensure that further monitoring is undertaken and compliance with the most current requirements of the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (Stand and Site Guide) are assumed by the MNRF.

In making my decision, I have given careful consideration to Whiskey Jack FMP documentation, the provisions of Declaration Order MNR-71, referred to as MNRF's Class Environmental Assessment Approval for Forest Management on Crown Lands in Ontario (Class EA), and the issues/concerns raised in your IEA request. Your concerns together with the reasons for my decision are set out in the attached table.

The Class EA is a process by which MNRF prepares Forest Management Plans (FMPs), including evaluating alternatives, assessing environmental effects, developing mitigation measures, and consulting with the public, without having to obtain approval from me and Cabinet for each individual FMP.

The Class EA has itself been subject to review and approval under the *Environmental Assessment Act* (EAA), which determined, in part, that the application of the Class EA

process would enable proponents to meet the intent and purpose of the EAA. MNRF has demonstrated that it has planned and developed the Whiskey Jack FMP in accordance with the provisions of the Class EA. I am satisfied, therefore, that the purpose of the EAA, "the betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management in Ontario of the environment", has been met for the Whiskey Jack FMP.

The issues/concerns you raised were extensively reviewed. I am satisfied that the issues/concerns have been addressed by the work done to date by MNRF, or will be addressed in future work that is required to be carried out.

With this decision having been made, MNRF can now proceed with the FMP activities set out in the Whiskey Jack FMP, subject to any other permits or approvals required. MNRF must implement the activities in the manner in which they are set out in the Whiskey Jack FMP, and inclusive of all commitments made during the review of the IEA request, mitigation measures, and environmental and other provisions therein.

Again, I would like to thank you for participating in the Class EA process and for bringing your concerns to my attention.

Sincerely,

Agatha Garcia-Wright
Director
Environmental Approvals Branch

c: Mr. Allan Willcocks, Regional Director, Northwest Region, MNR
Mr. Kurt Pochailo, Management Forester, MNR
Mr. Paul Glassford, MNR Senior Advisor, Forest Class EA – Sault Ste. Marie
Mr. John Sullivan, MNR Forest EA Implementation Coordinator
EA File No. 02-07 Whiskey Jack FMP 2012-2022

Whiskey Jack Forest 2012-2022 Forest Management Plan

Ministry's Review of Issues Raised by Grassy Narrows First Nation:

Issues	Response
Clearcut logging and the construction of access roads will disturb the soil causing mercury to travel through the water system, amplifying existing contamination.	The MNRF uses the Stand and Site Guide to develop forest management plans. The Stand and Site Guide provides direction to minimize site disturbance, sediment transport and hydrologic disruption in forest management plans. These reduce the potential for existing mercury mobilization as a result of forest disturbances. The MNRF has informed the Ministry of the Environment and Climate Change (MOECC) that mobilization of mercury following forest disturbance may not be any different than that experienced during natural disturbances. The Whiskey Jack FMP will also mitigate potential adverse effects on the environment including the application of Area of Concern prescriptions, silvicultural ground rules, and best management practices for road construction activities. The MNRF is currently undertaking research to gain further understanding of the potential connection between forestry operations and mercury. This will help inform the development of guidance material used for forest management planning. The MOECC is placing a condition requiring the MNRF to implement forest management planning activities in accordance with the Whiskey Jack FMP and the Stand and Site Guide to ensure that monitoring of the environment, which includes mercury, is undertaken. In addition, a condition requiring the MNRF to follow the most current version of the Stand and Site Guide will be imposed by the MOECC to ensure that the best available guidance is being used for the development of forest management planning. A final condition will be imposed requiring the MNRF to report to the Director, Environmental Approvals Branch, what changes have been made to the Whiskey Jack FMP as a result of any updates to the Stand and Site Guide. I am satisfied that the Stand and Site Guide, used to prepare the Whiskey Jack FMP, provides a methodology to minimize potential mercury contamination in waterways following disturbances such as road construction and clearcut logging.
An increase in mercury will harm fish and terrestrial animals that eat fish, including humans, for a long time period.	The MNRF has followed scientific studies which show that increases in methylmercury concentrations in fish following clearcut operations are generally limited to cases when soils are disturbed. As mentioned above, the Stand and Site Guide provides a methodology for minimizing soil disturbance, such as operating on frozen ground. As the Whiskey Jack FMP has been developed under the provisions of the Stand and Site Guide, the MNRF will minimize soil disturbance, thus minimizing potential mercury movement and contamination in fish and

Issues	Response
	terrestrial animals. The implementation of mitigation measures that the MNRF will be using for the WJFMU, such as emulating natural disturbance patterns, harvesting only in winter on shallow soil sites and reinforcing slopes and bank, will reduce the risk of mercury contamination in animals. I am satisfied that mercury movement and potential mercury contamination in animals will be mitigated using methodologies from the Stand and Site Guide which were incorporated into the Whiskey Jack FMP.
Clearcut logging leads to an increase in mercury, whereas forest fires remove mercury.	The MNRF informed the MOECC that fire intensity is an important factor that influences mercury response. High intensity fires volatilize mercury in the organic soil layer whereas low intensity fires leave this layer undisturbed, with mercury subsequently being mobilized as water tables rise and surface runoff increases. The MNRF has stated that studies conducted by various research groups have found that the highest mercury levels in fish are from watersheds impacted by low intensity fires and lower mercury levels are in fish from watersheds with high intensity fires. The MNRF has indicated that for the 10-year planned renewal and tending operations in the WJFMU, which consists of 745,548 ha of productive forest, prescribed burns will occur during site preparation over an area of 1,069 ha. The MNRF is also planning to undertake natural regeneration which will include clearcut silvicultural system over an area of 25,631 ha. Artificial regeneration will be applied over an area of 27,839 ha and will include planting and seeding. The MNRF claims that harvesting in the WJFMU should emulate natural disturbances (i.e. forest fires). The MNRF also claims that increases in mercury due to clearcut operations would be no different than those experienced for natural occurrences. The requester is suggesting that the production of methylmercury is greater with clearcut operations versus natural forest fires. The Stand and Site Guide acknowledges that mercury dynamics will likely change within the watershed as a result of any type of forest disturbance. MNRF has concluded that the mechanism and magnitude of mercury response differs between burned and harvested watersheds but that some level of mercury response is also found following disturbance by fire. As noted previously, potential mercury movement and contamination is associated with the disruption of soils. To reduce the disruption of soils and the level of mercury movement, the MNRF will implement mitigation measures, such as emulating natural disturbance patterns, harvesting only in winter on shallow soil sites and reinforcing slopes and bank, in the WJFMU.

Issues	Response
	I am satisfied that a combination of forest disturbances will be used during the management of the Whiskey Jack FMP and will include prescribed burns.
The MNRF does not have the science and information to develop prescriptions to mitigate the effect of mercury on terrestrial or aquatic ecosystems.	The Declaration Order stipulates that MNRF shall maintain a program of scientific studies to assess the effectiveness of forest management guides. Results from these studies are used to assist MNRF in the review and revision of forest management guides. The MNRF is currently supporting research projects that are examining patterns in fish mercury bioaccumulation, evaluating the levels of mercury runoff from forest and wetland soils to aquatic systems, and examining the synthesis of land use effects (e.g., mining, hydroelectric, and forest management activities) on watershed mercury cycling and export. The MNRF states that results from its ongoing research will be used during the required periodic reviews of the Stand and Site Guide. Periodic reviews of the Stand and Site Guide are required as part of the adaptive management approach in order to evaluate and improve direction in the guide with respect to minimizing the potential adverse effects of mercury mobilization and subsequent bioaccumulation. The Stand and Site Guide includes a series of predictions or hypotheses. Those with a high degree of uncertainty have been identified as a high priority for testing through an effectiveness monitoring program. The results of the monitoring program, along with other sources of information, are used during periodic reviews of the Stand and Site Guide to ensure the most up to date information is being used when developing forest management plans. The MNRF Stand and Site Guide Background and Rationale for Direction document outlines a mercury response to forest management activities but also identifies mercury export as a priority for effectiveness monitoring. The MOECC is imposing a condition requiring MNRF to conduct monitoring in the Whiskey Jack FMP in accordance with the most current version of the Stand and Site Guide. This will help to ensure that the best available guidance is being used and current research methods to minimize the adverse effects of mercury mobilization and subsequent bioaccumulation are implemented. I am satisfied that the MNRF has prepared the Whiskey Jack FMP in accordance with its Stand and Site Guide and will be subject to any updates based on new research.

Issues	Response
The Whiskey Jack FMP does not contain requirements for ongoing monitoring of mercury levels to determine if approved forest operations will elevate mercury levels.	The MNRF's Declaration Order and the Forest Management Planning Manual contain planning requirements for the monitoring of forest management activities in a forest management plan. The requirements include providing a description of the monitoring of forest operations, with specific provisions for Areas of Concern, to ensure operations are in compliance with the forest management plan. The prevention, minimization and mitigation of the effects of forest management on the environment are addressed through the application of the appropriate guides required by Condition 38 of Declaration Order MNR-71. The development, review and revision of these guides is also mandated by this same condition of the Declaration Order, and directs the MNRF to assess the effectiveness of guides through appropriate scientific research projects and does not implicate ongoing monitoring in the context of individual forest management plans. Concerns such as those identified by the requesters are addressed during the periodic review, and potential revision, of the guides. The Stand and Site Guide acknowledges that mercury dynamics will likely change within the watershed as a result of any type of forest disturbance and that further research and monitoring is required to refine direction in the guide. The MNRF is currently considering the issue of the effects of mercury in the review of the Stand and Site Guide which is scheduled for review in the fall of 2014, with a completion date of December 31, 2015. The MOECC has also established in the Declaration Order a requirement for the formulation and implementation of a Provincial Forest Technical Committee, whose role will be to ensure that Guides are kept current with respect to scientific knowledge and management practices. The committee acts as a review board for proposed changes to existing guides and recommending priorities for new or existing guides. The MOECC is imposing a condition requiring MNRF to conduct monitoring in the Whiskey Jack FMP in accordance with the most current version of the Stand and Site Guide. This will help to ensure that the best available guidance is being used and current research methods to minimize the adverse effects of mercury mobilization are implemented. I am satisfied that the MNRF is considering the effects of mercury in the review of the Stand and Site Guide.
The MNRF did not respond to comments	The MNRF did not receive correspondence during the planning process from the Grassy Narrows First Nation regarding mercury concerns. Concerns regarding honouring the Process Agreement made between

Issues	Response
submitted by you on the mercury issue during the preparation of the Forest Management Plan.	Grassy Narrows First Nation and MNRF, amalgamating the Whiskey Jack and Kenora forests, and being kept informed during the Whiskey Jack FMP planning process were raised by Grassy Narrows First Nation in 2010. The issue of methylmercury was raised by Grassy Narrows First Nation for the first time, prior to the IEA request, in an October 24th, 2013 letter to the Premier, coinciding with Stage 4 of the forest management planning process (review of the Draft Whiskey Jack FMP). The Premier's office responded to Grassy Narrows First Nation on February 11, 2014 and stated that Ontario wanted to continue to work together. The MNRF also received a letter from Grassy Narrows First Nation on October 28, 2013; however, there was no mention of mercury. On April 17, 2014 the MNRF responded to the concerns raised in Grassy Narrows First Nation's October 28, 2013 letter. Earthroots submitted correspondence to the MNRF on October 31, 2013 stating that it was concerned with the impact of clearcutting on mercury levels in fish in local lakes and rivers. The MNRF responded to the concerns identified by Earthroots in a letter dated April 7, 2014, indicating that MNRF applied the direction in the approved Stand and Site Guide to mitigate potential adverse effects of forest management activities on the environment. A more detailed account of the consultation conducted between Grassy Narrows First Nation and the MNRF can be found in the section below. I am satisfied that the MNRF responded to comments submitted by the requesters during the preparation of the Whiskey Jack FMP.
Concerns about the failure to discharge the duty to consult in the development of the Whiskey Jack FMP.	The MNRF informed the MOECC that it followed the public and Aboriginal consultation requirements outlined in the Declaration Order and the 2009 Forest Management Planning Manual for the Whiskey Jack FMP (Phase I). At each stage in the development of the Contingency Plan and Forest Management Plan notification letters were sent to Grassy Narrows First Nation to invite participation in the Forest Management Plan process. Prior to the commencement of the formal public consultation process for the preparation of the Whiskey Jack FMP the MNRF consulted with the Grassy Narrows First Nation. In a letter dated April 20, 2009 the MNRF invited six Aboriginal communities, including Grassy Narrows First Nation, to discuss the development of a customized consultation approach for forest management planning in advance of the formal public consultation. Also in this correspondence, the MNRF offered the Aboriginal communities an opportunity to have a community

Issues	Response
	representative sit on the Forest Management Plan Planning Team and Local Citizens Committee. All of the Aboriginal communities declined the opportunity to develop a customized consultation approach and did not provide representation to the Local Citizens Committee. All of the Aboriginal communities, except for Grassy Narrows First Nation, did provide representatives for the Planning Team. The Invitation to Participate, dated February 3, 2010, was sent by MNRF to the six Aboriginal communities. Grassy Narrows First Nation responded to the invitation on March 17, 2010 in which they outlined their concerns with moving forward with the planning of the Whiskey Jack FMP without a Process Agreement in place. The MNRF responded to Grassy Narrows First Nation's letter on June 22, 2010 and stated that MNRF wanted to work together with Grassy Narrows First Nation. No other formal response was provided by the other five Aboriginal communities; however, representatives from all five communities began attending the Planning Team meetings. A letter was sent on December 14, 2011 inviting the six Aboriginal communities to review and comment on the Long Term Management Direction for the Whiskey Jack FMP. Grassy Narrows First Nation submitted a letter to the MNRF on June 13, 2012 requesting information and providing an overview of their concerns. The MNRF responded on July 6, 2012. The other five Aboriginal communities participated in meetings with the MNRF and continued to participate on the Planning Team. On January 14, 2013 the MNRF sent letters to each of the six Aboriginal communities asking if they would like an information session provided to their communities. On January 31, 2013 the MNRF sent a follow-up letter to the six Aboriginal communities announcing the MNRF's intention to hold public information centres. On April 3, 2013 the MNRF sent another letter to Grassy Narrows First Nation asking if the community would like an information session to be held. The MNRF did not receive a response from Grassy Narrows First Nation.Specific Aboriginal communities, Whitefish Bay First Nation, Wabauskang First Nation and Dalles First Nation, accepted the MNRF's offer of information sessions. An invitation to review the Draft Plan for the Whiskey Jack FMP was sent to the six Aboriginal Communities on July 30, 2013. Grassy Narrows First Nation sent a letter to the Premier of Ontario dated October 24, 2013 outlining their concerns with the undertaking and highlighting mercury concerns. The Premier's office responded on February 11, 2014 and stated that Ontario wanted to continue to work together. A letter was also submitted by Grassy Narrows First Nation

Issues	Response
	to the MNRF on October 28, 2013 and was responded to by the MNRF on April 17, 2014. Whitefish Bay First Nation was the only other Aboriginal community to respond to the MNRF's invitation to review the Draft Plan; however, due to circumstances within the community a meeting was never held. On December 23, 2013 the MNRF invited the six Aboriginal communities to inspect the final Whiskey Jack FMP. Grassy Narrows First Nation submitted an IEA request and no response was received by the MNRF from the other communities. I am satisfied that the duty to consult has been met.

This is Exhibit C referred to in the
affidavit of ROGER FOBISTER SR.
ES affirmed sworn before me, this 26th
day of AUGUST 20 15
ES
A COMMISSIONER FOR TAKING AFFIDAVITS
ERICA STAHL

---------- Forwarded message ----------
From: **Grassy Narrows Asubpeeschoseewagong Anishinabek** <riverrun2010@gmail.com>
Date: Mon, Dec 29, 2014 at 8:36 AM
Subject: RELEASE: ON says 'no' to environmental assessment of clearcut mercury impacts in Grassy Narrows
To: toronto.newswire@masses.tao.ca

RELEASE Monday Dec. 29, 2014

ON says 'no' to environmental assessment of clearcut mercury impacts in Grassy Narrows

Science indicates that clearcuts will deepen the tragedy of mercury poisoning

Grassy Narrows – On the night before Christmas Grassy Narrows First Nation received notice that Ontario is rejecting the community's request for an Individual Environmental Assessment of the mercury impacts from the controversial final plan for clearcut logging on their homeland. Grassy Narrows is concerned that the planned clearcut logging will harm the health of their families by raising mercury poison levels in local fish – a traditional staple.

Ontario's logging plan makes no mention of mercury, and contains no special measures to account for the fact that Grassy Narrows' homeland is the site of Canada's most infamous case of mercury poisoning arising from 9,000 kg of mercury that was dumped into their river by a paper mill upstream in the 1960's. Scientific studies indicate that clearcut logging in the boreal forest can raise mercury in fish to unsafe levels.

"Ontario has ignored our voices and is planning to force more devastating clearcuts on our people without even applying their own Individual Environmental Assessment process," said Joseph Fobister, a Grassy Narrows land-user and businessman. "It makes me sad that our people will become even sicker if the government allows the logging industry to poison the fish that we eat."

"I am disheartened by this hurtful decision," said Chief Roger Fobister Sr. of Grassy Narrows. "It seems that our health and our culture do not matter to the government as they attempt to force their clearcut plans on us. The only honourable way forward here is to work together to gain our agreement before our land and water are used."

Grassy Narrows' request was an important test of Ontario's environmental laws. People with concerns can request an Individual Environmental Assessment (IEA) of a logging plan if they believe that environmental and human health are not being protected. However, such requests are rarely, if ever, granted since the current regulatory regime was established in 1994. The Timber Class Environmental Assessment for all logging which was approved in 1994 did not consider the mercury impacts from logging as they were not known until 1997.

"This is a glaring failure to use our environmental laws to ensure that the health of people and our environment are safe from the harmful impacts of industrial clearcut logging," explained Amber Ellis, Executive Director of Earthroots, which supported Grassy Narrows in their request. "It is hard to imagine a situation that requires an Individual Environmental Assessment more than the mercury issue in Grassy Narrows. What use is an Individual Environmental Assessment process when every request is rejected?"

The Ontario Ministry of Natural Resources and Forestry (MNRF) writes that "[t]he potential for forest management activities to result in mobilization of terrestrial mercury into aquatic systems is well documented and a serious concern." MNRF also admits that "[T]here are not mitigation measures specific to mercury in the [logging rules]," and "[t]here are no claims that the [logging rules] direction and application of the [logging rules] will mitigate or eliminate Hg mobilization."

And yet the Ontario Ministry of Environment and Climate Change has given the green light to the MNRF to authorize clearcut logging in one of the most mercury impacted parts of the planet, against the loud objections of Grassy Narrows where many families already suffer the debilitating symptoms of mercury poisoning.

CONTACT:

Chief Roger Fobister Sr. 807-407-1574

For primary source documents, high res photos, and b-roll contact: riverrun2010@gmail.com.

For more information see: www.FreeGrassy.net

BACKGROUND

Kathleen Wynne visited Grassy Narrows in the summer of 2012 as Minister of Aboriginal Affairs and promised to rebuild Ontario's relationship with Grassy Narrows. Instead, on December 23rd, 2013 the Wynne government approved unilateral plans for another decade of clearcut logging in Grassy Narrows Territory against the will of the community and without consent. Grassy Narrows' request for an Individual Environmental Assessment provided an opportunity for the Wynne Government to use their secure majority to ensure that logging does not deepen the mercury problem in Grassy Narrows.

The Whiskey Jack Forest Management Plan includes dozens of large clearcuts on Grassy Narrows Territory, one alone nearly the size of pre-amalgamation Toronto (79 sq km vs. 97 sq km). This logging will further erode the Aboriginal and Treaty Rights of Grassy Narrows which depends on the forest to sustain their families and to practice their culture through fishing, hunting, trapping, medicine harvesting, ceremony and healing for all generations.

The unilateral plan makes exclusive use of clearcut logging, a practice which has been scientifically reported to raise mercury levels in fish to dangerous levels. The most extensive study found that 100% of walleye and pike in studied clearcut boreal lakes in Quebec had mercury levels above the World Health Organization limit for safe human consumption, compared to only 18% in unlogged lakes (Gracia and Carignan 2005).

The Supreme Court of Canada ruled on July 11th, 2014 that Ontario must respect Grassy Narrows' Treaty rights when authorizing logging on their land, and has a duty to protect a meaningful ability for Grassy Narrows people to practice their right to fish and hunt.

The new logging plan was scheduled to take effect on April 1st, 2014 but then MNRF Minister Orazietti, promised that no logging would occur within 60km of Grassy Narrows until April 1st, 2015.

Ontario's rejection of Grassy Narrows' request for Individual Environmental Assessment gives the green light for clearcut logging to proceed over the long-standing objections of the people of Grassy Narrows.

QUICK FACTS

"There is clear indication that forest harvesting leads to increases in Hg_{tot} and MeHg loading, as well as increased bioaccumulation in downstream aquatic biota." (Bishop et al. 2009 review paper)

"The potential for forest management activities to result in mobilization of terrestrial mercury into aquatic systems is well documented and a serious concern." (MNRF response to IEA request p.19 ph3)

"There are no claims that the [logging rules] direction and application of the [logging rules] will mitigate or eliminate Hg mobilization." (MNRF response to IEA request p.10 ph3)

"Because there are no studies which identify or evaluate mitigation measures to minimize mercury mobilization following disturbance there are not mitigation measures specific to mercury in the [logging rules]." (MNRF response to IEA request p.19 last ph)

"MNR has made no further commitments in the [logging plan] to address issues raised by the requesters." (MNRF response to EA request p.7)

The logging rules to deal with mercury impacts have "a high degree of uncertainty" and have been identified as a "high priority for testing through an effectiveness monitoring program." (MNRF Guide for Conserving Biodiversity at the Stand and Site Scale)

A 2011 MNRF review of the effectiveness monitoring program found that "it was agreed that current work is not sufficient to address Aquatic Ecosystem Processes uncertainties" including mercury impacts.

1578

001535

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GRASSY NARROWS, ONTARIO P0X 1B0 • PHONE: (807) 925-2201 • FAX: (807) 925-2649

BAND COUNCIL RESOLUTION

Chronological No. 3681

File Reference No.

This is Exhibit P referred to in the affidavit of ROGER FORSTER SR.

Affirmed sworn before me, this 26th day of AUGUST 2015

A COMMISSIONER FOR TAKING AFFIDAVITS

ERICA STAHL

The Council of the: GRASSY NARROWS FIRST NATION		Capital Account
Date of duly convened meeting: D M Y 20/02/2015	PROVINCE ONTARIO	Revenue Account $

DO HEREBY RESOLVE:

February 20, 2015

Resolution to begin litigation on mercury impacts of logging

Whereas:

- Our traditional homeland has been heavily impacted by mercury pollution in our waterways, including large volumes of mercury that were emitted from the Dryden paper mill in the 1950s-60s, and this mercury pollution has had a devastating impact on our fish, our environment, our health, our economy, our culture, our way of life, and other aspects of our rights and interests;
- We have learned about scientific research showing that logging, particularly clearcut logging in the boreal forest, increases the release of mercury into waterways;
- The Government of Ontario's Ministry of Natural Resources nevertheless approved a Forest Management Plan for the Whiskey Jack Forest in December 2013 that provides for large amounts of clearcut logging in our traditional homeland;
- We therefore submitted a "bump-up" request that asked the Government of Ontario's Ministry of Environment to conduct an individual environmental assessment of that Forest Management Plan to examine the impacts of mercury;
- That request was rejected in December 2014;
- The Canadian Environmental Law Association has offered to work with us on a legal challenge to these decisions of the Government of Ontario;

Now therefore we resolve that:

1. We retain Joseph F. Castrilli and Richard D. Lindgren, lawyers at the Canadian Environmental Law Association (the CELA lawyers) for the purpose of beginning an application for judicial review in the Ontario Divisional Court of:
   a. the decision of the Ontario Ministry of Natural Resources to approve the 2012-2022 Forest Management Plan for the Whiskey Jack Forest under the *Crown Forest Sustainability Act* (Ontario), and
   b. the decision of the Ontario Ministry of Environment to reject our request for an individual environmental assessment, also known as a "bump-up", under the *Environmental Assessment Act* (Ontario).

QUORUM: THREE (3)

(Councillor) (Chief) (Councillor) (Councillor)

(Councillor)

GRASSY NARROWS FIRST NATION

Asubpeeschoseewagong
Netum Anishinabek
GRASSY NARROWS, ONTARIO P0X 1B0 • PHONE: (807) 925-2201 • FAX: (807) 925-2649

BAND COUNCIL RESOLUTION

Chronological No. 3681
File Reference No.

The Council of the: GRASSY NARROWS FIRST NATION		Capital Account $
Date of duly convened meeting: D M Y 20/02/2015	PROVINCE ONTARIO	Revenue Account $

DO HEREBY RESOLVE:

2. We direct the CELA lawyers to initiate and pursue this application for judicial review, with the applicant being our First Nation and, at our further option, such members of our First Nation as the CELA lawyers may advise and we approve.

3. We direct the CELA lawyers to take all further instructions from the Chief and Council of our First Nation, or from such person(s) as we may direct from time to time, and to regularly inform and consult with our other legal counsel at Olthuis Kleer Townshend LLP.

QUORUM: **THREE (3)**

(Councillor) (Chief) (Councillor) (Councillor)

(Councillor)

GRASSY NARROWS FIRST NATION

Canadian Environmental Law Association
EQUITY. JUSTICE. HEALTH.

VIA ELECTRONIC MAIL AND ORDINARY MAIL
< bmauro.mpp@liberal.ola.org >

This is Exhibit E referred to in the affidavit of ROGER FORISTER SR.
ES affirmed ~~sworn~~ before me, this 26th day of AUGUST 20 15
ES
A COMMISSIONER FOR TAKING AFFIDAVITS
ERICA STAHL

July 31, 2015

The Honourable Bill Mauro
Minister of Natural Resources and Forestry
99 Wellesley Street West
Room 6630, 6th Floor, Whitney Block
Toronto, Ontario M7A 1W3

Dear Minister Mauro:

RE: Ministry of Natural Resources and Forestry ("MNRF") - Whiskey Jack Forest Management Plan – 2012-2022 ("WJFMP")

We are the solicitors for Grassy Narrows First Nation and four individuals ("Grassy Narrows") concerning the above matter.

We have been instructed to request that you exercise your authority under s. 9 of the *Crown Forest Sustainability Act, 1994*, S.O. 1994, c. 25 ("*CFSA*"), and (1) rescind, or order the rescission of, the approval of the WJFMP issued under your authority in December 2013 under the *CFSA*, and (2) substitute an order that MNRF not operate, or allow third parties to operate, under the authority of the WJFMP until such time as MNRF has complied with Part II of the *Environmental Assessment Act*, R.S.O. 1990, c. E.18 ("*EAA*"), and prepared an indvidual environmental assessment ("IEA") examining the potential for clear-cut logging authorized under the WJFMP to release mercury to the environment, elevate mercury levels in water and fish, and produce adverse effects on the health of people who eat the fish.

If our office has not received a copy of your (1) rescission order, and (2) substitution order by Tuesday, August 11, 2015, we have been instructed by Grassy Narrows to initiate proceedings in this matter, which proceedings may be broader in the scope of relief sought than the request contained in this letter.

Yours truly,
CANADIAN ENVIRONMENTAL LAW ASSOCIATION

Joseph F. Castrilli
Counsel

Richard D. Lindgren
Counsel

Canadian Environmental Law Association
EQUITY. JUSTICE. HEALTH.

VIA ELECTRONIC MAIL AND ORDINARY MAIL
< gmurray.mpp@liberal.ola.org >

This is Exhibit F referred to in the affidavit of ROGER FORSTER SR.
ES affirmed ~~sworn~~ before me, this 26th day of AUGUST 2015
ERICA STAHL
A COMMISSIONER FOR TAKING AFFIDAVITS

July 31, 2015

The Honourable Glen R. Murray
Minister of the Environment and Climate Change
77 Wellesley Street West
11th Floor, Ferguson Block
Toronto, Ontario M7A 2T5

Dear Minister Murray:

RE: Ministry of Natural Resources and Forestry ("MNRF") - Whiskey Jack Forest Management Plan – 2012-2022 ("WJFMP")

We are the solicitors for Grassy Narrows First Nation and four individuals ("Grassy Narrows") concerning the above matter. In this capacity, we have been instructed to request that you exercise your authority under s. 16 of the *Environmental Assessment Act*, R.S.O. 1990, c. E.18 ("*EAA*") and (1) rescind, or order the rescission of, the December 22, 2014 decision of your Director of Environmental Approvals, Agatha Garcia-Wright, which decision refused the request of our clients that the proponent MNRF prepare an indvidual environmental assessment ("IEA") examining the potential for clear-cut logging authorized under the WJFMP to release mercury to the environment, elevate mercury levels in water and fish, and produce adverse effects on the health of people who eat the fish, and (2) substitute an order directing that the MNRF comply with Part II of the *EAA* and examine through an IEA the potential for clear-cut logging authorized under the WJFMP to release mercury to the environment, elevate mercury levels in water and fish, and produce adverse effects on the health of people who eat the fish.

If our office has not received a copy of your (1) rescission order, and (2) substitution order by Tuesday, August 11, 2015, we have been instructed by Grassy Narrows to initiate proceedings in this matter, which proceedings may be broader in the scope of relief sought than the request contained in this letter.

Yours truly,
CANADIAN ENVIRONMENTAL LAW ASSOCIATION

Joseph F. Castrilli
Counsel

Richard D. Lindgren
Counsel

Court File No.

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

AFFIDAVIT OF ROGER FOBISTER, SENIOR

CANADIAN ENVIRONMENTAL LAW ASSOCIATION
130 SPADINA AVE., SUITE 301
TORONTO, ONTARIO M5V 2L4

Telephone: (416) 960-2284
Facsimile: (416) 960-9392

Joseph F. Castrilli (LSUC No. 26123A)
Richard D. Lindgren (LSUC No. 28529E)

Solicitors for the Applicants

Court File No.

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other
members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

AFFIDAVIT OF JOSEPH FOBISTER

I, JOSEPH FOBISTER, of Grassy Narrows, in the District of Kenora, AFFIRM AND SAY AS FOLLOWS:

1. I am a Band member of the Grassy Narrows First Nation ("Grassy Narrows"), and I have acted as advisor to former Chief Simon Fobister on logging issues, and negotiator for Grassy Narrows on logging issues between 2007 and 2014. I have continued to work with

current Chief Roger Fobister, Senior on the bump-up request referred to below and matters arising from that issue. As such I have knowledge of the matters hereinafter deposed to.

2. I live on property located on the Grassy Narrows Reserve. I fish in the English-Wabigoon river system and its watershed and I eat the fish that I catch from these waters. I mostly eat walleye, and to a lesser extent I eat pike, and lake trout, as did my father and most people in the Grassy Narrows community, as these are our traditionally preferred fish species. The river system runs through the Whiskey Jack Forest most of which, I have learned through elders in our community, we regard as our traditional territory, or homeland.

FIPPA REQUEST

3. As mentioned and referred to in the affidavit of Simon Fobister, Grassy Narrows and Earthroots filed a January 2014 bump-up request with the Ministry of the Environment and Climate Change ("MOECC") asking that the 2012-2022 Whiskey Jack Forest Management Plan ("Plan"), which had been approved by the Ministry of Natural Resources and Forestry ("MNRF") in December 2013, be subjected to an Individual Environmental Assessment ("IEA"). The purpose of the bump-up request was to examine the potential impacts on the environment and human health at Grassy Narrows from the release of mercury to the English-Wabigoon river system watershed caused by clearcut logging allowed under the Plan.

4. In conjunction with the bump-up request, and in an attempt to learn the extent to which existing or potential mercury impacts had been considered by MNRF before it made its December 2013 decision to approve the Plan, in late January 2014, I filed on behalf of Grassy Narrows a request for information with the MNRF under the *Freedom of Information and Protection of Privacy Act* ("*FIPPA*"). The purpose of the *FIPPA* request was to seek all records as defined under *FIPPA* that related to mercury contamination, or potential mercury contamination, or mercury in so far as such information related to the Plan and for the period 1997 to 2014. A copy of my *FIPPA* request is attached as Exhibit "A" to my affidavit.

5. In March 2014, I received correspondence from Laura Lee May, an MNRF Information Coordinator, who indicated that records responsive to my request would be captured within the records of those requested by another requester. A copy of the correspondence from Ms May is attached as Exhibit "B" to my affidavit.

6. In July 2014, I exchanged email correspondence with Bernadette O'Neill, a *FIPPA* Senior Analyst with MNRF in which I indicated that I only wished to receive records responsive to my request that were not provided to Earthroots, the source of the other request. As noted in the affidavit of David Sone in connection with the within application for judicial review, he also had made, in January 2014, a similar, but more specific, request of MNRF under *FIPPA*. Ms O'Neill advised me in her July email that there were no additional records responsive to just my request as all of the responsive records were

considered responsive to both requests. A copy of this exchange of email correspondence is attached as Exhibit “C” to my affidavit.

7. Because it would have duplicated information that Earthroots was receiving, or in the process of receiving, from MNRF, as well as needlessly expensive, I did not further pursue the Grassy Narrows *FIPPA* request but was content to wait for the results of the Earthroots *FIPPA* request in furtherance of receiving information we were both seeking in support of the January 2014 bump-up request about the extent to which mercury had been considered prior to the MNRF decision to approve the Plan.

SUPPLEMENTARY SUBMISSIONS FILED WITH MOECC

8. As mentioned and referred to in the affidavit of Chief Roger Fobister, Senior in the within application for judicial review, Grassy Narrows and Earthroots filed supplementary submissions in September and November 2014 with the Ministry of the Environment and Climate Change (“MOECC”). Earthroots also filed a July 2014 supplementary submission by itself, but also on behalf of Grassy Narrows, which is attached to the affidavit of Amber Ellis and David Sone, and that addresses information received as a result of *FIPPA* requests filed by Earthroots. These supplementary submissions were all in support of the January 2014 bump-up request.

9. In this regard, Chief Fobister authorized me to approve the filing of all three of the supplementary submissions, and to sign the September and Novermber submissions in his stead, on behalf of Grassy Narrows. As a result, I am familiar with all three of these

submissions, but particularly the September and November submissions as they relate to matters directly impacting the people of Grassy Narrows from a lay perspective. On scientific and technical issues generally, Earthroots took the lead as co-authors of the submissions.

SEPTEMBER 2014 SUPPLEMENTARY SUBMISSIONS

10. In September 2014, Grassy Narrows and Earthroots filed with MOECC supplementary submissions in support of the bump-up request. These supplementary submissions are attached as Exhibit “H” to the affidavit of Amber Ellis and David Sone of Earthroots. As can be seen from the September 2014 submissions, a significant portion of the document was devoted to summarizing expressions of concern and fears of future harm by members of the Grassy Narrows community communicated to the media and the Ontario government during the 15-year period from early 1999 to March 2014 on the issue of clearcut logging generally, and mercury releases anticipated from clearcut logging, including that to be authorized under the Plan. These are fears I share given my long experience living in the Grassy Narrows community.

11. The September 2014 submissions also reported numerous neurological ailments members of the Grassy Narrows community are experiencing that they fear are caused by their exposure to mercury because they have eaten fish caught in our waters that were contaminated by past industrial discharges of mercury to the river system and its watershed.

NOVEMBER 2014 SUPPLEMENTARY SUBMISSIONS

12. In November 2014, Grassy Narrows and Earthroots filed further supplementary submissions with MOECC in support of the January 2014 bump-up request. A copy of these submissions is attached as Exhibit "I" to the affidavit of Amber Ellis and David Sone. These submissions note, based largely on government documents or scientific studies, that subsistence fishing, an important component of the lifestyle and culture of the Grassy Narrows community and one that helps to strengthen our social fabric and traditions, has been severely damaged by mercury contamination. This is an observation I agree with from my first hand experience living in the Grassy Narrows community. I fear that clearcut logging would prolong and deepen the mercury problem throughout our traditional territory causing more damage to our health, culture, economy, and social fabric.

13. I affirm this affidavit in support of the within application for judicial review, and for no other or improper purpose.

AFFIRMED before me in the District of Kenora, in the Province of Ontario, this 26th day of August, 2015.

A Commissioner, etc.

ERICA STAHL

Joseph Fobister

JOSEPH FOBISTER

Joseph Fobister
General Delivery
Grassy Narrows
Ontario
P0X 1B0

This is Exhibit A referred to in the affidavit of JOSEPH FOBISTER
ES affirmed sworn before me, this 26th
day of AUGUST 2015
A COMMISSIONER FOR TAKING AFFIDAVITS
ERICA STAHL

January 31, 2014

Ms. Laura Lee May
Freedom of Information and Protection of Privacy Coordinator
Ministry of Natural Resources
Information and Privacy Unit
300 Water St.3rd Floor, North Tower
Peterborough, ON
K9J 8M5

Via Mail

Dear Ms. May:

Re: Request for Information under the Freedom of Information and Protection of Privacy Act

Please consider the following as a request for information under the *Freedom of Information and Protection of Privacy Act* (*FIPPA*):

We request all records as defined under *FIPPA* that relate to mercury contamination, the potential for mercury contamination or mercury in so far as information in these three areas relates to the forest management plan covering forest management activities for the Whiskey Jack Forest for the period 2012 – 2022.

We are requesting all records for the period covering January 1, 1997 to January 22, 2014.

Enclosed please find a cheque for the sum of $5.00 (five dollars) made payable to the Minister of Finance.

If you have any questions with respect to the above please do not hesitate to contact me at 807-407-2745 or via email at jbfobister@gmail.com.

Yours truly,

Joseph Fobister

Ontario

Ministry of Natural Resources

Information Management Section -Information,
Privacy & Records Management Unit
300 Water Street, 3rd Floor North
Peterborough, ON K9J 5M5

Phone (705) 755-1653
Fax (705) 755-1621

Ministere des Richesses naturelles

Section de la gestion de l'information
Unite de l'acces a l'information, de la protection de la vie privee
et de la gestion des documents
300, rue Water, 3e etage Nord
Peterborough, ON K9J 8M5
Telephone (705) 755-1653
Telecopieur (705) 755-1621

March 3, 2014

This is Exhibit B referred to in the affidavit of JOSEPH FOBISTER affirmed ~~sworn~~ before me, this 26th day of AUGUST 20 15

A COMMISSIONER FOR TAKING AFFIDAVITS
ERICA STAHL

Mr. Joseph Fobister
General Delivery
Grassy Narrows, Ontario POX 1 BO

MNR Reference Number: A-2014-000231BMO

Dear Mr. Fobister:

I am responding to your February 11, 2014 request, made under the Freedom of Information and Protection of Privacy Act (the Act), for

> "All records that relate to mercury contamination, the potential for mercury contamination or mercury ins so far as information in these three areas relates to the forest management plan covering forest management activities for the Whiskey Jack Forest for the period 2012-2022.
>
> All records for the period covering January 1, 1997 to January 22, 2014."

The Ministry received a request for similar information (see wording below) and based on discussions with staff in the Kenora District Office and the Northwest Regional Office they believe that the records responsive to your request would be captured within the records of the earlier request.

Wordlg of earlier request:

> all records as defined under FIPPA in the possession, management or control of the MNR from January 1, 1997 to January 22, 2014 that address, identify or evaluate:
>
> (a) the potential for logging activities (particularly clear cutting) authorized under the Forest Management Plan for the Whiskey Jack Forest for the period 2012-2022 to cause, or materially contribute torthe release of mercury into local watercourses;

(b) the potential for logging-related mercury releases to form methyl mercury that may be ingested, up taken or bioaccumulate within fish, wildlife or humans in the vicinity of the Whiskey Jack Forest;
(c) the likelihood or significance of the effects of logging-related mercury releases, or subsequent methyl formation, *upon fish,* wildlife *or humans in the vicinity of the* Whiskey Jack Forest;
(d) the mitigation measures needed to prevent, reduce or minimize logging-related mercury releases, methyl mercury formation and the above-noted impacts on ecosystem and human health in the vicinity of the Whiskey Jack Forest;
(e) the detailed requirements of an environmental monitoring program capable of detecting and assessing the logging-related mercury releases, rnethyl mercury formation and the above-noted impacts on ecosystem and human health in the vicinity of the Whiskey Jack Forest; and
(f) the detailed requirements of contingency measures or corrective action that will be taken by MNR (or logging companies) if logging-related mercury releases result in methyl mercury formation and cause the above-noted impacts upon ecosystem or human health in the vicinity of the Whiskey Jack Forest."

The Ministry has issued an interim fee decision on the earlier request and is waiting to hear if the requester wishes to proceed, We are asking the requester to pay 50% of the estimated fee and have also informed the requester that the Ministry is taking an additional 30 days to process the request. If the other request proceeds and you are willing to wait, then you will only have to pay for the photocopies of the records, which at this time we anticipate there being approximately 30 pages ($6.00).

However, if the requester in the earlier request does not wish to proceed or you are unwilling to wait then you will be required to pay the fee deposit. The estimated fee for the records that may be released has been calculated as follows:

Search time (7.50 hours x $30.00 per hour)	$225.00
Record preparation (0.25 hour x $30.00 per hour)	$7.50
Photocopies (30 pages x $0.20 per page)	$6.00
Total	**$238.50**

The Act states that a government organization may require a requester to pay a deposit equal to 50 percent of the estimated fee. Your written acceptance of the fee and a deposit of $119.25, payable to the Minister of Finance, is required before we can fully process your request. Please remit payment to:

_._-_M irri+ *rrrFe** a roes _____Information
Management Section
Information, Privacy & Records Management Unit 300
Water Street, 3rd Floor North
Peterborough, ON K9J 8M5

Visa or Mastercard payments can be made by calling Leeanne Battah at 705-755-1653 and providing your account number and expiry date.

Please contact Bernadette O'Neill at (705) 755-1625 fo' disduss how you would like to proceed.

Sincerely,

L.L. May

Laura Lee May
Information, Privacy and Records Management Coordinator

Attach.

Section 57 - Fees

1. A head shall require the person who makes a request for access to a record to pay fees in the amounts prescribed by the regulations for,
   (a) the costs of every hour of manual search required to locate a record;
   (b) the costs of preparing the record for disclosure;
   (c) computer and other costs incurred in locating, retrieving, processing and copying a record;
   (d) shipping costs; and
   (e) any other costs incurred in responding to a request for access to a record.

Estimate of costs

3. The head of an institution shall, before giving access to a record, give the person requesting access a reasonable estimate of any amount that will be required to be paid under this Act that is over $25.

Waiver of payment

4. A head shall waive the payment of all or any part of an amount required to be paid under subsection (1) if, in the head's opinion, it is fair and equitable to do so after considering,
   (a) the extent to which the actual cost of processing, collecting and copying the record varies from the amount of the payment required by subsection (1);
   (b) whether the payment will cause a financial hardship for the person requesting the record;
   (c) whether dissemination of the record will benefit public health or safety; and
   (d) any other matter prescribed in the regulations.

Review

5. A person who is required to pay a fee under subsection (1) may ask the Commissioner to review the amount of the fee or the head's decision not to waive the fee. R.S.O. 1990, c. F.31, s. 57(25).

Disposition of fees

6. The fees provided in this section shall be paid and distributed in the manner and at the times prescribed in the regulations.

O.-Rgg..46D-s 7

1. If a head gives a person an estimate of an amount payable under the Act and the estimate is $100 or more, the head may require the person to pay a deposit equal to 50 per cent of the estimate before the head takes any further steps to respond to the request.

2. A head shall refund any amount paid under subsection (1) that is subsequently waived.

This is Exhibit C referred to in the affidavit of JOSEPH FOBISTER
ES affirmed sworn before me, this 26th
day of AUGUST 2015.

A COMMISSIONER FOR TAKING AFFIDAVITS
ERICA STATHL

---------- Forwarded message ----------
From: **O'Neill, Bernadette (MNR)** <bernadette.oneill@ontario.ca>
Date: Thu, Jul 24, 2014 at 12:08 PM
Subject: RE: A-2014-00023/BMO
To: Joseph Fobister <jbfobister@gmail.com>
Cc: David Sone <david.sone@gmail.com>

Dear Mr. Fobister,

There were no additional records responsive to just your request. All of the responsive records were considered responsive to both requests.

Bernadette O'Neill

Senior Analyst, FIPPA

(705) 755-1625

From: Joseph Fobister [mailto:jbfobister@gmail.com]
Sent: Monday, July 21, 2014 11:06 AM
To: O'Neill, Bernadette (MNR)
Cc: David Sone
Subject: A-2014-00023/BMO

Good Morning.

Further to your letter of March 3, 2014, I request that you provide me with any records that are responsive to my request and that were not provided to Earthroots in response to its February 4, 2014 request under the *Freedom of Information and Protection of Privacy Act*.

Thank you,

Joseph Fobister

Court File No.

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

AFFIDAVIT OF JOSEPH FOBISTER

CANADIAN ENVIRONMENTAL LAW ASSOCIATION
130 SPADINA AVE., SUITE 301
TORONTO, ONTARIO M5V 2L4

Telephone: (416) 960-2284
Facsimile: (416) 960-9392

Joseph F. Castrilli (LSUC No. 26123A)
Richard D. Lindgren (LSUC No. 28529E)

Solicitors for the Applicants

Court File No.

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

AFFIDAVIT OF WILLIAM FOBISTER, SENIOR

I, WILLIAM FOBISTER, SENIOR, of Grassy Narrows, in the District of Kenora, AFFIRM AS FOLLOWS:

1. I am one of the applicants in the within application for judicial review, and as such have knowledge of the matters hereinafter deposed to.

2. I was a Councilor of the Grassy Narrows First Nation (hereinafter “Grassy Narrows”) Band Council from 1980 to 1992. I was the elected Chief of Grassy Narrows from 1992 to 2002. From 2003 until the present time, I have again been a Councilor of the Grassy Narrows Band Council.

3. I live on property located on the Grassy Narrows Reserve. Like many of our people, I fish various lakes, streams, and waters of the watershed that is part of the English-Wabigoon River System and I eat fish that I catch from these waterways. I have learned from elders in my community and I believe it to be true that this river system runs through our traditional territory, or homeland, in the Whiskey Jack Forest and that our people have always occupied and used it for traditional activities like hunting, trapping, fishing and harvesting of plants for food and medicine.

4. I was born on my family’s trapline in 1946. My father was a trapper and a small-scale commercial fisherman, and my siblings and I were raised in the Anishinaabe way. We grew up on a diet that consisted primarily of wild fish and game. I ate fish from the English-Wabigoon River System every day. While I loved it, we did not have other options: wild fish was the cheapest, most reliably available source of protein accessible to my family. We survived off of fishing growing up.

5. I left my traditional territory for four to five years (1954-1958) as a child to attend Residential School. Luckily, my father had already taught me how to fish and work the traplines. When I was thirteen years old I got my first job as a fishing guide in Grassy

Narrows. I worked as a guide through the late 1950s into the mid 1960s. When guiding, I ate fish multiple times a day. I also brought fish home to feed my family daily, including my wife when she was pregnant.

6. After I stopped working as a guide I continued to catch and eat fish from the English-Wabigoon River System multiple times a week. The government told us that the river was contaminated in 1970 after which my father had to shut down his commercial fishing operation. Wild fish remained an extremely important part of my diet, as it was cheap and accessible, and this is our traditional way of life as Anishinaabe people. I love my way of life.

7. To this day, I continue to catch and eat fish from the English-Wabigoon River System several times a week. I also catch and eat fish from lakes from our homeland upstream from the English-Wabigoon River System. Most of the fish that I eat is walleye, which is my favourite and traditional fish. It connects me to my family and my culture, and store-bought or frozen fish is not as good. Health Canada says that it is safe to eat whitefish and walleye from the English-Wabigoon River System if the walleye weighs less than one (1) pound. If I were to limit myself to walleye under one pound it would seriously limit my catch and make the effort of feeding my family with fish much greater as I would have to throw out much of my catch, as my net catches fish of all sizes.

8. I have been examined by the Mercury Disability Board and diagnosed with symptoms consistent with mercury poisoning. As a result of my exposure to mercury I have no

sense of taste, no sense of smell, tunnel vision, twitching and weakness in my legs, weakness and tingling in my hands, and intermittent tingling and cramps in my legs. I was found eligible for compenation by, and I receive $350.00 each month from, the Mercury Disability Board.

9. In April 2010, I was interviewed by the CBC regarding the effects I have experienced due to exposure to mercury. Exhibit “A” to my affidavit contains underlined excerpts of my comments to the CBC, which state: “During the ‘60s, we were in full bloom, fishing, guiding, everything, that we did and and we thought everything was okay. But not until we’re seeing some of our fish acting weird and dying off, that’s when…there is something wrong….My symptoms is my numbness and loss of sensation and my vision. My speech is kind of getting pretty sloppy. My taste, I lost my taste. I lost my smell. I can’t smell any more.” I have reviewed these excerpts and they are true and accurate. These excerpts were included in a larger document Grassy Narrows filed with the Ministry of the Environment in September, 2014 in an attempt to persuade the Ministry to examine through an individual environmental assessment the effects of mercury released by clearcut logging authorized by the Respondent Minister of Natural Resources for the Whisky Jack Forest (the “Plan”) for the period 2012 to 2022.

10. I have also been examined on several occasions by a team of doctors from Japan, lead by Dr. Masazumi Harada. Dr. Harada is now deceased but his diagnosis was, and that of his team remains, that I have mercury poisoning. Over time, my symptoms have gotten worse and I fear that my health will continue to deteriorate.

11. My wife was recently diagnosed with symptoms consistent with mercury poisoning, and two of my grandchildren have also been so diagnosed, by doctors in Canada. I tell my children and grandchildren not to eat too much fish. However, the other options are not good either. Moose and deer populations are declining in our traditional territory, and the shift from a purely traditional diet to one more reliant on Western foods is causing higher incidences of obesity and diabetes in our community. Store food is expensive and many of our people are poor. Also, the activity of catching, cleaning, and preparing fish, being out on the water, is healthy for our people, and an important part of our culture. When we stop fishing, it is sometimes replaced by idleness, which is not healthy.

12. I am extremely concerned about future mercury exposure. I do not believe that the discharges of mercury from the Dryden plant in the early 1960s have been cleaned up, and I am concerned that my family and I are being exposed to chronic, low-level doses of mercury from that source. I am even more concerned that additional mercury could be released from the forest floor as a result of clearcutting. I fear that my existing symptoms will get worse if I am exposed to yet more mercury. I fear for the health of my wife, children, and grandchildren. I cry when I think about my grandchildren and the suffering they have had to endure through no fault of their own.

13. Yet, despite my fears I will never give up eating fish from the English-Wabigoon River System. This land is who I am. Fishing is who I am. It connects me to my father and my

culture. Even if more mercury is allowed to enter the river system, I will not break my connection to my ancestors and my land. Grassy Narrows will never relocate.

14. I want my great-grandchildren and great-great-grandchildren to have a safe environment so they can grow up the way I grew up. I want them to be able to fish off the dock, and out on the trapline, and not worry about losing their sense of taste, experiencing seizures, or creeping weakness in their limbs. I am strongly opposed to the clearcut logging recently authorized by the Respondents under the Plan. I fear that it will release more mercury into the watershed, contaminate the fish we eat from those waters, and harm our health and well-being. I have read sections 7 and 15(1) of the *Canadian Charter of Rights and Freedoms*. I believe the decision of the Respondents to approve clearcut logging and not study its effects on the people of Grassy Narrows would be in violation of our legal and equality rights under those sections. We do not want clearcut logging on our territory, and the Respondents have failed to present an acceptable alternative.

15. I affirm this affidavit in support of the within application for judicial review, and for no other or improper purpose.

AFFIRMED before me in the City of Toronto, in the Province of Ontario, this 30th day of July 2015

Joseph Castrilli

A Commissioner, etc.

JOSEPH CASTRILLI

William Fobister, Senior

This is Exhibit "A" referred to in the affidavit of WILLIAM FOBISTER, SENIOR sworn before me, this 30th day of JULY 20 15

affirmed

Joseph Castrilli
A COMMISSIONER FOR TAKING AFFIDAVITS

JOSEPH CASTRILLI

Sept. 4, 2004	Aboriginal leaders in northwestern Ontario call for a public inquiry after an international health expert says people living in the area are still showing effects of mercury poisoning. Dr. Masazumi Harada, a world-renowned neurologist, says that the conditions of people exposed to mercury three decades ago have stayed the same or worsened.[4]
Feb. 2006	A Grassy Narrows letter to logging companies states that decades of unsustainable logging have poisoned waters with mercury and other toxins, interfered with economic opportunities and nearly eliminated the ability to practice an aboriginal way of life. Spokesman Joseph Fobister says: "We have participated fully in planning for many years, and our concerns are never properly considered," he said. "We are never treated as equal partners in the process. What's worse, our attendance at the information sessions and open houses is misconstrued as participation or approval".[5]
Apr. 5, 2010	CBC reports on continuing impacts of mercury in Grassy Narrows, including impacts on children. [This is a 5-page transcript – the following excerpts cover just the statements of three people interviewed – Sherry Fobister, a Grassy Narrows resident, Bill Fobister, former Chief of Grassy Narrows, and Steve Fobister, Grassy Narrows Chief in 1983]. "Sherry Fobister: 'I feel angry knowing that something that happened in the '60s, you know...Like, how it affected my

[3] D. Bueckert, "Mercury poisoning issue back 30 years later, disease signs present in Indians", The Toronto Star (July 28, 2003).

[4] CBC, "Ontario reserves demand inquiry into mercury poisoning" (September 4, 2004); < http://www.cbc.ca/news/canada/ontario-reserves-demand-inquiry-into-mercury-poisoning-1.515484 >.

[5] "Forestry firms under fire at Grassy Narrows", February 28, 2006. Globe and Mail (online?); < http://freegrassy.net/2006/02/28/forestry-firms-under-fire-at-grassy-narrows/#sthash.zzdz53a4.dpuf >

family....' . Bill Fobister: 'During the '60s, we were in full bloom, fishing, guiding, everything, that we did and we thought everything was okay. But not until we're seeing some of our fish acting weird and dying off, that's when ...there is something wrong.' Bill Fobister: 'My symptoms is my numbness and loss of sensation and my vision. My speech is kind of getting pretty sloppy. My taste, I lost my taste. I lost my smell. I can't smell any more.' Steve Fobister: 'I don't think, you know, it's right to say, look, you know, you don't have to go trapping. You can live on welfare....My whole nervous system is out of whack, you know, I can't barely walk and, you know, I have to hold my jaw to talk because my muscles are practically gone...[As a fishing guide, he] had [to eat what he caught even after the mercury was discovered] We had to do this in order to appease our guests that the fish was ok. The tourist camp owners encouraged us to do it...[Dr. Harada, during his return to Grassy Narrows in March 2010, said to Steve Fobister] 'You know you have some kind of a metal poisoning' And the closest definition to [Harada's] examination...it's got to be mercury'...'I only have one granddaughter. She's the one who kind of possesses violent seizures.' Sherry Fobister: '[Ms Fobister ate fish when she was pregnant]...it's [eating fish] a part of life, you know...I love eating fish. It's a delicacy...it's part of our lifestyle. I don't know, I still eat it to this day. [no one told her not to eat fish when she was pregnant].[6]

Apr.7, 2010 — Grassy Narrows' members and supporters protest in Toronto at the provincial legislature calling for justice for mercury survivors and an end to clearcutting. A Grassy Narrows' press release quotes a Grassy Narrows mother: "When I was pregnant I couldn't afford to buy food at the store, so I ate what my grandfather brought home – mostly fish," explained Sherry Fobister, a young Grassy Narrows mother. "Now both my children are sick with strange illnesses, just like their cousins. I myself have tremors and numbness, but I don't qualify for compensation. Sometimes I can't afford to bring my kids to Winnipeg for treatment. I want everyone in Grassy Narrows tested." "As Chief in the 1970's, when the government first negotiated with us, I said that Grassy Narrows requires the control over our land and resources for our people to recover from the devastating impacts of mercury pollution on our health, our culture, and our economy. This is still true," said Grassy Narrows Chief Simon Fobister.[7]

2010 — Toronto Star reports that "Premier Dalton McGuinty responded to the chief's concerns by saying the province has a 'heavy responsibility' to study Harada's findings, because they conflict with what the federal government claims – that

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[6] CBC Television, The National (Transcript), "Years of mercury poisoning have not been kind to the people of Grassy Narrows" (Toronto: CBC, Apr. 5, 2010).

[7] < http://freegrassy.net/wp-content/uploads/2010/01/River_Run_Press_Release_April_71.pdf >.

Court File No.

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

AFFIDAVIT OF WILLIAM FOBISTER, SENIOR

CANADIAN ENVIRONMENTAL LAW ASSOCIATION
130 SPADINA AVE., SUITE 301
TORONTO, ONTARIO M5V 2L4

Telephone: (416) 960-2284
Facsimile: (416) 960-9392

Joseph F. Castrilli (LSUC No. 26123A)
Richard D. Lindgren (LSUC No. 28529E)

Solicitors for the Applicants

Court File No.

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

AFFIDAVIT OF SHERRY FOBISTER

I, SHERRY FOBISTER, of Grassy Narrows, in the District of Kenora, AFFIRM AND SAY AS FOLLOWS:

1. I am one of the applicants in the within application for judicial review, and as such have knowledge of the matters hereinafter deposed to.

2. I am a member of the Grassy Narrows First Nation ("Grassy Narrows") and I live on the Grassy Narrows Reserve. I eat fish caught in various bodies of water that form part of the watershed of the English-Wabigoon River System, which runs through our traditional territory, in the Whiskey Jack Forest. I learned about our traditional territory and the traditional activities, such as hunting, trapping, and fishing, that we continue to practice as did our ancestors, from elders in my community. They taught me these activities and how they are practiced throughout our traditional territory. Recently, I have learned that clearcut logging for this Forest was approved by the Respondents as part of a Forest Management Plan (the "Plan") for the period 2012 to 2022.

3. I was born in 1978 on the Grassy Narrows Reserve and have lived here my entire life, with the exception of the nine-year period 1992-2001 when I attended school during the week, first in Kenora, Ontario and later in Winnipeg, Manitoba, returning to the Reserve on weekends. Even while I was away at school, I continued to eat wild food from the English-Wabigoon area because my parents would send me food, including fish, from the region to supplement my diet.

4. I suffered from seizures as a child, and continued to suffer from them as a young adult. At the age of eighteen (18), I was diagnosed with a neurological condition by a doctor in Winnipeg.

5. I went on anti-seizure medications in order to control my seizures. I have not had a seizure for the last eight to ten (8-10) years.

6. After I moved back permanently to Grassy Narrows, I got a job at the Band Office, and now support my three children, ages fifteen (15), seven (7), and two (2). I also support my mother and my nephew. Both my eldest child and my nephew have been diagnosed with symptoms consistent with mercury poisoning and receive compensation from the Mercury Disability Board. I am currently getting my middle child tested by the Mercury Disability Board because he has the same or similar symptoms as my eldest child.

7. I follow the government's guidelines around fish consumption to minimize my family's exposure to mercury, but I am deeply concerned about further exposing myself and my family to the mercury that is already in the English-Wabigoon River System as a result of the past industrial discharge from the Dryden pulp and paper plant, as well as mercury that might come from clearcut logging allowed by the Plan.

8. In April 2010, I was interviewed by the CBC regarding the impacts I have experienced from mercury. Attached to my affidavit as Exhibit "A" are statements I made to the CBC at that time that state the following: "I feel angry knowing that something that happened in the '60s…Like, how it affected my family…" "[Ms Fobister ate fish when she was pregnant]…it's [eating fish] a part of life, you know…I love eating fish. It's a delicacy…it's part of our lifestyle. I don't know, I still eat it to this day. [no one told her not to eat fish when she was pregnant]." Exhibit "A" also contains other statements I made in April 2010 that appeared in a Grassy Narrows' press release, including: "When I was pregnant I couldn't afford to buy food at the store, so I ate what my grandfather

brought home – mostly fish….Now both my children are sick with strange illnesses, just like their cousins. I myself have tremors and numbness, but I don't qualify for compensation…" I have reviewed these statements and they are accurate and true. They were included in a larger document Grassy Narrows sent to the Ministry of the Environment in September, 2014 in an attempt to get the Ministry to examine the impacts of mercury from clearcut logging allowed by the Plan. A full copy of this document is attached as Exhibit "H" to the affidavit of Amber Ellis and David Sone in connection with this application for judicial review.

9. In my household we eat fish frequently. I support five (5) family-members, two of whom have serious disabilities, while earning a little over minimum wage, so I cannot afford to buy only store-bought meat. I supplement our diet with fish from the English-Wabigoon River System and, occasionally, wild game. In Grassy Narrows it is primarily women who are responsible for taking care of babies, children, and sick family members. The burden of caring for children and adults who are impacted by mercury falls mostly on women.

10. Given my family's current health problems resulting from mercury exposure, we avoid eating larger fish so as to minimize our mercury intake. Health Canada has told us that it is safe to eat fish that weigh less than one (1) pound. My family and I will continue to avoid eating the larger fish until Health Canada tells us that it is safe to eat them. I hope that happens as soon as possible. Elders in our community have taught me that eating fish is an important part of our culture, and safe fish is a healthy food good for children to eat.

11. It distresses me greatly to know that my daughter is suffering and may suffer for her whole life because of mercury. She deserves to live a good life and be happy. That the planned clearcut logging could make the mercury problem even worse, make my family even more ill, and deprive us and the whole Grassy Narrows community of our traditional diet of fish, scares and upsets me. I have read sections 7 and 15(1) of the *Canadian Charter of Rights and Freedoms* and I believe that approval and implementation of clearcut logging in our traditional territory violates my life, liberty, and personal security and that of my family by exposing us to more mercury and discriminates against us because we live on reserve and fish in our traditional territory.

12. It is an issue of cultural identity for me to be able to eat fish caught from our local waters. At Grassy Narrows, traditional feasts require the eating of traditional foods, such as fish we would catch, as well as wild game and wild rice. If the English-Wabigoon River System becomes further contaminated with mercury due to clearcut logging to the point that it is unsafe to eat the fish that are caught there, I will be forced to stop eating fish. Reducing the amount of fish that we can catch and eat would also deprive us of the many health benefits associated with eating fish, and the pride, happiness, peacefulness, healing, and self-sufficiency that comes from practising our fishing culture with our families. These are all things that improve my mental health and help to counter the feelings of depression, hopelessness, anxiety, and fear that I have experienced from living in a community suffering from mercury and having sick family members.

13. As a practical matter, I am uncertain that I could find other means of supplementing my family's food budget if we could not eat the fish we catch. My position would be untenable. My father is Steve Fobister. I hope that my children will be able to use his trapline as he has, including eating the fish from the many small lakes and streams in that area, including the lake that he calls Zagaatigooning-zaaga'iganish – Little Lake of the Dense Woods. I am concerned that this lake has extensive clearcut logging planned around it and I fear that such logging will contaminate fish in the lake with mercury.

14. I affirm this affidavit in support of the within application for judicial review, and for no other or improper purpose.

AFFIRMED before me in the District of Kenora, in the Province of Ontario, this 26th day of August, 2015.

A Commissioner, etc.
ERICA STAHL

Sherry Fobister

This is Exhibit A referred to in the
affidavit of SHERRY FOBISTER
ES affirmed ~~sworn~~ before me, this 26th
day of AUGUST 2015
A COMMISSIONER FOR TAKING AFFIDAVITS
ERICA STAHL

Sept. 4, 2004	Aboriginal leaders in northwestern Ontario call for a public inquiry after an international health expert says people living in the area are still showing effects of mercury poisoning. Dr. Masazumi Harada, a world-renowned neurologist, says that the conditions of people exposed to mercury three decades ago have stayed the same or worsened.[4]
Feb. 2006	A Grassy Narrows letter to logging companies states that decades of unsustainable logging have poisoned waters with mercury and other toxins, interfered with economic opportunities and nearly eliminated the ability to practice an aboriginal way of life. Spokesman Joseph Fobister says: "We have participated fully in planning for many years, and our concerns are never properly considered," he said. "We are never treated as equal partners in the process. What's worse, our attendance at the information sessions and open houses is misconstrued as participation or approval".[5]
Apr. 5, 2010	CBC reports on continuing impacts of mercury in Grassy Narrows, including impacts on children. [This is a 5-page transcript – the following excerpts cover just the statements of three people interviewed – Sherry Fobister, a Grassy Narrows resident, Bill Fobister, former Chief of Grassy Narrows, and Steve Fobister, Grassy Narrows Chief in 1983]. "Sherry Fobister: 'I feel angry knowing that something that happened in the '60s, you know...Like, how it affected my

[3] D. Bueckert, "Mercury poisoning issue back 30 years later, disease signs present in Indians", The Toronto Star (July 28, 2003).
[4] CBC, "Ontario reserves demand inquiry into mercury poisoning" (September 4, 2004); < http://www.cbc.ca/news/canada/ontario-reserves-demand-inquiry-into-mercury-poisoning-1.515484 >.
[5] "Forestry firms under fire at Grassy Narrows", February 28, 2006. Globe and Mail (online?); < http://freegrassy.net/2006/02/28/forestry-firms-under-fire-at-grassy-narrows/#sthash.zzdz53a4.dpuf >

family....' . Bill Fobister: 'During the '60s, we were in full bloom, fishing, guiding, everything, that we did and we thought everything was okay. But not until we're seeing some of our fish acting weird and dying off, that's when ...there is something wrong.' Bill Fobister: 'My symptoms is my numbness and loss of sensation and my vision. My speech is kind of getting pretty sloppy. My taste, I lost my taste. I lost my smell. I can't smell any more.' Steve Fobister: 'I don't think, you know, it's right to say, look, you know, you don't have to go trapping. You can live on welfare....My whole nervous system is out of whack, you know, I can't barely walk and, you know, I have to hold my jaw to talk because my muscles are practically gone...[As a fishing guide, he] had [to eat what he caught even after the mercury was discovered] We had to do this in order to appease our guests that the fish was ok. The tourist camp owners encouraged us to do it...[Dr. Harada, during his return to Grassy Narrows in March 2010, said to Steve Fobister] 'You know you have some kind of a metal poisoning' And the closest definition to [Harada's] examination...it's got to be mercury'...'I only have one granddaughter. She's the one who kind of possesses violent seizures.' Sherry Fobister: '[Ms Fobister ate fish when she was pregnant]...it's [eating fish] a part of life, you know...I love eating fish. It's a delicacy...it's part of our lifestyle. I don't know, I still eat it to this day. [no one told her not to eat fish when she was pregnant].[6]

Apr.7, 2010 — Grassy Narrows' members and supporters protest in Toronto at the provincial legislature calling for justice for mercury survivors and an end to clearcutting. A Grassy Narrows' press release quotes a Grassy Narrows mother: "When I was pregnant I couldn't afford to buy food at the store, so I ate what my grandfather brought home – mostly fish," explained Sherry Fobister, a young Grassy Narrows mother. "Now both my children are sick with strange illnesses, just like their cousins. I myself have tremors and numbness, but I don't qualify for compensation. Sometimes I can't afford to bring my kids to Winnipeg for treatment. I want everyone in Grassy Narrows tested." "As Chief in the 1970's, when the government first negotiated with us, I said that Grassy Narrows requires the control over our land and resources for our people to recover from the devastating impacts of mercury pollution on our health, our culture, and our economy. This is still true," said Grassy Narrows Chief Simon Fobister.[7]

2010 — Toronto Star reports that "Premier Dalton McGuinty responded to the chief's concerns by saying the province has a 'heavy responsibility' to study Harada's findings, because they conflict with what the federal government claims – that

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[6] CBC Television, The National (Transcript), "Years of mercury poisoning have not been kind to the people of Grassy Narrows" (Toronto: CBC, Apr. 5, 2010).

[7] < http://freegrassy.net/wp-content/uploads/2010/01/River_Run_Press_Release_April_71.pdf >.

Court File No.

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

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Court File No. **446 / 15**

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

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ONTARIO
SUPERIOR COURT OF JUSTICE

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APPLICATION RECORD

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Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, CHIEF SIMON FOBISTER
and
former CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO),
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

APPLICATION UNDER Section 2(1)
of the *Judicial Review Procedure Act*
R.S.O. 1990, c. J.1

SUPPLEMENTARY APPLICATION RECORD
VOLUME 1 OF 3

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Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

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Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

BETWEEN:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, CHIEF SIMON FOBISTER
and
former CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

- and -

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

(AMENDED) NOTICE OF APPLICATION TO DIVISIONAL COURT FOR JUDICIAL REVIEW

TO THE RESPONDENTS:

A LEGAL PROCEEDING HAS BEEN COMMENCED by the Applicants. The claim made by the Applicants appears on the following pages.

THIS APPLICATION for Judicial Review will come on for a hearing before the Divisional Court on a date to be fixed by the Registrar at the place of hearing requested by the Applicants. The Applicants request that this application be heard at Osgoode Hall, 130 Queen Street West, Toronto, Ontario, M5H 2N5.

IF YOU WISH TO OPPOSE THIS APPLICATION, to receive notice of any step in the application or to be served with any documents in the application, you or an Ontario lawyer acting for you must forthwith prepare a notice of appearance in Form 38A prescribed by the Rules of Civil Procedure, serve it on the Applicants' lawyer or, where

the Applicants do not have a lawyer, serve it on the Applicants, and file it, with proof of service, in the office of the Divisional Court, and you or your lawyer must appear at the hearing.

IF YOU WISH TO PRESENT AFFIDAVIT OR OTHER DOCUMENTARY EVIDENCE TO THE COURT OR TO EXAMINE OR CROSS-EXAMINE WITNESSES ON THE APPLICATION, YOU OR YOUR LAWYER MUST, IN ADDITION TO SERVING YOUR NOTICE OF APPEARANCE, SERVE A COPY OF THE EVIDENCE ON THE Applicants' lawyer or, where the Applicants do not have a lawyer, serve it on the Applicants, and file it, with proof of service, in the office of the Divisional Court within thirty days after service on you of the Applicants' application record, or not later than 2 p.m. on the day before the hearing, whichever is earlier.

IF YOU FAIL TO APPEAR AT THE HEARING, JUDGMENT MAY BE GIVEN IN YOUR ABSENCE AND WITHOUT FURTHER NOTICE TO YOU. IF YOU WISH TO DEFEND THIS PROCEEDING BUT ARE UNABLE TO PAY LEGAL FEES, LEGAL AID MAY BE AVAILABLE TO YOU BY CONTACTING A LOCAL LEGAL AID OFFICE.

Date: September 1, 2015
(Amended April 8, 2016)

Issued by "Effie Koubridis"

Registrar
Divisional Court
Superior Court of Justice
Osgoode Hall
130 Queen Street West
Toronto, Ontario M5H 2N5

~~TO: The Honourable Bill Mauro~~
~~Minister of Natural Resources and Forestry~~
~~c/o Legal Services Branch~~
~~Ministry of Natural Resources and Forestry~~
~~Whitney Block, Room 3420~~
~~99 Wellesley Street West~~
~~Toronto, Ontario M7A 1W3~~
~~Attention: Mr. Leith Hunter, Director~~

~~AND TO: The Honourable Glen Murray~~
~~Minister of the Environment and Climate Change~~
~~c/o Legal Services Branch~~
~~Ministry of the Environment and Climate Change~~
~~135 St. Clair Avenue West, 10th Floor~~
~~Toronto, Ontario M4V 1P5~~
~~Attention: Ms Halyna Perun, Director~~

~~AND TO: Attorney General of Ontario~~
~~Crown Law Office – Civil~~
~~8th Floor, 720 Bay Street~~
~~Toronto, Ontario~~
~~M7A 2S9~~
~~Attention: Mr. Troy Harrison, Director~~

~~Constitutional Law Branch~~
~~4th Floor, 720 Bay Street~~
~~Toronto, Ontario~~
~~M7A 2S9~~
~~Attention: Mr. Michel Helie, Director~~

TO: **MINISTRY OF THE ATTORNEY GENERAL**
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Lawyers for the Respondents

APPLICATION

This is an Application for judicial review of a provincial decision approving clearcut logging activities and refusing to order an individual environmental assessment ("IEA") regarding potential mercury contamination and adverse human health effects, arising from the approved activities.

The decision consists of two inter-related stages:

(1) a December 2013 decision by the Minister of Natural Resources and Forestry, or the Minister's designate (the "Natural Resources Minister"), approving a forest management plan ("Plan"), which allows clearcut logging of the Whiskey Jack Forest in northwestern Ontario under section 9 of the *Crown Forest Sustainability Act,* S.O. 1994, c. 25 ("*CFSA*"), and

(2) a December 2014 decision by the Minister of the Environment and Climate Change, or the Minister's designate (the "Environment Minister") refusing, under section 16 of the *Environmental Assessment Act,* R.S.O. 1990, c. E.18 ("*EAA*"), to grant a Part II order (or "bump-up") requested by the Applicants that would have allowed an IEA to be conducted on whether clearcut logging authorized under the Plan could:

(a) release mercury to the watersheds of and adjacent to the English-Wabigoon river system, which system runs through the

Whiskey Jack Forest most of which is part of the traditional territory of the Grassy Narrows First Nation ("Grassy Narrows"),

(b) contaminate fish therein, and

(c) increase the risk of harm to humans consuming the fish.

The Applicants challenge the approval of the Plan and the refusal of their request for a bump-up with respect thereto (collectively the "Decision") on the basis that the exercise of these statutory powers of decision infringe on the rights of their members (1) to life, liberty and security of the person as guaranteed by section 7 of the *Canadian Charter of Rights and Freedoms*, Part 1 of the *Constitution Act, 1982* being Schedule B to the *Canada Act 1982* (U.K.), c. 11 (the "*Charter*"), and (2) to equality under section 15(1) of the *Charter*.

The Applicants also challenge the Decision on other constitutional and administrative law grounds set out below.

1. The Applicants make application for:

Charter Remedies

(a) an order under section 24(1) of the *Charter* declaring that the Decision,

(i) infringes section 7 of the *Charter*, by depriving them of their life, liberty and security of the person in a manner not in accordance with the principles of fundamental justice;

(ii) infringes section 15(1) of the *Charter* by depriving them of their right to equality;

(b) an order under section 24(1) of the *Charter* setting aside the Decision;

(c) an order under section 24(1) of the *Charter* in the nature of mandamus directing the Environment Minister to authorize an IEA as requested by the Applicants;

(d) an interim and permanent order under section 24(1) of the *Charter* prohibiting the Natural Resources Minister from authorizing third parties, by licence or otherwise, from conducting clearcut logging in the Whiskey Jack Forest under authority of the Plan;

(e) an interim and permanent order under section 24(1) of the *Charter* enjoining third parties with a licence or other instrument from the Natural Resources Minister from conducting clearcut logging in the Whiskey Jack Forest under authority of the Plan;

Administrative Law Remedies

(f) an order declaring that:

(i) in failing to ensure that mercury releases would be prevented or mitigated, approval of the Plan by the Natural Resources Minister was without legal authority under the *CFSA* or, in the alternative, unreasonable; and

(ii) the refusal by the Environment Minister to grant a bump-up request so as to assess under an IEA potential environmental and

health impacts from mercury releases was without legal authority under the *EAA* or, in the alternative, unreasonable;

(g) an order quashing or setting aside:

(i) the Decision; and

(ii) any authorizations, licences, permits, or approvals by the Ministers, or their respective ministries, enabling implementation of the Plan to proceed, in whole or in part, before this Application has been heard and determined by this Honourable Court;

Remedies Based on the Federal Paramountcy Doctrine

(h) an order declaring that the Plan, by permitting release of mercury, a deleterious substance, into water frequented by fish, is contrary to, conflicts or is inconsistent with, section 36(3) of the federal *Fisheries Act*, R.S.C. 1985, c. F-14, and is thereby rendered inoperative to the extent of the conflict or inconsistency;

Costs

(i) an order requiring the Respondents to pay the Applicants costs of this Application if requested or, in the alternative, an order that all parties shall bear their own costs;

Other Relief

(j) such further or other relief as counsel may advise and this Honourable Court may permit.

Grounds for the Application

2. The Grounds for the application are:

The Parties

(a) The Applicants are:

(i) Chief Simon Fobister, ~~Senior,~~ the elected chief and a member of Grassy Narrows, and having the status of an "Indian" within the meaning of the *Indian Act*, R.S.C. 1985, c. I-5 ("*Indian Act*"), who is bringing this application on his own behalf and on behalf of all other members of Grassy Narrows;

(ii) Sherry Fobister, William Fobister, Senior, and ~~Simon~~ former Chief Roger Fobister, Senior each of whom is a member of Grassy Narrows, having the status of an "Indian" within the meaning of the *Indian Act*, who also bring this application on their own behalf and on behalf of all other members of Grassy Narrows; and

(iii) Grassy Narrows, a First Nation being among the Aboriginal peoples of Canada recognized under s. 35 of the *Constitution Act, 1982*, and having the status of a "band" within the meaning of the *Indian Act*. Members of Grassy Narrows live on and off the English River 21 Reserve (hereinafter the "Grassy Narrows Reserve"), a "reserve" within the meaning of the *Indian Act*. The members of Grassy Narrows, whose ancestors signed Treaty No. 3, are Anishinabe

(Ojibway) men, women, and children many of whom engage in the practice of traditional Anishinabe activities in their traditional territory, which are central to their identity, diet, culture, and economy, including by:

(A) fishing in the English-Wabigoon river system watershed, or adjacent watersheds, in the area that includes the Whiskey Jack Forest; and

(B) consuming fish caught from those waters.

(b) The Respondent Natural Resources Minister is responsible for the *CFSA*, Ontario's primary statute permitting logging of, and development and approval of forest management plans for, the Crown forests of Ontario.

(c) The Respondent Environment Minister is responsible for the *EAA*, Ontario's primary statute for examining the effects of undertakings, such as logging and related forest management activities on Crown lands in Ontario, on the natural environment, human life, and social, economic, and cultural conditions.

Overview

(d) The Applicants rely on fishing in the watershed of the English-Wabigoon river system as a significant part of their way of life, and on the consumption of area fish as a significant part of their diet. Existing

mercury pollution dating from the discharge of mercury by a Dryden, Ontario chlor-alkali plant into the same river system in the 1960s has had, and continues to have, a significant adverse impact, due to the consumption of mercury-contaminated fish, on the health and well-being of members of Grassy Narrows, including some of the individual Applicants who have been diagnosed with, or whose children have been diagnosed with, symptoms consistent with mercury poisoning. The Applicants fear that clearcut logging authorized under the Plan poses a serious risk of additional harm to the health and well-being of community members because it will trigger new releases of mercury to the watershed, increase the accumulation of mercury in the food chain, and prolong and exacerbate the existing mercury problem.

Historical Background: Industrial Discharges of Mercury in the English-Wabigoon River System

(e) Beginning in the 1960s, a chlor-alkali plant at Dryden, Ontario began discharging mercury into the English-Wabigoon river system, eventually discharging approximately 9,000 kilograms of mercury into the river system, which flows into and through the traditional lands and territory of the Applicants;

(f) Once in the water, the mercury was transformed by chemical-biological processes into methyl mercury, a nerve poison capable of bio-accumulating up the food chain, being ingested by fish, and adversely

impacting humans consuming methyl mercury-contaminated fish caught from waters in the aforementioned area;

(g) The consumption of methyl mercury-contaminated fish by members of Grassy Narrows resulted over the decades in serious, and well-documented, neurological harm and other adverse health impacts, many of which continue to afflict many members of Grassy Narrows to this day;

(h) Litigation by Grassy Narrows against the federal and Ontario governments, and the successor company to the original industrial discharger, resulted in a settlement in the 1980s and the payment of some compensation as well as the establishment of a mercury disability board to evaluate and compensate members of Grassy Narrows suffering on-going neurological harm and other adverse health impacts consistent with mercury poisoning arising from the industrial discharges of mercury into local bodies of water;

(i) The watershed of the English-Wabigoon river system where the industrial discharges of mercury took place encompasses most of the Whiskey Jack Forest;

(j) Fish within this watershed continue to have levels of mercury above, or near, the limit for safe human consumption;

(k) Grassy Narrows Reserve is located within the Whiskey Jack Forest itself.

The Whiskey Jack Forest Management Plan

(l) Starting in or about 2010 and continuing to late 2013, the Ministry of Natural Resources and Forestry ("MNRF") gave periodic public notice of its intention to develop a forest management plan that would authorize logging for the Whiskey Jack Forest, and sought from time to time public comment on various stages of what eventually became the approved Plan.

(m) Over this same 2010 to 2013 period, Grassy Narrows and other groups raised publicly through the media, and directly with the provincial government, their concern that the sole method of harvesting trees under the Plan, clearcut logging, would interfere with the rights of the members of Grassy Narrows and risked the release of new, or additional, sources of mercury into the region's watershed system, the potential for increased methyl mercury contamination of fish, and consequential harm, or further harm, to the health and well-being of members of Grassy Narrows consuming the fish.

(n) During the 2010 to 2013 period, and earlier, MNRF also was independently aware, through its own research and investigations, of the mercury problem arising from clearcut logging and the challenge of

preventing or mitigating it. Notwithstanding these concerns, the Natural Resources Minister approved the Plan in December 2013.

The Bump-up Request

(o) The notice of decision approving the Plan indicated that persons objecting to the decision could apply to the Ministry of the Environment and Climate Change ("MOECC") requesting a bump-up under the *EAA* that would, if approved, authorize an IEA to be performed before the Plan would be allowed to go into effect.

(p) Grassy Narrows, in conjunction with an environmental non-governmental organization not party to this application, filed such a request in January 2014 as well as supplementary submissions with supporting material in May, July, September, and November 2014.

(q) The initial request, the supplementary submissions of Grassy Narrows, and the response of MNRF demonstrated the need for an IEA, including:

(i) since the industrial discharges of mercury in the 1960s, clinical evaluations of members of Grassy Narrows show that many have suffered from, and continue to suffer from, a variety of neurological health problems attributable to eating methyl mercury contaminated fish caught in area waters;

(ii) peer-reviewed scientific studies show clearcut logging in boreal forests at latitudes similar to the Whiskey Jack Forest, leads to the presence, or increased presence, of methyl mercury in fish in watersheds where the logging takes place;

(iii) members of Grassy Narrows fear the health risks posed by eating mercury-contaminated fish but continue to do so for a variety of complex reasons, including because fishing and consumption of fish caught has always been part of their traditional way of life, diet, and culture, which they do not wish to lose, and because it is an affordable source of food in an impoverished community;

(iv) MNRF admitted that it makes no claims for the effectiveness of the only measures it proposes for the mitigation of mercury impacts to water from clearcut logging authorized under the Plan;

(v) MNRF personnel involved in preparation of, or comment with respect to, guidance materials for the Plan raised concerns that key measures proposed for use with the Plan would not be enforceable and would not adequately mitigate mercury releases to water and could, in fact, exacerbate them.

(r) Despite the above and related submissions and material filed by Grassy Narrows and admissions by MNRF, the Environment Minister, or his designate, refused the bump-up request of Grassy Narrows in December 2014, allowing implementation of the Plan to proceed. In doing so, the refusal decision specifically relied on the mitigation measures that MNRF disclaimed the effectiveness of in controlling mercury impacts, and simply imposed requirements for monitoring such measures during clearcut logging activity authorized under the Plan.

The Decision Violates the Section 7 *Charter* Rights of the Applicants

(s) Section 7 of the *Charter* declares that everyone has the right to life, liberty and security of the person and the right not to be deprived thereof except in accordance with the principles of fundamental justice.

Depriving Applicants of Right to Life, Liberty and Security of the Person

(t) The Decision violates the section 7 *Charter* rights of the Applicants by:

(i) Depriving them of their right to life guaranteed under section 7 by increasing their risk of death, illness or disease as a result of the approval and anticipated implementation of the Plan and corresponding refusal to examine beforehand, through an IEA, the potential impacts to them posed by consumption of mercury-contaminated fish arising from, or exacerbated by, clearcut logging authorized by the Plan in the Whiskey Jack Forest;

(ii) Depriving them of their right to liberty guaranteed under section 7 by undermining, or seriously compromising, their freedom to choose an environment in which to reside and in which to practice their traditional way of life, including fishing in their traditional territory, due to the serious risks they face, if they stay in the area, of neurological or other harm, or such further harm, as a result of eating fish caught in local waterways contaminated by methyl mercury caused by clearcut logging authorized by the Plan, and not studied beforehand, through an IEA;

(iii) Depriving them of their right to security of the person guaranteed under section 7 by:

(A) increasing the risk to their physical security by exposing them to health damage, or further health damage, including death or disability, due to approval and implementation of the Plan that will permit clearcut logging with known potential to release mercury into the watershed, contaminating fish, and leading to neurological and other harm to those consuming the fish, and not studying the issue beforehand through an IEA; and

(B) increasing the risk to their psychological security because the Decision constitutes serious state-imposed psychological stress arising from their fear that clearcut logging authorized by the Decision, which has been strongly linked in the scientific literature to runoff and bioaccumulation of mercury, will exacerbate the contamination of fish, as well as neurological and other health problems experienced by members of Grassy Narrows consuming the fish.

The Deprivations are not in Accordance with Principles of Fundamental Justice

(u) The Decision also constitutes a deprivation of the section 7 rights of the Applicants by not being in accordance with principles of fundamental justice.

Failure to Respect Sanctity of Human Life

(i) Given the history of mercury impacts on the members of Grassy Narrows, the Decision fails to respect the sanctity of human life, a substantive principle of fundamental justice, by risking further harm to human health and well-being, if not loss of human life, in the community from mercury exposure arising from approval and implementation of the Plan, which authorizes clearcut logging, and failing to examine the risks before hand through an IEA.

Denial of Procedural Protections

(ii) The Decision denies the Applicants procedural protections as it was made without their being able to appear before an independent body that could have considered these matters under three different statutes because:

(A) MNRF failed to promulgate a regulation setting out an appeal process for forest management plans as authorized under section 12 of the *CFSA*;

(B) MNRF and/or MOECC failed to classify by regulation forest management plans as instruments that are eligible for third party appeals under sections 38-48 of the *Environmental Bill of Rights, 1993*, S.O. 1993, c. 28 and O. Reg. 681/94 promulgated thereunder, which could have led to an independent public hearing with respect to the Plan;

(C) as a result of the Environment Minister refusing to grant the bump-up request, the Applicants were denied an opportunity:

(1) to obtain an IEA that could have provided in-depth study and consideration of the issue of mercury release to area waters and resulting health implications thereof, from the Plan's authorization of clearcut logging, matters of vital concern to their life, health, and well-being as consumers of fish from these waters; and

(2) to request an independent public hearing under sections 9.1-9.3 of the *EAA* with respect to the resulting IEA; and

(D) the substitution of a notice, comment, ~~and~~ consultation, and IEA request opportunity offered by MNRF/MOECC to Grassy Narrows was not adequate in the context of this case in comparison to a hearing before an independent body, particularly given the health threats posed by mercury to members of Grassy Narrows arising from clearcut logging authorized under the Plan, and the information known only to MNRF at the time respecting the limitations of its mercury mitigation measures. The MOECC, as the decision-maker in the IEA process, did not act in accordance with principles of fundamental justice in that it collaborated with MNRF, the Plan proponent, on

both MNRF's substantive submissions to, and on the ultimate decision of, MOECC, all without the knowledge of the Applicants.

Effects Grossly Disproportionate to Objectives

(iii) The effects of the Decision on the life, liberty, and security of the person of members of Grassy Narrows due to potential additional exposure to mercury and the failure to study same through an IEA before proceeding, are grossly disproportionate to the Decision's objectives of allowing the harvesting of trees in the Crown forest by clearcut logging.

Offends Basic Tenet of Legal System

(iv) The Decision also is not in accordance with principles of fundamental justice because it offends a basic tenet of the legal system by violating the equality rights of the Applicants under section 15(1) of the *Charter*, as set out below.

The Decision Violates the Section 15(1) *Charter* Rights of the Applicants

(v) Section 15(1) of the *Charter* declares that every individual is equal before and under the law and has the right to the equal protection and equal benefit of the law without discrimination and, in particular, without discrimination based on race, national or ethnic origin, colour, religion, sex, age or mental or physical disability.

(w) The Decision violates the section 15(1) *Charter* rights of the Applicants by: (1) creating a distinction based on grounds enumerated in, or analogous to, section 15(1); and (2) creating a disadvantage based on the distinction.

Creating a Distinction

(x) The Decision violates section 15(1) of the *Charter* by creating a distinction that:

(i) disproportionately burdens:

(A) members of Grassy Narrows who live within the watershed and who are identifiable by their Aboriginality, their place of residence, their historical and ongoing practice of traditional Aboriginal activities in their traditional territory, including fishing, all characteristics that are actually or constructively immutable, and which the government has no legitimate interest in expecting the people of Grassy Narrows to change in order to receive substantive equality under the law; and

(B) women of childbearing age in the community who must avoid consumption of methyl mercury-contaminated fish or risk exposing their unborn children to serious adverse health effects; and

(ii) ignores their pre-existing health disadvantage as a result of past consumption of methyl mercury-contaminated fish from local waters.

Creating a Disadvantage

(y) The Decision further violates section 15(1) of the *Charter* by creating a disadvantage on the basis of the above distinction that perpetuates the history of prejudice experienced by Aboriginal peoples in Canada in general, and the exposure to mercury suffered by members of Grassy Narrows in particular by authorizing, and refusing to examine beforehand through an IEA potential impacts to them posed by, clearcut logging that will trigger new releases of mercury into the local water system, thus effectively putting the members of Grassy Narrows in the position of either:

(i) giving up the fishing and other traditional activities in their traditional territory that are of significant importance to a band member's personal identity; or

(ii) further exposing themselves and their unborn children to harm due to consumption of fish contaminated by new releases of mercury to area waters.

The Decision is not justified by Section 1 of the *Charter*, or Disproportionately and Unreasonably Interferes with *Charter* Guarantees

(z) The violations of sections 7 and 15(1) of the *Charter* set out above do not constitute a reasonable limit demonstrably justified in a free and democratic society pursuant to section 1 of the *Charter*. The impugned Decision impairs the rights of the Applicants, does not advance a sufficiently important governmental objective and, in any event, fails to meet the proportionality requirements of section 1 of the *Charter*. Alternatively, the Decision, in seeking to meet statutory objectives, disproportionately and unreasonably interferes with protections guaranteed to the Applicants under sections 7 and 15(1) of the *Charter*.

The Decision Violates Administrative Law Principles

(aa) In making the Decision, the Ministers, or their designates, erred in law and/or acted beyond or without jurisdiction in that:

(i) there was no evidence that the mercury mitigation measures proposed pursuant to, or in conjunction with, the Plan would mitigate mercury impacts to the river system, avoid contamination of fish, or prevent serious risk of harm to members of Grassy Narrows consuming contaminated fish, and there was substantial evidence to the contrary;

(ii) the Natural Resources Minister failed to meet the purposes, duties, and conditions precedent imposed upon the Minister pursuant to

sections 1, 2, 9, and 68 of the *CFSA* and various manuals and guides promulgated thereunder, requiring the Minister to only approve a Plan that provides for the sustainability of the Crown forest ecosystem by meeting the social, economic, and environmental needs of present and future generations, as well as minimizing adverse effects to animal life and water;

(iii) the Environment Minister, in refusing to grant the bump-up request and order that an IEA be conducted and in allowing, without the knowledge of the Applicants, MOECC to collaborate with MNRF during the decision-making process with respect thereto, or failing to ensure such collaboration did not occur, acted unfairly or unreasonably, and failed to meet the purposes and duties imposed by sections 1, 2 and 16 of the *EAA* and declaration orders promulgated thereunder related specifically to forest management on Crown lands, to protect the environment, including human life;

(iv) relevant factors were not taken into account or, in the alternative, irrelevant factors were taken into account.

The Plan Conflicts, or is Inconsistent, with the Federal *Fisheries Act*

(bb) In authorizing the Plan under section 9 of the *CFSA*, which will allow clearcut logging operations causing or permitting the deposit of mercury, a

deleterious substance, into water frequented by fish, including the watersheds of and adjacent to, the English-Wabigoon river system, the Natural Resources Minister's decision conflicts or is inconsistent with the prohibition in section 36(3) of the *Fisheries Act* prohibiting such deposits and is thereby, pursuant to the federal paramountcy doctrine, inoperative to the extent of the conflict or inconsistency.

Constitutional and Statutory Provisions

(cc) *Canadian Charter of Rights and Freedoms*, Part 1 of the *Constitution Act, 1982* being Schedule B to the *Canada Act 1982* (U.K.), 1982, c. 11 (the "*Charter*"), sections 1, 7, 15(1), 24(1), 28;

(dd) *Constitution Act, 1982*, being Schedule B to the *Canada Act 1982* (U.K.), 1982, c. 11, section 35;

(ee) *Indian Act*, R.S.C. 1985, c. I-5;

(ff) *Crown Forest Sustainability Act*, S.O. 1994, c. 25;

(gg) *Environmental Assessment Act*, R.S.O. 1990, c. E.18;

(hh) *Environmental Bill of Rights, 1993*, S.O. 1993, c. 28 and O. Reg. 681/94;

(ii) *Fisheries Act*, R.S.C. 1985, c. F-14, section 36(3);

(jj) *Judicial Review Procedure Act*, R.S.O. 1990, c. J.1;

(kk) *Courts of Justice Act*, R.S.O. 1990, c. C.43;

(ll) *Rules of Civil Procedure*, R.R.O. 1990, Regulation 194.

(mm) Such further or other grounds as counsel may advise and this Honourable Court may permit.

Documentary Evidence

3. The following documentary evidence will be used at the hearing of the application:

(a) the record to be filed by the Respondent Ministers pursuant to section 10 of the *Judicial Review Procedure Act*, R.S.O. 1990, c. J.1;

Applicants' Application Record

(b) Affidavit of Simon Fobister, affirmed July 30, 2015;

(c) Affidavit of Amber Ellis and David Sone, sworn August 21, 2015;

(d) Affidavit of Chief Roger Fobister, Senior, affirmed August 26, 2015;

(e) Affidavit of Joseph Fobister, affirmed August 26, 2015;

(f) Affidavit of William Fobister, Senior, affirmed July 30, 2015;

(g) Affidavit of Sherry Fobister, affirmed August 26, 2015;

(h) Affidavit of David Sone, sworn August 21, 2015;

Applicants' Supplementary Application Record

(i) Affidavit of Dr. Richard Carignan, ~~to be~~ sworn February 18, 2016;

(j) Supplementary Affidavit of Dr. Richard Carignan, ~~to be~~ sworn February 18, 2016;

(k) Affidavit of Dr. Donna Mergler, ~~to be~~ sworn November 6, 2015;

(l) Affidavit of Dr. Anna Willow, ~~to be~~ sworn, February 18, 2016;

(m) Affidavit of Dr. Justin Podur, ~~to be~~ sworn, December 10, 2015;

(n) Affidavit of Stephen Kilburn, affirmed January 29, 2016;

(o) Affidavit of Steven Fobister, Senior, affirmed March 24, 2016;

(p) Supplementary Affidavit of David Sone, sworn March 9, 2016;

(q) Supplementary Affidavit of Joseph Fobister, affirmed March 22, 2016;

(r) Supplementary Affidavit of Chief Roger Fobister, Senior, affirmed March 9, 2016;

(s) Supplementary Affidavit of Simon Fobister, affirmed March 22, 2016;

(t) Supplementary Affidavit of William Fobister, Senior, affirmed March 9, 2016;

(u) Supplementary Affidavit of Sherry Fobister, affirmed March 24, 2016;

(v) Affidavit of Dr. Shigeru Takaoka, to be sworn _____, 2016;

(w) Affidavit of Dr. Tadashi Fujino, to be sworn _____, 2016;

(x) Affidavit of Dr. Akitomo Shimoji, to be sworn _____, 2016;

~~(n)~~(y) Such further or other material as counsel may advise and this Honourable Court may permit.

Date: September 1, 2015
(Amended April 8, 2016)

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Lawyers for the Applicants

Court File No. 446/15

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

SUPERIOR COURT OF JUSTICE
COUR SUPÉRIEURE DE JUSTICE
FILED / DÉPOSÉ

APR 08 2016

REGISTRAR / GREFFIER
DIVISIONAL COURT TORONTO
COUR DIVISIONNAIRE

CERTIFIED TO BE A TRUE COPY OF
ORIGINATING PROCESS ISSUED HEREIN

SOLICITOR FOR THE APPLICANT
AGENT

THIS IS TO CERTIFY THAT THIS DOCUMENT, EACH PAGE OF WHICH IS STAMPED WITH THE SEAL OF THE SUPERIOR COURT OF JUSTICE AT TORONTO, IS A TRUE COPY OF THE DOCUMENT ON FILE IN THIS OFFICE

LA PRÉSENT ATTEST QUE CE DOCUMENT, DONT CHACUNE DES PAGES EST REVÊTUE DU SCEAU DE LA COUR SUPÉRIEURE DE JUSTICE À TORONTO, EST UNE COPIE CONFORME DU DOCUMENT CONSERVÉ DANS CE BUREAU

DATED AT TORONTO THIS 8th DAY OF April 2016
FAIT À TORONTO LE JOUR DE

Effie Kavlichis
REGISTRAR DIVISIONAL COURT / GREFFIER

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

(AMENDED) NOTICE OF APPLICATION TO DIVISIONAL COURT FOR JUDICIAL REVIEW

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Lawyers for the Applicants

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

AFFIDAVIT OF RICHARD CARIGNAN

I, RICHARD CARIGNAN, of the City of Montreal, in the Province of Quebec, MAKE OATH AND SAY AS FOLLOWS:

1. I am a professional limnologist and ecologist. I hold a doctorate in limnology from McGill University and a Bachelor of Science degree in ecology from the University of Quebec at Montreal. I am currently a professor in the Department of Biological Sciences at the Université de Montreal where I teach courses in such subjects as ecotoxicology,

limnology, advanced limnology, and research methods with respect to these areas. I am also a member of the Interuniversity Research Group on Limnology and the Aquatic Environment and I have been an associate editor of the Canadian Journal of Fisheries and Aquatic Sciences. I am qualified to research and analyze issues involving freshwater lakes and effects on fish in such lakes from the introduction of materials arising from human and natural activities. I have conducted field research projects at such lakes in the Boreal forest of Quebec studying the effects of clear-cut logging on mercury levels in fish. I have published on this subject in a variety of peer-reviewed scientific journals. In this regard, I have reviewed the Forest Management Plan approved by the Ontario Ministry of Natural Resources and Forestry in December 2013 that allows clear-cut logging for the portion of the northwestern Ontario Boreal Forest known as the Whiskey Jack Forest. I have also reviewed related documents, such as the Ministry's Stand and Site Guide, which addresses mercury mitigation measures in relation to logging activities. A copy of my curriculum vitae is attached to Exhibit "A", below.

2. In January 2015 I was asked by counsel for Grassy Narrows to answer certain questions in a report on the potential effects of the December 2013 Forest Management Plan on mercury contamination in fish. The questions and my answers to them appear as part of my February 2016 expert report attached as Exhibit "A" to my Affidavit.

3. A copy of my Acknowledgement of Expert's Duty form is attached as Exhibit "B" to my Affidavit.

SWORN BEFORE ME in the City of Montreal, in the Province of Quebec, this ___ day of _____, 2016.

A Commissioner, etc.

_____
Richard Carignan

EXPERT REPORT

Grassy Narrows First Nation and Sherry Fobister, William Fobister, Senior, Simon Fobister and Chief Roger Fobister, Senior on their own behalf and on behalf of all other members of Grassy Narrows First Nation v. Minister of Natural Resources and Forestry (Ontario) and Minister of the Environment and Climate Change (Ontario), and the Attorney General of Ontario

Ontario Superior Court of Justice

(Divisional Court)

Prepared for

Joseph F. Castrilli and Richard D. Lindgren

Counsel, Canadian Environmental Law Association

130 Spadina Avenue, Suite 301

Toronto, Ontario

M5V 2L4

Report on the potential effects of the December 2013 Ontario Ministry of Natural Resources approved Whiskey Jack Forest Management Plan on mercury contamination in fish

Richard Carignan
Université de Montréal
February , 2016

_____
Richard Carignan

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Introduction

I am a professional limnologist and ecologist. I hold a doctorate in limnology from McGill University and a Bachelor of Science degree in ecology from the University of Quebec at Montreal. I am currently a professor at the Department of Biological Sciences at the Université de Montreal where I teach courses in such subjects as ecotoxicology, limnology, advanced limnology, and research methods with respect to these areas. I am also a member of the Interuniversity Research Group on Limnology and the Aquatic Environment and I have been an associate editor of the Canadian Journal of Fisheries and Aquatic Sciences. I am qualified to research and analyze issues involving freshwater lakes and effects on fish in such lakes from the introduction of materials arising from human and natural activities. I have conducted field research projects at such lakes in the Boreal forest of Quebec studying the effects of clear-cut logging on mercury levels in fish. I have published on this subject in a variety of peer-reviewed scientific journals. In this regard, I have reviewed the Forest Management Plan approved by the Ontario Ministry of Natural Resources and Forestry in December 2013 that allows clear-cut logging for the portion of the northwestern Ontario Boreal Forest known as the Whiskey Jack Forest. I have also reviewed related documents, such as the Ministry's Stand and Site Guide, which addresses mercury mitigation measures in relation to logging activities. My curriculum vitae appears in Appendix A of the Expert Report.

I have been asked by Joseph F. Castrilli and Richard D. Lindgren of the Canadian Environmental Law Association on behalf of Grassy Narrows First Nation to prepare an expert report that responds to several questions. I am solely responsible for the preparation of this report.

Questions

Question 1. What were the results of your studies on the effects of clear-cut logging? In particular:

1a. What effect, if any, did clear-cut logging have on mercury levels in piscivorous fish?

1b. What were the hypothesized mechanisms for mercury release and bioaccumulation?

1c. If effects were observed, what were their duration?

1d. What were your observations, if any, on the effect of fire on mercury levels in fish?

1e. If not covered by 1.d above, was there a difference between mercury impacts of clear-cutting and fire and, if so, what do you believe to be the reasons for the difference?

1f. What has research since your study generally found?

2. What effect, if any, could clear-cut logging planned under the FMP have on mercury levels in fish at Grassy Narrows? In particular:

2a. How do the watershed characteristics in the Whiskey Jack Forest (e.g. slope, soil types, forest type, geology, precipitation, percentage of wetlands, etc.) compare to those in your Québec study area and how likely are they to produce mercury effects after clear-cut logging?

2b. How likely is it, if at all, that the logging methods set out in the Plan could lead to mercury bio-accumulation?

2c. Please comment on the extent to which other FMP planned activities, such as scarification and thinning, could product mercury impacts?

2d. Please comment on the similarities and/or differences in the mitigation measures identified in the FMP (see Stand and Site Guide rationale) to those used in your Québec study site in terms of catchment disturbance thresholds, size of clear-cuts, nature of soil protections, size of riparian buffers, or other measures you wish to comment on, and what you would expect in terms of the ability of these respective measures to prevent, or not prevent, mercury impacts?

2e. Based on the landscape pattern map what, in your professional opinion, are the implications for mercury impacts, if any, of the proximity of currently planned cut-blocks to previous cut-blocks, or of the plan direction to create clear-cut areas as large as 7,900 ha?

2f. If not otherwise answered by you, what is your professional opinion on the effectiveness of the measures in the Stand and Site Guide, which the Stand and Site Guide Rationale suggests will control mercury impacts (e.g. measures to minimize soil compaction, measures to minimize hydrological disruption, riparian buffers, etc.)?

3. Please comment on whether clear-cut logging arising from the FMP is likely, or not likely, to compound the previous mercury problem at Grassy Narrows through cumulative effects, or otherwise. In particular:

3a. Does clear-cut logging proposed under the FMP risk, or not risk, increasing the release and bio-accumulation of mercury in bodies of water?

3b. Does clear-cut logging risk exacerbating, or not, pre-existing mercury conditions in the English-Wabigoon river system? In particular, (i) will it increase, or not, methylation of existing mercury in top layers of river sediment, (ii) will it decrease, or not, demethylation, (iii) will it decrease, or not, volatization, and (iv) will it increase, or not, supplies of fresh carbon and anoxic conditions?

3c. Please comment on whether headwater lakes upstream from the contaminated English-Wabigoon river system are likely, or not, to have elevated mercury levels in fish after clear-cut logging?

4. Please comment on whether selective logging would have greater, lesser, or no different impacts on the release of mercury than clear-cut logging? In particular:

4a. Would selective logging produce less, or more, hydrological impacts (e.g. raised water table, increased soil moisture, increased total flows) and soil impacts, than clear-cut logging?

4b. What are your views, if any, on the need for local experiments to confirm the effects of selective logging before allowing it as a substitute for clear-cut logging?

4c. What are your views, if any, on whether modified clear-cut logging methods such as measures to prevent soil damage, increased buffers, increased residuals, timing restrictions, measures to prevent hydrological disruption, etc., would prevent, or not prevent, mercury impacts to water/fish?

5. What is your general overall conclusion in light of your research on the capacity of clear-cut logging to increase mercury levels in fish in bodies of water in the Whiskey Jack Forest?

Organization of Expert Report

The Expert Report is organized to provide where appropriate both summary, followed by full, answers to the questions**.**

Overview

With an average concentration of about 0.05 ppm in crustal rocks, mercury (Hg) is a trace element which occupies the 66th rank in terms of abundance. Mercury occurs in nature as two oxidation states : Hg(0) and Hg(II). Elemental mercury [Hg(0)] is volatile and is the dominant form in the atmosphere, where its residence time exceeds one year. Because of its long atmospheric residence time, Hg (0) can circle the Earth many times before being eventually deposited as Hg(II) all over the globe. Natural sources of mercury to the atmosphere include evasion from oceans and other surface waters, rocks, top soils and vegetation, injection from volcanoes and other geothermal processes, and forest fires. Over the last centuries but especially since the mid 19th century, anthropogenic activities (coal burning, incineration, metal smelting and refining, artisanal gold mining, cement production and chloralkali plants) have become significant contributors to global mercury pollution. It is estimated that between 50% and 75% of the current global atmospheric Hg burden is contributed by anthropogenic sources. Mercury(II) naturally forms numerous inorganic and organic compounds including methyl mercury (MeHg or CH_3Hg^+), a potent neurotoxin which is bioamplified in food chains (Morel et al. 1998).

Summary and Full Answers to Questions

Question 1. What were the results of your studies on the effects of clear-cut logging? In particular:

1a. What effect, if any, did clear-cut logging have on mercury levels in piscivorous fish?

Summary Answer: Research conducted in the Quebec boreal forest strongly suggests that extensive clear-cut logging activities disrupt the natural cycling of mercury in watersheds and increase mercury levels in aquatic food webs. In cut lakes, mercury concentrations exceeded the advisory limit for human consumption (0.5 mg/g wet wt) from the World Health Organization in all top predatory species (northern pike, walleye and burbot).

Full Answer: In fish, total Hg is essentially present as MeHg. Between 1996 and 1998, total Hg levels were measured in northern pike (*Esox lucius*) found in 19 lakes with undisturbed (n=8), logged (n=4), or burned (n=7) catchments impacted in 1995 (Figure 1). The average Hg level in standard 560-mm northern pike, on a dry weight basis, was significantly higher in logged lakes (3.4 $mg \cdot g^{-1}$) than in reference lakes (1.9 $mg \cdot g^{-1}$). The average Hg concentration in burned lakes (3.0 $mg \cdot g^{-1}$) was intermediate, and did not differ significantly from those in logged and references lakes. The higher variability of Hg in pike from burned lakes in Figure 1 was attributed to the inclusion of one lake where low intensity fires cleared only 50% of the catchment.

Concentrations of Hg normalized to trophic position determined from isotopic composition yielded similar results. Mercury levels were above the World Health Organization safe consumption limit of 0.5 $mg \cdot g^{-1}$ or ppm (fresh weight) in all logged lakes. Mercury in northern pike was correlated with methyl mercury in zooplankton (+), total N (+), pH (–), alkalinity (–), sulfate (+), dissolved organic C loading (+), and light attenuation in lake water (+). Stepwise multiple regressions explained 79% of the variability in Hg in fish and included methyl mercury in zooplankton, pH, and sulfate as independent variables. Explained variability increased to 92% when a second-order lake with an exceptionally large drainage area was excluded. These results suggest that extensive clear-cut logging activities disrupt the natural cycling of Hg in watersheds and increase Hg levels in the aquatic biota.

Results pertaining to northern pike found in only 19 of the 38 lakes covered in the Carignan et al. studies were generalised to the entire fish communities present in all 38 lakes using stable isotopes to estimate trophic position and to correct for bioamplification effects (Garcia and Carignan 2005). Total mercury concentrations increased significantly with increasing fish trophic position (r^2 = 0.52, 0.49, and 0.30 for cut, reference and burnt lakes, respectively). Mercury concentrations in organisms at the base of the food chain in lakes with logged catchments were higher than that in reference lakes. In logged lakes, Hg concentrations in fish were significantly related to ratio of the clear-cut area to lake area (Figure 5). Applying Figure 5 to a 55 cm walleye having a 15N ratio of 7.9 per mil suggests that , on average, Hg concentration will increase from 0.24 mg/g to 0.51 mg/g (on a fresh weight basis) when the impact ratio (clear-cut:lake area) reaches 8. In other words, at a small impact ratio there is a small mercury increase, at a large impact ratio there is a large increase. The mercury increase is zero if the impact ratio is zero. The clear-cut area/lake area ratio was, in turn, significantly correlated with dissolved organic carbon (DOC). These findings suggest that differential loading of organic matter–bound Hg to lakes can affect Hg cycling. In addition, Hg concentrations exceeded the advisory limit for human consumption (0.5 mg/g wet wt) from the World Health Organization in all top predatory species (northern pike, walleye and burbot) found in cut and in two partially burnt lakes. None of the top predatory species exceeded 0.5 mg/g where fire had completely cleared the forest. Thus, high Hg concentrations in fish from harvested and partially burnt lakes may reflect increased exposure to Hg relative to undisturbed lakes.

The same region was revisited in 2000-2002 with the objective of evaluating the chemical and biological responses of lakes to clear-cut logging using a BACI (before/after control/impact) statistical approach. Water quality (DOC, TP and major ions), periphyton

biomass and Hg contamination were compared in 10 control and 8 lakes logged in 2001 and 2002 (Desrosiers et al. 2006). The BACI statistical analyses revealed a significant impact of logging on periphyton biomass (decrease; 0.6- to 1.5-fold) and MeHg accumulation (increase; 2- to 9.6-fold, Figure 2). Because periphyton is at the base of littoral food chains, the significant positive effect of logging on MeHg accumulation by periphyton strongly suggests that higher trophic levels (secondary consumers and fish) have been affected as well.

These Québec studies addressing directly the empirical links between watershed disturbances (fire or clear-cut logging), water quality and MeHg in the foodwebs of several lakes took advantage of the simultaneous occurrence of large fires and forest removal activities in the same region. For this reason, they have never been replicated elsewhere in the World. However, they have inspired several more studies reviewed in Bishop et al. (2009) and aimed at understanding the links between clear-cut logging and Hg mobilisation in aquatic systems. The studies reviewed in Bishop et al. (2009) generally supported our findings.

1b. What were the hypothesized mechanisms for mercury release and bioaccumulation?

Summary Answer: Dissolved organic matter is a known carrier of mercury to streams and lakes. Clear-cutting raises the water table of soils and increases the export of dissolved organic matter, mercury and methyl-mercury to lakes. Methyl-mercury is bioamplified along food webs resulting in human exposure through consumption of fish.

Full Answer: Mercury contamination of aquatic ecosystems and subsequent MeHg bioamplification are significant environmental problems of global extent which have been exacerbated by anthropogenic activities. A small fraction of mercury in natural waters is converted to MeHg by anoxic bacteria (Morel et al. 1998). Contrary to other Hg forms, MeHg can be accumulated and bioamplified along food webs resulting in human exposure through consumption of fish. Several environmental and biological factors can affect Hg methylation and accumulation in fish, including lake productivity, pH, alkalinity, sulfate and calcium concentrations, trophic position and age and growth (Hill et al. 1996; Hudson et al. 1994; Cabana et al. 1994; MacCrimmon et al. 1983). Humic matter, in particular, has been inferred as an important vector of Hg(II) from topsoils to lakes and streams (Kalbitz and Wennrich 1998; Kolka et al. 1999), and this may explain observed relationships between water color or dissolved organic carbon (DOC) and MeHg concentration in aquatic biota; furthermore, because colored DOC decreases light penetration and decreases MeHg photodegradation in surface waters (Sellers et al. 1996; O'Driscoll et al. 2006), under equal MeHg loading, the biota of colored lakes is expected to be more contaminated than that of clear lakes.

Forest removal by fire or logging increases soil temperature, runoff and DOC export to lakes (Hobbie and Likens 1973; Lamontagne et al. 2000; many others). Removal of the forest canopy by clear-cut logging or fire significantly reduces evapo-transpiration and normally causes a transient (years to decades) rise of the water table and an increase in runoff, thereby increasing the export of dissolved and particulate substances from catchments to the receiving waters. The impacts of forest removal by fire or logging on aquatic systems differ markedly, however. In the Carignan et al. studies, dissolved organic carbon (DOC) was up to threefold higher in cut lakes than in reference and burnt lakes (Figure 3). Compared with reference lakes, cut and burnt lakes had higher (two- to three-fold) concentrations of total phosphorus (TP) total organic nitrogen (TON, twofold), and K^+, Cl^-, and Ca^{2+} (up to sixfold). Nitrate and sulfate (SO_4^{2-}) concentrations were up to 60- and 6-fold higher, respectively, in burnt lakes than in reference and cut lakes. In most cases, impacts were directly proportional to the area harvested or burnt

divided by the lake's volume or area. The simple impact-intensity models generated from these observations correctly predicted the changes observed in three reference lakes harvested during the study. Collectively, these observations strongly indicate that clear-cut logging activities based on natural disturbance models do not mimic the chemical impacts of wildfire on streams and lakes. Logging mobilizes Hg from watersheds to lakes and streams with the amount of mobilization proportional to the clear-cut :lake area ratio whereas fire volatilizes Hg to the atmosphere (Woodruff and Cannon 2010).

Because clear-cutting significantly increases DOC export to lakes relative to wildfire, it was hypothesised that the supply of DOC-bound Hg to lakes and to their food webs would also increase. After clear-cutting and fires, the water table rises, the upper organic layer of the soil becomes waterlogged and more exposed to erosion, and the transfer of particulate matter and DOC to aquatic systems typically increases (Hobbie and Likens 1973). Since Hg^{++} strongly binds to the thiol (or sulfhydryl) groups of DOC in forest soils, its transfer to streams and lakes should also increase. Furthermore, the production of MeHg in the waterlogged sub-oxic or anoxic organic A_0 horizon of clear-cut soils is expected to increase. During high-intensity fires, however, most of the organic matter in the forest floor is mineralized and most of the liberated inorganic elements are leached to ground and surface waters (Bormann and Likens 1979) although some volatile elements, including Hg, are lost to the atmosphere (Sigler et al. 2003).

Analyses of MeHg in zooplankton collected in the same lakes (Garcia and Carignan 1999; Figure 4) confirmed that MeHg concentrations were significantly higher ($P < 0.01$) in zooplankton collected in lakes with recently logged catchments (135 ng·g dry weight^{-1}) than in lakes with recently burned (97 ng·g dry weight^{-1}) or undisturbed catchments (112 ng·g dry weight^{-1}). Methyl-mercury levels in zooplankton collected in burned and reference lakes were not significantly different. The increased contamination of zooplankton signifies that other components of the littoral and pelagic foodwebs, including pike and walleye will be contaminated as well. In these lakes, four variables (dissolved organic carbon, pH, dissolved oxygen, and immature zooplankton biomass) explained 43% of the variability in MeHg levels in bulk zooplankton. The presence of DOC in this statistical model supported the importance of catchment processes in the transfer of humic matter bound Hg to aquatic food webs.

1c. If effects were observed, what were their duration?

Summary Answer: After clear-cutting, the concentration of dissolved organic carbon (a known vector for mercury) in receiving lakes decreased at a rate of 10-15% per year. Methyl-mercury in short-lived organisms have likely followed similar trends. However, because Hg is bioamplified in food chains, the duration of excess Hg contamination is expected to last much longer in longer-lived top predators such as pike and walleye.

Full Answer: Some of the observed chemical effects occurred on different time scales (Figure 3). Mobile ions released by fire (K^+, Cl^-, SO_4^{2-}, NO_3^-) or harvesting (K^+, Cl^-) were rapidly flushed out of the catchment (50% decrease in 3 years) while other constituents (TP, TON, DOC, Ca^{2+}, Mg^{2+}) showed little change or were still increasing after three years. In particular, DOC concentrations in harvested lakes significantly decreased, but only at a rate of about 10-15% per year during the three years following impact. Because the transfer of Hg and DOC from catchments to lakes is expected to co-vary, Hg loading and MeHg contamination of short-lived organisms (phytoplankton, zooplankton and benthos) have likely followed trends similar to that of DOC. Mercury contamination in longer-lived top predators such as pike and walleye has only been followed for three years following clear-cut logging. However, because Hg is bioamplified

in food chains, the duration of excess Hg contamination is expected to last longer in longer-lived top predators. Bishop et al. (2009) estimated a 10 year duration for the increased Hg loading effect following a clear-cut. Because walleye can live up to 20-25 years in these lakes, increased Hg contamination may persist for more than 20 years.

1d. What were your observations, if any, on the effect of fire on mercury levels in fish?

Summary Answer: The average Hg concentration in northern pike collected in burnt lakes was similar to that of reference lakes and significantly lower than observed in clear-cut lakes when one lake with a partially and less severely burned watershed was removed from the dataset.

Full Answer: The impacts of forest removal by fire or logging on the chemical composition of aquatic systems differ markedly. As stated above (1b), DOC, a recognised Hg carrier, was up to threefold higher in cut lakes than in reference and burnt lakes (Figure 3). Compared with reference lakes, cut and burnt lakes had higher (two- to three-fold) concentrations of total phosphorus (TP) total organic nitrogen (TON, twofold), and K^+, Cl^-, and Ca^{2+} (up to sixfold). Nitrate and sulfate (SO_4^{2-}) concentrations were up to 60- and 6-fold higher, respectively, in burnt lakes than in reference and cut lakes. The average Hg concentration in northern pike collected in burnt lakes was similar to that of reference lakes and significantly lower than observed in clear-cut lakes when one lake with a partially (50.1%) and less severely burned watershed was removed from the dataset of Figure 1. The same effect of partial burns on high Hg levels in fish was observed when all species were considered and when Hg levels were normalized for trophic position (Garcia and Carignan 2005); Hg concentrations in fish from two partially burnt lakes were the highest observed. In these two lakes, substantial patches of crown fires and intact forest were left in the catchment compared to other burnt lakes, where fire was more severe and cleared the entire catchment area.

1e. If not covered by 1.d above, was there a difference between mercury impacts of clear-cutting and fire and, if so, what do you believe to be the reasons for the difference?

Summary Answer: Hot wildfires not only clear the forest, but also consume part of the forest floor (LFH horizon) where a large part of a watershed's mercury burden is stored. Being a volatile element, mercury stored in soils is expected to be at least partially lost to the atmosphere during fire.

Full Answer: Hot wildfires not only clear the forest, but also consume part of the forest floor (LFH horizon) where a large part of a watershed's Hg burden is stored. Being a volatile element, Hg stored in soils is expected to be at least partially lost to the atmosphere during fire (Sigler et al. 2003; Woodruff et al. 2010). This explains why DOC (a Hg carrier) export from burnt watersheds were considerably and significantly less than that observed in clear-cut watersheds. Furthermore, the large nutrient pulse which follows fire (Figure 3) normally stimulates primary production and causes a Hg decrease by biodilution at the base of the foodweb which propagates to higher trophic levels.

1f. What has research since your study generally found?

Summary Answer: Studies conducted elsewhere confirmed that logging operations generally increase mercury loading to streams and lakes.

Full Answer: Other studies of forestry effects have considered the concentrations and fluxes of Total Hg and/or MeHg in runoff. Porvari et al. (2003) showed in Finland that harvesting of a 7 ha stand increased Hg fluxes by a factor of four and MeHg by a factor of six. The increased fluxes resulted from both a doubling in runoff and concentration increases. It was difficult, however, to distinguish the effect of the harvest itself from the subsequent site preparation. Recent, unpublished data show that the harvest effect on this site has persisted for over 5 years (Porvari, pers. comm.). In a before/after study of clear-cutting impacts in a Thunder Bay (Ontario) watershed, Allan et al. (2009) reported that although no statistically significant changes occurred in post logging Hg concentrations, the export of MeHg and total Hg respectively increased by 81% and 116% after 22 months due to increased water yield. Such increased Hg loading from clear-cuts will increase in-lake Hg concentrations. Allan et al. (2009) further concluded that the increased Hg transport to aquatic systems was expected to persist for at least a decade.

2. What effect, if any, could clear-cut logging planned under the FMP have on mercury levels in fish at Grassy Narrows? In particular:

2a. How do the watershed characteristics in the Whiskey Jack Forest (e.g. slope, soil types, forest type, geology, precipitation, percentage of wetlands, etc.) compare to those in your Québec study area and how likely are they to produce mercury effects after clear-cut logging?

Summary Answer: In the Whiskey Jack Forest, there is a clear risk of increased mercury contamination following clear-cut logging. However, because of hydrologic and climatic differences between the Whiskey Jack Forest and other sites where research has taken place, a site-specific impact study would be necessary to confirm effects observed elsewhere.

Full Answer: The geomorphology and pedology of the Whiskey Jack Forest and of the Québec study site bear many resemblances. On both terrains, the moderate bedrock relief of only 50–70 m has been smoothed by a thin mantle of glacial till and sediment deposited in numerous glacial lakes covering ≈ 10-20% of the landscape. The Lake Wabigoon Ecoregion is comprised mainly of gneissic, granitic, and metavolcanic Precambrian bedrock (William et al. 2009) and has a similar geology to that of the Québec study site. Substantial areas, are characterised by bedrock exposures with limited (less than 2 m) unconsolidated matter. In Western Ontario, dystric brunisols dominate upland materials associated with thin moraine and glaciofluvial deposits while more eluviated ferro-humic podzols are encountered in the more humid Québec site.

According to the 2012-2022 Whiskey Jack Forest FMP, the most important forest units are: jack pine (24%), black or white spruce (17%), mixed hardwoods (14%), mixed conifers (12% and poplar (12%). With the exception of a larger prevalence of jack pine at the Whiskey Jack Forest, these percentages are similar to what is observed at the Québec study site (Carignan et al. 2000).

With a mean annual precipitation ranging between 565 and 724 mm (William et al. 2009), the climate of the Whiskey Jack Forest is relatively dry compared to that of the Québec study site, which annually receives ≈1000 mm of precipitation. The Whiskey Jack Forest is significantly influenced by the adjacent prairie climate, and seasonal weather patterns can include substantial periods of summer drought. The dryer climate results in a much lower mean

annual runoff (≈ 200 mm/y) than at the Québec study site (≈ 500 mm/y) and a less pronounced spring runoff (http://atlas.nrcan.gc.ca/site/english/maps/water.html).

As explained in Section 1, much of the excess Hg export and contamination associated with clear-cutting at the Québec site is thought to occur through increased DOC-Hg export following the rise of the water table due to reduced evapo-transpiration and possibly through increased MeHg production in waterlogged, sub-oxic and warm clear-cut soils. In other words, in clear-cut watersheds, the top of the summertime water table often intersects the warm organic LFH top layer at the Québec site, which favours Hg export to streams and lakes. Since annual runoff in the Whiskey Jack Forest is substantially lower than at the Québec site, waterlogged conditions are not expected to be as frequent, and Hg transfer to lakes and streams at the Whiskey Jack Forest should be lower than in Québec if other conditions (slope, thickness of unconsolidated deposits, catchment size) are equal. On the other hand, if similar forest biomasses are felled at both sites, the rise of the water table following clear-cut should be similar. Therefore, the formation of waterlogged sub-oxic soil zones where Hg methylation can occur on gently sloping terrain and near lakeshores and streams is also likely in the Whiskey Jack Forest.

Furthermore, because runoff is much lower in Northern Ontario than it is in central Québec, important in-lake properties such as water residence time, light penetration, DOC and Hg concentrations and dynamics likely differ between the two regions. For these reasons, my general conclusion is that there is a clear risk of increased Hg contamination, but that a site-specific impact study will definitely be necessary in the Whiskey Jack Forest.

2b. How likely is it, if at all, that the logging methods set out in the Plan could lead to mercury bio-accumulation?

Summary Answer: If the Québec results are applied to the Whiskey Jack Forest, mercury contamination problems due to planned clear-cut logging and excessive cut-block size are expected in several lakes. Note, however, that hydrology differs and food web structure may differ in both regions; for this reason, a site-specific impact study is recommended for the Whiskey Jack Forest.

Full Answer: The Québec studies reveal that large impacts of clear-cuts on lake chemistry are observed when the clear-cut:watershed area ratio exceeds about 0.2 (Carignan et al. 2000). Furthermore, significant impacts of clear-cuts on Hg levels normalised to trophic level in lake biota are observed in 1st order lakes when the clear-cut:lake area ratio exceeds about 2 (Garcia and Carignan 2005, Figure 5). However, these results only quantify the relationship between Hg levels in food webs and clear-cut logging in Québec; they cannot be directly applied to the prediction of Hg levels in walleye from the Whiskey Jack Forest because hydrology differs, because food web structure may differ and because such predictions are based on a knowledge of the trophic position of walleye in each lake of interest.

Nevertheless, in order to compare the importance of clear-cuts in the Whiskey Jack Forest to those of the Québec site, the Ontario Flow Assessment Tool (www.giscoeapp.lrc.gov.on.ca/web/mnr/wrip/ofat/Viewer/viewer.html) was used to delineate watersheds of 48 randomly selected lakes of varying sizes (0.1 – 43.4 km^2). These watersheds were then intersected with the cutblocks defined in the December 2013 Ontario Ministry of Natural Resources approved Whiskey Jack Forest Management Plan where the “HARVCAT” categories “REGULAR1” and “REGULAR2” were summed to estimate the size of the projected cutblocks for the entire duration of the 2012-2022 forest management plan.

The results (Table 1) indicate that if the Québec-specific impact indicators (water chemistry, Hg in fish) are applied to the Whiskey Jack Forest, Hg contamination problems due to planned clear-cuts and excessive cut-block size are expected in several lakes (highlighted in blue in Table 1). Furthermore, as revealed by a GIS analysis of previous clear-cuts in the Whiskey Jack Forest by Stephen Kilburn (2015), some of these lakes have already been impacted by clear-cuts performed in past decades. Note, however, that all the impacted lakes in our sample are rather small (0.11 – 1.78 km^2).

2c. Please comment on the extent to which other FMP planned activities, such as scarification and thinning, could product mercury impacts?

Summary Answer: Large effects of scarification and thinning compared to those of clear-cuts are not anticipated.

Full Answer: Insufficient scientific information exists on the effect of the various site-specific scarification procedures on Hg export to lakes and streams. However, large effects compared to those arising from the hydrological perturbations of the Hg cycle following large clear-cuts are not anticipated. The impact of thinning should be less pronounced than that of clear-cut logging because thinning leaves a substantial proportion of the forest cover unperturbed and does not affect evapo-transpiration and the hydrological balance as much as clear-cut logging does.

2d. Please comment on the similarities and/or differences in the mitigation measures identified in the FMP (see Stand and Site Guide rationale) to those used in your Québec study site in terms of catchment disturbance thresholds, size of clear-cuts, nature of soil protections, size of riparian buffers, or other measures you wish to comment on, and what you would expect in terms of the ability of these respective measures to prevent, or not prevent, mercury impacts?

Summary Answer: In my opinion, and as recognised in the Ontario Stand and Site Guide, the effects of harvesting and wildfire on water quality appear to be influenced by the relative extent of catchment disturbance, and not by shoreline buffers or other mitigation measures.

Full Answer: Although cut-block sizes are roughly comparable in Ontario and Québec, riparian buffers widths around stream and lakes differ considerably. In the publicly owned forest of Québec, buffers around streams and lakes are limited to 20 m beginning at the riparian-forest ecotone, and are often wind-blown after a few years. Québec regulations allow the removal of commercial stems within the 20-m buffer as long as the slope does not exceed 40% and as long as a minimum stem density of 500/ha is maintained for stems exceeding 10 cm.[1]

The Ontario Stand and Site Guide norms for conserving biodiversity at the stand and site scales are more complex[2]. Based on terrain slope, Ontario 'buffers/AOC' range from 30-90m on lakes and streams, but clear-cutting is allowed within the buffers to within 3m from the edge of woody vegetation, and within that 3m selective logging is allowed to remove approximately.

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1 http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=3&file=/A_18_1/A18_1R7.HTM

2 Ontario Ministry of Natural Resources, 2010. Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales – Background and Rationale for Direction.

50% of the cover. Other directive measures regarding rutting and soil compaction within AOC's are stated. However, in my opinion and as recognised in the Ontario Stand and Site Guide, the effects of harvesting and wildfire on water quality appear to be influenced by the extent of catchment disturbance, and not by shoreline buffers. Our studies in Québec indicate that it is the cut-block size relative the watershed and lake size that determine the severity of impacts by Hg contamination. In their present forms, the SSG rationales of both Ontario and Québec do not contain any directives regarding maximum catchment disturbance in relation to watershed or lake size.

2e. Based on the landscape pattern map what, in your professional opinion, are the implications for mercury impacts, if any, of the proximity of currently planned cut-blocks to previous cut-blocks, or of the plan direction to create clear-cut areas as large as 7,900 ha?

Summary Answer: It is not the absolute size of the cut-blocks that matters, but rather the relative size of all clear-cut areas within a watershed. In this regard, excessive mercury contamination may occur in many small lakes of the Whiskey Jack Forest.

Full Answer: The maximum size of the cut-blocks listed in the December 2013 Ontario Ministry of Natural Resources approved Whiskey Jack Forest Management Plan (Tables: FMP 12 Planned Clear-cuts > 260 Ha) is 7 905 ha. Most joined cut-blocks of this management plan are smaller than 300 ha. As noted above, according to our Québec observations, it is not the absolute size of the cut-blocks that matter, but rather the relative size of all clear-cut areas within a watershed. In this regard, Table 1 shows that excessive Hg contamination may occur in many small lakes of the Whiskey Jack Forest.

2f. If not otherwise answered by you, what is your professional opinion on the effectiveness of the measures in the Stand and Site Guide, which the Stand and Site Guide Rationale suggests will control mercury impacts (e.g. measures to minimize soil compaction, measures to minimize hydrological disruption, riparian buffers, etc.)?

Summary Answer: Excess mercury contamination likely arises from a general rise of the water table and flooding of organic soil layers following the reduction of forest transpiration after clear-cuts. Such catchment-level disturbances are ignored in the Ontario SSG.

Full Answer: Although the general forest management practises presented in the Stand and Site Guide appear generally more respectful of the environment than current practises observed in Québec, they do not include any specific measures to limit Hg bioaccumulation in the aquatic biota. As explained above (2b, 2d), excess Hg contamination likely arises from a general rise of the water table and flooding of organic soil layers following the reduction of forest transpiration after clear-cuts. Such catchment-level disturbances are ignored in the Ontario SSG. There is currently no experimental evidence showing that quantitative thresholds on the amount or depth of rutting or other alterations of the micro-scale hydrological connectivity will prevent mercury impacts. In my opinion, such thresholds will not lessen Hg-related problems in the receiving lakes and streams.

3. Please comment on whether clear-cut logging arising from the FMP is likely, or not likely, to compound the previous mercury problem at Grassy Narrows through cumulative effects, or otherwise. In particular:

3a. Does clear-cut logging proposed under the FMP risk, or not risk, increasing the release and bio-accumulation of mercury in bodies of water?

Summary Answer: The Whiskey Jack FMP is likely to increase Hg bioaccumulation in fish caught in some small lakes where the size of cut-blocks is large relative to watershed area or lake area.

Full Answer: The Whiskey Jack FMP is likely to increase Hg bioaccumulation in fish caught in some small lakes (Table 1) draining watersheds where the size of cut-blocks is large relative to watershed area or lake area. However, because of the very different hydrological context between Québec and the Whiskey Jack Forest, a site-specific study would be necessary to ascertain the effects of current clear-cut logging practises on Hg contamination in fish.

3b. Does clear-cut logging risk exacerbating, or not, pre-existing mercury conditions in the English-Wabigoon river system? In particular, (i) will it increase, or not, methylation of existing mercury in top layers of river sediment, (ii) will it decrease, or not, demethylation, (iii) will it decrease, or not, volatization, and (iv) will it increase, or not, supplies of fresh carbon and anoxic conditions?

Summary Answer: The impact of the Whiskey Jack FMP alone on the Hg cycle of the English-Wabigoon river system is most likely negligible. However, if the annual forest removal rate (about 0,7% per year or 7% per decade) of the Whiskey Jack FMP is extrapolated to the entire English-Wabigoon watershed, current forestry practises in Ontario may increase Hg contamination in a detectable manner.

Full Answer: The watershed of the English-Wabigoon river system is very large (48 700 km^2 at the outlet of Separation lake) relative to the total area of all cut-blocks (≈440 km^2) planned within the Grassy Narrows First Nation territory (≈6 800 km^2) under the Whiskey Jack FMP. Therefore, the impact of the Whiskey Jack FMP alone on the Hg cycle of the English-Wabigoon river system is most likely negligible. Nevertheless, if the annual forest removal rate (about 0,7% per year or 7% per decade) of the Whiskey Jack FMP is extrapolated to the entire English-Wabigoon watershed, current forestry practises in Ontario may increase Hg contamination in a detectable manner. For example, after reviewing several studies conducted in Canada, Finland, the United-Sates and Sweden, Bishop et al. (2009) estimated that under a 1% annual forest removal rate scenario, Hg concentration in fish would increase by 10% to30%. Changes anticipated in smaller watersheds and upstream lakes will likely propagate to larger river systems such as the English-Wabigoon where previous Hg contaminations problems are well documented.

3c. Please comment on whether headwater lakes upstream from the contaminated English-Wabigoon river system are likely, or not, to have elevated mercury levels in fish after clear-cut logging?

Please see 2a and 2b.

4. Please comment on whether selective logging would have greater, lesser, or no different impacts on the release of mercury than clear-cut logging? In particular:

4a. Would selective logging produce less, or more, hydrological impacts (e.g. raised water table, increased soil moisture, increased total flows) and soil impacts, than clear-cut logging?

Full Answer: Compared to clear-cut logging, selective logging in cut-blocks of identical sizes than those of the Whiskey Jack FMP would likely reduce hydrological flow and reduce Hg export to the aquatic environment arising from lessened transpiration.

4b. What are your views, if any, on the need for local experiments to confirm the effects of selective logging before allowing it as a substitute for clear-cut logging?

Summary Answer: Comprehensive before/after impact observations lasting at least three years and involving at least five controls, five clear-cut and five selectively cut 1st order lakes where walleye is present should be initiated in order to derive forestry practises that are respectful of the aquatic environment.

Full Answer: As already stated under 2a, hydrological conditions at the Québec site are different from those prevailing in Northwestern Ontario. For this reason, the Québec results can probably not be directly applied to the Whiskey Jack region. Nevertheless, the Québec results strongly suggest that the Ontario MNR should be concerned about the potential local link between clear-cut logging and Hg contamination. Comprehensive before/after impact observations lasting at least three years and involving at least five controls, five clear-cut and five selectively cut 1st order lakes where walleye is present should be initiated in order to derive forestry practises that are respectful of the aquatic environment.

4c. What are your views, if any, on whether modified clear-cut logging methods such as measures to prevent soil damage, increased buffers, increased residuals, timing restrictions, measures to prevent hydrological disruption, etc., would prevent, or not prevent, mercury impacts to water/fish?

Full Answer: As stated above, the Québec studies indicate that it is the substantial rise of the water table during several years following clear-cut logging that leads to increased Hg in fish. Mitigating measures such as soil damage prevention, increased buffers, increased residuals and timing restrictions may alleviate the problem, but will have very little effects on the rise of the water table, increased runoff following a clear-cut, and the increase in Hg contamination. Region-specific guidelines should be derived from a region-specific study on the impacts of logging on the aquatic Hg cycle.

5. What is your general overall conclusion in light of your research on the capacity of clear-cut logging to increase mercury levels in fish in bodies of water in the Whiskey Jack Forest?

My general conclusion is that there is a clear risk of increased Hg contamination, but that a site-specific impact study will definitely be necessary to orient sustainable forestry practices in the Whiskey Jack Forest.

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FIGURES

Figure 1. Box plots showing median values and 10th, 25th, 75th, and 90th percentiles of Hg in 560-mm northern pike, expressed on a dry weight basis, from logged (*N* = 4), burned (*N* = 7), and reference lakes (*N* = 8). Letters on top of the boxes indicate between-treatment differences: boxes with different letters are significantly different (Wilcoxon–Mann–Whitney test, $p < 0.01$). Note that in burned lakes, the highest Hg concentration was found in a lake with a partially (50.1%) burned watershed; when this lake is removed from the dataset, logged and burned lakes become significantly different. From Garcia and Carignan (2000).

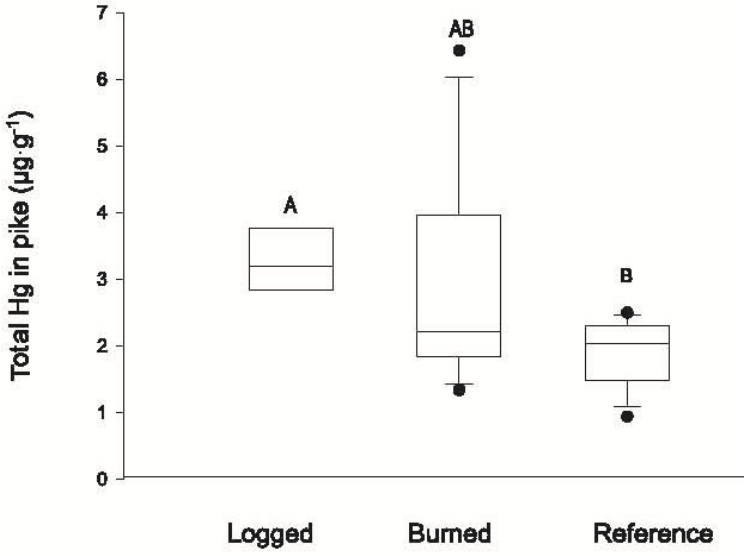

Figure 2. Periphyton methylmercury concentrations (MeHg; ng Hg·g–1 dry mass (DM); mean ± standard error) in experimental lakes sampled before and two consecutive summers after logging. Different letters indicate significant mean differences within years (one-way analysis of variance, $p < 0.01$). From Desrosiers et al. (2006).

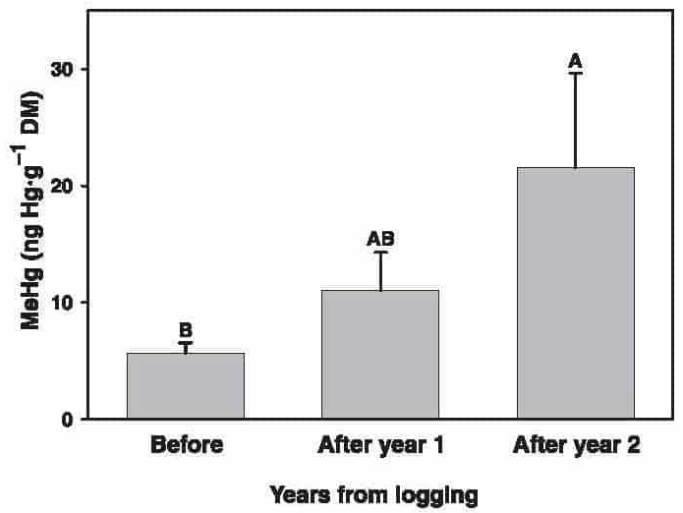

Figure 3. Box plots showing median values with the 25th and 75th and the 5th and 95th percentiles of annual average concentrations of dissolved constituents and of the light extinction coefficient ePAR in reference (open boxes, *n* = 17), cut (hatched boxes, *n* = 7), and burnt lakes (cross-hatched boxes, *n* = 9). The thick horizontal lines indicate between-treatment differences: for a given year, boxes with different levels are significantly different. Arrows on top of the boxes indicate significant increasing or decreasing trends with time compared with the reference group (paired RMA). Two lakes (C40 and C44) where only a small portion of the catchment had been harvested are excluded from these analyses. From Carignan et al. (2000).

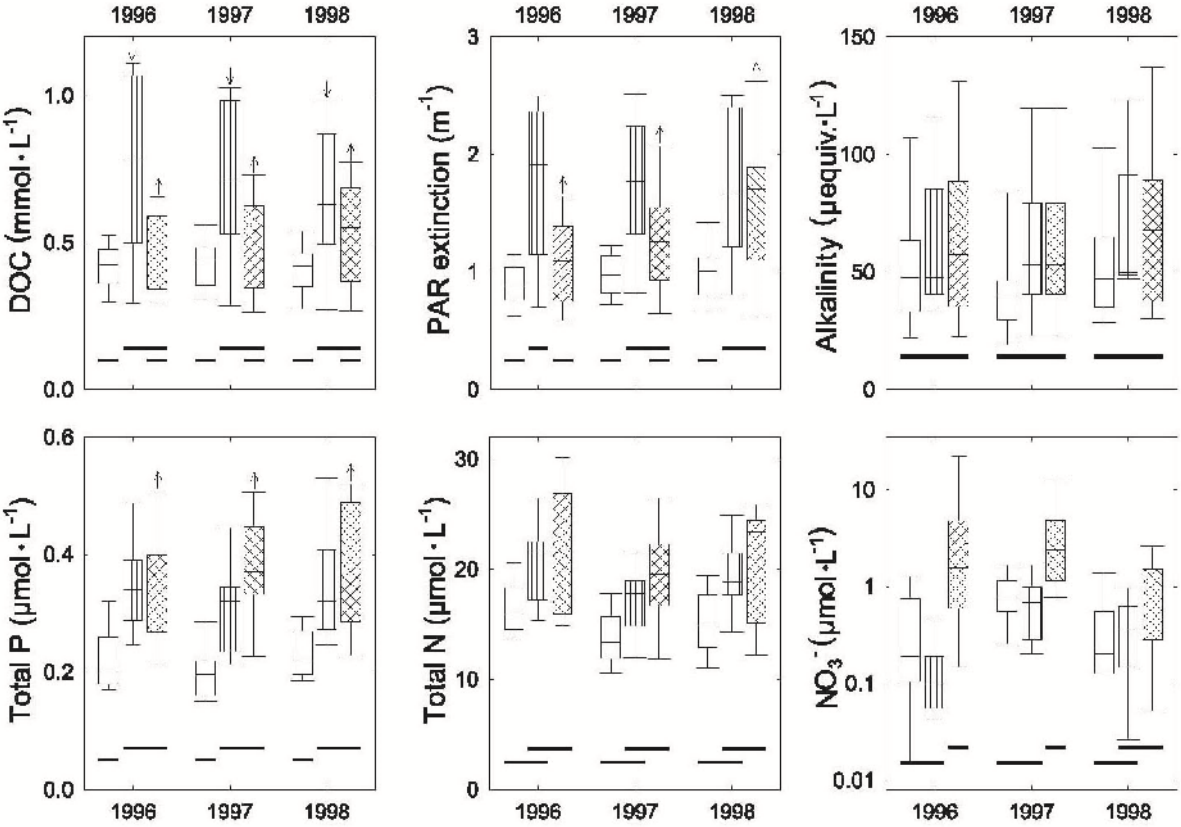

Figure 4. (A) MeHg levels in zooplankton and (B) DOC in water from logged (*N* = 9), burned (*N* = 9), and reference lakes (*N* = 20). Values are averages for each sample period. Error bars represent 1 SE. From Garcia and Carignan (1999),

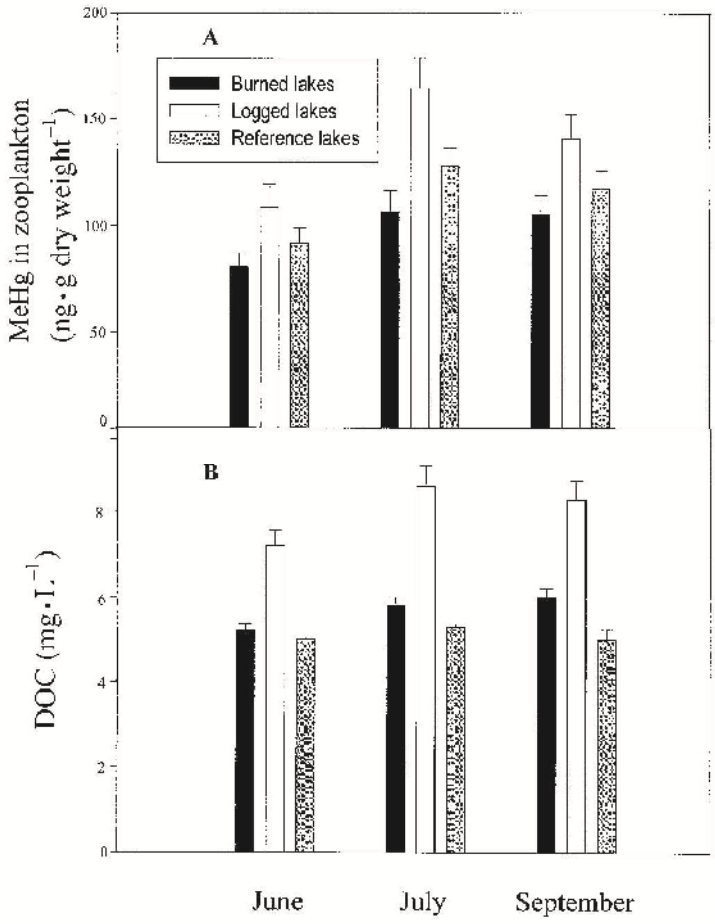

Figure 5. Relationships between mercury (Hg) concentrations in fish (on a dry-mass basis) normalized to baseline corrected d15N and ratio of logged area to lake area (r = 0.74, p , 0.01). From Garcia and Carignan (2005).

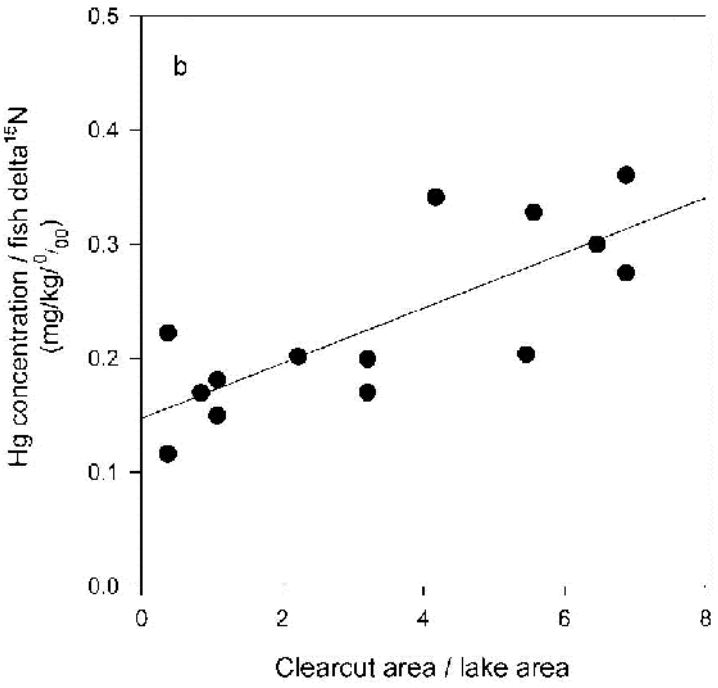

Table 1. Morphometric and watershed properties of selected lakes in the Whiskey Jack Forest. Lakes where the %clear-cut and the %clear-cut/lake area ratio appear excessive in terms of Hg contamination if the Québec models are applied are highlighted in blue.

	Outlet										
Name	Latitude	Longitude	Watershed area	Lake area	ΣLakes area	Wetland area	Wetland area	Slope	Clear-cut	Clear-cut	Clear-cut
	degree.decimal		(km^2)	(km^2)	(km^2)	(km^2)	(% of watershed)	(%)	(km^2)	(% watershed)	(% lake area)
Ball	50,26190	-94,02620	47388,00	17,01	8662,8	2609,5		4,8	toolarge	n/a	n/a
Brown Bear	50,23933	-94,33764	94,15	6,00	22,488	5,17	5,5	8,0	3,096	3,3	52
Bug Lake	50,14531	-93,47351	3,39	0,47	0,489	0,36	10,6	9,5	0,206	6,1	44
Carter	50,11778	-93,99701	86,58	2,84	10,253	6,167	7,1	8,7	3,14	3,6	110
Deadfish	50,18847	-93,93916	5,90	1,03	1,087	0,431	7,3	7,1	0	0,0	0
Dedee	50,77821	-94,01164	59,11	4,90	7,837	3,437	5,8	6,6	2,536	4,3	52
Direct	50,08743	-94,23541	189,02	3,63	42,23	3,88	2,1	8,1	6,149	3,3	169
Hat	50,59375	-94,38389	12,49	0,35	0,493	0,639	5,1	6,4	2,105	16,9	595
Helder	50,35834	-94,19810	17,87	4,67	4,962	0,425	2,4	7,6	0,1516	0,8	3
Keys	50,04911	-94,00772	43,04	5,79	11,636	0,401	0,9	9,4	4,678	10,9	81
Longlegged	50,67453	-93,96702	543,98	21,05	116,11	29,76	5,5	5,7	12,55	2,3	60
Mermaid	50,04770	-94,10263	12,72	0,58	2,237	0,123	1,0	10,5	1,911	15,0	330
NoName01	50,09313	-94,21168	1,47	0,14	0,141	0,19	13,0	9,8	0,3659	25,0	267
NoName02	50,02562	-94,11353	2,22	0,17	0,408	0,007	0,3	11,0	0,5904	26,6	349
NoName03	50,02036	-94,10999	1,31	0,19	0,239	0,007	0,5	10,6	0,4523	34,5	233
NoName04	50,03255	-94,09521	0,74	0,14	0,139	0	0,0	10,5	0,374	50,5	270
NoName05	50,05445	-94,10238	1,47	0,34	0,339	0,009	0,6	9,8	0	0,0	0
NoName06	50,05455	-94,11564	21,58	0,35	4,539	0,188	0,9	10,4	2,988	13,8	854
NoName07	50,03008	-94,07027	3,92	0,55	0,889	0,092	2,3	10,2	0,487	12,4	88
NoName08	50,02582	-93,99701	19,89	2,37	3,35	0,152	0,8	10,2	3,142	15,8	132
NoName10	50,15366	-93,90342	1,57	0,30	0,302	0,024	1,5	6,9	0	0,0	0
NoName11	50,21274	-94,22997	3,30	0,62	0,613	0,149	4,5	7,3	1,329	40,3	216
NoName13	50,35590	-94,26276	0,94	0,32	0,32	0	0,0	6,3	0	0,0	0
NoName14	50,36631	-94,22774	1,62	0,10	0,107	0,146	9,0	6,3	0	0,0	0
NoName15	50,38335	-94,25940	1,83	0,20	0,199	0,256	14,0	8,0	0,378	20,7	192
NoName16	50,39242	-94,22485	2,55	0,19	0,186	0,175	6,9	8,2	0,378	14,8	199
NoName17	50,37702	-94,19756	21,11	1,78	3,166	1,167	5,5	8,7	3,921	18,6	220
NoName18	50,37716	-94,14828	4,13	0,79	0,877	0,083	2,0	8,4	0,931	22,6	118
NoName19	50,38045	-94,13140	0,69	0,11	0,111	0,001	0,1	9,3	0,287	41,6	264
NoName20	50,41701	-94,12452	6,18	0,59	0,666	0,119	1,9	10,2	1,943	31,4	328
NoName21	50,40956	-93,99509	13,36	1,76	1,797	0,557	4,2	9,8	1,628	12,2	93
NoName22	50,44092	-93,92374	40,89	1,73	7,402	1,556	3,8	9,1	2,963	7,2	172
NoName23	50,45959	-93,88353	7,70	0,99	1,44	0,506	6,6	7,9	1,143	14,9	115
NoName24	50,52294	-93,66795	4,63	0,53	0,613	0,074	1,6	7,3	1,769	38,2	335
NoName25	50,72715	-93,93038	15,85	0,91	1,251	0,939	5,9	8,3	1,566	9,9	172
NoName26	50,78794	-94,08228	0,90	0,11	0,109	0	0,0	8,5	0,575	63,6	537
Norse-Norse	50,28257	-94,31332	46,30	1,17	15,083	0,86	1,9	8,3	0,527	1,1	45
Northwest	50,02387	-94,22418	3,41	0,32	0,636	0,004	0,1	15,2	0,586	17,2	186
Oak	50,41538	-93,86025	38428,00	41,37	7039,6	1888,24	4,9	4,5	too large	n/a	n/a
Old Man	50,05025	-94,20660	152,49	1,61	35,5	2,58	1,7	7,7	4,261	2,8	264
Pic	50,07073	-94,21021	3,36	1,10	1,2	0,022	0,7	9,5	0,2017	6,0	18
Pineneedle	50,65136	-94,38053	43,79	10,15	10,993	1,433	3,3	6,9	0,687	1,6	7
Portal	50,34434	-93,63877	149,97	4,58	28,307	10,728	7,2	6,0	11,04	7,4	241
Rocky	50,01370	-94,27129	5,42	0,29	0,37	0	0,0	11,7	1,745	32,2	599
Scotty	50,32877	-94,07857	71,09	7,40	11,76	4,119	5,8	9,2	1,749	2,5	24
Stewart	50,26200	-93,81619	91,84	0,75	11,809	9,584	10,4	7,3	4,757	5,2	631
Sup	50,32185	-93,55256	40,31	6,77	9,155	3,001	7,4	5,1	3,152	7,8	47
William	50,06517	-94,06639	8,81	4,42	4,404	0	0,0	8,6	0,1895	2,2	4
Zizania	50,53042	-93,50238	49,61	5,04	10,933	1,823	3,7	7,8	3,173	6,4	63
MIN			0,69	0,10	0,11	0,00	0,00	4,52	0,00	0,00	0,00
MAX			47388,00	41,37	8662,80	2609,50	14,00	15,16	12,55	63,61	853,71
AVG			1790,42	3,44	328,40	93,65	3,88	8,43	2,04	14,33	186,83
MEDIAN			12,49	0,91	1,44	0,36	2,83	8,34	1,33	9,88	132,41

Appendix A – Curriculum Vitae

Conseil de recherches en sciences naturelles et en génie du Canada | Natural Sciences and Engineering Research Council of Canada

FORMULAIRE 100
Formulaire de renseignements personnels
PARTIE I

Date: 2016/01/11

Nom de famille	Prénom	Initiale(s) de tous les prénoms	N° d'identification personnel (NIP)
Carignan	Richard	R	Valide 13928

☐ J'occupe un poste au sein du corps professoral d'un collège canadien admissible (remplissez les annexes B-1 et C).

☐ Je n'occupe pas de poste ou n'en occuperai aucun au sein du corps professoral d'un établissement postsecondaire canadien. Lieu d'emploi autre qu'un établissement postsecondaire canadien (indiquez-en l'adresse à l'annexe A).

NOMINATION À UN ÉTABLISSEMENT POSTSECONDAIRE

Titre du poste: Professeur

Département: Sciences biologiques

Campus:

Établissement postsecondaire canadien: Montréal

Une nomination universitaire/collégiale permanente ou menant à la permanence — Oui [X] Non [ ]

Nomination à temps partiel [ ] Nomination à plein temps [X]

- Pour les nominations universitaires qui ne sont pas permanentes ou qui ne mènent pas à la permanence et pour les postes de professeurs émérites, remplissez les annexes B et C.
- Pour les postes de professeurs émérites à plein temps et les postes à temps partiel, remplissez l'annexe C.

FORMATION UNIVERSITAIRE

Diplôme	Nom de la discipline	Établissement	Pays	Date aaaa/mm
Baccalauréat	Biologie sp. écologie	Québec à Montréal	CANADA	1975 / 06
Doctorat	Limnologie	McGill	CANADA	1981 / 06

PERSONNEL HAUTEMENT QUALIFIÉ (PHQ)

Précisez le nombre d'étudiants, de stagiaires et d'autres personnels de recherche que vous supervisez ou avez supervisés :

	Actuellement		Au cours des six dernières années (à l'exception de l'année en cours)		
	Supervision	Cosupervision	Supervision	Cosupervision	Total
Étudiants de 1er cycle	2		28		30
Étudiants à la maîtrise	1	1	5	2	9
Étudiants au doctorat			2	2	4
Stagiaires postdoctoraux	1		3		4
Autres	2		4		6
Total	6	1	42	4	53

Formulaire 100 (2009 W) Canada

Les renseignements personnels figurant dans ce formulaire et dans les annexes seront intégrés dans le fichier de renseignements personnels du programme approprié.
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Complété

N° d'identification personnel (NIP)	Nom de famille
Valide 13928	Carignan

EXPÉRIENCE DANS L'ENSEIGNEMENT, LA RECHERCHE OU L'INDUSTRIE (page supplémenatire)

Poste occupé (commencez par le poste actuel)	Établissement	Département	Période (de aaaa/mm à aaaa/mm)
Professeur	Montréal	Sciences biologiques	1994/09
Professeur-chercheur	Institut national de la recherche scientifique	INRS-Eau	1984/06 à 1994/06
Chercheur	Centre canadien des eaux intérieures		1981/06 à 1984/06

N° d'identification personnel (NIP)	Nom de famille
Valide 13928	Carignan

APPUI À LA RECHERCHE

Nom de famille et initiale(s) du candidat	Titre de la proposition, source et programme de financement, et temps consacré (heures/mois)	Montant annuel	Années de validité (aaaa)
Dressez la liste de toutes les sources d'appui (**y compris les subventions du CRSNG et les fonds de lancement de l'université**) détenues à titre de candidat ou de membre d'un groupe : a) appui dont vous avez bénéficié au cours des quatre dernières années mais qui a pris fin, b) appui dont vous bénéficiez actuellement et c) appui qui fait l'objet d'une demande. Dans le cas des subventions de groupe, indiquez la proportion (en pourcentage) des fonds affectés directement à votre recherche. Utilisez des pages supplémentaires au besoin.			
a) Financement détenu au cours des quatre (4) dernières années			
Carignan, Richard	Travaux au lac Heney Ministère de l'environnement du Québec Contrat de recherche MDDEP 20 heures/mois	40,000(100%) 60,000(100%) 60,000(100%) 60,000(100%) 60,000	2007 2008 2009 2010 2011
Carignan, R.	Fluoroprobe BBE CRSNG Appareillage 5 heures/mois	45,000 (50%)	2007
Carignan, R.	Biogéochimie des milieux aquatiques CRSNG Recherche 30 heures/mois	52,000(100%) 52,000(100%) 52,000(100%) 52,000(100%) 52,000(100%)	2008 2009 2010 2011 2012
Carignan, R.	Causes du développement des blooms de cyanobactéries nuisibles dans les Laurentides et en Estrie FQRNT 30 heures/mois	95,000 (30%) 95,000 (30%) 95,000 (30%) 95,000 (30%)	2008 2009 2010 2011

N° d'identification personnel (NIP)	Nom de famille
Valide 13928	Carignan

APPUI À LA RECHERCHE

Nom de famille et initiale(s) du candidat	Titre de la proposition, source et programme de financement, et temps consacré (heures/mois)	Montant annuel	Années de validité (aaaa)
Dressez la liste de toutes les sources d'appui (**y compris les subventions du CRSNG et les fonds de lancement de l'université**) détenues à titre de candidat ou de membre d'un groupe : a) appui dont vous avez bénéficié au cours des quatre dernières années mais qui a pris fin, b) appui dont vous bénéficiez actuellement et c) appui qui fait l'objet d'une demande. Dans le cas des subventions de groupe, indiquez la proportion (en pourcentage) des fonds affectés directement à votre recherche. Utilisez des pages supplémentaires au besoin.			
b) Financement actuellement détenu			
Magnan, Pierre	Groupe de recherche inter-universitaire en limnologie FQRNT Centres 5 heures/mois	210,000 (2%) 210,000 (2%) 150,000 (2%) 200,750 (2%) 200,750 (2%)	2008 2009 2010 2011 2012

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Personnel hautement qualifié (PHQ)

Fournissez des renseignements personnels au sujet des personnes que vous supervisez actuellement ou que vous avez supervisées au cours des six dernières années (y compris en cosupervision).

N° d'identification personnel (NIP)	Nom de famille
Valide 13928	Carignan

Nom du stagiaire	Type de formation de PHQ et statut	Période de supervision ou de cosupervision	Titre du projet ou de la thèse	Poste actuel
Lauzé, Andréane	Technicien (En cours)	Supervision 2006 -	Analyste de laboratoire	Technicienne
Roy, Viginie	Maîtrise	Cosupervision 2006 -	Impact des barrages de castor sur l'exportation de méthylmer	Étudiante PhD
Denis-Blancha Ariane	Maîtrise (En cours)	Supervision 2012 - 2013	Facteurs contrôlant le développement des macrophytes	Étudiante MSc
Lupien, Gabrielle	1er cycle (Terminée)	Supervision 2012 - 2012	Bathymétrie des lacs	Étudiante BSc
St-Amour, Marie-Michell	1er cycle (Terminée)	Supervision 2012 - 2012	Les macrophytes dans les lacs	Étudiante BSc
Laurin, Philippe	1er cycle (Terminée)	Supervision 2011 - 2012	Méthodes bathymétries	Étudiant BSc
Greene, Mélissa	Maîtrise (Terminée)	Cosupervision 2009 - 2012	Effet du développement résidentiel sur l'habitat et la distr	Enseignement
Labonté, Émie	Maîtrise (Terminée)	Cosupervision 2009 - 2012	Cooccurrence des espèces de mercure (MeHg et HgT), du séléni	Inconnu
Boisvert, Jennifer	Technicien (En cours)	Supervision 2008 - 2012	Gestion durable des lacs	Technicienne Toronto
Mireault, Catherine	1er cycle (Terminée)	Supervision 2011 - 2011	Les macrophytes	Étudiante BSc
Kalamaras, Marie-Mélissa	Technicien (Terminée)	Supervision 2010 - 2010	Techniques bathymétriques	MRNFQ
Oligny-Hébert Hélène	1er cycle (Terminée)	Supervision 2010 - 2010	Les macrophytes dans les lacs	Étudiante MSc
Perceval, Olivier	Stag. postdoc. (Terminée)	Supervision 2007 - 2007	Gestion des lacs des Laurentides	Europe
Guckert, Kristal	Doctorat (Terminée)	Cosupervision 2002 - 2007	Rapports P:R dans les écosystèmes aquatiques	U. Ottawa

Les renseignements personnels figurant dans ce formulaire et dans les annexes seront intégrés dans le fichier de renseignements personnels du programme approprié. English version available

Canada

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PARTIE II. CONTRIBUTIONS À LA RECHERCHE

1. LISTE DES CONTRIBUTIONS À LA RECHERCHE

1.1 Contributions les plus importantes

Carignan, R., C. Vis et D. Planas (2000). Planktonic production and respiration in oligotrophic Shield lakes **Limnology and Oceanography** 45: 189-199. Ces travaux portent sur un aspect fondamental de notre compréhension des écosystèmes aquatiques. Ils montrent que, contrairement aux hypothèses récentes, le métabolisme global des lacs oligotrophes est essentiellement autotrophe et dépend peu des sources de carbone organique externes. *This study, highlighted by the Editors in the January 2000 issue of L&O, focuses on a fundamental aspect of global metabolism in aquatic ecosystems. It shows that, contrary to current hypotheses, lakes are essentially autotrophic systems and rely only marginally on external organic carbon supply.*

Carignan, R., P. D'Arcy et S. Lamontagne (2000). Comparative impacts of fire and forest harvesting in Boreal Shield Lakes. **Can. J. Fish. Aquat. Sci.** 57(suppl. 2): 105-117. Ces travaux distinguent, pour la première fois en Amérique du Nord, les effets de la coupe forestière de ceux causés par les feux de forêt sur la qualité des eaux dans les lacs de la forêt boréale. De plus, ils proposent des modèles de gestion forestière permettant de minimiser les impacts des coupes. *This work contrasts, for the first time in North America, the differential impacts of clear cutting and wildfires on water quality in boreal lakes.*

Carignan, R., A.-M. Blais, et C. Vis (1998). Measurement of primary production and community respiration in oligotrophic lakes using the Winkler method. **Can. J. Fish. Aquat. Sci.** 55: 1078-1084. Ce travail démontre, pour la première fois, qu'il est possible de mesurer avec précision la production et la respiration planctoniques dans les eaux peu productives par dosage électrochimique de l'oxygène dissous. La méthodologie décrite est susceptible de remplacer la méthode du ^{14}C en océanographie et en limnologie. *This work shows, for the first time, that planktonic production and respiration can be accurately measured in oligotrophic waters using the oxygen method. The new protocol is likely to replace the ^{14}C method in oceanography and limnology in the near future.*

Carignan, R. (1998). Automated measurement of carbon dioxide, oxygen and nitrogen partial pressures in surface waters. **Limnol. Oceanogr.** 43: 969-975. L'instrument décrit permet, pour la première fois, de mesurer avec très grande précision et simultanément les concentrations de CO_2, O_2 et N_2 dans les eaux de surface. Il permet, entre autres, d'étudier la balance production-respiration au niveau de l'écosystème entier, et de mesurer les coefficients d'échange gazeux à l'interface air-eau. *This new intrument allows, for the first time, accurate and automated measurements of CO_2, O_2 and N_2 concentrations in surface waters. It allows the study of the global production-respiration balance at the ecosystem level, and the determination of gas tranfer coefficients at the air-water interface.*

Carignan, R., et D. Planas (1994). Recognition of nutrient and light limitation in turbid mixed layers: Three approaches compared in the Paraná floodplain (Argentina). **Limnol. Oceanogr.** 39: 580-596. Ce travail montre, pour la première fois, que les lacs de la plaine inondable du fleuve

Parana sont limités par la lumière ou l'azote, et non pas par le phosphore. De plus, les résultats montrent que seule la fertilisation de lacs entiers permet de mettre en évidence le rôle limitant de l'azote et de la lumière. *This work shows, for the first time, that nitrogen and light - and not phosporus - are limiting factors in the Parana River floodplain lakes. The results also show that the limiting roles of nitrogen and light can be unambiguously demonstrated only with whole-lake fertilization experiments.*

1.2 Contributions à la recherche

1.21 Contributions avec comité de lecture

RC01- Forget, M.-H., Carignan, R. et C. Hudon (2009). Influence of diel cycles of respiration, chlorophyll, and photosynthetic parameters on the summer metabolic balance of temperate lakes and rivers. **Can. J. Fish. Aquat. Sci.** (66: 1048-1058).

RC02- Dubois, K., R. Carignan et Jan Veizer (2009). Can pelagic net heterotrophy account for carbon fluxes from eastern Canadian lakes? **Applied Geochemistry** 24: 998-988.

RC03- Roy, V., M. Amyot et R. Carignan (2009). Beaver ponds increase methylmercury and nutrient levels in Canadian shield streams. **Environmental Sci. & Technol.** 43: 5605-5611.

RC04- Roy, V., M. Amyot et R. Carignan (2009). Seasonal methylmercury trends in waters draining three beaver impoundements. **Journal of Geophysical Research** 114 doi:10.1029/2008JG000763.

RC05- Hudon, C. et R. Carignan (2008). Hydrological influence on water quality in Lake Saint-Pierre (St. Lawrence River, Quebec, Canada). **Can. J. Fish. Aquat. Sci.** (65: 1165-1180).

RC06- Lambert, D., Cattaneo, A, et R. Carignan (2008). Periphyton as an early indicator of eutophication in recreational lakes. **Can. J. Fish. Aquat. Sci.** 65: 258-265.

RC07- Garcia, E., R. Carignan, et D. Lean (2007). Seasonal and inter-annual variations in methyl mercury concentrations in zooplankton from boreal lakes impacted by deforestation or natural forest fires. **Environmental Monitoring and Assessment** 131: 1-11.

RC08- Vis, C., Hudon, C., Carignan, R. and P. Gagnon (2007). Spatial analysis of production by macrophytes, phytoplankton and epiphyton in a large river system under different water-level conditions. **Ecosystems** 10:293-310.

RC09- Vis, C., Hudon, C., et R. Carignan (2006). Influence of the vertical structure of macrophyte stands on epiphyte community metabolism. **Can. J. Fish. Aquat. Sci.** 63: 1014-1026.

RC10- O'Driscoll, N.J., Siciliano, S.D., Peak, D., R. Carignan et D.R. Lean (2006). The influence of forestry activity on the structure of dissolved organic mannter in lakes: implications for mercury photoreactions. **Sci. Tot. Environ.** 366 : 880-893.

RC11- Gallon, C., Tessier, A., Gobeil, C., et R. Carignan. 2006. Historical perspective of industrial lead emissions to the atmosphere from a canadian smelter. **Environ. Sci. Technol.** 40 : 741-747.

RC12- Garcia, E., et R. Carignan (2006). Seasonal and inter-annual variations in methyl mercury concentrations in zooplankton from boreal lakes impacted by deforestation or natural forest fires. **Environmental Monitoring and Assessment** (sous presse).

RC13- Vis, C., Hudon, C., et R. Carignan (2006). Variations in photosynthesis and respiration by epiphyton and filamentous algal mats in a fluvial lake of the St. Lawrence River: implications on estimates of areal epiphyton production. **Can. J. Fish. Aquat. Sci.** (sous presse).

RC14- Bertolo, A., Carignan, R., Magnan, P., Pinel-Alloul, B. et D. Planas (2005). Decoupling of pelagic and littoral food webs in oligotrophic Shield lakes. **Oikos** 111 : 534-546.
RC15- Laforte, L., Tessier, A., Gobeil, C., et R. Carignan. 2005. Thallium diagenesis in lacustrine sediments. **Geochimica et Cosmochimica Acta** 69 : 5295-5306.
RC16- Garcia, E., et R. Carignan (2005). Hg contamination of fish from forest harvesting and fire-impacted boreal lakes compared using stable nitrogen isotopes. **Environmental Chemistry and Toxicology** 24 : 685-693.

1.22 Articles soumis à des revues avec comité de lecture.

RC17- Carignan, R. et D. Blais (2012). Influence of lake morphometry, watershed properties and lakeshore development on summertime epilimnetic phosphorus, chlorophyll and dissolved organic carbon in the Laurentian region (Québec, Canada). **Can. J. Fish. Aquat. Sci.** (soumis. oct. 2012).

1.23 Autres contributions avec comité de lecture, livres.

RC18- Carignan, R. (2004). Le lac Saint-Pierre en péril. **Québec Science** 42 : 20-27.

1.24 Publications ou rapports sans comité de lecture

RC19- Carignan, R., O. Perceval, Y.T. Prairie et A. Parkes (2007). Développement d'un outil de prévention de l'eutrophisation des lacs des Laurentides et de l'Estrie. Rapport final de recherche remis au MDDEP dans le cadre du programme PARDE du Ministère de l'Environnement du Québec. 120 p.
RC20- Carignan, R. (2009). Suivi de la qualité des eaux au lac Heney (mars 2007 à mars 2009) avant et après son traitement au chlorure de fer et impacts du traitement sur la composition du phytoplancton et des faunes zooplanctoniques et benthiques. 47 p. Remis au Comité paritaire du lac Heney.
RC21- Carignan, R. (2010). Évolution de la qualité des eaux au lac Heney entre mars 2007 et juin 2010 et impacts du traitement sur la composition des faunes benthiques en 2009. 53 p. Remis au Comité paritaire du lac Heney.
RC22- Carignan, R. (2011). Évolution de la qualité des eaux au lac Heney entre mars 2007 et juin 2011. 38 p.

1.26 Collaborations

- Centro de ecología aplicada del litoral (Argentine,Prof. J.J. Neiff, Directeur). Sujet: écologie de la plaine inondable du Paraná.
- UQAM (Dr. D. Planas). Sujet: écologie du Paraná (Argentine) et métabolisme lacustre.
- Centre Saint-Laurent (Dr. C. Hudon). Sujet: métabolisme fluvial.

1.27 Explication des contributions à la recherche

L'examen de la section 1 révèlera une préférence pour la qualité et l'originalité des publications plutôt que la quantité. La majorité des périodiques choisis (Geochimica et Cosmochimica Acta, Limnology and Oceanography, Environmental Science and Technology, Canadian Journal of Fisheries and Aquatic Sciences, Biogeochemistry) sont les mieux cotés de leur discipline. Noter que certaines publications extensives auraient pu être scindées en plusieurs publications d'envergure moindre.

3. AUTRES PREUVES DE CONTRIBUTIONS ET D'INCIDENCES

- Membre du Comité 1503 du CRSNG (2010-2013).
- Éditeur associé de la revue Canadian Journal of Fisheries and Aquatic Sciences (2001-2007).
- Environ 2 conférences internationales par étudiant par année.
- Environ 20 conférences locales à la province (MDDEP), aux MRC et aux municipalités sur la gestion durable des lacs.
- Directeur de la Station de biologie des Laurentides de l'Université de Montréal (1999-2006).
- Co-Leader du Réseau de centres d'excellence CRSNG "Sustainable Forest Management" (1995-2001).
- Révision de 15 à 20 articles par année pour Limnology and Oceanography, Can. J. Fish. Aquat. Sci., Geochimica et Cosmochimica Acta, Biogeochemistry, Marine Chemistry, Environ. Sci. Technol., Hydrobiologia, etc...

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO),
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

ACKNOWLEDGEMENT OF EXPERT'S DUTY

1. My name is Richard Carignan. I live in Montreal in the Province of Quebec.

2. I have been engaged by or on behalf of Grassy Narrows First Nation to provide evidence in relation to the above-noted court proceeding.

3. I acknowledge that it is my duty to provide evidence in relation to this proceeding as follows:

   (a) to provide opinion evidence that is fair, objective and non-partisan;

   (b) to provide opinion evidence that is related only to matters that are within my area of expertise; and

   (c) to provide such additional assistance as the court may reasonably require, to determine a matter in issue.

4. I acknowledge that the duty referred to above prevails over any obligation which I may owe to any party by whom or on whose behalf I am engaged.

Date: _____ _____

Richard Carignan

Court File No. 446/15

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

AFFIDAVIT OF RICHARD CARIGNAN

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Joseph F. Castrilli (LSUC No. 26123A)
Richard D. Lindgren (LSUC No. 28529E)
Jacqueline Wilson (LSUC No. 60330R)

Solicitors for the Applicants

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

SUPPLEMENTARY AFFIDAVIT OF RICHARD CARIGNAN

I, RICHARD CARIGNAN, of the City of Montreal, in the Province of Quebec, MAKE OATH AND SAY AS FOLLOWS:

1. I am a professional limnologist and ecologist. I hold a doctorate in limnology from McGill University and a Bachelor of Science degree in ecology from the University of Quebec at Montreal. I am currently a professor in the Department of Biological Sciences at the Université de Montreal where I teach courses in such subjects as ecotoxicology,

limnology, advanced limnology, and research methods with respect to these areas. I am also a member of the Interuniversity Research Group on Limnology and the Aquatic Environment and I have been an associate editor of the Canadian Journal of Fisheries and Aquatic Sciences. I am qualified to research and analyze issues involving freshwater lakes and effects on fish in such lakes from the introduction of materials arising from human and natural activities. I have conducted field research projects at such lakes in the Boreal forest of Quebec studying the effects of clear-cut logging on mercury levels in fish. I have published on this subject in a variety of peer-reviewed scientific journals. In this regard, I have reviewed the Forest Management Plan approved by the Ontario Ministry of Natural Resources and Forestry in December 2013 that allows clear-cut logging for the portion of the northwestern Ontario Boreal Forest known as the Whiskey Jack Forest. I have also reviewed related documents, such as the Ministry's Stand and Site Guide, which addresses mercury mitigation measures in relation to logging activities. A copy of my curriculum vitae is attached to Exhibit "A", below.

2. In December 2015 I was asked by counsel for Grassy Narrows to answer certain further questions in a report on the potential effects of the December 2013 Forest Management Plan on mercury contamination in fish. The questions and my answers to them appear as part of my February 2016 supplementaty expert report attached as Exhibit "A" to my Affidavit.

3. A copy of my Acknowledgement of Expert's Duty form is attached as Exhibit "B" to my Affidavit.

SWORN BEFORE ME in the City of Montreal, in the Province of Quebec, this ___ day of _____, 2016.

A Commissioner, etc.

_____
Richard Carignan

EXPERT REPORT

Grassy Narrows First Nation and Sherry Fobister, William Fobister, Senior, Simon Fobister and Chief Roger Fobister, Senior on their own behalf and on behalf of all other members of Grassy Narrows First Nation v. Minister of Natural Resources and Forestry (Ontario) and Minister of the Environment and Climate Change (Ontario), and the Attorney General of Ontario

Ontario Superior Court of Justice

(Divisional Court)

Prepared for

Joseph F. Castrilli and Richard D. Lindgren

Counsel, Canadian Environmental Law Association

130 Spadina Avenue, Suite 301

Toronto, Ontario

M5V 2L4

Supplementary Report on the potential effects of the December 2013 Ontario Ministry of Natural Resources approved Whiskey Jack Forest Management Plan on mercury contamination in fish

Richard Carignan
Université de Montréal
February , 2016

_____
Richard Carignan

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Introduction

I am a professional limnologist and ecologist. I hold a doctorate in limnology from McGill University and a Bachelor of Science degree in ecology from the University of Quebec at Montreal. I am currently a professor at the Department of Biological Sciences at the Université de Montreal where I teach courses in such subjects as ecotoxicology, limnology, advanced limnology, and research methods with respect to these areas. I am also a member of the Interuniversity Research Group on Limnology and the Aquatic Environment and I have been an associate editor of the Canadian Journal of Fisheries and Aquatic Sciences. I am qualified to research and analyze issues involving freshwater lakes and effects on fish in such lakes from the introduction of materials arising from human and natural activities. I have conducted field research projects at such lakes in the Boreal forest of Quebec studying the effects of clear-cut logging on mercury levels in fish. I have published on this subject in a variety of peer-reviewed scientific journals. In this regard, I have reviewed the Forest Management Plan approved by the Ontario Ministry of Natural Resources and Forestry in December 2013 that allows clear-cut logging for the portion of the northwestern Ontario Boreal Forest known as the Whiskey Jack Forest. I have also reviewed related documents, such as the Ministry's Stand and Site Guide, which addresses mercury mitigation measures in relation to logging activities. My curriculum vitae appears in Appendix A of this Expert Report.

I have been asked by Joseph F. Castrilli and Richard D. Lindgren of the Canadian Environmental Law Association on behalf of Grassy Narrows First Nation to prepare a further expert report that responds to several additional questions. I am solely responsible for the preparation of this report.

Questions

1. For the documents referred to in A. below, please indicate on a document by document basis if the views expressed in those documents that relate to the subject matter of your first expert report, and/or that are attributed to you, are accurate in every material respect? If not, please indicate in your second expert report the corrections, if any, that should be made with respect thereto:

A. The Grassy Narrows-Earthroots request, dated January 2014 (pages noted below[1]), of the Ministry of the Environment for an individual environmental assessment (IEA) on the Whiskey Jack Forest Management Plan (2012-2022), and the supplementary submissions made to the Ministry dated [B.] May 2014 (pages noted below[2]), and [C.] November 2014 (pages noted below[3]), insofar as they relate to your area of expertise and the subject matter of your first expert report.

2. What are your views on matters within your area of expertise and the subject matter of your first expert report that are addressed in the Ministry of Natural Resources and Forestry July 2014 response to the Grassy Narrows-Earthroots May 2014 submissions referred to in Question 1 (pages noted below[4])?

3. What are your views on the December 2014 Ministry of the Environment decision's treatment of evidence provided by the Ministry of Natural Resources and Forestry where matters within your area of expertise are discussed (pages noted below[5])?

[1] Volume 3 of Applicants' Application Record in Case No. 446/15 – pages 001246-001248 also identified as pages 3-5; pages 001256-001265 also identified as pages 13-22; pages 001267-001268 also identified as pages 24-25; pages 001270-001277 also identified as pages 27-34; and pages 001287-001293 also identified as pages 44-50.
[2] Volume 3 of Applicants' Application Record in Case No. 446/15 – pages 001351-001355 also identified as pages 3-7; and pages 001361 (bottom half of page) - 001369 also identified as pages 13-21.
[3] Volume 4 of the Applicants' Application Record in Case No. 446/15 – pages 001490-001491 also identified as pages 3-4; and 001495-001496 also identified as pages 8-9.
[4] Volume 5 of the Applicants' Application Record in Case No. 446/15 – pages 001712-001715.
[5] Volume 1 of the Applicants' Application Record in Case No. 446/15 – pages 000031-000033.

Answers to Questions

Question:

1. For the documents below, please indicate on a document by document basis if the views expressed in those documents that relate to the subject matter of your first expert report, and/or that are attributed to you, are accurate in every material respect? If not, please indicate the corrections, if any, that should be made with respect thereto:

A. The Grassy Narrows-Earthroots request, dated January 2014 (pages noted below), of the Ministry of the Environment for an individual environmental assessment (IEA) on the Whiskey Jack Forest Management Plan (2012-2022), insofar as [it] relate[s] to your area of expertise and the subject matter of your first expert report.

Volume 3 of Applicants' Application Record in Case No. 446/15 – pages 001246-001248 also identified as pages 3-5.

Answer: This document correctly summarises results by Carignan et al. and by many others. However, its conclusions that 1- "Clearcutting on Grassy Narrows Territory **will** cause the discharge of mercury into the aquatic environment" and 2- "Clearcutting in Grassy Narrows Territory **will** result in the harmful alteration of fish habitat by causing levels of methyl mercury in the fish's environment and food chain to be elevated." are extrapolations of studies conducted under different geo-climatic regimes. It would have been preferable to replace "will" by "will likely" in conclusions 1 and 2 above. Only a site-specific study of the type sought in the IEA request and for which I discussed the need in my first expert report, could establish with confidence the impacts of clearcutting on mercury in fish in the Grassy Narrows Territory.

Volume 3 of Applicants' Application Record in Case No. 446/15 – pages 001256-001265 also identified as pages 13-22.

Answer: The views attributed to Carignan et al. and Garcia at al, are accurate. Furthermore, the Applicants' conclusions on the "Fundamental Problems with MNR Rationale" are essentially correct: (A) Natural disturbance (wildfire) emulation is not appropriate for mercury management because fire and logging have different impacts on the behavior of mercury in watersheds; a fully burnt forest releases its mercury to the atmosphere, whereas a clearcut forest releases its mercury to the watershed.
(B) MNR cannot mitigate mercury bioaccumulation using measures for which there is no experimental evidence; (C) MNR provides no scientific experimental evidence that their mercury mitigation measures are effective.

Volume 3 of Applicants' Application Record in Case No. 446/15 – pages 001267-001268 also identified as pages 24-25.

Answer: The preamble, conclusion and views attributed to Carignan et al. and Garcia at al. in these pages are correct. The impacts of releasing mercury into the environment in Grassy Narrows through clearcut logging are likely to last at least a decade in fish, and at least one human lifespan beyond that in people.

Volume 3 of Applicants' Application Record in Case No. 446/15 – pages 001270-001277 also identified as pages 27-34.

Answer: The comments attributed to Carignan et al., Garcia et al. and Garcia, Carignan and Lean are correct.

Volume 3 of Applicants' Application Record in Case No. 446/15 – pages 001287-001293 also identified as pages 44-50.

Answer: The question (Q2) raised in the MNR Stand and Site Guide about whether *"the fine filter direction will retain sufficient residual forest within catchments to ensure that hydrological effects resulting from forest management operations: i) do not exceed those observed in naturally disturbed catchments and ii) do not exceed acceptable levels for specific parameters (e.g., methyl mercury)?"* is legitimate and stems from a large body of scientific evidence acquired in Quebec and Europe.

On the other hand, the MNR Stand and Site Guide Rationale misinterprets the scientific evidence by stating that the "Removal of trees from catchments by timber harvest **or** wildfire is associated with **generally similar** changes in the hydrology, chemistry, and biota of lakes and streams." (MNR, Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales: Background and Rationale for Direction, July 15, 2010, at page 24). Our observations in Quebec show that forest removal by fire and logging has widely different impacts on water quality and methyl-mercury contamination in receiving lakes. As I noted above and in my first expert report, a (fully) burnt forest releases its mercury to the atmosphere, whereas a clearcut forest releases its mercury to the watershed.

Question:

1. For the documents below, please indicate on a document by document basis if the views expressed in those documents that relate to the subject matter of your first expert report, and/or that are attributed to you, are accurate in every material respect? If not, please indicate the corrections, if any, that should be made with respect thereto:

….

B. The Grassy Narrows-Earthroots….supplementary submissions made to the Ministry [of the Environment] dated May 2014 (pages noted below), insofar as they relate to your area of expertise and the subject matter of your first expert report.

Volume 3 of Applicants' Application Record in Case No. 446/15 – pages 001351-001355 also identified as pages 3-7.

Answer: Regarding the MNR argument that: "The range of Hg levels in fish in harvested watersheds was within the range of those in burned watersheds (Garcia and Carignan 2000, 2005)."

Grassy Narrows/Earthroots replied that:

1- Garcia and Carignan indicate that intense fires do not significantly raise mercury levels in fish (logging did);
2-Intense fires may form a pathway for mercury out of the total forest mercury pool (terrestrial + aquatic) (logging does not);
3- "Most area burned in N American boreal forests is by high intensity crown fires, and this is likely to continue in the future" (de Groot et al., 2003, p.363);
4- Therefore, the total mercury pool in a logging dominated landscape may be higher than a fire dominated landscape. (i.e. not within the natural range for the landscape);
5- The total aquatic mercury pool in a logging dominated landscape may also be higher than in a fire dominated landscape;
6- When looking at the statistical trend line (rather than the data points) Fig. 4 of Garcia and Carignan shows that logging generally led to higher levels of mercury in fish than fire did.

Replies 1 through 6 by Grassy Narrows/Earthroots are correct. However, because the precipitation/evapotranspiration regimes of Northwestern Ontario and Quebec boreal zones are different, site-specific studies would be required to establish the effects of clearcut logging on methyl-mercury contamination of the aquatic biota of Northwestern Ontario. Nevertheless, in a study on post-logging mercury export near Thunder Bay (Allan et al., 2009) found a doubling of mercury flux due to a doubling of flow and expected the increase in mercury export to last at least ten years. They estimated that 20% of mercury in NW Ontario fish was due to logging. The Allan et al. (2009) study is reproduced in Volume 5 of the Applicants' Application Record in Case No. 446/15 – pages 001630-001638.

Volume 3 of Applicants' Application Record in Case No. 446/15 – pages 001361 (bottom half of page) - 001369 also identified as pages 13-21.

Answer: The Grassy Narrows/Earthroots interpretation of the Carignan et al. studies is essentially correct.

Question:

1. For the documents below, please indicate on a document by document basis if the views expressed in those documents that relate to the subject matter of your first expert report, and/or that are attributed to you, are accurate in every material respect? If not, please indicate the corrections, if any, that should be made with respect thereto:

….

C. The Grassy Narrows-Earthroots…. supplementary submissions made to the Ministry [of the Environment] dated….November 2014 (pages noted below), insofar as they relate to your area of expertise and the subject matter of your first expert report.

Volume 4 of the Applicants' Application Record in Case No. 446/15 – 001495-001496 also identified as pages 8-9.

Answer: The views expressed by Grassy Narrows/Earthroots are accurate in every material respect.

Question:

2. What are your views on matters within your area of expertise and the subject matter of your first expert report that are addressed in the Ministry of Natural Resources and Forestry July 2014 response to the Grassy Narrows-Earthroots May 2014 submissions referred to in Question 1 (pages noted below)?

Volume 5 of the Applicants' Application Record in Case No. 446/15 – pages 001712-001715.

Answer: In January 2014, Grassy Narrows First Nation/Earthroots requested an IEA for the Whiskey Jack Forest Management Plan. The requestors' indicated that the plan fails to adequately deal with the impacts of logging on mercury levels in boreal water and fish, and that the fine filter (a mitigation measure such as limiting soil disruption/ hydrological disturbance on a micro scale) is designed to minimize upland and lowland disruptions, not mercury impacts on aquatic ecosystems. In April 2014, MNR filed a science response to the IEA request. In May 2014, Grassy Narrows/Earthroots submitted a reply. In July 2014, MNRF produced a further response. Salient points in the July 2014 MNRF science response to the Grassy Narrows First Nation/Earthroots material included the following (with MNRF material appearing in *italics* and my answer appearing immediately below it for each of the following three points):

1- ***MNRF July 2014: [****While] "the" [Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales – Background and Rationale for Direction] "SSG does not contain direction specifically intended to mitigate mercury impacts… there is, however, other direction in the SSG intended to mitigate other undesirable impacts including soil disturbance, hydrologic disruption and disturbance to riparian and wetland areas….it was concluded that these actions may also help reduce the mobilization of mercury during forest management" (page 001713).*

   Answer: Based on our data in lakes impacted by logging or fire in Quebec, the increased dissolved organic matter and mercury contamination observed in logged lakes relative to burnt and pristine lakes is likely attributable to the elevation of the water table following logging or fire. While severe fires virtually eliminate the organic- and mercury-rich forest floor and volatilize its mercury, logging not only preserves the organic, mercury-rich forest floor but promotes the export of dissolved organic matter and mercury to streams and lakes, as observed in many studies in Quebec, Ontario and elsewhere in the world.

2- ***MNRF July 2014:*** *"…the potential effects of climate change on mercury methylation do need to be considered. Based on a predicted warmer and dryer climate, both upland-mineral and lowland-organic soils would become dryer, and methyl mercury production rates will likely be lower than current levels" (page 001713).*

   Answer: These MNRF comments are based on hypothetical grounds and just confuse the issue. A dryer climate will lower the water table in all watersheds impacted or not by fire/logging. Because logging preserves mercury stocks in soils compared to fire, mercury export to lakes impacted by logging will likely be higher. Whether this phenomenon is important or not in the Whiskey Jack Forest, where the climate is already dryer, is unknown. However, observations conducted in Quebec and elsewhere

fully justify the implementation of a long-term site-specific study on the effects of fire/logging on mercury levels in fish.

3- ***MNRF July 2014: "…****the [January 2014] IEA request, which stated that 'logging and forest fire have nearly opposite effects on mercury '…is not supported by any scientific studies". [The MNRF concludes that]: "Simply put, the study [Garcia and Carignan, 2005] provides evidence that forest disturbance within a given lake's watershed is associated with increased levels of mercury in fish but it does not provide evidence that mercury levels of fish differ consistently between lakes of harvested watersheds and those with intensively or extensively burned watersheds" (page 001714).*

Answer: To illustrate its point, the MNRF chose to only comment on one figure (Figure 4 in Garcia and Carignan 2005) where mercury in fish is related to trophic level estimated using ^{15}N in 63 populations of fish sampled in 38 lakes (20 reference, 9 logged and 9 **partially** or completely burnt). The MNRF ignored here that the burned lakes of Figure 4 included two watersheds where mercury was highest and where fire was only partial in terms of extent and severity. In these partially burnt watersheds, forest removal by fire still raised the water table of residual forest which promoted mercury export to streams and lakes. Moreover, the MNRF ignored other studies (Carignan et al. 1999; Garcia and Carignan, 1999, 2000; Desrosiers et al. 2006) suggesting a clear effect of logging on the water quality and mercury contamination in other components of the food web such as zooplankton and periphyton. The Grassy Narrows/Earthroots position on this issue essentially reflects the results of our comparative studies on the impacts of logging and fire which clearly indicate that both disturbances are not comparable in terms of mercury mobilization.

In short, the MNRF response to the Grassy Narrows/Earthroots IEA request is reliant on the adequacy of the SSG. But elsewhere, the MNRF states that it makes "no claims that SSG direction and application…will mitigate or eliminate Hg [mercury] mobilization" (Volume 3 of the Applicants' Application Record in Case No. 446/15 at pages 001323, 001333 – MNR April 23, 2014 Response to January 2014 IEA Request). Resolving the clearcut logging/mercury issue in the Whiskey Jack Forest requires examination that could come from the IEA requested by Grassy Narrows/Earthroots and the type of study I recommended in my first expert report.

Question:

3. What are your views on the December 2014 Ministry of the Environment decision's treatment of evidence provided by the Ministry of Natural Resources and Forestry where matters within your area of expertise are discussed)?

Volume 1 of the Applicants' Application Record in Case No. 446/15 – pages 000031-000033.

Answer: There are four issues raised by Grassy Narrows that are addressed in the Ministry of the Environment's treatment of, and reliance on, MNRF's evidence that are of concern to me. I first set out the issue (in **boldface**), then the MNRF evidence relied on by the Ministry of the Environment (in *italics*), and finally my answer to it (in regular text).

Issue 1 (page 000031): Clearcut logging and the construction of access roads will disturb the soil causing mercury to travel through the water system, amplifying mercury contamination.

The MNRF responses to this issue are that "the Stand and Site Guide provides direction to minimize site disturbance, sediment transport and hydrologic disruption*. These reduce the potential for existing mercury mobilization as a result of forest disturbances. The MNRF… informed the Ministry of the Environment and Climate Change (MOECC) that mobilization of mercury following forest disturbance may not be any different than that experienced during natural disturbances. The MNRF is currently undertaking research to gain further understanding of the potential connections between forestry operations and mercury".*

Answer: Our studies in Quebec were not designed to address the effects of mechanical soil disturbance during logging on mercury contamination. Rather, our studies suggest that mercury mobilization in clearcut watersheds is proportional to the size of clearcuts relative to the size of the receiving lake. Because current SSG directions contain no measure to limit the clearcut/lake size ratio, they do not reduce the potential for mercury mobilization. Further, our comparative studies on the impacts of logging and fire clearly indicate that both disturbances are not comparable in terms of mercury mobilization. As I noted above and in my first expert report, a (fully) burnt forest releases its mercury to the atmosphere, whereas a clearcut forest releases its mercury to the watershed. The exact protocols supporting the research currently undertaken by the MNRF on this issue should be clearly laid out.

Issue 2 (page 000031): An increase in mercury will harm fish and terrestrial animals that eat fish, including humans, for a long time period.

The MNRF states "that increases in methylmercury concentrations following clearcuts are generally limited to cases when soils are disturbed", and the SSG contains "a methodology for minimizing soil disturbance".

Answer: The MNRF has very little scientific evidence to support its claim. Three Swedish studies (Sorensen et al., 2009; Eklof et al., 2012, 2013) have looked at the effects of stump harvest and scarification on total mercury and methyl-mercury concentrations in runoff across large (1 000 km north-south) temperature and runoff gradients and found mixed responses. However, all three studies found an increase in mercury export relative to reference sites. According to the Quebec studies, measures implemented by the MNRF at the WJFMU such as natural disturbance emulation, limiting ruts and harvesting only in winter on shallow soils will not reduce the risk of mercury contamination in animals and fish.

Issue 3 (page 000032): Clearcut logging leads to an increase in mercury, whereas forest fires remove mercury.

MNRF states that: "fire intensity is an important factor that influences mercury response. High intensity fires volatilize mercury in the organic soil layer whereas low intensity fires leave this layer undisturbed, with mercury subsequently being mobilized as water tables rise and surface runoff increases…studies conducted by various research groups have found that the highest mercury levels in fish are from watersheds impacted by low intensity fires and lower mercury

levels are in fish from watersheds with high intensity fires". The MNRF further adds that out of the 745,748 ha of productive forest concerned in the WJFMU, prescribed burns will occur on 1,069 (or 0.14%) of the productive forest.

Answer: The first paragraph of the MNRF response to this issue quoted in part above clearly indicates that, contrary to its responses to issues 1 and 2 above, MNRF fully understands the results and conclusions of studies conducted in Quebec and elsewhere on the differential impacts of logging and fire on mercury contamination. However, the second and third paragraphs of the MOECC summary of the MNRF response defy logic. The MNRF claims that, contrary to what is stated in the first paragraph, "increases in mercury due to clearcut operations would be no different than those experienced for natural occurrences" and that "emulating natural disturbance patterns, harvesting only in winter on shallow soils, and reinforcing slopes and banks in the WJFMU" will mitigate mercury contamination. In summary, the MNRF response appears inconsistent for two reasons. First, as noted above, a (fully) burnt forest releases mercury to the atmosphere, whereas a clearcut forest releases mercury to its watershed. Second, MNRF stated to MOECC that it makes "no claims that SSG direction and application…will mitigate or eliminate Hg [mercury] mobilization". Furthermore, as I noted earlier, our Quebec studies suggest that mercury mobilization in clearcut watersheds is proportional to the size of clearcuts relative to the size of the receiving lake. Because current SSG directions contain no measure to limit the clearcut/lake size ratio, they do not reduce the potential for mercury mobilization. Therefore, the measures MNRF proposes to rely on in the Whiskey Jack Forest, such as natural disturbance emulation (also known as coarse filter), limiting ruts, and harvesting only in winter on shallow soils, will not reduce the risk of mercury contamination in animals and fish.

Issue 4 (page 000033): The MNRF does not have the science and information to develop prescriptions to mitigate the effect of mercury on terrestrial or aquatic ecosystems.

The MOECC decision notes that: "…MNRF is currently supporting research projects that are examining patterns in fish mercury bioaccumulation, evaluating the levels of mercury runoff from forest and wetland soils to aquatic systems", and "results from its ongoing research will be used during the required periodic review of the Stand and Site Guide".

Answer: The MNRF response summarized under issue 4 appears well-intentioned. However, no details are given about how the MNRF will achieve these goals. Furthermore, it remains unclear how the current MNRF research projects will help to refine the natural disturbance paradigm by resolving the issue of differential impacts of **fire and logging** on mercury cycling in the aquatic systems of the WJFMU.

References

Carignan, R., D'Arcy, P., Lamontagne, S. 2000. Comparative impacts of fire and forest harvesting on water quality in Boreal Shield lakes. Can. J. Fish. Aquat. Sci. 57(Suppl. 2): 105–117.

Desrosiers, M., Planas, D. and Mucci, A. 2006. Short-term responses to watershed logging on biomass mercury and methylmercury accumulation by periphyton in boreal lakes. Can. J. Fish. Aquat. Sci. 63, 1734–1745.

Eklöf, K., Kraus, K., Weyhenmeyer, G.A., Meili, M. and Bishop, K. 2012. Forestry influence by stump harvest and site preparation on methylmercury, total mercury and other stream water chemistry parameters across a boreal landscape. Ecosystems 15, 1308-1320.

Eklöf, K., Meili, M., Åkerblom, S., von Brömssen, C. and Bishop, K. 2013. Impact of stump harvest on run-off concentrations of mercury and methylmercury. Forest Ecology and Management 290, 283-294.

Garcia, E. and Carignan, R. 2000. Mercury concentrations in northern pike (Esox lucius) from boreal lakes with logged, burned, or undisturbed catchments. Can. J. Fish. Aquat. Sci. 57 (Suppl. 2): 129–135.

Garcia, E. and Carignan, R. 1999. Impact of wildfire and clear-cutting in the boreal forest on methyl mercury in zooplankton. Can. J. Fish. Aquat. Sci. 56, 339–345.

Garcia, E. and Carignan, R. 2005. Mercury concentrations in fish from forest harvesting and fire-impacted canadian boreal lakes compared using stable isotopes of nitrogen. Environmental Toxicology and Chemistry, 24, 685–693.

Garcia, E., R. Carignan, and D. Lean (2007). Seasonal and inter-annual variations in methyl mercury concentrations in zooplankton from boreal lakes impacted by deforestation or natural forest fires. Environmental Monitoring and Assessment 131: 1-11.

Lamontagne, S., Carignan, R., D'Arcy, P., Prairie, Y.T., and Paré, D. 2000. Element export in runoff from eastern Canadian Boreal Shield drainage basins following forest harvesting and wildfires. *Can J. Fish Aquat Sci* 57(Suppl 2):118–128.

Sørensen, R., Meili, M., Lambertsson, L., von Brömssen, C., and Bishop, K. 2009. The effects of forest harvest operations on mercury and methylmercury in two boreal streams: Relatively small changes in the first two years prior to site preparation. Ambio 38, 364-372.

Appendix A – Curriculum Vitae

Conseil de recherches en sciences naturelles et en génie du Canada | Natural Sciences and Engineering Research Council of Canada

FORMULAIRE 100
Formulaire de renseignements personnels
PARTIE I

Date: 2016/01/11

Nom de famille	Prénom	Initiale(s) de tous les prénoms	N° d'identification personnel (NIP)
Carignan	Richard	R	**Valide** 13928

☐ J'occupe un poste au sein du corps professoral d'un collège canadien admissible (remplissez les annexes B-1 et C).

☐ Je n'occupe pas de poste ou n'en occuperai aucun au sein du corps professoral d'un établissement postsecondaire canadien. Lieu d'emploi autre qu'un établissement postsecondaire canadien (indiquez-en l'adresse à l'annexe A).

NOMINATION À UN ÉTABLISSEMENT POSTSECONDAIRE

Titre du poste: Professeur

Département: Sciences biologiques

Campus:

Établissement postsecondaire canadien: Montréal

Une nomination universitaire/collégiale permanente ou menant à la permanence — Oui [X] Non [ ]

Nomination à temps partiel [ ] Nomination à plein temps [X]

- Pour les nominations universitaires qui ne sont pas permanentes ou qui ne mènent pas à la permanence et pour les postes de professeurs émérites, remplissez les annexes B et C.
- Pour les postes de professeurs émérites à plein temps et les postes à temps partiel, remplissez l'annexe C.

FORMATION UNIVERSITAIRE

Diplôme	Nom de la discipline	Établissement	Pays	Date aaaa/mm
Baccalauréat	Biologie sp. écologie	Québec à Montréal	CANADA	1975 / 06
Doctorat	Limnologie	McGill	CANADA	1981 / 06

PERSONNEL HAUTEMENT QUALIFIÉ (PHQ)

Précisez le nombre d'étudiants, de stagiaires et d'autres personnels de recherche que vous supervisez ou avez supervisés :

	Actuellement		Au cours des six dernières années (à l'exception de l'année en cours)		
	Supervision	Cosupervision	Supervision	Cosupervision	Total
Étudiants de 1er cycle	2		28		30
Étudiants à la maîtrise	1	1	5	2	9
Étudiants au doctorat			2	2	4
Stagiaires postdoctoraux	1		3		4
Autres	2		4		6
Total	6	1	42	4	53

Formulaire 100 (2009/W) Canada

Les renseignements personnels figurant dans ce formulaire et dans les annexes seront intégrés dans le fichier de renseignements personnels du programme approprié.
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Complété

N° d'identification personnel (NIP)	Nom de famille
Valide 13928	Carignan

EXPÉRIENCE DANS L'ENSEIGNEMENT, LA RECHERCHE OU L'INDUSTRIE (page supplémenatire)

Poste occupé (commencez par le poste actuel)	Établissement	Département	Période (de aaaa/mm à aaaa/mm)
Professeur	Montréal	Sciences biologiques	1994/09
Professeur-chercheur	Institut national de la recherche scientifique	INRS-Eau	1984/06 à 1994/06
Chercheur	Centre canadien des eaux intérieures		1981/06 à 1984/06

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N° d'identification personnel (NIP)	Nom de famille
Valide 13928	Carignan

APPUI À LA RECHERCHE

Nom de famille et initiale(s) du candidat	Titre de la proposition, source et programme de financement, et temps consacré (heures/mois)	Montant annuel	Années de validité (aaaa)
Dressez la liste de toutes les sources d'appui (**y compris les subventions du CRSNG et les fonds de lancement de l'université**) détenues à titre de candidat ou de membre d'un groupe : a) appui dont vous avez bénéficié au cours des quatre dernières années mais qui a pris fin, b) appui dont vous bénéficiez actuellement et c) appui qui fait l'objet d'une demande. Dans le cas des subventions de groupe, indiquez la proportion (en pourcentage) des fonds affectés directement à votre recherche. Utilisez des pages supplémentaires au besoin.			
a) Financement détenu au cours des quatre (4) dernières années			
Carignan, Richard	Travaux au lac Heney Ministère de l'environnement du Québec Contrat de recherche MDDEP 20 heures/mois	40,000(100%) 60,000(100%) 60,000(100%) 60,000(100%) 60,000	2007 2008 2009 2010 2011
Carignan, R.	Fluoroprobe BBE CRSNG Appareillage 5 heures/mois	45,000 (50%)	2007
Carignan, R.	Biogéochimie des milieux aquatiques CRSNG Recherche 30 heures/mois	52,000(100%) 52,000(100%) 52,000(100%) 52,000(100%) 52,000(100%)	2008 2009 2010 2011 2012
Carignan, R.	Causes du développement des blooms de cyanobactéries nuisibles dans les Laurentides et en Estrie FQRNT 30 heures/mois	95,000 (30%) 95,000 (30%) 95,000 (30%) 95,000 (30%)	2008 2009 2010 2011

N° d'identification personnel (NIP)	Nom de famille
Valide 13928	Carignan

APPUI À LA RECHERCHE

Nom de famille et initiale(s) du candidat	Titre de la proposition, source et programme de financement, et temps consacré (heures/mois)	Montant annuel	Années de validité (aaaa)
Dressez la liste de toutes les sources d'appui (**y compris les subventions du CRSNG et les fonds de lancement de l'université**) détenues à titre de candidat ou de membre d'un groupe : a) appui dont vous avez bénéficié au cours des quatre dernières années mais qui a pris fin, b) appui dont vous bénéficiez actuellement et c) appui qui fait l'objet d'une demande. Dans le cas des subventions de groupe, indiquez la proportion (en pourcentage) des fonds affectés directement à votre recherche. Utilisez des pages supplémentaires au besoin.			
b) Financement actuellement détenu			
Magnan, Pierre	Groupe de recherche inter-universitaire en limnologie FQRNT Centres 5 heures/mois	210,000 (2%) 210,000 (2%) 150,000 (2%) 200,750 (2%) 200,750 (2%)	2008 2009 2010 2011 2012

PROTÉGÉ UNE FOIS REMPLI

Personnel hautement qualifié (PHQ)

Fournissez des renseignements personnels au sujet des personnes que vous supervisez actuellement ou que vous avez supervisées au cours des six dernières années (y compris en cosupervision).

N° d'identification personnel (NIP)	Nom de famille
Valide 13928	Carignan

Nom du stagiaire	Type de formation de PHQ et statut	Période de supervision ou de cosupervision	Titre du projet ou de la thèse	Poste actuel
Lauzé, Andréane	Technicien (En cours)	Supervision 2006 -	Analyste de laboratoire	Technicienne
Roy, Viginie	Maîtrise	Cosupervision 2006 -	Impact des barrages de castor sur l'exportation de méthylmer	Étudiante PhD
Denis-Blancha Ariane	Maîtrise (En cours)	Supervision 2012 - 2013	Facteurs contrôlant le développement des macrophytes	Étudiante MSc
Lupien, Gabrielle	1er cycle (Terminée)	Supervision 2012 - 2012	Bathymétrie des lacs	Étudiante BSc
St-Amour, Marie-Michell	1er cycle (Terminée)	Supervision 2012 - 2012	Les macrophytes dans les lacs	Étudiante BSc
Laurin, Philippe	1er cycle (Terminée)	Supervision 2011 - 2012	Méthodes bathymétries	Étudiant BSc
Greene, Mélissa	Maîtrise (Terminée)	Cosupervision 2009 - 2012	Effet du développement résidentiel sur l'habitat et la distr	Enseignement
Labonté, Émie	Maîtrise (Terminée)	Cosupervision 2009 - 2012	Cooccurrence des espèces de mercure (MeHg et HgT), du séléni	Inconnu
Boisvert, Jennifer	Technicien (En cours)	Supervision 2008 - 2012	Gestion durable des lacs	Technicienne Toronto
Mireault, Catherine	1er cycle (Terminée)	Supervision 2011 - 2011	Les macrophytes	Étudiante BSc
Kalamaras, Marie-Mélissa	Technicien (Terminée)	Supervision 2010 - 2010	Techniques bathymétriques	MRNFQ
Oligny-Hébert Hélène	1er cycle (Terminée)	Supervision 2010 - 2010	Les macrophytes dans les lacs	Étudiante MSc
Perceval, Olivier	Stag. postdoc. (Terminée)	Supervision 2007 - 2007	Gestion des lacs des Laurentides	Europe
Guckert, Kristal	Doctorat (Terminée)	Cosupervision 2002 - 2007	Rapports P:R dans les écosystèmes aquatiques	U. Ottawa

Les renseignements personnels figurant dans ce formulaire et dans les annexes seront intégrés dans le fichier de renseignements personnels du programme approprié.

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Canada

PROTÉGÉ UNE FOIS REMPLI

PARTIE II. CONTRIBUTIONS À LA RECHERCHE

1. LISTE DES CONTRIBUTIONS À LA RECHERCHE

1.1 Contributions les plus importantes

Carignan, R., C. Vis et D. Planas (2000). Planktonic production and respiration in oligotrophic Shield lakes **Limnology and Oceanography** 45: 189-199. Ces travaux portent sur un aspect fondamental de notre compréhension des écosystèmes aquatiques. Ils montrent que, contrairement aux hypothèses récentes, le métabolisme global des lacs oligotrophes est essentiellement autotrophe et dépend peu des sources de carbone organique externes. *This study, highlighted by the Editors in the January 2000 issue of L&O, focuses on a fundamental aspect of global metabolism in aquatic ecosystems. It shows that, contrary to current hypotheses, lakes are essentially autotrophic systems and rely only marginally on external organic carbon supply.*

Carignan, R., P. D'Arcy et S. Lamontagne (2000). Comparative impacts of fire and forest harvesting in Boreal Shield Lakes. **Can. J. Fish. Aquat. Sci.** 57(suppl. 2): 105-117. Ces travaux distinguent, pour la première fois en Amérique du Nord, les effets de la coupe forestière de ceux causés par les feux de forêt sur la qualité des eaux dans les lacs de la forêt boréale. De plus, ils proposent des modèles de gestion forestière permettant de minimiser les impacts des coupes. *This work contrasts, for the first time in North America, the differential impacts of clear cutting and wildfires on water quality in boreal lakes.*

Carignan, R., A.-M. Blais, et C. Vis (1998). Measurement of primary production and community respiration in oligotrophic lakes using the Winkler method. **Can. J. Fish. Aquat. Sci.** 55: 1078-1084. Ce travail démontre, pour la première fois, qu'il est possible de mesurer avec précision la production et la respiration planctoniques dans les eaux peu productives par dosage électrochimique de l'oxygène dissous. La méthodologie décrite est susceptible de remplacer la méthode du ^{14}C en océanographie et en limnologie. *This work shows, for the first time, that planktonic production and respiration can be accurately measured in oligotrophic waters using the oxygen method. The new protocol is likely to replace the ^{14}C method in oceanography and limnology in the near future.*

Carignan, R. (1998). Automated measurement of carbon dioxide, oxygen and nitrogen partial pressures in surface waters. **Limnol. Oceanogr.** 43: 969-975. L'instrument décrit permet, pour la première fois, de mesurer avec très grande précision et simultanément les concentrations de CO_2, O_2 et N_2 dans les eaux de surface. Il permet, entre autres, d'étudier la balance production-respiration au niveau de l'écosystème entier, et de mesurer les coefficients d'échange gazeux à l'interface air-eau. *This new intrument allows, for the first time, accurate and automated measurements of CO_2, O_2 and N_2 concentrations in surface waters. It allows the study of the global production-respiration balance at the ecosystem level, and the determination of gas tranfer coefficients at the air-water interface.*

Carignan, R., et D. Planas (1994). Recognition of nutrient and light limitation in turbid mixed layers: Three approaches compared in the Paraná floodplain (Argentina). **Limnol. Oceanogr.** 39: 580-596. Ce travail montre, pour la première fois, que les lacs de la plaine inondable du fleuve

Parana sont limités par la lumière ou l'azote, et non pas par le phosphore. De plus, les résultats montrent que seule la fertilisation de lacs entiers permet de mettre en évidence le rôle limitant de l'azote et de la lumière. *This work shows, for the first time, that nitrogen and light - and not phosporus - are limiting factors in the Parana River floodplain lakes. The results also show that the limiting roles of nitrogen and light can be unambiguously demonstrated only with whole-lake fertilization experiments.*

1.2 Contributions à la recherche

1.21 Contributions avec comité de lecture

RC01- Forget, M.-H., Carignan, R. et C. Hudon (2009). Influence of diel cycles of respiration, chlorophyll, and photosynthetic parameters on the summer metabolic balance of temperate lakes and rivers. **Can. J. Fish. Aquat. Sci.** (66: 1048-1058).

RC02- Dubois, K., R. Carignan et Jan Veizer (2009). Can pelagic net heterotrophy account for carbon fluxes from eastern Canadian lakes? **Applied Geochemistry** 24: 998-988.

RC03- Roy, V., M. Amyot et R. Carignan (2009). Beaver ponds increase methylmercury and nutrient levels in Canadian shield streams. **Environmental Sci. & Technol.** 43: 5605-5611.

RC04- Roy, V., M. Amyot et R. Carignan (2009). Seasonal methylmercury trends in waters draining three beaver impoundements. **Journal of Geophysical Research** 114 doi:10.1029/2008JG000763.

RC05- Hudon, C. et R. Carignan (2008). Hydrological influence on water quality in Lake Saint-Pierre (St. Lawrence River, Quebec, Canada). **Can. J. Fish. Aquat. Sci.** (65: 1165-1180).

RC06- Lambert, D., Cattaneo, A, et R. Carignan (2008). Periphyton as an early indicator of eutophication in recreational lakes. **Can. J. Fish. Aquat. Sci.** 65: 258-265.

RC07- Garcia, E., R. Carignan, et D. Lean (2007). Seasonal and inter-annual variations in methyl mercury concentrations in zooplankton from boreal lakes impacted by deforestation or natural forest fires. **Environmental Monitoring and Assessment** 131: 1-11.

RC08- Vis, C., Hudon, C., Carignan, R. and P. Gagnon (2007). Spatial analysis of production by macrophytes, phytoplankton and epiphyton in a large river system under different water-level conditions. **Ecosystems** 10:293-310.

RC09- Vis, C., Hudon, C., et R. Carignan (2006). Influence of the vertical structure of macrophyte stands on epiphyte community metabolism. **Can. J. Fish. Aquat. Sci.** 63: 1014-1026.

RC10- O'Driscoll, N.J., Siciliano, S.D., Peak, D., R. Carignan et D.R. Lean (2006). The influence of forestry activity on the structure of dissolved organic mannter in lakes: implications for mercury photoreactions. **Sci. Tot. Environ.** 366 : 880-893.

RC11- Gallon, C., Tessier, A., Gobeil, C., et R. Carignan. 2006. Historical perspective of industrial lead emissions to the atmosphere from a canadian smelter. **Environ. Sci. Technol.** 40 : 741-747.

RC12- Garcia, E., et R. Carignan (2006). Seasonal and inter-annual variations in methyl mercury concentrations in zooplankton from boreal lakes impacted by deforestation or natural forest fires. **Environmental Monitoring and Assessment** (sous presse).

RC13- Vis, C., Hudon, C., et R. Carignan (2006). Variations in photosynthesis and respiration by epiphyton and filamentous algal mats in a fluvial lake of the St. Lawrence River: implications on estimates of areal epiphyton production. **Can. J. Fish. Aquat. Sci.** (sous presse).

RC14- Bertolo, A., Carignan, R., Magnan, P., Pinel-Alloul, B. et D. Planas (2005). Decoupling of pelagic and littoral food webs in oligotrophic Shield lakes. **Oikos** 111 : 534-546.
RC15- Laforte, L., Tessier, A., Gobeil, C., et R. Carignan. 2005. Thallium diagenesis in lacustrine sediments. **Geochimica et Cosmochimica Acta** 69 : 5295-5306.
RC16- Garcia, E., et R. Carignan (2005). Hg contamination of fish from forest harvesting and fire-impacted boreal lakes compared using stable nitrogen isotopes. **Environmental Chemistry and Toxicology** 24 : 685-693.

1.22 Articles soumis à des revues avec comité de lecture.

RC17- Carignan, R. et D. Blais (2012). Influence of lake morphometry, watershed properties and lakeshore development on summertime epilimnetic phosphorus, chlorophyll and dissolved organic carbon in the Laurentian region (Québec, Canada). **Can. J. Fish. Aquat. Sci.** (soumis. oct. 2012).

1.23 Autres contributions avec comité de lecture, livres.

RC18- Carignan, R. (2004). Le lac Saint-Pierre en péril. **Québec Science** 42 : 20-27.

1.24 Publications ou rapports sans comité de lecture

RC19- Carignan, R., O. Perceval, Y.T. Prairie et A. Parkes (2007). Développement d'un outil de prévention de l'eutrophisation des lacs des Laurentides et de l'Estrie. Rapport final de recherche remis au MDDEP dans le cadre du programme PARDE du Ministère de l'Environnement du Québec. 120 p.
RC20- Carignan, R. (2009). Suivi de la qualité des eaux au lac Heney (mars 2007 à mars 2009) avant et après son traitement au chlorure de fer et impacts du traitement sur la composition du phytoplancton et des faunes zooplanctoniques et benthiques. 47 p. Remis au Comité paritaire du lac Heney.
RC21- Carignan, R. (2010). Évolution de la qualité des eaux au lac Heney entre mars 2007 et juin 2010 et impacts du traitement sur la composition des faunes benthiques en 2009. 53 p. Remis au Comité paritaire du lac Heney.
RC22- Carignan, R. (2011). Évolution de la qualité des eaux au lac Heney entre mars 2007 et juin 2011. 38 p.

1.26 Collaborations

- Centro de ecología aplicada del litoral (Argentine,Prof. J.J. Neiff, Directeur). Sujet: écologie de la plaine inondable du Paraná.
- UQAM (Dr. D. Planas). Sujet: écologie du Paraná (Argentine) et métabolisme lacustre.
- Centre Saint-Laurent (Dr. C. Hudon). Sujet: métabolisme fluvial.

1.27 Explication des contributions à la recherche

L'examen de la section 1 révèlera une préférence pour la qualité et l'originalité des publications plutôt que la quantité. La majorité des périodiques choisis (Geochimica et Cosmochimica Acta, Limnology and Oceanography, Environmental Science and Technology, Canadian Journal of Fisheries and Aquatic Sciences, Biogeochemistry) sont les mieux cotés de leur discipline. Noter que certaines publications extensives auraient pu être scindées en plusieurs publications d'envergure moindre.

3. AUTRES PREUVES DE CONTRIBUTIONS ET D'INCIDENCES

- Membre du Comité 1503 du CRSNG (2010-2013).
- Éditeur associé de la revue Canadian Journal of Fisheries and Aquatic Sciences (2001-2007).
- Environ 2 conférences internationales par étudiant par année.
- Environ 20 conférences locales à la province (MDDEP), aux MRC et aux municipalités sur la gestion durable des lacs.
- Directeur de la Station de biologie des Laurentides de l'Université de Montréal (1999-2006).
- Co-Leader du Réseau de centres d'excellence CRSNG "Sustainable Forest Management" (1995-2001).
- Révision de 15 à 20 articles par année pour Limnology and Oceanography, Can. J. Fish. Aquat. Sci., Geochimica et Cosmochimica Acta, Biogeochemistry, Marine Chemistry, Environ. Sci. Technol., Hydrobiologia, etc...

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO),
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

ACKNOWLEDGEMENT OF EXPERT'S DUTY

1. My name is Richard Carignan. I live in Montreal in the Province of Quebec.

2. I have been engaged by or on behalf of Grassy Narrows First Nation to provide evidence in relation to the above-noted court proceeding.

3. I acknowledge that it is my duty to provide evidence in relation to this proceeding as follows:

   (a) to provide opinion evidence that is fair, objective and non-partisan;

   (b) to provide opinion evidence that is related only to matters that are within my area of expertise; and

   (c) to provide such additional assistance as the court may reasonably require, to determine a matter in issue.

4. I acknowledge that the duty referred to above prevails over any obligation which I may owe to any party by whom or on whose behalf I am engaged.

Date: _____ _____

Richard Carignan

Court File No. 446/15

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

SUPPLEMENTARYAFFIDAVIT OF RICHARD CARIGNAN

CANADIAN ENVIRONMENTAL LAW ASSOCIATION
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Joseph F. Castrilli (LSUC No. 26123A)
Richard D. Lindgren (LSUC No. 28529E)
Jacqueline Wilson (LSUC No. 60330R)

Solicitors for the Applicants

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

AFFIDAVIT OF DONNA MERGLER

I, DONNA MERGLER, of the City of Montreal, in the Province of Quebec, MAKE OATH AND SAY AS FOLLOWS:

1. I am a professor emerita at the *Université du Québec à Montréal* (UQAM), where I was a professor in the Department of Biological Sciences from 1970 to 2006. I hold a doctorate in physiology from McGill University. I am a former chair of the department (1982-1984), head of the doctoral program in environmental sciences (1993) and chair of the UQAM Institute for Environmental Sciences (2001-2003). I founded the Center

for Interdisciplinary Research on Well-being, Health, Environment and Society (CINBIOSE) in 1985, and was director at different periods until 2000. From 1998 to 2013, I was director of the CINBIOSE World Health Organization-Pan American Health Organization Collaborating Center for the Prevention of Work and Environment-related illnesses. I was co-coordinator of the Latin American Community of Practice in Ecosystem Approaches to Human Health (2005-2013). Since 2008, I head a pan-Canadian research team on Gender, Environment and Health. I have been a member of the Quebec Council for Science and Technology (1984-1989) and the science advisory board of the International Joint Commission of the Great Lakes (2001-2011). My teaching, research and writing have focused on the early neurotoxic effects in humans of environmental pollutants generally, including mercury. In 2006, I chaired an international scientific group which wrote a consensus document on mercury and human health. I have authored over 150 peer-reviewed scientific articles, including 50 scientific papers on the subject of mercury exposure and effects in freshwater fish-eating populations. I have given keynote addresses on mercury and human health at major international conferences and numerous presentations on the subject at national and international meetings, including the Office of Science and Technology Policy of the United States' White House (1988). I have written reports on mercury and health as it relates to the members of Grassy Narrows First Nation. My curriculum vitae appears in Appendix A of this Expert Report.

2. In February 2015 I was asked by counsel for Grassy Narrows to answer certain questions in a report on the health effects of mercury generally, and on the people of Grassy

Narrows, in particular. The questions and my answers to them appear as part of my Novemberr 2015 expert report attached as Exhibit "A" to my Affidavit.

3. A copy of my Acknowledgement of Expert's Duty form is attached as Exhibit "B" to my Affidavit.

SWORN BEFORE ME in the City of Montreal, in the Province of Quebec, this 6h day of November, 2015.

Barbara Creary, Lawyer,
Member of the Quebec Bar
#183138-1

Donna Mergler

EXPERT REPORT

Grassy Narrows First Nation and Sherry Fobister, William Fobister, Senior, Simon Fobister and Chief Roger Fobister, Senior on their own behalf and on behalf of all other members of Grassy Narrows First Nation v. Minister of Natural Resources and Forestry (Ontario) and Minister of the Environment and Climate Change (Ontario), and the Attorney General of Ontario

Ontario Superior Court of Justice
(Divisional Court)

Prepared for
Joseph F. Castrilli and Richard D. Lindgren
Counsel, Canadian Environmental Law Association
130 Spadina Avenue, Suite 301
Toronto, Ontario
M5V 2L4

GRASSY NARROWS
GENERAL MERCURY AND HEALTH FACTS

prepared by

Donna Mergler PhD
Professor Emerita
Université du Québec à Montréal

Date: November 6, 2015 _____
Donna Mergler

This is Exhibit A referred to in the affidavit of Donna Mergler
sworn before me this 6th day of November 2015

_____
Barbara Creary, lawyer, member of the Quebec Bar #183138-1

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Appendix A – Curriculum Vita

INTRODUCTION

I am a professor emerita at the *Université du Québec à Montréal* (UQAM), where I was a professor in the Department of Biological Sciences from 1970 to 2006. I hold a doctorate in physiology from McGill University. I am a former chair of the department (1982-1984), head of the doctoral program in environmental sciences (1993) and chair of the UQAM Institute for Environmental Sciences (2001-2003). I founded the Center for Interdisciplinary Research on Well-being, Health, Environment and Society (CINBIOSE) in 1985, and was director at different periods until 2000. From 1998 to 2013, I was director of the CINBIOSE World Health Organization-Pan American Health Organization Collaborating Center for the Prevention of Work and Environment-related illnesses. I was co-coordinator of the Latin American Community of Practice in Ecosystem Approaches to Human Health (2005-2013). Since 2008, I head the pan-Canadian research team on Gender, Environment and Health. I have been a member of the Quebec Council for Science and Technology (1984-1989) and the Science Advisory Board of the International Joint Commission of the Great Lakes (2001-2011). My teaching, research and writing have focused on the early neurotoxic effects in humans of environmental pollutants generally, including mercury. In 2006, I chaired an international scientific group that wrote a consensus document on mercury and human health. I have authored over 150 peer-reviewed scientific articles, including 50 scientific papers on the subject of mercury exposure and effects in freshwater fish-eating populations. I have given keynote addresses on mercury and human health at major international conferences and numerous presentations on the subject at national and international meetings, including the Office of Science and Technology Policy of the United States' White House (1988). I have written reports on mercury and health as it relates to the members of Grassy Narrows First Nation. My curriculum vita appears in Appendix A of this Expert Report.

I have been asked by Joseph F. Castrilli and Richard D. Lindgren of the Canadian Environmental Law Association on behalf of Grassy Narrows First Nation to prepare an expert report that responds to several questions. I am solely responsible for the preparation of this report.

QUESTIONS

1. For the documents referred to below, please indicate if the views expressed in those documents that relate to the subject matter of this expert report, and/or that are attributed to you, are accurate in every material respect? If not, please indicate in your expert report the corrections, if any, that should be made with respect thereto.

A. The Grassy Narrows-Earthroots request, dated January 2014, of the Ministry of the Environment for an individual environmental assessment (IEA) on the Whiskey Jack Forest Management Plan (2012-2022), and the supplementary submissions made to the Ministry dated May, July, September and November 2014 insofar as they relate to your area of expertise and the subject matter for your report.

B. Literature Review of the Mercury Disability Board, dated September 2010. This document (consisting of two reviews) is referred to in the September 2014 submission.

1.1 For the documents referred to below, please indicate your views on them to the extent they relate to the subject matter of your expert report and are within your area of expertise:

C. The article by Harada, et al. entitled "Mercury Poisoning in First Nations Groups in Ontario: 35 Years of Minamata Disease in Canada" (translated from the Japanese version published in the Journal of Minamata Studies in 2011).

D. The article by Takaoka, et al. entitled "Signs and Symptoms of methylmercury contamination in a First Nations community in Northwestern Ontario, Canada" published in the journal Science of the Total Environment in 2014.

2. Regarding the subject of mercury and human health:

a. Is mercury toxic to humans? If so, on the scale of toxic substances in the environment, where does mercury rank in terms of overall toxicity risk to humans?
b. If so, what are the clinical human health impacts of mercury?
c. Does exposure to mercury increase the risk of other health problems developing and, if so, identify those other health problems?

3. At what levels of exposure to mercury have adverse clinical health impacts on adults been documented in the scientific literature?

4. Does exposure to mercury affect the development of foetuses and children and, if so, what are the effects, and for what duration of time, if any, will those effects persist? At what exposure levels have these developmental effects been documented in the scientific literature?

5. Are there sub-clinical effects:

a. *In a community where mercury-related neurologic clinical disorders are present, could there be other persons with sub-clinical signs and symptoms?*
b. *What is the nature of these effects at each exposure level that have been documented in the scientific literature; and*
c. *Are developmental effects of mercury exposure affected by low socio-economic status based on such factors as education, income, etc.?*

6. *What are the sub-clinical population level effects, if any, of exposure to mercury? Compare these effects to individual clinical effects and to the mercury levels at which they are found? Comment on the nature and severity of the effect of these impacts at a community level?*

7. *Does mercury bio-concentrate across the placenta and, if so, what is the average concentration factor? What is the concentration factor at the 95th percentile?*

8. *Is there a delay in the manifestation of health effects following exposure to mercury? How do mercury impacts change with aging?*

9. *What evidence is there, if any, that mercury changes the rate or severity of degenerative neurological conditions such as Alzheimer, ALS, etc.?*

10. *What is the most important source of mercury in humans? How would you characterize the levels of mercury, if any, in piscivorous wildlife, such as ducks, loons, and otters? What effect, if any, do dental fillings have on human mercury body burden? How would you characterize the risk of methylmercury exposure from eating wild fish alone compared to the total mercury risk in an Aboriginal population that also eats ducks, otters, store fish, and has dental fillings?*

11. *What is the Health Canada – World Health Organization recommended fish mercury content limit (measured in parts per million – ppm) for subsistence eaters? What is the mercury limit measured in ppm for legal possession of lake fish meant for sale in Ontario?*

12. *In general, what is a reference dose? Compare the Canadian reference dose for preventing fetal neurotoxicity and developmental impacts with the reference dose adopted by the Environmental Protection Agency in the United States ("USEPA")? What caveats, if any, come with using the USEPA reference dose? Which of the two reference doses, in your professional opinion, is more appropriate and safe to use (1) for the general population, and (2) at Grassy Narrows, and why?*

13. *How does the USEPA reference dose, if at all, account for bio-concentration across the placenta? If it does not account for bio-concentration, how would it need to be modified in order to do so? How does the Canadian reference dose, if at all, account for bio-concentration across the placenta?*

14. *What are the health benefits, if any, of eating fish? What are the health benefits, if any, of the practice of fishing?*

15. *If there are health benefits to eating fish what, in your professional opinion and in the scientific literature of which you are aware, should be done with respect to practices that lead to the bio-accumulation of mercury in fish? How would this principle apply at Grassy Narrows?*

16. *How would you characterize the appropriateness of the health guidance contained in the Ontario Guide for Sport Fish Eaters for indigenous communities who eat fish? Which reference dose is used in developing the Guide?*

17. *Compare with the general population, the level of sensitivity of those who already have experienced elevated mercury exposure, or show symptoms of mercury poisoning, upon further exposure? Comment on the appropriateness of intake guidelines designed for the general population when applied to people exhibiting symptoms consistent with mercury poisoning?*

Grassy Narrows

18. *For document B listed above, and if not already addressed in response to question 1, please indicate the following:*

    a. *What role, if any, did you play in the preparation of document B?*
    b. *Are the findings and conclusions contained in document B still valid today? If not, indicate what material changes have occurred since the release of document B that would cause the need for significant revisions in its findings and conclusions?*
    c. *What would be the revised findings and conclusions, if any?*

19. *If not otherwise answered in response to question 1, above, please indicate if the statements are accurate that are contained in the first six pages of the September 2014 supplementary submission listed in item A that are attributed to your document B report?*

20. *Are you aware of a more thorough long-term study than that of Dr. Harada and his colleagues from Japan (including Takaoka and Fujino, et al.), on the issue of mercury exposure and effects at Grassy Narrows?*

21. *What risks, if any, do current mercury levels in pike and walleye present to the people of Grassy Narrows who eat fish caught from local waters?*

22. What risk is there, if any, to the health of people at Grassy Narrows who eat fish caught from local waters if mercury levels were to increase? How low an increase in fish mercury level would pose a health risk, if any?

ORGANIZATION OF EXPERT REPORT

The Expert Report is organized into two parts. Part 1 provides short summary answers to the questions listed above.

Part 2 updates the review of the scientific literature presented in the document entitled *Literature Review: The Impact of Mercury on Human Health* prepared by Dr. H.M. Chan and myself for the Mercury Disability Board in 2009, and in 2010 with a review of Dr. Harada's studies (Document B). Taken together, these provide the greater context and scientific background for the summary answers provided in Part 1.

PART 1

SUMMARY ANSWERS TO QUESTIONS

Question 1:

1. For the documents referred to below, please indicate if the views expressed in those documents that relate to the subject matter of this expert report, and/or that are attributed to you, are accurate in every material respect? If not, please indicate in your expert report the corrections, if any, that should be made with respect thereto.

> ***A. The Grassy Narrows-Earthroots request, dated January 2014, of the Ministry of the Environment for an individual environmental assessment (IEA) on the Whiskey Jack Forest Management Plan (2012-2022), and the supplementary submissions made to the Ministry dated May, July, September and November 2014 insofar as they relate to your area of expertise and the subject matter for your report.***

Answer to Question 1A: The information contained in these documents as concerns my expertise on mercury exposure and human health are accurate, with the following details

- **[IEA request, supplemental information, September, 2014 p. 3]** I verified this information with a colleague at the Minamata Institute, Dr. Mineshi Sakamoto, who informed me that the diagnostic criteria for Minamata disease have not changed. These

are the same diagnostic criteria that Dr. Harada used in Grassy Narrows. In Japan, a Law Concerning Special Measures to Provide Relief to Minamata Disease Victims, passed in 2009 was enacted in April, 2010[1]. On May 1, 2010, then Prime Minister Hatoyama attended and gave prayers at the Memorial Service for the Victims of Minamata Disease and was the first prime minister to do so. On the same day, the acceptance of applications for relief started, and eligible persons began to receive a lump sum payment in October 2010. By 2012, there were 48,327 applications for lump-sum payment and 16,824 applications for Minamata Disease Victims' Passbook. It is noteworthy that as early as 1977, the Japanese Ministry of the Environment initiated dredging because "even though the discharge of the methylmercury compound was stopped, the residual presence of mercury in the substratum of nearby waters could still cause the contamination of water and marine lives, making it necessary to remove the contaminated base sediment"[2].

- **[IEA request, supplemental information, September, 2014 p. 8]** The information written up in the Toronto Star (2003) was, in part, in error. I verified this information with Dr. Laurie Chan. While Dr. Chan did express his alarm at the high prevalence of persons still suffering from neurological symptoms after 30 years, he did not head a Health Canada financed study of neurological effects in Grassy Narrows. He did examine mercury in fish, fish consumption patterns and human exposure in Grassy Narrows[3].

- **[IEA request. Supplemental information, November, 2014]** While the psychological, social and economic impacts, cited in the Donnan 1986 report, are accurate, they do not do justice to the overall impact of mercury contamination and the ensuing reduced consumption of fish on the physical and mental health and well-being within the Grassy Narrow community.

- **[IEA request. Supplemental information, November, 2014; p. 13]** More precisely, the value for fish advisories at 0.049 µg/g is the EPA screening value for fish; it was derived specifically for subsistence fishers[4]. (see answer to Question 11)

- **[IEA request. Supplemental information, November, 2014; p. 13]** More precisely, as indicated in the text, the 0.2 µ/g wet weight was a recommendation made by the Medical Services Branch of Health and Welfare Canada for Grassy Narrows and White Dog in 1979.

[1] Japan Ministry of the Environment. Lessons from Minamata Disease and Mercury Management in Japan, (2013)
[2] Japan Ministry of the Environment Lessons from Minamata Disease and Mercury Management in Japan, (2013) p. 15
[3] Chan (2005)
[4] EPA Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories Volume 2 Risk Assessment and Fish Consumption Limits Third Edition, p. 1-6 (2000)

- **[IEA request. Supplemental information, November, 2014; p. 15]** I would rephrase the term 'the scientific literature recommends' in the following terms: There is scientific evidence to support that the EPA RfD, based on cord blood, may be too high since cord blood contains 60-70% more mercury than maternal blood, and approximately 100% higher for the upper 5% and recent studies have observed neurotoxic effects in children at these levels of prenatal exposure (see question 7 and Part 2; section 4).

B. Literature Review of the Mercury Disability Board, dated September 2010. This document (consisting of two reviews) is referred to in the September 2014 submission

Answer to Question 1B:

I was co-author of these reports and the information contained in these reports is still timely. Studies since that time further support and confirm the conclusions of these reports.

Question 1.1: For the documents referred to below, please indicate your views on them to the extent they relate to the subject matter of your expert report and are within your area of expertise:

C. The article by Harada, et al. entitled "Mercury Poisoning in First Nations Groups in Ontario: 35 Years of Minamata Disease in Canada" (translated from the Japanese version published in the Journal of Minamata Studies in 2011).

Answer to question 1.1 C.

In the article, Dr. Harada describes his experience over the past 35 years in the diagnosis of Minamata Disease in Grassy Narrows and White Dog. Dr. Harada was a clinical neurologist, with world-renowned expertise on Minamata Disease. He began examining patients with Minamata disease in 1961 and was the first to describe Fetal Minamata Disease from prenatal mercury exposure.

He relates in this article that since 1975 he has examined persons from Grassy Narrows and White Dog for signs and symptoms of Minamata Disease. Over the years, he has diagnosed many cases of Minamata Disease in these two communities. The studies up to 2004 are reviewed in our report to the Mercury Disability Board (see Document B).

In 2010, he lead a team, which included 5 neurologists/psychiatrists and internal medicine specialists in neurology. In Grassy Narrows, they examined 73 persons above the age of 20 years on the basis of the diagnostic criteria applied in Japan since 1975 for Minamata Disease. The

team identified 30 persons with Minamata Disease and a further 12 persons with "suspected Minamata Disease", among whom there were 5 cases reminiscent of Minamata developmental disorders from fetal exposure. Dr. Harada notes in this report that "fetal influence remains to be studied … there is no plan of investigation as of now."

The article reflects a great degree of thoughtfulness and care on the part of the physicians involved and, as Dr. Harada so aptly stated, ".. the undoubtable fact that Minamata Disease occurred in the corresponding districts in Canada, based on [their] long term investigation result."

D. The article by Takaoka, et al. entitled "Signs and Symptoms of methylmercury contamination in a First Nations community in Northwestern Ontario, Canada" published in the journal Science of the Total Environment in 2014.

Answer to question 1.1D.

In this article Takaoka and co-authors describe a comparison of signs and symptoms of 80 residents from Grassy Narrows above the age of 16 years with 88 mercury exposed Japanese residents and 164 Japanese non-exposed control residents. The group from Grassy Narrows was divided into 2 groups according to age: the older group from 45 years old to 76 years old and the younger (less than 45 years of age). The age of the two Japanese groups were similar to the older Grassy Narrows group. Their findings were:

- Although the Japanese exposed group reported more subjective symptoms, the more specific mercury related complaints were similar for the Japanese exposed and the Grassy Narrows older group.

- Neurological findings and quantitative sensory measurements were similar in the Grassy Narrows Older and Japanese Exposed groups than in the Japanese Control group.

- The results for the younger Grassy Narrows group fell between those of the Grassy Narrow Older and the Japanese Control groups.

- The authors mention the limitations of such a comparison due primarily to different living conditions and cultures, but emphasize the diagnostic validity of the examination.

- The authors conclude that the data collected from methylmercury-exposed indigenous residents of Grassy Narrows suggest that they were poisoned by methylmercury. The health abnormalities also appear to exist in a milder form in the younger generations from Grassy Narrows.

The findings of this study are consistent with the scientific literature on mercury poisoning. In

the absence of an epidemiologic study on neurotoxic effects of mercury exposure in Grassy Narrows, the study presents an innovative way of examining similarities and differences in signs and symptoms in communities who have been exposed to mercury. Ideally, it would have been useful to examine the signs and symptoms in Grassy Narrow residents with respect to past and present exposure and use a local reference group.

Question 2: Regarding the subject of mercury and human health:

a. Is mercury toxic to humans? If so, on the scale of toxic substances in the environment, where does mercury rank in terms of overall toxicity risk to humans?

Answer to Question 2a

Mercury is definitely toxic to humans. Every few years, the United States Agency for Toxic Substances establishes a Priority List of Hazardous Substances, which includes substances that have been determined to be of greatest public health concern to persons at or near National Priority List sites[12]. While this list considers aspects other than toxicity, it includes a measure of toxicity. The 2013, Registry[3] gives mercury the highest attributable toxicity points, at the same levels as arsenic and polychlorinated biphenyls (PCBs) and ranks mercury ranks third (after arsenic and lead) on the overall priority scoring list of 785 hazardous substances. It is noteworthy that mercury has held this ranking since 1991, when the first list was established.

b. If so, what are the clinical human health impacts of mercury?

The most severe clinical impacts of fetal and adult exposure to methylmercury are the neurodegenerative diseases: Fetal Minamata Disease and Minamata Disease, respectively.

Clinical effects in adults : Gait disturbance, loss of balance, speech disturbance constriction of visual fields, sensory disturbances (numbness, loss of feeling or tingling in extremities and around the mouth), hearing disturbances, muscle weakness, muscle cramps.

Clinical effects of in utero exposure: severe cerebral palsy-like symptoms, even when their mothers have mild or no manifestation of the poisoning: mental retardation, cerebellar ataxia (coordination and balance problems), primitive reflexes (present in infants, which normally disappear in adulthood), dysarthria (muscle speech disorders), and hyperkinesia (uncontrolled muscular movements).

[1] Agency for Toxic Substances Registry (http://www.atsdr.cdc.gov/spl/)
[2] It should be noted that this priority list is not a list of "most toxic" substances, but rather a prioritization of substances based on a combination of their frequency, toxicity, and potential for human exposure at NPL sites ((http://www.atsdr.cdc.gov/spl/))
[3] Agency for Toxic Substances Registry. Support Document to the 2013 list of hazardous substances that will be the subject of toxicological profiles.

c. Does exposure to mercury increase the risk of other health problems developing and, if so, identify those other health problems?

Mercury has been shown to increase the risk for learning disabilities in children and, in adults, the risk for cardiovascular disorders, such as myocardial infarction and hypertension. There is some evidence of an association between mercury exposure and metabolic syndrome, diabetes and autoimmune disorders, but more studies are required to confirm or not these associations (see Part 2, section 1)

Question 3: At what levels of exposure to mercury have adverse clinical health impacts on adults been documented in the scientific literature? What are the reported adverse clinical health effects in adults at these levels?

Answer to Question 3:

For clinical neurological effects in adults, there are case reports of moderate to severe neurological symptoms in patients with blood mercury concentrations from 12 – 38 μg/L[1,2].

It should be noted that, for adults, it is difficult to establish a level of exposure since mercury-related subtle neurological alterations may have existed since conception and the biomarkers of mercury exposure (hair and blood) only represent recent exposure. Thus, adults who have been prenatally exposed to mercury, with continued exposure through childhood and early adulthood, may suffer clinical effects that are not related to their current mercury exposure, but to their past exposure. Furthermore, the large majority of studies on adults include persons who eat marine fish, which have considerably higher concentrations of beneficial nutrients such as omega-3 fatty acids and selenium, compared to freshwater fish.

Question 4: Does exposure to mercury effect the development of foetuses and children and, if so, what are the effects, and for what duration of time, if any, will those effects persist? At what exposure levels have these developmental effects been documented in the scientific literature?

Answer to Question 4:

There is a very substantial scientific literature showing prenatal and early childhood exposure to mercury is associated with a decrease in children's intellectual capacities. This has been

[1] Silbernagel et al. (2011)
[2] Groth (2008)

confirmed in animal studies and in brain imaging and electrophysiological examinations (see Part 2; sections 5 and 6).

Follow-up studies of mercury-exposed children indicate that these deficits persist over time. For example, a study of Canadian Inuit children at 8 years of age, exposed prenatally to mercury, showed that 17.2% of the children whose cord blood mercury was above 7.5µg/L were below the clinical cut-off for learning disabilities compared to 4.3% for the others[1].

A 22-year follow-up study of children of mothers with high mercury exposure[2] shows that there are still deficits in major domains of brain function as well as general intelligence in relation to their cord blood mercury concentrations; the geometric mean of their current blood mercury concentrations was 2.53µg/L and hair mercury 0.68µg/g.

The lowest reference dose for the protection of foetus and children is the US EPA reference dose (5.8 µg/L blood mercury; 1 µg/g hair mercury), which includes a tenfold uncertainty factor[3]. However, since the mercury in the cord blood is higher than in mother's blood, it may be too high (see part 2, section 4).

Question 5: Are there sub-clinical effects:

a. *In a community where mercury-related neurologic clinical disorders are present, could there be other persons with sub-clinical signs and symptoms?*
b. *Nature of these effects at each exposure level that have been documented in the scientific literature; and*
c. *Developmental effects of mercury, if any, in children in families with low socio-economic status based on such factors as education, income, etc.?*

Answer to Question 5a:

Clinical manifestations of mercury poisoning constitute the tip of the iceberg with respect to the harmful health effects of mercury exposure. In a contaminated environment, for every person with clinical manifestations, there are many more with sub-clinical signs and symptoms and even more with symptoms of decreased well-being, which affect a person's physical, mental and social capacities.

Answer to Question 5b:

[1] Jacobson et al. (2005)
[2] Debes et al. (2015)
[3] Rice (2004)

In adults, the tip of the iceberg is composed of people with the most severe classical symptoms of mercury poisoning (described in answer to question 2b), a higher number of mercury-exposed persons present signs and symptoms that are less severe, but debilitating, such as poorer cognition, motor deficits, vision problems and cataracts. Cognitive deficits have been observed in freshwater fish-eating communities with hair mercury concentrations that ranged from 0.56 to 13.6 µg/g, with half of the participants having levels below 6 µg/g.

For cardiovascular effects, an analysis of existing studies by an expert committee indicate a twofold increased risk for myocardial infarction at equivalent hair concentrations less than 1.66µg/L[1] (see Part 2, section 1)

In children, the most severe classical symptoms of mercury exposure in their development years are described in question 2b. Many more children are exposed to lesser concentrations.

There is consensus on the fact that mercury exposure is associated with delayed learning, shortened attention span, memory deficits, delayed language acquisition, poorer motor control or coordination (see part 2, sections 5 and 6)

Even at very low concentrations of prenatal and early childhood exposures (maternal mean hair mercury 0. 0.53 (range 0–2.3) µg/g)[2], some of these effects are present in the developing child and the frequency and severity of these problems increases with the exposure dose.

In the study of Inuit children mentioned above, mothers' hair mercury at birth ranged from 1.4µg/g – 15 µg/g.

Electrophysiological and neuro-imaging techniques have confirmed altered brain activity in children with prenatal exposure to mercury.

Answer to Question 5c.

In addition to mercury exposure, children's development can be affected by other factors, such as poor nutrition and housing, pre-existing diseases and parents' unhealthy lifestyle, little access to health care, poor schooling, minimal parental stimulation (see Part 2, section 6).

Developmental mercury exposure can compound the effects of these conditions, resulting in, for example, a larger percentage of children with learning disabilities (see Part 2, Section 6, Figures 4,5 and 6)).

Question 6: What are the sub-clinical population level affects, if any, of exposure to mercury? Comment on the nature and severity of the effect of these impacts at a community level?

[1] Guallar et al. (2002)
[2] Oken et al. (2008)

What are the levels of mercury exposure documented in the scientific literature at which these effects can occur?

Answer to Question 6:

For adults, sub-clinical effects include poorer cognitive functions, poorer vision, poor motor function and earlier age-related cataracts. These affect people's capacity to earn their living and carry out daily activities (see part 2 sections 5, 6 and 7). Overall the community's capacity to develop is hindered. In some studies, cardiovascular and metabolic changes have been reported in relation to mercury exposure, but results are inconsistent and co-factors, such as nutritional status and lifestyle, may play a role (see Part 2, sections 1 and 2).

For children, even a small decrease in average cognitive function has striking repercussions for the community. For example, an average decrease of 5 IQ points, among exposed children means that in a community twice as many children have severe learning difficulties and half as many children are gifted (see Part 2, sections 5 and 6).

When other harmful factors (poor nutrition, lack of stimulation, poor education) are present, the effects of mercury may be greater (see Part 2, section 6). In a study of an Inuit community, an average loos of 4.8 IQ points resulted in over four times more children with learning disability[1]. (Part 2, section 6)

The loss of cognitive function has life-long effects for these children who do less well in school. Educational level is an important determinant of later-life earning capacity and health status.

Question 7: Does mercury bio-concentrate across the placenta and, if so, what is the average concentration factor? What is the concentration factor at the 95th percentile?

Answer to question 7:

Throughout pregnancy, the placenta concentrates methylmercury and blood mercury concentration in the umbilical cord, which nourishes the foetus, is higher than in the mother's blood.

At birth, the average cord mercury blood concentration is almost double that of the mother, while for one in twenty, that concentration is over three and a half times higher. (see part 2, section 4)

[1] Jacobson (2015)

Question 8: Is there a delay in the manifestation of health effects following exposure to mercury? How do mercury impacts change with aging?

Answer to Question 8:

Minamata Disease is a progressive disorder and some infants, who had a normal appearance at birth, slowly developed the disease over time.[1]

Studies of persons from the Minamata region show that even those that do not have the diagnosed disease show more signs of aging compared to persons from other regions (see Part 2, section 7 and Figure 6).

The aging brain is more sensitive to toxic assault and studies of aging fish-eaters exposed to mercury have shown mercury-related progressive visual disorders, even when exposure was reduced, and a higher prevalence of age-related cataracts. (see Part 2, section 7)

Question 9: What evidence is there, if any, that mercury changes the rate or severity of degenerative neurological conditions such as Alzheimer, ALS, etc.?

Answer to Question 9:

To my knowledge, there is no evidence of a higher prevalence of Alzheimer disease or amyotrophic lateral sclerosis (ALS). The features of fetal Minamata Disease are similar to cerebral palsy. However, because of the pervasive neurologic effects of mercury exposure, there may be misdiagnoses.

Question 10: What is the most important source of mercury in humans? How would you characterize the levels of mercury, if any, in piscivorous wildlife, such as ducks, loons, and otters? What effect, if any, do dental fillings have on human mercury body burden? How would you characterize the risk of methylmercury exposure from eating wild fish alone compared to the total mercury risk in an Aboriginal population that also eats ducks, otters, store fish, and has dental fillings?

Answer to Question 10:

The most important source of mercury exposure in humans is from the consumption of fish and fish-eating animals (see Part 2, section 8).

[1] Maruyama et al, (2012)

Mercury is accumulated and biomagnified through the food chain; the process is initiated through the action of bacteria that transform inorganic mercury, present in the water, to methylmercury.

Larger fish eat many small fish, incorporating all of their mercury. Fowl and mammals that eat fish will likewise accumulate mercury in the same way.

At the top of the food chain are humans. The risk depends on the total amount of mercury from each of the foods.

The risk for mercury exposure in Aboriginal populations that eat fish and fish-eating animals has been shown to be considerably higher than in other populations

A study of adult dietary practices among 7 Eeyou Istchee (Cree) communities in the James Bay area showed that blood mercury concentrations 3 – 20 times higher than those reported in the Canadian Health Measures Survey (CHMS) [1], which did not include Aboriginal communities living on reserves. (see Part 2, section 9).

In the study of the Cree community mentioned above, the geometric mean for blood mercury of persons with the highest traditional food intake was 5.3µg/L, for those who consumed the least traditional food, it was 3µg/L,[2] while for the general adult Canadian population, it is approximately 0.8 µg/L[3].

A further source of methylmercury exposure may come from wild rice that grows in sediments that have been contaminated with mercury.

Mercury in dental amalgams is inorganic mercury that can be measured in blood and urine, but not in hair. In the Canadian Health Measures Survey, blood mercury concentrations increased with the number of dental amalgams. The geometric mean for those with no mercury-based dental amalgams is 0.6 µg/L, while for those who have over 26 amalgams, it is 1.24µg/L[4].

Question 11: What is the Health Canada – World Health Organization recommended fish mercury content limit (measured in parts per million – ppm) for subsistence eaters? What is the mercury limit measured in ppm for legal possession of lake fish meant for sale in Ontario?

Answer to Question 11:

[1] Johnson-Down et al. (2015)
[2] Johnson-Down et al. (2012)
[3] Lye et al. (2013)
[4] Lye et al. (2013)

There are different types of recommended limits concerning fish consumption: (i) amount of mercury in the fish (expressed in mg/kg, µg/g or ppm); (ii) the amount of mercury considered safe to consume on a daily basis, considering persons' weight (µg/kg/day) over a lifetime; (iii) the average amount of fish that should be eaten (g/day or fish meals/month), based on a risk assessment of risks and benefits. Table 1 contains some of these recommendations from different agencies.

Table 1 Recommendations by different national and international agencies for limits for mercury on fish, mercury consumption and fish consumption

	Canada	Ontario	US-EPA	WHO/FAO
MERCURY IN FISH				
Commercial sale	0.5 ppm[a]			
Fishing for sale				
Recreational			0.4 ppm[c]	
Women of child-bearing age and children under 15		0.26 ppm[b] Do not eat: 0.52 ppm		
Others		0.61 ppm[b] Do not eat: 1.84 ppm		
Subsistence	0.2 ppm[h]		0.049 ppm[c]	
METHYLMERCURY IN THE PLATE				
Intake dose	0.2µg/kg body weight/day[d]		0.1µg/kg body weight/day[e]	0.23µg/kg body weight/day[f]
FISH CONSUMPTION				
General				
1-4 year old	10g/day[g]			
5-11 year old	14g/day[g]			
Adults	22g/day[g]			
Subsistence fishing				
1-4 year old	20g/day[g]			
5-11 year old	33g/day[g]			
Adults	40g/day[g]			

a. There are some exceptions to this for a few marine fish, with higher concentrations
b. These are the values used by the *Ontario Guide for Sport Fisher Eaters (2013-2014)* to

provide information on fish consumption for anglers (and their families) who consume moderate quantities of fish. The consumption advice is intended to protect individuals who follow the advice in the guide and consume no more than 8 meals per month of the fish they catch. Specific information is available for each lake.

c. Screening value from US Environmental Protection Agency *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories Volume 2 Risk Assessment and Fish Consumption Limits Third Edition (2000)*
d. Canadian Total Daily Intake Value Health Canada
e. EPA website http://www.epa.gov/iris/subst/0073.htm;
f. A recent review of these guidelines by the European Food Safety Authority (2012) proposed that it be reduced to 0.19 µg/kg/body weight
g. Daily fish consumption recommended in the document *Human Health Risk Assessment of Mercury in Fish and Health Benefits of Fish Consumption.* Bureau of Chemical Safety Food Directorate Health Products and Food Branch, Health Canada (2007)
h. Health and Welfare Canada recommendation for Grassy Narrows and White Dog in 1979.

Question 12: In general, what is a reference dose? Compare the Canadian reference dose for preventing fetal neurotoxicity and developmental impacts with the reference dose adopted by the Environmental Protection Agency in the United States ("USEPA")? What caveats, if any, come with using the USEPA reference dose? Which of the two reference doses, in your professional opinion, is more appropriate and safe to use (1) for the general population, and (2) at Grassy Narrows, and why?

Answer to Question 12:

The US-EPA uses the term Reference Dose (RfD), defined as ''an estimate of a daily exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious effects during a lifetime.''[1] Some scientists have raised the issue that this RfD may be too high because it is based on cord blood and does not take into account methylmercury accumulation in the placenta[2].

Canada uses Toxicity Reference Values (TRVs) to derive Total Daily Intake, (TDI) defined as "the maximum amount of a chemical that can be ingested on a daily basis over a lifetime without increased risk of adverse health effects.

As indicated in the table above, for methylmercury, the US-EPA RfD is 0.1µg/kg body weight/day, while the Canadian TDI is 0.2µg/kg body weight/day.

My opinion is that the US-EPA reference offers better protection against the harmful effects of

[1] cited in Rice (2004)
[2] Stern (2005)

exposure to methylmercury to all populations. Mercury intake for most of the general Canadian population is well below this intake.

In 2003, Chan[1] calculated the intake of mercury in the Grassy Narrow community and estimated mercury intake from fish consumption using the actual values that were measured in fish species from the various lakes and the reported portion size per fish meal.

In Grassy Narrows, in 2003, the average mercury intake over the year was 0.2µg/kg body weight/day, with men having higher average intakes compared to women (0.3 µg/kg body weight/day vs. 0.1µg/kg body weight/day). The average intakes included people who don't eat fish; if the analysis had included only fish-eaters, the average mercury intake would have been higher.

By season, the highest mercury intake was by men in summer and spring (3.7 µg/kg body weight/day). Approximately 25% had estimated intakes above the Canadian TDI and 41% were above the US-EPA RfD.

The average mercury intake for Grassy Narrows women in 2003 was above the US-EPA RfD of 0.1 µg/kg body weight/day. It should be noted that this includes all women who were surveyed, including those that don't eat fish.

Cord blood data from Grassy Narrows between 1978 and 1992 shows that the concentration mercury was much higher, particularly in the earlier period (see Part 2, section 14a and Figure 8). Today, these persons are between the ages of 23 and 37 years old.

Given the information on estimated methylmercury intake from past and present exposures in Grassy Narrows, there are already effects on their health and well-being from mercury exposure and the EPA RfD would be more suitable for the Grassy Narrows population. However, this does not take into account the health, social and economic benefits of fishing and fish consumption.

Question 13: How does the USEPA reference dose, if at all, account for bio-concentration across the placenta? If it does not account for bio-concentration, how would it need to be modified in order to do so? How does the Canadian reference dose, if at all, account for bio-concentration across the placenta?

Answer to Question 13:

The US-EPA reference dose, which is based on cord blood, does not take into account bio-concentration across the placenta. It is based on a cord blood concentration of 58 µ/L and then

[1] Chan (2005)

uses a tenfold security factor to arrive at a cord blood concentration of 5.8µg/L from which mercury intake is derived as 0.1µg/kg body weight/day. Mahaffey, who was one of the committee members who set the EPA RfD, suggests that it should be based on a value of 3.5 µg/L to take into account bioconcentration[1]. The relation between maternal mercury intake and cord blood is not necessarily linear[2] and what one can say at this point is that it would be lower than 0.1µg/kg body weight/day.

The Canadian Total Daily Intake is based on maternal hair at birth[3] and did not take into account placental bioconcentration and thus did not account for the fact that hair mercury concentrations decrease over pregnancy (see Part 2; figure 2).

Question 14: What are the health benefits, if any, of eating fish? What are the health benefits, if any, of the practice of fishing?

Answer to Question 14:

Fish is a highly nutritious food, providing a wide variety of nutrients, including omega-3 fatty acids (see Part 2, section 11).

In utero and throughout lifespan, omega-3 fatty acids are likewise positive physical and mental health outcomes, including children's neurodevelopment, visual functions, blood pressure, cardiac function, vascular reactivity and lipids

Studies of children exposed to mercury through fish consumption show the negative effects of mercury exposure and the positive effects of omega-3 fatty acids on neurodevelopment. Studies of adults, as well, have shown the opposing effects of mercury and omega-3 fatty acids and visual function, as well as for the risk of myocardial infarction (Part 2, section 11, Figure 7)

The US-EPA advisory for subsistence fishing was developed in collaboration with representatives from Native American tribes. It indicates: "EPA recognizes, however, that Native American subsistence fishers are a unique subsistence fisher population that needs to be considered separately. For Native American subsistence fishers, eating fish is not simply a dietary choice that can be completely eliminated if chemical contamination reaches unacceptable levels; rather eating fish is an integral part of their lifestyle and culture. This traditional lifestyle is a living religion that includes values about environmental responsibility and community health as taught by elders and tribal religious leaders. Therefore, methods for balancing benefits and risks from eating contaminated fish must be evaluated differently than for the general fisher

[1] Mahaffey (2009)
[2] Stern (2003)
[3] Legrand et al (2010)

population"[1]."

Question 15: If there are health benefits to eating fish what, in your professional opinion and in the scientific literature of which you are aware, should be done with respect to practices that lead to the bio-accumulation of mercury in fish? How would this principle apply at Grassy Narrows?

Answer to Question 15:

In my professional opinion, based on the existing scientific literature, fish-eating practices should seek to maximize the nutritional benefits from fish consumption and minimize the toxic risk from mercury and other contaminants.

The Grassy Narrows community has been exposed to high concentrations mercury in fish for many years and individuals and the community are suffering the effects. **It would only add toxic insult to toxic injury to further expose this population to mercury**

While the community needs the nutrition from the fish, their intake of mercury needs to be minimal. To achieve this there needs to be a comprehensive plan:

- to reduce mercury at the source in the lake sediments;
- to never increase the mercury load in this environment;
- to eat more fish with little mercury;
- to initiate schooling and health programs to address the issue of mercury poisoning in this community.

Question 16: How would you characterize the appropriateness of the health guidance contained in the Ontario Guide for Sport Fish Eaters for indigenous communities who eat fish? Which reference dose is used in developing the Guide?

Answer to Question 16:

The Ontario Guide for Sport Fish Eaters is designed for "anglers (and their families) who consume moderate quantities of fish. The consumption advice is intended to protect individuals who follow the advice in the guide and consume no more than 8 meals per month of the fish they catch." The Guide notes that the advisory is based on the Canadian TDI. Their fish advisory recommends that "for women of child-bearing age and children under 15 years old, restrictions on consuming sport fish containing mercury begin at levels of 0.26 parts per million. Complete restriction (i.e., do not eat) is advised for levels above 0.52 parts per million. For the general population, consumption restrictions begin at levels above 0.61 parts per million. Complete

[1] US Environmental Protection Agency *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories Volume 2 Risk Assessment and Fish Consumption Limits Third Edition (2000) p. 16*

restriction is advised for levels above 1.84 parts per million."[1]

The guide clearly indicates that it is not for heavy fish eaters. In Grassy Narrows, using the 2003 information on fish consumption from Chan, approximately 16% of persons eat more than 9 fish meals/month, and the average mercury content for several of the fish species in many of the lakes is above 0.52 ppm.

Question 17: Compare with the general population, the level of sensitivity of those who already have experienced elevated mercury exposure, or show symptoms of mercury poisoning, upon further exposure? Comment on the appropriateness of intake guidelines designed for the general population when applied to people exhibiting symptoms consistent with mercury poisoning?

Answer to Question 17:

There is ample evidence from animal and human studies that mercury modifies normal functioning of many systems, and in particular, the nervous system. While some of these changes result in symptoms and signs of damage, many remain undetectable because of the body's capacity to adapt. There is, however, a limit to this physiological adaptation and further exposure will build on the damage already present.

The guidelines for mercury intake refer to "over a lifetime". If exposures have been higher in the past than at present, the intake guidelines do not apply since over the lifespan, one's intake will be higher than those recommended by the guidelines.

Grassy Narrows

Question 18: For document B listed above, and if not already addressed in response to question 1, please indicate the following:

- ***a. What role, if any, did you play in the preparation of document B?***
- ***b. Are the findings and conclusions contained in document B still valid today? If not, indicate what material changes have occurred since the release of document B that would cause the need for significant revisions in its findings and conclusions?***
- ***c. What would be the revised findings and conclusions, if any?***

Answer to Question 18a:

I prepared document B in collaboration with Dr. Laurie Chan, Professor and holder of the Canada Research Chair in Toxicology and Environmental Health.

[1] Ontario Ministry of the Environment. 2013-2014 Guide to Eating Ontario Sport Fish, p. 16,

Answer to Question 18b:

The findings and conclusion of document B, which was submitted to the Mercury Disability Board in 2010, are still valid today. Since that time the science of mercury exposure and its effects on human health has continued to advance substantially and Part 2 of the present document updates the scientific evidence since that time. Studies published since 2010 on the effects of mercury on health and well-being, confirm the conclusions contained in Document B.

Answer to Question 18c:

The more recent studies indicate effects of mercury exposure are present at lower levels than previously thought and that they are long-lasting.

Question 19: If not otherwise answered in response to question 1, above, please indicate if the statements are accurate that are contained in the first six pages of the September 2014 supplementary submission listed in item A that are attributed to your document B report?

Answer to Question 19:

The statements are accurate and the scientific literature of the past 5 years provides strong confirmation. One further update: The law Concerning Special Measures to Provide Relief to Minamata Disease Victims, passed in 2009 was enacted in April, 2010 (see question 1 above).

Question 20: Are you aware of a more thorough long-term study than that of Dr. Harada and his colleagues from Japan (including Takaoka and Fujino, et al.), on the issue of mercury exposure and effects at Grassy Narrows?

Answer to Question 20:

Dr. Harada was a clinical neurologist, with world-renowned expertise on Minamata Disease, who began examining patients with Minamata Disease in 1961. He carried out a most thorough study of clinical manifestations of Minamata Disease in Grassy Narrows. No other group of scientists have carried extensive health studies with this community, although, as we indicated in the MDB report and Dr. Harada mentions in his 2011 report, there is a need for studies on the long-term effects of fetal exposure and the overall impact of mercury exposure on the physical and mental well-being of this community.

Question 21: What risks, if any, do current mercury levels in pike and walleye present to the people of Grassy Narrows who eat fish caught from local waters?

Answer to Question 21:

According to the 2005 report by Chan[1], the average mercury concentration in walleye in the lakes that are around Grassy Narrows (Ball Lake, Garden Lake and Indian Lake) are above almost all fish advisories guidelines for consumption. They are between twelve to twenty times higher than the US-EPA screening value for subsistence fish-eating. Northern Pike from these lakes are twelve to eighteen times higher than the screening value. Using the Ontario Fish advisories, all of the walleye and northern pike from these lakes are above the 'do not eat' concentration for women of child-bearing age and children (0.52 µg/g), while for the others, there would be restrictions for Ball and Indian Lake since the average mercury concentration in fish is above 0.62 µg/g).

Historical data from the English-Wabigoon River system from 1975 onwards show that there were much higher exposures in the past. While these high concentrations for walleye and northern pike declined rapidly from 1975 to 1985, the decline was much less and often stable until 2010[2].

When estimating the risk for mercury poisoning in Grassy Narrows, it is necessary to take into account past exposures (including prenatal exposure), as well as present exposures,. Even without actual data, it is clear that the risk for mercury poisoning is very high for walleye and northern pike fish-eaters.

It should also be mentioned that particularly for *in utero* exposures, immediately after ingestion of the fish, there would be a very large peak of mercury exposure at a critical moments in fetal development. Prenatal effects may differ depending upon the moment of this peak exposure during fetal development.

Question 22: What risk is there, if any, to the health of people at Grassy Narrows who eat fish caught from local waters if mercury levels were to increase?

Answer to Question 22:

There is no question that the mercury already present in the Grassy Narrow area poses important risks to health and well-being to the community and that any further addition of

[1] Chan (2005)
[2] Neff et al. (2012)

mercury would increase that risk. It would, indeed be adding insult to injury. In my opinion, based on the scientific literature and Dr. Harada's work, it would be shameless, and I would call it irresponsible, to add more mercury to this mercury-laden environment. The health and well being of this community has already been harmed not only through mercury poisoning of those who continue to eat fish, but also and by depriving important nutrients to those who reduced their fish consumption because of the mercury.

PART 2

OVERVIEW

> *"At first, methylmercury research was impaired by inappropriate attention to narrow case definitions and uncertain chemical speciation. It also ignored the link between ecotoxicity and human toxicity. As a result, serious delays affected the recognition of methylmercury as a cause of serious human poisonings in Minamata, Japan. Developmental neurotoxicity was first reported in 1952, but despite accumulating evidence, the vulnerability of the developing nervous system was not taken into account in risk assessment internationally until approximately 50 years later. Imprecision in exposure assessment and other forms of uncertainty tended to cause an underestimation of methylmercury toxicity and repeatedly led to calls for more research rather than prevention."*
>
> *Grandjean et al, 2010*

This review on general mercury and health facts sought to provide the most up-to-date information on mercury and human health, building on the information contained in the document entitled *Literature Review: The Impact of Mercury on Human Health* prepared by Dr. H.M. Chan and myself for the Mercury Disability Board in 2009, updated in 2010 with a review of Dr. Harada's studies. The two documents provide the scientific background for the answers to the questions above. Since 2010, over 800 articles have been published on methylmercury and fish, with half in the medical domain. Figure 1 shows the evolution of articles on methylmercury and fish since 1966. Approximately half of these are on health issues.

Figure 1 Evolution of scientific articles on methylmercury and fish since 1966

The literature review, here, is not exhaustive and serves to provide background for the questions that were posed. Relevant published scientific reviews and studies, since we wrote the report for the Mercury Disability Board in 2010 were identified, and where, possible, an

emphasis placed on those that examined methylmercury exposure and health effects in Canadian First Nation and Inuit communities.

The studies of the past years, reviewed here, support the following conclusions:

- There is no doubt that at the levels of exposure experienced in Grassy Narrows, the community has suffered and continues to suffer from mercury poisoning, individually and collectively.
- The scientific literature continues to provide evidence for Dr. Masazumi Harada and colleagues' clinical findings, reviewed by Chan and Mergler for the MDB[1] on the similarities between the neurologic signs and symptoms of persons from Grassy Narrows and White Dog and Minamata Disease in Japan. Using the diagnostic criteria for Minamata Disease, in Harada's 2010 he diagnosed Minamata Disease in 30 people from Grassy Narrows and 12 persons with 'suspected MInamata Disease.' (see question 1 C).
- The reduction of consumption of local fish and wildlife resulting from mercury pollution of the area deprived the people of Grassy Narrows of healthful nutrients, which have been shown to be beneficial for a large number of physiological functions and to be preventive for many and diseases.
- It is surprising that although the Japanese neurologists have identified many cases of Minamata Disease in Grassy Narrows and many persons have illnesses that have been associated with mercury intoxication, there has never been a scientifically sound epidemiologic study of the impact of pre and post natal mercury exposure on the health and well-being of this community.
- Any increase of exposure to this already 'sensitive' community to mercury contamination from sources, such as mining, logging and reservoirs, would further compound the harm to the health and well-being of the present and future generations.

1. Mercury is highly toxic to human health. Impacts include fetal and child development, neurological disorders and cardiovascular changes.

The effects of mercury from fish consumption on the nervous system has been extensively studied since the Minamata disaster and there is consensus on mercury neurotoxicity and its harmful neurologic effects during fetal and child development and in adults. Epidemiologic studies of exposed populations show increased risk for neurodevelopmental deficits, loss of cognitive and motor functions and visual deficits[2]. Changes in brain functioning in methylmercury-exposed persons have been confirmed in electrophysiological[3] and brain

[1] Chan and Mergler (2010)
[2] Grandjean et al. (2010)
[3] Ethier et al, (2012)

imaging[1] studies. Experimental studies with mercury-exposed animals provide extensive information on the mechanisms that underlie mercury toxicity[2].

More recently, the possible effects of mercury on other health endpoints have been examined. In 2011, the Environmental Protection Agency of the United States convened a workshop of experts on methylmercury exposure and cardiovascular endpoints[3]. The authors concluded that there was strong evidence for the relation between biomarkers of mercury exposure, measures in toenails or hair and myocardial infarction (MI). It is noteworthy that the range of the equivalent hair mercury exposure of the studies reviewed by this committee was from 0.34µg/g to 1.66µg/g[4]. Among the studies, upon which their conclusions were based, was an international study that showed a doubling of the risk for a first myocardial infarction for men in the highest quintile of hair mercury.

In addition, several studies have shown associations between biomarkers of methylmercury exposure and other cardiovascular disorders**,** including hypertension and changes in heart rate variability profiles[5]. In a study of Cree adults[6], the authors observed a positive association between altered heart rate variability parameters and blood mercury, after considering fish nutrients (omega-3 fatty acids and selenium) and other contaminants (lead and polychlorinated biphenyls) that are also present in the traditional diet of this population.

There is some evidence that mercury exposure increases the risk for Type II diabetes, but it is inconsistent. A recent 18-year follow-up study[7] of 3875 young United States' adults (20-32 years old), free of diabetes at the onset of the study, showed that those with the highest mercury exposure (equivalent of 1.2 – 1.5 µg/g hair mercury) had an elevated risk for diabetes compared to those with the lowest exposure, while another follow-up study of 2 cohorts did not show an association of incident cases of Type 2 diabetes and toenail mercury concentrations[8]. An analysis of data from the Korean National Health and Nutrition Examination Survey showed and increased risk for metabolic syndrome in men with respect to blood mercury, but not in women[9].

A recent study used the data from the United States' National Health and Nutrition Evaluation on 1352 women of reproductive age women (16 – 49 years) to examine biomarkers of the immune system. Low levels of blood and hair mercury, generally considered safe, were

[1] White et al. (2011)
[2] Fretham et al. (2012)
[3] Roman et al. (2011)
[4] Guallar et al, (2002)
[5] Houston (2011)
[6] Valera et al (2011)
[7] He et al (2013)
[8] Mozaffarian et al. (2013)
[9] Chung et al, (2014)

associated with subclinical autoimmunity among reproductive-age females.[1]. The authors put forward that methylmercury exposure may be relevant to future autoimmune disease risk.

2. Adults can be impacted at levels well below the old threshold level for risk of 50 µg/g in hair.

With the increasing information from research on risks of methylmercury exposure and the evolution in our understanding of how subtle functional alterations in many individuals can translate into important risks for a community (see Part 2, section 5), regulatory agencies continue to revise recommended threshold levels for risk.

In Canada in the 1970's, the agency that later became the First Nation and Inuit Health Branch of Health Canada considered blood mercury levels below 20 µg/L (or 6 mg/kg in hair) as being "acceptable" and levels greater than 100 µg/L in blood (or 30 mg/kg in hair) as "at risk" based on the knowledge at that time and the unusually high mercury concentrations observed in Grassy Narrows and Whitedog[2]. Today, Health Canada provides different threshold levels for risk depending on age and sex. Legrand and co-authors[3] summarized existing Health Canada methylmercury blood guidance values for the general population and expanded them to include a harmonized provisional interim blood guidance value. The threshold action levels for pregnant women, women from birth to 49 years and men less than 18 years was reduced but those for women above 50 years and men over 18 years, they are the same as in the 1970s. The table below is adapted from the table in the article by Legrand et al. in 2010 entitled:

Table 2 Overview of Health Canada Existing and Harmonized Blood Methylmercury Guidance Values

	Blood mercury threshold action levels			
	1	2	3	4
• pregnant women • women from birth to 49 years • men less than 18 years	less than 8 µg/L	8 – 40 µg/L	above 40 µg/L	
• women above 50 years • men above 18	less than 20 µg/L	20 -100 µg/L		
• women and men all ages				above 100µg/L

[1] Somers et al. (2015)
[2] Legrand et al. (2010)
[3] Legrand et al. (2010)

Action levels:

1. No follow-up required
2. Repeat blood/hair test in 6 months; provide dietary advice
3. Repeat blood/hair test immediately; schedule an appointment with a public health professional to review exposure history to identify sources of mercury exposure; provide dietary advice;
4. Repeat blood/hair test immediately; schedule an appointment with a public health professional to review exposure history to identify sources of mercury exposure; provide dietary advice; refer study participant to a physician or medical toxicologist for assessment and follow-up in terms of checking basic neurological signs and symptoms and making a decision concerning appropriateness of any therapeutic intervention

Other regulatory agencies have one reference dose for all, based on the studies of prenatal exposure and effects. The US-EPA reference dose for oral exposure to methylmercury is 0.1µg/kg body weight/day, which corresponds to mercury concentration of 5.8 µg/L (1 µg/g hair mercury)[1]. The Joint Expert Committee on Food Additives and Contaminants (JECFA) of the Food and Agriculture Organization (FAO) and the World Health Organization (WHO) proposed 1.6µ/kg body weight/ week (0.23µg/kg body weight/day)[2]. However, a recent review of the JEFCA guidelines by the European Food Safety Authority (EFSA)[3], published in 2012 and based on European data for fish consumption, proposed that the tolerable weekly intake be reduced to 1.3 µg/kg/week (0.19µg/kg body weight/day).

It is difficult to propose a threshold value for adults since few studies have focused on adult men and non-pregnant women since the developing foetus and child are more vulnerable to toxics and mercury is actively transported from the mother to the foetus. Moreover, the results on the studies on adults are inconsistent, probably due to the fact that the adults under study have different life histories (including prenatal exposure), life styles and nutrition (including difference in consumption of marine and fresh-water fish). The Health Canada guidelines in the Table above consider blood mercury of 20µg/L, which is approximately 10µg/g hair mercury.

A study of Taiwanese 240 adults (36 – 70 years old), who had lived in the region of a chloralkali plant that had been in operation between 1942 and 1985, was undertaken in 2005[4]. Mean total blood mercury was 17.3 ± 10.9 µg/L, with 90% methylmercury. Comparison of those in the 75th percentile (greater or equal to 19.2µg/L; mean 27.1 ± 10.9) to the others (mean 11.6 ± 4.7 µg/L) showed higher abnormality rates for tests of remote memory, mental manipulation, orientation and verbal fluency, but not for tests covering recent memory, attention, abstract thinking, language and drawing. The authors indicate that they do not have information on historic exposures.

[1] http://www.epa.gov/iris/subst/0073.htm (referenced May 5, 2015)
[2] JECFA (2004)
[3] EFSA (2012)
[4] Chang et al. (2008)

3. Foetuses and children can be impacted at far lower levels than adults.

There is now a very large number of studies on prenatal exposure to mercury and adverse health effects, most notably on children's neurodevelopment. In their review of the literature, EFSA[1] identified 34 articles of children's neurodevelopment in relation to prenatal exposure since 2003; the results of these studies motivated their recommendation to reduce the threshold for intake from 1.6µ/kg body weight/week to 1.3 µ/kg body weight/week, which would correspond to a decrease in blood mercury from 12 µg/L to 9.6 µg/L. As noted above, Health Canada considers a guidance level for blood mercury of 8 µg/L (hair mercury 2µg/g considering a ratio of 250:1) for pregnant women and women of reproductive age.

The lowest reference dose for the protection of foetus and children is the US EPA reference dose, which was based on three cohort studies of fish-eating populations[2]. It was derived by taking the lower limit of the benchmark dose[3] for cord blood and dividing it by an uncertainty factor of ten to account for variability in elimination half-life and pharmacodynamics variability[4]. It does not take into account bioaccumulation of mercury across the placenta (see section 4 below). Recent studies, however, suggest that measurable neurobehavioral effects may be present at cord blood concentrations near the US EPA reference dose.[5,6,7]

It is noteworthy that the birth cohort studies of mother-child pairs in the Seychelles[8] Islands continue to show little or no effects of mercury exposure despite concentrations similar and even higher than those which have demonstrated mercury-related effects on performance on neuropsychological tests and on electrophysiological and imaging. However, the authors of the Seychelles' studies note that the benchmark dose estimates that serve as the basis for regulatory decision-making have been largely comparable across the Seychelles, Faroese and New Zealand studies. Several hypotheses have been proposed to explain the differences between this fish-eating population and others, such as nutrients in the ocean fish in this area and possible genetic heritage factors. Indeed, in longitudinal analysis of young children's development, positive effects of omega-3 fatty acids were observed as well as small negative effects of prenatal mercury[9] and a study of school achievement showed a slight negative association with postnatal mercury in boys[10].

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[1] EFSA (2012)
[2] Rice (2004)
[3] The Benchmark Dose Level is the lower 95th percentile of the dose that corresponds to a specific change in an adverse response.
[4] Rice (2004)
[5] Bellinger (2013)
[6] Koren et al. (2010)
[7] Orenstein et al. (2014)
[8] van Wijngaarden et al. (2013)
[9] Stokes-Riner et al. (2011)
[10] Davidson et al. (2010)

4. Mercury is bio-concentrated across the placenta.

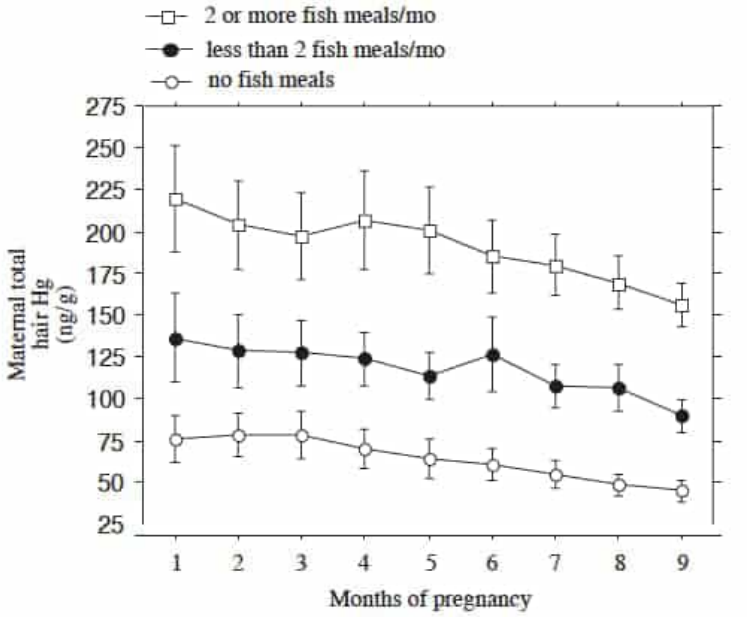
Throughout pregnancy, the placenta concentrates methylmercury and blood mercury concentration in the umbilical cord, which nourishes the foetus, is higher than in the mother's blood. A recent meta-analysis of cord to maternal blood ratios for methylmercury from 10 studies, using different modeling techniques, shows a mean cord to maternal blood ratio of 1.89 with the uppermost 95th percentile of 3.63.[1]. Thus, at birth, the average cord mercury blood concentration will be almost double that of the mother, while for one in twenty that concentration can be over three and a half times more.

Because methylmercury is concentrated across the placenta, biomarkers of maternal methylmercury decrease throughout pregnancy as the placenta takes up the methylmercury. Figure 2 shows the decline in hair mercury concentrations during pregnancy for women with different frequencies of fish consumption[2].

For biomonitoring purposes, blood mercury concentrations are measured in women of childbearing age and not in cord blood. In the study illustrated in the figure below mean maternal blood methylmercury in the first trimester was 0.48 µg/L and at birth 0.26 µg/L. Mean cord blood concentrations (0.45 µg/L) were similar to mothers' blood methylmercury concentrations in early pregnancy.

[1] Ou et al. (2014)
[2] Morrissette et al (2004)

Figure 2. Decline in Hair Mercury Concentrations During Pregnancy for Women with Different Frequencies of Fish Consumption



from Morrissette et al. (2004)

5. Population level impacts can be found at much lower levels of exposure than clear individual impacts (e.g. lower IQ). These can have major impacts at a community level.

The threshold concentrations of all of the above-mentioned agencies were based on neurobehavioral outcomes and not on illnesses. These statistically significant but individually subtle effects can greatly impact a community.

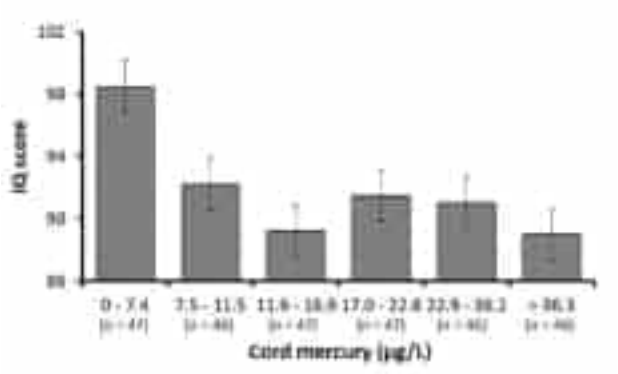
A recent video made by Dr. Bruce Lanphear of Simon Fraser University entitled 'Little Things Matter' (https://www.youtube.com/watch?v=E6KoMAbz1Bw) well describes the impact of very small quantities of toxic substances on children's neurodevelopment. Even **a small decrease in the learning capacity of children in a community has striking repercussions for the community**[1]. For example, an average decrease of 5 IQ points, among exposed children means that, in this community, twice as many children have severe learning difficulties and half as many children are gifted. The effects are amplified if the children have other problems, including poor nutrition, low intellectual stimulation or other toxicant exposures.

In a study of school-age Inuit children from 14 villages in Artic Quebec, children with **cord blood mercury equal to or greater than ≥ 7.5 µg/L were four times as likely to have an IQ score**

[1] Lanphear B. (2015)

below 80, the clinical cut-off for borderline intellectual disability[1], compared to those with lower cord mercury. It is noteworthy that since some of the IQ sub-tests are culturally sensitive, for this study, these tests were modified and validated for this population. The scores ranged from 61 – 125.

Figure 3. Test scores with respect to cord blood mercury in Inuit children 8-14 years old



from Jacobson et al, 2015

6. Developmental impacts of mercury have life-long impacts.

There is increasing evidence that prenatal exposure to mercury has lifelong effects. Subsequent to the Minamata disaster, many children born to asymptomatic mothers with high concentrations of methylmercury during pregnancy, appeared normal at birth but developed a progressive neurological disorder called Minamata fetal disease[2]. At lower levels, prenatal exposure to methylmercury is associated with a decrease in children's later cognitive functions, affecting their learning capacity and success in school and in later life.

Recent studies which have examined long term effect of low-level prenatal exposure on brain activity**,** using electrophysiological or neuro-imaging techniques, have confirmed altered brain activity in children with prenatal exposure to mercury[3,4,5,6]

In the United States, researchers have calculated that neurodevelopmental effects of

[1] Jacobson et al. (2015)
[2] Grandjean et al. (2010)
[3] White et al. (2011)
[4] Ethier et al. (2012)
[5] Yorifuji et al. (2013)
[6] Boucher et al. (2010)

methylmercury in that country accounts for a loss of $8.7 billion dollars annually in earning capacity[1]. The authors of the above-mentioned study of prenatal exposure and cognitive effects in Inuit children point out that intellectual disability on school-age IQ is a measure that is predictive of occupational success in adulthood.

In the above-mentioned study of Inuit children, the adjusted[1] mean IQ of the **lowest exposure group was 4.8 points (5%) higher than the others**. However comparing the percentage below 80, the clinical cut-off for borderline intellectual disability: **only 4.3% of the lowest exposure group** were in this category compared to **17.2% for the more exposed.**

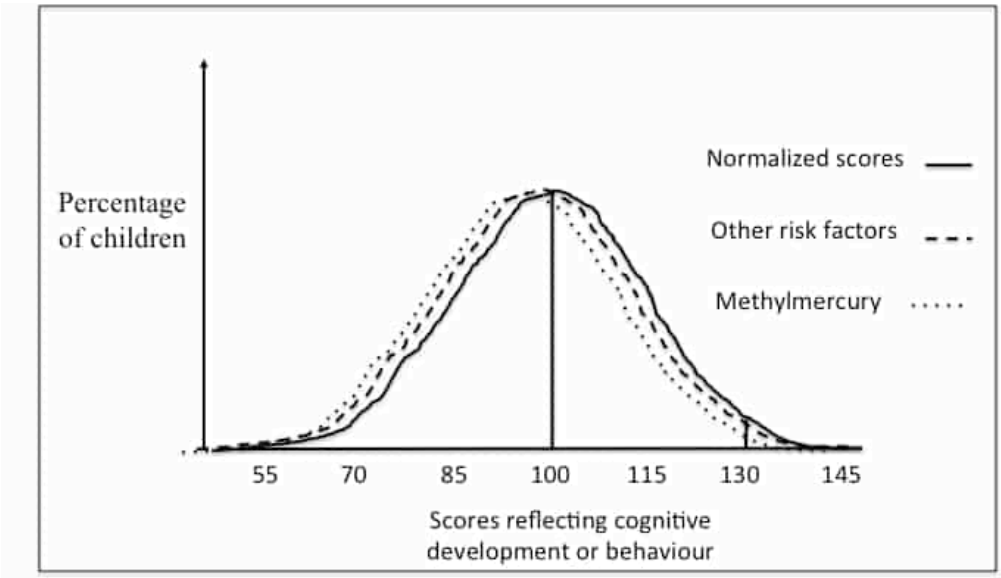
In addition, some studies suggest that there may be associations between attention deficits and/or impulsive or hyperactive behaviour in relation to methylmercury exposure. The birth cohort study of **8 – 14 year old Inuit children** shows that **problems of attention and teacher reported symptoms of attention deficits/hyperactive disorders (ADHD) were associated with higher prenatal mercury concentrations, but not current exposures**[2]. In a study in the United States of 8 year old children living near a contaminated site (superfund site), increased risk for inattention impulsive/hyperactive behaviour for boys, but not for girls, was associated with maternal hair mercury, measured close to child's birth, equal to or above 1µg/g.

Several authors have raised the issue of the combined effects of toxic exposures on children's development in communities with other risk factors, such as poor nutrition and housing, pre-existing diseases and parents' unhealthy lifestyle. Weiss and Bellinger[3] refer to the "social ecology of children's vulnerability to environmental pollutants". The impact of toxic exposures on children who are vulnerable because of other risk factors is greater on the community.

Figure 4 below shows how methylmercury compounds the effects of other risk factors on intellectual capacities. Children's average cognitive capacities or behaviour are influenced by factors such as poor nutrition and housing, pre-existing diseases and parents' unhealthy lifestyle, pushing the normal curve towards the left, with more children suffering from learning difficulties. Methylmercury exposure further pushes the curve towards the left.

[1] In this study, to assess the contribution of mercury, IQ scores were adjusted for cord lead, current PCB153, cord DHA, cord selenium, social environment
[2] Boucher et al. (2012)
[3] Weiss and Belanger (2006)

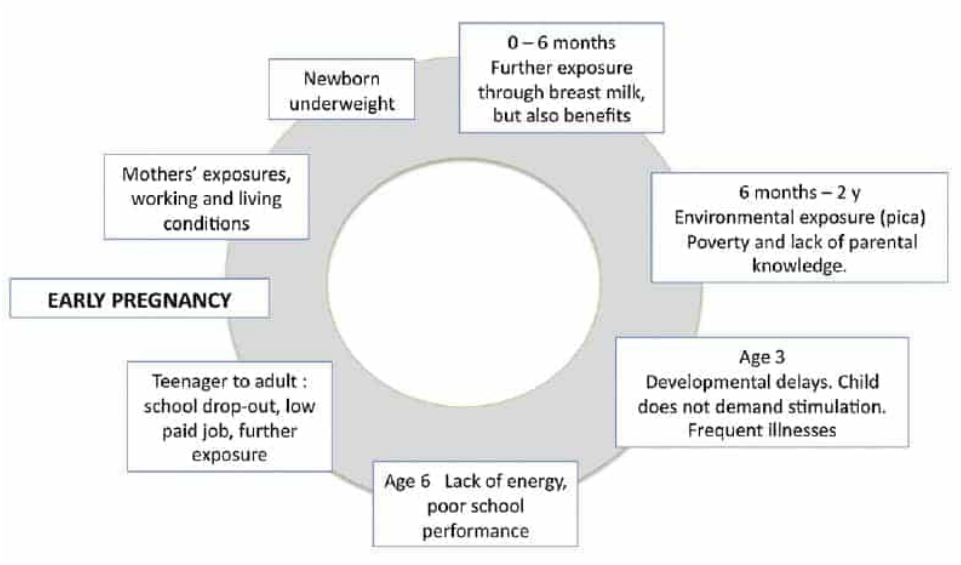
Figure 4 Estimated distribution of intellectual capacities with methylmercury exposure combined with other factors. The normal curve moves towards the left, towards lower scores.



The impact of exposure may also be passed on from one generation to the next[1], not only through the fetal environment, but also through the care that parents, who function less well because of their exposure, are able to give to their children. It can become a vicious circle, as shown in Figure 5. The way in which boys and girls experience these effects may differ[2]. Boys and girls who drop out of school may occupy poorer jobs or no jobs and act out their dissatisfaction in different ways. For girls, early pregnancy may be a further consequence. Although associations between early pregnancy and school achievement, living conditions and income have been studied in aboriginal and non-aboriginal communities[3], the possible contribution of exposure to contaminants to these situations has not been examined.

[1] Mergler (2012)
[2] Mergler (2012)
[3] Garner et al. (2013)

Figure 5 Impact of Environmental Exposure from One Generation to the Next



from Mergler (2012)

7. The health impacts of mercury exposure in adults can take a long time to manifest and can be long lasting and degenerative.

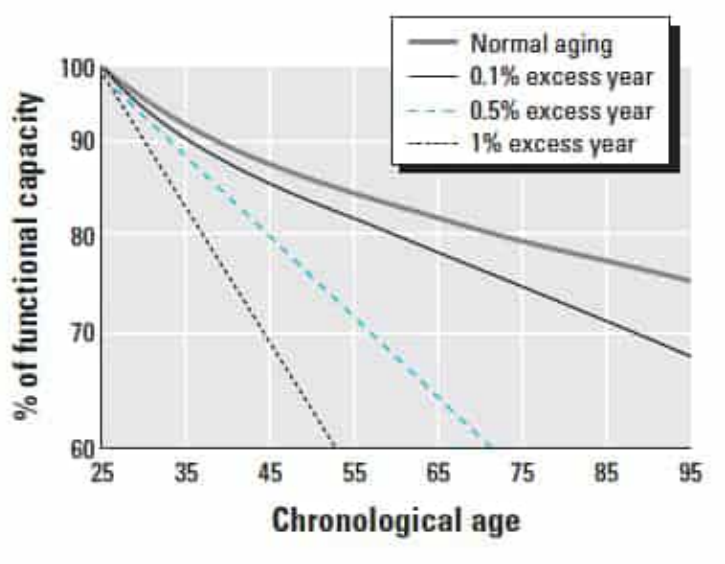
Adverse effects of methylmercury exposure in adults can result from pre-natal and childhood exposure and/or exposure during adulthood. However, the harm may not be immediately evident. Even with high exposures during adulthood, such as those that occurred in Iraq and in Minamata, there was often a delay between exposure and mild to severe neurological effects exposure, varying from weeks to years[1]. A study in Japan[2] compared the subjective complaints and activities of daily living (ADL score) of a randomly chosen sample of 750 persons, classified into three groups with respect to estimated previous exposure to methylmercury; all had lived in their current residence for over 40 years. While no difference was observed between exposure categories for the 40-49 year olds, as they got older there was a strong dose-effect relation, with those in the higher group showing the worst scores. Further data from Minamata and the surrounding areas suggest that, in later life, exposed persons display a higher prevalence of psychiatric problems[3], hypertension[4] and lower urinary tract disorders[5].

[1] Weiss et al. (2002)
[2] Ushijima et al. (2012)
[3] Yorifuji et al. (2011)
[4] Yorifuji et al. (2009)
[5] Hara et al. (2013)

In adult subsistence fish-eaters of the Brazilian Amazon region, hair mercury concentrations have been associated with deficits in visual functions[1] and motor performance[2]. Age-related decrease in near visual acuity and the prevalence of age-related cataracts were higher among those with higher exposures to mercury[3,4]. In a follow-up study of persons in this region, who continued to eat the same amount of fish, but preferentially those with less mercury, the resulting decrease in hair mercury was associated with an improvement in motor functions, but visual functions continued to decrease in relation to their past exposure levels[5].

Studies of non-human primates dosed with methylmercury, the latency period for signs and symptoms increased as the dose decreased[6]. In Figure 6, taken from Weiss (2002), the impact of slight increases in loss of functional capacity with age is illustrated. Like with small decrements in IQ in children, which have a large impact on society, small decrements in functional capacity with age likewise impact the aging process. Again with poor nutrition, living conditions and access to health facilities, the decrease in functional capacities is greater.

Figure 6 Impact of Slight Increases in Loss of Functional Capacity with Age



From Weiss (2002)

[1] Fillion et al. (2013)
[2] Fillion et al. (2011a)
[3] Fillion et al. (2011b)
[4] Lemire et al. (2010)
[5] Fillion et al. (2011a)
[6] Weiss (2002)

To better understand the mechanisms involved in adult exposure to methylmercury, researchers have examined the brains of animals chronically exposed to methylmercury over a period of time. These studies show extensive alterations in the cortical regions of the brain[1,2] Autopsies performed on the brains of children and adults from the Minamata disaster show different patterns of mercury related impairment, more diffuse in children and more concentrated in specific areas in adults[3].

Methylmercury from fish consumption has also been associated with chronic conditions in adults although the contribution of previous prenatal and/or postnatal exposure vs. current exposure is difficult to determine. In the study cited above of a Taiwanese population living near a deserted chloralkali plant, there was no historical data and the researchers were unable to determine the contribution of past exposures to their neurologic deficits, which were associated with current exposure concentrations. In this same population, the authors found that current mercury blood concentrations were associated with increased risk of insulin resistance[4].

8. Fish is the most important source of mercury in humans. Other sources of mercury in humans include fish eating wildlife (ducks, otters, etc.), dental fillings, etc. Estimates of mercury impacts based on MeHg or fish alone may underestimate the total impact.

Humans are exposed to both inorganic mercury and organic mercury (usually in the form of methylmercury). Exposure to inorganic mercury is usually through mercury vapours from occupational and industrial sources; mercury amalgams in dental fillings can also be a source of exposure to inorganic mercury. When inhaled or swallowed, this form of mercury passes passively into the blood and is excreted through the urine. Contrary to methylmercury, tissues, such as the brain or the placenta, do not actively take it up and the concentration in mother's blood is similar to that in cord blood[5].

Methylmercury has been used in industrial processes; the methylmercury poisoning disaster in Iraq in the early seventies was due to the methylmercury containing fungicide that was consumed by humans[6]. However, outside of accidental exposures, human exposure to methylmercury is very largely through fish consumption and to a lesser extent through consumption of fish-eating birds and mammals.

To estimate the total intake of methylmercury, one needs to consider the entire diet, including

[1] Dasari et al. (2010)
[2] Kong et al. (2012)
[3] Eto et al. (2010)
[4] Chang et al . (2011)
[5] Morisette et al. (2004)
[6] Grandjean et al. (2010)

fish-eating birds and mammals. The Environment Canada website on mercury in the food chain, updated in 2013 well describes how mercury accumulates through the food chain (https://www.ec.gc.ca/mercure-mercury/default.asp?lang=En&n=D721AC1F-1).

Some salient points are made in this document:

- *Because mercury is a persistent substance, it can build up, or bioaccumulate, in living organisms, inflicting increasing levels of harm on higher order species such as predatory fish and fish eating birds and mammals through a process know as "biomagnification".*
- *In the environment, particularly lakes, waterways and wetlands, mercury can be converted to a highly toxic, organic compound called methylmercury through biogeochemical interactions.*
- *The most important pathway for mercury bioaccumulation is through the food chain. In the water, plants and small organisms like plankton take up mercury through passive surface absorption or through food intake. … Methylmercury biomagnifies through the food chain as predators eat other organisms and absorb the contaminants that their food sources contained.*
- *Over time, an individual who consumes plants or prey contaminated with methylmercury will acquire levels greater than in either its habitat or its food. As a result, top predators acquire greater body burdens of mercury than the fish they consume.*
- *In some cases, methylmercury levels in carnivorous fish, such as freshwater bass, walleye and pike … bioaccumulate up to a million times greater than in the surrounding water.*
- *Piscivorous (fish eating) predators such as loons, merganser ducks, osprey, eagles, herons, and kingfishers, generally have very high concentrations of mercury.*
- *In addition, mercury has been found in predatory mammals such as otters from south central Ontario.*

9. In 1979 the Health and Welfare Canada recommended a limit of 0.2 ppm in fish as a fish consumption limit for Grassy Narrows and White Dog. The limit for possession of fish for sale is 0.5 ppm wet weight.

In 1973, a Task Force on Organic Mercury in the Environment was established by the Minister of National Health and Welfare (currently Health Canada) "in order to respond to the problem of high and unusual mercury levels in relation to the health and well-being of residents of Grassy Narrows and Whitedog, Ontario"[1]. A biomonitoring program was initiated. In 1979, The Health and Welfare Canada recommended a limit of 0.2 ppm in fish for consumption in Grassy Narrows and Whitedog.

[1] cited in Legrand et al. (2010)

The Canadian limit of fish for commercial purposes of 0.5 ppm wet weight is based on the fact that in the general population, fish consumption is not very high. Data from the 2007-2009 Canadian Health Measures Survey (CHMS), which does not include people living on reserves or in remote regions, show that most Canadians eat (82.6%) eat less than three meals of fish and/or shellfish per week. Overall blood mercury levels are low, with median values at 0.81µg/L and the 95th percentile 4.70 µg/L. Blood mercury levels increase with fish consumption. Among pregnant women, 98% are below the Health Canada guideline for blood mercury (8µg/L).

In contrast, a study of diet among 7 Istchee (Cree) communities in the James Bay area showed that blood mercury concentrations 3 – 20 times higher than those reported in the CHMS; blood mercury increased with inland traditional food intake[1]. Another study of persons from the Wapekeka and Kasabonika communities[2] showed hair mercury concentrations 1.5 times higher in persons who ate more than 1 meal of wildlife/week (age adjusted hair mercury concentration (2.96 ± 0.3 µg/g)

10. The Canadian reference dose for preventing fetal neurotoxicity and developmental impacts is double that recommended by US EPA.

In section 2, the different guidelines for mercury exposures are presented. The guidelines were developed to recommend **tolerable daily intake (TDI) or weekly intake (TWI)** of mercury. The Canadian provisional tolerable daily intake for pregnant women, women of reproductive age and infants of 0.2µg/kg body weight/day is twice the US EPA of 0.1µg/kg body weight/day and slightly higher than the proposed revision of the FAO/WHO reference dose (0.19µg/kg body weight/day) (see section 2). The US EPA reference dose is based on **cord blood concentrations**, while the JECFA and Canadian recommendations are based on **hair concentrations**. The Canadian recommendation used a 5-fold uncertainty factor to account for inter-individual variability[3]. The studies that support this recommendation used maternal hair mercury concentrations at birth that are lower than those at the beginning of pregnancy due to placental accumulation (see figure 2 in section 4). All of these reference doses are high for Grassy Narrow since the population has already been exposed to levels that are higher, and in many cases, considerably higher than these.

11. Eating fish has a number of important health benefits. Serious efforts should be made to avoid practices that lead to bio-accumulation of mercury in fish so that the health benefits of fish can be enjoyed while minimizing health impacts from mercury.

Fish is a highly nutritious food, providing a wide variety of nutrients, including omega-3 fatty

[1] Johnson-Down et al. (2015)
[2] Seabert et al. (2014)
[3] Legrand et al. (2010)

acids. In a review of the cardio vascular benefits of omega-3 fatty acids, Mori[1] writes: "Many clinical and epidemiological studies have shown that the polyunsaturated n-3 fatty acids EPA and DHA from fish and fish oils, provide cardiovascular protection, particularly in the setting of secondary prevention. Omega-3 fatty acids beneficially influence a number of cardiometabolic risk factors including blood pressure, cardiac function, vascular reactivity and lipids, as well as having anti-platelet, anti-inflammatory and anti-oxidative actions". Omega-3 fatty acids are likewise positively associated with neuropsychological and neurophysiological outcomes throughout the lifespan.[2,3] Indeed, **today, most studies of mercury toxicity from consumption of fish and fish-eating animals take into account the positive effects of omega-3 fatty acids.**

An article describing a study of myocardial infarction in a Swedish and Finnish cohort well illustrates the benefits associated with omega-3 fatty acids and risks associated with methylmercury from fish consumption[4]. Their model of risk, presented in Figure 7, shows that at lower concentrations of methylmercury, even a small increase in omega-3 fatty acids can have an important impact in reducing the risk of myocardial infarction, but at higher concentrations of methylmercury, the beneficial effects are counteracted.

[1] Mori (2014)
[2] Bernard et al (2013)
[3] Virtanen et al. (2013)
[4] Wennberg et al (2012)

Figure 7. Risk for Myocardial Infarction with respect to hair mercury concentrations and the percentage of omega -3 fatty acids (s-PUFA) in blood

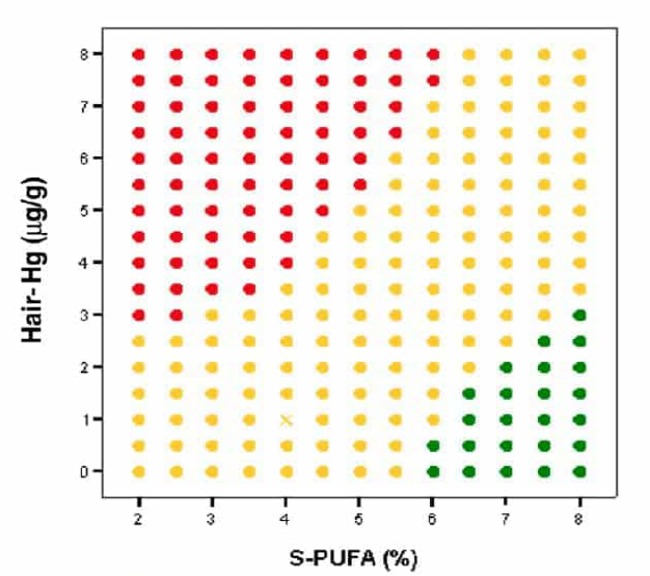


FIGURE 3. Associations of concentrations of long-chain n−3 S-PUFA and Hair-Hg with risk reduction (green circles; upper 95% CI limit for model-based RR <1.0) or increased risk of myocardial infarction (red circles; lower 95% CI limit RR >1.0), with the reference point (RR = 1.0; yellow X) set to S-PUFA = 4.0% and Hair-Hg = 1.0 µg/g; yellow circles denote no statistical evidence of an effect. Hair-Hg, amount of mercury in hair; S-PUFA, PUFAs in serum.

From Wennberg et al. (2012)

Like in many other birth cohort studies, the studies of Inuit children described above, which showed negative effects of prenatal mercury exposure on school-aged children's performance on neurobehavioral tests[1,2], likewise show positive effects of **cord blood DHA**; the benefits and risks are likewise reflected in electrophysiological measurements[3.]

In adult freshwater fish eaters from the Brazilian Amazon, although omega-3 fatty acid concentrations are low compared to consumers of marine fish and mammals, positive effects of omega-3 fatty acids have been observed with better visual functions[4]

The serum omega-3 fatty acids in First Nation inland communities increases with proportion of

[1] Boucher et al, (2011)
[2] Jacobson et al. (2015)
[3] Boucher et al (2011)
[4] Fillion et al, (2011)(2013)

traditional diet meals[1,2]

12. The Ontario Guide for Sport Fish Eaters is not appropriate for Indigenous communities who eat fish as part of their cultural practice. It assumes that fish are eaten relatively infrequently.

The Ontario Guide for Sport Fisher Eaters (2013-2014) indicates: "The advice in this guide is designed for anglers (and their families) who consume moderate quantities of fish. The consumption advice is intended to protect individuals who follow the advice in the guide and consume no more than 8 meals per month of the fish they catch. This maximum recommended consumption frequency was based on the results of surveys indicating that most anglers do not consume sport fish more frequently than 8 meals per month. However, many of these fish can be safely consumed more frequently. Anyone who consumes sport fish more frequently than 8 meals per month is advised to contact the Sport Fish Contaminant Monitoring Program (416-327-6816 or 1-800-820-2716, sportfish.moe@ontario.ca." [3]

The US-EPA developed a guide for subsistence fishing with the collaboration of representatives from Native American tribes. It indicates: "EPA recognizes, however, that Native American subsistence fishers are a unique subsistence fisher population that needs to be considered separately. For Native American subsistence fishers, eating fish is not simply a dietary choice that can be completely eliminated if chemical contamination reaches unacceptable levels; rather eating fish is an integral part of their lifestyle and culture. This traditional lifestyle is a living religion that includes values about environmental responsibility and community health as taught by elders and tribal religious leaders. Therefore, methods for balancing benefits and risks from eating contaminated fish must be evaluated differently than for the general fisher population"[4].

13. People who have already experienced elevated mercury exposure, or are showing symptoms of mercury poisoning, may be more sensitive to further exposure than the general population.

Both animal and human studies have shown long latency effects of methylmercury exposure.[5] Adding further toxic exposure can add further harm to systems that have already been affected. A large number of human and animal studies have shown neuronal and metabolic changes in the absence of manifest signs and symptoms. Persons whose systems have already been altered by previous exposures are more sensitive than the general population.

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[1] Seabert et al (2014)
[2] Johnson-Down (2015)
[3] The Ontario Guide for Sport Fisher Eaters (2013-2014) p. 7
[4] US Environmental Protection Agency *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories Volume 2 Risk Assessment and Fish Consumption Limits Third Edition (2000) p. 16*
[5] Newland et al. (2015)

14. CONCLUSIONS WITH RESPECT TO GRASSY NARROWS

This updated analysis of the scientific literature provides substantial further support and confirm the Chan and Mergler conclusions in the report to the Mercury Disability Board (MDB) in 2009[1]:

14a There is no doubt that at the levels of exposure experienced in Grassy Narrows, many people have suffered and are suffering from mercury poisoning.

- Further scientific knowledge of the past 6 years informs us that damage occurs at concentrations much lower than those previously considered harmless, with important impacts not only for individuals but also on the entire community.
- A growing number of birth cohort studies show that the foetus is particularly sensitive to methylmercury neurotoxicity and even very low concentrations of exposure can affect future cognitive capacity and behaviour.
- In 1996, the Research and Development, Environmental Contaminants, Medical Services Branch of Health Canada presented a report on the mercury and child development research project for the Grassy Narrows Band Council[2]. Although the report has numerous methodological problems as regards data analyses[3] and data presentation is confusing, there is information on children's exposure:
    - For the 139 children included in the study, the authors report that between 1978 and 1990 average cord blood concentrations was 8.67 µg/L, with a maximum value of 78.5 µg/L and 10% above 20 µg/L.
    - One child born in 1979, who was not included in the study, had a cord blood mercury concentration above 120 µg/g, while another born in 1978 had over 80 µg/g.
    - Overall, there was an important decrease in cord blood mercury concentrations between 1978 and 1991, however, in 1992, there appears to be an increase.
    - The mean hair mercury concentration of the participants at the time of the study was 3.90 µg/g with the maximum at 26 µg/g.
    - Figure 8, taken from this report, shows the cord mercury concentrations measured in Grassy Narrows over time.

[1] Chan and Mergler (2009)
[2] Research and Development, Environmental Contaminants, Medical Services Branch of Health Canada (1996)
[3] The analyses that were carried out were insufficient to arrive at any conclusions and particularly the conclusion that there were no effects.

- **At these cord blood concentrations, there is consensus from the current scientific literature that there would be effects on children's neurodevelopment.**

Figure 8 Umbilical cord blood levels/year measured in Grassy Narrows

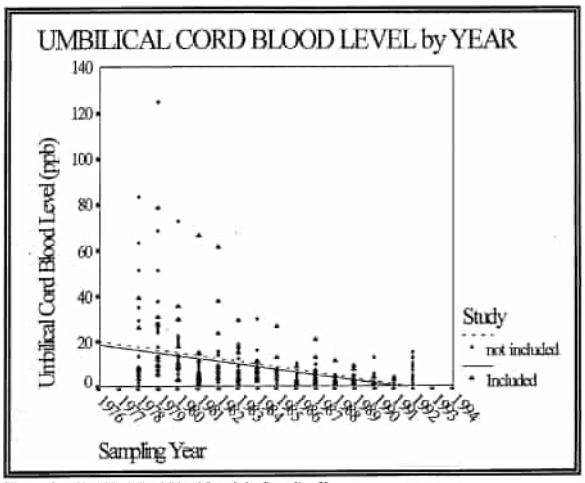

Figure 1. Umbilical Cord Blood Levels by Sampling Years

From the Mercury and Child Development Research Project, Grassy Narrows, Research and Development, Environment Contaminants, Medical Services Branch, Health Canada (1996)

- In a history of Minamata Disease published in 1995[1], Harada describes the diagnosis of the initial cases in 1956. He recounts that by 1960, "while the number of grave cases with acute Minamata Disease in the initial stage was decreasing, the numbers of chronic Minamata patients who manifested symptoms gradually over an extended period of time was on the increase."
- Recent studies from MInamata, supported by findings from animal research, show that methylmercury accelerates the aging process.
- A large number of animal studies and several human electrophysiological and imaging studies are elucidating the mechanistic basis for mercury neurotoxicity.
- While the nervous system is the primary target organ for methylmercury, studies indicate that the cardiovascular system and metabolic pathways may also be affected by methylmercury.

[1] Harada (1995)

14 b. The scientific literature continues to support Dr. Masazumi Harada and colleagues' clinical findings, reviewed by Chan and Mergler for the MDB[1] on the similarities between the neurologic signs and symptoms of persons from Grassy Narrows and White Dog and Minamata Disease in Japan.

- In their early reports[2,3], Harada and colleagues had examined 89 persons from Grassy Narrows and Whitedog and indicated that no one presented all of the classical signs and symptoms of Minamata Disease, although many persons presented one or more classical signs of the disease. Although they did not carry out statistical analyses, they provide evidence of dose-effect relations.

- In 2002[4], the same neurologists examined 57 persons of whom 9 had been examined in 1975. The authors classified 11 of the 57 persons with Minamata Disease, 12 with Minamata Disease and other complications and 22 with "light Minamata Disease".

- None of the persons Harada found with levels over 50 in 1975 survived to be re-tested in 2002. Of the 9 who were re-examined none fell into the Minamata Disease category, but for 7 of the 9, symptoms and signs had worsened.

- In 2004, this team examined 187 persons, among whom they identified 60 of Minamata Disease and 54 cases of the disease with complications. Twenty-seven had participated as well in 1975. In their review of Dr. Harada's follow-up studies (1975 - 2004)[5], the **Chan and Mergler report point outs that the most valuable information of this report was the evolution of neurologic signs and symptoms consistent with mercury poisoning in those that were tested in the two periods.**

- In 2011, Harada and his co-workers[6] wrote a review of the work that they had carried out in Grassy Narrows and White Dog since 1975, including a further study carried out in 2010. In 2010, they performed neurologic assessments of 73 persons from Grassy Narrows and 87 from White Dog over 20 years old. The report indicated that under the diagnostic criteria used in Minamata City, 33.7% of the group that they examined were diagnosed as Minamata Disease patients; and 25.0% as suspected Minamata Disease cases (see more details in answer to question 1.1 c).

[1] Chan and Mergler (2010)
[2] Harada et al. (1976)
[3] Harada et al. (1977)
[4] Harada et al. (2005)
[5] Harada et al. (unpublished report)
[6] Harada et al. (2011)

- Using the findings from the 2010 examinations, Takoaka and coworkers[1] compared the neurologic signs and symptoms of 80 volunteers aged 16 to 76 from Grassy Narrows and Japanese exposed and control groups. From the observed similarities, particularly between the Grassy Narrows older group and the Japanese exposed group, the authors conclude that "clinical signs and symptoms of the residents of Grassy Narrows are almost the same as those recorded for Minamata disease in Japan." (see more details in answer to question 1.1 d)
- It should be noted that Dr. Harada and his team sought to determine whether persons exposed to mercury in Grassy Narrows and White Dog presented a neurological clinical profile similar to Minamata Disease. While they identified cases and possible cases using the Minamata Disease criteria, they did not examine the possible contribution of mercury into other disorders or the impact of more subtle changes of nervous system functions, particularly during fetal exposure and childhood, which occur at lower concentrations of exposure. .
- Both Harada et al (2011) and Takaoka et al (2014) mention that the participants in their studies presented a high prevalence of several health disorders, including hypertension and diabetes among the participants, **but the possible contribution of mercury to these conditions has not been examined.**

14 c. Because of mercury contamination in the region, the people of Grassy Narrows were obliged to reduce their consumption of local fish and wildlife and were thus deprived of healthful nutrients, which have been shown to be beneficial for a large number of physiological functions and to be preventive for many and diseases.

- The historically high mercury concentrations in fish forced the community to greatly decrease their fish and wildlife consumption, depriving them of the nutritional and social benefits[2] of a traditional diet.
- In a 2003 study of 87 persons from Grassy Narrows[3], 61% reported that they currently fish in the surrounding area, 31% reported that they used to but no longer had fished in the area, and 8% reported they have never fished in the area. Of these participants, 9% reported eating more traditional food compared to 10 years ago, 55% reported eating about the same, and 36% reported eating less. Reasons provided for a decrease in the consumption of traditional foods included:
    - changes in the family structure;
    - decreased hunting and fishing practices;
    - decreased availability;

[1] Takaoka et al. (2014)
[2] Wheatley and Wheatley (2000)
[3] Chan (2005)

- concerns about the safety/contamination of the food;
- the convenience of market foods.

- Although there has been marked decrease in mercury in fish in the English-Wabigoon River system,[1] recent concentrations of mercury in fish[2] and fish-eating wildlife[3] oblige the community to limit consumption of fish and wildlife.
- Kinghorn et al[4] analyzed fish mercury concentrations in 4 fish species from seven lakes in the Grassy Narrows territory and describe the relation between fish length with respect to mercury concentration. They note that the fish harvested from Grassy Narrows lakes show stronger associations between fish length and mercury compared to those from the Wabaseemong territory. The authors indicate that this may be because "these lakes are closest to the Dryden spill site. Higher levels of mercury in the sediment of these lakes may affect the rate of uptake of mercury in the fish that live predominantly within them."
- For a report in 2005, Chan calculated mercury intake and hair concentrations for 87 persons from Grassy Narrows and 55 from Wabaseemoong measured in 2003. In Grassy Narrows, the average yearly local fish consumption in Grassy Narrows was 20g/day, but in older men (+61 years of age) it averaged 60g/day. When all of the hair segments were analyzed, mean hair mercury was 1.3 µg/g with a maximum of 7.1 µg/g. The highest individual hair segment was 15.5 µg/g. Hair mercury increased with mercury intake from fish consumption. In 2004, Harada reported that one person had a concentration of 25 µg/g and in 2003, Chan reported that persons from the White Dog area had hair concentrations of 60µg/g.
- The 2012 report on fish Contaminant Monitoring near Grassy Narrows First Nation by the Environmental Monitoring and Reporting Branch Ontario Ministry of the Environment[5] shows elevated mercury in the 50 km area around Grassy Narrows in walleye and much lower concentrations in Whitefish. For walleye, with the exception of one site where the report indicates that fish can be eaten with restriction, all the other sites indicate DO NOT EAT. Whitefish present much lower concentrations, which may still pose a risk to subsistence eaters.
- The 2012 above-mentioned report presents separate values for sensitive populations, defined as women of child-bearing age and children under 15 years old, and for the general population. Given the recent information on mercury reviewed above, a population that has already suffered effects from mercury contamination and other harmful risk factors for poor health may also be considered 'sensitive'.

[1] Neff et al. (2012)
[2] Kinghorn et al. (2007)
[3] Sellers et al. (2010)
[4] Kinghorn et al (2007)
[5] Ontario Ministry of the Environment (2012)

Grassy Narrows: a sensitive population

- Prior to the events and poisoning that occurred due to mercury contamination, the Grassy Narrows community had undergone important upheaval that negatively impacted their lives and lifestyle.[1,2,3] The toxic effects of mercury would compound the effects of these stresses on the nervous system and their health status.

- Because of the high prevalence of disease, coupled to mercury intoxication, in the communities of Grassy Narrows and White Dog, in the 2010 MDB report, Chan and Mergler point out " It is paramount that members of the two communities receive the necessary medical care and support. In contrast, residents in Minamata, Japan enjoy superb health care from neurologists and therapists even they had not officially been classified as victims of Minamata Disease".

- It is surprising that although the Japanese neurologists have identified many cases of Minamata Disease in Grassy Narrows and many persons have illness that have been associated with mercury intoxication, there has never been a scientifically sound epidemiologic study of the impact of pre and post natal mercury exposure on the health and well-being of this community.

- There are many sources of mercury contamination. The river and lake systems around Grassy Narrows have been polluted by industrial activities; hydro-electric reservoirs and logging can also contribute to the mercury burden in this ecosystem. Any increase of exposure to this already 'sensitive' community would further compound the harm to the health and well-being of the present and future generations.

[1] Vecsey (1987)
[2] Etken D. (2015)
[3] Ilnyak (2014)

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Yorifuji T, Tsuda T, Inoue S, Takao S, Harada M. Long-term exposure to methylmercury and psychiatric symptoms in residents of Minamata, Japan. Environ Int. 2011 Jul;37(5):907-13.

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APPENDIX A – CURRICULUM VITAE

Curriculum Vita

Donna Mergler PhD

Professor Emerita

Université du Québec à Montréal

Name: Donna Mergler
Address: Centre for Interdisciplinary Studies on Biology, Health, Environment and Society (CINBIOSE): http://www.cinbiose.uqam.ca/
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Academic Degrees

1965	B.Sc, (honours physiology) McGill University, Montreal, Quebec, Canada
1973	Ph.D.(physiology) McGill University, Montreal, Quebec, Canada

Academic Positions

2006-	Professor Emerita, Department of Biological Sciences, UQAM
l970-06	Professor, Department of Biological Sciences, University of Quebec at Montreal (UQAM) (full professor since 1980)
1998-	Director, World Health Organization – Pan-American Health Organization Collaborating Center or the Prevention of Occupational and Environmental Illnesses
2002-04	Director, Institute of Environmental Sciences, UQAM
1995-00	Director of the Center for the study of Biology, Health and the Environment (CINBIOSE), UQAM
1994-95	Invited Professor. Pesticide Program, National University, Costa Rica
1993-	Adjunct professor, McGill University Centre for Studies on Aging
1993	Head of the Doctoral Program in Environmental Sciences, UQAM
1990-91	Director of the Center for the study of Biology, Health and the Environment (CINBIOSE), UQAM
l982-84	Chair of the Department of Biological Sciences, UQAM
l985-89	Co-director of the Research-action group in Work Biology, UQAM (associated to the Quebec Institute for Research in Occupational Health and Safety)
1987-88	Visiting scholar: University of California, Berkeley: Department of Biomedical and Environmental Health Sciences; Northern California Occupational Health Centre. Labor Occupational Health Program

Awards/Recognition

1990	Muriel Duckworth Award for Women's Studies
1994	Woman of Merit Award in Science and Technology, given by the YWCA
1995	Michel-Jurdant Award for Environmental Sciences, given by ACFAS
1999-2002	International Development Research Centre (IDRC) Ecosystem and Health Academic Fellowship
2001	Silver Award for Environmental Health. (Canadian Minister of the Environment and Canadian Geographic Magazine)
2003	Phenix Circle for the Environment (Government of Quebec)
2005	Écodéfi Award from the Network on Women and Environment
2008	Distinguished Woman in Ecohealth Research (IDRC)
2011	*Bâtisseuse de la science* (Faculty of Science, UQAM)
2014	Fellow of the Collegium Ramazzini

Government Advisory Boards

1984 - 88	Member of the Advisory Board on Women's Studies of the Canadian Secretary of State
l984 - 89	Member of the Quebec Council for Science and Technology
1990 - 92	Member of the Expert Committee on Mental Health Subcommittee of the Quebec Minister of Social Affairs
2001	Member of the Sub-committee on Environmental Health of the National Round Table on the Economy and the Environment
2001-11	Member of the Scientific Advisory Board of the International Commission on the Great Lakes
2008-09	Member of the Scientific Council of the health component of the *Plan Chlordécone* (France : *Insitut de Veille Sanitaire* and *Institut national de la santé et de la recherche médicale* (INSERM)

Funded Research Projects (since 1987)

(**IDRC** : International Development Research Centre of Canada; **CIHR** : Canadian Institutes for Health Research; **NSERC** : National Science and Engineering Research Council; **CQRS** : *Conseil québécois pour la recherche sociale;* **FCAR** : *Fonds pour la formation des chercheurs et l'aide à la recherche;* **FRSQ** : *Fonds de la recherche en santé du Québec*; **SSHRC** : Social Sciences and Humanities Research Council; **TSRI** : Toxic Substances Research Initiative; **US-EPA** : United States' Environmental Protection Agency; **IRSST** : *Institut de recherche en santé et en sécurité du Québec)*
(**PI** : principal investigator)

Years	Project	Funding Agency
2008-2014	CIHR Team on Gender, Environment and Health (PI)	CIHR
2011-2012	Prenatal manganese exposure from mancozeb use: expanding knowledge from a birth cohort study on pesticides and children's development (PI).	Health Canada
2009-2013	A community of practice on ecosystem approaches to promote research and policy in Latin America and the Caribbean (co-PI)	IDRC
2008-2010	*Relever le défi analytique intégré des études en écosystème et santé (PI)*	IDRC
2008-2009	Mercury, nutrition and health in the Brazilian Amazon: community appropriation of research results (PI)	CIHR
2008-2011	A Canadian Community of Practice in Ecosystem Approaches to Human Health (co-investigator)	IDRC
2007–2010	Does manganese in water affect children's neurodevelopment? (PI)	CIHR
2005-2008	A community of practice on ecosystem approaches to promote research and policy for reducing toxic exposures and improving collective health in Latin America and the Caribbean (co-PI)	IDRC
2005-2008	Effects of methylmercury exposure on visual functions in the Brazilian Amazon (PI)	CIHR
2003-2006 :	Combining traditional knowledge to maximise use of traditional food and minimise toxic risk (co-PI)	CIHR
2003-2006	*Manganèse et vieillissement cognitif et moteur: étude de suivi de cohorte 12 ans après l'arrêt de l'exposition professionnelle (PI)*	CIHR
2003-2004	An ecosystem approach to environmental and occupational health in developing countries (PI)	CIHR
2002-2005	*Exposition au mercure, santé des écosystèmes et des populations humaines en Amazonie: de l'échelle locale à l'échelle régionale: CARUSO III.(co-PI)*	IDRC
2002-2003	Development of a protocol for gender-based standards in the export industries in Central America (co-PI)	Inter-American Development Bank

2002-2003	Finalizing a research proposal and realizing a financial set up for a project on sustainable tropical agriculture models through the reinforcement of an international network (co-investigator)	NSERC
2001-2006	Mercury and Ecosystem Health: A Collaborative Mercury Research Network: COMERN (co-investigator)	NSERC
2001-2004	*L'invisible qui fait mal: mondialisation et santé des femmes au travail* (co-investigator)	CQRS
2000-2003	*Travail atypique: protection légale des conditions minimales et de la santé au travail* (co-investigator) :	FCAR
1999-2002	*Chercheure émérite en santé et ecosystèmes* (Fellowship)	IDRC
2001-2004	*Santé au travail: interaction des sciences bio-médicales et juridiques dans l'indemnisation et la prévention* (co-investigator)	FCAR
2001-2004	*Conséquences thérapeutiques et anti-thérapeutiques de certains régimes d'indemnisation: programmes actuels et modèles alternatifs* (co-investigator)	SSHRC
1999-2002	Mercury in The Brazilian Amazon : Building Solutions with the Community (co-PI):	IDRC
1999-2002	Assessment of toxicological risks of environmental contamination by manganese (co-investigator)	TSRI
1999-2002	Effects of fish consumption from the St-Lawrence river on hormonal balance and calcium transport in pregnancy (co-PI)	TSRI
2001-2002	Assessment of Neurotoxic effects in a First Nation Community Exposed to Polychlorinated biphenyls (PCBs) (co-PI)	TSRI
1998-2001	*Santé au travail: démonstrations dans les sciences naturelles et juridiques*	FCAR
1999-2000	Manganese in well water of the Eastern Townships of Quebec (Canada). Is there a problem ?	FRSQ
1997-2000	*L'invisible qui fait mal: vers une approche de recherche et d'intervention en santé qui tient compte de la division sexuelle du travail (co-invesitgator)*	CQRS
1996-1999	Source, dispersion and impact of mercury pollution in the Brazilian Amazon (co-PI)	IDRC
1995-1999	Early signs and symptoms of manganese neurotoxicity in environmentally exposed human populations (PI)	US-EPA
1994-1996	*Santé mentale et vie familiale chez des personnes exposées aux substances neurotoxiques*	FRSQ-CQRS
1994-1995	*Projet pilote : Exposition de l'environnement et des humains au mercure (Brésil)* (co-PI)	IDRC
1993-1995	*L'invisible qui fait mal: Impact du travail sur la santé des femmes* co-investigator)	CQRS
1992-1994	*Surveillance des effets neurotoxiques de l'exposition au styrène en milieu de travail: Phase II* (co-PI)	IRSST

1992-1994	*Facteurs de risque pour la santé mentale en milieu de travail* (co-PI)	FRSQ-CQRS
1989-1992	*Etude des effets neurotoxiques précoces chez des travailleurs exposés au manganèse dans une usine de production d'alliages de ferro- et de silico-manganèse* (PI)	IRSST
1990-1992	*Appréciation des risques associés à l'exposition aux solvants organiques chez les personnels de laboratoire* (co-PI)	Min. Recherche (France)
1990-1992	*Méthodologie épidémiologique et statistique en pathologie industrielle* (co-PI)	IRSST
1990-1991	*Etude des lésions musculo-squelettiques aux membres supérieurs dues au travail répétitif dans les abattoirs de porcs* (co-PI)	IRSST
1990-1991	*Surveillance des effets neurotoxiques de l'exposition au styrène en milieu de travail* (PI)	IRSST
1990-1991	Ergonomic analysis of work activity and work practices in jobs originally designed for men and now done by women (co-investigator)	SSHRC
1989-1990	*Effets de l'exposition au toluène sur les systèmes nerveux et rénaux des travailleurs qui appliquent un ciment imperméabilisant* (PI)	IRSST
1988-1989	*Développement et application d'une batterie de tests pour évaluer la perte sensorielle associée à l'exposition professionnnelle aux solvants organiques* (PI)	Health Canada
1988-1989	*Mesure des effets de l'utilisation d'un écran de visualisation monochromatique sur l'indice de confusion chromatique par le test Lanthony D-15 désaturé* (PI)	Health Canada
1987-1990	*Dépistage d'altérations biologiques. Infrastructure d'équipe associée* (co-PI)	IRSST
1987-1989	*Etude des conditions et de l'activité de travail des buandières soumises saisonnièrement à une ambiance thermique chaude et des conséquences sur leur santé* (PI).	SSHRC
1987-1988	*Caractérisation de la discrimination chromatique des travailleurs d'imprimerie en fonction du degré et de la durée de l'exposition aux solvants organiques* (PI)	IRSST

Graduate student supervision

Diploma	Thesis	year
M.Sc Biology		
Nicole Vézina	*La prévalence de verrues chez les travailleurs et travailleuses des abattoirs de volaille : une approche environnementale*	1982
Sylvie de Grosbois	*Analyse descriptive des effets neurotoxiques de l'éther éthylique et de l'alcool éthylique : une approche en milieu de travail.*	1985
Lucie Blain	*Utilisation de la vision des couleurs comme indice biologique d'exposition aux solvants organiques.*	1986
Suzanne Legault-Bélanger	*La discrimination chromatique chez des personnes exposées aux encres d'imprimerie.*	1988
Sylvie Bédard	*L'inconfort thermique et la thermorégulation des calandreuses.*	1989
Isabel Fortier	*La perception olfactive chez les personnes exposées aux solvants organiques en milieu de travail*	1990
Ginette Plouffe	*La contribution de l'exposition au froid aux maux musculo-squelettique chez des travailleurs et des travailleuses d'une industrie de transformation de poissons.*	1990
Luc Martin	*La perception vibrotactile chez des travailleurs exposés au manganèse.*	1992
Dave Campagna	*Altération de fonctions visuelles chez des travailleurs exposés au styrène.*	1993
Marie-Pascale Sassine	*Variations des catécholamines chez des travailleurs et travailleuses exposés au styrène.*	1995
Jean-Pierre Lagacé	*La vision des couleurs chez les opérateurs et opératrices des écrans cathodiques.*	1995
Julie Dolbec	*Motricité et exposition au méthylmercure dans l'Amazonie*	1998
Bahya Bovyahia	*Validation d'un test neuromoteur, le test des mouvements altérnants de Branches. (BAMT).*	2000
Laura Alida Castillo	*Fonctions visuelles et exposition aux solvants.*	2000
Kathy Fortin	*Contribution rélative de l'exposition à l'aluminium et la prédisposition génétique à la maladie d'Alzheimer*	2000
Ludivine Chateau-Degat	*Sécretion du cortisol et mémoire chez des travailleurs exposés aux solvants organiques.*	2000
Maryse Bouchard	*Effets neurotoxiques du manganèse*	2002
Joëlle Morissette	*Mercure chez des femmes enceintes du sud-ouest du Québec.*	2003

Silmara Souza de Morais	*Effets neurotoxiques de l'exposition au méthylmercure dans l'Amazonie brésilienne*	2006

M.Sc. Environmental Sciences

Rosemarie Schneeberger	*Comparaison du taux de pollen d'herbe à poux dans quelques municipalités et zones de la région de Lanaudière.*	1990
Chantal Jetté	*La caractérisation de la discrimination chromatique chez des travailleurs et travailleuses d'une imprimerie.*	1991
Julie Desharnais	*Etude descriptive des problèmes menstruels chez des femmes d'une industrie de montage de microélectronique exposées aux solvants organiques multiples.*	1991
François Demers	*Influence de la cristalochimie surla toxicité des silicotes.*	1991
Dominique Léger	*Exposition professionnelle et environnementale aux solvants incidences sur la fonction reproductrice des femmes*	1992
Pauline Gagnon	*Variations de l'odorat lors de l'exposition contrôlée aux substances polluantes.*	1993
Annick Girard	*Etude des effets neuropsychologiques d'une exposition au manganèse comparé au Parkinsonisme.*	1995
Louis Bilodeau	*Étude des facteurs influençant le taux de manganèse sanguin dans une population*	1998
Nathalie Risse	*Les effets de la consommation de poissons constaminés sur la réussite scolaire des enfants. (1999)*	1999
Carlos Jose Passas	*Une étude communautaire pour réduire la contamination par le mercure basée sur les régimes alimentaires traditionnels une recherche participative*	2002
Geneviève St-Amour	*Densité de circulation et exposition au manganèese chez des nouveaux-nés.*	2002
Simon Lajeunesse	*Évaluation du manganèse dans les puits des Cantons de l'Est*	2001
Jennifer Webb	*Exposition au mercure chez des populations de l'Amazonie écuadorienne.*	2004
Myriam Filion	*Exposition au mercure et qualité de vie des populations riveraines du Tapajós en Amazonie brésilienne*	2005
Mélanie Lemire	*Le sélenium dans le régime alimentaire des populations riveraines du Tapajós en Amazonie brésilienne*	2005
Ugo Lachapelle	*Intégrer la santé dans des études d'impacts sur la circulation automobile dans le Nord et le Sud (co-rection avec Laurent Lepage*	2005
François Laforest	*Exposition au manganèse par l'eau potable municipale*	2009

Ph.D. Environmental Sciences

Carole Brabant	*Intérêt de la fréquence cardiaque en tant que résultante des contraintes gestuelles, posturales et thermique en situation de travail sédentaire et répétitif*	1991
Audrey Smargiassi	*Marqueurs périphériques du système dopaminergique*	1996
Jean Lebel	*Mercure et santé environnementale en Amazonie.*	1997
Maryse Bouchard	*Effets à long terme de l'exposition aux neurotoxiques sur la santé mentale et la qualité de vie.*	2006
Carlos Jose Passos	*Une approche écosystémique à l'étude de l'influence de la consommation de fruits tropicaux le mercure chez des populations riveraines de l'Amazonie brésilienne*	2007
Frédéric Mertens	*Le rôle des réseaux sociaux dans la diffusion d'innovations préventives complexes dans le cadre d'une recherche participative pour réduire l'exposition au mercure en Amazonie (Co-direction avec Johanne St-Charles)*	2010
Mélanie Lemire	*Effets de l'exposition au Sélénium dans l'Amazonie brésilienne*	2010
Myriam Fillion	*Effets combinés de mercure et sélénium sur les systèmes visuels et moteurs en Amazonie brésilienne*	2011

Ph.D. Biological Sciences

Nadia Abdelouahab	*Exposition multiple aux contaminants par la consommation des poissons : effets neurocomportementaux et hormonaux*	2010
Laura Atikessé	*L'exposition au mercure et aux contaminants et leurs effets chez les Innus de Labrabor une approche écosystémique (Co-direction avec Sylvie de Grosbois)*	2010

Post-doctotal Fellows

Takser, Larissa	*Expositions multiples et effets sur la santé*	2002
Aline Philibert	*Analyses biostatistiques de données épidémiologiques*	2005-07

Other

Antonio Menezes	*Exposition et effets de manganèse chez des enfants qui résident proche d'une industrie de transformation de manganèse (tutrice pour Mount Sinai Medical Centre, New York)*	2010

List of peer-reviewed publications

(* indicates graduate student or post-doctoral fellow)

1. Webb J, Coomes OT, Mainville N, Mergler D. Mercury Contamination in an Indicator Fish Species from Andean Amazonian Rivers Affected by Petroleum Extraction. Bull Environ Contam Toxicol. 2015; 95(3):279-85.
2. Mora AM, van Wendel de Joode B, Mergler D, Córdoba L, Cano C, Quesada R, Smith DR, Menezes-Filho JA, Eskenazi B. Maternal blood and hair manganese concentrations, fetal growth, and length of gestation in the ISA cohort in Costa Rica. Environ Res. 2015;136:47-56.
3. van Wendel de Joode B, Mora AM, Córdoba L, Cano JC, Quesada R, Faniband M, Wesseling C, Ruepert C, Oberg M, Eskenazi B, Mergler D, Lindh CH. Aerial application of mancozeb and urinary ethylene thiourea (ETU) concentrations among pregnant women in Costa Rica: the Infants' Environmental Health Study (ISA). Environ Health Perspect. 2014;122(12):1321-8.
4. Oulhote Y, Mergler D, Bouchard MF. 2014. Sex- and age-differences in blood manganese levels in the U.S. general population: national health and nutrition examination survey 2011-2012. Environ Health. 2014;13:87.
5. Park RM, Bouchard MF, Baldwin M, Bowler R, Mergler D. Respiratory manganese particle size, time-course and neurobehavioral outcomes in workers at a manganese alloy production plant. Neurotoxicology. 2014;45:276-84.
6. Park RM, Baldwin M, Bouchard MF, Mergler D. Airborne manganese as dust vs. fume determining blood levels in workers at a manganese alloy production plant. Neurotoxicology. 2014;45:267-75.
7. Mora AM, van Wendel de Joode B, Mergler D, Córdoba L, Cano C, Quesada R, Smith DR, Menezes-Filho JA, Lundh T, Lindh CH, Bradman A, Eskenazi B. Blood and hair manganese concentrations in pregnant women from the infants' environmental health study (ISA) in Costa Rica. Environ Sci Technol. 2014 Mar 18;48(6):3467-76.
8. Menezes-Filho JA, de Carvalho-Vivas CF, Viana GF, Ferreira JR, Nunes LS, Mergler D, Abreu N. Elevated manganese exposure and school-aged children's behavior: A gender-stratified analysis. Neurotoxicology. Neurotoxicology. 2014;45:293-300.
9. Ritz SA, Antle DM, Côté J, Deroy K, Fraleigh N, Messing K, Parent L, St-Pierre J, Vaillancourt C, Mergler D. 2014 First steps for integrating sex and gender considerations into basic biomedical research. FASEB J. 28:4-13.
10. Fillion M*, Lemire M*, Philibert A, Frenette B, Weiler HA, Deguire JR, Guimarães JR, Larribe F, Jr FB, **Mergler D**. 2013. Toxic risks and nutritional benefits of traditional diet on near visual contrast sensitivity and color vision in the Brazilian Amazon. Neurotoxicology. 37:173-81.
11. Meyer-Baron M, Schäper M, Knapp G, Lucchini R, Zoni S, Bast-Pettersen R, Ellingsen DG, Thomassen Y, He S, Yuan H, Niu Q, Wang XL, Yang YJ, Iregren A, Sjögren B, Blond M, Laursen P, Netterstrom B, **Mergler D**, Bowler R, van Thriel C. 2013. The neurobehavioral impact of manganese: results and challenges obtained by a meta-analysis of individual participant data. Neurotoxicology 36:1-9
12. van Wendel de Joode B, Barraza D, Ruepert C, Mora AM*, Córdoba L, Oberg M, Wesseling C, Mergler D, Lindh CH. 2012. Indigenous children living nearby plantations with chlorpyrifos-treated bags have elevated 3,5,6-trichloro-2-pyridinol (TCPy) urinary concentrations. Environ Res. 117:17-26.
13. Mergler D. 2012. Neurotoxic exposures and effects: Gender and sex matter! Hänninen Lecture 2011. 2012 Neurotoxicology 33:644-51.
14. Roels HA, Bowler RM, Kim Y, Claus Henn B, Mergler D, Hoet P, Gocheva VV, Bellinger DC, Wright RO, Harris MG, Chang Y, Bouchard MF, Riojas-Rodriguez H, Menezes-Filho JA, Téllez-Rojo MM. 2012. Manganese exposure and cognitive deficits: A growing concern for manganese neurotoxicity. Neurotoxicology. 33:872-80.

15. Mertens F, Saint-Charles J, Mergler D. 2012. Social communication network analysis of the role of participatory research in the adoption of new fish consumption behaviors. Soc Sci Med. 75:643-50.

16. Lemire M*, Philibert A*, Fillion M*, Passos CJ, Guimarães JR, Barbosa F Jr, Mergler D. 2012 No evidence of selenosis from a selenium-rich diet in the Brazilian Amazon. Environ Int. 40:128-36.

17. Menezes-Filho JA*, Novaes Cde O, Moreira JC, Sarcinelli PN, Mergler D. 2011. Elevated manganese and cognitive performance in school-aged children and their mothers. Environ Res. 111:156-63.

18. Bouchard MF, Sauvé S, Barbeau B, Legrand M, Brodeur MÈ, Bouffard T, Limoges E, Bellinger DC, Mergler D. 2011. Intellectual impairment in school-age children exposed to manganese from drinking water. Environ Health Perspect. 119:138-43.

19. Joly A*, Lambert J., Gagnon C., Kennedy G., Mergler D, Adam-Poupart A., Zayed J. 2011. Reduced Atmospheric Manganese in Montreal Following Removal of Methylcyclopentadienyl Manganese Tricarbonyl (MMT). Water, Air and Soil Pollution 219 : 263-270

20. Fillion M*, Philibert A*, Mertens F, Lemire M*, Passos CJ, Frenette B, Guimarães JR, Mergler D. 2011 Neurotoxic sequelae of mercury exposure: an intervention and follow-up study in the Brazilian Amazon. Ecohealth. 2011 Jun;8(2): 210-22.

21. Turyk ME, Bhavsar SP, Bowerman W, Boysen E, Clark M, Diamond M, Mergler D, Pantazopoulos P, Schantz S, Carpenter DO. 2012. Risks and benefits of consumption of Great Lakes fish. Environ Health Perspect. 120:11-8.

22. Fillion M*, Lemire M*, Philibert A*, Frenette B, Weiler HA, Deguire JR, Guimarães JR, Larribe F, Barbosa F, Mergler D. 2011 Visual acuity in fish consumers of the Brazilian Amazon: risks and benefits from local diet. Public Health Nutr. 6:1-9.

23. Nyland JF, Fillion M*, Barbosa F Jr, Shirley DL, Chine C, Lemire M*, Mergler D, Silbergeld EK. 2011. Biomarkers of methylmercury exposure immunotoxicity among fish consumers in Amazonian Brazil. Environ Health Perspect. 119:1733-8.

24. Meyer-Baron M, Schäper M, Knapp G, Lucchini R, Albini E, Bast-Pettersen R, He S, Yuan H, Niu Q, Wang XL, Yang YJ, Iregren A, Sjögren B, Blond M, Laursen P, Netterstrom B, Mergler D, Bowler R, van Thriel C. 2011. Statistical means to enhance the comparability of data within a pooled analysis of individual data in neurobehavioral toxicology. Toxicol Lett. 206:144-51.

25. Lemire M*, Fillion M*, Frenette B, Passos CJ, Guimarães JR, Barbosa F Jr, Mergler D. 2011. Selenium from dietary sources and motor functions in the Brazilian Amazon. Neurotoxicology. 32:944-53.

26. Coelho-Souza SA, Guimarães JR, Miranda MR, Poirier H, Mauro JB, Lucotte M, Mergler D. 2011 Mercury and flooding cycles in the Tapajós River basin, Brazilian Amazon: the role of periphyton of a floating macrophyte (Paspalum repens). Sci Total Environ.409:2746-53.

27. Webb, JC, Mergler D, Parkes MW, Saint-Charles J, Spiegel J, Waltner-Toews D, Yassi A, Woollard RF, 2010. Tools for thoughtful action: The role of ecosystem approaches to health in enhancing public health. Canadian Journal of Public Health.101:439-441.

28. Wesseling C, van Wendel de Joode B, Keifer M, London L, Mergler D, Stallones L. 2010. Symptoms of psychological distress and suicidal ideation among banana workers with a history of poisoning by organophosphate or n-methyl carbamate pesticides.. Occup Environ Med. 778-84.

29. Lemire M*, Fillion M*, Frenette B, Mayer A, Philibert A, Passos CJ, Guimarães JR, Barbosa Jr F Jr, Mergler D. 2010. Selenium and Mercury in the Brazilian Amazon: Opposing Influences on Age-Related Cataracts. Environ Health Perspect. 118 : 1584-1589.

30. Lemire M, Fillion M, Barbosa F Jr, Guimarães JR, Mergler D. 2010 Elevated levels of selenium in the typical diet of Amazonian riverside populations. Sci Total Environ. 408:4076-84.

31. Jacob-Ferreira AL*, Passos CJ*, Jordão AA, Fillion M*, Mergler D, Lemire M*, Gerlach RF, Barbosa Jr F, Tanus-Santos JE. Mercury Exposure Increases Circulating Net Matrix Metalloproteinase (MMP)-2 and MMP-9 Activities. Basic Clin Pharmacol Toxicol 105 :281-288.

32. Grotto D*, Valentini J, Fillion M*, Passos CJ, Garcia SC, Mergler D, Barbosa F Jr. 2010. Mercury exposure and oxidative stress in communities of the Brazilian Amazon. Sci Total Environ.408:806-11

33. Philibert A*, Schwartz H, Mergler D 2009. An exploratory study of diabetes in a First Nation community with respect to serum concentrations of *p,p'*-DDE and PCBs and fish consumption. Int J Environ Res Public Health. 6:3179-89

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Conferences

Dr. Mergler has given hundreds of seminars and conferences at national and international conventions, universities and government committees. Below is selected list of some of these events

- 1st African Regional Conference of the International Association of Ecohealth, Côte d'Ivoire (2013) keynote address
- Haninën Lecture at the Joint meeting of the International Neurotoxicology Association and the International Congress on Occupational Health International Symposium on Neurobehavioral Methods and Effects in Occupational and Environmental Health, Xian, China (2011) keunote address
- 9th International Conference on Mercury as a Global Pollutant, Guiyang, China (2009) keynote address
- 7th International Conference on Mercury as a Global Pollutant, Madison, USA (2006) keynote address
- International Conference on Rivers and Civilizations, La Crosse, USA (2006) key note address
- Children's Environmental Health, Almaty, Khazakstan (2005) panel presentation
- 3rd Conference on Occupational and Environmental Health in the Americas. San Jose, Costaa Rica (2005) keynote address
- Health Canada Annual Forum. Ottawa, Canada (2004) conference to government scientists and policy-makers
- 8th International Symposium on Neurobehavioral Methods and Effects in Occupational and Environmental Health, Brescia, Italy (2002) keynote address

- 7th International Symposium on Neurobehavioral Methods and Effects in Occupational and Environmental Health. Stockholm, Sweden (1999) keynote address
- PREMUS-ISEOH, Helsinki (1998) keynote address
- Office of Science and Technology of the White House, Triangle Park, USA (1998) (presentation to a government committee) panel presentation to government scientists and policy-makers
- US National Academy of Science's Committee on Mercury, Washington, USA (1998) presentation to the committee on the toxicological effects of methylmercury
- 15ième International Conference of Neurotoxicology, Little Rock' USA (1997) keynote address

KEY FILMS, RADIO PROGRAMS AND MAGAZINE ARTICLES ON DONNA MERGLER'S WORK

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Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO),
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

ACKNOWLEDGEMENT OF EXPERT'S DUTY

1. My name is Donna Mergler. I live in Montreal in the Province of Quebec.

2. I have been engaged by or on behalf of Grassy Narrows First Nation to provide evidence in relation to the above-noted court proceeding.

3. I acknowledge that it is my duty to provide evidence in relation to this proceeding as follows:

   (a) to provide opinion evidence that is fair, objective and non-partisan;

   (b) to provide opinion evidence that is related only to matters that are within my area of expertise; and

   (c) to provide such additional assistance as the court may reasonably require, to determine a matter in issue.

4. I acknowledge that the duty referred to above prevails over any obligation which I may owe to any party by whom or on whose behalf I am engaged.

Date: _____ _____

Donna Mergler

Court File No. 446/15

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

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(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

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SUPERIOR COURT OF JUSTICE

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DECEMBER 10, 2021

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	Determination, dated March 29, 2021; 3. ANA Letter to Regional Manager, Ministry of Energy, Northern Development and Mines RE: Trillium Gold Leo Project Drilling Program, dated December 18, 2020 4. ANA Letter to Hon. Greg Rickford, Minister of Energy, Northern Development and Mines RE: Request to Exercise Mining Acts. 35(1) Withdrawal of Lands Power, dated November 13, 2020 5. ANA Letter to Hon. Greg Rickford, Minister of Energy, Northern Development and Mines RE: Request to Exercise Mining Act s. 35(1) Withdrawal of Lands Power, dated October 1, 2020 6. ANA Letter to Hon. Greg Rickfod, Minister of Energy, Northern Development and Mines RE: Request to exercise Mining Acts 35(1) withdrawal of lands power, dated February 26, 2020 7. ANA Open Letter Re: Moratorium on industry in our Traditional Territory, and opposition to MNR Tender Process, dated January 17, 2007 8. ANA Letter to Mr. Holmes, Mr. Brown, Ms. Stuart, Ms. Bjorgan, and Ms. Capling, dated December 20, 2019 9. Email communications from Lara Koerner-Yeo to Mr. Holmes, Mr. Brown, Ms. Stuard, Ms. Bjorgan and Ms. Capling dated February 25, 2020, February 6, 2020, January 28, 2020 and December 23, 2019 10. ANA Letter to Hon. Rod Phillips, Minister of Environment, Conservation and Parks, dated March 25, 2019 11. Email communication from David Sone to Hon. Jeff Yurek and Rod Phillips, dated October 11, 2018 12. ANA Letter to Hon. Jeff Yurek, Minister of Natural Resources and Forestry and The Honourable Rod Phillips Minister of Environment, Conservation and Parks, dated September 18, 2018	
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Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, CHIEF SIMON FOBISTER
and
former CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
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Applicants

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MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO),
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and THE ATTORNEY GENERAL OF ONTARIO

Respondents

APPLICATION UNDER Section 2(1)
of the *Judicial Review Procedure Act*
R.S.O. 1990, c. J.1

SUPPLEMENTARY APPLICATION RECORD
VOLUME 2 OF 3

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ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

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Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

AFFIDAVIT OF ANNA WILLOW

I, ANNA WILLOW, of the City of Delaware, in the State of Ohio, in the country of the United States of America, MAKE OATH AND SAY AS FOLLOWS:

1. I hold a master's and a doctorate in anthropology from the University of Wisconsin as well as a master's in natural resources and environment from the University of Michigan. I am currently an associate professor of anthropology at Ohio State University. My professional training and research experience have been in the areas of cultural and

environmental anthropology especially concerning Anishinaabe environmental relationships, uses and values. I have broad experience and expertise concerning boreal forest First Nations peoples and cultures and knowledge about their sociocultural responses to environmental transformations resulting from natural resources extraction. I have conducted multiple independent research projects, including long-term ethnographic participant-observation research at Grassy Narrows First Nation. I also have published a book, numerous peer-reviewed journal articles, professional reports, and delivered numerous papers at conference proceedings in my field of study. A copy of my curriculum vitae is attached to Exhibit "A", below.

2. In February 2015 I was asked by counsel for Grassy Narrows to answer certain questions in a report on the importance of fishing and the consumption of fish as part of the traditional cultural activity and identity of the people of Grassy Narrows First Nation. The questions and my answers to them appear as part of my February 2016 expert report attached as Exhibit "A" to my Affidavit.

3. A copy of my Acknowledgement of Expert's Duty form is attached as Exhibit "B" to my Affidavit.

SWORN BEFORE ME in the City of Marion, in the State of Ohio, in the United States of America, this ___ day of _____, 2016.

A Commissioner, etc.

_____
Anna Willow

EXPERT REPORT

Grassy Narrows First Nation and Sherry Fobister, William Fobister, Senior, Simon Fobister and Chief Roger Fobister, Senior on their own behalf and on behalf of all other members of Grassy Narrows First Nation v. Minister of Natural Resources and Forestry (Ontario) and Minister of the Environment and Climate Change (Ontario), and the Attorney General of Ontario

Ontario Superior Court of Justice
(Divisional Court)

Prepared for

Joseph F. Castrilli and Richard D. Lindgren
Counsel, Canadian Environmental Law Association
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M5V 2L4

The Importance of Fishing and the Consumption of Fish as Part of the Traditional Cultural Activity and Identity of the People of Grassy Narrows First Nation: An Anthropological Perspective

Dr. Anna Willow, Associate Professor,
Ohio State University, Department of Anthropology
1465 Mt. Vernon Avenue, Marion, OH 43302 USA

Date: February 3, 2016

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I. Area of Expertise and Qualifications

My professional training and extensive research experience qualify me as an expert in the areas of cultural and environmental anthropology, especially concerning Anishinaabe environmental relationships, uses, and values. I have broad expertise concerning boreal forest First Nations peoples and cultures and I am knowledgeable about sociocultural responses to environmental transformations resulting from natural resource extraction. I earned a PhD in Anthropology from the University of Wisconsin (2008). Additionally, I hold two Masters Degrees, one from the University of Wisconsin in the field of Anthropology (2003) and the other from the University of Michigan in the field of Natural Resources and Environment (2001). Since the autumn of 2009, I have been employed at the Ohio State University. I was promoted from assistant to associate professor of anthropology in June of 2015. I have conducted multiple independent research projects, including long-term ethnographic participant-observation research at Grassy Narrows First Nation (which took place mainly from June 2004 to April 2005, with additional shorter visits between May 2003 and August 2007). As my CV (Appendix B) details, I have to date published one book, thirteen peer-reviewed journal articles, and two professional reports in the areas of my expertise. I have also delivered numerous papers at professional conferences in my field of study.

The report that follows combines extensive reviews of published ethnohistorical and social scientific literature with observations and conversations derived from my time at Grassy Narrows First Nation. Some of the material contained in this report is excerpted and adapted from my own previously published works, especially including the following three items:

Willow, Anna. 2012. *Strong Hearts, Native Lands: Anti-Clearcutting Activism at*

Grassy Narrows First Nation. Winnipeg: University of Manitoba Press (Concurrently published in the United States as *Strong Hearts, Native Lands: The Cultural and Political Landscape of Anishinaabe Anti-Clearcutting Activism.* Albany: State University of New York Press).

Willow, Anna. 2011. Conceiving Kakipitatapitmok: The Political Landscape of Anishinaabe Anti-Clearcutting Activism. *American Anthropologist* 13(2):262-276.

Willow, Anna. 2009. Clear-cutting and Colonialism: The Ethnopolitical Dynamics of Indigenous Environmental Activism in Northwestern Ontario. *Ethnohistory* 56(1):35-67.

II. Instructions, Nature of Opinion Sought, and Questions

I have been asked by Joseph F. Castrilli and Richard D. Lindgren of the Canadian Environmental Law Association to prepare an expert report that answers twelve questions. The primary purpose of this report is to describe the importance of fishing and the consumption of fish as part of the traditional cultural activity and identity of the people of Grassy Narrows First Nation. My answers to the questions are contextualized by my anthropological understanding of Grassy Narrow First Nation's cultural and geographic affiliation, Anishinaabe subsistence patterns of the past and present, and broader patterns of human-environment relationships among the indigenous peoples of the Canadian boreal region. The report documents the ongoing relevance of traditional Anishinaabe culture, the importance of fishing as a form of land-based subsistence, and the continuing cultural impacts of mercury contamination.

I was provided with and asked to review four relevant documents (Item A):

A. The Grassy Narrows-Earthroots request, dated January 2014, of the Ministry of the Environment for an individual environmental assessment (IEA) on the Whiskey Jack Forest Management Plan (2012-2022), and the supplementary submissions made to the Ministry dated May, July, September and November 2014 insofar as they relate to your area of expertise and the subject matter for your report.

B. The Lovisek Report, dated June 2008.

C. *Keewatin v. Ontario*, 2011 selected factual findings from the trial judgment pertinent to your report (Exhibit "A").

D. Ontario Ministry of Natural Resources and Forestry approved 2012-2022 Forest Management Plan for the Whiskey Jack Forest.

I was also asked to answer twelve questions in four general areas. I list the twelve questions here and include my summary and full detailed answers—along with reasons for those answers—in the subsequent section.

A: General

1. For the documents referred to in item A, above, please indicate if the views expressed in those documents that relate to the subject matter of this report, and/or that are attributed to you, are accurate in every material respect? If not, please indicate in your report the corrections that should be made with respect thereto. In responding to this question, please also address the questions that follow.

B: Historical Importance of Fishing

2. What factual findings are made in the 2011 trial judgment of Keewatin v. Ontario, if any, that are relevant to the subject matter of your report respecting:

a. The traditional activities the ancestors of Grassy Narrows engaged in with respect to the Grassy Narrows Homeland/Traditional Land Use Area ("TLUA") before and following their signing of Treaty No. 3?

b. The definition of the historical seasonal round of Grassy Narrows and, in particular and to the extent not discussed in response to question 2(a) above, the historical importance of fishing to the culture, sustenance, and economy of Grassy Narrows?

3. If not answered in response to question 2(b) above what has been the historical importance of fishing, if any, to the culture, economy, and sustenance of the people of Grassy Narrows?

C: Contemporary Importance of Fishing

4. How important today is fishing to the culture, economy, and sustenance of the people of Grassy Narrows and, if not discussed in response to questions 1, 2, or 3 above, the relationship of the TLUA of Grassy Narrows to the Whiskey Jack Forest?

5. Which fish species are eaten by the people of Grassy Narrows, from which geographic areas, and why? In particular, what traditional factors, if any, apply to the bodies of water, and fish species a member of Grassy Narrows may fish for in the area?

6. What role, if any, does fishing play in the identity and society of the people of Grassy Narrows? Is this role different, and if so how, from non-aboriginal Canadian society in the region, and from the urban aboriginal population in the region?

7. Taking into account your responses to the above questions regarding the importance of fishing and the consumption of fish caught, how effective have been measures used by the federal or provincial governments, such as consumption advisories and the provision of freezer fish, in protecting the people of Grassy Narrows from mercury impacts? Please explain your answer.

D: Impacts of Mercury Exposure on the Culture and Community of the People of Grassy Narrows

8. What has been the impact of past mercury exposure from industrial discharges on the culture and community of Grassy Narrows, and what inferences can be drawn from this history when considering future activities, such as clear-cut logging, and whether they could introduce new sources of mercury exposure through fish consumption?

9. If not answered in response to question 8 above, what have been the community level psychological impacts of past mercury exposure from industrial discharges on the people of Grassy Narrows and what additional community level psychological impacts are currently experienced or anticipated from planned future activities, such as clear-cut logging, and whether they could introduce new sources of mercury exposure?

10. Are the impacts at the community level in Grassy Narrows from past mercury exposure, and those anticipated in future from new sources of mercury exposure, experienced differently by gender and age and, if so, how?

11. If not answered in response to questions 8, 9 and 10 above, how does the experience at Grassy Narrows compare with the documented experience of other aboriginal communities that have faced environmental contamination problems?

12. What community level responses have occurred in response to past mercury exposure, and what community level responses are possible in future to activities that could add mercury to bodies of water used by the people of Grassy Narrows for fishing and other traditional pursuits?

III. Summary and Full Answers to Questions and Reasons for Opinions

In this core section of the report, I provide both summary and full answers to the questions I was asked to consider and explain the reasons—based on my review of the relevant literature and on observations made as a trained anthropological observer—for my opinions.

A: General

1. For the documents referred to in item A, above, please indicate if the views expressed in those documents that relate to the subject matter of this report, and/or that are attributed to you, are accurate in every material respect? If not, please indicate in your report the corrections that should be made with respect thereto. In responding to this question, please also address the questions that follow.

Summary Answer:

Regarding all of these documents, I agree with the information that is within my area of expertise to assess. I found no errors related to the subject matter of this report.

Full Answer:

A. The Grassy Narrows-Earthroots Request

Concerning the Grassy Narrows-Earthroots request of January 2014 for individual environmental assessment (IEA) and its subsequent supplementary submissions, I agree with the information that is within my area of expertise to assess and found no errors related to the subject matter of this report. I am not qualified to offer an expert opinion regarding the effects of clearcutting on mercury levels, nor on its implications for wildlife or human physiology. I would like to reiterate the importance and accuracy of several of the points contained in the Grassy Narrows-Earthroots submissions as they relate to my area of expertise:

1. The initial request (dated January 22, 2014) draws attention to the fact that the English and Wabigoon watersheds and their Aboriginal residents have already experienced serious harm as a result of mercury contamination (p. 1, p. 22). Because impacts on indigenous subsistence and culture are cumulative in nature, any future activities that could adversely impact the subsistence and culture of First Nations residents must be considered in this light.

2. The initial submission states that fish caught in the waters surrounding Grassy Narrows and consumed by community residents already have mercury levels that are above or approaching limits for safe human consumption (p. 6). This has long been the case and is well-known among environmental management professionals and environmental social science researchers in Canada.

3. The initial submission states that Grassy Narrows has consistently objected to the OMNRF's planning process (p. 10). Based on my experience at Grassy Narrows, I can attest to community members' long-term concern with the planning process, with public objections dating back to the late 1990s and internally-voiced complaints possibly extending further back in time. As described below, the residents of Grassy Narrows have also expressed specific concerns about mercury contamination for many years.

4. The initial submission points out that the people of Grassy Narrows have experienced multiple, mutually-compounding industrial activities that have been harmful to their health, culture, and livelihood (p. 22). Based on my knowledge of the case, I know this to be accurate.

5. The September 8, 2014 supplementary submission states that people at Grassy Narrows continue to perceive the risk of mercury pollution to be high, that sufficient levels of communication and trust have not been developed between Grassy Narrows residents and scientific/health professionals, and that the detrimental consequences of mercury contamination extend beyond its effects on physical health (p. 5). The report that follows supports and elaborates on these points.

6. The supplementary submission dated November 14, 2014 states that the impacts of mercury have been disproportionately experienced by those Grassy Narrows residents who practice a traditional way of life that includes fishing (p. 5). I agree with this point and elaborate on its significance below.

7. I agree with the points set out in the supplementary submission dated November 14, 2014 regarding the inappropriate nature of sports fishing consumption guidelines for First Nations peoples (p. 10-11) and the general importance of fishing for the people of Grassy Narrows (p. 18-19). I elaborate on these topics below.

B. *Keewatin v. Ontario,* 2011: Selected Factual Findings from the Trial Judgment Arising from the Lovisek Report

Regarding the Lovisek Report, dated June 2008, I found the material that is within my area of expertise (Anishinaabe ethnohistory and subsistence) to be accurate.

It is noteworthy that the ability to access and utilize the region's rich fisheries was viewed as especially important by Anishinaabe negotiators to Treaty Three, so much so that Commissioner Simon Dawson noted the following in his report:

> I am in a position to say that, as an inducement to the Indians to sign the Treaty, the commissioners pointed out to them that, along with the land reserves and money payments, they would forever have the use of their fisheries. This point was strongly insisted on and it had great weight with the Indians, who for some years previously had persistently refused to enter into any Treaty (Dawson 1873:50; cited on p. 161 of the Lovisek report).

Twine for the manufacture of fishing nets, Lovesick accordingly points out, was a key Saulteaux demand (p. 87, 91, 119). In short, when Anishinaabe negotiators signed Treaty Three in 1873, they did so with the confidence that their people would retain the ability to utilize the region's rich fisheries as a healthy and traditional dietary staple. For Anishinaabe people today, the ability to access and safely consume fish and other traditionally harvested resources throughout their customary Land Use Area (or traditional territory) remains extremely important.

One way in which I diverge with Lovisek is not a matter of accuracy, but one of preferred ethnonym. Because it is their own self-designation, I use the terms *Anishinaabe* and *Anishinaabeg* (plural) throughout this report to refer to the Aboriginal people also known in the literature as Ojibwe/a, Ojibway, and Saulteaux. This reflects our different disciplinary backgrounds (ethnohistory vs. cultural anthropology) and temporal research emphasis (historical documents vs. contemporary speech). Where I cite the work or documents of others, I use the term found in the original.

I also agree with the three selected excerpts that were identified as pertinent to this report (paragraphs 475, 772, and 773), reproduced here:

> [475] Lovisek gave evidence that in 1873, the Ojibway were primarily concerned about preserving their way of life, including their right to continue hunting, fishing and trapping as in the past. They valued their seasonal round, the pursuit of their livelihood through traditional harvesting. Their culture and

> identities were intimately connected with hunting, trapping, fishing and harvesting wild rice as their ancestors had done since time immemorial.
>
> [772] The Treaty 3 Ojibway loved their lives and their country (Lovisek, November 16, 2009 at p. 39). They relished their way of life, including their seasonal round of trapping, hunting, fishing and harvesting over the breadth of their territories. They valued their customs and were not prepared to give them up….
>
> [773] I accept the evidence of Lovisek…that they were prepared to embrace a Euro-Canadian presence **only** if it would be compatible with their cherished way of life, and would not cause serious interference with their hunting, fishing and trapping – central aspects of their distinctive culture central to their identity.

Furthermore, I found accurate and relevant information in the trial judgment regarding the Ojibway seasonal round (paragraphs 229-230, 1153, 1158-1164) and the assumed compatibility of Aboriginal and Euro-Canadian uses of the land (paragraphs 913, 1233). These paragraphs are reproduced in Appendix C of this report.

D. 2012-2022 Forest Management Plan for the Whiskey Jack Forest

Silviculture and forest management planning are outside my area of expertise and I am not qualified to identify inaccuracies in this area. However, as an anthropologist concerned with the sociocultural elements of systems that include both ecological and human components, I note the following matters relevant to my report:

> 1. There is no mention in the Forest Management Plan of the previous opposition of Grassy Narrows First Nation members to clearcutting within their Traditional Land Use Area (traditional territory), which has included high-profile direct action protest as well as sustained opposition to the forest management planning process itself. The Plan notes that "Abitibi surrendered the Whiskey Jack Forest SFL to MNR in 2009" (p. 18), but the context of that surrender (which was informed, among other factors, by years of protest by members of Grassy Narrows First Nation and the entry into a memorandum of understanding to initiate formal negotiations to resolve the ongoing dispute) is not mentioned in any manner. This lack is again conspicuous on pages 109-111 in the Forest Management Plan's very general section on Aboriginal Interests.
>
> This contrasts with an independent audit that notes that a separate process is now underway to address Grassy Narrows community members' concerns about forest management. The independent audit supports Grassy Narrows First Nation's view that the Forest Management Planning process, as currently practiced, does not constitute

adequate consultation. The *Whiskey Jack Forest Independent Forest Audit, 2004-2009* draws attention to "fundamental differences in the viewpoints between GNFN and MNR regarding forest management principles and practices" and goes on to state:

> "it is the audit team's opinion that these differences cannot be resolved without the Province setting aside many of the requirements to manage the Whiskey Jack Forest under the CFSA and the FMPM, and relinquishing significant authority to the First Nation to manage portions of the Whiskey Jack Forest according to the desires of the GNFN community. The audit team further believes that the forest management planning process did not anticipate, nor was it designed to resolve the type of dispute currently being experienced on the Whiskey Jack Forest" (KBM Forestry Consultants 2010:7).

2. The Plan notes that 84% of the area in question falls into the category of "Managed, Crown land" (p. 20). While this is technically accurate, there is no mention of the fact that this overlaps considerably with the area Grassy Narrows residents understand to be their Traditional Land Use Area or traditional territory.

3. Although the region's important fisheries resource is discussed (p. 68-70), there is no mention of mercury in the report. First Nations fishing is discussed briefly (p. 102), but the English-Wabigoon River's serious mercury problem is not noted. This is especially concerning because the contamination case is well-known in northwestern Ontario and among environmental and social science researchers across Canada.

4. The Plan includes summaries of the demographic profiles of communities that "receive significant social and economic benefits from the Whiskey Jack Forest" (p. 86), but does not acknowledge the possibility that these communities might also face significant social and environmental risks or harms as a result of the activities described in the Forest Management Plan. While the concept of "net impact" is recognized with regards to recreation and tourism (p. 218), there is no explicit consideration of the possibility that Aboriginal communities could be adversely impacted by forestry activities. This is in spite of the fact that supplementary documentation in the Plan itself acknowledges that "subsistence hunting, fishing, and gathering of resources from within the forest are an integral part of community existence" (p. 26).

5. While wildlife habitat, visual aesthetics, tourism agreements, and fuelwood are included in the Plan's Harvest Selection Criteria (p. 187-189), Aboriginal Interests are not.

B: Historical Importance of Fishing

2. What factual findings are made in the 2011 trial judgment of Keewatin v. Ontario, if any, that are relevant to the subject matter of your report respecting:

a. The traditional activities the ancestors of Grassy Narrows engaged in with respect to the Grassy Narrows Homeland/Traditional Land Use Area ("TLUA") before and following their signing of Treaty No. 3?

Summary Answer:

Factual findings from the trial judgement concerning the acknowledged importance of subsistence harvesting at the time of the Treaty are relevant to the subject of this report. Treaty commissioners knew that traditional harvesting—specifically including fishing—was essential to Anishinaabe people.

Full Answer:

In addition to the selected excerpts noted above, the following additional findings in the *Keewatin v. Ontario* judgment are relevant to the historical importance of fishing at Grassy Narrows First Nation:

1. It was widely understood by the Treaty Three Commissioners that traditional harvesting was of the utmost importance to the Anishinaabe and that they would be unlikely to agree to a treaty if harvesting was not protected. As stated at Paragraph 747, "All three Treaty Commissioners understood the importance of harvesting to the Ojibway and therefor the importance of promising continuing Harvesting Rights to induce the Ojibway to enter into the Treaty."

2. The judgment accepts that the Treaty Commissioners knew most of the Treaty Three area was unsuitable for agriculture. They were aware of the general pattern of Anishinaabe subsistence and expected it to continue. Along these lines, paragraph 750 states that "Morris made it clear to the treaty 3 Ojibway that he expected their gardening <u>to supplement, not replace</u>, their traditional harvesting." Similarly, paragraph 759 states, "…from Canada's perspective, the continuation of the hunting, trapping and fishing rights was important to ensuring that the Ojibway did not become dependent upon relief or welfare delivered by the Department of Indian Affairs"

b. The definition of the historical seasonal round of Grassy Narrows and, in particular

and to the extent not discussed in response to question 2(a) above, the historical importance of fishing to the culture, sustenance, and economy of Grassy Narrows?

Summary Answer:

Factual findings concerning the centrality of fishing to the Anishinaabe seasonal round are relevant to the subject of this report. Fishing was historically—and remains today—a staple subsistence activity at Grassy Narrows First Nation.

Full Answer:

Findings relevant to the historical seasonal round, especially fishing, are also present in *Keewatin v. Ontario:*

1. Paragraph 229 gives a broad overview of the Anishinaabe subsistence strategy, emphasizing seasonal mobility and adaptability to the availability of diverse boreal forest resources. The following paragraph (Paragraph 230) quotes a letter from Simon Dawson to the Minister of Public Works (dated December 19, 1870) which states that in summer, "the grand occupation is fishing, and this is to them the happiest season of the year" and goes on to broadly but accurately describe the activities undertaken in each season.

2. While not specific to the people of the English-Wabigoon River region, Paragraph 1053 describes complaints following Treaty Three made by Anishinaabe leaders of the Rainy River, Rainy Lake, and Seine River Bands who were in 1909 experiencing opposition to their traditional subsistence activities. The loss of hunting grounds and interference by outsiders with hunting is noted. Regarding fishing, the1909 petition includes the following statement: "We also wish to Fish for ourselves all the year and no reserve seasons for us. It's our daily food."

3. The evidence of William Fobister (Paragraphs 1153-1164) presents an accurate description of recent historical Anishinaabe subsistence patterns. Fobister describes the early summer gardening season at the pre-relocation Reserve, the summer blueberry harvest, the late summer wild rice harvest, the garden harvest, travel to the winter trapline, and the hunting and trapping of autumn and winter. The judgment also notes based on Fobister's evidence, which states:

   > "The Grassy Narrows people fished for their own consumption and for sale to others until 1970, when mercury poisoning was discovered in the Wabigoon and English River system and adjacent lakes. Fish were

declared unsafe to eat. Fishing ended. The tourist industry, formerly the main employer in the area, collapsed. Welfare was introduced for the first time" (Paragraph 1173).

I believe this assessment to reflect what Fobister witnessed in the early 1970s. Today, however, many people at Grassy Narrows do continue to fish for their own subsistence, in ways and for reasons that are outlined below. Commercial fishing continues to be curtailed by contamination. Guiding for the tourist industry, although less significant than prior to mercury contamination, continues to employ some Grassy Narrows residents. Grassy Narrows members now work as fishing guides employed by Ball Lake Lodge and Grassy Narrows Lodge, both which are owned by the Grassy Narrows band. There also exists at least one independent family-owned guiding business.

4. The trial judge acknowledges that "In the case of the Grassy Narrows Ojibway, the life of Fobister is illustrative of the continuing reality that they were still pursuing the seasonal round without significant Euro-Canadian influence, at least into the 1960s and that Euro-Canadian uses and traditional harvesting were compatible" (Paragraph 1233).

3. If not answered in response to question 2(b) above what has been the historical importance of fishing, if any, to the culture, economy, and sustenance of the people of Grassy Narrows?

Summary Answer:

Since time immemorial, fishing has provided a primary source of food for Anishinaabe residents of Grassy Narrows and the surrounding region. Historically, it was an essential component of Grassy Narrows First Nation's economy as well as an important aspect of Anishinaabe cultural life.

Full Answer:

Fishing has been a significant activity and a staple source of food for countless generations of Grassy Narrows citizens. In both the traditional hunting-gathering economy and the more recent mixed economy, the role of fishing is central. Historically, fishing was an essential component of the seasonal round, with summer activities revolving around fishing and seasonal residence locations chosen based on proximity to productive fishing grounds. When reminiscing about times on the trapline in decades past, Grassy Narrows elders speak of fishing with nets (with walleye and northern noted as the main edible catch) as a principal activity. Beginning in the 1940s and continuing until the 1970 discovery of mercury, commercial fishing also became an

important source of wage labor income for Grassy Narrows residents. Employment of community members as fishing guides for the tourist industry began in the same period and continues today.

Prior to Euro-Canadian interference, Grassy Narrows Anishinaabeg lived a semi-nomadic lifestyle, moving within their homeland according to seasonal patterns of resource availability. In northwestern Ontario, the traditional Anishinaabe land-based seasonal subsistence cycle (or "annual round") (see Densmore 1979 [1929], Danziger 1979) shared many similarities with that observed in other parts of the North American subarctic. Through December, January, February, and March, primary subsistence activities included ice fishing and the trapping of furbearers. With families dispersed for the season, some opportunistic large game hunting also took place in the winter. In late April and early May, waterfowl returning to boreal forest lakes or passing through along their migration routes to more northerly destinations offered a welcome source of food. As soon as the ice broke up, people began fishing the waters of the English-Wabigoon River, often concentrating their earliest efforts on rapids or known spawning zones. From its commencement in May until the waters turned icy with fall, open water fishing was the dominant subsistence activity. With many families gathered together at prime fishing locations, summer was also the most social of the seasons. Late summer was a time of particular bounty. In August, Anishinaabeg picked several varieties of berries and harvested the annual crop of wild rice. Both resources, together with dried meat and fish, were processed for storage in underground caches. With fall's arrival, hunting for migratory waterfowl once again became a central activity. Large mammals—moose, white-tailed deer, and bear—were hunted most intensively in the autumn months. As fall gave way to winter, families once again dispersed, resuming trapping and recommencing the annual cycle.

Throughout most of the eighteenth and nineteenth centuries, Anishinaabe people moved within their homeland according to the seasons and the demands of the fur trade (see *Keewatin v. Ontario* paragraph 230). Family and extended family groups traveled with the seasons and land-based subsistence was the core of economic life (Hickerson 1970). Over time, particular groups became associated with specific trading posts operated by the Hudson Bay Company, where they traded furs for firearms, steel traps, cloth, and other provisions each spring and often remained to fish through the summer months. One of these posts, located just up the English River from present-day Grassy Narrows at Lac Seul, attracted a loose confederacy of Anishinaabe families (Shkilnyk 1985). At the time Treaty Three was signed in 1873, the Anishinaabeg gathered at Lac Seul were under the traditional hereditary leadership of Chief Sakatcheway. In the years following the Treaty, the government established reserves for each group of signatory Indians. In 1882, the people associated with Lac Seul were divided into the two groups that became Grassy Narrows and the smaller Wabauskang First Nation. The two communities remain closely linked today through ties of family and friendship.

Participation in the fur trade implied the emergence of a mixed economy (i.e., a living made through a combination of traditional land-based subsistence and wage/cash income) but in no way undermined the forest-based way of life. Anishinaabe people continue to hunt, fish, and gather as in generations past. Through the first half of the twentieth century, people from Grassy Narrows sold furs and blueberries for cash and a handful participated in various types of wage labor, but the bulk of the community's subsistence still came directly from the forest and from the region's lakes and rivers. A small Hudson Bay Company store operated on the Old Reserve (the common term used to denote the pre-relocation community), but its limited inventory and high prices meant that Grassy Narrows residents purchased only basic supplies—equipment to facilitate land-base subsistence, flour, sugar, and lard—regularly. The people of Grassy Narrows remained highly mobile and spent most of their winters out on their traplines. Contacts with non-Native Canadian society in this era were limited to semi-annual visits from Indian Health Service doctors and ceremonial Treaty Day visits from an Indian Agent and RCMP officer (Shkilnyk 1985).

It was only in the late 1940s that wage labor came to play a significant role in Grassy Narrows First Nation's local economy. Following World War II, a businessman from Minnesota built a luxurious lodge on Ball Lake, located several kilometers upriver from Grassy Narrows. From that time on, men from the First Nation community participated seasonally in a burgeoning tourism industry, working as fishing guides for wealthy anglers. Commercial fishing was also economically important in this period.

C: Contemporary Importance of Fishing

4. How important today is fishing to the culture, economy, and sustenance of the people of Grassy Narrows and, if not discussed in response to questions 1, 2, or 3 above, the relationship of the TLUA of Grassy Narrows to the Whiskey Jack Forest?

Summary Answer:

Fishing remains essential to the culture, economy, and sustenance of Grassy Narrows First Nation residents. As a key component of a land-based Anishinaabe way of life, fishing overlaps with many other traditional activities and reinforces enduring ties the community's Traditional Land Use Area.

Full Answer:

Fishing remains a very important part of life at Grassy Narrows and must be understood as a key component of a land-based way of life which also includes many other complementary activities. The economy and diet experienced by contemporary Grassy Narrows residents differs from that of past generations, yet First Nation members' land-based subsistence activities diverge more in

quantity than in quality from the historical pattern described above. Every family group still includes individuals who hunt, fish, and/or trap. Many community members continue to gather each season's characteristic wild resources despite the social and economic upheavals of the past fifty years (i.e., relocation and road construction in the 1960s, mercury contamination in the 1970s, clearcut logging in the 1990s and beyond). Furthermore, those who are unable to participate regularly in land-based subsistence eagerly await traditional products shared by others and maintain genuine respect for community members who engage frequently in traditional subsistence pursuits.

At Grassy Narrows today, trapping remains the dominant cold-season subsistence activity, although ice fishing also takes place during the winter. Grassy Narrows trappers hold over 30 registered traplines scattered throughout the Traditional Land Use Area surrounding the community. Travel to and within traplines usually occurs by snowmobile and trips are usually completed in one day, although some trappers maintain cabins that make longer stays feasible. In these cases, people fish and hunt for much of their food during their time out on the trapline. In addition to registered trapline holders, official "assistants" and younger relatives frequently accompany trappers in order to develop their own skills. The most commonly sought furbearers include beaver—trapped not only for fur but also as a food source—and members of the weasel family: pine marten, river otter, fisher, mink, and wolverine. Red fox, lynx, wolf, and muskrat are also trapped periodically. Trapping provides supplementary income for many Grassy Narrows families.

In late summer, people at Grassy Narrows eagerly await the ripening of two important wild foods: wild rice and blueberries. The availability of these resources varies according to weather conditions. Additionally, a large portion of the region's wild rice remains at the mercy of the dams that now constrain the English-Wabigoon River system; if water levels are raised while the rice is still in its vulnerable floating leaf stage, an entire harvest can be damaged beyond recovery. If, however, conditions have been favorable, both crops can be remarkably rich. Harvesting wild rice requires access to a boat and considerable skill, but a handful of Grassy Narrows residents collect the aquatic grain each year and share the products of their labor widely. Abundant and accessible, hundreds of First Nation residents take part in the seasonal harvest of wild blueberries.

In the fall—and to a lesser extent throughout winter and into early spring—First Nation members hunt moose and white-tailed deer by firearm. Most frequently, two or three people set out together in the morning or evening, hunting with the aid of a boat or vehicle for transportation. Meat from these large animals is shared widely while fresh and frozen for consumption throughout the year. In both fall and spring, migratory waterfowl are also harvested.

Despite anxiety about mercury and other toxic substances, fishing is the dominant warm-season subsistence activity and is undertaken by Grassy Narrows residents of all ages on waterbodies

throughout the Traditional Land Use Area, including the English-Wabigoon River and its constituent lakes as well as headwater lakes. Men, women, and children fish with rod and reel (this usually means jigging from boats or casting from the rocky shoreline with inexpensive jigheads and rubber lures) and some gather to snare fish with wire during the spring spawning season. In spring, people travel long distances by truck to reach areas of moving water (i.e. rapids) which are already free of ice and where they can fish from shore.[1] In summer, those who are able travel by truck and car to widely scattered sites that are known to be productive shore-fishing sites and by boat to numerous productive locations away from shore. Nets are set for the procurement of fish in both the summer and winter seasons and are especially important when a large number of fish are needed for a feast event.

In addition to the consumption of fish for household-level subsistence, some individuals at Grassy Narrows earn money through participation in fishing-related labor, although the commercial fishery and guiding industries are smaller than they were prior to the 1970 announcement of mercury contamination. The continuing significance of commercial fishing income and the continuing severity of mercury contamination in the waters of the English-Wabigoon River system are both substantiated by the 2006 conviction of a Grassy Narrows First Nation commercial fisherman who attempted to sell "tainted" fish caught in Grassy Narrows Lake to a fish processing plant in Kenora. The charged individual held an approved license for commercial fishing on Oak Lake, located north of Grassy Narrows within the community's Traditional Land Use Area (Kenora Daily Miner and News 2006). Statistics Canada data from 2006 indicate that of 415 individuals at Grassy Narrows over the age of 15, 75 were in the labor force but unemployed and 195 were not in the labor force. The official unemployment rate of 33.3% does not account for the numerous individuals who have removed themselves from the search for employment. The same data set shows that of the 190 individuals included in the experienced labor force, 70 listed sales and service as their occupation, which would include fishing and guiding.[2]

Although a large portion of food consumed at Grassy Narrows now comes from the supermarkets of Kenora, it would be highly erroneous to assume that wild foods are inconsequential for sustenance. Indeed, wild foods—especially including fish—are the most valued part of contemporary Grassy Narrows residents' diet. Wild foods are viewed as more nutritious than store-bought foods, especially the highly-processed items typically accessible on a small budget. Fresh foods are unavailable for purchase in Grassy Narrows and obviously non-nutritious convenience and snack items (e.g., chips, soda pop, candy) are ubiquitous in the community, especially among youth and families with children.

[1] Fieldnotes, April 29, 2004.
[2] See http://www12.statcan.gc.ca/census-recensement/2006/dp-pd/prof/92-594/details/Page.cfm?Lang=E&Geo1=CSD&Code1=3560058&Geo2=PR&Code2=35&Data=Count&SearchText=Grassy&SearchType=Begins&SearchPR=01&B1=All&Custom= (accessed April 22, 2015).

For some families in some parts of the year, wild meat, fish, wild rice, and berries complete many meals. While I was in Grassy Narrows, I regularly witnessed (and more frequently heard about) households running out of money and food as the end of the payment month approached. For many Grassy Narrows residents, the experience of scarcity is a recurring, taken-for-granted part of life. Statistics Canada data from 2005 show a median income at Grassy Narrows First Nation of only $6,112, with 66.7% from earned income and 31.9% from government transfers. Grassy Narrows residents have a significantly lower median income than recorded for Aboriginal Ontario residents as a whole ($18,808), as well as a lower percentage of earned income and a higher percentage of government transfers (the figures for all Aboriginal residents of Ontario indicate 77.2% of income from earnings and 16.6% of income from government transfers).[3] For comparison, the mean income for all residents of Canada in 2005 was $30,000 for females and $46,900 for males.[4] Grassy Narrows residents thus look to fish at times when they are unable to afford other foods. Given the high unemployment rate in the community and the fact that welfare payments are insufficient to meet many families' needs, catching fish often means the difference between hunger and satiation. This point is especially important because while other wild foods are unharvestable at certain times of the year, fish are available year round.

Despite its continuing importance, there are several factors that limit First Nation members' participation in time-intensive and geographically-dispersed forms of land-based subsistence. Children, for one thing, must remain close to school. In my time at Grassy Narrows, I heard of a few parents who took their children out of school for a land-based subsistence event they deemed important, but on no known occasion did this extend beyond a day or two. Travel into the bush also requires transportation in the form of a snowmobile, boat, and/or truck as well as the gas to get it there. This requires money. Somewhat paradoxically, the same adults who hold regular jobs are most able to afford such travel, but are often too busy with other demands to undertake it regularly. As described below, local walleye fishing is not limited in these ways.

The people of Grassy Narrows have a close and enduring relationship with a large territory known as the "Grassy Narrows Traditional Land Use Area," which has been occupied by their forbearers since time immemorial (see *Keewatin v. Ontario* paragraph 475). I have viewed the map that shows the "Area of Requestors IEA Request" and found the delineated region to be consistent with my knowledge of the Traditional Land Use Area. Based on historical reports, publications, and my observations of active use, I believe the entire Area of Interest to be included within Grassy Narrows First Nation's area of traditional land use, but also note that this Area does not necessarily include all of land historically and currently utilized by Grassy Narrows First Nation members.

[3] See http://www12.statcan.gc.ca/census-recensement/2006/dp-pd/prof/92-594/details/Page.cfm?Lang=E&Geo1=CSD&Code1=3560058&Geo2=PR&Code2=35&Data=Count&SearchText=Grassy&SearchType=Begins&SearchPR=01&B1=All&Custom= (accessed April 22, 2015).
[4] See http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/labor01a-eng.htm (accessed October 12, 2015).

For present day citizens of Grassy Narrows, connection to this homeland is enacted through land-based subsistence and comprehended through stories told by living elders of seasonal movements throughout the region and life prior to the community's relocation in the early 1960s. Although considerably overlapped by the OMNRF-designated Whiskey Jack Forest, the Grassy Narrows Traditional Land Use Area is essential for the livelihood and cultural identity of the people of Grassy Narrows. It is the setting in which the vast majority of traditional land-based subsistence takes place and provides a material base on which Grassy Narrows residents are able to learn and live traditional Anishinaabe culture. Fishing is a critical part of these place-based activities and, as noted above, supplementary documentation within the Forest Management Plan itself acknowledges that "subsistence hunting, fishing, and gathering of resources from within the forest are an integral part of community existence" (p. 26).

5. Which fish species are eaten by the people of Grassy Narrows, from which geographic areas, and why? In particular, what traditional factors, if any, apply to the bodies of water, and fish species a member of Grassy Narrows may fish for in the area?

Summary Answer:

Walleye is the favored and most consumed fish species at Grassy Narrows. While Grassy Narrows residents fish throughout their entire Traditional Land Use Area, the English-Wabigoon River system that flows through the contemporary reserve community is the most accessible and, therefore, the most widely utilized and productive source of fish.

Full Answer:

Walleye are Grassy Narrows residents' most often consumed, most favored, and most important species of fish. Especially in the months of open water, walleye are consumed very frequently (the exact frequency depends on the individual or family in question, but most people I came into contact with ate walleye at least once a week and some ate considerably more). Fish species such as trout, whitefish, and pike are also occasionally consumed by Grassy Narrows residents, but much less frequently than walleye. This is partially because not all fish species are found in all areas. Lake trout and whitefish, for example, tend to occur only in cold deep lakes, whereas pike and walleye inhabit relatively warmer and more accessible lakes and rivers. And while walleye are a favored food source, pike are not a desirable food species and are sometimes returned to the water if caught. While walleye can be caught easily with a simple rod and reel—sometimes only steps from most Grassy Narrows residents' front doors—species such as whitefish and trout require a boat and/or net. Given the level of poverty on the reserve, many people do not have consistent access to these items and, compared to walleye, these species are rarely harvested.

Grassy Narrows First Nation members fish on all of the waterbodies within their Traditional Land Use Area. Fishing continues to be an important activity for those who spend time on traplines, with Grassy Narrows residents utilizing of all of the small lakes within their own trapline areas and readily acknowledging that other residents do the same. While smaller headwater lakes that are not fed by the river system are especially important to families who customarily use and/or have registered traplines in their vicinity, several factors—including (1) traditional family use patterns, (2) officially registered (OMNRF) traplines, (3) existing commercial fishing licenses, (4) the availability of vehicles/boats/trailers, (5) knowledge of waterways and their hazards, (6) expertise concerning the harvest of particular species, and (7) the availability of fishing gear—combine to constrain fishing location options. Critically, people at Grassy Narrows are not able to relocate to other fisheries within or outside of their traditional territory if the waterbodies they customarily fish become contaminated, as they now have been for decades. If Grassy Narrows residents were to travel outside of their own traditional territory to harvest fish or other resources, they would require the consent of the First Nation whose territory they seek to utilize. Furthermore, their treaty-guaranteed traditional harvesting rights may not necessarily be protected outside of their own territory.

Grassy Narrows residents are thus limited in the species they can catch due to tradition, taste, knowledge concerning the locations and time of year particular species can be caught, access to sites and required equipment, and proficiency with equipment. While all lakes and rivers are utilized by some residents at some time, the English-Wabigoon River is the most easily accessible body of water to the reserve community. Every home on the reserve is within easy walking distance of the river and fishing from shore can occur even in the absence of prohibitively costly vehicles, boats, gasoline, and specialized equipment. While not the First Nation's only source of fish, the river is thus the most widely utilized and the most productive.

6. What role, if any, does fishing play in the identity and society of the people of Grassy Narrows? Is this role different, and if so how, from non-aboriginal Canadian society in the region, and from the urban aboriginal population in the region?

Summary Answer:

Fishing is an essential component of contemporary Anishinaabe cultural identity as well as an important intergenerational social and educational activity for Grassy Narrows residents. Its deeply emplaced social significance differs from fishing practices and meanings among non-aboriginal Canadians and urban Aboriginal populations.

Full Answer:

The relationship between the harvest and consumption of wild foods is extremely important to Anishinaabe cultural identity, which is critical to community members' collective psychological

well-being. For many people at Grassy Narrows, land-based subsistence is much more than simply a source of livelihood; it is deeply symbolic of a way of life. Anthropologists identify land-based subsistence as the most quintessential aspect of indigenous subarctic peoples' cultural lives. As Paul Nadasdy (2003:63) explains, "to First Nations people living in the Arctic and Subarctic, hunting is synonymous with life itself."[5] Kirk Dombrowski (2001) similarly points out that subsistence is both an identity and a livelihood, both a way of life and a way to live. In the past, the truth of these statements was quite literal. While the transitions of recent decades mean that a mixed economy emphasizing land-based subsistence supplemented with a small amount of wage labor and other sources of monetary income has become a mixed economy in which (at least from a strictly material point of view) the reverse is true, indigenous peoples of the north continue to depend on land-based subsistence for physical as well as psychological sustenance. Like other Aboriginal boreal forest residents, the people of Grassy Narrows hold wild foods—including walleye and other fish, moose meat, venison, beaver, wild rice, and blueberries—in much higher regard than the commodities available for purchase, not only for their nutritional value, but also for the links to cultural identity and healthy-living they imply.

Not only do they consider such items healthier, but the acts of gathering and consuming wild foods are important markers of contemporary Anishinaabe identity. By fishing and trapping, by gathering berries and rice, people at Grassy Narrows are able to forge tangible and embodied connections to their heritage. Critically, land-based subsistence also constructs an affirmative Anishinaabe sense of self and gives people a way to define themselves that breaks free of mainstream society's pessimistic comparisons and categorizations. The devastating poverty of Canada's First Nations has been well documented (e.g. York 1990), even if not fully grasped by the general Canadian public. Although they lament the blatant economic disparities that divide them from their Euro-Canadian neighbors, many Anishinaabe people feel that their cultural, spiritual, and social richness far outweighs their material poverty. Keeping culturally distinct patterns of land-based subsistence alive lies at the core of this perceived wealth.

Given the centrality of fishing to the land-based Anishinaabe way of life, arguments about the inextricability of subsistence, culture, and identity clearly apply to the harvest, consumption, and sharing of fish. As Peter Usher et al. state, "fish are part of the Ojibwa heritage, and like other country food, have meaning beyond simply eating. This meaning lies in the skills, knowledge and labor of obtaining food, as well as the social links which are perpetuated by sharing it. Fish are the end product of a way of life" (1979:11). I concur with Usher et al. on this point and believe it to be just as relevant in the twenty-first century as it was 35 years ago.

At Grassy Narrows today, fishing remains an intensely social activity, with the harvesting and eating of fish both occurring communally. Unlike large-game hunting and trapping (both which require extensive training and supplies), fishing is undertaken by a very large portion of Grassy Narrows First Nation's population. Fishing is a source of pride; a way for any individual of any

[5] Hunting in this statement categorically includes fishing and trapping activities.

age or status to proudly supply food for his or her family. Frequently taking place in intergenerational family groups, fishing is a way of socializing children as well as a vehicle for the fulfillment of culturally distinctive economic bonds and obligations (also noted by Usher et al. 1979:364). Today as in years past, fish are shared widely among Anishinaabe people. In many cases, when an individual catches more than he or she can consume, a portion of the catch is given to family members, friends, and/or elders. Fish are also shared in a larger-scale and more intentional manner as a ubiquitous dish at ceremonial and social feasts.

This is quite different from the role of fishing among members of non-Aboriginal Canadian society in the region. In my experience (which includes significant interactions with Euro-Canadian residents of Kenora, Ontario), non-Aboriginal individuals fish for several reasons. Most often, they fish for sport and recreation. In some cases, non-Aboriginal people do consume and appreciate the nutritional value of the fish they catch. Time spent fishing is seen as a valuable form of social interaction and intergenerational learning by some (but certainly not all) non-Aboriginal fishers. However, there are significant sociocultural differences between non-Aboriginal and Grassy Narrows Anishinaabe fishing behavior. Unlike non-Aboriginals, Grassy Narrows residents associate fishing with attachment to homeland, assertion of cultural rights, and expression of cultural identity; those who maintain such connections are perceived to enjoy a higher level of wellbeing than those who do not. Fish are also less likely to be consumed in social settings or shared in communal feasts among non-Aboriginal citizens. My experience with urban Aboriginal populations is limited to individuals who are affiliated with Grassy Narrows (i.e., people who have relatives at Grassy Narrows and/or have previously lived on the reserve). My general sense is that while urban Aboriginal residents may also experience poverty and fish for subsistence when and where it is possible as well as for family enjoyment, they tend not to experience the deep connections to specific places and the social significance of fishing described above unless it is within the context of their home reserve community.

7. Taking into account your responses to the above questions regarding the importance of fishing and the consumption of fish caught, how effective have been measures used by the federal or provincial governments, such as consumption advisories and the provision of freezer fish, in protecting the people of Grassy Narrows from mercury impacts? Please explain your answer.

Summary Answer:

Measures employed in attempt to limit or replace Grassy Narrows residents' consumption of contaminated fish have been ineffective due to the irreplaceability of distinctive social and cultural values associated with the harvesting of local fish.

Full Answer:

For several reasons, measures taken to limit Grassy Narrows residents' consumption of fish from the English-Wabigoon River have been ineffective, both in the past and the present. Following the discovery of mercury, people at Grassy Narrows had trouble coming to terms with the enormity of the crisis they faced. Throughout the 1970 season, the government attempted to discourage people from eating the contaminated fish. Signs that read "Fish for Fun" in bold letters and featured an image of a fish in a frying pan with an "X" over it were posted at boat landings (Troyer 1977). It didn't take the media long to point out that the Fish for Fun campaign did Native commercial and subsistence fishers no good (CBC 1970). Many of the signs were quickly marked by graffiti or ripped down and none were posted in subsequent years. Most Grassy Narrows residents continued doing what they had always done—eating fish—even after hearing of its potential toxicity.

Few people I spoke with between 2003 and 2005 about the initial announcement of mercury recalled the community's reaction as a dramatic one. Several factors may explain their response (or lack thereof). The river's large and plentiful walleye had long been a favored source of protein. Additionally, fish were one the most accessible remaining sources of wild food on the post-relocation reserve. Compounding these factors, First Nation residents observed as tourists continued to eat their catch with no adverse effects (Hutchison and Wallace 1977). Furthermore, as described above, harvesting and consuming fish made it possible for people at Grassy Narrows to maintain a culturally distinct Anishinaabe identity associated with a land-based way of life.

Today, a disconcerting number of Grassy Narrows residents are able to recite offhand the parts-per-billion (ppb) of mercury in their own bodies.[6] And, as they have now for decades, harvesters continuously weigh the economic and cultural benefits of consuming wild foods against the known physical risks.[7] They struggle to reconcile their desire to retain their land-based way of life with the risks inherent in eating the products of their labor. At Grassy Narrows, fish in the absence of fishing (i.e., the consumption of frozen fish harvested elsewhere and supplied to the community) lack the critical cultural and social connections associated with fish harvested locally by community residents. Connections to cultural identity, history, and socialization derived from the process of fishing cannot be replaced by freezer fish. Nor can the pride of self-sufficiency. If we acknowledge that fishing accomplishes much more than just the production of fish, the choice of many Grassy Narrows residents to continue consuming fish harvested from the contaminated English-Wabigoon River begins to make sense. Some Grassy Narrows residents state that they persist in consuming fresh fish from the river because the available frozen fish are not of the type or quality they are accustomed to. Beyond such matters of preference, however, the profound social and cultural importance (described above) of the harvesting/preparation/consumption process cannot be replaced.

[6] Fieldnotes, June 17, 2004.
[7] Fieldnotes, June 2, 2003.

Even as people at Grassy Narrows remain deeply concerned about the presence of mercury in fish (and potentially in other wild foods) and insist that these risks be minimized, many feel that the benefits of consuming such items thus outweigh the risks. Grassy Narrows residents' reactions to the health risks associated with toxins in the environment highlight the cultural significance of land-based subsistence. Judy DaSilva—a well-known community leader and mother of five children—once expressed her concerns about contaminants at a public forum. An outsider attending the event suggested a simple solution: Why, he asked, didn't they simply stop eating wild foods? Judy had been taken aback. Reflecting on this exchange, she emphatically told me, "It's not just something you quit. It's not just food for us; it's spiritual."[8]

D: Impacts of Mercury Exposure on the Culture and Community of the People of Grassy Narrows

8. What has been the impact of past mercury exposure from industrial discharges on the culture and community of Grassy Narrows, and what inferences can be drawn from this history when considering future activities, such as clear-cut logging, and whether they could introduce new sources of mercury exposure through fish consumption?

Summary Answer:

The effects of past mercury exposure at Grassy Narrows have been severe and have included serious health problems, challenges to traditional subsistence and cultural identity, economic hardship, and social strain within the community. Newly introduced mercury would exacerbate these detrimental effects.

Full Answer:

Until the discovery of mercury in 1970, the local fishery was central to Grassy Narrows First Nation's economic production, supplying household subsistence as well as commercial fishing income (Usher et al. 1979:364). The original request for Individual Environmental Assessment more fully describes the history and health impacts of mercury contamination at Grassy Narrows. Based on my knowledge of the case, I agree with these submissions. The mercury originated in effluent released by a factory located in far upstream Dryden, Ontario. From 1962 to 1970, roughly 20,000 pounds of the substance entered the river and followed its gradual northwesterly course (Erickson and Vecsey 1980; Shkilnyk 1985; Troyer 1977). As the water flowed on, anaerobic bacteria in the riverbed transformed the mercury from the comparatively benign inorganic compound released by the plant into a deadly bioaccumulating form. Already facing

[8] Fieldnotes, January 29, 2005.

the detrimental impacts of relocation, mercury contamination was a major blow for the community.

After relocation, the community's transition from a relatively independent, subsistence livelihood to participation in the wider wage labor economy accelerated. Citizens of Grassy Narrows depended on the river more than ever before for their living, with a majority of the First Nation's employed population earning wages either in the local commercial fishery or in the tourism and guiding industry. These economic opportunities evaporated after the discovery of mercury. By the spring of 1970, fish from ten lakes within the English-Wabigoon River system—including Clay, Ball, Indian, and Grassy Narrows Lakes—were deemed unsafe for consumption. Almost overnight, unemployment at Grassy Narrows jumped from twenty to eighty percent due to mercury related job losses (Troyer 1977) and an estimated ninety percent of men in the community were out of work (Erikson and Vecsey 1980). The welfare economy tightened its grip on the people of Grassy Narrows, so that by 1977 the community was economically dependent upon steadily increasing transfer payments from the Canadian government, with 37.2 percent of all income deriving from unearned sources and the government functioning as the community's principal employer (Shkilnyk 1985:148).

Significant physical, economic, and psychological (described below) repercussions of mercury contamination continue to this day. I am not trained to trace the pathways of mercury through ecological systems, but based on what I know regarding (1) mercury's bioaccumulation and persistence over time, (2) the sound science linking clearcutting to increased levels of mercury in waterways, (3) the specific history of adverse impacts in the English-Wabigoon River region, and (4) the cumulative effects of numerous additional threats to the Anishinaabe way of life, any activity that increases mercury levels in the traditional diet of Grassy Narrows Anishinaabeg will have serious detrimental impacts. These impacts may entail enduring health effects for adult residents, lives curtailed by health problems for today's children, and anxiety for the health of those who are not yet born. Collective consequences may also include continued affronts to traditional subsistence and cultural identity, economic hardship, and mounting frustration over a long-term problem left inadequately unaddressed.

Two key facts make Grassy Narrows First Nation's case unique. First of all, the historical and contemporary pattern of land-based subsistence—which includes as its centerpiece the practice of fishing on the English-Wabigoon River—must be taken into consideration. Second, the people of Grassy Narrows have been forced to face the persistent physical and cultural impacts of mercury contamination for 45 years. In other words, citizens of Grassy Narrows not only rely on fish and other wild foods as a crucial component of their diet and essential element of their culture, but they have also been previously exposed to mercury. For these reasons, a healthy future for the people of Grassy Narrows and for generations yet to come requires that industrial activities do not increase mercury levels in the fish harvested by Grassy Narrows First Nation residents.

9. If not answered in response to question 8 above, what have been the community level psychological impacts of past mercury exposure from industrial discharges on the people of Grassy Narrows and what additional community level psychological impacts are currently experienced or anticipated from planned future activities, such as clear-cut logging, and whether they could introduce new sources of mercury exposure?

Summary Answer:

Due to the presence of mercury in the English-Wabigoon River system, residents of Grassy Narrows have experienced substantial fear and anxiety for their health. Cultural beliefs about reciprocal relationships between Anishinaabe people and non-human components of the environment and the perceived ability to live a traditional way of life have been jeopardized.

Full Answer:

The impact of mercury contamination was both cultural and material; to this day, the once sustaining English-Wabigoon River is perceived by some Grassy Narrows residents as a "river of poison."[9] I agree with previously submitted material stating that the experience of mercury poisoning has caused serious psychological problems among Grassy Narrows residents, especially including fear and anxiety (noted in Supplementary Submissions, based on Donnan 1986), but also confusion, grief, suspicion, and anger. While I am not a psychologist, it is within my disciplinary area of expertise to document shared socio-cultural trauma. Community-level effects that follow a distressing event or process often result in what Kai Erikson calls *collective trauma*, described as "a blow to the basic tissues of social life" (Erikson 1976:154). Such trauma has undoubtedly occurred at Grassy Narrows First Nation. I also find Usher et al.'s assessments to be both correct and highly relevant today; Usher et al. conclude that mercury pollution stands out as a major event in the First Nation's history, one "which eliminated a central economic activity and a major source of income, and endangered health and aroused anxiety in regard to the same" (Usher et al. 1979:368).

On page 23 of this report, I stated that most Grassy Narrows residents I talked to between 2003-2005 did not recall the initial announcement of mercury as a dramatic event. Over time, however, Grassy Narrows residents began to correlate the unusual medical symptoms they and their loved ones had suffered in recent years with the presence of *pijibowin*—poison. In the fall of 1972, Tom Strong, a forty-two-year-old trapper and fishing guide, died unexpectedly (Hutchison and Wallace 1977). Although Strong had always been healthy, he began to experience slurred speech, weight loss, and chest pains in the summer of that year. He was camped with his family harvesting the annual crop of wild rice when he died of an apparent

[9] Fieldnotes, September 1, 2004.

massive heart attack. In the same year, a boy was born to a fishing guide and his wife with what looked like a full-blown case of acute mercury poisoning, also known as Minamata disease. It was not lost on Grassy Narrow residents that, in both cases, the victims and their families were heavy consumers of fish.

Erikson and Vecsey made the following observation regarding mercury poisoning at Grassy Narrows:

> The discovery of mercury in the local waters has presented a psychological and perhaps even spiritual problem, for the apprehensions and uncertainties that follow such a discovery can affect the mind as surely as the poison itself can affect the body. This process is a subtle one and difficult to document, but it takes the form of a pervasive fear that the world of nature and the world of men are now contaminated and can no longer be trusted in the old way (1980:159).

At Grassy Narrows, the cultural consequences of mercury contamination were substantial. People at Grassy Narrows felt powerless to control their situation. Their customary comprehension of human-environment relationships taught that respectful reciprocity with powerful "other-than-human persons" was necessary to the achievement of *bimaadiziwin*—a good life free of illness and misfortune (Hallowell 1975, 1992; Nesper 2002).[10] But mercury contamination defied patterns of explanation and order that had served them well in their boreal forest homeland for hundreds of years. Human beings, distant both geographically and culturally, had unleashed the toxins that were now disrupting Anishinaabe lives. Most individuals at Grassy Narrows had no knowledge of the Dryden mill and no use for its products. They had done nothing to upset their delicately balanced relationship with the natural world nor to diminish the river's capacity to sustain life.

Although the fundamental cultural ties that bind Grassy Narrows residents to their homeland remain strong, important changes have taken place. Critically, many contemporary Grassy Narrows residents feel that the positive, sustaining nature of their environment can no longer be unreservedly trusted. Relied upon for generations to provide for their people, the river is now a source of *pijibowin* and a site of trepidation. Instead of offering nourishment and the satisfaction of self-sufficiency, the river can now make them sick. It is significant that those within the community who continue to practice traditional Anishinaabe subsistence to the greatest degree are most impacted—and most troubled—by the presence of mercury in the environment.

If additional mercury is allowed to enter the regional ecosystem, these effects can be expected to persist and probably worsen over time. Detrimental consequences of additional mercury

[10] This term has been spelled in various ways, including *pīmädäzīwin* (Hallowell 1975) and *pimadiziwin* (Nesper 2002). I use the double-vowel spelling found in Nichols and Nyholm's *Concise Dictionary of Minnesota Ojibwe* (1995).

exposure are likely to parallel those seen at Grassy Narrows since 1970 and can be expected to include fear, anxiety, and grief associated with a loss of connection to emplaced cultural activities. When communication about risks is not sufficient or trusted, confusion, suspicion, and anger are also likely to ensue. Recent press releases from the community suggest that fear and anxiety are already increasing as a result of the Forest Management Plan's allowance of additional clearcutting. In a release issued in response to the rejection of the community's request for an Individual Environmental Assessment in late 2014, Joseph (J.B.) Fobister stated:

> "Ontario has ignored our voices and is planning to force more devastating clearcuts on our people without even applying their own Individual Environmental Assessment process...It makes me sad that our people will become even sicker if the government allows the logging industry to poison the fish that we eat."

Grassy Narrows residents' association with their traditional landbase must be understood as a comprehensive and holistic package of land-based subsistence and culture rather than as a series of distinct, isolated harvesting activities. As a result, the aggregate impacts of hydroelectric dams, mercury contamination, and clearcutting are greater than the sum of their parts. A trapper who no longer feels safe obtaining fish while out on the trapline may spend less time in the bush. An Anishinaabe youth who experiences anxiety due to the presence of mercury while at a land-based healing camp may rejoin friends partying on the reserve. Mercury contamination—alone as well as in conjunction with other known challenges—poses a serious threat to the Anishinaabe way of life.

10. Are the impacts at the community level in Grassy Narrows from past mercury exposure, and those anticipated in future from new sources of mercury exposure, experienced differently by gender and age and, if so, how?

Summary Answer:

Based on their roles as primary caregivers, their ability to bring new life into the world, and their cultural duties as protectors of water, women at Grassy Narrows are disproportionately impacted by past, present, and future mercury exposure.

Full Answer:

In addition to its disproportionate effects on traditional harvesters and their families, mercury's impacts on the women of Grassy Narrows have been especially profound. Gender roles and family structures at Grassy Narrows largely follow a traditional Anishinaabe pattern (see Landes 1997 [1938]). Historically, subsistence pursuits among the Anishinaabe proceeded according to a gendered division of labor, with men the primary hunters and trappers and women completing the bulk of gathering and domestic work. While some women at Grassy Narrows do work

outside the home (especially in office and education service positions), this is still largely the case regarding land-based subsistence activities. In my time at Grassy Narrows, I observed members of both genders participate regularly in fishing and in the processing of animal products, while men remained the most frequent hunters and trappers and women remained the most common gatherers of wild plant products. Following from generations past, when women were in charge of the construction of *wiigiwaaman*—dwellings (Densmore 1979 [1929]), contemporary Anishinaabe women have primary obligation for maintenance of the home.

As bearers of the next generation and primary caretakers of children, disabled individuals, and elders, women bear a burden over and above others in the community. This includes the additional time, effort, and stress associated with caring for those who are disabled (or less-abled) as a result of mercury's physical and/or psychological effects. It also includes the anxiety and fear catalyzed by the congenital effects of mercury contamination (i.e., worries that a fetus will be born with defects as a result of the mother's consumption of fish) and the disproportionate impacts of mercury on the developing brains of children.

The customary relationship between Anishinaabe women and water merits special mention. Water is perceived by many Anishinaabeg to be the source of all life and is viewed by individuals of both genders as "women's business." Women's symbolic duty as protectors or "carriers" of water is enacted through the central role of women in traditional water ceremonies. Anishinaabe women explain their relationship with water in reference to the prominence of water in the processes of bringing new life into being (i.e., through pregnancy and childbirth). By extension, Anishinaabe people comprehend rivers as metaphorically equivalent to the veins of mother earth.[11] Given this context of belief, women's traditional capacity is greatly disrupted by the degradation of water resources and waterborne contamination. When water is contaminated, upholding these traditional duties becomes more onerous.

11. If not answered in response to questions 8, 9 and 10 above, how does the experience at Grassy Narrows compare with the documented experience of other aboriginal communities that have faced environmental contamination problems?

Summary Answer:

While other First Nations communities have experienced mercury contamination, Grassy Narrows has faced sustained and persistent environmental transformations over many years that have resulted in cumulative detrimental effects.

Full Answer:

[11] Fieldnotes, June 22, 2004.

In many ways, Grassy Narrows residents' experience of mercury has been similar to other communities facing such contamination. Ronald Niezen (1998:88), for example, describes comparable reactions to the discovery of mercury among the James Bay Cree (a group related linguistically and culturally to the Grassy Narrows Anishinaabe), pointing out that "such dramatic changes to the land as flooding and contamination of fish can only lead to a sense of sorrow or spiritual malaise among those accustomed to a careful scrutiny of human relationships with animals and the environment." Although the origin of mercury contamination in the James Bay region differed from the English-Wabigoon River's industrial pollution, the anxiety and sense of vulnerability—as well as the widespread refusal to cease harvesting and consuming fish—that resulted from the substance's presence did not.[12] Margaret Wheatley suggests that among First Nations peoples, the social and cultural impacts of mercury contamination are often more severe than the physical risks and often serve to amplify them (1997). While not specific to mercury, reactions of anxiety, confusion, and the need to weigh risks and benefits of traditional land-based subsistence have been documented among Aboriginal populations at Walpole Island (VanWynsberge 2002), Aamjiwnaang (Jackson 2011), and Akwesasne (Grande and Johansen 1995) as well as among American Indian peoples facing contamination in the United States (see Grinde and Johansen 1995; LaDuke 1999).

Still, the Grassy Narrows case is unique in the cumulative and persistent nature of environmental impacts. Grassy Narrows First Nation's recent history has been punctuated by several episodes of unsolicited—and largely undesirable—change, which have combined to create aggregate effects more damaging than even the most dramatic alteration could produce independently. The people of Grassy Narrows saw their immediate environment transformed without their consent for the first time in the late 1920s, when hydroelectric dams were constructed along the English River to generate power for Euro-Canadian settlements and industries (Kenora Daily Miner and News Staff and the Canadian Press 1984). These dams led to localized flooding and unpredictable water-level fluctuations. More recently, Grassy Narrows has faced large-scale industrial logging throughout its Traditional Land Use Area. These changes compound one another by limiting access to some areas and by reducing community members' trust in the land to provide for their needs. Since the late 1990s, residents have responded to industrial logging within their territory with formal letters of complaint, media campaigns, litigation, and a peaceful direct action blockade.

12. What community level responses have occurred in response to past mercury exposure, and what community level responses are possible in future to activities that could add mercury to bodies of water used by the people of Grassy Narrows for fishing and other traditional pursuits?

[12] Mercury became a problem in the James Bay region following hydroelectric development and subsequent flooding. Richard Scott (2001) traces the James Bay Cree experience of mercury poisoning as well as the history of mercury poisoning in Canadian First Nations more generally.

Summary Answer:

Residents of Grassy Narrows are extremely worried about the presence of mercury in the environment and in their own bodies. They have worked for many years to draw attention to the mercury contamination that has impacted their community and are deeply concerned by the documented relationship between clearcutting and increased mercury levels.

Full Answer:

Based on my firsthand experience at Grassy Narrows, I can attest that people in the community are extremely worried about the continuing impacts of mercury contamination on their health and their immediate environment. They have discussed this issue publically for many years in many different forums. I witnessed numerous discussions reflecting these concerns between 2003 and 2007 and have continued to follow developments since that time.

During my period of research at Grassy Narrows, mercury was a topic of frequent conversation and a matter of collective concern. Specifically, I was present for one of Dr. Harada's visits to Grassy Narrows, which was attended by dozens of Anishinaabe citizens who came to the reserve clinic to be examined by the doctor and his team. [13] All were searching for solutions to health problems they believed to be associated with mercury contamination. I also observed activities related to a community wild food contaminant study, which was designed to shed light on the specific quantities of mercury and other toxins in wild foods and help harvesters understand which species were at risk of contamination.[14] After 2007, Grassy Narrows residents continued to voice concern regarding mercury. While not witnessed firsthand, I am aware of several more recent events designed to draw attention to mercury contamination that have been organized by Grassy Narrows residents—most notably the River Runs of 2010 and 2012—as a result of my use of Facebook and other electronic media. As they did during the previous period of intensive clearcutting and proposed cutblocks within the Traditional Land Use Area that ended in 2008, many residents of Grassy Narrows are already experiencing detrimental anticipatory anxiety. They are fearful that portions of their homeland and way of life may be further degraded as a result of additional clearcutting and associated mercury contamination. As Deputy Chief Randy Fobister recently declared "That's all we know—fishing. Mercury destroyed that once. If they allow more cutting, we'll never be able to sustain ourselves" (Porter 2015).

Residents of Grassy Narrows have been concerned about mercury contamination for 45 years and about clearcutting for 20 years. Since at least 2010, members of the community have publically discussed the link between the two sources of industrial impact (see initial submission, p. 10-11). Furthermore, Anishinaabe people believe strongly that the various components of the

[13] Fieldnotes, August 29, 2004. For Dr. Harada's findings, see Harada et al. 2005.
[14] Fieldnotes, July 29, 2004.

boreal forest ecosystem are interconnected and have long observed and voiced concern regarding logging's impacts on water quality and the habitats of forest species.

For the people of Grassy Narrows First Nation, firsthand experience with environmental degradation—most especially the discharge of mercury into the English-Wabigoon River system—instilled a harsh lesson: if the environment becomes further degraded, traditional land-based subsistence and the rich set of cultural beliefs and practices that are bound to it will be severely curtailed. Based on my experience at Grassy Narrows, I believe community members wish to avoid being forced to choose between (1) giving up traditional activities that are central to their individual and collective identity by ceasing to eat fish they catch in the area in order to protect their health and (2) exposing themselves to further harm caused by exposure to new sources of mercury in order to continue eating fish as part of their traditional way of life.

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Appendix B: Author's CV

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Education

Ph.D., Anthropology
University of Wisconsin-Madison
2008

M.A., Anthropology
University of Wisconsin-Madison
2003

M.S., Natural Resources and Environment-Behavior and Education
University of Michigan-Ann Arbor
2001

B.A., Anthropology, Environmental Studies Certificate
University of Wisconsin-Madison
1998
Graduated with Distinction (Cumulative GPA 3.97)

Also attended: San Francisco Art Institute

Academic Positions

Associate Professor
Current Position
The Ohio State University
Department of Anthropology/Marion Campus
Courses taught at the Ohio State University: Anthropology 2202/202: Peoples and Cultures: Introduction to Cultural Anthropology; Anthropology 3420/421.08: Indians of North America; Anthropology 620: Anthropology of Religion; Anthropology 699: Undergraduate Research; Anthropology 5624: The Anthropology of Food: Culture, Society, and Eating; Anthropology 3525: History of Anthropological Theory

Assistant Professor
Fall 2009-Spring 2015
The Ohio State University
Department of Anthropology/Marion Campus

Lecturer and Honorary Fellow
2008-2009
University of Wisconsin-Madison
Anthropology and American Indian Studies
Courses: Anthropology 343: The Anthropology of Religion; American Indian Studies 450: American Indians and the Environment: Environmental Justice

Lecturer
Spring 2006, Spring 2007, Fall 2007
University of Wisconsin Colleges
Department of Anthropology and Sociology
Fond du Lac and Fox Valley Campuses
Courses*:* Anthropology/American Indian Studies 314: The Indians of North America

Teaching Assistant
Fall 2001, Spring 2002, Fall 2005, Spring 2008
University of Wisconsin-Madison
Department of Anthropology
Courses**:** Anthropology 104: Cultural Anthropology and Human Diversity, Anthropology/American Indian Studies 314: The Indians of North America

Project (Research) Assistant
2007
University of Wisconsin-Madison
Department of Anthropology
Project**:** Big Lake/Rice Creek Traditional Cultural Property Analysis (Cultural Resource Management in collaboration with the Lac du Flambeau Band of Lake Superior Chippewa (Ojibwe) and the Bureau of Land Management). *Supervisor*: Dr. Larry Nesper

2002-2004
University of Wisconsin-Madison
Department of Anthropology
Project**:** A Cultural Analysis of Kluane First Nation Land Claims. Negotiations. *Supervisor*: Dr. Paul Nadasdy

Grants, Awards, and Honors

Wenner-Gren Foundation for Anthropological Research. To aid research on "Contested Developments and Cumulative Effects: Understanding Diverse Responses to Energy Resource Development in British Columbia's Peace River Region." $16,500. **2016-2017.**

Coca-Cola Critical Difference for Women Grant. "Gendering Extraction: Experiences of Unconventional Energy Development in Ohio." $4,000. **2014-2015.**

Ohio State University Regional Campus Faculty Research Grant. "Gendering Extraction: Experiences of Unconventional Energy Development in Ohio." $2,000. **2014-2015.**

Ohio State University Regional Campus Faculty Research Grant. "A Sociocultural Analysis of Shale Energy Development in Ohio." $1,629. **2013-2014.**

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Beth Wilder Dillingham Award (Central States Anthropological Society). $400. **2007.**

Vilas Travel Grant, University of Wisconsin-Madison. $600. **2006.**

J. William Fulbright Foreign Scholarship Board, Canada-US Fulbright Award. $15,000. **2004-2005.**

Canadian Embassy Graduate Research Fellowship. $6,500. **2004-2005.**

University of Wisconsin-Madison Departmental Research Travel Award. $500. **2003.**

Elected to Phi Beta Kappa, Phi Kappa Phi, and the Golden Key Honor Society. **1998.**

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Conference Presentations

"Shale Energy and Waterscape Transformation in Ohio." Presented at the 75th Society for Applied Anthropology Annual Meeting. Pittsburgh, PA. March 27, **2015**.

"Collaborative Conservation as a Survival Strategy: New Contexts of Indigenous Resistance in Canada's Boreal Forest." Presented at the 113th American Anthropological Association Annual Meeting. Washington, DC. December 7, **2014**.

"Hydraulic Fracking and the New Politics of Environmental Degradation." Presented at the 112th American Anthropological Association Annual Meeting. Chicago, Illinois. November 21, **2013**.

"The Contested Landscape of Hydraulic Fracking: Unconventional Energy and Reimagined Environments in Ohio's Shale Gas Regions." Presented at the 111th American Anthropological Association Annual Meeting. San Francisco, California. November 15, **2012**.

"Degradation, Disempowerment, and Vulnerability: Cultural Responses to Uninvited Environmental Change." Presented at the 4th International Eco-Summit. Columbus, Ohio. October 1, **2012**.

"Re(con)figuring Alliances: Environmental Protection and Indigenous Empowerment in Canada's Boreal Forest." Presented at the Central States Anthropological Society Annual Meeting. Toledo, Ohio. March 23, **2012**.

"Indigenizing Invasive Species Management: Native North Americans and the Emerald Ash Borer (EAB) Beetle." Presented at the 109th American Anthropological Association Annual Meeting. New Orleans, Louisiana. November 19, **2010**.

"American Indians, Cultural Anthropologists, and the Search for Common Ground." Presented at the First Annual Workshop on American Indian Issues. Ohio State University. Columbus, Ohio. April 23, **2010**.

"Negotiating Scientific Management, Political Historicity, and the Black Ash Basketry Tradition: Native North American Responses to the Invasive Emerald Ash Borer (EAB) Beetle." Presented at the Central States Anthropological Society Annual Meeting. Madison, Wisconsin. April 9, **2010**.

"Culture and Power at Kakipitatapitmok: Reflections on Landscape Anthropology and Anishinaabe Anti-Clearcutting Activism." Presented at the 108th American Anthropological Association Meeting. Philadelphia, Pennsylvania. December 2-6, **2009**.

"Convergence and Collaboration: Cultural Revitalization in Anthropological and Indigenous Discourse." Presented at the 107th American Anthropological Association Annual Meeting. San Francisco, California. November 19-22, **2008**.

"Drawing a Political Landscape: The Grassy Narrows Traditional Land Use Area." Presented at the Central States Anthropological Society Spring Meeting. Minneapolis, Minnesota. April 13, **2007**.

"Confronting Colonialism: The Processes and Politics of Environmental Change and Contemporary Activism in an Ojibwe Community." Presented at the 105th American Anthropological Association Annual Meeting. San Jose, California. November 15-19, **2006**.

"Engaging with Environmentalism: Transformational Politics and Indigenous Activism in Northwestern Ontario." Presented at the Society for Cultural Anthropology Conference. Milwaukee, Wisconsin. May 6, **2006**.

"(Re)Presenting Indigenous Environmental Activism: On Histories of Management and Sovereign Futures at Grassy Narrows First Nation." Presented at Annual American Society for Ethnohistory Conference. Chicago, Illinois. October 30, **2004**.

"(Re)Presenting Indigenous Environmental Activism: Images and Their Uses at Grassy Narrows First Nation, Ontario." Presented at the 81st Annual Meeting of the Central States Anthropological Society. Milwaukee, Wisconsin. April 17, **2004**.

"The Context of Resistance: Articulating an Ethnohydrology in Wisconsin's Indian Country." Presented at the Committee for Intercollegiate Cooperation (CIC) Conference for American Indian Studies. Chicago, Illinois. April 25, **2003**.

"Animals in Anishinaabe Life: A Diachronic Cultural Perspective." Presented at the Committee for Intercollegiate Cooperation Conference for American Indian Studies. East Lansing, Michigan, April 19, **2002**.

Main Research and Teaching Interests

Environmental Anthropology
Native North American/American Indian Studies
Anishinaabe/Ojibwe Studies
Cultural Resource Management/Traditional Cultural Properties
Sociocultural Consequences of Natural Resource Extraction

Professional Service

Reviewer for the National Science Foundation and for *American Ethnologist*, *Anthropology Today*, *Cambridge Archeological Journal*, *Current Anthropology*, *Environmental Management*, *Human Ecology*, *Human Organization*, *Left History*, *Local Environment*, *PoLAR: Political and Legal Anthropology Review*, and *Rural Sociology.*

Appendix C: Relevant factual findings from *Keewatin v. Ontario*, 2011

[229] From season to season, the Ojibway moved from area to area, travelling by birch bark canoe in summer, snow shoe in winter. They gathered resources for their sustenance whenever and wherever they were available.

[230] In a letter to the Minister of Public Works dated December 19, 1870 [Ex. 1, Vol. 4, tab 103], to which I have earlier referred in other respects in the section on Euro-Canadian perspective, Dawson, anticipating that after the Treaty was made, the Ojibway would be treated as minors and that they would come under the care of the Dominion Government, provided a detailed description of their habits and means of obtaining their subsistence:

> In spring, as the navigation opens, the Indians leave their hunting grounds, and betake themselves to the Lakes and Rivers and, as the fish literally swarm in these inland waters, in the early part of Summer, they then have no difficulty in obtaining food, and the means of communication being easy to their light canoes, they can congregate in considerable numbers. Rainy River is the Chief resort, and it is there that their Councils are held, and their Feasts celebrated, but Rainy River, although the Sturgeon abound in its waters, cannot support the whole tribe, and the number which assemble there is generally limited to 600 or a thousand people, including men, women and children. Last summer, however, the number was greater than usual, there having been at one time full 1500 people in the vicinity of Fort Frances.
> …
> … early in Summer, the grand occupation is fishing, and this is to them the happiest season of the year, as they have then an opportunity of uniting after a long winter of isolation. Food is abundant and the time passes pleasantly under circumstances of peculiar fascination to the Savage. With his gun in readiness for the wild fowl, and his spear for the fish, he can, with little labour, secure enough for his immediate wants, and the future troubles him not. The produce of the winter's hunt affords him the means of renovating his garments and bedecking himself to his tastes; marriages and dances are the order of the day with the young, and the old and experienced meet in Council to deliberate on the affairs of the Community, while matrons with some regard to the future, dry the flesh of the sturgeon in the sun, and store it past a day of want.
>
> The fishing season lasts til the rivers began to fall, in the beginning of July, and the busy season commences, numbers then proceed to sandy plains, or rocky islets, where blueberries are in such abundance. These the women and children gather in great quantities and dry in the sun, or compress into cakes which they store past for future use; but a still more important harvest than that of berries soon waits them, and the whole tribe sets off for the rice fields.

> In certain parts of the Lake of the Woods, and on the upper reaches of the Winnipeg, the water spreads out into vast lagoons or shallow marshes, and in these the wild rice grows up from the bottom and rises high over the water, covering extensive areas ... When this crop is ripe, the canoes are perfectly watertight and pushed at will through the standing rice, the method of securing it being to bend it over the gunwale and thresh the ears out with sticks, the grain falling on mats prepared to receive it in the bottom of the canoe; meantime the harvest is disputed by other gleaners in the shape of vast flocks of aquatic fowl, and of these the Indians can easily secure all that they can consume.
> At the time of the rice harvest, the authority and patience of the Chiefs are put to the test, in deciding disputed claims and meting out justice to all ...
>
> It may be maintained that the rice is not always a sure crop. If the water should be too high, it in a measure fails, and even when it promises well, if heavy rains and strong gales occur when it is ripening, it is beaten down to the water and rendered valueless, and the moment it begins to ripen the wild fowl attack it, sometimes in such numbers as to impair the harvest.
>
> Besides the resources as far enumerated, the Indians have crops other than those which nature unaided produces. When the first French explorers came among them they found them growing maize on the banks of the Rainy River, and on the islands of the Lake of the Woods. Two centuries have since elapsed and Indian corn is still grown in the little gardens which produced it then, although not to the same extent. But the Indians have now added to the growth of maize, the culture of potatoes and this at least shows some taste for farming operations, which if properly encouraged, might lead to important results.
>
> When the rice harvest is gathered, and autumn approaching, the Indians having provided themselves with ammunition, and such articles of clothing as they can get at the trading posts, set out for their hunting grounds, in single families, and are once more separated, not to meet again until the following summer. …

[913] The Ojibway understood they were agreeing to share the use of their whole territory and resources with Euro-Canadians, so long as the sharing would not significantly interfere with their own Harvesting Rights. They did not agree to give up their means of making a living, i.e., their own use of resources or their continuing rights to subsistence harvesting on that land. The Commissioners recognized that that was their condition for entering into the Treaty, and they expressly promised the Ojibway could keep those rights to induce them to do so.

[1153] Into the 20th century, the Indian Agents reported every year that the principal activities of the Ojibway at Grassy Narrows were hunting, fishing, berry picking and the harvesting of wild rice.

[1158] **Seasonal Round.** From May to June, the family would be at the Reserve, where they planted potatoes, corn, cabbage and onions in their gardens. In July, they would paddle and portage a freighter canoe to a location about 30 kilometres from the Reserve. They would spend

two to three weeks there, living in tents and harvesting blueberries that they canned or dried over the open fire for winter use or for sale to others.

[1159] After the blueberry harvest, his family would return to the Reserve for a week or so to check on their gardens. Then they would journey 10-15 kilometres in another direction to harvest and preserve wild rice, living in tents or cabins. A great deal of work was involved. One family member would sit in front of a canoe and paddle. Another would sit at the back and hit the rice into the canoe with a stick. While the rice dried, they would dig holes. Then they would place the dried rice in them and dance on the rice to remove the husks. They would sell some of the wild rice and keep some for winter use.

[1160] After that harvest, they would return to the Reserve to harvest their gardens. His parents, who did not have a root cellar, would bury the produce, surrounded with dry grass, in a hole in a sandy area of the bush to preserve it until the winter.

[1161] In mid-September, after they had gathered and stored wood for the older family members who wintered at the Reserve, the family travelled two-three days by freighter canoe to their winter trap line. Along the way, they would hunt and trap. After reaching their trap line, they would ensure their cabin was well maintained, and gather and store wood for the winter. His older brothers helped their father hunt, setting traps and snares to catch beaver, otter, mink and other animals.

[1162] When he was very young, Fobister would remain in the cabin with his mother and learn from her how to preserve animal pelts. He would help her bring in wood and haul water. She made moccasins, gloves, jackets and pants from the pelts. His father sold fur and pelts to the HBC.

[1163] They lived on their trap line throughout the winter and into the spring, eating deer, moose, beaver, lake trout, walleye, northerns and sucker meat, supplemented with wild rice, dried blueberries and produce preserved from their gardens. A dog team was used to haul wood and meat and to travel to buy food at the closest store, about 15-20 kilometres away.

[1164] In April after the wolf and fox moulted, the family would move to another location to trap muskrat, otter and beaver. They would then return to the Reserve and prepare the garden for another year.

[1233] In the case of the Grassy Narrows Ojibway, the life of Fobister is illustrative of the continuing reality that they were still pursuing the seasonal round without significant Euro-Canadian interference, at least into the 1960s and that Euro-Canadian uses and traditional harvesting were compatible.

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO),
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

ACKNOWLEDGEMENT OF EXPERT'S DUTY

1. My name is Anna Willow. I live in Delaware in the State of Ohio.

2. I have been engaged by or on behalf of Grassy Narrows First Nation to provide evidence in relation to the above-noted court proceeding.

3. I acknowledge that it is my duty to provide evidence in relation to this proceeding as follows:

   (a) to provide opinion evidence that is fair, objective and non-partisan;

   (b) to provide opinion evidence that is related only to matters that are within my area of expertise; and

   (c) to provide such additional assistance as the court may reasonably require, to determine a matter in issue.

4. I acknowledge that the duty referred to above prevails over any obligation which I may owe to any party by whom or on whose behalf I am engaged.

Date: _____ _____

Anna Willow

Court File No. 446/15

GRASSY NARROWS FIRST NATION, *et al.*	v.	**MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***
Applicants		Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

AFFIDAVIT OF ANNA WILLOW

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Joseph F. Castrilli (LSUC No. 26123A)
Richard D. Lindgren (LSUC No. 28529E)
Jacqueline Wilson (LSUC No. 60330R)

Solicitors for the Applicants

2025

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

AFFIDAVIT OF JUSTIN PODUR

I, JUSTIN PODUR, of the City of Toronto, in the Province of Ontario, MAKE OATH AND SAY AS FOLLOWS:

1. I hold a master's and a doctorate in forestry from the University of Toronto. I am currently an associate professor at the Faculty of Environmental Studies, York University. My teaching, research and writing have focused on forest fires in Ontario, including their spatial and temporal patterns, increases in their numbers and area burned.

My research methods in this field of study have included using mathematical and computer models to study fire and ecological problems. I have published in a variety of peer and non-peer reviewed journals on the subject of forest fires, including the Canadian Journal of Forest Research, Ecological Modeling, Ecological Applications, and the International Journal of Wildland Fire. I am also affiliated with the University of Toronto Forest Fire Management Systems Laboratory. A copy of my curriculum vitae is attached to Exhibit “A”, below.

2. In February 2015 I was asked by counsel for Grassy Narrows to answer certain questions in a report on fire in the northwestern Ontario boreal forest, in particular, natural and human-caused disturbances. The questions and my answers to them appear as part of my December 2015 expert report attached as Exhibit “A” to my Affidavit.

3. A copy of my Acknowledgement of Expert's Duty form is attached as Exhibit “B” to my Affidavit.

SWORN BEFORE ME in the City of Toronto, in the Province of Ontario, this ___ day of _____, 2015.

A Commissioner, etc.

_____
Justin Podur

EXPERT REPORT

Grassy Narrows First Nation and Sherry Fobister, William Fobister, Senior, Simon Fobister and Chief Roger Fobister, Senior on their own behalf and on behalf of all other members of Grassy Narrows First Nation v. Minister of Natural Resources and Forestry (Ontario) and Minister of the Environment and Climate Change (Ontario), and the Attorney General of Ontario

Ontario Superior Court of Justice
(Divisional Court)

Prepared for
Joseph F. Castrilli and Richard D. Lindgren
Counsel, Canadian Environmental Law Association
130 Spadina Avenue, Suite 301
Toronto, Ontario
M5V 2L4

Fire in the northwestern Ontario boreal forest: natural and human-caused disturbances

Prepared by

Justin Podur, PhD
Associate Professor
Faculty of Environmental Studies
York University

Date: December 10, 2015

_____
Justin Podur

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Introduction

I hold a masters and a doctorate in forestry from the University of Toronto. I am currently an associate professor at the Faculty of Environmental Studies, York University. My teaching, research and writing have focused on forest fires in Ontario, including their spatial and temporal patterns, increases in their numbers and area burned. My research methods in this field of study have included using mathematical and computer models to study fire and ecological problems. I have published in a variety of peer and non-peer reviewed journals on the subject of forest fires, including the Canadian Journal of Forest Research, Ecological Modeling, Ecological Applications, and the International Journal of Wildland Fire. I am also affiliated with the University of Toronto Forest Fire Management Systems Laboratory. My curriculum vitae appears in Appendix A of this Expert Report.

I have been asked by Joseph F. Castrilli and Richard D. Lindgren of the Canadian Environmental Law Association on behalf of Grassy Narrows First Nation to prepare an expert report that responds to several questions. I am solely responsible for the preparation of this report.

Questions

1. For the documents referred to below, please indicate on a document by document basis if the views expressed in those documents that relate to the subject matter of this expert report, and/or that are attributed to you, are accurate in every material respect? If not, please indicate in your expert report the corrections, if any, that should be made with respect thereto:

> A. The Grassy Narrows-Earthroots request, dated January 2014 (pages 16-19), of the Ministry of the Environment for an individual environmental assessment (IEA) on the Whiskey Jack Forest Management Plan (2012-2022), and the supplementary submissions made to the Ministry dated May (pages 3-5, 13-14, 19-21), and November 2014 (pages 8-9) insofar as they relate to your area of expertise and the subject matter for your report.

2. What are your views on matters within your area of expertise and the subject matter of this report that are addressed under the heading “Fire vs harvest impacts on Hg dynamics” in the Ministry of Natural Resources and Forestry July 2014 response to the Grassy Narrows-Earthroots May 2014 submissions?

3. What proportion:

> (a) of the boreal landscape in Ontario is burned by large vs. small fires in a “natural” scenario?;
>
> (b) of the boreal landscape in the specific eco-climatic fire zone in which the Whiskey Jack Forest is situated is burned by large vs. small fires in a “natural” scenario?

4. What proportion:

(a) of the boreal landscape in Ontario is burned by large vs. small fires in a fire suppression scenario?;

(b) of the boreal landscape in the specific eco-climatic fire zone in which the Whiskey Jack Forest is situated is burned by large vs. small fires in a fire suppression scenario?

5. Is there a relationship between fire size and fire intensity and severity? If so, what is that relationship?

6. How are fire size, frequency, and intensity expected to change, if at all, as a result of climate change in:

(a) the boreal forest of Ontario?;

(b) in the area of the Whiskey Jack Forest?

7. What amount of mercury, if any, would you expect to be volatized into the atmosphere from Grassy Narrows Traditional Territory in an average fire decade?

8. What are the implications of the natural fire regime for the Whiskey Jack Forest on mercury levels in soil, and on mercury bio-accumulation in fish?

9. How does this compare to the mercury impacts of the logging and fire suppression cycle on mercury levels in soil, and on mercury bio-accumulation in fish?

10. Overall, do logging and fire have similar, or dis-similar, impacts on mercury in the boreal forest?

Organization of Expert Report

The Expert Report is organized into two parts. Part 1 provides short summary answers to the questions that are listed above. Part 2 of the Expert Report is designed to provided greater detail in support of the summary answers set out in Part 1.

Part 1

Summary Answers to Questions

1. For the documents referred to below, please indicate on a document by document basis if the views expressed in those documents that relate to the subject matter of this expert report, and/or that are attributed to you, are accurate in every material respect? If not, please indicate in your expert report the corrections, if any, that should be made with respect thereto:

A. The Grassy Narrows-Earthroots request, dated January 2014 (pages 16-19), of the Ministry of the Environment for an individual environmental assessment (IEA) on the Whiskey Jack Forest Management Plan (2012-2022), and the supplementary submissions made to the Ministry dated May (pages 3-5, 13-14, 19-21), and November 2014 (pages 8-9) insofar as they relate to your area

of expertise and the subject matter for your report.

Answer to Question 1: The Grassy Narrows-Earthroots request for an IEA is accurate in every material respect as it relates to forest fires. The supplementary submissions made to the Ministry dated May, and November 2014 are accurate in every material respect as they related to forest fires.

2. What are your views on matters within your area of expertise and the subject matter of this report that are addressed under the heading "Fire vs harvest impacts on Hg dynamics" in the Ministry of Natural Resources and Forestry July 2014 response to the Grassy Narrows-Earthroots May 2014 submissions?

Answer to Question 2: The MNRF July 2014 response argues that the statement that "logging and forest fire have nearly opposite impacts on mercury", "is not supported by scientific studies". Elsewhere, the response argues that there is a lack of evidence "that mercury levels of fish differ consistently between lakes with harvested watersheds and those with intensively or extensively burned watersheds."

The MNRF response ignores the physical and chemical changes caused by the combustion of forest fuels, as well as the changes to the forest due to the removal of biomass due to harvesting. Large-scale boreal fires of the kind that account for 90% or more of burned areas, result in atmospheric emissions of mercury that travel long distances before being redeposited, thus reducing the total pool of mercury in the local watershed. Whereas forestry (clearcutting) operations release mercury into local water bodies.

3. What proportion:

(a) of the boreal landscape in Ontario is burned by large vs. small fires in a "natural" scenario?;

(b) of the boreal landscape in the specific eco-climatic fire zone in which the Whiskey Jack Forest is situated is burned by large vs. small fires in a "natural" scenario?

Answer to Question 3:

a) 1.3% of fires larger than 200 ha burned 96% of the area for the period 1976-2004 in the portion of boreal Ontario under active fire suppression. For a "natural" scenario I would expect the proportion of area burned by large fires to be even higher.

b) In the Whiskey Jack Forest for the period 1960-2013, 1.1% of large fires burned 95% of the area. For a "natural" scenario I would expect the proportion of area burned by large fires to be even higher.

4. What proportion:

(a) of the boreal landscape in Ontario is burned by large vs. small fires in a fire suppression scenario?;

(b) of the boreal landscape in the specific eco-climatic fire zone in which the Whiskey Jack Forest is situated is burned by large vs. small fires in a fire suppression scenario?

Answer to Question 4:

a) 1.3% of fires larger than 200 ha burned 96% of the area for the period 1976-2004 in boreal Ontario.

b) In the Whiskey Jack Forest for the period 1960-2013, 1.1% of large fires burned 95% of the area.

5. Is there a relationship between fire size and fire intensity and severity? If so, what is that relationship?

Answer to Question 5: There is a positive correlation between fire size and fire intensity and severity. Most of the boreal forest is under active fire suppression. It is more intense fires that tend to become large fires. These fires are also more severe and tend to leave fewer unburned islands.

6. How are fire size, frequency, and intensity expected to change, if at all, as a result of climate change in:

(a) the boreal forest of Ontario?;

(b) in the area of the Whiskey Jack Forest?

Answer to Question 6:

a) Fire size, frequency, and intensity are all expected to increase as a result of climate change. All forest fire models, when run with climate change simulation model data, predict increased fire size, frequency, and intensity. This is equally true for the entire boreal forest and for b) the area of the Whiskey Jack Forest.

7. What amount of mercury, if any, would you expect to be volatized into the atmosphere from Grassy Narrows Traditional Territory in an average fire decade?

Answer to Question 7:

There is a high amount of variability in decadal area burned, but the historical figures range from 498 g in the 2000s to 56 000 g in the 1980s.

8. What are the implications of the natural fire regime for the Whiskey Jack Forest on mercury levels in soil, and on mercury bio-accumulation in fish?

Answer to Question 8:

Because of the role of combustion in volatilizing mercury into the atmosphere, the natural fire regime results in an amount of mercury released into the atmosphere proportional to the area burned. Larger, more intense, and more severe fires all result in a higher amount of mercury being removed into the atmosphere.

9. How does this compare to the mercury impacts of the logging and fire suppression cycle on mercury levels in soil, and on mercury bio-accumulation in fish?

Answer to Question 9:

Harvesting operations increase mercury output into water bodies, and hence increase mercury bio-accumulation in fish.

10. Overall, do logging and fire have similar, or dis-similar, impacts on mercury in the boreal forest?

Answer to Question 10:

Overall, fire and logging have dissimilar impacts on mercury in the boreal forest.

Part 2

Forest management and fire: two distinct types of disturbance

In the comparison of natural disturbance with forest management, there are stand-level and landscape-level considerations. These are discussed in a general way by Bergeron et al. (1999).

Stand-level considerations

Stand level considerations include the effect on forest soils and the exposure of the soil post-fire vs. post-logging, the amount of wood volume and snags left behind after the disturbance, which depends on the intensity of the fire, and the presence of residual trees or unburned islands after a fire. With these considerations in mind, a fire in a jack pine, spruce, or aspen/poplar stand can be contrasted to a clear-cut with retention. In the clear cut, the soil has not been burned, the wood volume is decreased relative to the surface fire, and snags are absent, post clear-cut.

Landscape-level considerations

Greater differences appear at the landscape level. These include differences in age-class, size-class, and spatial distributions of stands.

Age-class distribution. The purpose of logging is the extraction of trees from the forest for their economic value. It is economically wasteful to allow trees above the rotation age to remain in the forest. The age structure, or age-class distribution, of a managed forest will, in the long-term, contain stands that are, at their oldest, the rotation age (typically planned to be 60-100 years in the boreal). By contrast, because the probability of burning is independent of stand age, the age-class distribution of a forest under a natural fire regime will have a large portion (Bergeron et al. 1999 give a figure of 37%, citing Johnson and Van Wagner 1985b) of stands that are older than the rotation age.

Size-class distribution. The spatial pattern of logging activity is organized by forest management principles, including ease of access and removal as well as age-class considerations discussed above. By contrast, fire is a random, or stochastic process, which produces a random distribution of fire sizes. Fire size has been modeled as a Pareto distribution (Ward et al. 2001), a Weibull distribution (Reed and McKelvey 2002), and others (cited in Podur et al. 2009), and aggregate area burned by a compound Poisson distribution (Podur et al. 2009). The random pattern of different sizes of fires distributed on the landscape results in a mosaic of patches, some of which are small, some of which can be very large. Different spatial mosaics have different implications for wildlife habitat, among other considerations.

Shape and distribution of burned stands. The stochastic nature of the fire process goes beyond fire size distribution, however, as the shapes of the stands and their physical distribution across the landscape is an even more complex process involving topography, wind, and forest fuel conditions at the times that the fires took place.

Two distinct types of disturbance

Because of all of these important differences, logging and fire are viewed by forest landscape and fire ecologists as completely distinct ecological processes in the boreal forest landscape. The OMNR produces guidelines for forest management with the intent to make forest management emulate natural disturbance with tree retention, specific types and shapes of cuts, a range of clearcut sizes, and the retention of downed woody debris (OMNR 2014). All of these measures may increase the ecological integrity of logged stands, but fire and logging remain distinct disturbances from an ecological point of view.

A natural fire regime in the boreal forest

The boreal forest of Ontario is characterized by a fire regime that includes a high proportion of area burned by a small number of large, high-intensity fires.

Area burned is dominated by large fires

Stocks et al. (2002), studying the Canadian boreal forest, found for 1959-1997 that fires over 200 ha in size were 3% of the fires occurring in Canada but 97% of the total area burned. Podur and Wotton (2010) studied the zones of active fire suppression in Ontario for 1976-2004 and found that only 1.3% of fires grew to > 200 ha, but these fires resulted in 96% of the area burned in the region. In areas not under fire suppression, an even higher proportion of area burned would be due to large fires, as fewer fires would naturally stop at a small size.

Weather drives large fires more than fuels or suppression

Podur and Martell (2009) studied the fuels, or forest types, burned by fires for 594 fires larger than 40 ha that occurred in Ontario's boreal forest between 1996-2006, finding that fuels burned in the proportion they were available. This suggests that weather is dominant in controlling large fires. Podur and Martell (2007) found that fire suppression does, however, reduce area burned, even in large fires, by suppressing a class of fires that would have escaped had there been no suppression. In severe fire years, however, there remain a number of fires that are too intense for suppression to succeed, and these fires, which become large in size and have high burn severity, make up the most important portion of area burned. Podur and Wotton (2010) found that the number of these large, uncontrollable fires was likely to increase under climate change, with the potential to overwhelm fire suppression capacity.

Weather drives large fires. These studies all found that weather drives large fires and that large fires drive area burned. This is true throughout boreal Ontario, in managed forests and unmanaged, in forests where fire suppression is active and in areas where fire is monitored and not actively suppressed. This includes the Whiskey Jack forest in northwestern Ontario.

Differences between fire and logging in mercury (Hg) release

Large fires release Hg into the atmosphere

Sigler et al. (2003) studied a series of fires in the severe 2002 Quebec fire season, in which 250 fires burned 1,000,000 ha over a 1-month period. They measured gaseous mercury (Hg) at the Harvard Forest and provided a measure of Hg emissions from large-scale boreal forest fires. Scaling up, they provide global estimates of Hg emissions from boreal forest fires. The important point here is that large-scale boreal forest fires of the kind that account for 90% or more of the area burned result in atmospheric emissions of Hg. Turetsky et al. (2006) reinforce this point, quantifying organic soil Hg stocks in the boreal forest and estimating atmospheric emission of Hg due to increased boreal forest fire activity under climate change. They conclude that increased fire activity will result in greater release of Hg from boreal forest soils into the atmosphere.

Logging operations release Hg into local water bodies

Bishop et al. (2009) summarized a series of studies showing Hg accumulation downstream of forestry operations, finding a "forestry effect" on Hg accumulation in fish. In a study of Hg concentrations in fish in 38 boreal lakes, Garcia and Carignan (2005) found higher Hg concentrations in fish from logged and "partially burnt" lakes (i.e., lakes where small-scale fires had occurred).

The Whiskey Jack Forest - historical fires and estimated mercury emissions

The part of the Whiskey Jack Forest subject to the Grassy Narrows legal action is 631 413 ha in extent. The National Fire Database lists a total of 1222 fires in this area for the period 1960-2013. These fires burned a total of 18 541 ha. 17 662 ha, or 95% of the area, of this was burned by 14 fires, or 1.1% of the fires, which were larger than 200 ha. The pattern of large fires driving area burned also applies here. A higher number of large fires and a higher area burned would be expected in a natural fire scenario with no fire suppression.

The overall mean burn fraction for the boreal zone of Ontario calculated from the national fire database is 0.001 (the median burn fraction for the boreal zone of Ontario is much lower, 0.0003).

The burn fraction in all years except four for the study area was less than 0.001. The highest burn fraction was 0.016 (in 1983). The other three years were 1988 (0.005), 1976 (0.004), and 1980 (0.002). These low and highly variable burn fractions illustrate the difficulty of estimating a quantity like fire return interval or fire cycle from the burn fraction. Reed (2006) recommended the abandonment of the concept of fire cycle based on these difficulties, though the concept continues to be used: MNR analysts estimate a pre-suppression fire cycle of 81 years, or a burn fraction of 0.01, compared to a post-suppression fire cycle of 299 years, or a burn fraction of 0.003. The mean burn fraction in the region based on the national fire database (1960-2013) was 0.0007 - on average, 0.07% of the study area burned each year. The median burn fraction in the study area was 0.00001, an order of magnitude smaller.

Decadal average area burned and burn fraction for the study area are summarized in Table 1 below.

Table 1. Decadal average area burned for the study area

Decade	Area Burned (ha)	Burn fraction
1960-1969	810	0.0005
1970-1979	6143	0.0039
1980-1989	37330	0.0239
1990-1999	1117	0.0007
2000-2009	332	0.0002
2010-2013	84.3	0.00005
Totals	45817	0.0294

Using Turetsky et al. (2006) figure of 2.62 mg/m2 or 3.8 g/ha Hg stocks in upland forest soils, we arrive at an estimate of about 5.92 t of Hg in the soil of the study area. Sigler et al. (2003) estimate an Hg flux density of 1.5g Hg/ha. This means that a conservative estimate for the decadal mercury

emissions into the atmosphere from the study area ranged between 498g in the 2000s to 55995g, or 56kg in the 1980s. This is a conservative estimate because Turetsky (2006) calculates higher Hg stocks for boreal peatlands (25.14 mg/m2 in a drought scenario).

There is much higher Hg volatilization to the atmosphere in a natural non-fire suppression scenario, than in a fire suppression scenario with harvesting. Woodruff and Cannon (2010) found that high soil burn severity has the potential to reduce the concentration of mercury in burned soils for tens to hundreds of years post-fire. In Prince Albert National Park, Saskatchewan, Friedli et al. (2007) measured an increase in mercury stock from 1.01 mg/m2 for a 39-year old stand to 3.45 mg/m2 for a 130-year old stand. MNR analysts estimate a pre-suppression fire cycle of 81 years, or a burn fraction of 0.01, compared to a post-suppression fire cycle of 299 years, or a burn fraction of 0.003. If these estimates are correct and suppression results in older stands, higher mercury stocks are to be expected in these stands.

In a "natural fire" scenario a high proportion of these stocks are released into the atmosphere. In a suppression + harvesting scenario, a larger proportion of these mercury stocks are released into the water.

The Whiskey Jack Forest - estimated mercury release in a logging scenario

Bishop et al. (2009) estimate that if 100% of an area is harvested (clearcut), a two- to fourfold increase in loading and bioaccumulation of Hg can be expected in fish in the logged catchment area for 10 years. In the total landscape with 1% harvested annually, they estimate an increase of 10-30% in bioaccumulation compared to an unmanaged landscape, and an even higher increase if silviculture activities such as soil scarification and thinning also have mercury impacts. Bishop et al. (2009) provide untested silvicultural recommendations to minimize the impacts on Hg bioaccumulation after forestry operations, but possible reductions due to these impacts have not been quantified - we cannot know how much these silvicultural changes will reduce Hg bioaccumulation.

Conclusions

Forestry and forest fires are ecologically different processes at stand and landscape levels. The area affected by forest fires is primarily due to a small number of large, intense, severe fires. In these large fires, Hg is released into the atmosphere, traveling long distances before being redeposited, reducing the total mercury pool in the local watershed. In forestry operations, Hg is released into local water bodies. A small portion of the Whiskey Jack Forest has been affected by fire since 1960, releasing a small amount of Hg into the atmosphere. Projected forestry operations in the Whiskey Jack Forest can be expected to release a larger amount of Hg into local water bodies.

References

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Bishop, Kevin, et al. "The effects of forestry on Hg bioaccumulation in nemoral/boreal waters and recommendations for good silvicultural practice." *AMBIO: A Journal of the Human Environment* 38.7 (2009): 373-380.

Garcia, Edenise, and Richard Carignan. "Mercury concentrations in fish from forest harvesting and fire□impacted Canadian Boreal lakes compared using stable isotopes of nitrogen." *Environmental Toxicology and Chemistry* 24.3 (2005): 685-693.

Johnson, E.A. and C.E. Van Wagner. 1985. The theory and use of two fire history models. Can.J.For.Res. 15:214-220.

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Podur, Justin J., and David L. Martell. "The influence of weather and fuel type on the fuel composition of the area burned by forest fires in Ontario, 1996-2006." *Ecological Applications* 19.5 (2009): 1246-1252.

Podur, J. J., Martell, D. L. and Stanford, D. (2010), A compound Poisson model for the annual area burned by forest fires in the province of Ontario. Environmetrics, 21: 457–469. doi: 10.1002/env.996

Podur, Justin, and Michael Wotton. "Will climate change overwhelm fire management capacity?." *Ecological Modelling* 221.9 (2010): 1301-1309.

Reed, William J., and Kevin S. McKelvey. "Power-law behaviour and parametric models for the size-distribution of forest fires." *Ecological Modelling* 150.3 (2002): 239-254.

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Friedli, H. R., et al. "Mercury in vegetation and organic soil at an upland boreal forest site in Prince Albert National Park, Saskatchewan, Canada." *Journal of Geophysical Research: Biogeosciences (2005–2012)* 112.G1 (2007).

Sigler, J. M., X. Lee, and W. Munger. "Emission and long-range transport of gaseous mercury from a large-scale Canadian boreal forest fire." *Environmental science & technology* 37.19 (2003): 4343-4347.

Stocks, B. J., et al. "Large forest fires in Canada, 1959–1997." *Journal of Geophysical Research: Atmospheres (1984–2012)* 107.D1 (2002): FFR-5.

Turetsky, Merritt R., et al. "Wildfires threaten mercury stocks in northern soils." *Geophysical Research Letters* 33.16 (2006).

Ward, P. C., A. G. Tithecott, and B. M. Wotton. "Reply A re-examination of the effects of fire suppression in the boreal forest." *Canadian Journal of Forest Research* 31.8 (2001): 1467-1480.

Woodruff, Laurel G., and William F. Cannon. "Immediate and long-term fire effects on total mercury in forests soils of Northeastern Minnesota." *Environmental science & technology* 44.14 (2010): 5371-5376.

Appendix A – Curriculum Vitae

PERSONAL

Dr. Justin Podur, Associate Professor, Faculty of Environmental Studies, York University

DEGREES

2006 Ph.D., University of Toronto, Faculty of Forestry.

2001 MSc.F., University of Toronto, Faculty of Forestry.

1999 Honours BSc in Physics, University of Toronto, Department of Physics.

EMPLOYMENT HISTORY

2011- Associate Professor, Faculty of Environmental Studies, York University

2013 - Hony. Visiting Professor, Jamia Millia Islamia, Delhi (Jan-April)

2006-2011 Assistant Professor, Faculty of Environmental Studies, York University.

2011 Visiting Professor, Universite Evangelique en Afrique (July)

2008 Fellow, Iqbal Institute at International Islamic University – Islamabad (July).

2005-2006 Instructor, Faculty of Journalism, Ryerson University, Toronto.

2001-2006 Doctoral Candidate, Faculty of Forestry, University of Toronto. Supervisor: David L. Martell.

1999-2002 Teaching Assistant, Department of Physics, University of Toronto.

1999-2001 MSc.F. Candidate, Faculty of Forestry, University of Toronto. Supervisor: David L. Martell

1998 Undergraduate Summer Researcher, Department of Physics, University of Toronto. Supervisor: James R. Drummond

HONOURS AND AWARDS

2008-10 NSERC Discovery Grant (3-year, $15 000/yr)

2006 Columbia University Earth Institute Fellowship (2-year, $48 000/yr, declined)

2004-5 Frank A. MacDougall Fellowship

2000-4 Natural Sciences and Engineering Research Council (NSERC) Canadian Forest Service (CFS) Supplement

2002-4 NSERC Post Graduate Scholarship (PGS) B

2001-2 Ontario Graduate Scholarship

1999-2001 NSERC PGS A

SCHOLARLY AND PROFESSIONAL CONTRIBUTIONS

PUBLICATIONS

In preparation

Podur, Justin J., Arabian, J., Nigro, J., Merritt, W., Wang, W.H., Ruddick, S., Timmins, T. 2015. "Human wildlife encounters in the Greater Toronto Area: methods for studying urban relationships of conflict and coexistence". To be submitted to *Landscape and Urban Planning.*

Articles in refereed journals

Podur, Justin J., Wotton, B.M. (2011). "Defining fire spread event days for fire growth modeling". International Journal of Wildland Fire 20, 497-507.

Podur, Justin J., Wotton, B.M. (2010). "Will climate change overwhelm fire management capacity?" Ecological Modeling 221 (2010): 1301-1309.

Podur, Justin J., Martell, David L., Stanford, David A. (2010). "A compound Poisson model for the annual area burned by forest fires in the province of Ontario". Environmetrics 21 (5): 457-469, August 2010.

Podur, Justin J., Martell, David L. (2009). "The influence of weather and fuel type on the fuel composition of the area burned by forest fires in Ontario 1996-2006". Ecological Applications 19 (5) pp. 1246-1252.

Podur, Justin J., Martell, David L. (2007). "A simulation model of the growth and suppression of large forest fires in Ontario." International Journal of Wildland Fire 16, 285-294.

Hirsch, Kelvin G., Podur, Justin J., Janser, Robert F., and McAlpine, Robert S. (2003). "Productivity of Initial Attack Fire Crews: Results of an Expert Judgement Elicitation Study." Canadian Journal of Forest Research 34 (3) pp. 705-716.

Podur, Justin J., Martell, David L., and Csillag, Ferenc (2003) "Spatial Patterns of Lightning Caused Forest Fires in Ontario, 1976-1998". Ecological Modeling 164 (2003) pp.1-20.

Podur, Justin J., Martell, David L., and Knight, Keith (2002) "Statistical quality control analysis of forest fire activity in Canada". Canadian Journal of Forest Research 32 (2) pp.195-205.

CONFERENCE PAPERS

Invited Presentation: Podur, Justin J., Arabian, J. , Merritt, W., Nigro, J., Wang, W. (2015). "Studying human-wildlife encounters in the Greater Toronto Area: conflict and coexistence." May 18, 2015. International Urban Wildlife Conference May 17-20, Chicago.

Invited Presentation: Podur, Justin J., McAlpine, R.A. (2012). "What if we couldn't fight fire?" Wildland Fire Canada 2012, Kananaskis, Alberta, October 1-5, 2012.

Invited Presentation: Podur, Justin J. (2012). "Nature, capital, and commodification: Ecology and the Capital as Power framework." Capitalizing Power: The Qualities and Quantities of Accumulation. 3rd annual forum on Capital as Power, York University, September 29-30, 2012.

Invited Presentation: Podur, Justin J., Wotton, B.M., Saliola, A. (2010). "Incorporating a spread event model defined by MODIS hot spots into fire growth modeling." Wildland Fire Canada 2010, Waterloo, October 5-7, 2010.

Invited Presentation: Podur, Justin J., Wotton, B.M. (2009). "Weather associated with fire-ending events." 4th International Congress on Fire Ecology & Management, Savannah, GA December 1-4, 2009.

Invited Presentation: Podur, Justin J., Wotton, B.M. (2009) "Can increased fire suppression resources reduce area burned under climate change?" CORS Conference, Toronto, June 14-17 2009.

Invited Presentation: Podur, Justin J., Wotton, B.M. (2008). "Modeling weather associated with forest fire "spread events" using MODIS satellite data". CMOS Conference, Kelowna, BC. May 26-29, 2008.

Invited Presentation: Podur, Justin J., Wotton, B.M. (2008). "Climate change and future area burned in Ontario." BIRS Workshop, Banff, Ontario. May 4-9, 2008.

Presentation: Podur, Justin J., Martell, D.L., Stanford, D. (2007) "A compound Poisson model for aggregate area burned in Ontario." CORS Conference, London, Ontario. May 13-16, 2007.

Presentation: Podur, Justin J., Martell, D.L. (2005) "A Simulation Model for the Growth and Suppression of Large Forest Fires in Ontario." INFORMS Applied Probability Conference. Ottawa, Ontario. July 6, 2005.

Conference Paper: Podur, Justin J., Martell, D.L., Csillag F. (2000). "Spatial Point Pattern Analysis of Lightning-caused forest fires in the Boreal Forest region of Ontario." Systems Analysis in Forestry conference, September 28, 2000. Appears in the proceedings of "Eighth Symposium on Systems Analysis in Forest Resources". Snowmass, Colorado, USA. September 28-October 1, 2000. (Refereed)

UNPUBLISHED PROFESSIONAL REPORTS

Technical report: Podur, Justin J., Martell, D.L. (2000). "Fireline construction rate productivity study: report on statistical analysis". Conducted for the Fire Science and Technology Unit, Aviation, Flood and Fire Management Branch, Ontario Ministry of Natural Resources. September 1, 2000.

Drummond, J.R., Quine, B., Yu, Z. (1998). GENSPECT: A radiative transfer code, by James R. Drummond, Ben Quine, and Zhen Yu. I contributed to the development of this code during work in the summer of 1998.

PROFESSIONAL SERVICE

Reviewing activities

Ecological Applications (2015)

Applied Mathematical Modeling (2015)

International Journal of Wildland Fire (2007-present)

Climatic Change (Winter 2011)

The Forestry Chronicle (Winter 2011)

Journal of Applied Geography (Fall 2010)

Forest Science (Fall 2010)

Jones and Bartlett Press (Spring 2009)

Journal of Climate (Spring 2006)

Ecological Modeling (Winter 2008)

Between the Lines Press (Winter 2008)

INFORMS (Winter 2008)

Canadian Journal of Forest Research (Winter 2008)

Computers & Geosciences (Winter 2007, Spring 2008)

External Reviewer, Greenpeace Climate Report (Spring 2007)

External Reviewer, NSERC Strategic Grants Program (Fall 2007)

Other

Session Chair (Modeling in Forestry) Canadian Operations Research Society Conference June 14-17 2009

Professional memberships

Board member, nonprofit organization Pueblos En Camino

FUNDING

External research funding

Year	Source	Amount	Purpose
2013-2016	SSHRC Insight Grant: co-investigator with Leesa Fawcett and Susan Ruddick (U of T)	$179,590.00	Crossing Boundaries: Encounters with Urban Wildlife in the GTA
2008-2010 (deferred to 2012)	NSERC Discovery Grant	$15,000/yr for three years	Modeling forest fires and area burned for sustainable forest management
2006	Columbia University Earth Institute Fellowship (declined)	$48,000/yr for two years (declined offer)	Postdoctoral fellowship

2004-5	Frank A. MacDougall Fellowship (Faculty of Forestry, University of Toronto)	$18,000/yr	Support for PhD studies (operating)
2000-4	NSERC CFS Supplement	$5,000/yr	Research related to Canadian Forest Service Interests (operating)
2002-4	NSERC PGS B	$21,000/yr for 2 years	PhD support (operating)
2001-2	Ontario Graduate Scholarship	$19,000 for 1 year	PhD support (operating)
1999-2001	NSERC PGS A	$19,000/yr for 2 years	MSc.F. support (operating)

Internal research funding

Year	Source	Amount	Purpose
2011	FES Research Release	N/A	Fall Term Research
2007	FES Small Travel Grant	$500	CORS Conference, London ON, May 2007

TEACHING

UNDERGRADUATE

Courses:

2016
ENVS 2400 Environmental Management (W)

2015
ENVS 4520 Advanced GIS* (W)

Fall 2014 parental leave

2014
ENVS 4520 Advanced GIS*(W)

2012-2013 sabbatical

2012
ENVS 4520 Advanced GIS* (W)
ENVS 4810 Field Course in Tropical Ecology (Costa Rica) (S)

2011
ENVS 4520 Advanced GIS* (W)
ENVS 4810 Field Course in Tropical Ecology (Costa Rica) (S)

2010
ENVS 2100 Environment and Culture (W)
ENVS 4520 Advanced GIS* (W)
ENVS 4810 Field Course in Tropical Ecology (Costa Rica) (S)
ENVS 3710 Landscape Ecology* (F)

2009

ENVS 2100 Environment and Culture (W)

ENVS 3710 Landscape Ecology* (F)

2008

ENVS 3710 Landscape Ecology* (F)

Independent directed reading: ENVS 3900: Political Economy and Communication

2007

ENVS 3710 Landscape Ecology* (F)

2006

ENVS 4750 Landscape Theory* (F)

GRADUATE

Courses:

Fall 2014 parental leave

2012-2013 sabbatical

2012

ENVS 4810 Field Course in Tropical Ecology (Costa Rica) (S)

2011

ENVS 4810/6599 Costa Rica Field Course (S)

2010

ENVS 6119 Ecological Restoration (S)

ENVS 4810/6599 Costa Rica Field Course (S)

2009

ENVS 6119 Ecological Restoration (S)

2008

ENVS 6189 Geographic Information Systems (W)

ENVS 6119 Ecological Restoration (S)

2007

ENVS 6119 Ecological Restoration (S)

GRADUATE SUPERVISION AND INDEPENDENT STUDY SUPERVISION

Directed over 40 MES independent study or reading courses between 2007 and 2015

Since 2007 have advised and supervised approximately 70 MES and PhD candidates within the Faculty of Environmental Studies and participated as external examiner for additional masters and PhD candidates in other York faculties or at other universities.

COURSES TAKEN

Web Applications 9-week immersive. Bitmaker Labs. June-July 2014. Skills: Ruby on Rails, Javascript, JQuery, CSS, HTML.

Supervising Graduate Students - SEDA certified - June 2014. Teaching Commons, York University. Facilitator: Celia Popovic.

Instructional Skills Workshop (ISW): November 25-27, 2013. Teaching Commons, York University. Facilitator: Mandy Frake-Mistak

COURSES TAUGHT AT OTHER INSTITUTIONS

2014

"GIS and Urban Design", Lecturer, York University Asia Business and Management Program (ABMP), Toronto, December 9, 2014 (single lecture).

2013

"MA International Politics Seminar", Instructor, Jamia Millia Islamia, Delhi, India, Winter 2013 (sabbatical).

2011

"GIS Applications in Forest Management", Instructor, Universite Evangelique en Afrique Master's in Environmental Management Program, Bukavu, South Kivu, DRC, June 2011

"Globalization and Development", Instructor, Universite Evangelique en Afrique Master's in Environmental Management Program, Bukavu, South Kivu, DRC, June 2011

2003-2010

Instructor, Z Media Institute, Woods Hole MA. Supervisor: Michael Albert

2008

"Critical Thinking" Fellow, Iqbal Institute, International Islamic University, Islamabad, July 2008

2006

"Critical Issues in Journalism" Instructor, Faculty of Journalism, Ryerson University, Toronto. Supervisor: John Miller

2005

"Online Journalism" Instructor, Faculty of Journalism, Ryerson University, Toronto. Supervisor: Joyce Smith

2000-2002

"The Way of Physics", Teaching Assistant, Department of Physics, University of Toronto. Supervisor: David Harrison

1999

"Physics Laboratory" Teaching Assistant, Department of Physics, University of Toronto. Supervisor: Ruxandra Serbanescu

SERVICE

UNIVERSITY SERVICE

2015-16

Coordinator, GIS Certificate Program, Faculty of Environmental Studies

Senator, York University

Member, BES Curriculum Committee, Faculty of Environmental Studies

Member, YUFA Bargaining Team

2015

Graduate Program Director, Faculty of Environmental Studies (Winter)

Chair, Grade Assessment Committee, Faculty of Environmental Studies

Chair, MES Curriculum Committee, Faculty of Environmental Studies

Member, PhD Program Committee, Faculty of Environmental Studies

Member, Executive Committee, Faculty of Environmental Studies

Member, Faculty of Graduate Studies Council

Member, Las Nubes Committee

Member, YUFA Bargaining Team

Fall 2014 - parental leave

2013-2014

Graduate Program Director, Faculty of Environmental Studies

Chair, Grade Assessment Committee, Faculty of Environmental Studies

Chair, MES Curriculum Committee, Faculty of Environmental Studies

Member, PhD Program Committee, Faculty of Environmental Studies

Member, Executive Committee, Faculty of Environmental Studies

Member, Faculty of Graduate Studies Council

Member, Las Nubes Committee

2012-2013

Sabbatical

2011-12

Graduate Program Director, Faculty of Environmental Studies

Chair, Awards Committee, Faculty of Environmental Studies

Chair, MES Curriculum Committee, Faculty of Environmental Studies

Member, PhD Program Committee, Faculty of Environmental Studies

Member, Executive Committee, Faculty of Environmental Studies

Coordinator, FES GIS Certificate Program

Member, ad-hoc Information Technology Committee

Member, IRIS Executive Committee

Senator, York University

Member, Las Nubes Committee

2010-2011

Graduate Program Director, Faculty of Environmental Studies

Chair, Awards Committee, Faculty of Environmental Studies

Chair, MES Curriculum Committee, Faculty of Environmental Studies

Member, PhD Program Committee, Faculty of Environmental Studies

Member, Executive Committee, Faculty of Environmental Studies

Coordinator, FES GIS Certificate Program

Member, ad-hoc Information Technology Committee

Member, IRIS Executive Committee

Senator, York University

Member, Faculty Appointments Advisory Committee (FAAC)

2009-2010

Coordinator, FES GIS Certificate Program

Member, University Green Paper Working Group on Teaching & Learning

Member, FES Planning Programs Subcommittee

Member, Undergraduate Curriculum Committee

Member, ad-hoc Information Technology Committee

Member, IRIS Executive Committee

Senator, York University

2008-2009

Member, Sustainable Writing Lab Postdoctoral Fellows Selection Committee

Member, file preparation committee for Lewis Molot's advancement to full professor

Member, ad-hoc Information Technology (Moodle) Committee for ENVS 5101

Member, Undergraduate Curriculum Committee

Member, Research and Awards Committee (RAC)

Member, IRIS Executive Committee

Member, York University Senate Committee on Libraries & Information Technology

Member, York Geomatics User Group

2007-2008

Member, York University Senate Committee on Libraries & Information Technology

Member, FES Faculty Appointments Committee, Urban Ecologies & Environmental Planning search

Member, York Geomatics User Group

Shadow member, FES Risk Assessment Review Committee

Member, ad-hoc committee to draft Applied Ecology position job ad

Member, FES Planning Programs Subcommittee

2006-2007

Member, FES Planning Programs Subcommittee

Member, ad-hoc YUFA Merit Exercise Advisory Committee

FES Representative to York University Senate Committee on Libraries & Information Technology

Member, FES Faculty Appointments Committee, Environmental Policy and Climate Change search

Date c.v. prepared: Dec 2, 2015

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO),
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

ACKNOWLEDGEMENT OF EXPERT'S DUTY

1. My name is Justin Podur. I live in Toronto in the Province of Ontario.

2. I have been engaged by or on behalf of Grassy Narrows First Nation to provide evidence in relation to the above-noted court proceeding.

3. I acknowledge that it is my duty to provide evidence in relation to this proceeding as follows:

   (a) to provide opinion evidence that is fair, objective and non-partisan;

   (b) to provide opinion evidence that is related only to matters that are within my area of expertise; and

   (c) to provide such additional assistance as the court may reasonably require, to determine a matter in issue.

4. I acknowledge that the duty referred to above prevails over any obligation which I may owe to any party by whom or on whose behalf I am engaged.

Date: _____ _____

Justin Podur

Court File No. 446/15

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

AFFIDAVIT OF JUSTIN PODUR

CANADIAN ENVIRONMENTAL LAW ASSOCIATION
130 SPADINA AVE., SUITE 301
TORONTO, ONTARIO M5V 2L4

Telephone: (416) 960-2284
Facsimile: (416) 960-9392

Joseph F. Castrilli (LSUC No. 26123A)
Richard D. Lindgren (LSUC No. 28529E)
Jacqueline Wilson (LSUC No. 60330R)

Solicitors for the Applicants

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

AFFIDAVIT OF STEPHEN KILBURN

I, STEPHEN KILBURN, of the City of Guelph, in the Province of Ontario, AFFIRM AND SAY AS FOLLOWS:

1. I hold a Bachelor's degree in Environmental Studies, Urban and Regional Planning and a Master's degree in Regional Planning and Resources Development from the University of Waterloo. I am a Registered Professional Planner and member of the Ontario Professional Planning Institute and the Canadian Institute of Planners. I am a consultant

specializing in the application of geographic information system (GIS) methods in the fields of resource management and planning. GIS is a computer technology that allows users to store, manage, manipulate, analyze, and interact with geospatial information, and to create maps and other information products. I have provided GIS and related services to federal, provincial, territorial, municipal, and First Nation governments and agencies across Canada. I have also published and spoken widely in this field. A copy of my curriculum vitae is attached to Exhibit “A”, below.

2. In April 2015 I was asked by counsel for Grassy Narrows to prepare a series of maps on planned and recent clearcut logging in the Whiskey Jack Forest. The maps and a short report explaining the methodology I used in preparing them appear as part of my January 2016 expert report attached as Exhibit “A” to my Affidavit.

3. A copy of my Acknowledgement of Expert's Duty form is attached as Exhibit “B” to my Affidavit.

AFFIRMED BEFORE ME in the City of Toronto, in the Province of Ontario, this 29th day of January, 2016.)

A Commissioner, etc.)

_____
Stephen Kilburn

EXPERT REPORT

Grassy Narrows First Nation and Sherry Fobister, William Fobister, Senior, Simon Fobister and Chief Roger Fobister, Senior on their own behalf and on behalf of all other members of Grassy Narrows First Nation v. Minister of Natural Resources and Forestry (Ontario) and Minister of the Environment and Climate Change (Ontario), and the Attorney General of Ontario

Ontario Superior Court of Justice
(Divisional Court)

Prepared for
Joseph F. Castrilli and Richard D. Lindgren
Counsel, Canadian Environmental Law Association
130 Spadina Avenue, Suite 301
Toronto, Ontario
M5V 2L4

Watershed Map Series of Planned and Recent Clearcut Logging of Whiskey Jack Forest

Prepared by

Stephen Kilburn, BES, MA, MCIP, RPP
Guelph, Ontario

Date: January ___, 2016

_____
Stephen Kilburn

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Introduction

I hold a Bachelor's degree in Environmental Studies, Urban and Regional Planning and a Master's degree in Regional Planning and Resource Development from the University of Waterloo. I am a Registered Professional Planner and member of the Ontario Professional Planning Institute and the Canadian Institute of Planners. I am a consultant specializing in the application of geographic information system (GIS) methods in the fields of resource management and planning. GIS is a computer technology that allows users to store, manage, manipulate, analyze, and interact with geospatial information, and to create maps and other information products. I have provided GIS and related services to federal, provincial, territorial, municipal, and First Nation governments and agencies across Canada. I have also published and spoken widely in this field. My curriculum vitae appears in Appendix B of this Expert Report.

I have been asked by Joseph F. Castrilli and Richard D. Lindgren of the Canadian Environmental Law Association, on behalf of Grassy Narrows First Nation, to prepare a report and a series of watershed maps of planned and recent clearcut logging in the Whiskey Jack Forest of northwestern, Ontario. I am solely responsible for the preparation of this report and the accompanying maps.

Documentation for Maps in this Report

The following is an explanation of the data sources and methods used to create the maps in this report.

In the description below, sections of the document Ministry of Natural Resources (2009), *FIM Forest Management Planning Technical Specifications 2009* are referenced to provide reference for the meaning of attribute values. The abbreviation "FMPTS 2009" is used for this document.

The maps were prepared using ArcGIS software, version 10.1, SP1. Maps all use NAD 1983 datum and Universal Transverse Mercator (UTM) zone 15 north projection.

Two categories of maps are included behind Appendix A: trap line area maps (Appendix A.1), and watershed area maps (Appendix A.2). The former have been included because they cover a larger geographic area and, therefore, provide greater context for the location of the latter. For example, the trap line area map entitled "Trapping Area KE038" contains the watershed area entitled "Watershed Noname 20 near Campfire Lake". A blown-up version of the latter may be viewed by examining the separate watershed area map entitled "Watershed Noname 20 near Campfire Lake".

Base Features

Base features were mapped using the following data sources:

- Water lines and water areas were sourced from Land Information Ontario OHNWCRS and OHNWBDY datasets.

- Roads were sourced from Land Information Ontario MNRRDSEG.
- Wetland areas were extracted from the Whisky Jack Forest Management Plan (FMP) Planning Composite Inventory (PCI) using the attribute definition *POLYTYPE in ('TMS', 'OMS')* (i.e., treed muskeg and open muskeg, respectively [FMPTS 2009, A1.1.4]).
- Trapping areas were sourced from Land Information Ontario TRAPLINE.
- Watershed areas were sourced from Ontario Flow Assessment Tool III.
- Planned clearcuts and contingency clearcuts for 2012-2022 were extracted from the Whisky Jack FMP 2012-2022 dataset MU490_12PHR00.

Areas of Relevance

Areas of relevance for forestry planning and mercury impacts were mapped from the following sources:

- **Naturally Unforested Areas:** These were extracted from the PCI by excluding polygons with the POLYTYPE attributes 'TMS', 'OMS', 'FOR', 'WAT' (treed muskeg, open muskeg, productive forest, and water, respectively). This category includes exposed rock, brush and alder, islands less than 8 hectares in size. As well, it includes areas with the attribute definition *"DEVSTAGE" = 'LOWNAT' AND "YRDEP" < 1968* (i.e., areas disturbed before 1968 by natural causes where the area currently is below regeneration standards).
- **Forest:** Naturally forested areas were extracted from the PCI using the attribute definitions *POLYTYPE = 'FOR'* (i.e., productive forests, [FMPTS 2009, A1.1.4]); *YRDEP<1* (i.e., no recorded disturbance year [FMPTS 2009, A1.1.11]); and *DEVSTAGE ='FTGNAT'* (i.e., free-to-grow mainly natural regeneration, which includes both naturally regenerated forests and original forest [FMPTS 2009, A1.1.10]). Subsets younger and older than 45 years were extracted using the additional attribute queries *AGE<46* and *AGE>45*, respectively.
- **Forest, Depleted Before 1968:** Forested areas depleted before 1968 were extracted using the attribute definitions *YRDEP < 1968* and *YRDEP > 0* (i.e., areas that have recorded depletions before 1968); and *DEVSTAGE in (FTGPLANT, FTGSEED, FTGNAT)* (free-to-grow planted, seeded, and natural regeneration [FMPTS 2009, A1.1.10]).
- **Depletions After 1967:** This category is the best approximation of historical logging using the data provided by MNRF (see discussion below about the data provided). Depletion areas were extracted with subsets being defined using YRDEP attribute ranges (1968-1977, 1978-1987, 1988-1997, and 1998-2007) and using the attribute definition *NOT (DEVSTAGE in ('DEPNAT', 'LOWNAT')*, (i.e., areas with recorded disturbance years in the specified ranges where the original disturbance was not recorded as natural). In addition, the following natural depletion areas were excluded.

- **Fire Disturbances:** This identifies areas disturbed by fire based on the FIRE_DISTURBANCE_AREA polygons obtained from Land Information Ontario. We considered salvage logged areas to be primarily fire disturbed. To exclude salvage logged areas from the general depletion areas (above), FIRE_DISTURBANCE_AREA polygons were spatially intersected with a subset of the FRI where *YRDEP>0* (i.e., any area with a recorded depletion). From the resulting dataset, any areas where a fire event was recorded (*FIRE_YEAR > 0*) and the last disturbance year recorded in the FMP Land Classification was the same as or within 5 years after the fire year was mapped as fire disturbances.

- **Blowdown Disturbances:** To identify areas of blowdown disturbance, FOREST_ABIOTIC_DAMAGE_EVENT polygons were obtained from Land Information Ontario. These were spatially intersected with the FMP Land Classification Dataset. From the resulting dataset, any areas where a blowdown event was recorded (EVENT_NAME = 'Blowdown') and the last recorded disturbance year was after 1967 were mapped as blowdown disturbances.

- **Other Natural Disturbances:** Areas of potentially productive forest disturbed by natural events that have not met regeneration standards were extracted using the attribute definition *DEVSTAGE='LOWNAT'* and areas recently disturbed by natural events extracted using the attribute definition DEVSTAGE = 'DEPNAT'.

- **Confirmed Logging Since 1970:** There is a map titled "Area Harvested in the Whiskey Jack Forest between 1970 and the Present Time" in the Whiskey Jack Forest 2009-2019 Forest Management Plan 1.1.7.11 Historic Forest Condition, Tab 2, page 26 by David Anderson, Area Forester, Oct 24, 2006. Areas marked as logged in that dataset (shapefile WJF_1970) are marked as "Confirmed Logging since 1970" on our maps.

Discussion

Our primary intention was to produce maps that accurately represent the currently proposed clearcuts and contingency clearcuts in the context of mature productive forested areas, naturally disturbed forested areas, and areas that have been disturbed by previous forest cutting since 1968. The year 1968 was chosen because it likely captures all, or nearly all, historical logging in the area of interest. This is corroborated by the fact that the FMP map of historical logging uses 1970 as a start date.

A challenge to achieving this was presented by omission of an important attribute from the FMP land classification data (Planning Composite Inventory) provided by the MNRF. According to an MNRF presentation, "The Enhanced Forest Resources Inventory, January 22nd, 2013," (available online from the Canadian Institute of Forestry, http://www.cif-ifc.org/wp-content/uploads/2014/05/Banton.pdf), the FRI data should include a depletion type attribute (DEPTYPE) that "identifies the disturbance that occurred in the year recorded in the companion attribute YRDEP," (p.40) and includes entries that would allow harvest disturbances to be differentiated from natural disturbances.

When we requested the DEPTYPE attribute data The MNRF wrote to us that “The external link to the Forest Management Planning Tech Spec. http://www.ontario.ca/document/forest-management-planning-technical-specifications. This applies to the Planning Composite Inventory (PCM) that was provided as part of the current approved 2012 Whiskey Jack plan. The forest resource inventory (FRI) that this PCM was based upon unfortunately did not include a DEPTYPE field. The original FRI was developed prior to FIM and as such did not have an appropriate Tech. Spec.”

Because we lacked this attribute, we were forced to attempt to differentiate harvest depletions from natural depletions using other attributes. As well, at the recommendation of the MNR we obtained from Land Information Ontario the complementary datasets FIRE_DISTURBANCE_AREA, FOREST_ABIOTIC_DAMAGE_EVENT, FOREST_DISEASE_DAMAGE_EVENT, FOREST_INSECT_DAMAGE_EVENT, and FOREST_MISC_DAMAGE_EVENT. Of these, only the fire disturbance area dataset appears to be complete. As documented above, we made use of the abiotic damage event dataset to map blowdown areas, but note that the earliest recorded event is 2001, suggesting that the dataset is not complete. After inspecting their content, we determined that we could not make use of the other three datasets. The whole content of the disease damage event dataset was five polygons covering 1.82 square kilometres, all denoting “Ink spot of aspen” disease in 2009 and 2010. Even the subset of polygons in the insect damage event dataset for “Spruce Budworm” damage appear to be grossly generalized and not amenable to use with data of the accuracy of the FRI; and cover an area of approximately 295,000 square kilometres – nearly one third of the WJ Forest. The miscellaneous damage event dataset comprised five polygons covering 175,000 square kilometres, all denoting “Aspen decline” in 2009 and 2010.

Recent depletions that are not marked as confirmed logging likely reflect logging after the endpoint of the data used for “Area Harvested in the Whiskey Jack Forest between 1970 and the Present Time.” The presence of a road network in these areas corroborates this. Old depletions that are not marked as confirmed logging are likely natural disturbances but may be old logging overlooked in the FMP map

Conclusions

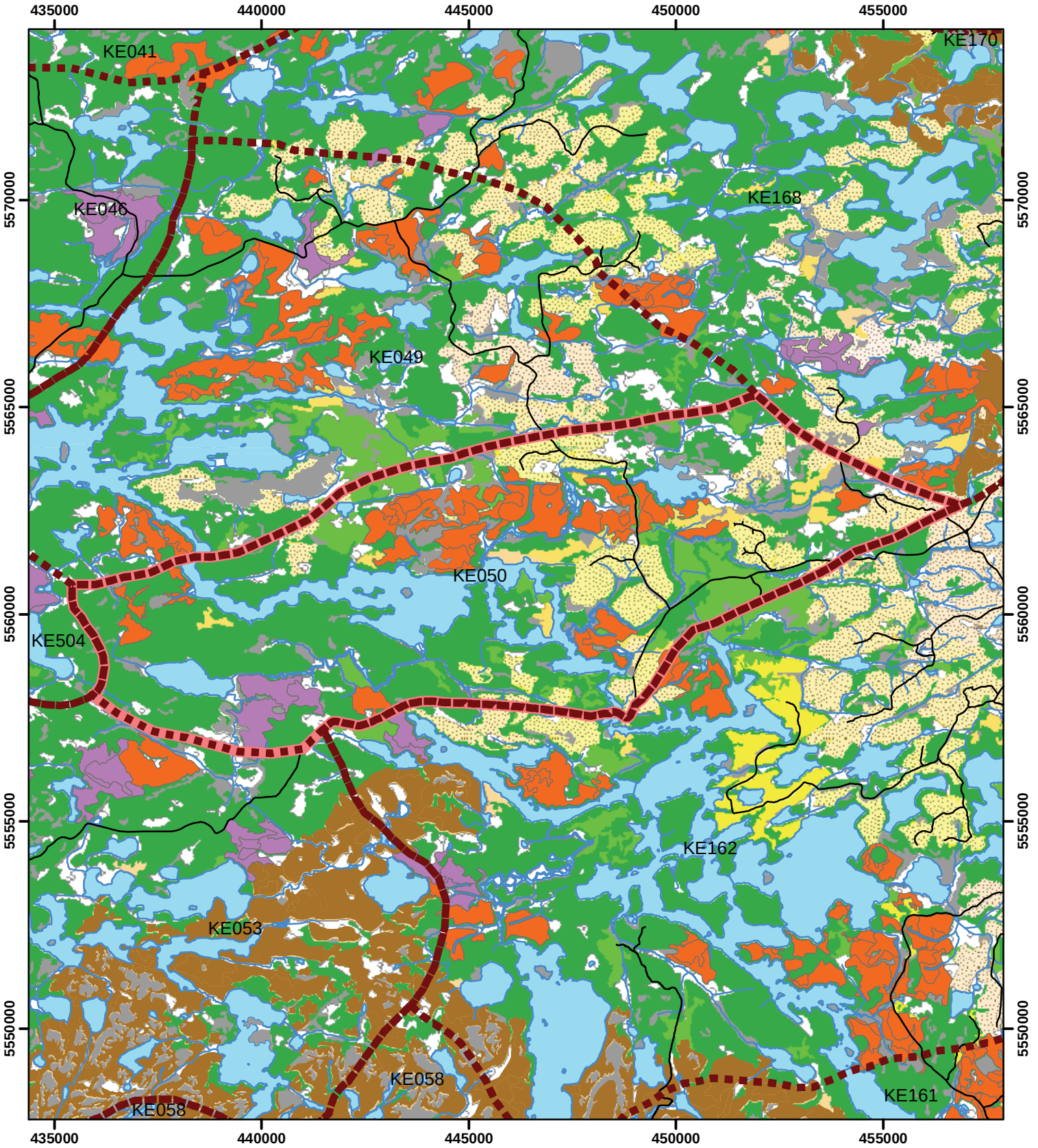
Despite these challenges we are confident that our mapping reasonably represents the landscape and the depletions that have occurred since 1968 to the best of our ability using the data that the MNRF has shared. Most importantly, the planned and contingency cutblocks are represented as accurately as in the FMP data.

Stephen Kilburn

APPENDIX A – MAPS

APPENDIX A.1 – TRAP LINE AREA MAPS

Planned and recent clearcut logging
Trapping Area KE050



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

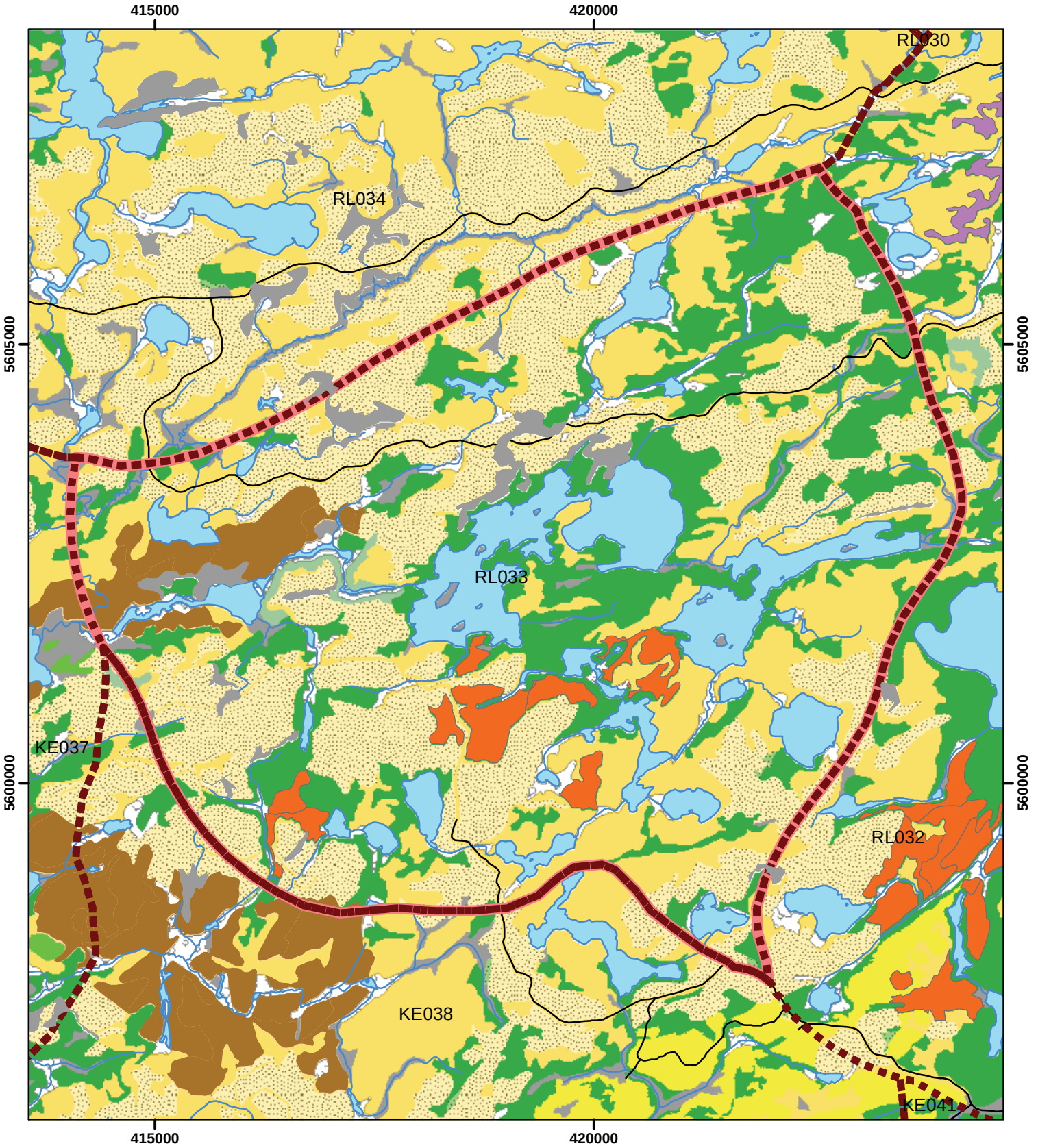
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:125,000

Planned and recent clearcut logging
Trapping Area RL033



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

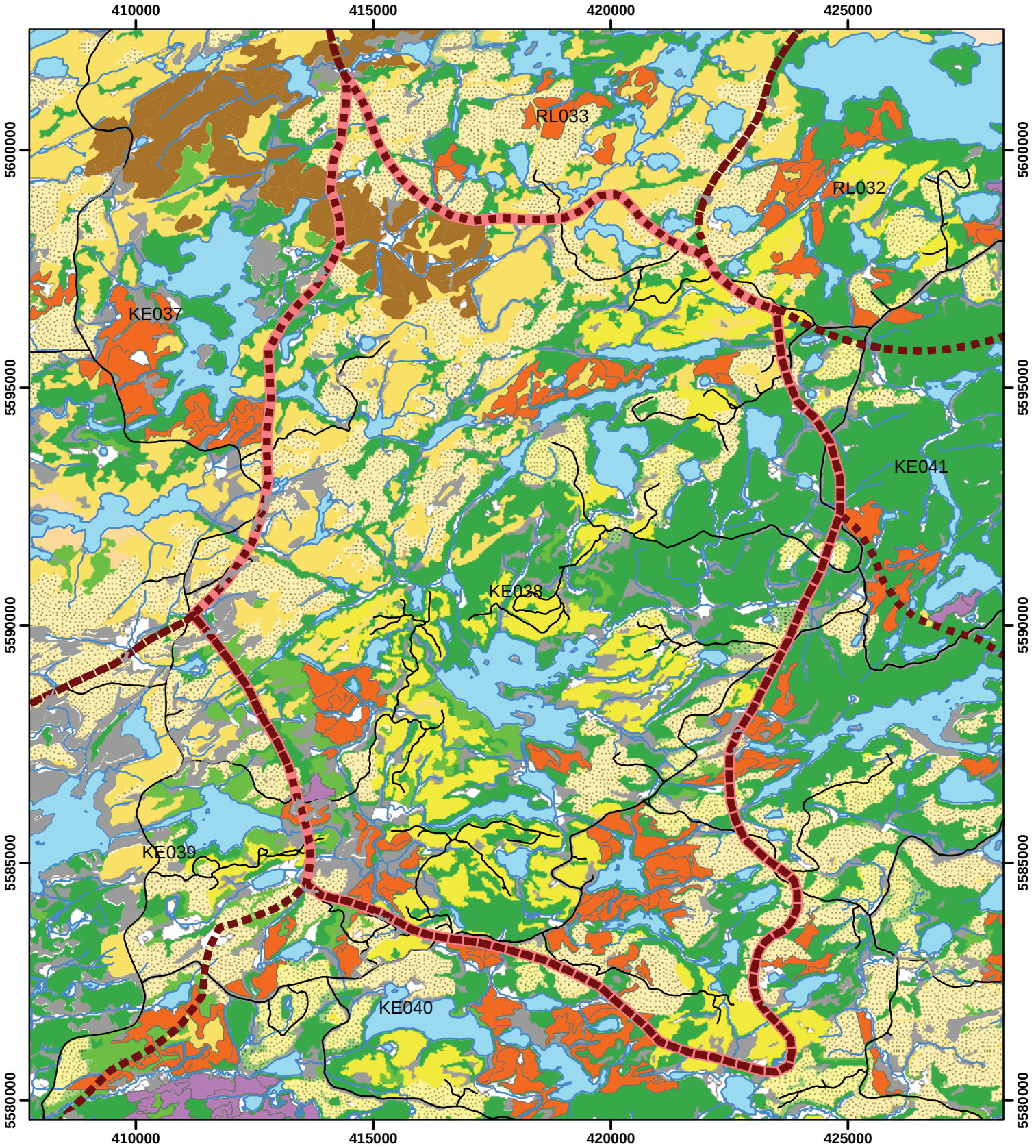
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.5 1 2 km

1:59,000

Planned and recent clearcut logging
Trapping Area KE038

2069



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

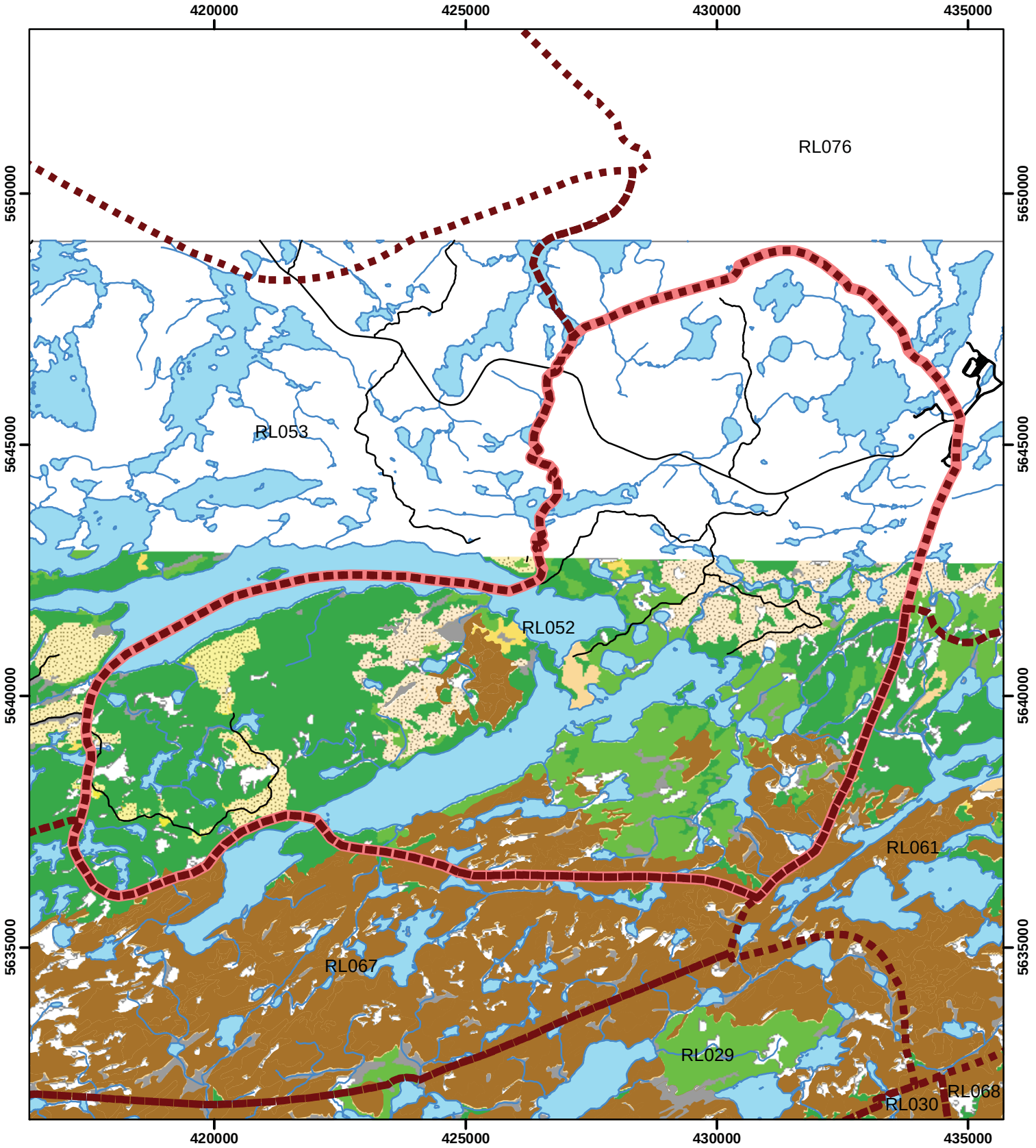
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:109,000

Planned and recent clearcut logging
Trapping Area RL052

2070



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

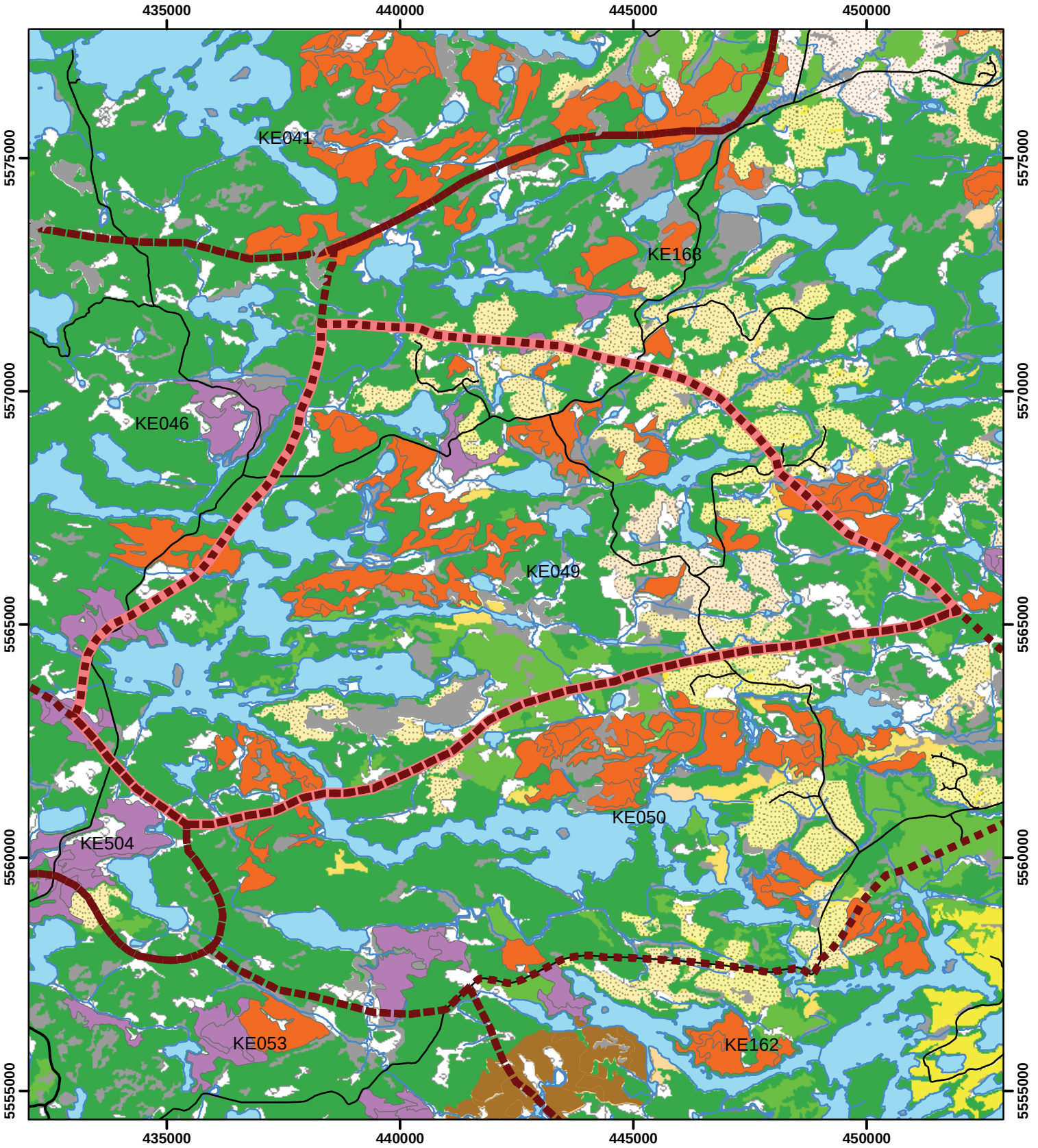
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:103,000

Planned and recent clearcut logging
Trapping Area KE049



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

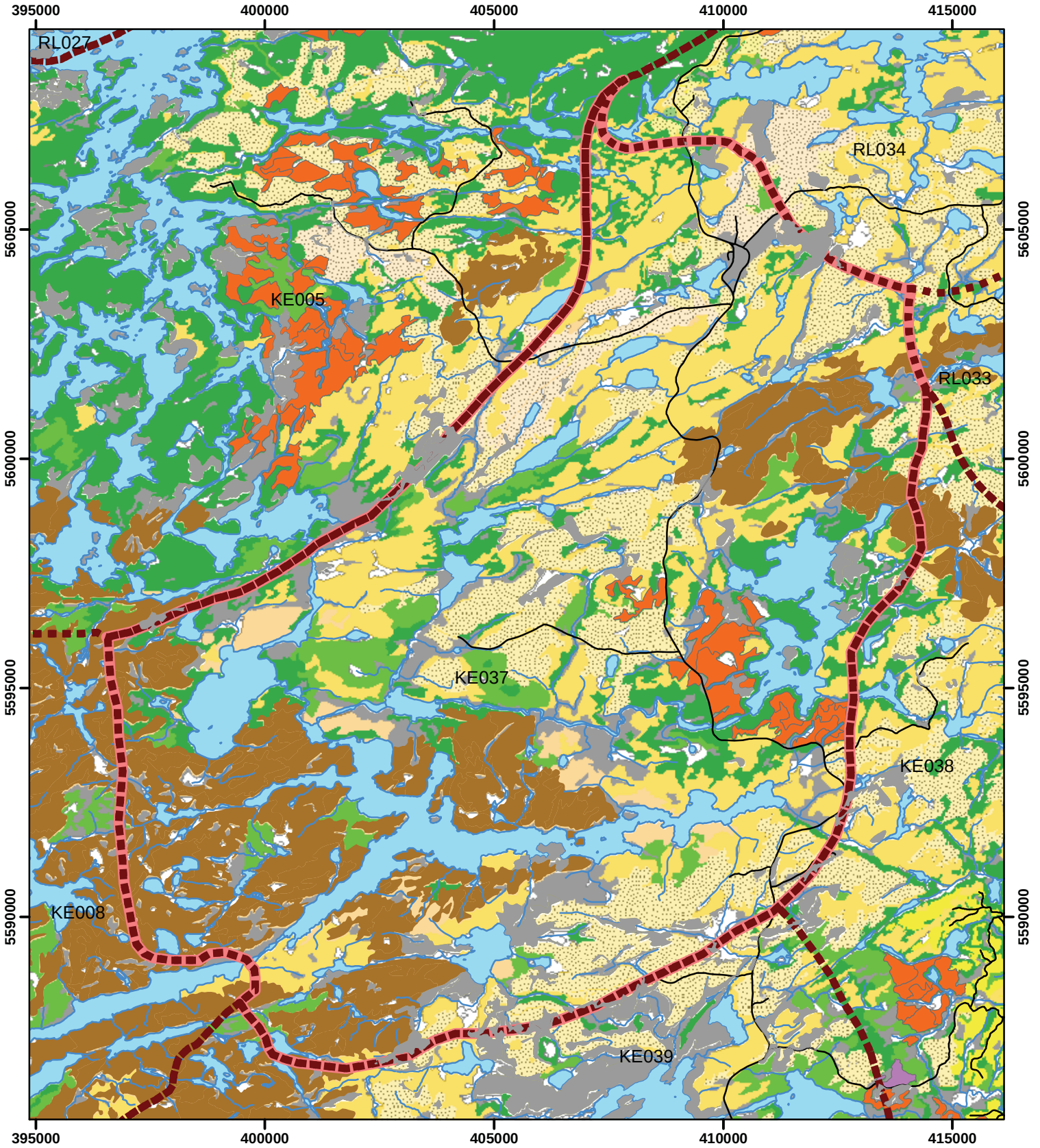
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:111,000

Planned and recent clearcut logging
Trapping Area KE037



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

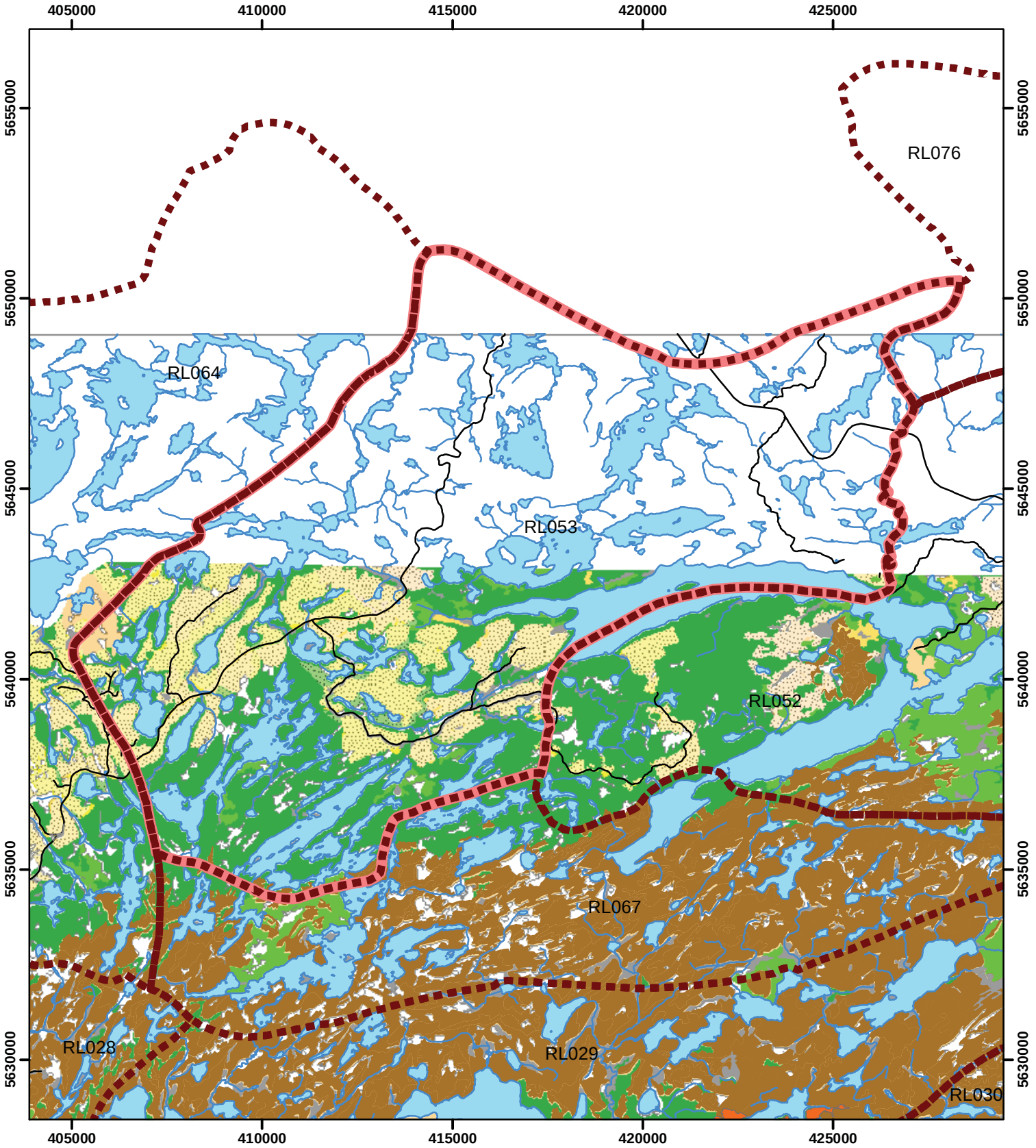
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:113,000

Planned and recent clearcut logging
Trapping Area RL053

2073



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

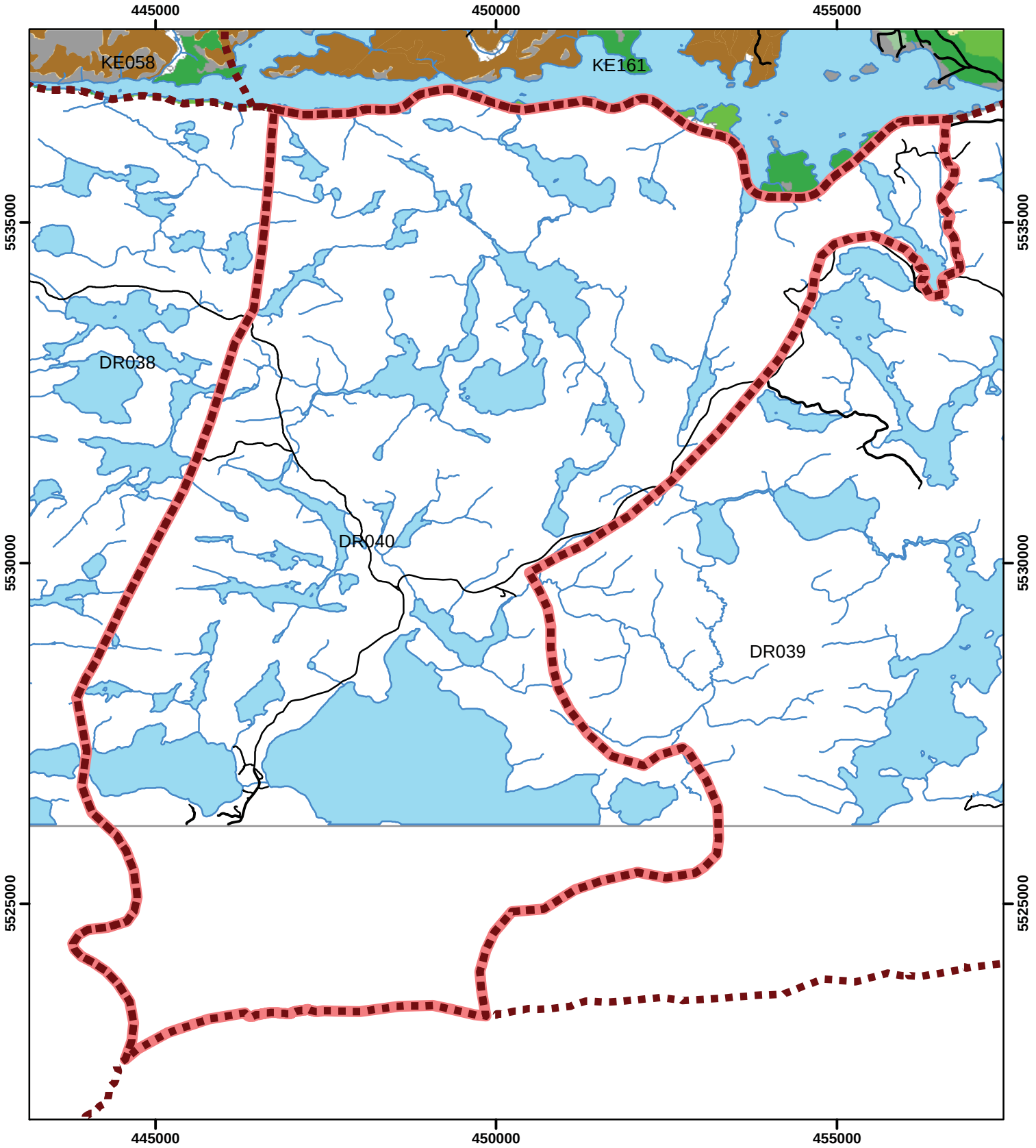
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:136,000

Planned and recent clearcut logging
Trapping Area DR040

2074



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

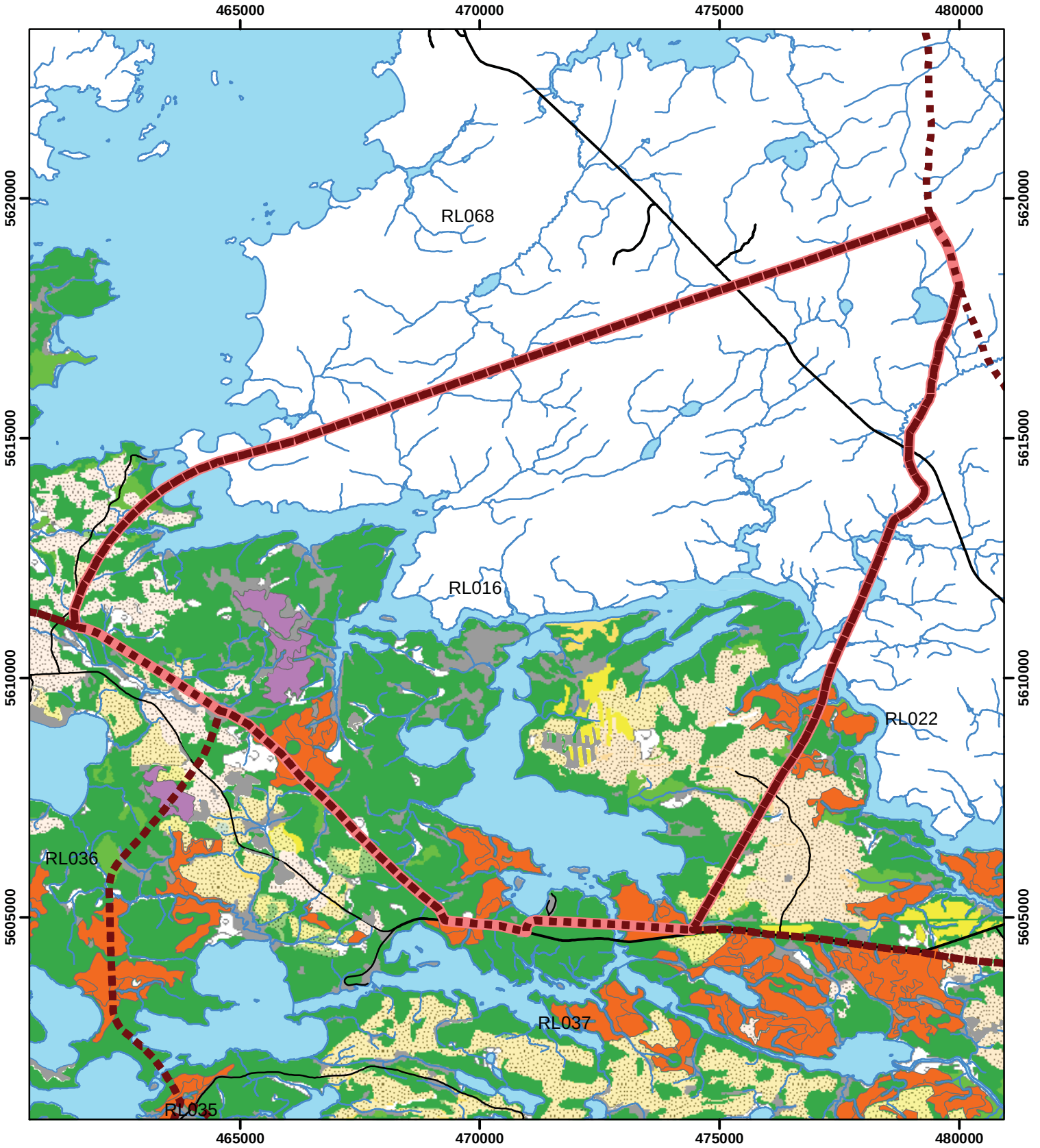
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.5 1 2 km

1:76,000

Planned and recent clearcut logging
Trapping Area RL016



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

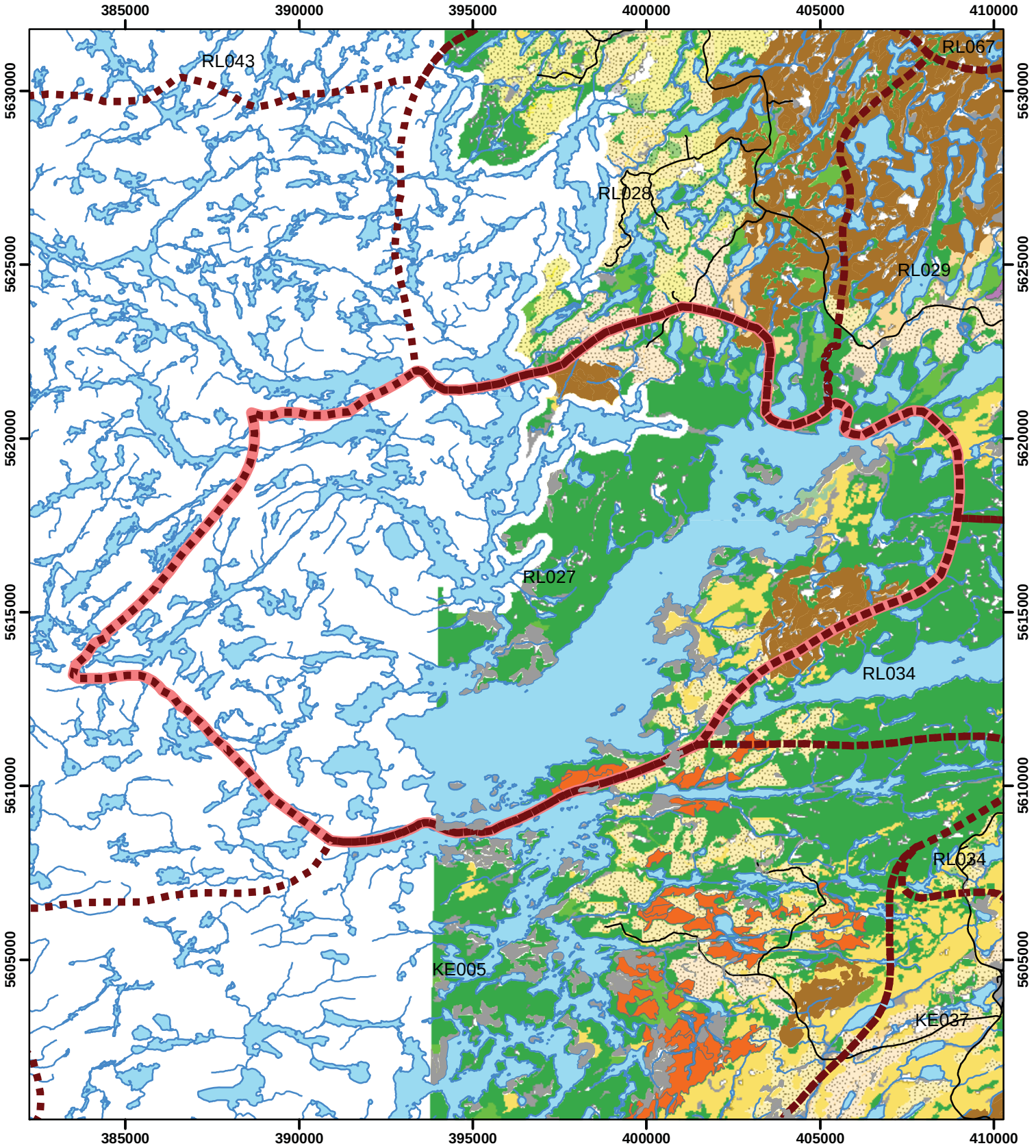
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:108,000

Planned and recent clearcut logging
Trapping Area RL027



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

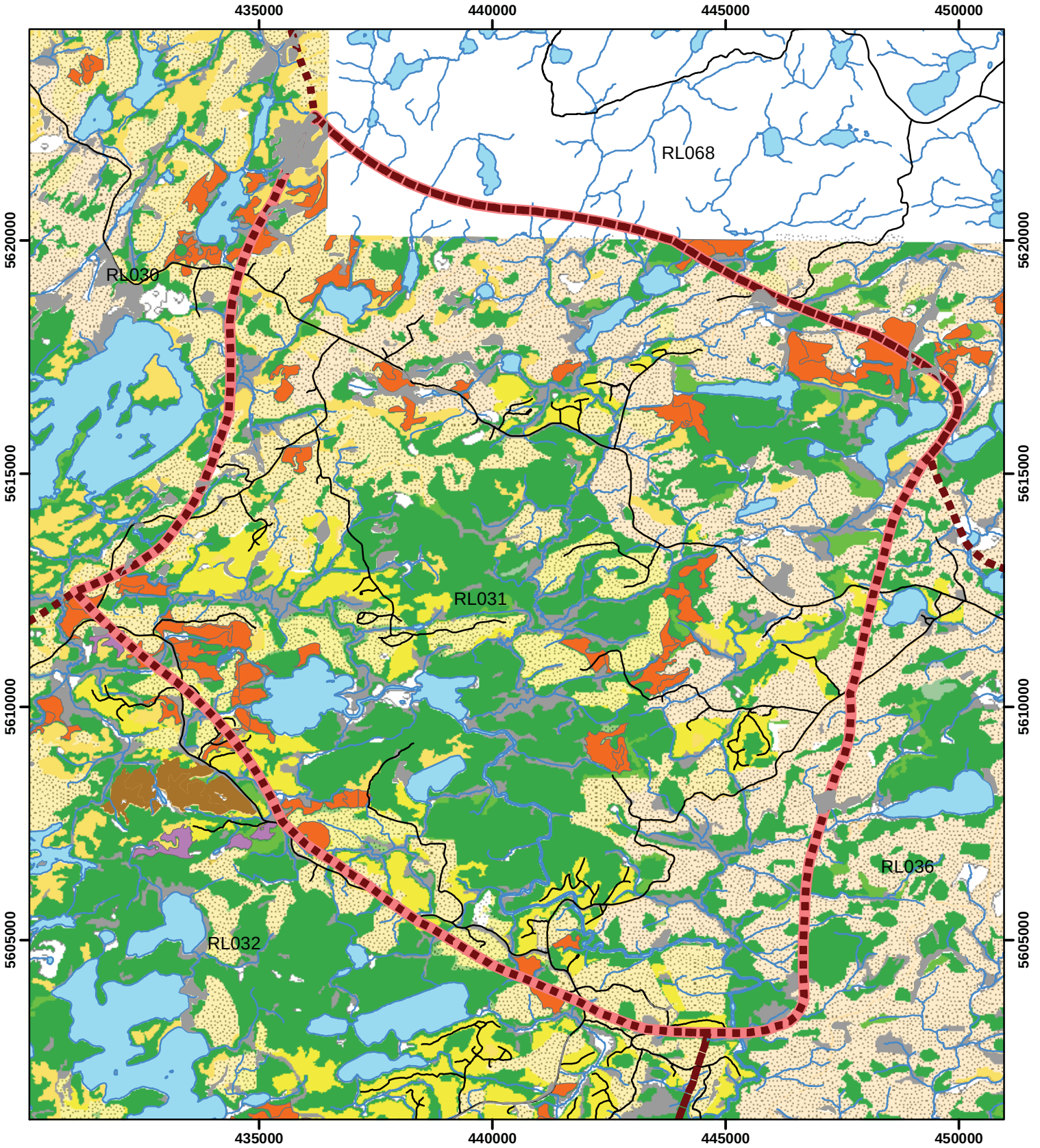
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:149,000

Planned and recent clearcut logging
Trapping Area RL031



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

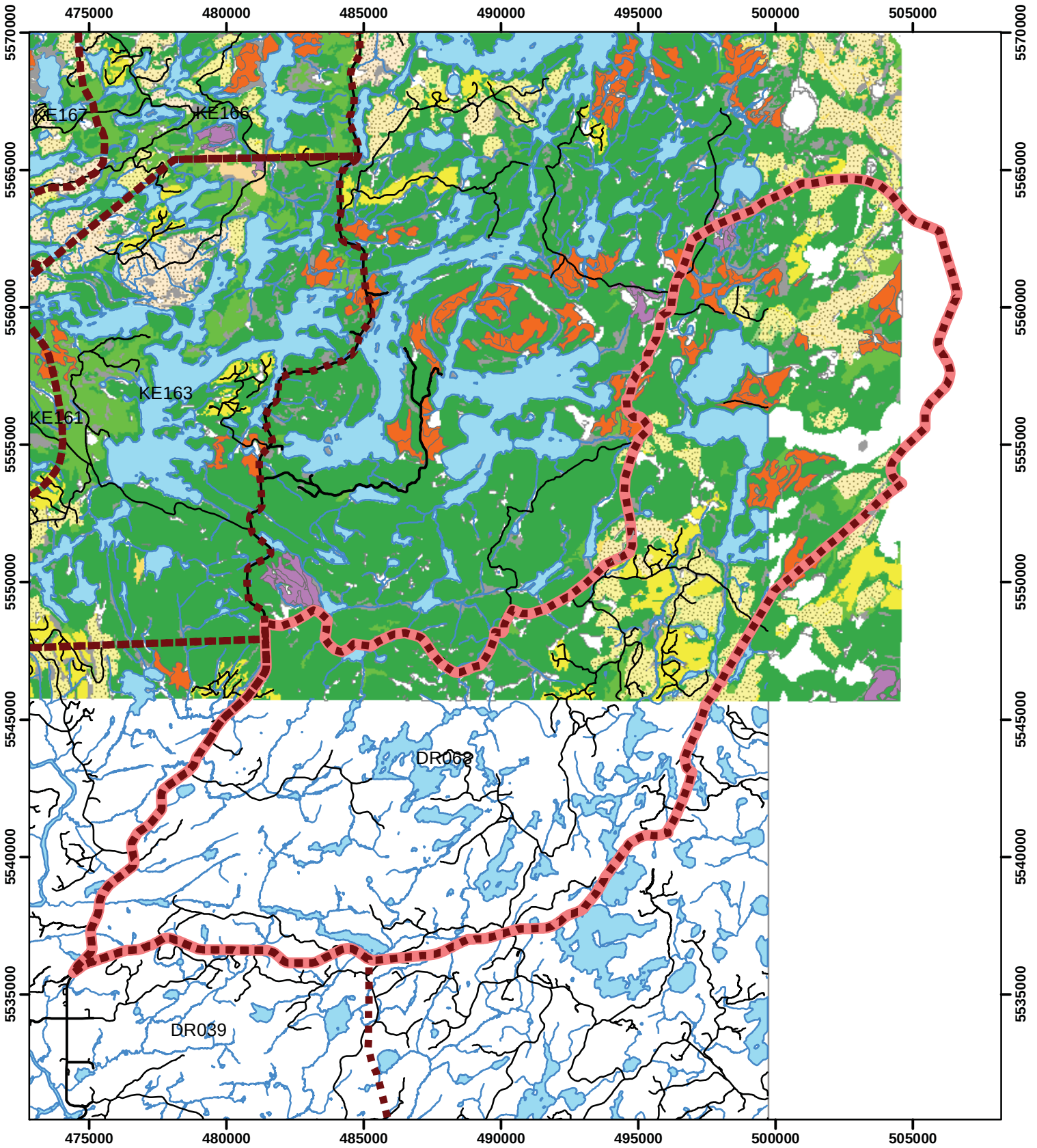
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:111,000

Planned and recent clearcut logging
Trapping Area DR068



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

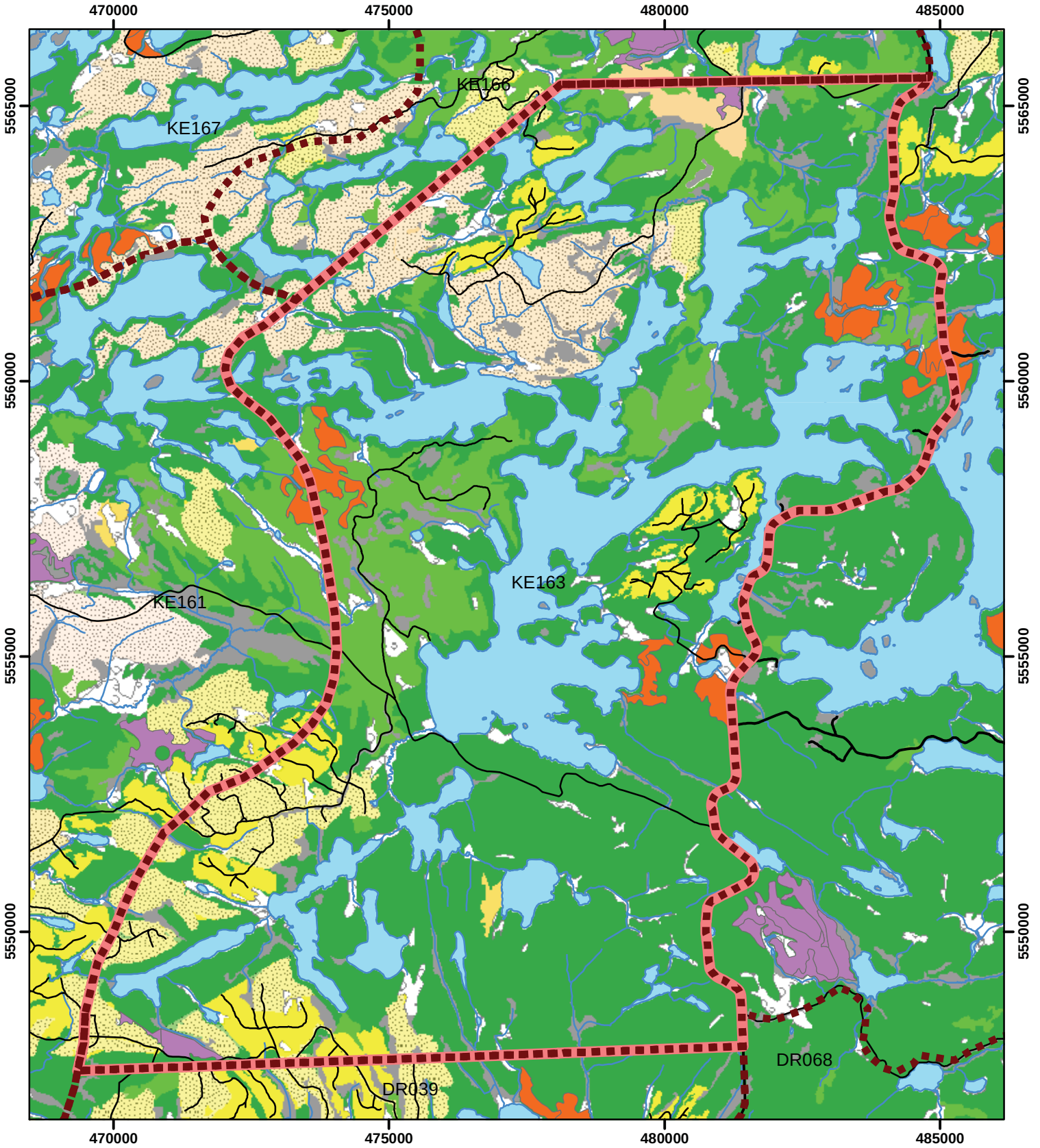
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.75 3.5 7 km

1:188,000

Planned and recent clearcut logging
Trapping Area KE163



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

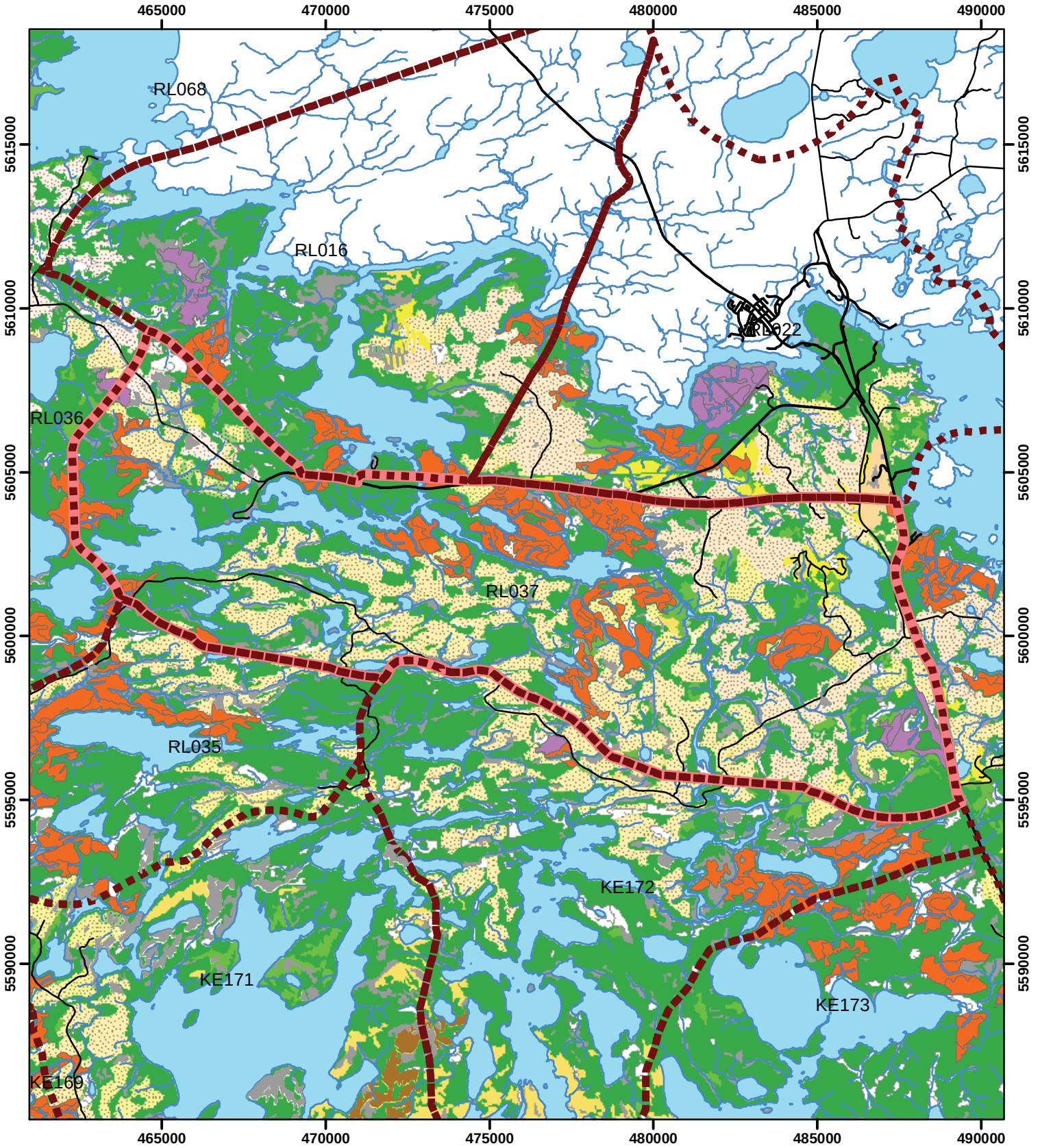
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:94,000

Planned and recent clearcut logging
Trapping Area RL037



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

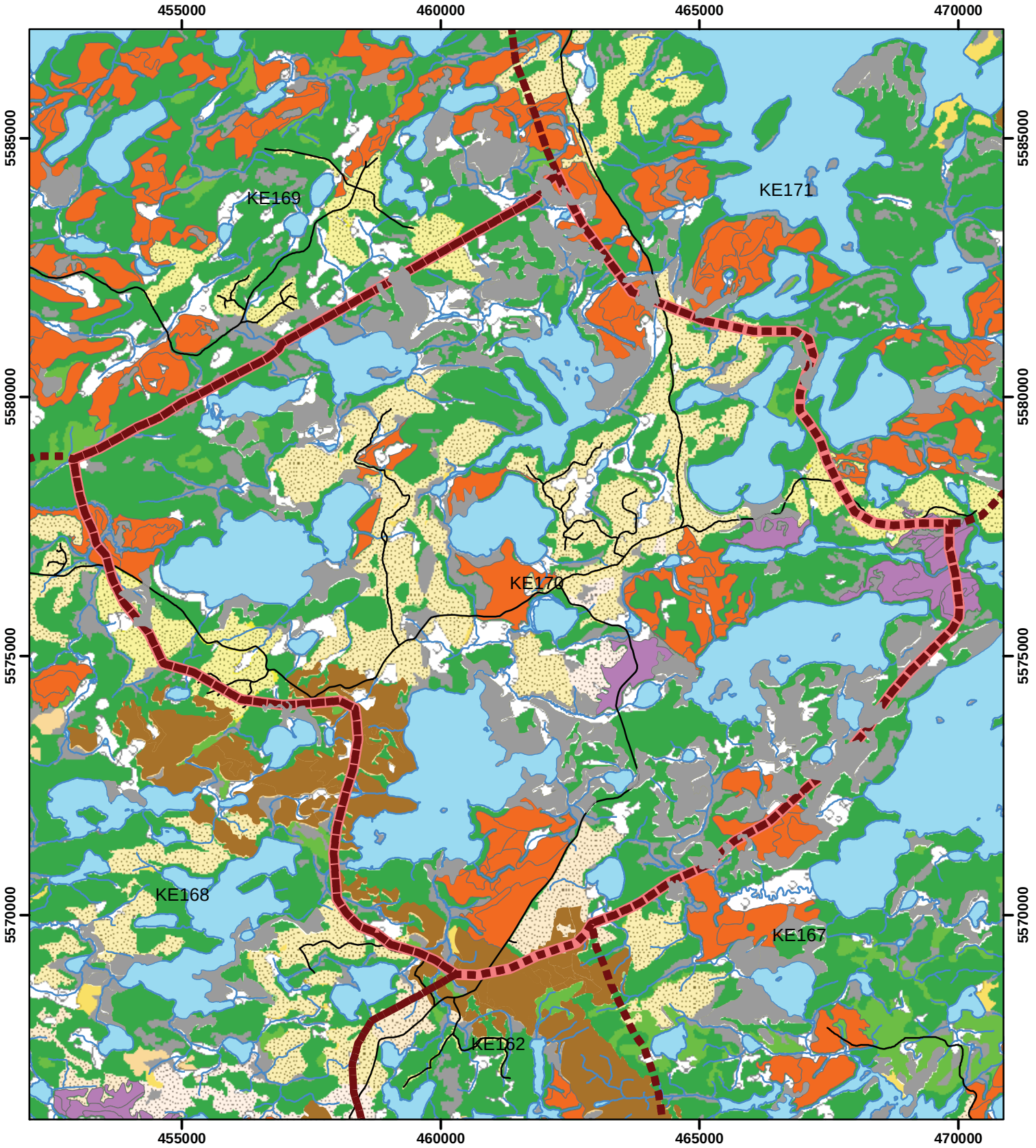
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.5 3 6 km

1:158,000

Planned and recent clearcut logging
Trapping Area KE170



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

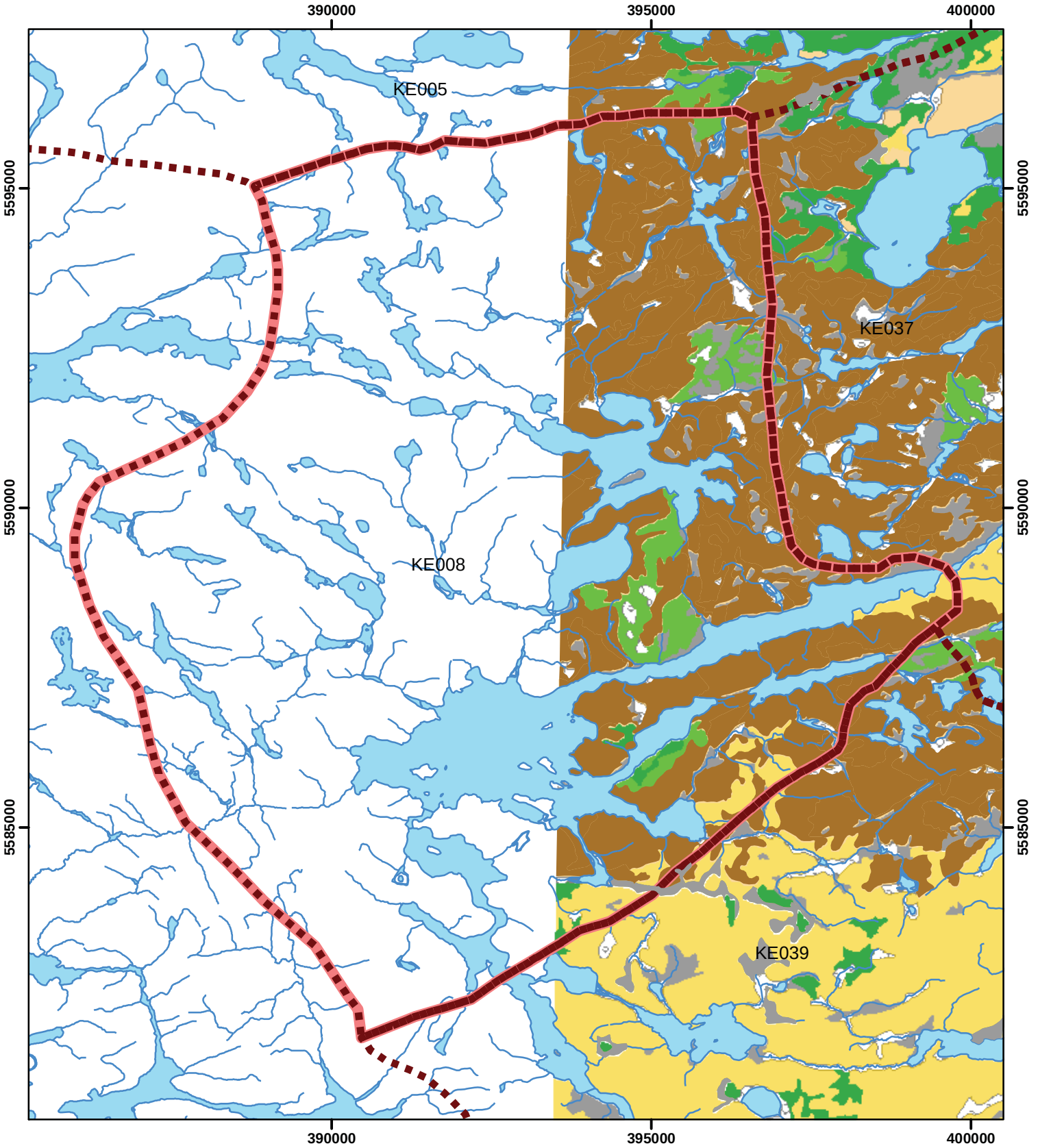
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

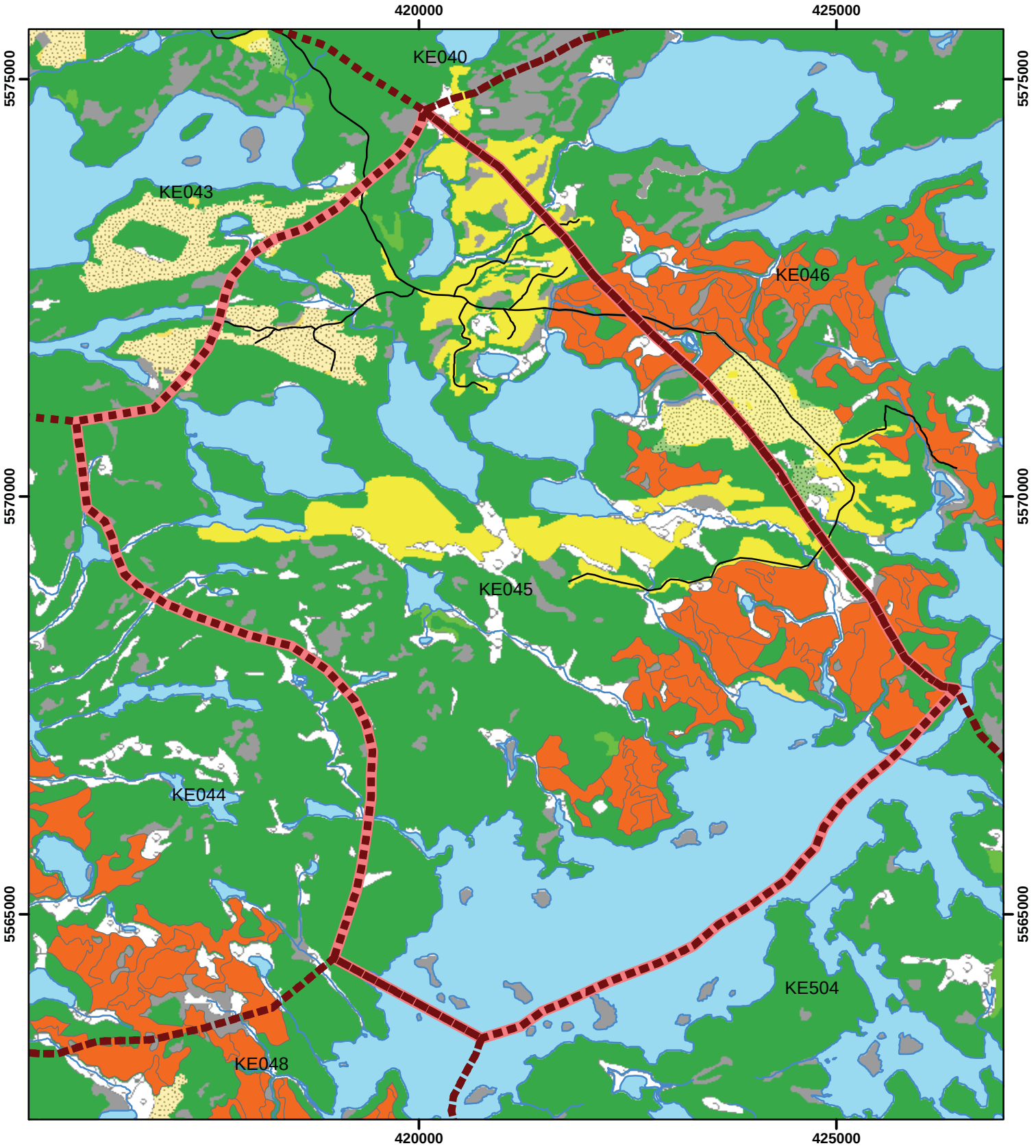
0 0.75 1.5 3 km

1:100,000

Planned and recent clearcut logging
Trapping Area KE008



Planned and recent clearcut logging
Trapping Area KE045



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

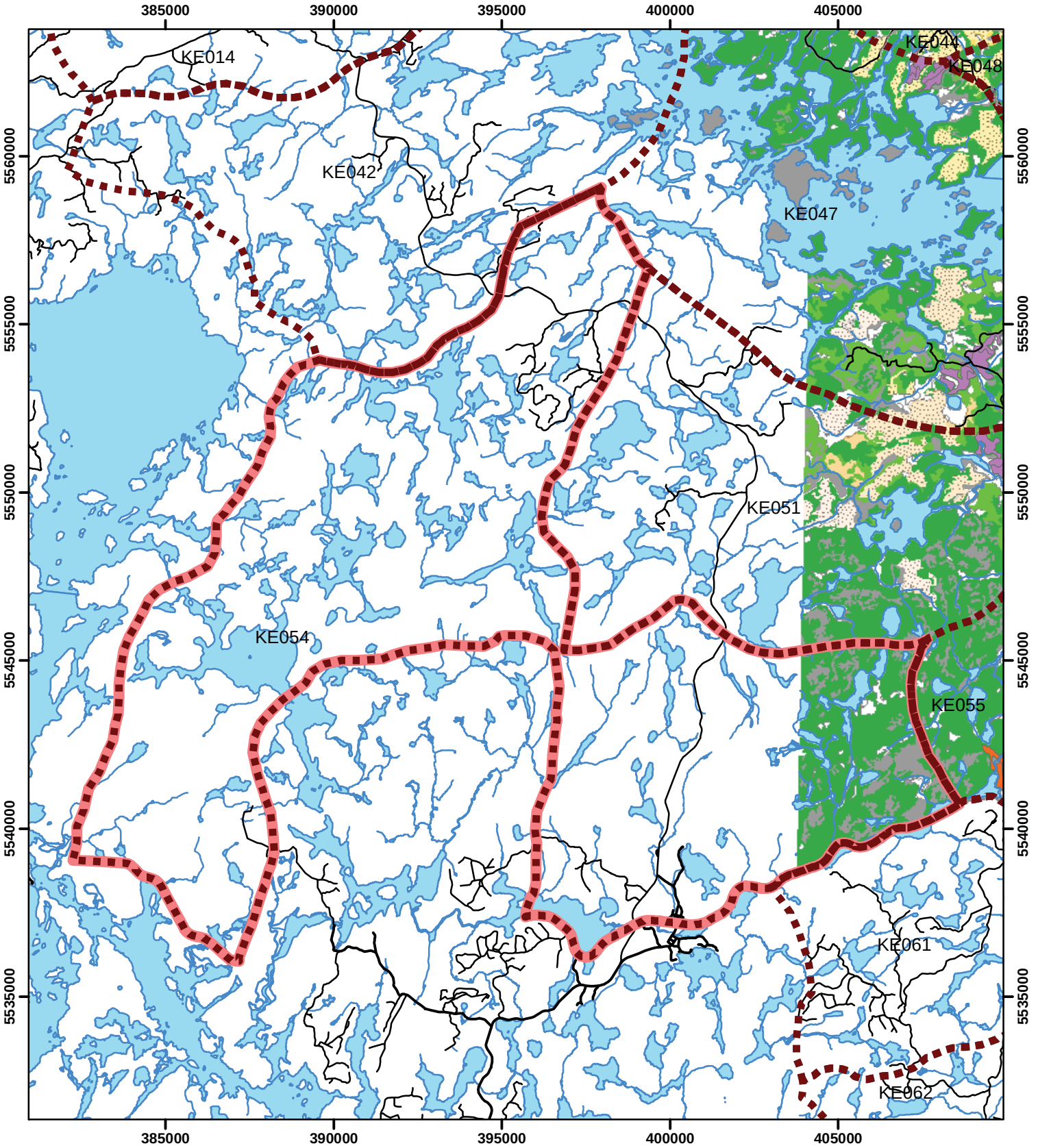
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

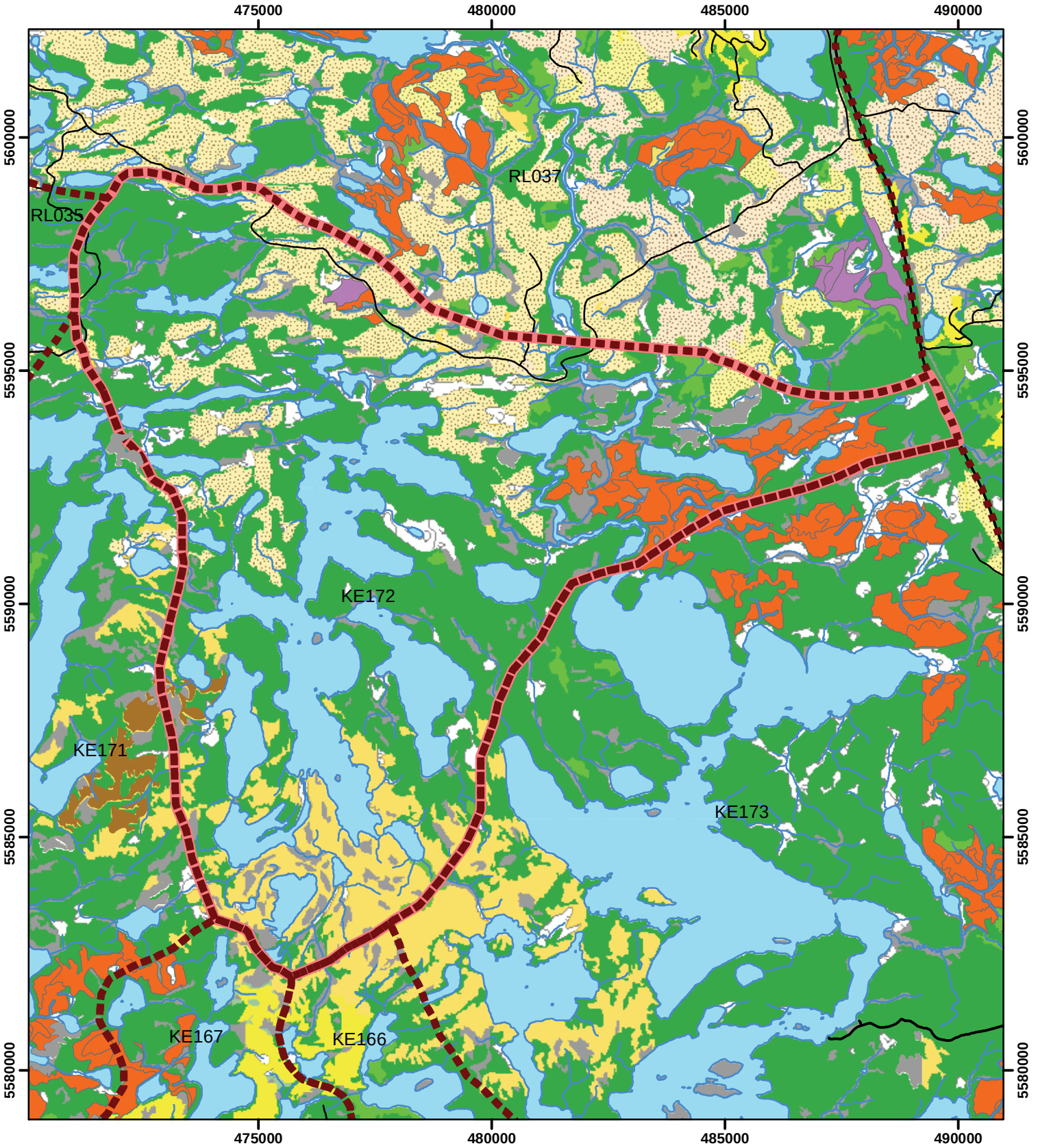
0 0.5 1 2 km

1:62,000

Planned and recent clearcut logging
Trapping Area KE054



Planned and recent clearcut logging
Trapping Area KE172



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

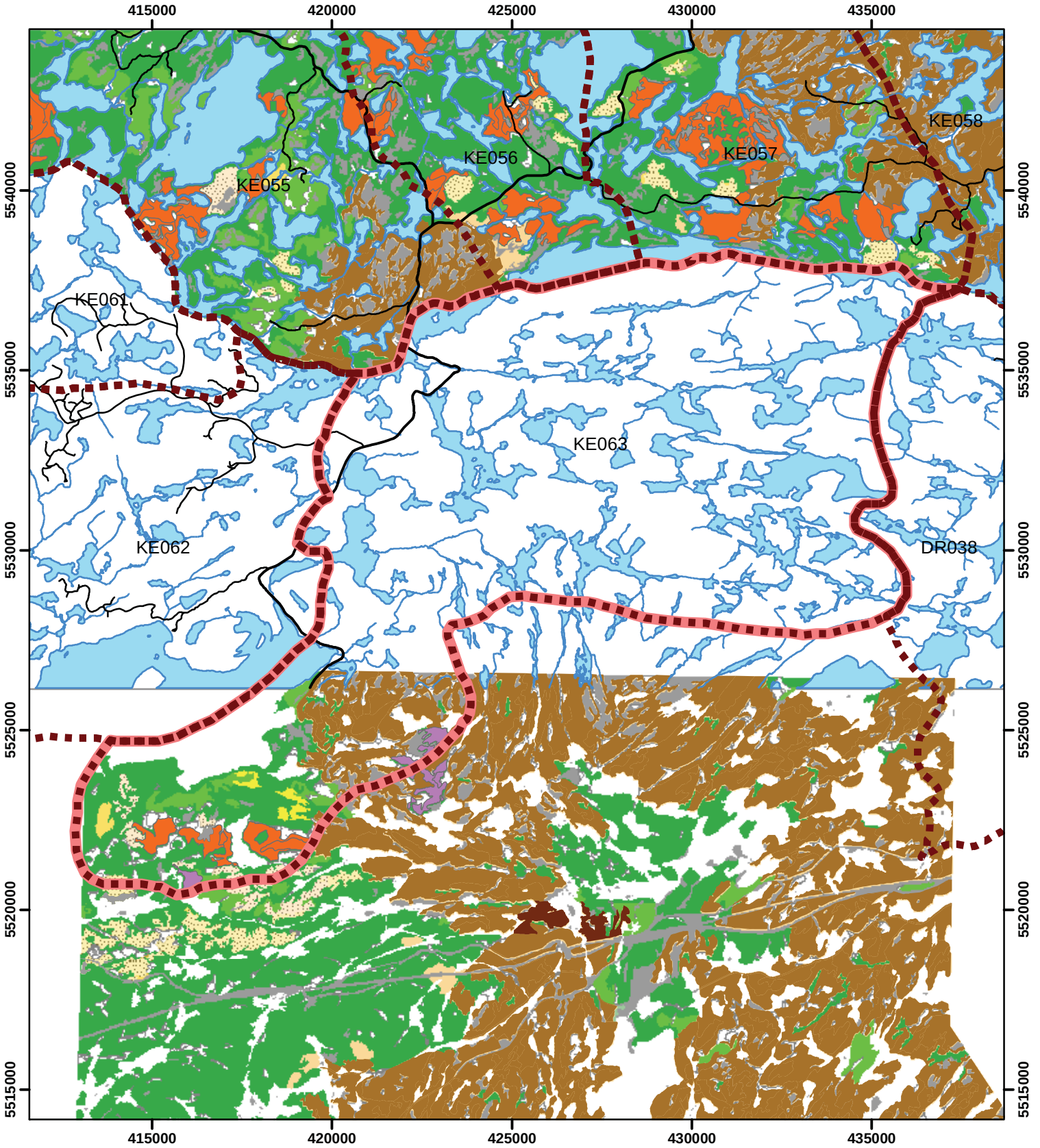
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:111,000

Planned and recent clearcut logging
Trapping Area KE063

2086



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

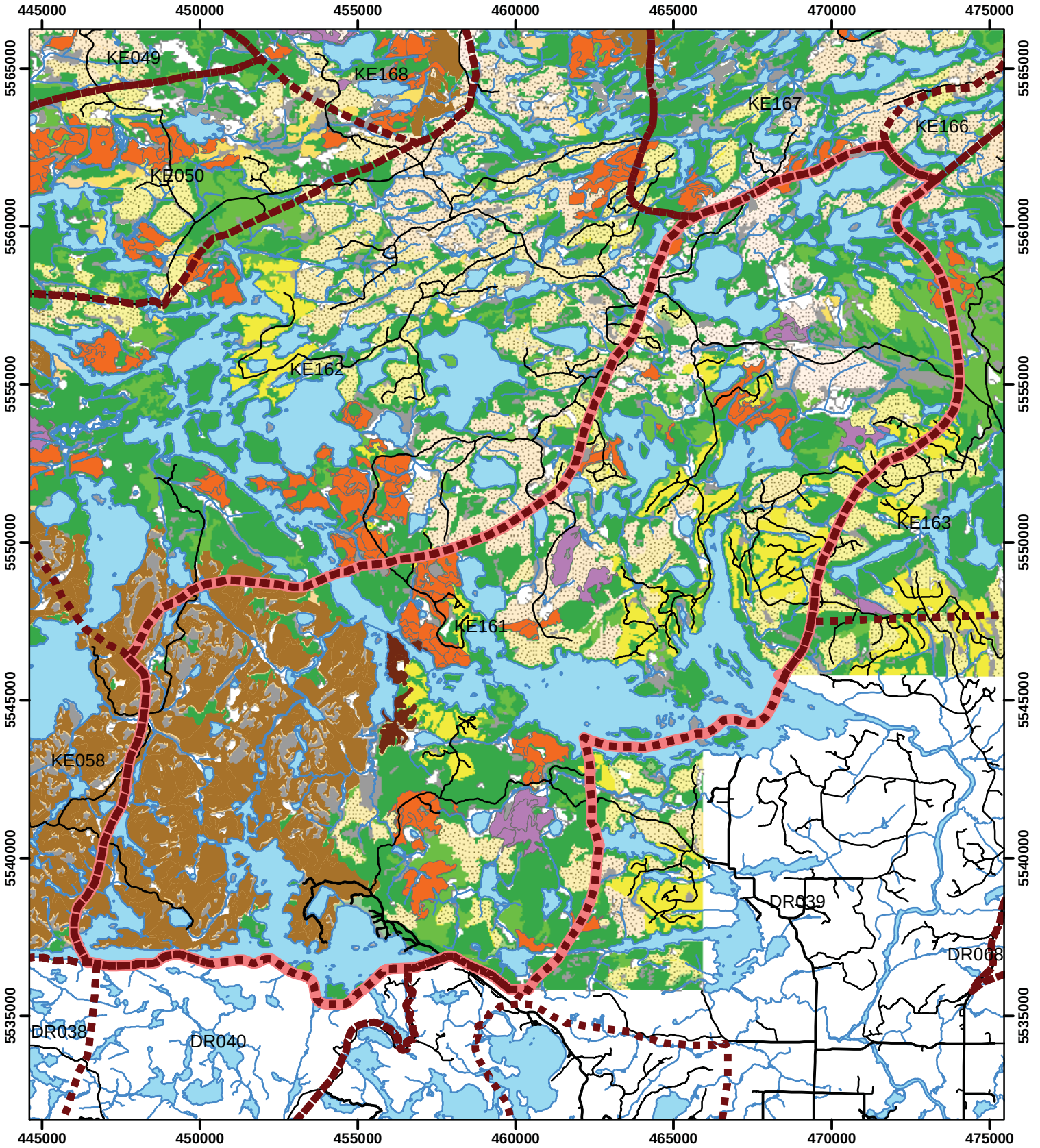
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:144,000

Planned and recent clearcut logging
Trapping Area KE161



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

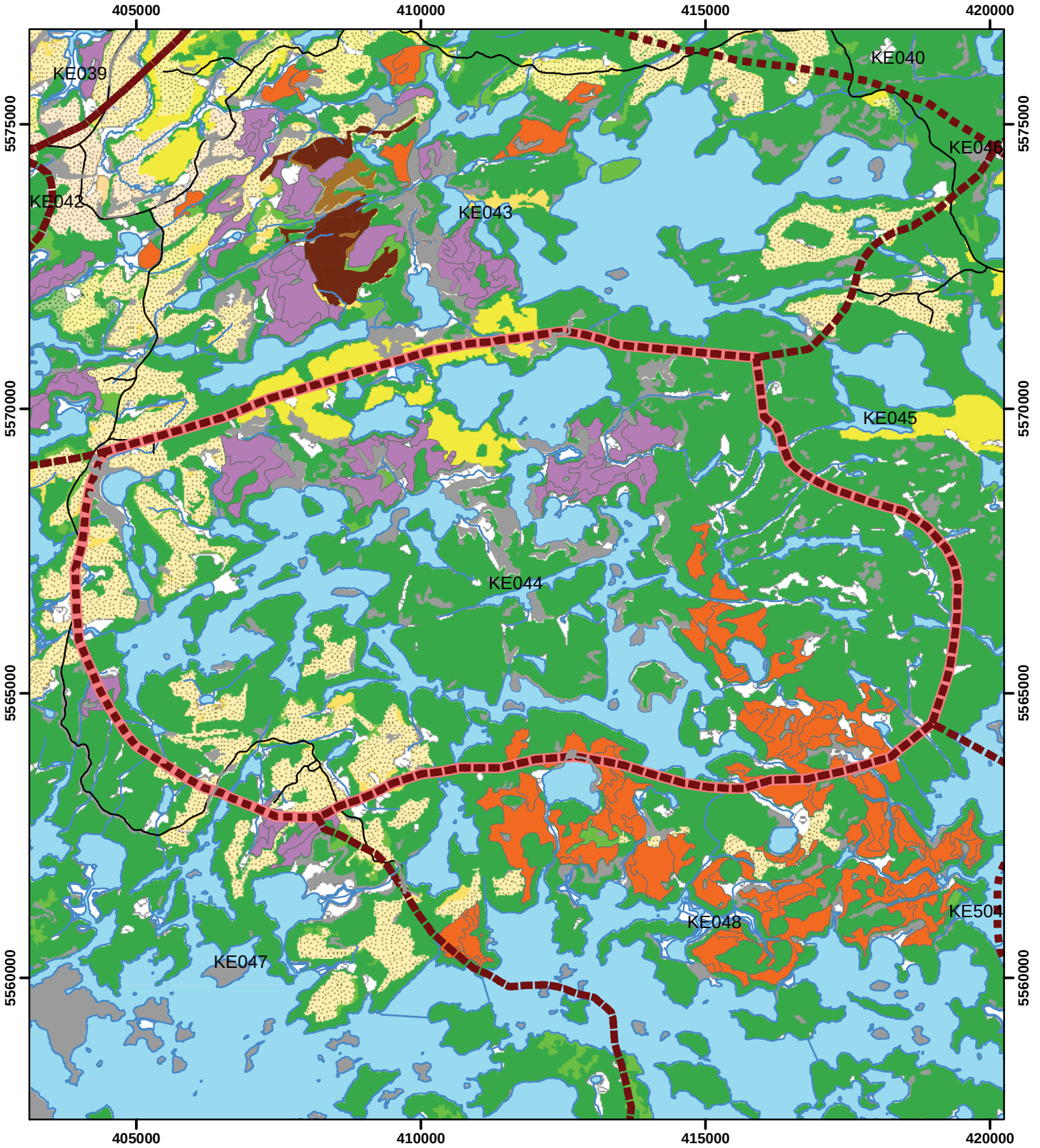
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.5 3 6 km

1:164,000

Planned and recent clearcut logging
Trapping Area KE044

2088



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

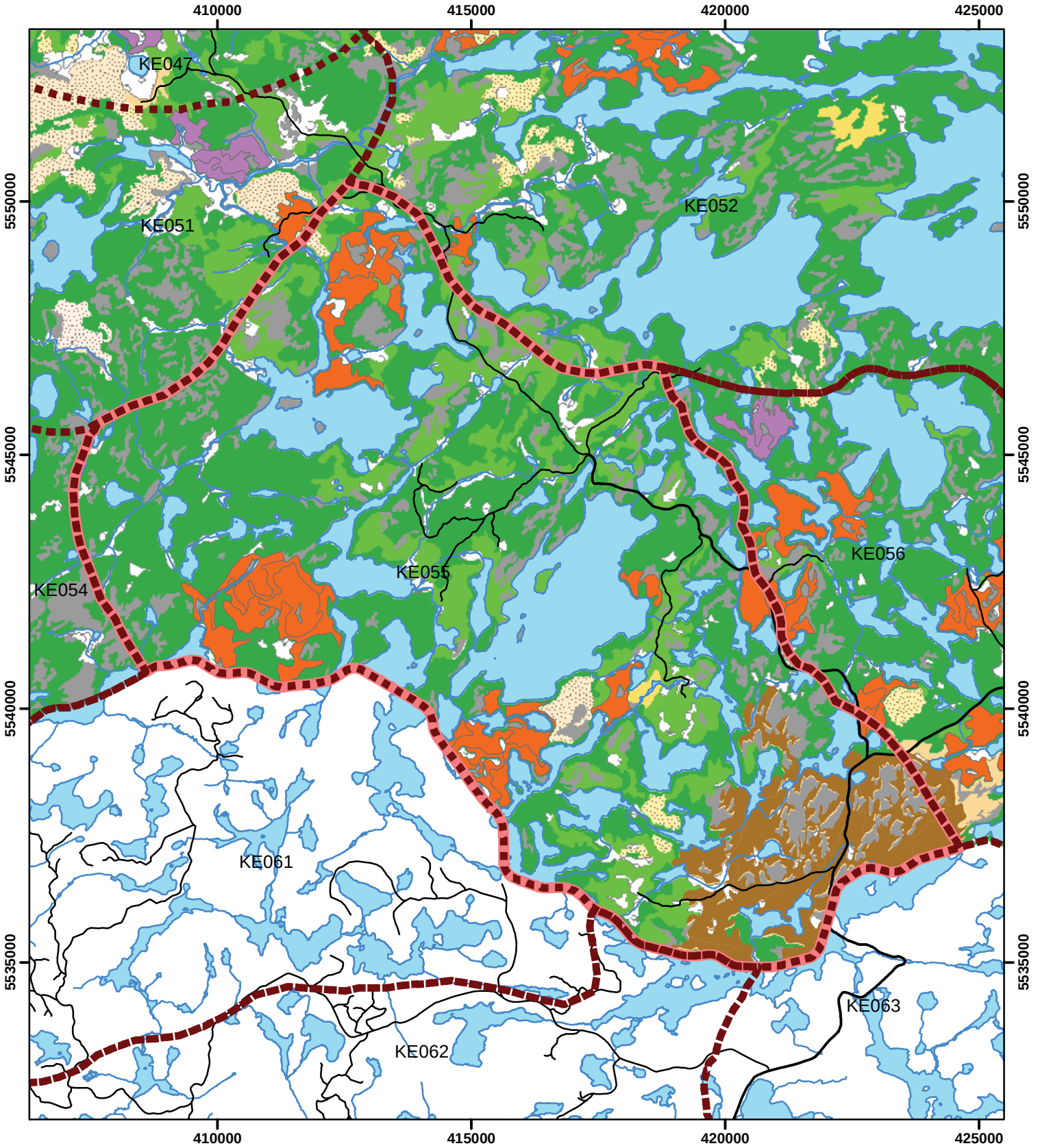
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:91,000

Planned and recent clearcut logging
Trapping Area KE055



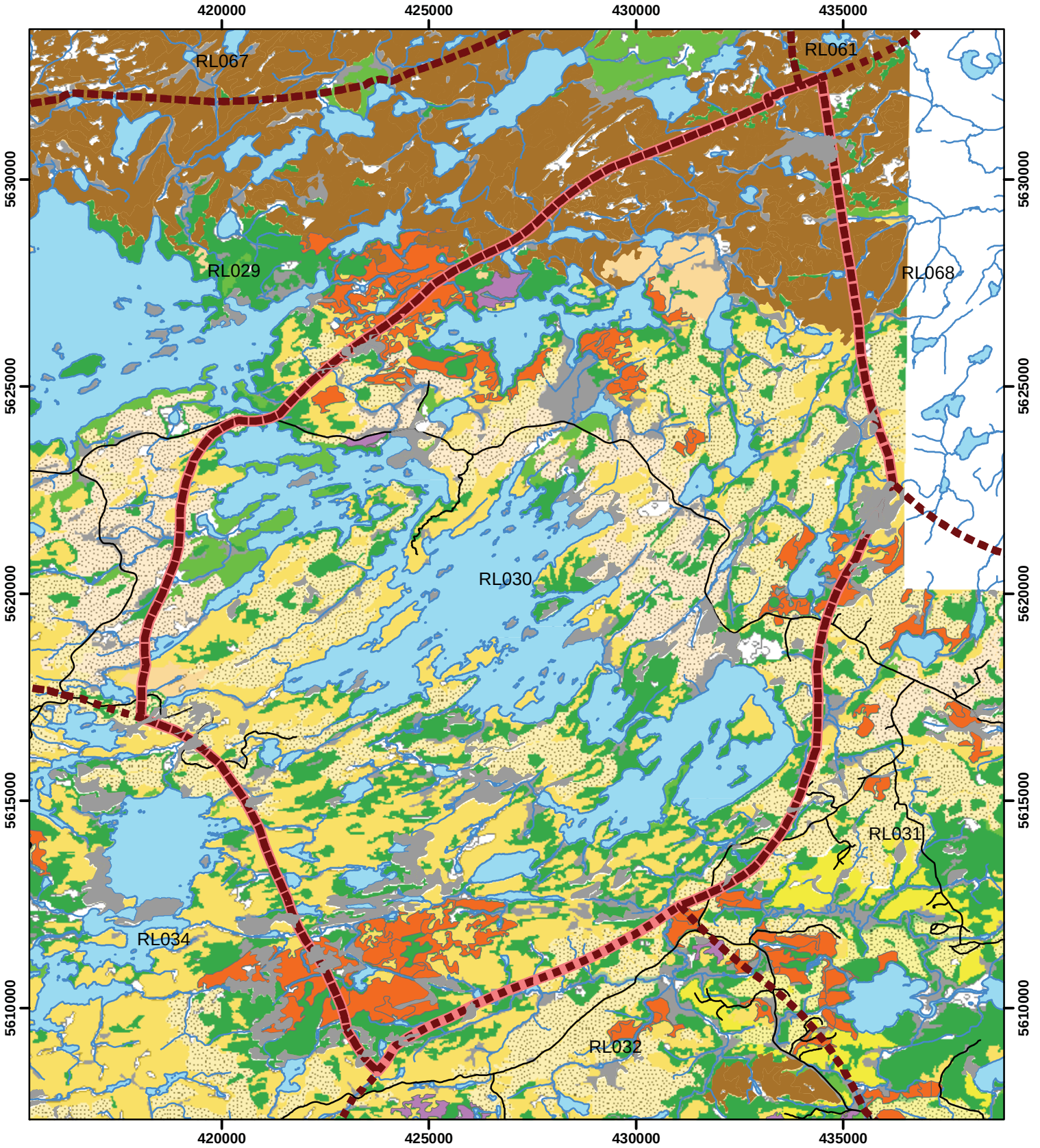
Trapping Area Boundaries
Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:102,000

Planned and recent clearcut logging
Trapping Area RL030

2090



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

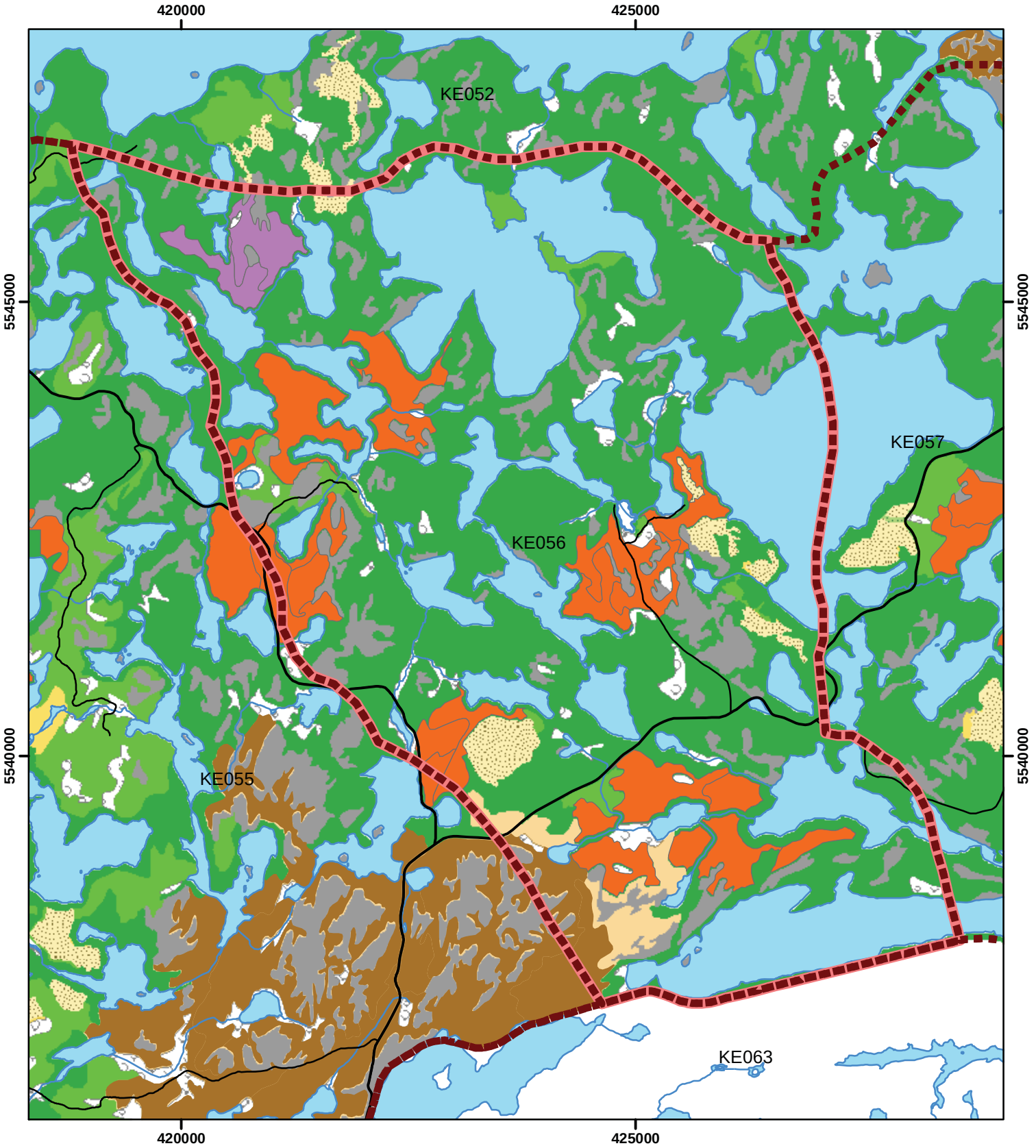
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:125,000

Planned and recent clearcut logging
Trapping Area KE056



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

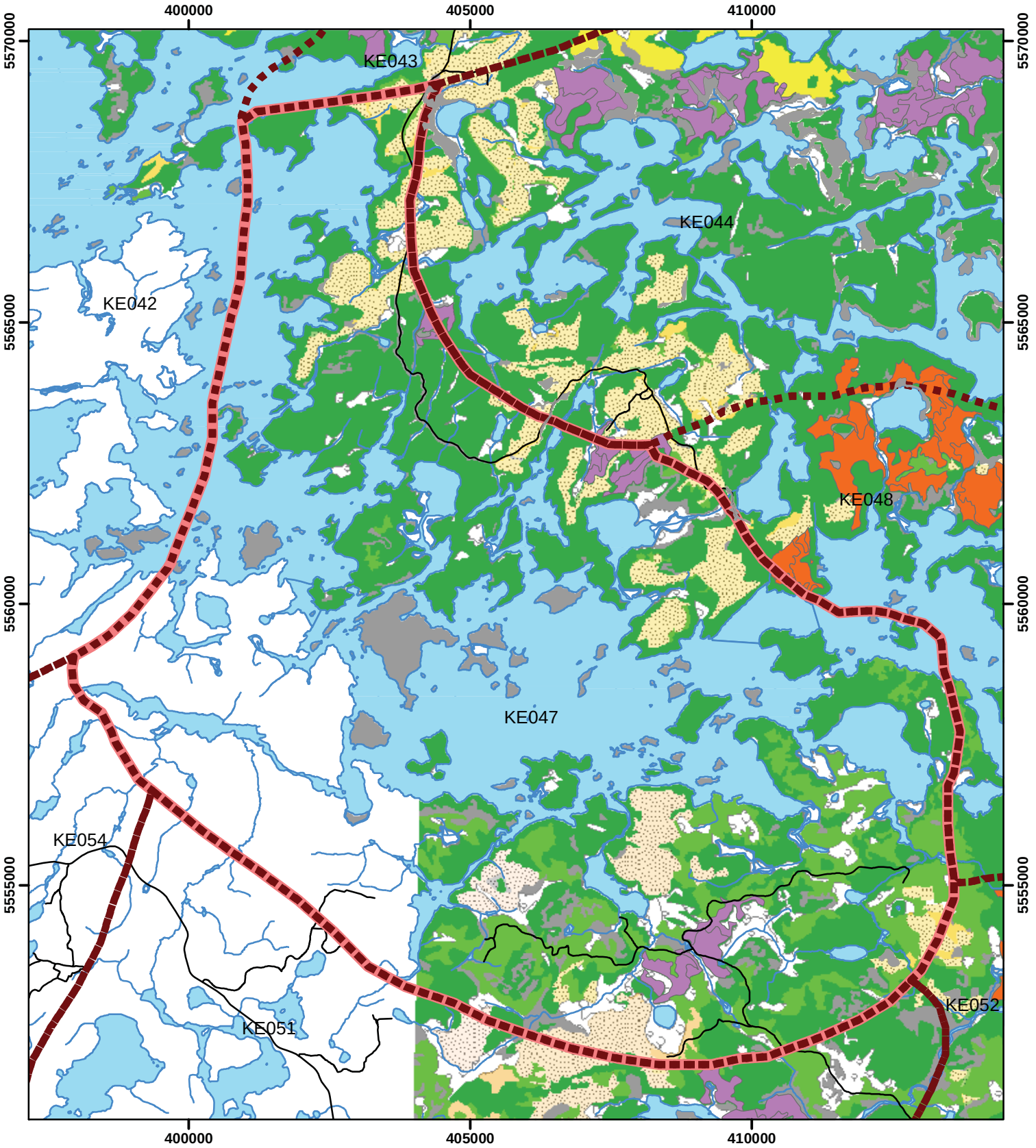
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

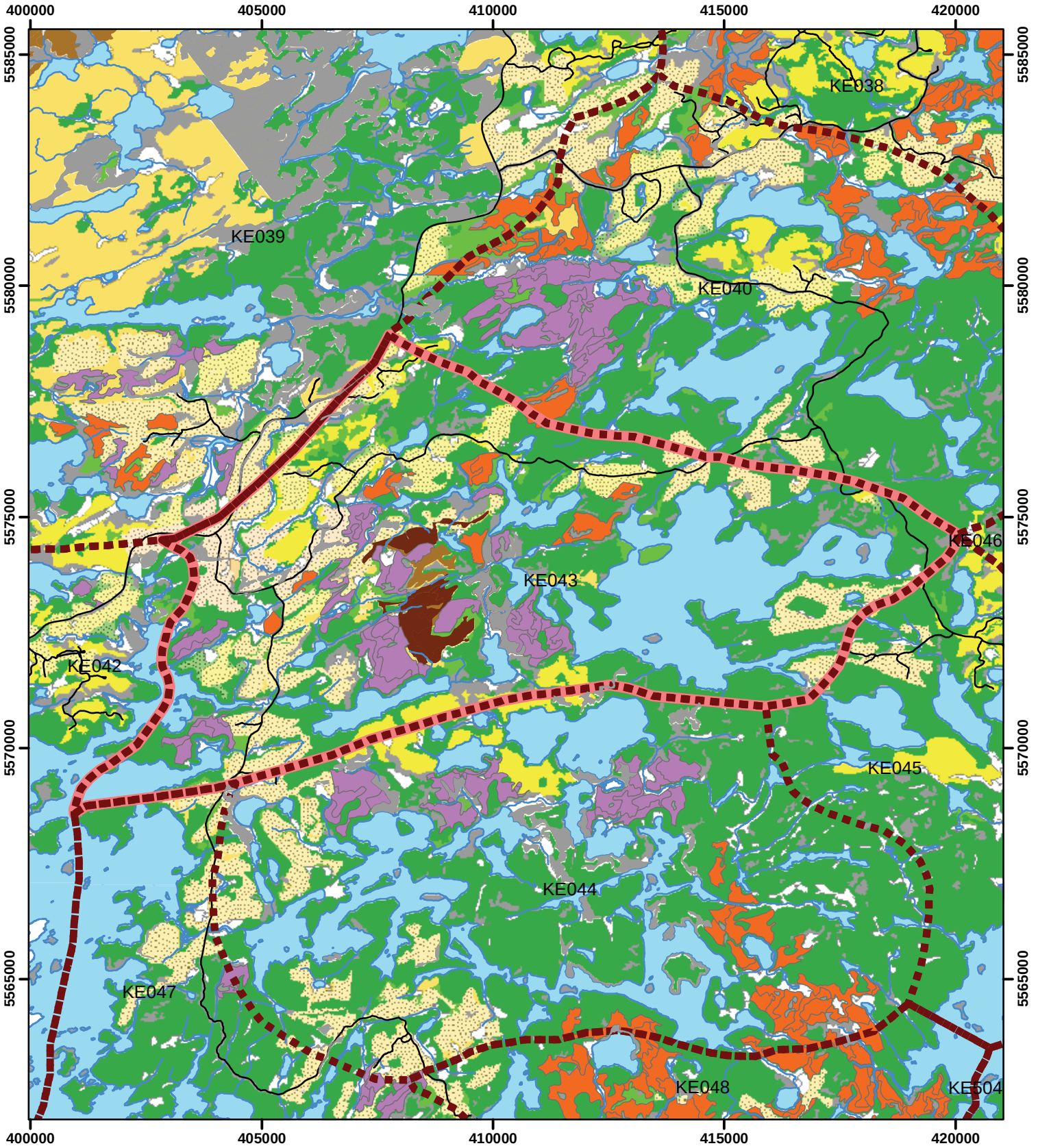
0 0.5 1 2 km

1:57,000

Planned and recent clearcut logging
Trapping Area KE047



Planned and recent clearcut logging
Trapping Area KE043



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

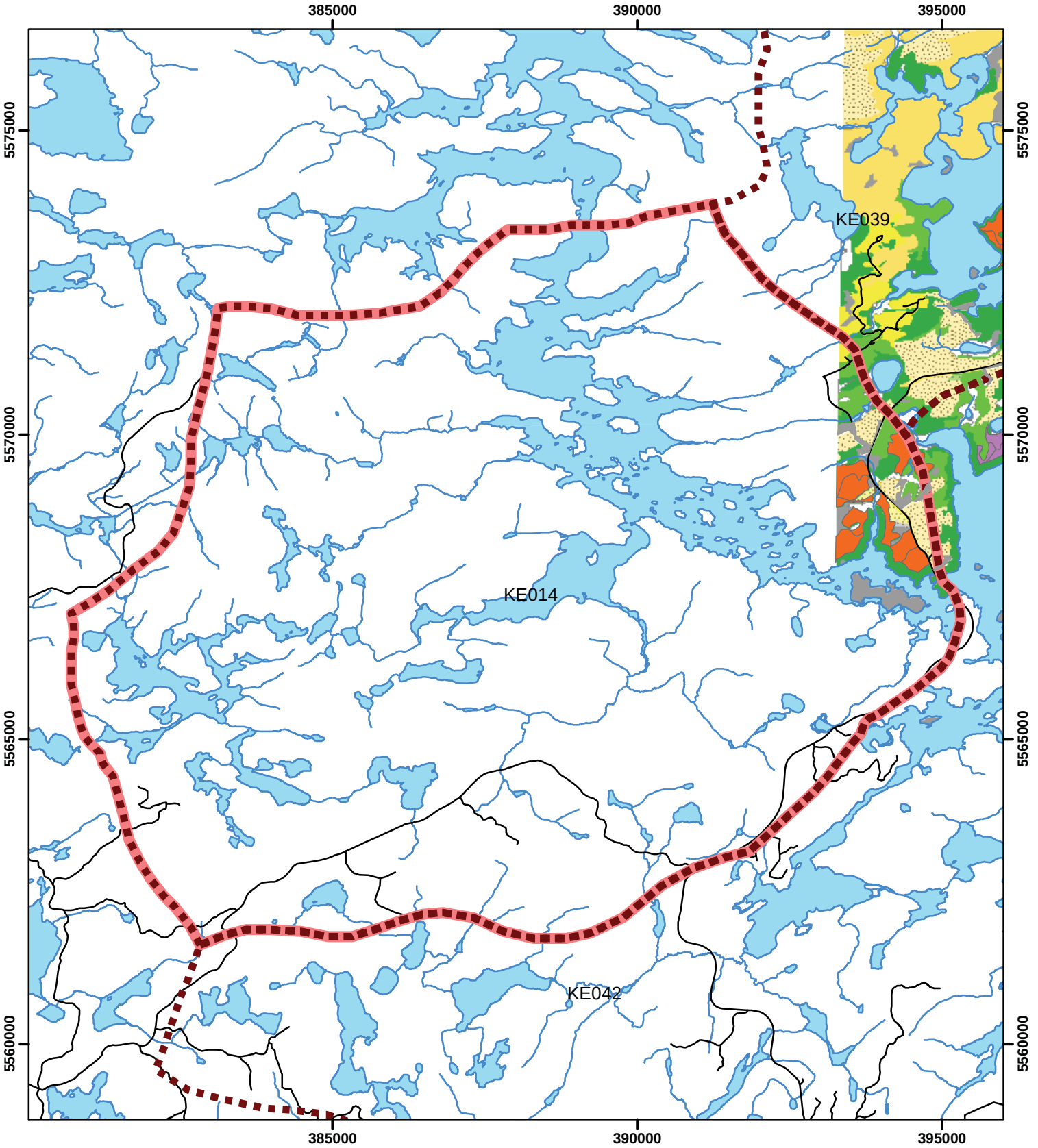
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:112,000

Planned and recent clearcut logging
Trapping Area KE014



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

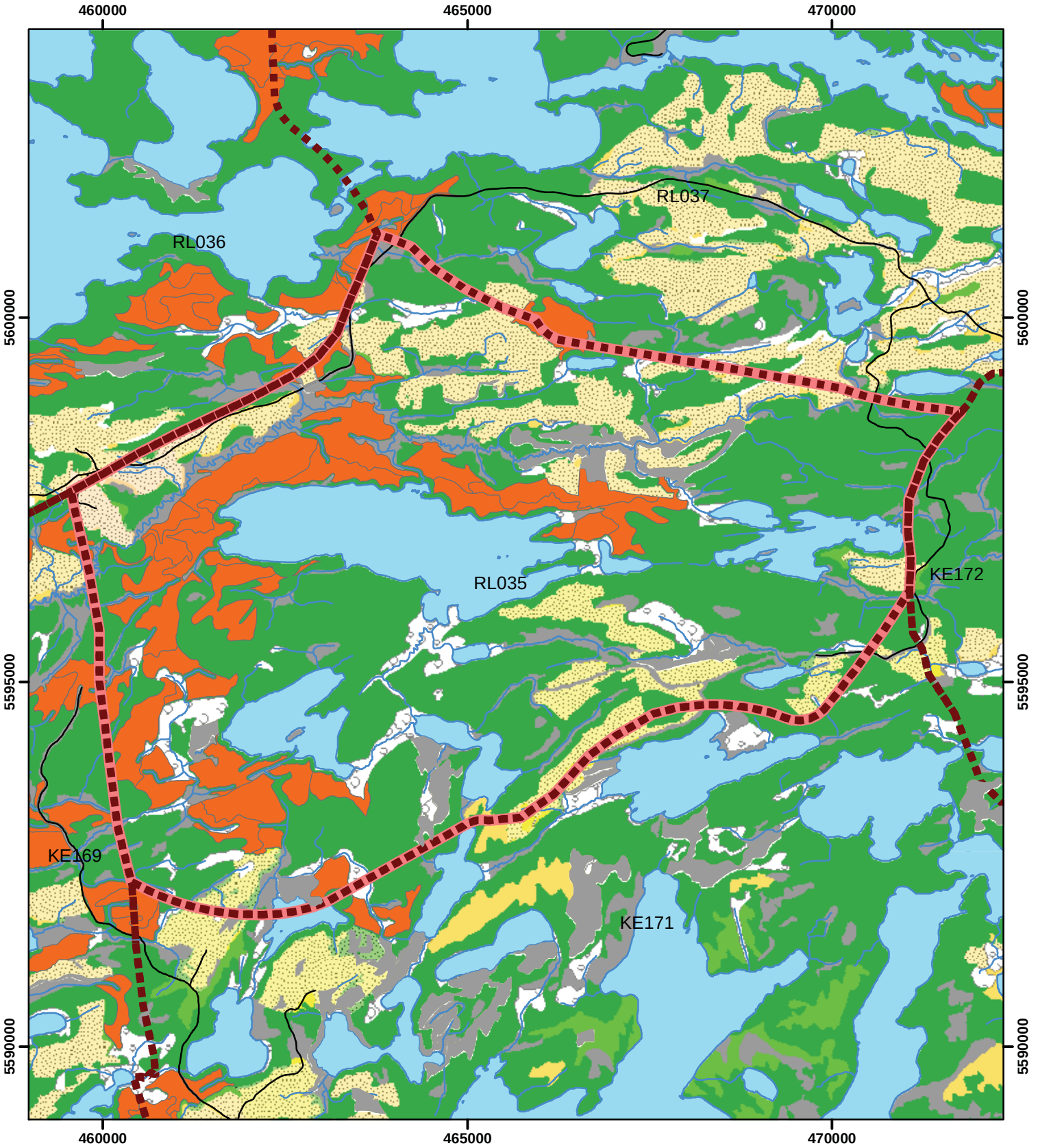
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:85,000

Planned and recent clearcut logging
Trapping Area RL035



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

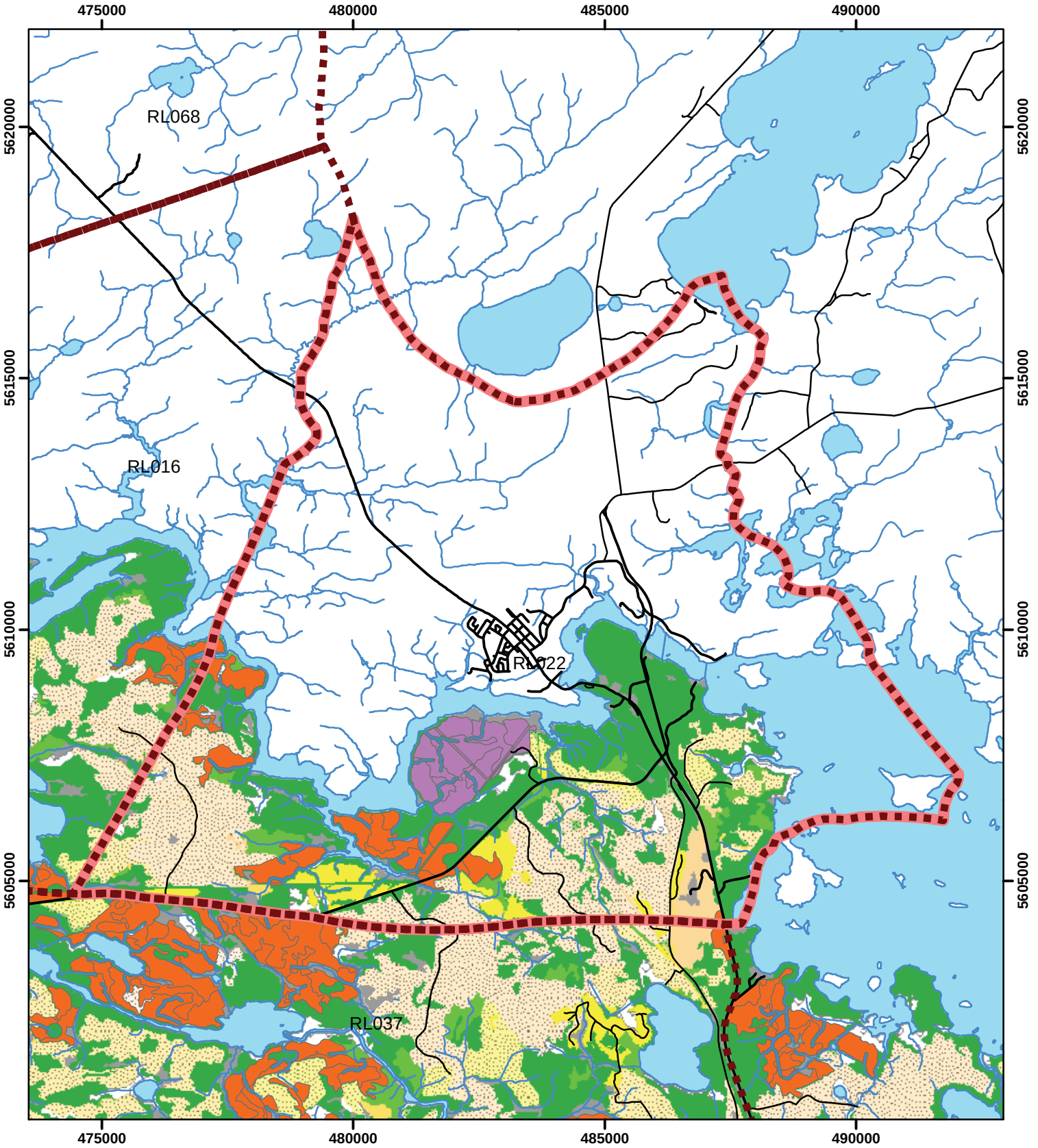
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.5 1 2 km

1:71,000

Planned and recent clearcut logging
Trapping Area RL022

2096



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

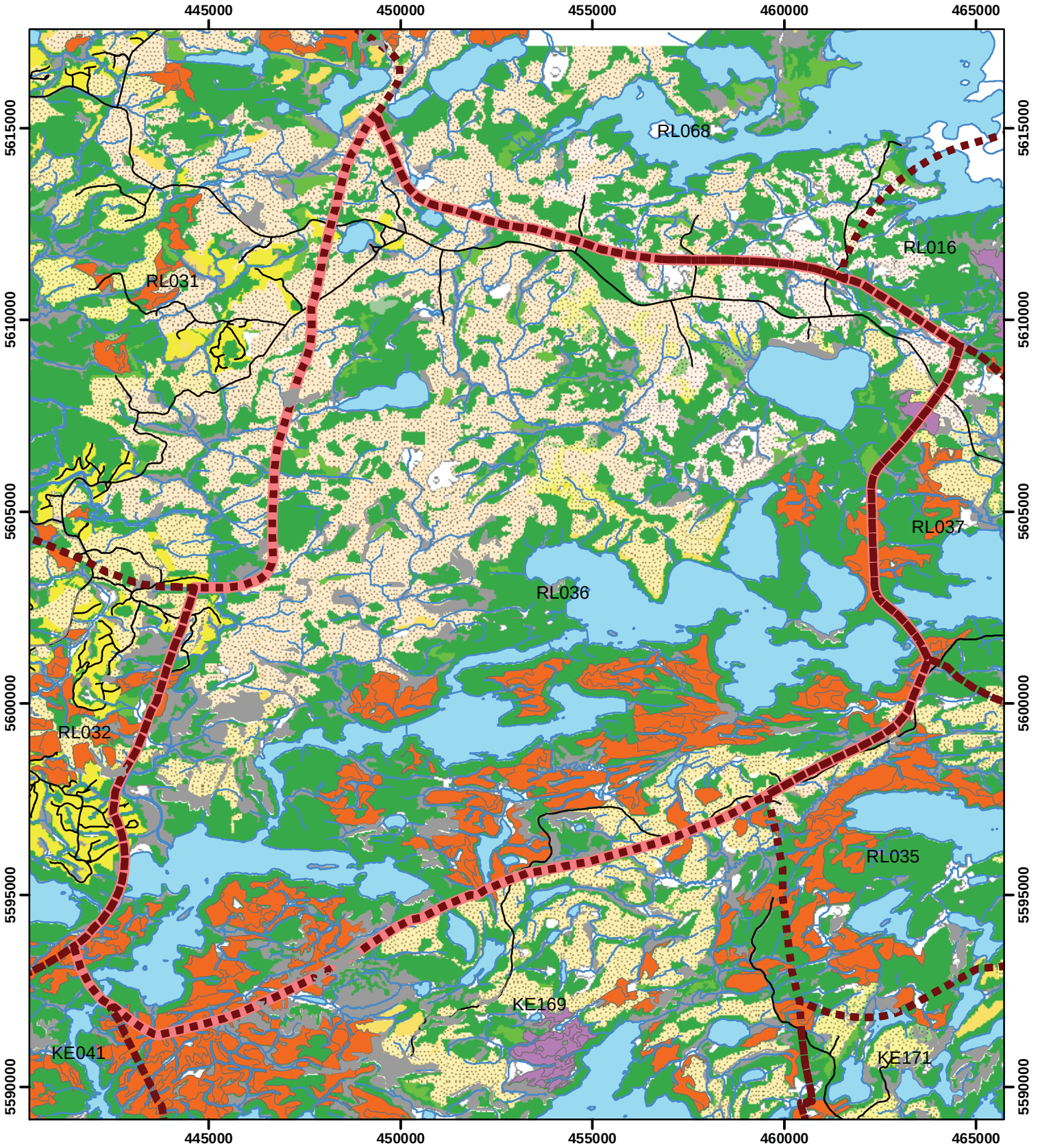
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:103,000

Planned and recent clearcut logging
Trapping Area RL036



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

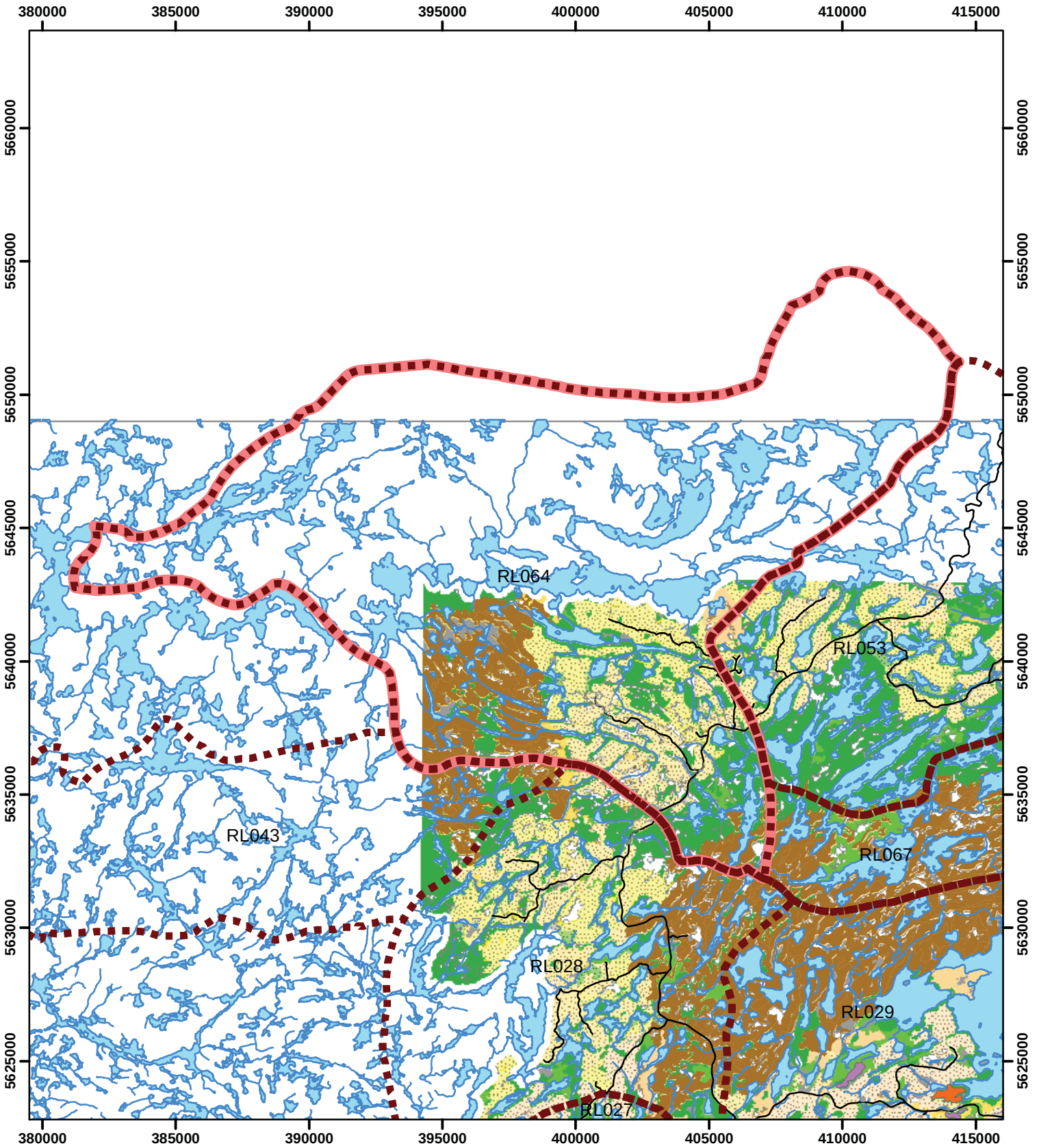
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:135,000

Planned and recent clearcut logging
Trapping Area RL064



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

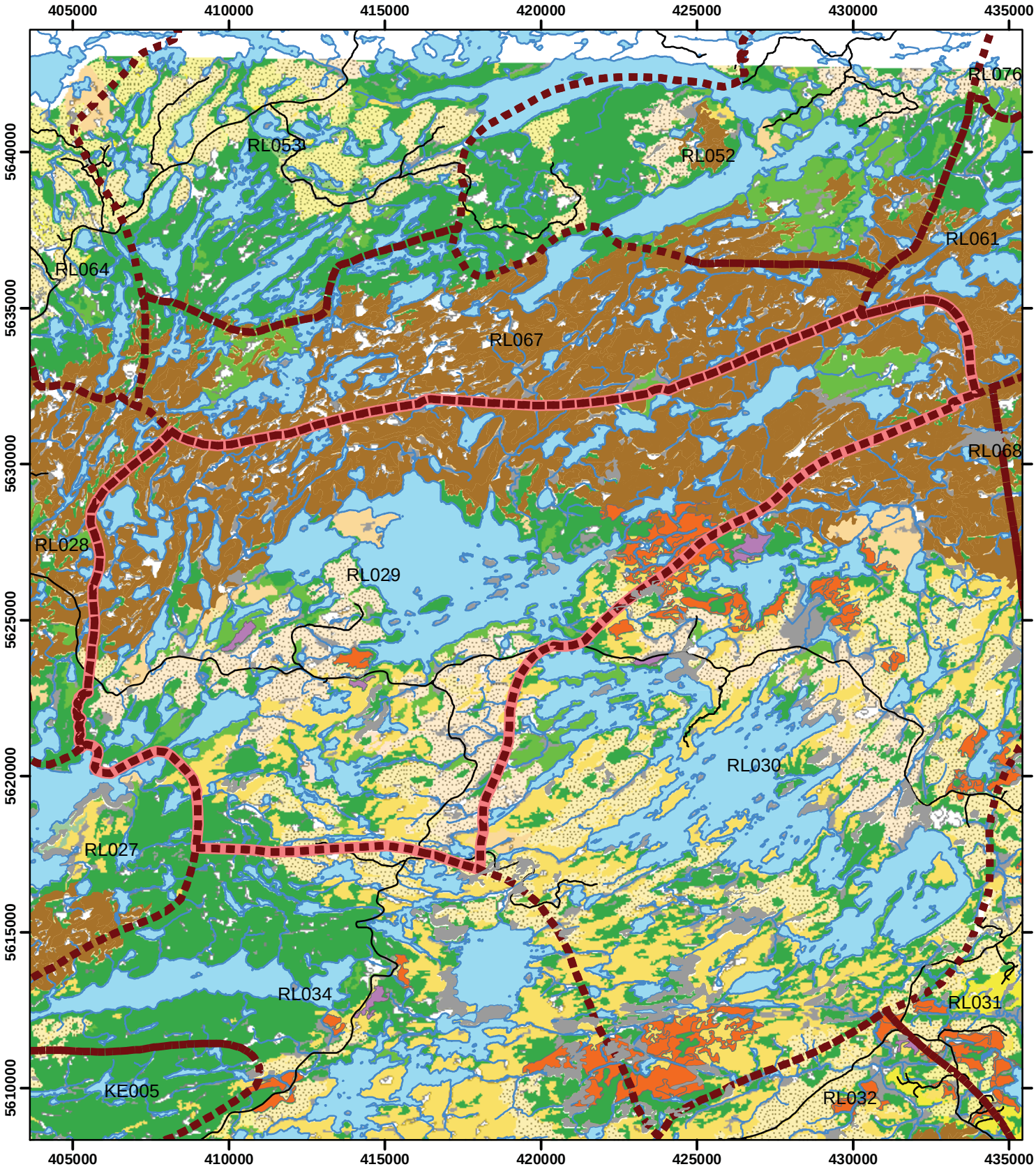
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.75 3.5 7 km

1:194,000

Planned and recent clearcut logging
Trapping Area RL029



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

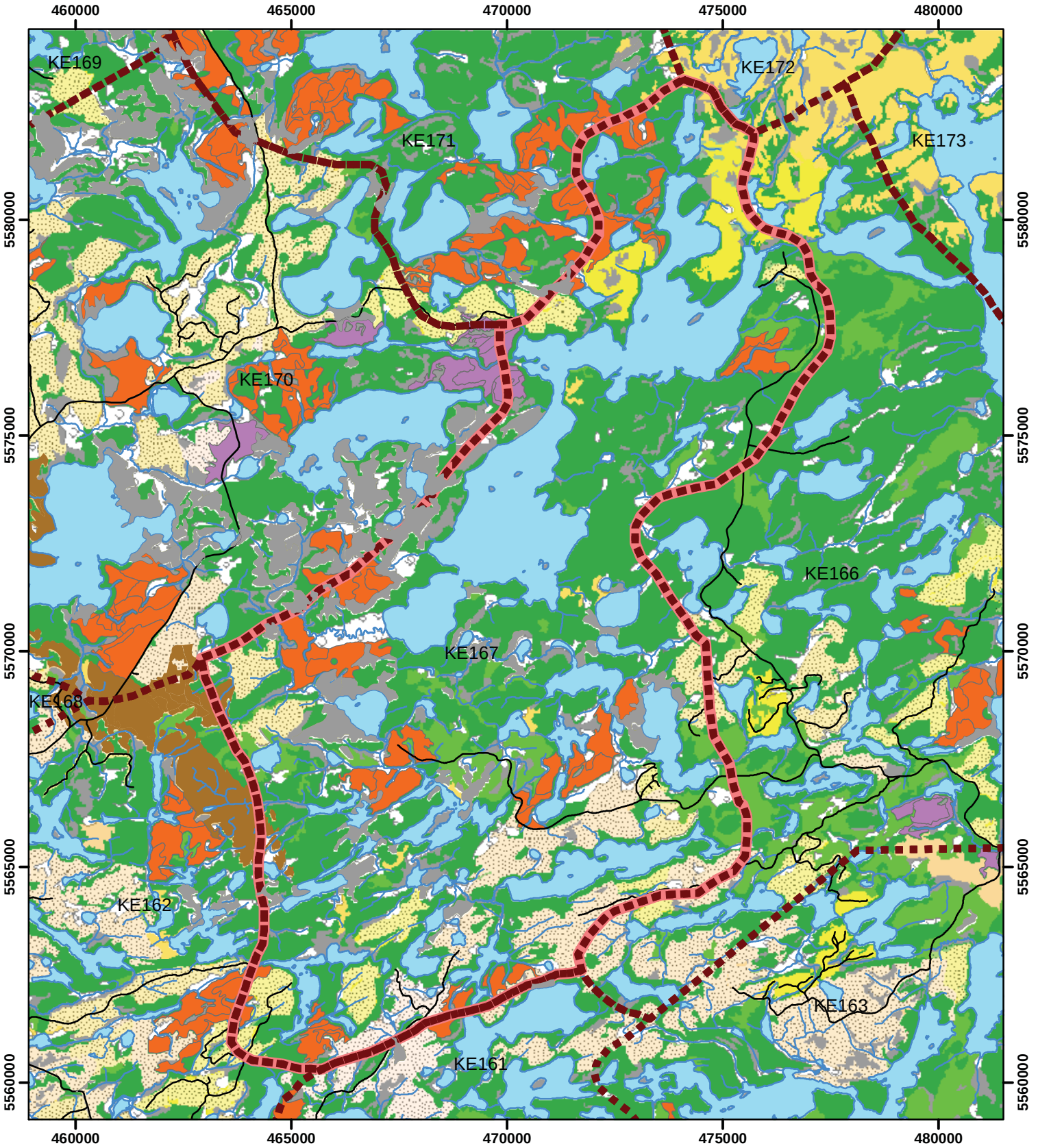
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.5 3 6 km

1:169,000

Planned and recent clearcut logging
Trapping Area KE167



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

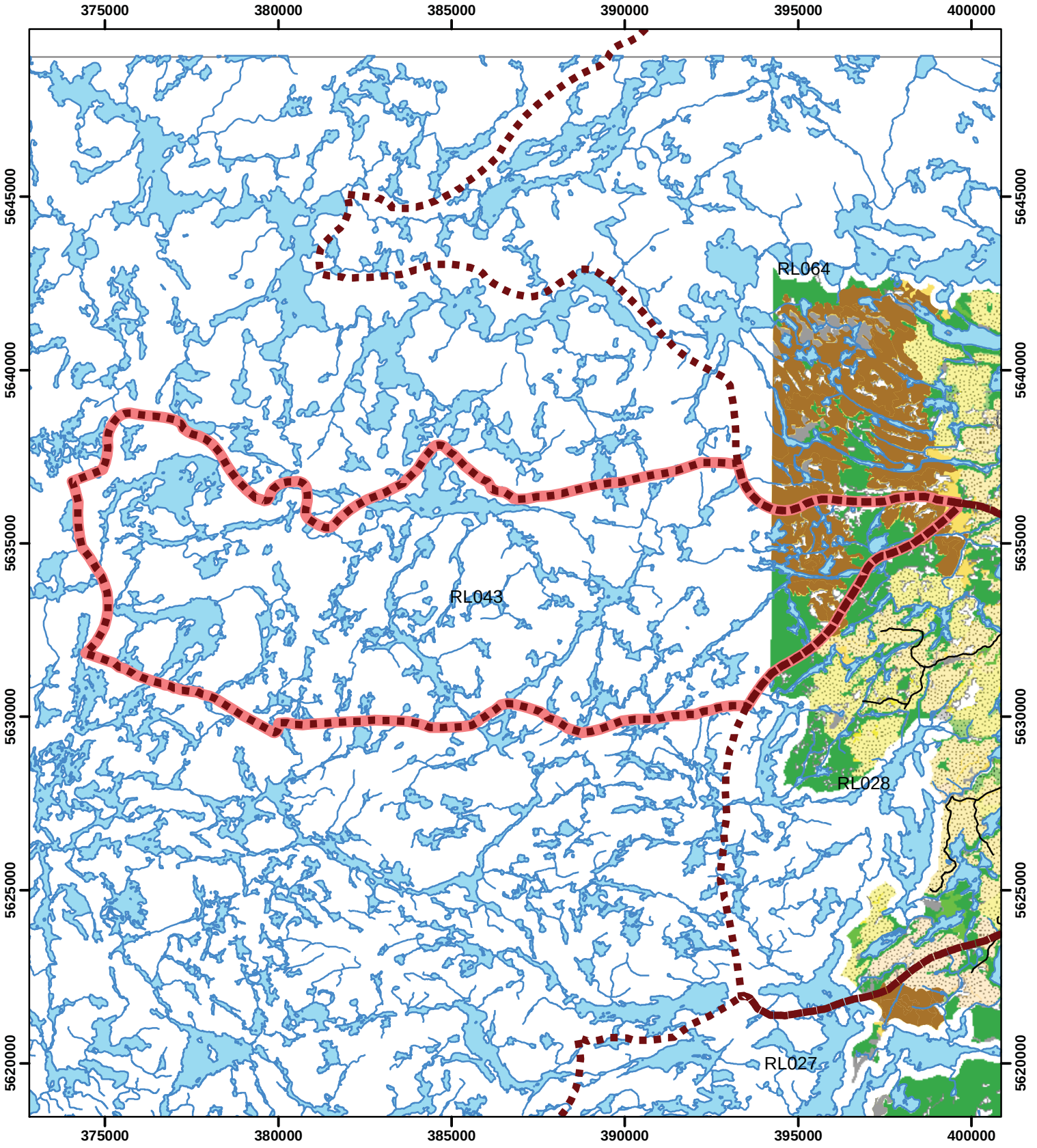
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:120,000

Planned and recent clearcut logging
Trapping Area RL043

2101 3 1



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

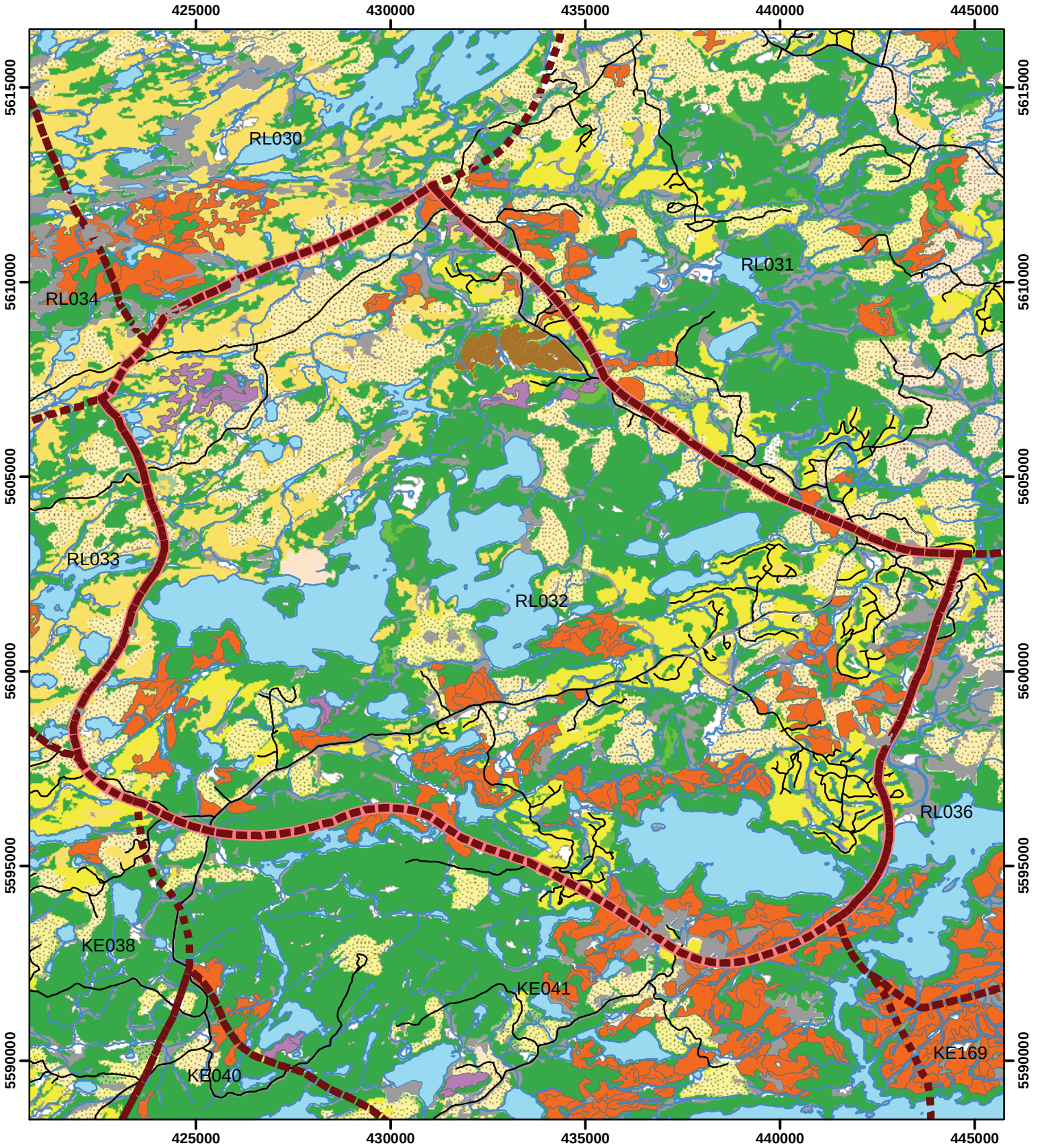
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:149,000

Planned and recent clearcut logging
Trapping Area RL032



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

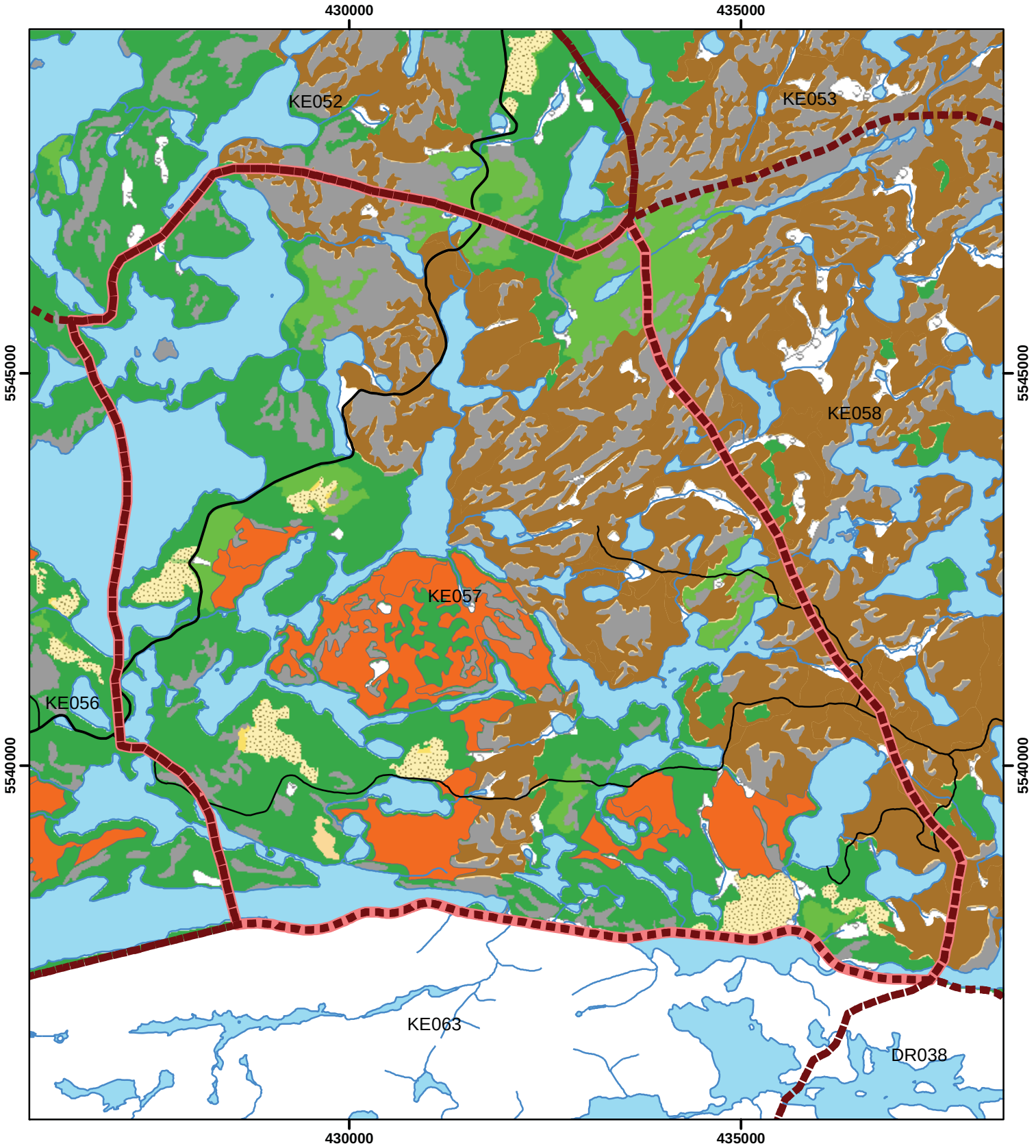
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:133,000

Planned and recent clearcut logging
Trapping Area KE057



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

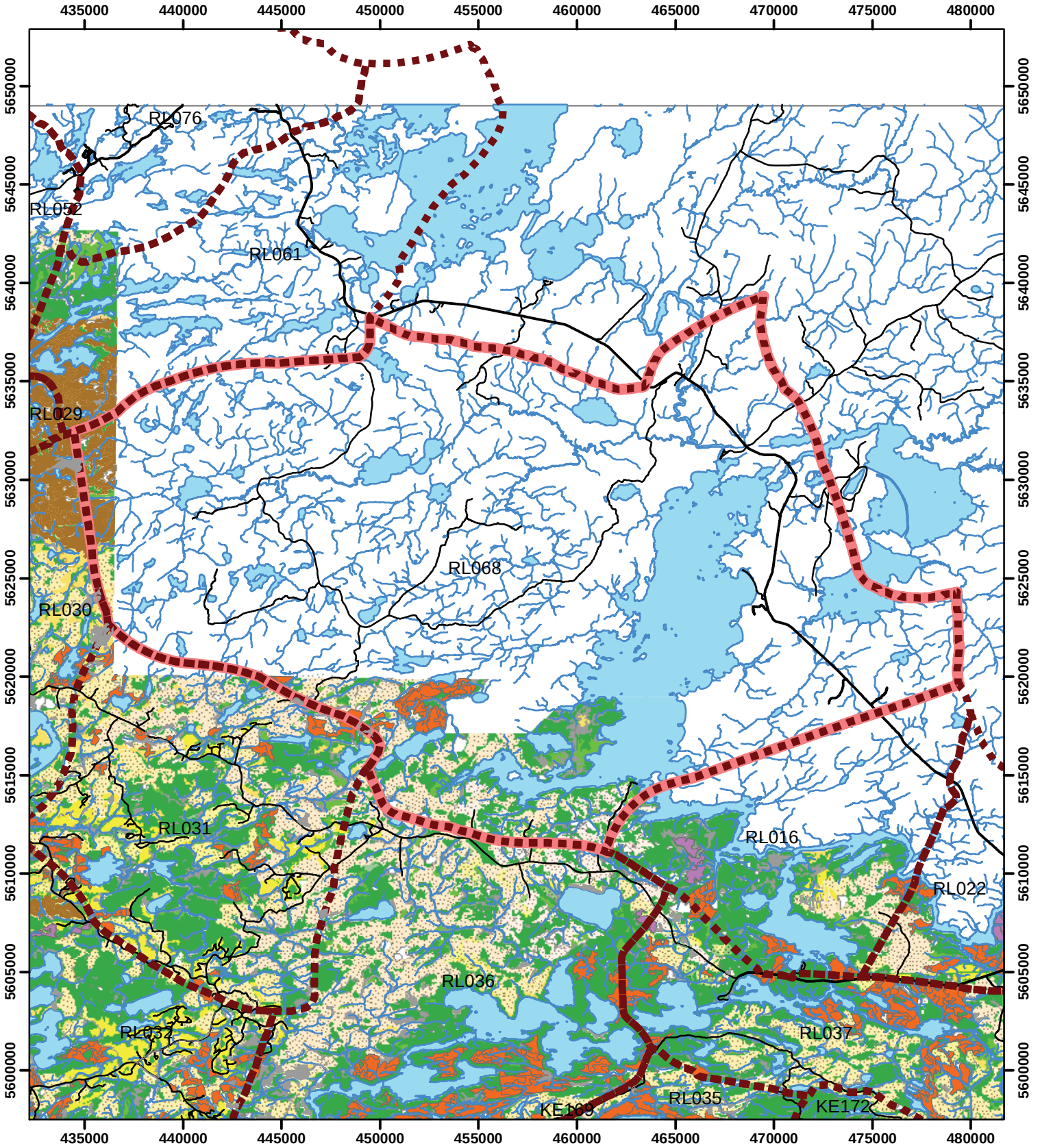
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.5 1 2 km

1:66,000

Planned and recent clearcut logging
Trapping Area RL068



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

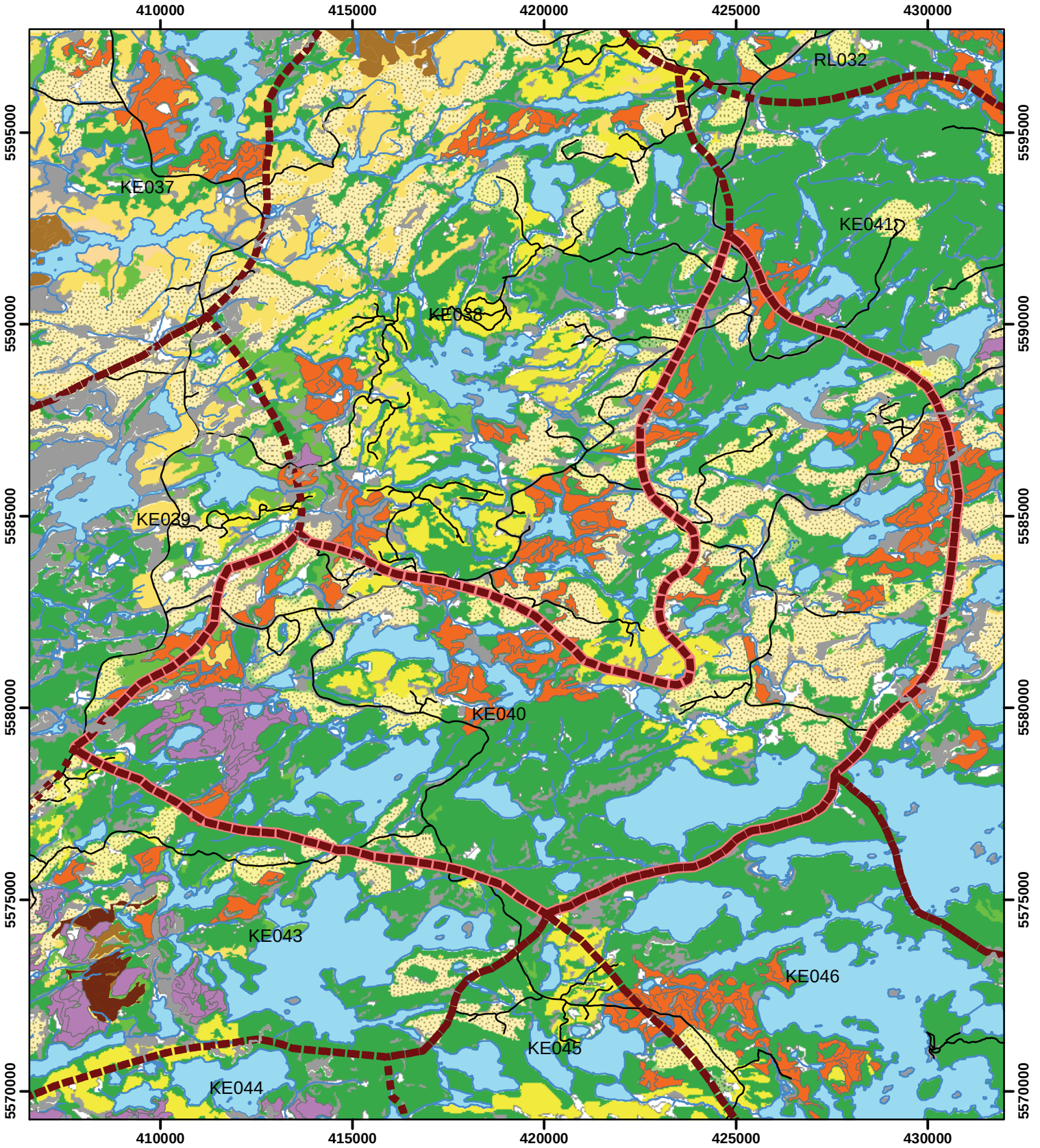
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 2.5 5 10 km

1:263,000

Planned and recent clearcut logging
Trapping Area KE040



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

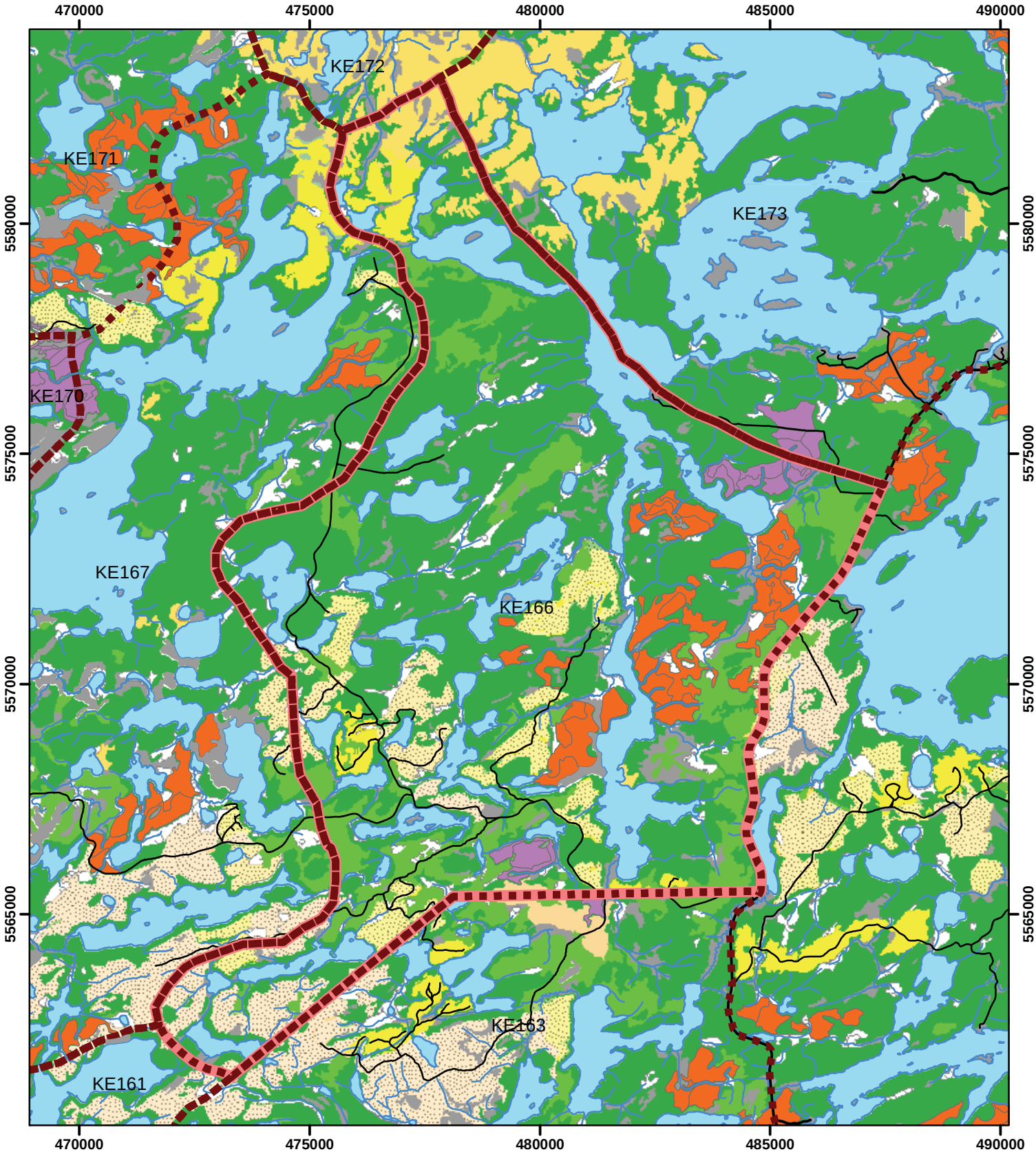
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:135,000

Planned and recent clearcut logging
Trapping Area KE166



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

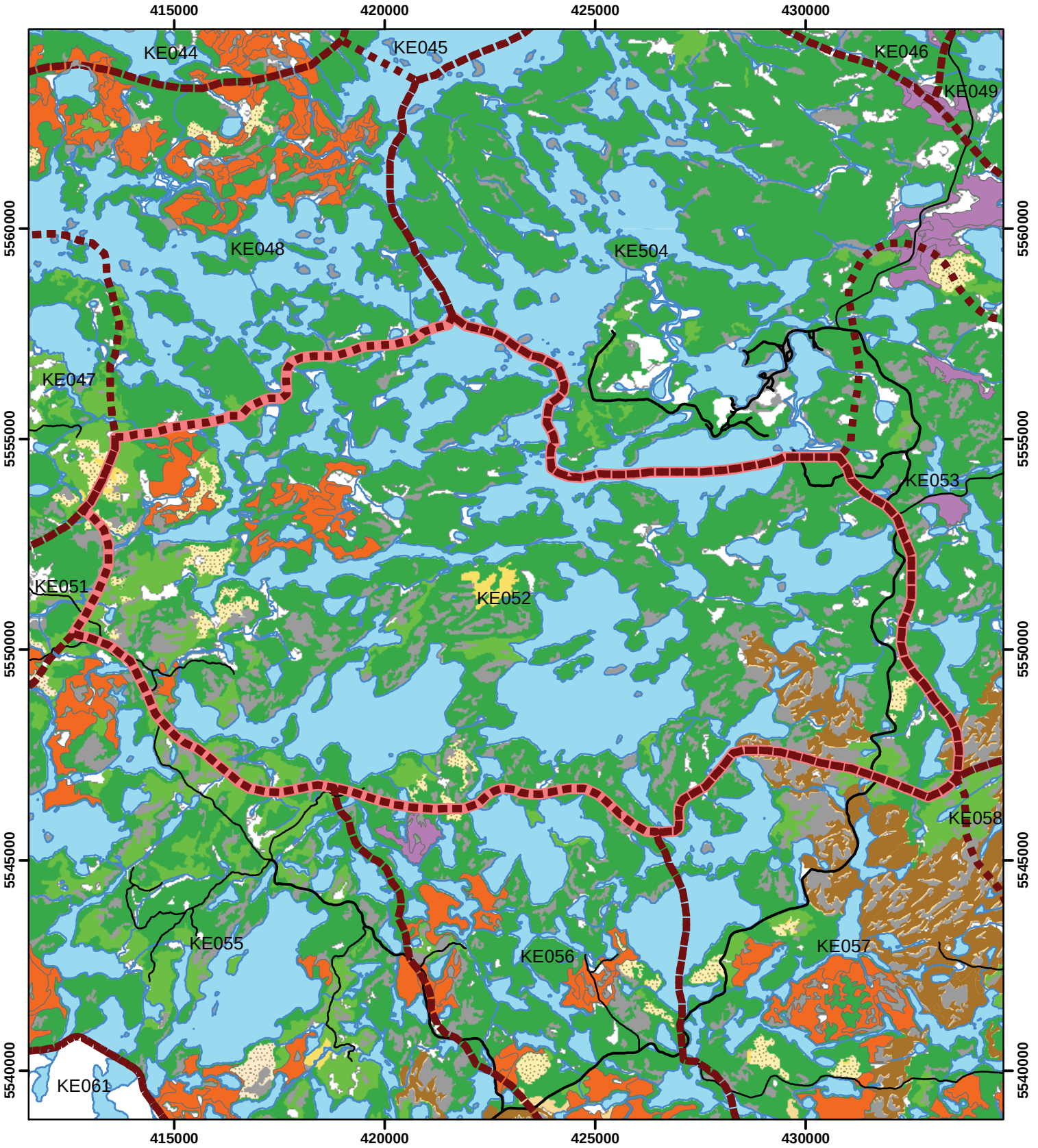
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

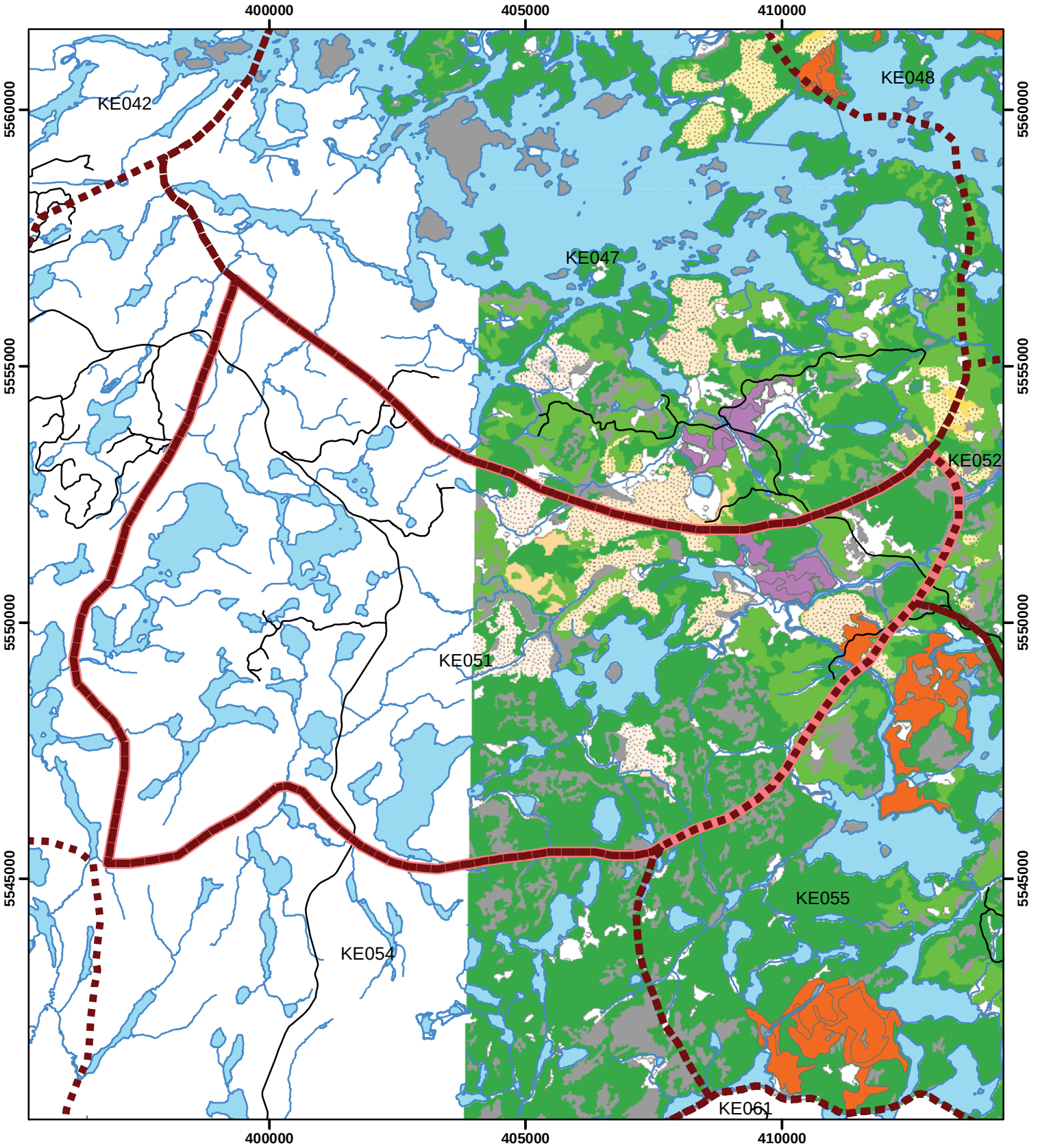
0 1 2 4 km

1:113,000

Planned and recent clearcut logging
Trapping Area KE052



Planned and recent clearcut logging
Trapping Area KE051



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

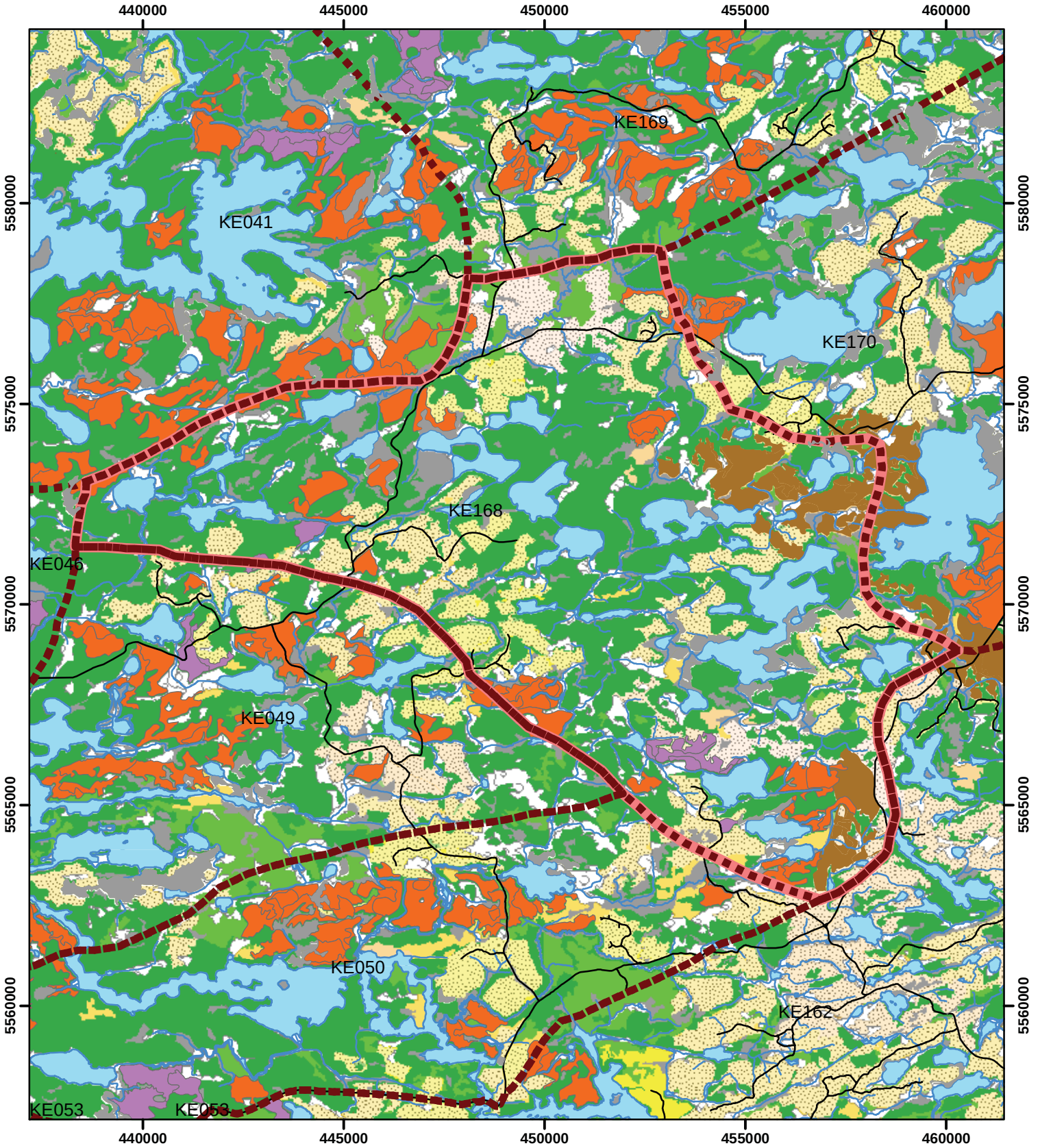
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:101,000

Planned and recent clearcut logging
Trapping Area KE168



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

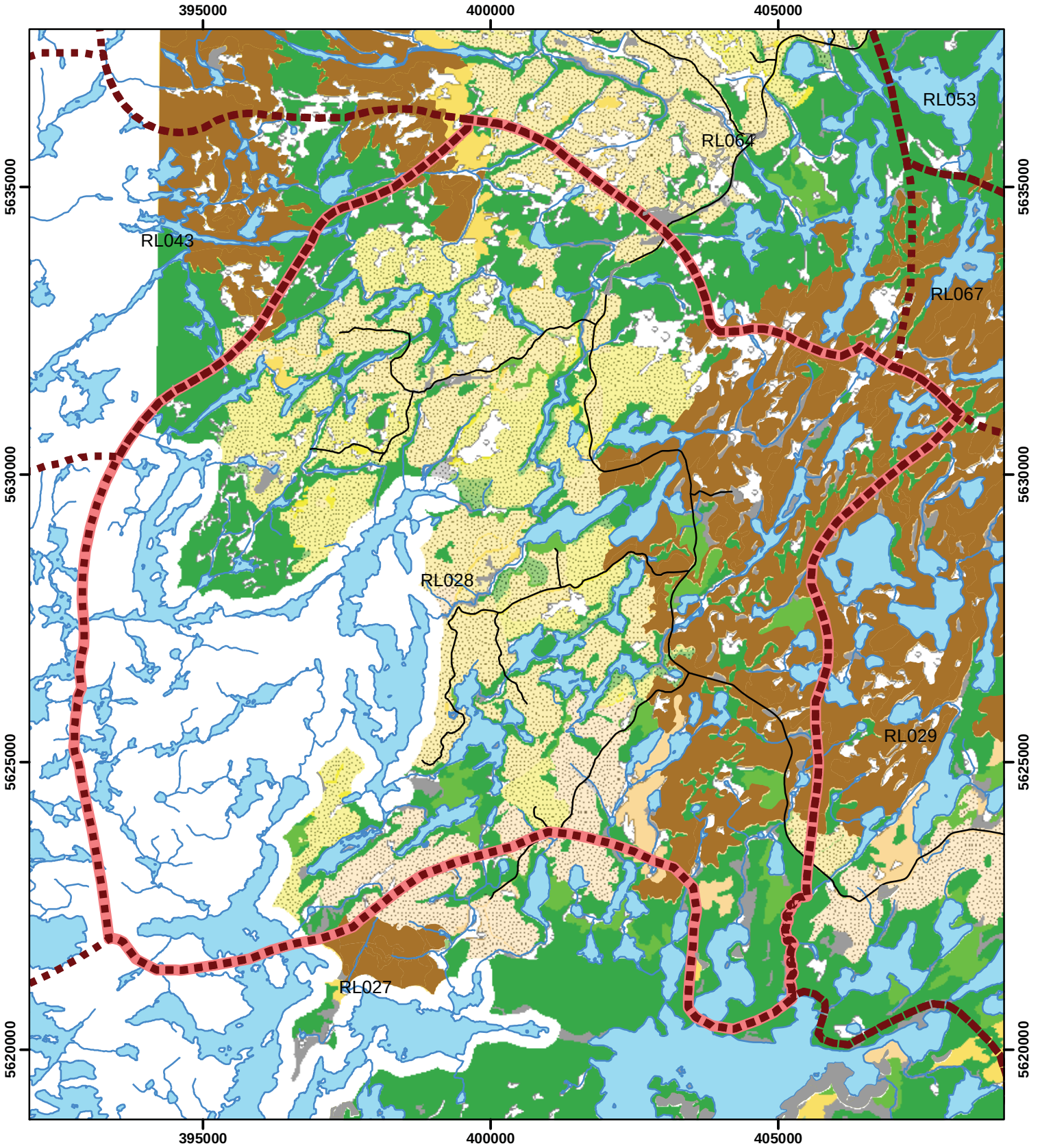
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:129,000

Planned and recent clearcut logging
Trapping Area RL028

2110



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

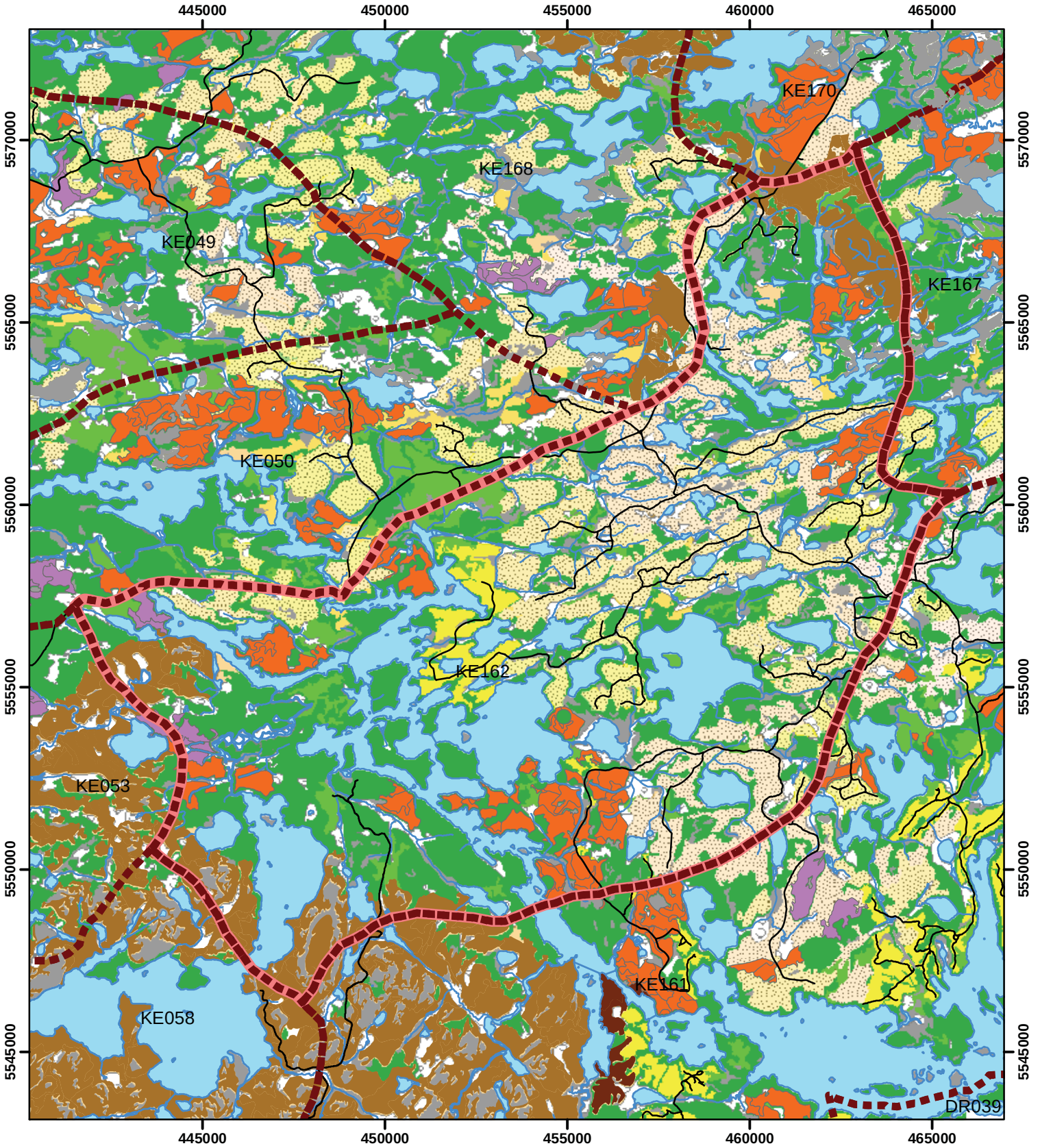
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:90,000

Planned and recent clearcut logging
Trapping Area KE162



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

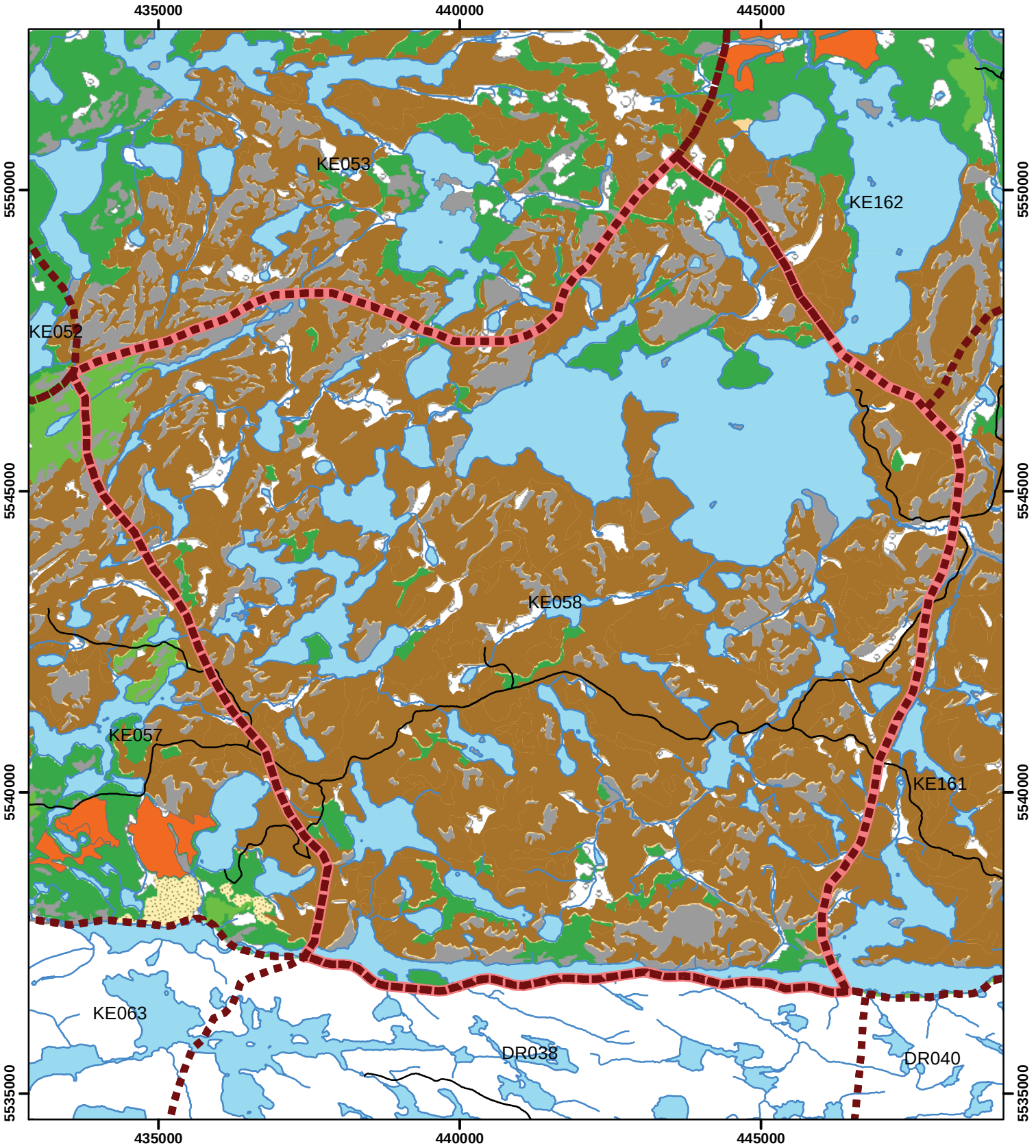
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:142,000

Planned and recent clearcut logging
Trapping Area KE058



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

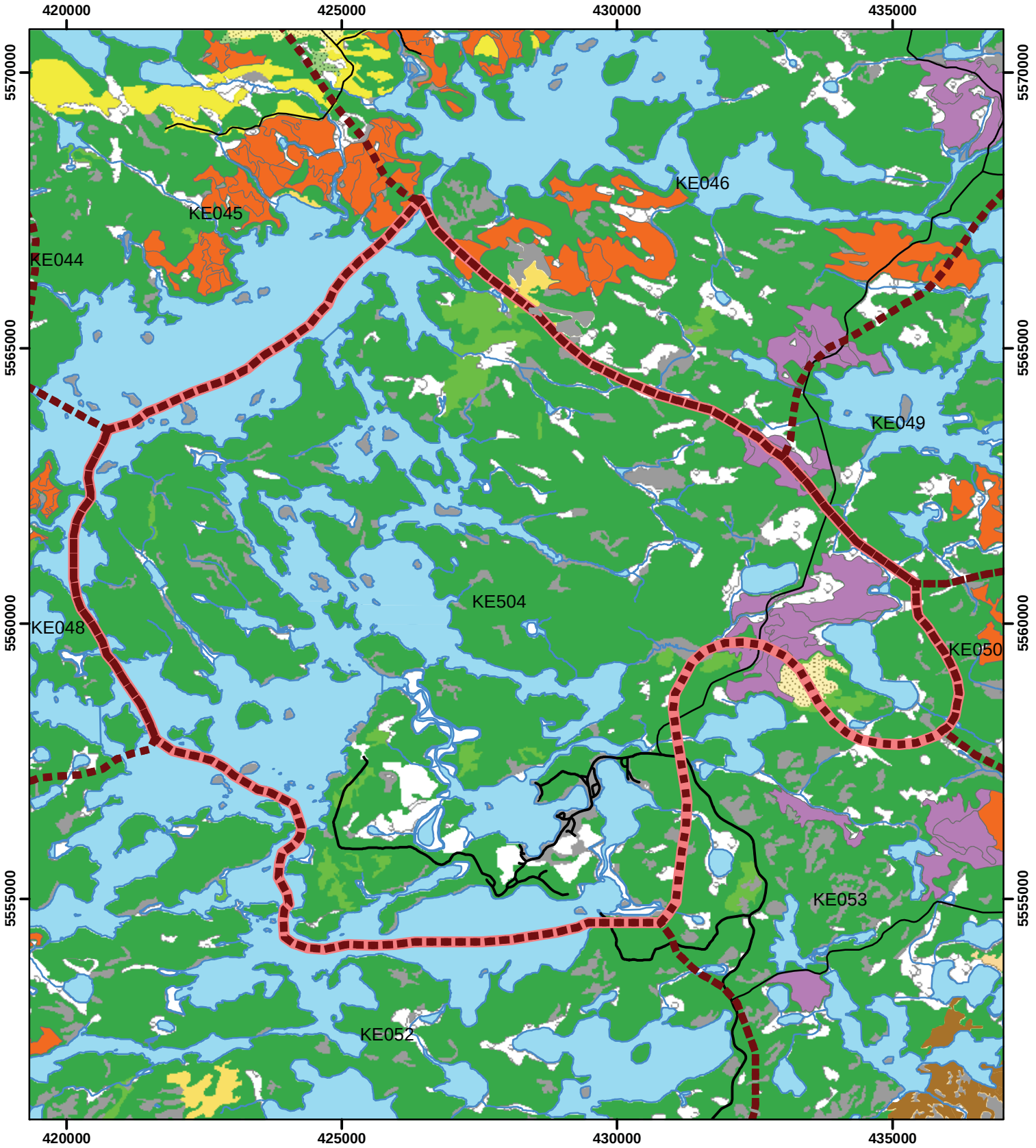
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:86,000

Planned and recent clearcut logging
Trapping Area KE504



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

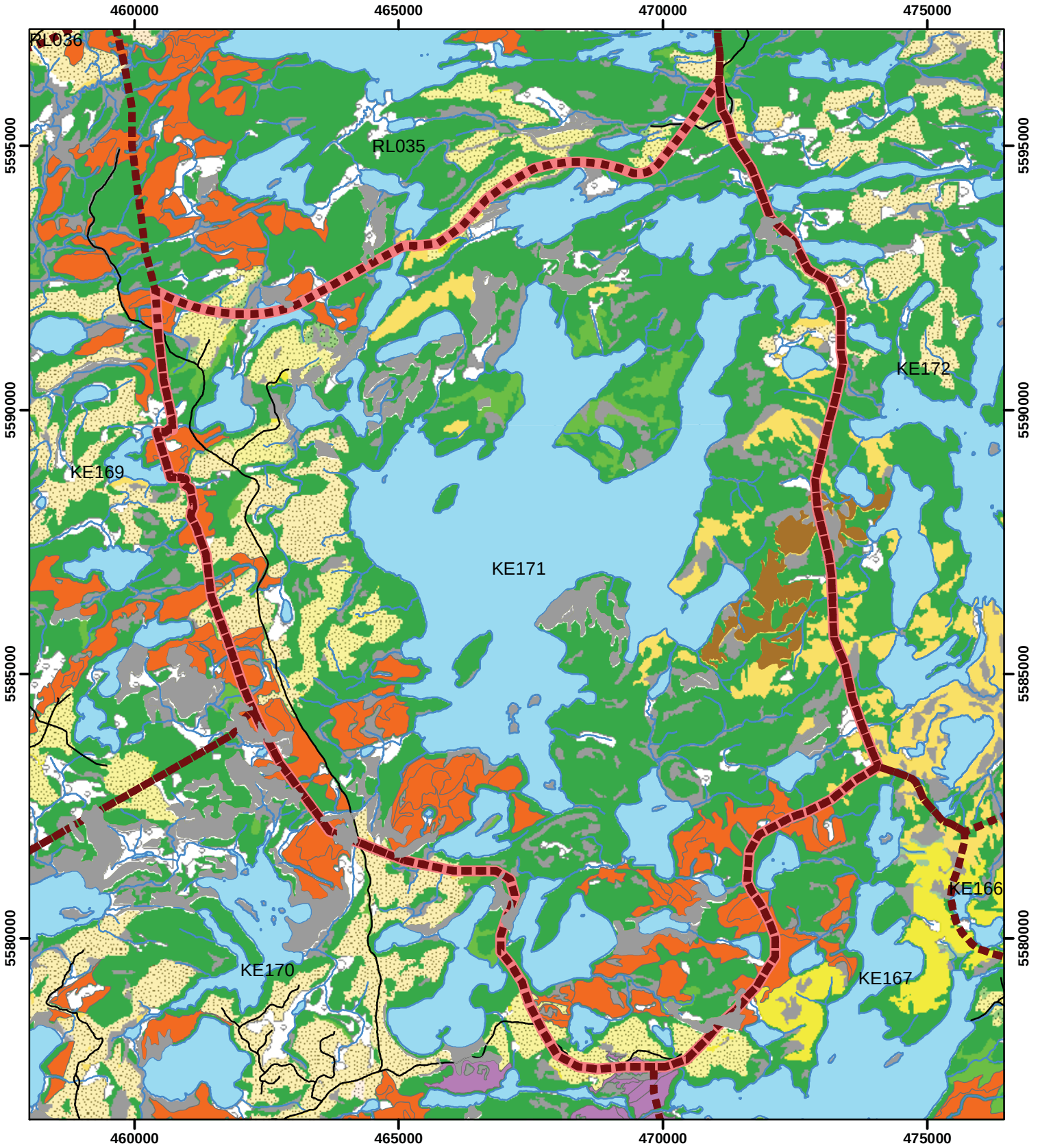
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:94,000

Planned and recent clearcut logging
Trapping Area KE171



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

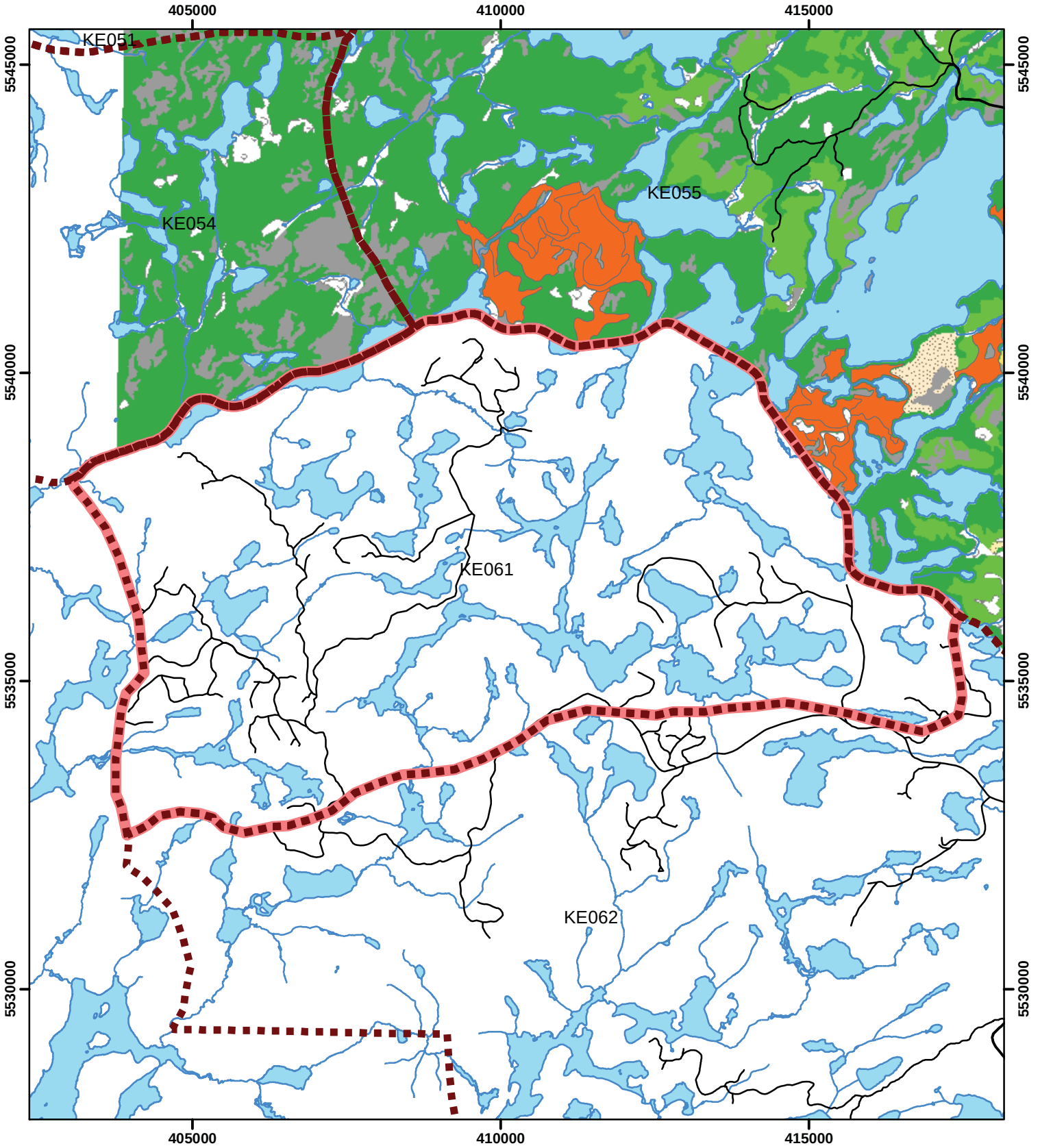
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:98,000

Planned and recent clearcut logging
Trapping Area KE061



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

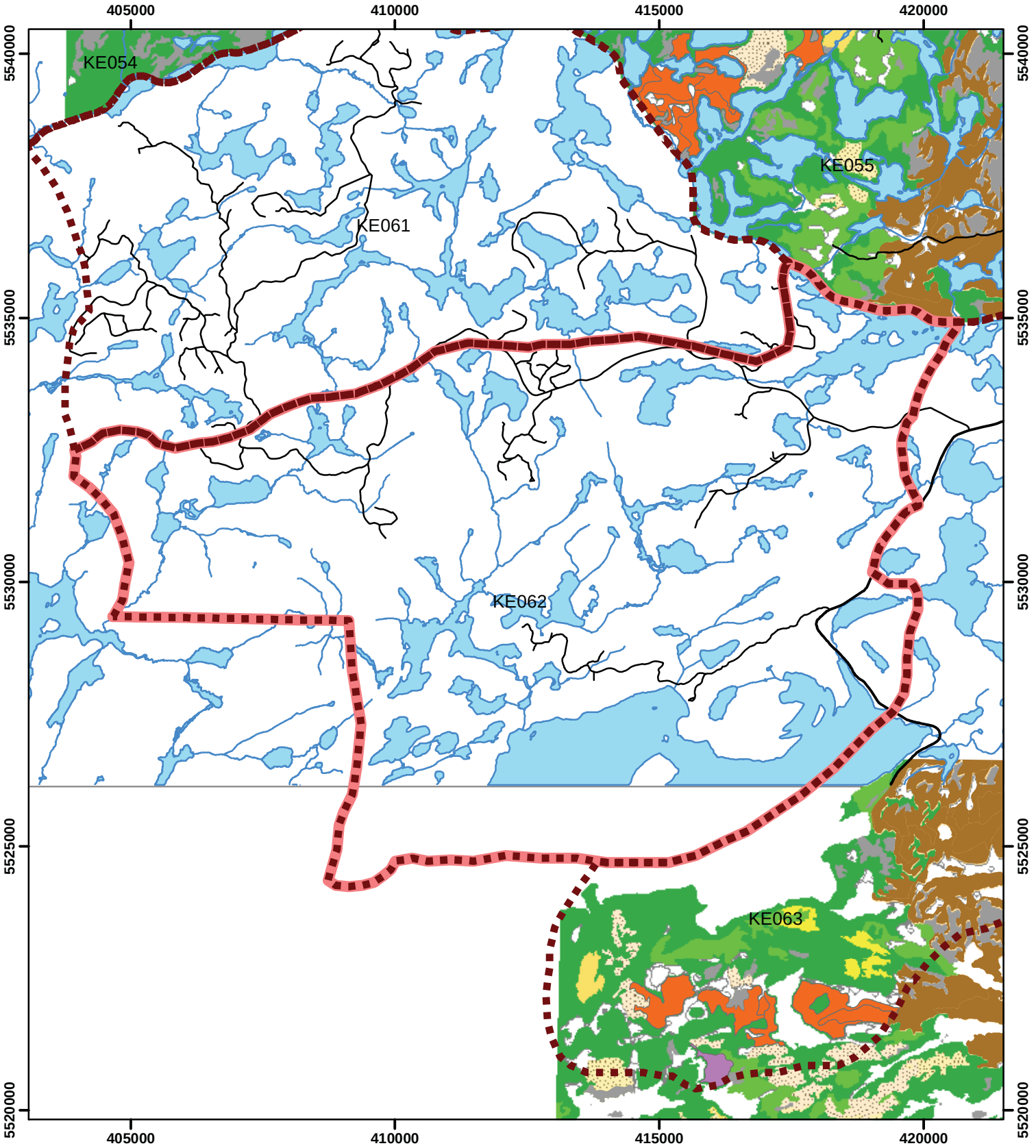
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:84,000

Planned and recent clearcut logging
Trapping Area KE062



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

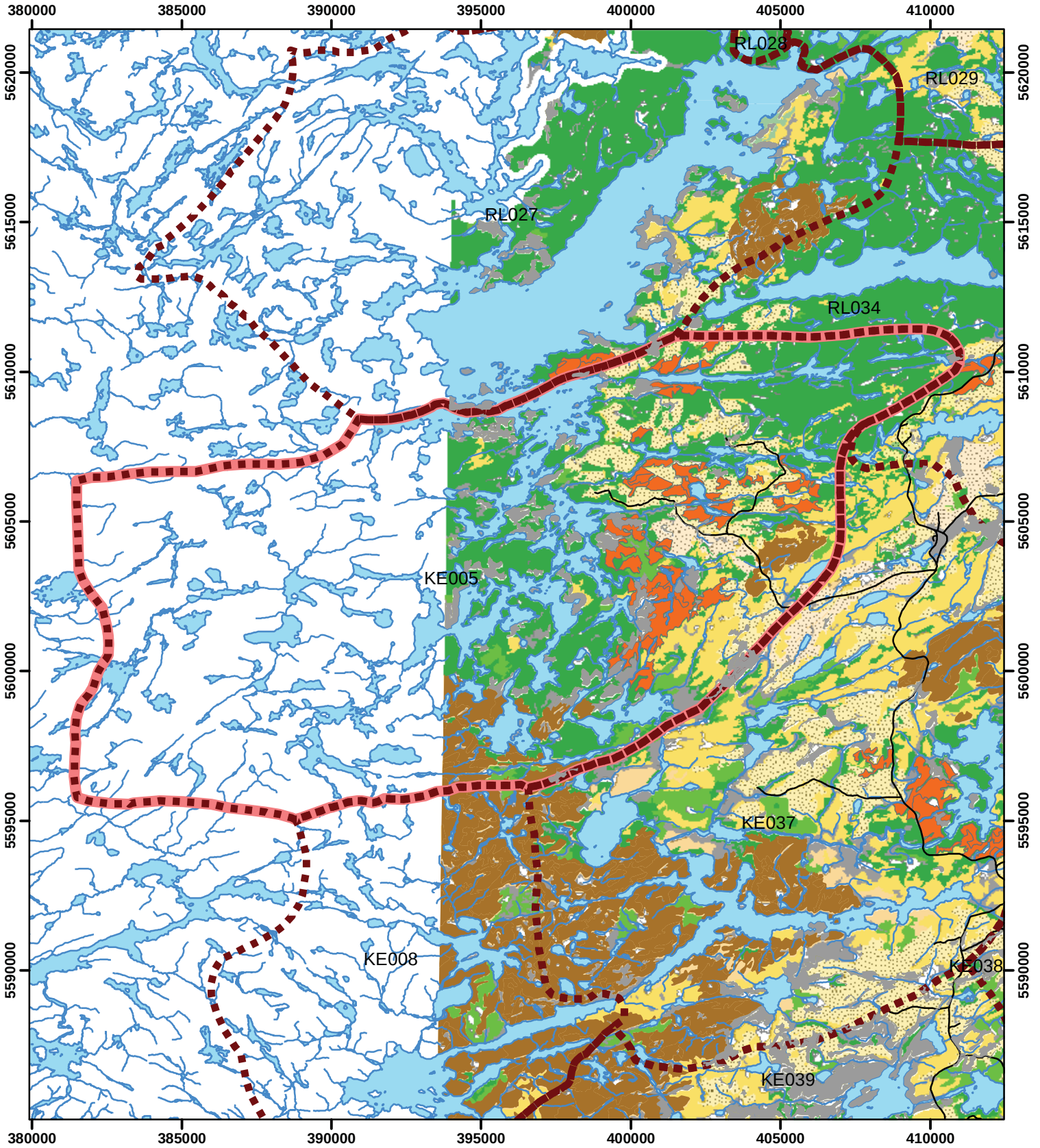
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:98,000

Planned and recent clearcut logging
Trapping Area KE005



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

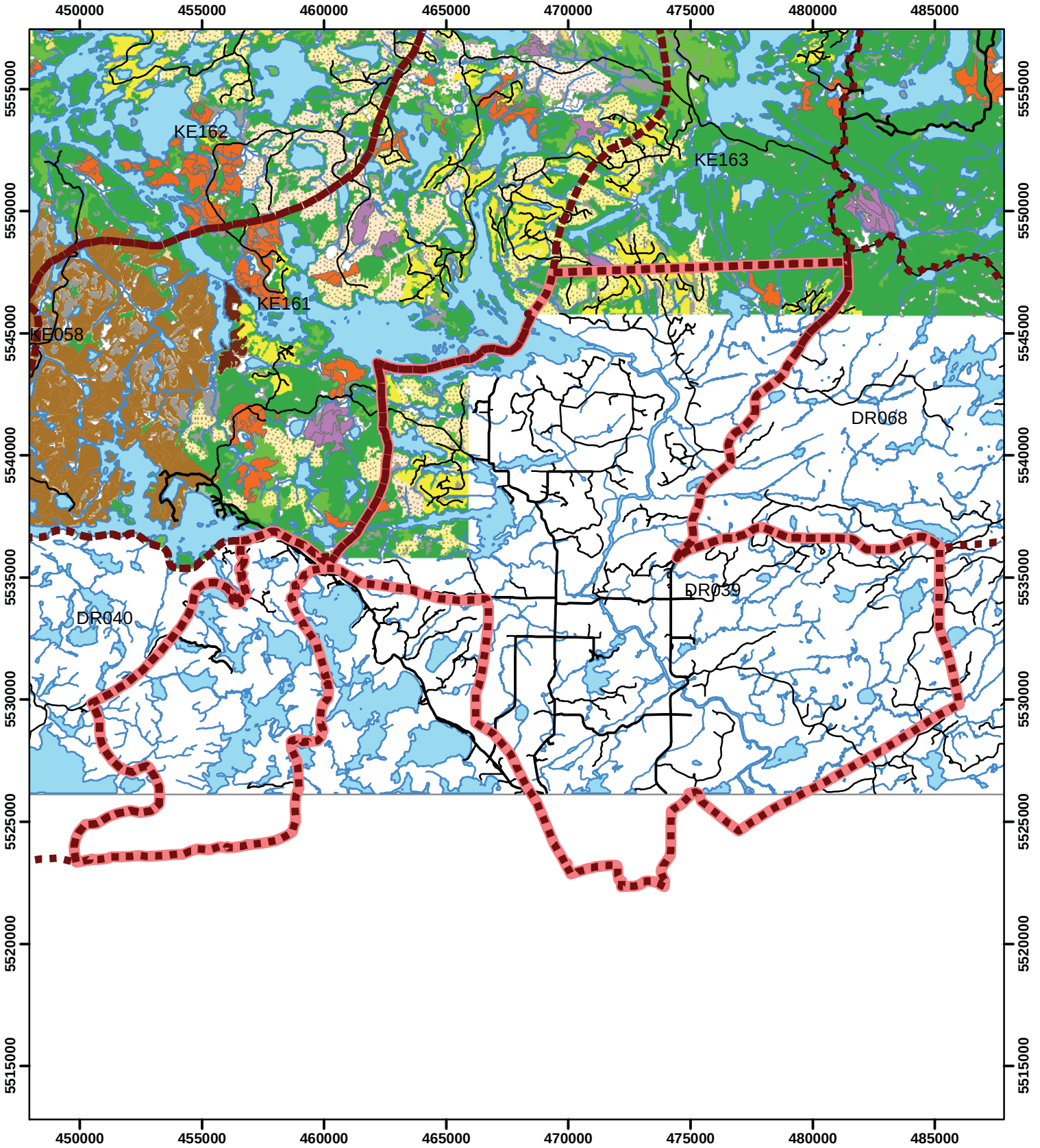
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.5 3 6 km

1:173,000

Planned and recent clearcut logging
Trapping Area DR039



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

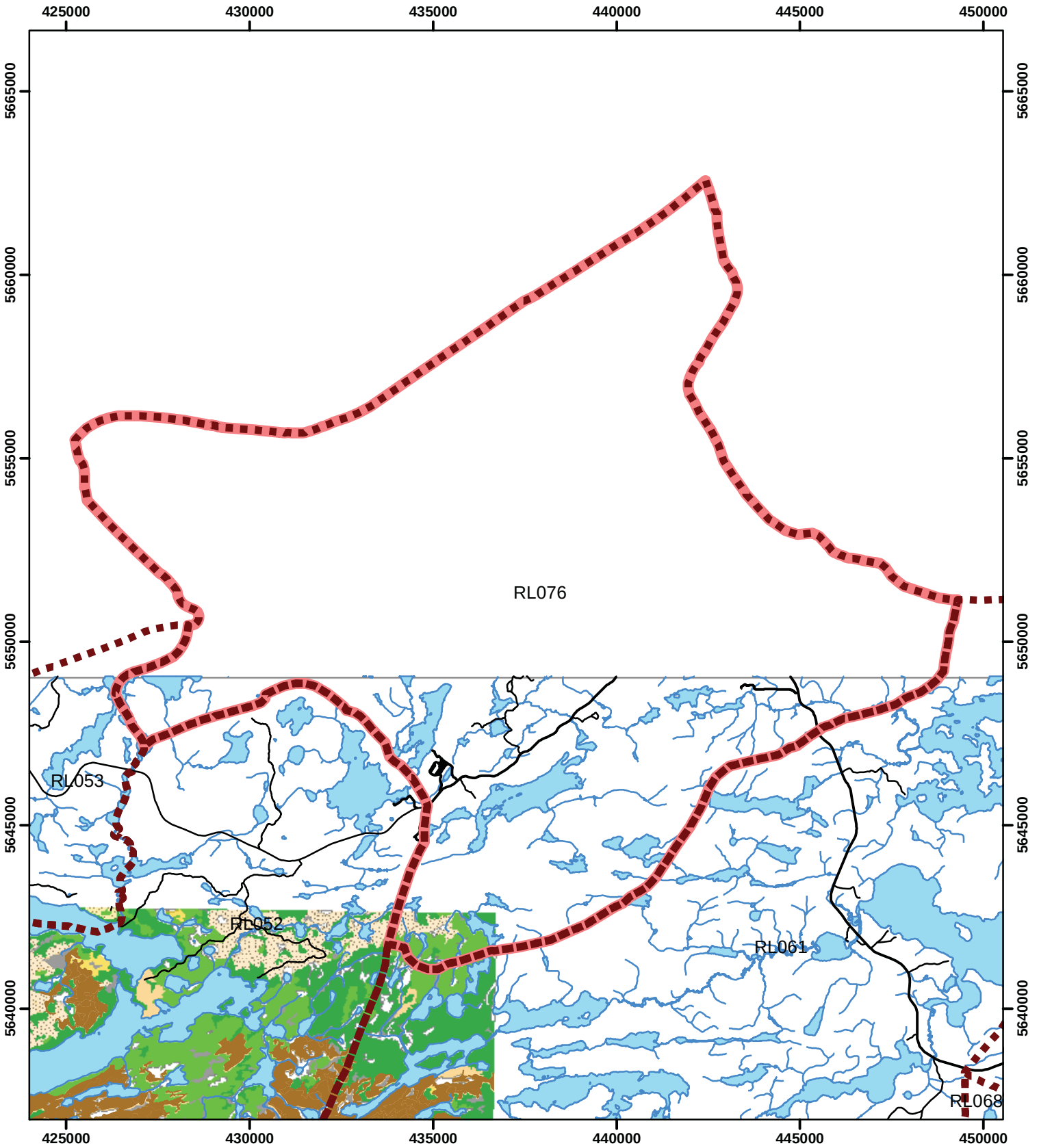
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 2 4 8 km

1:212,000

Planned and recent clearcut logging
Trapping Area RL076

2119



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

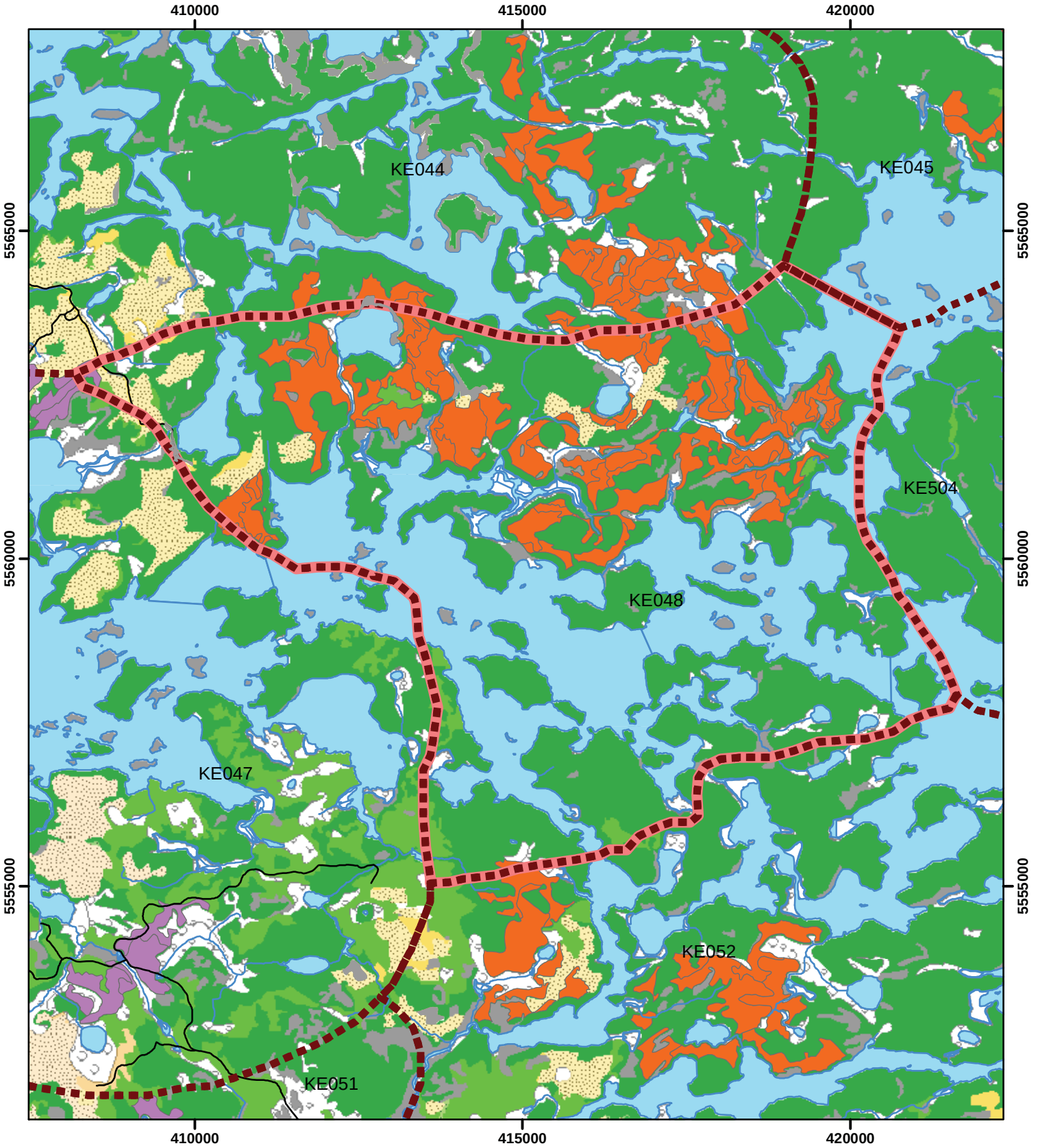
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:141,000

Planned and recent clearcut logging
Trapping Area KE048



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

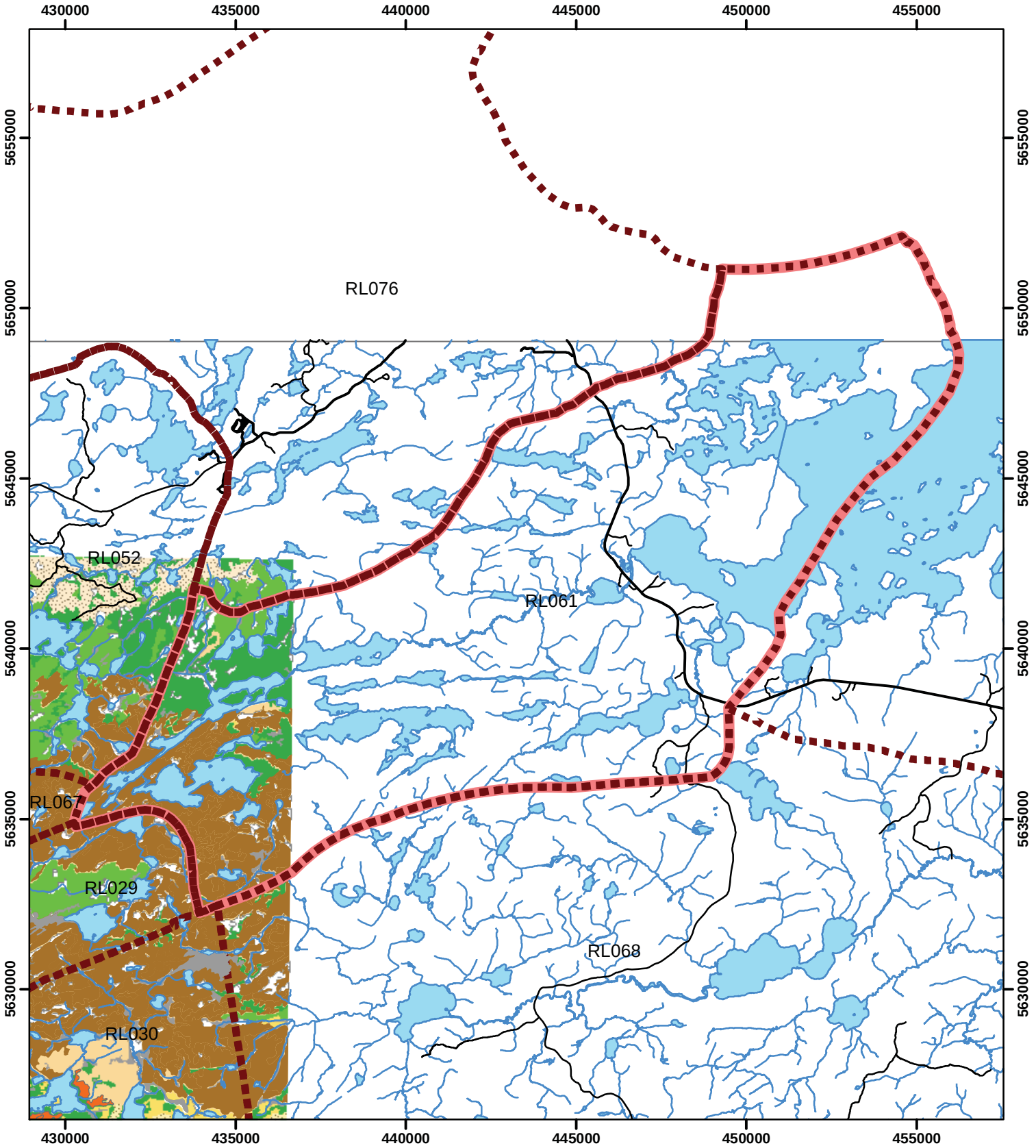
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:79,000

Planned and recent clearcut logging
Trapping Area RL061



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

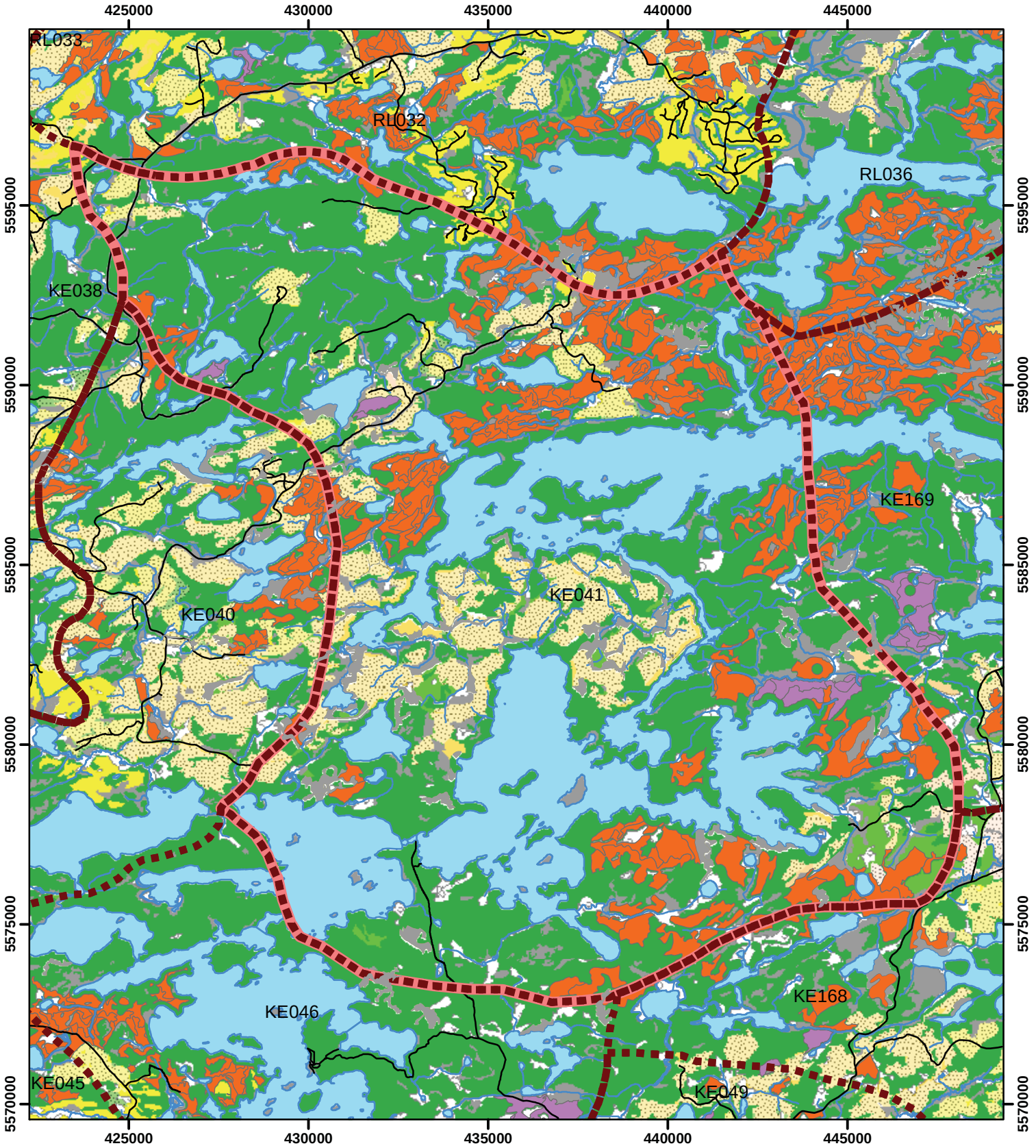
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:152,000

Planned and recent clearcut logging
Trapping Area KE041



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

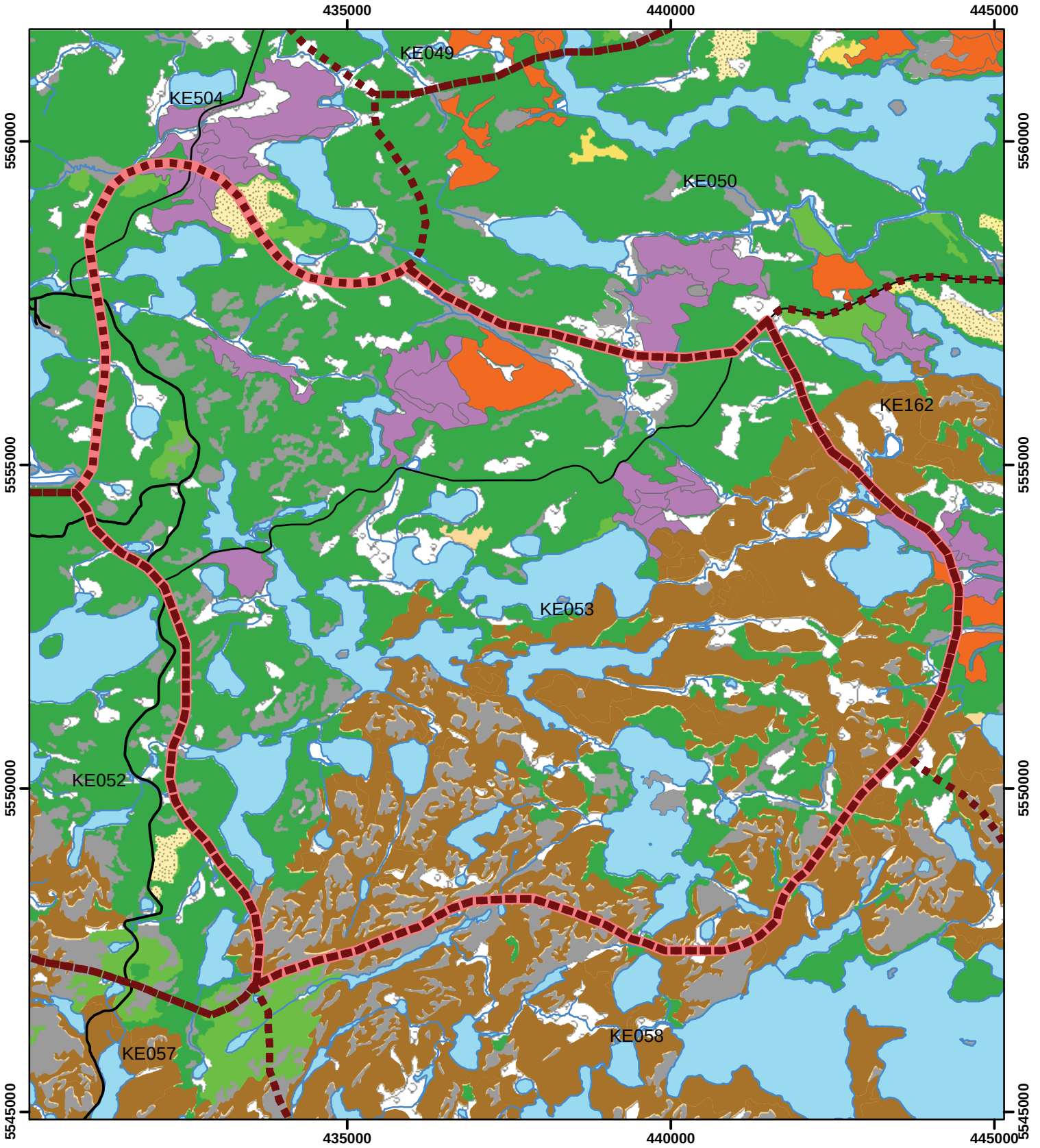
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:144,000

Planned and recent clearcut logging
Trapping Area KE053



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

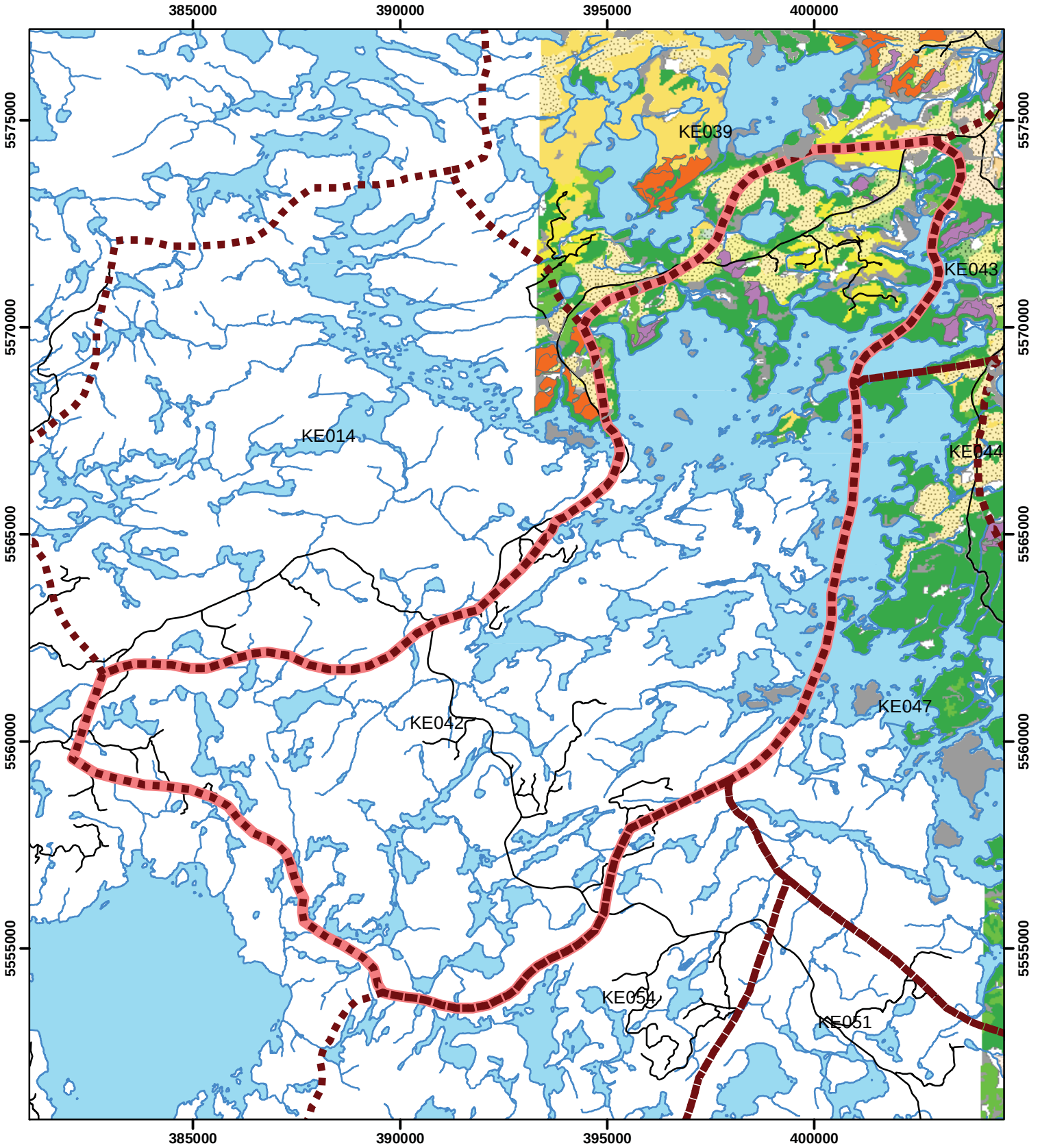
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:80,000

Planned and recent clearcut logging
Trapping Area KE042



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

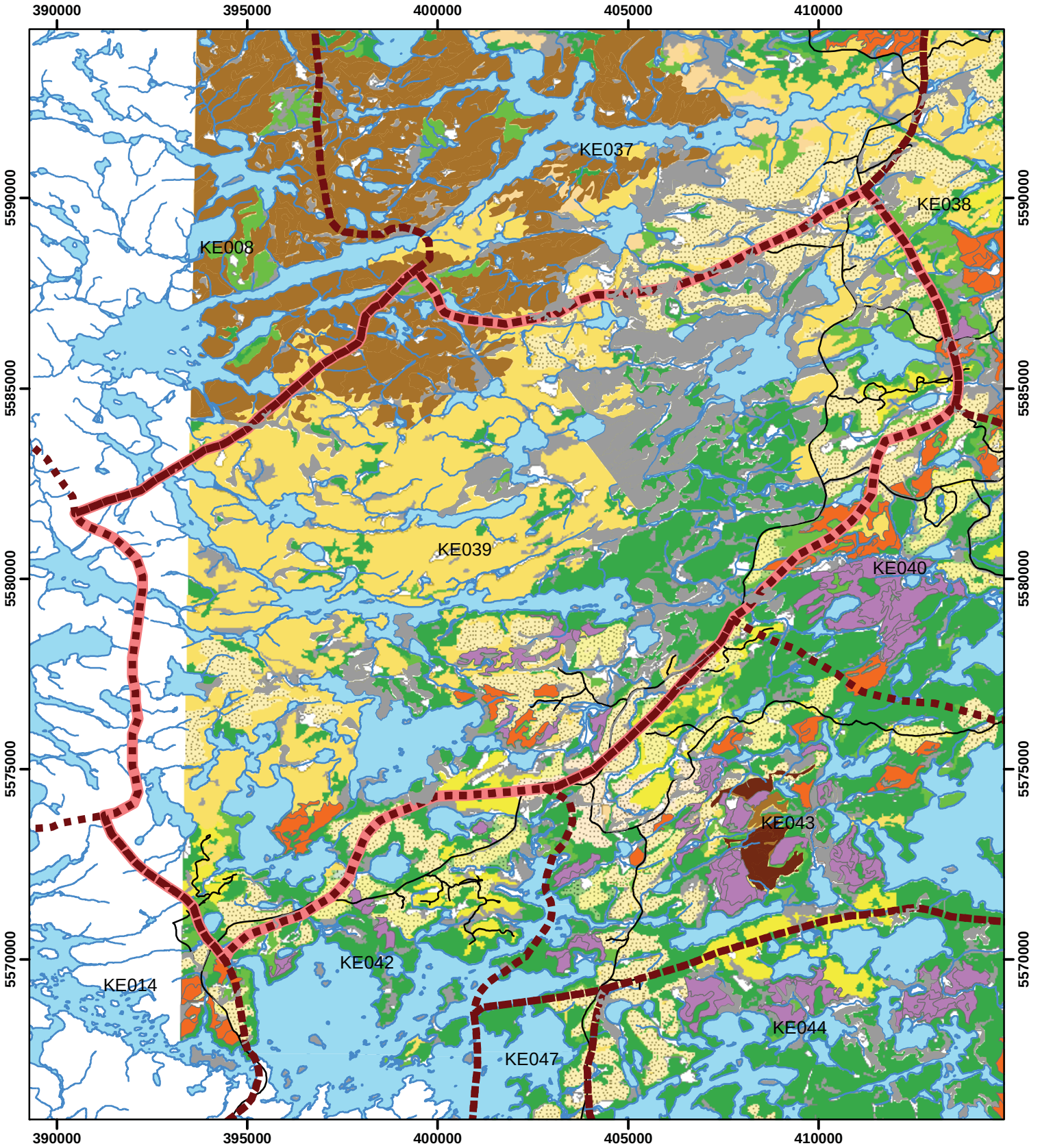
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:125,000

Planned and recent clearcut logging
Trapping Area KE039



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

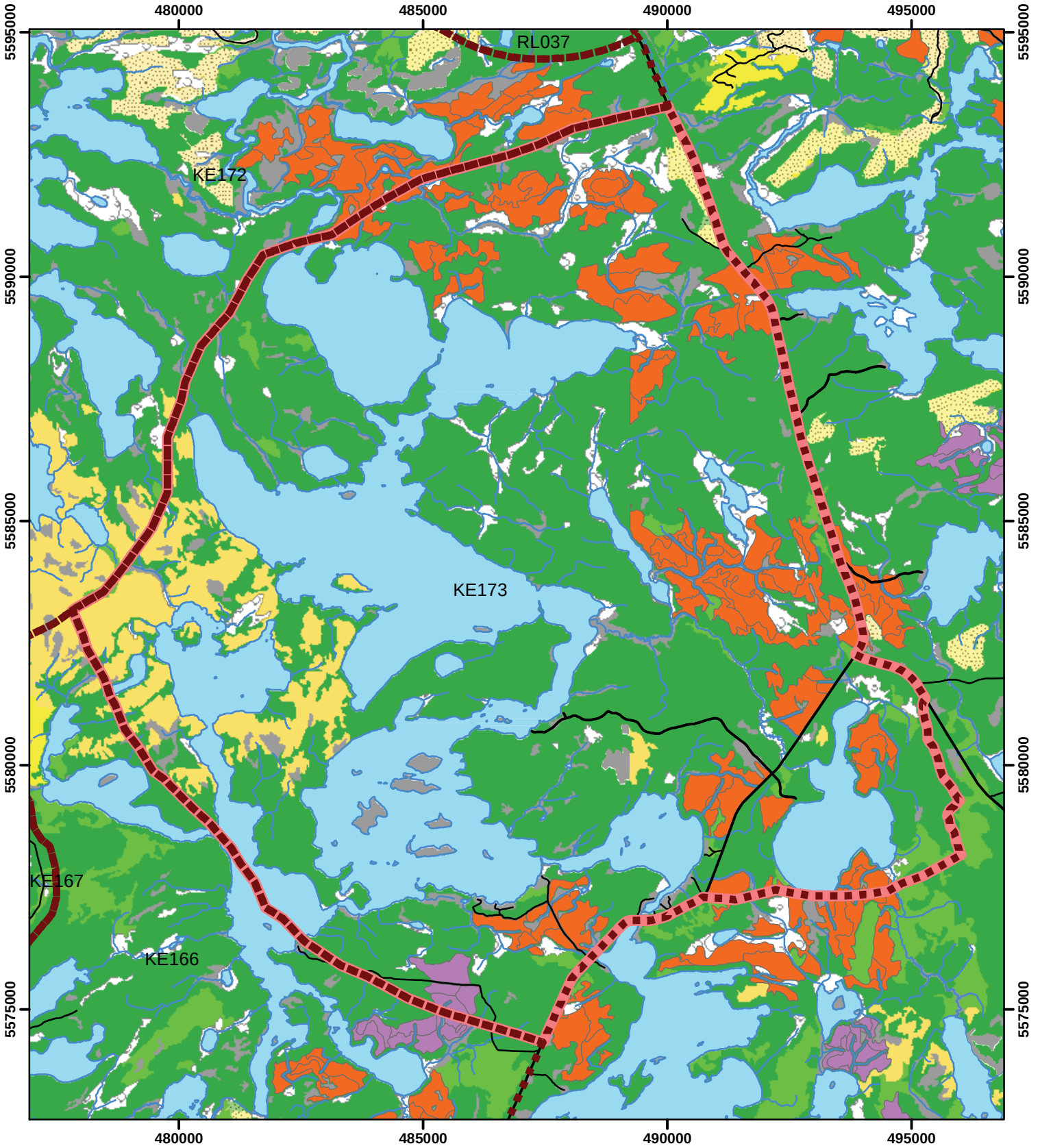
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:136,000

Planned and recent clearcut logging
Trapping Area KE173



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

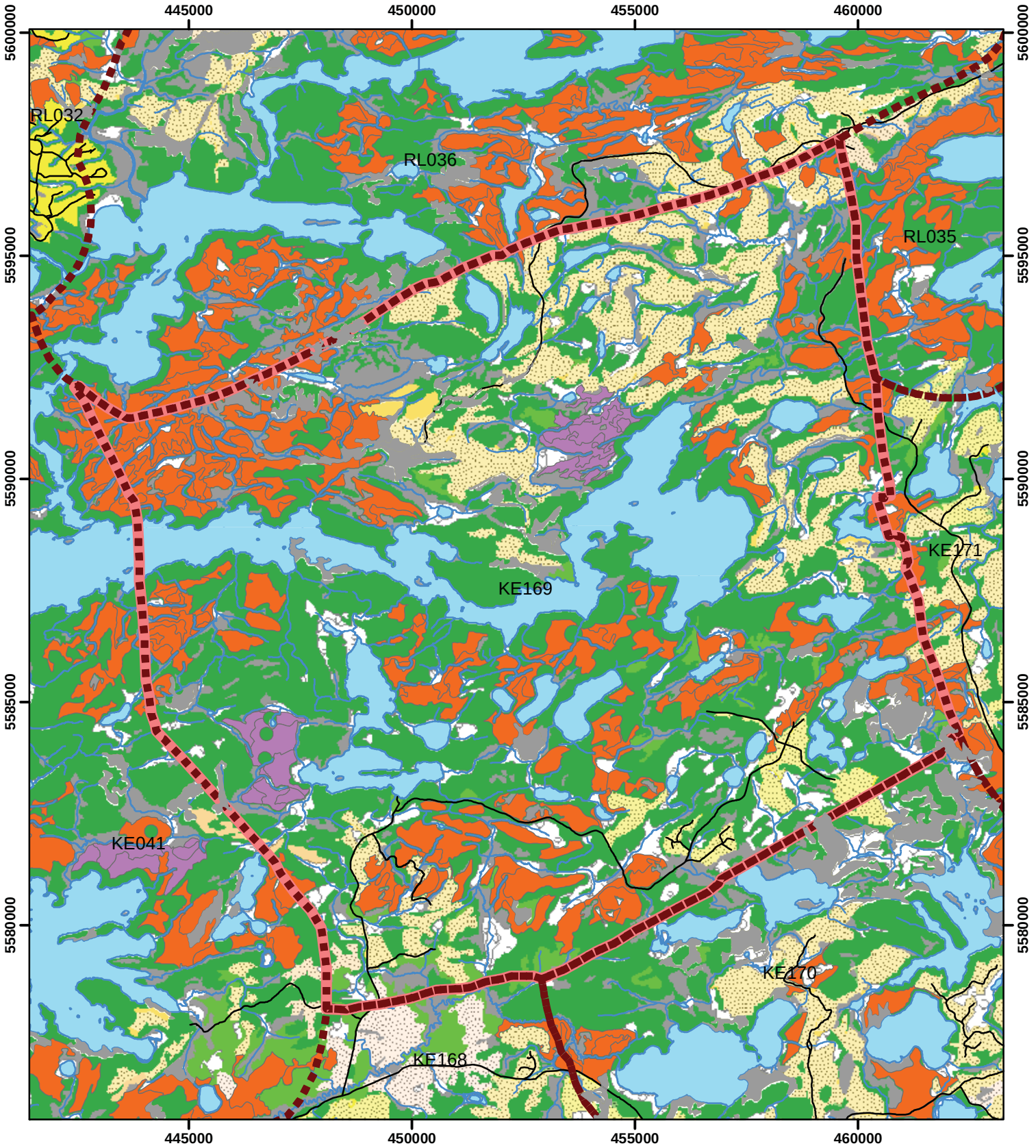
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:106,000

Planned and recent clearcut logging
Trapping Area KE169



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

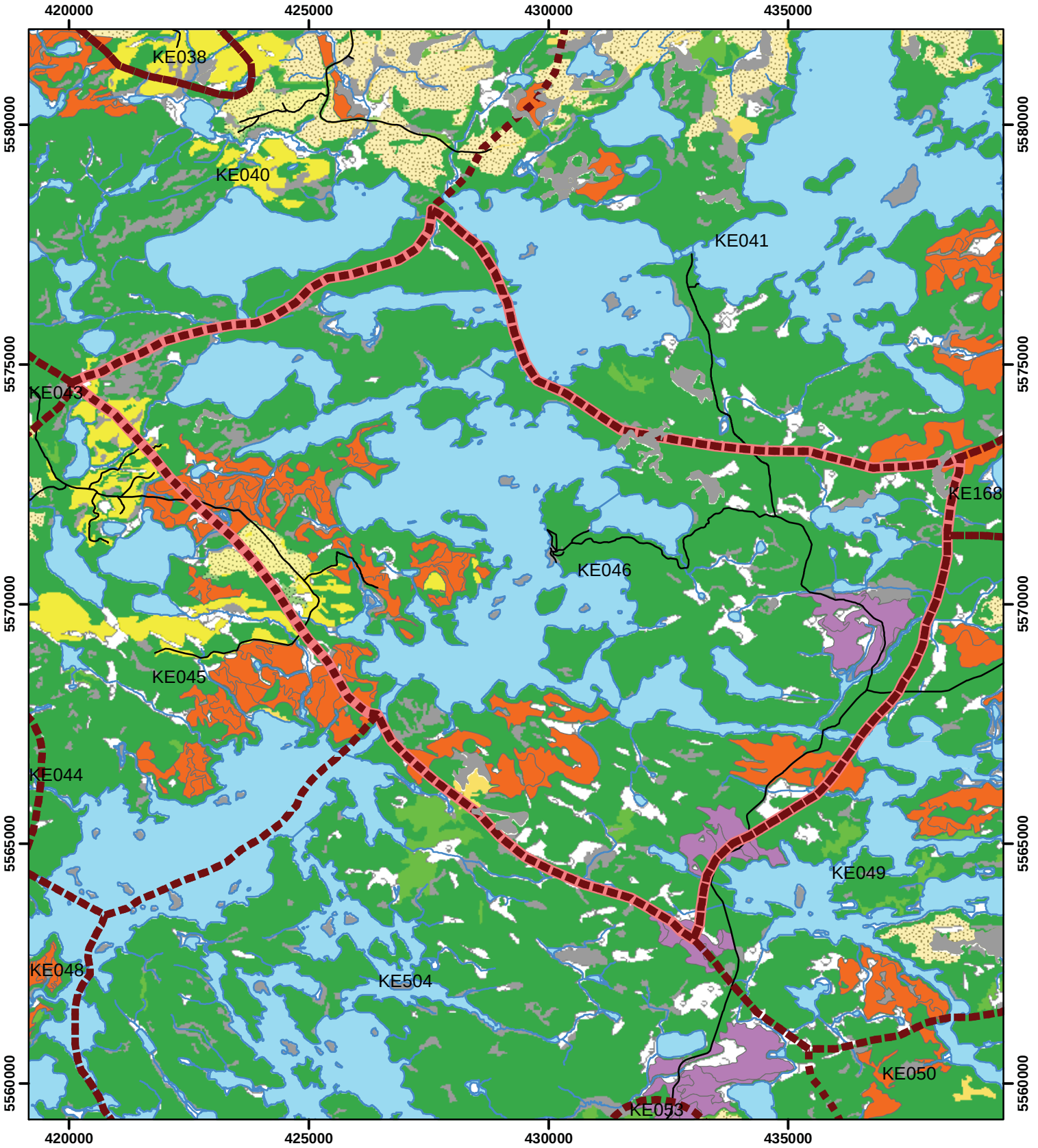
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:116,000

Planned and recent clearcut logging
Trapping Area KE046



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

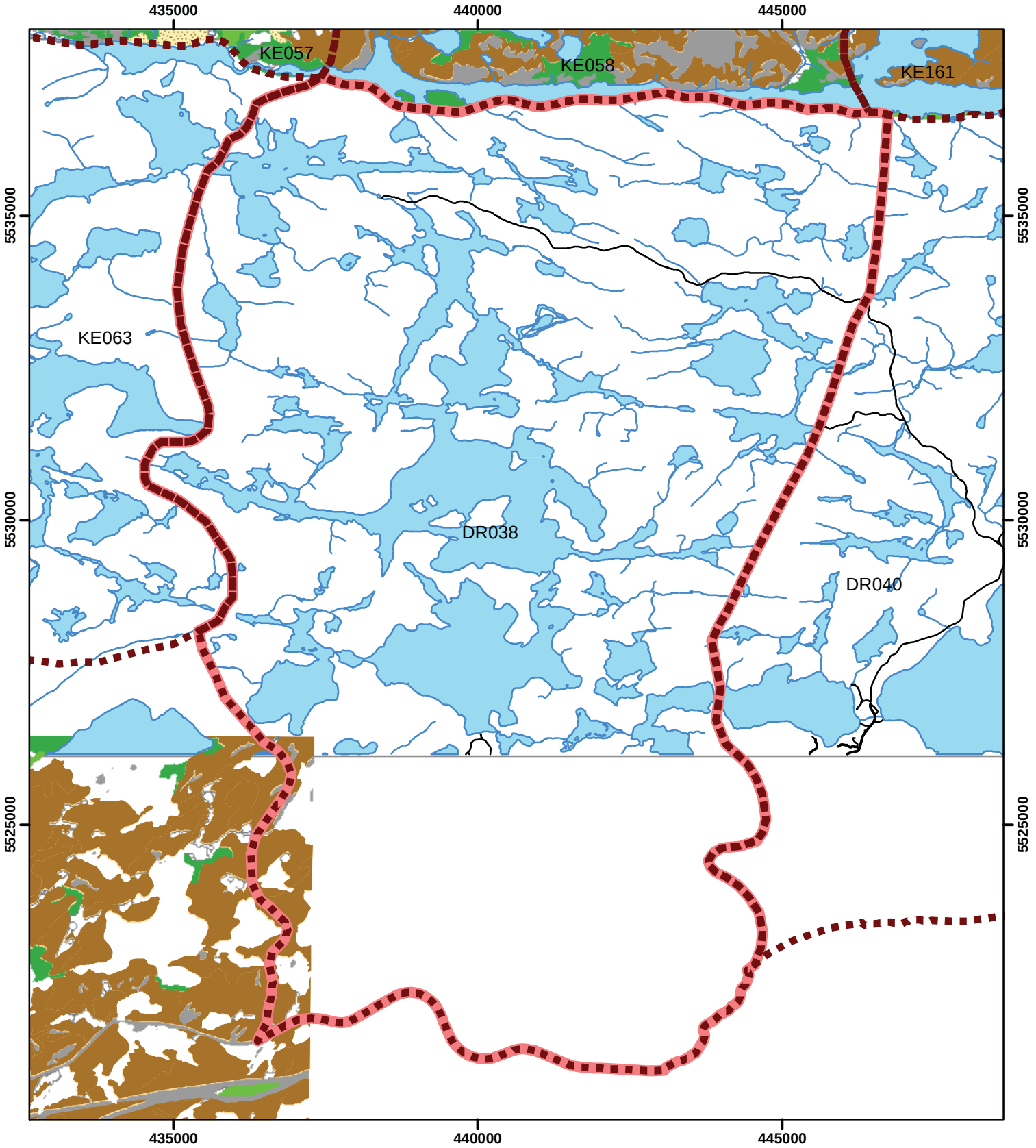
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:108,000

Planned and recent clearcut logging
Trapping Area DR038



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

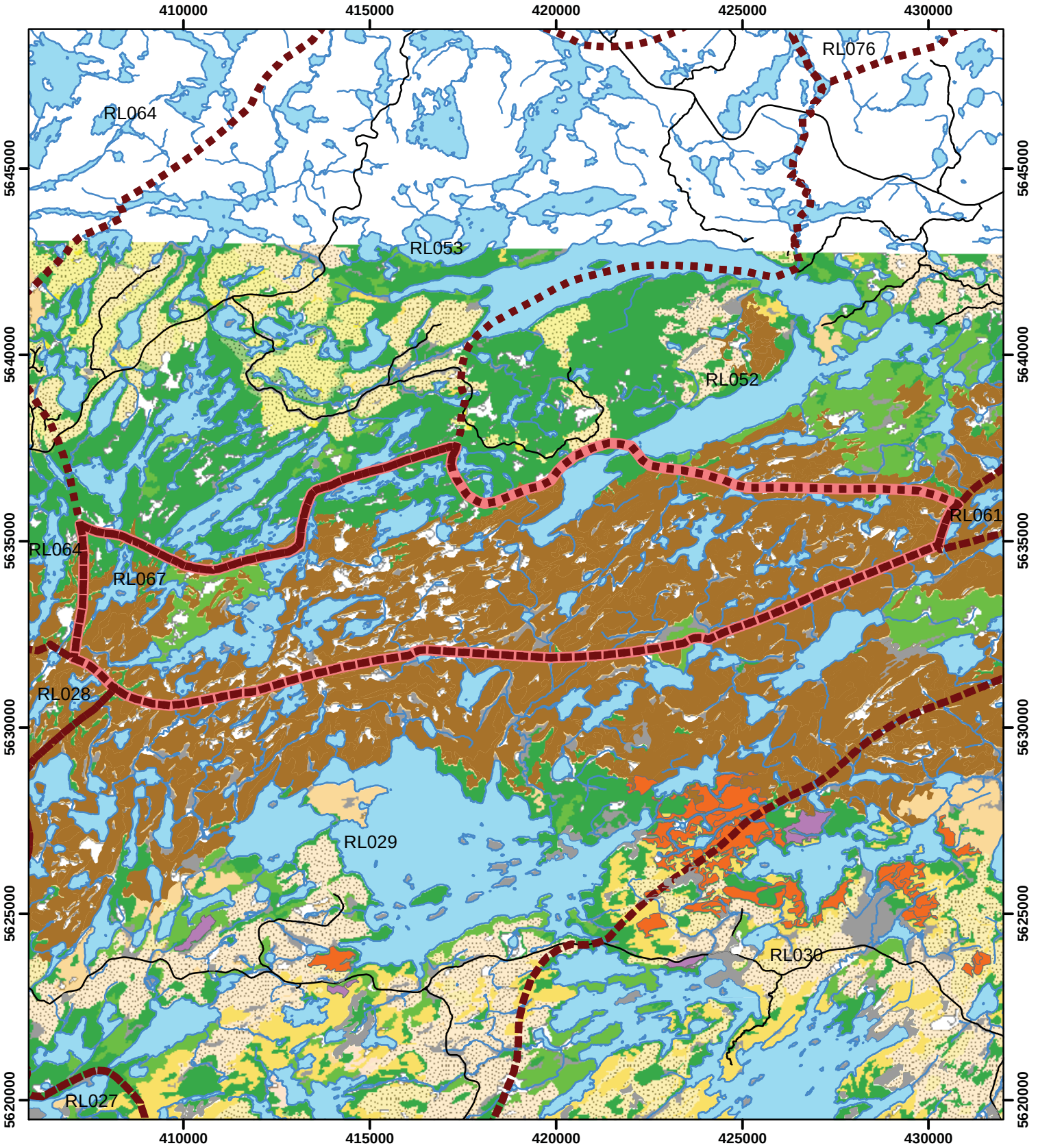
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:85,000

Planned and recent clearcut logging
Trapping Area RL067



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

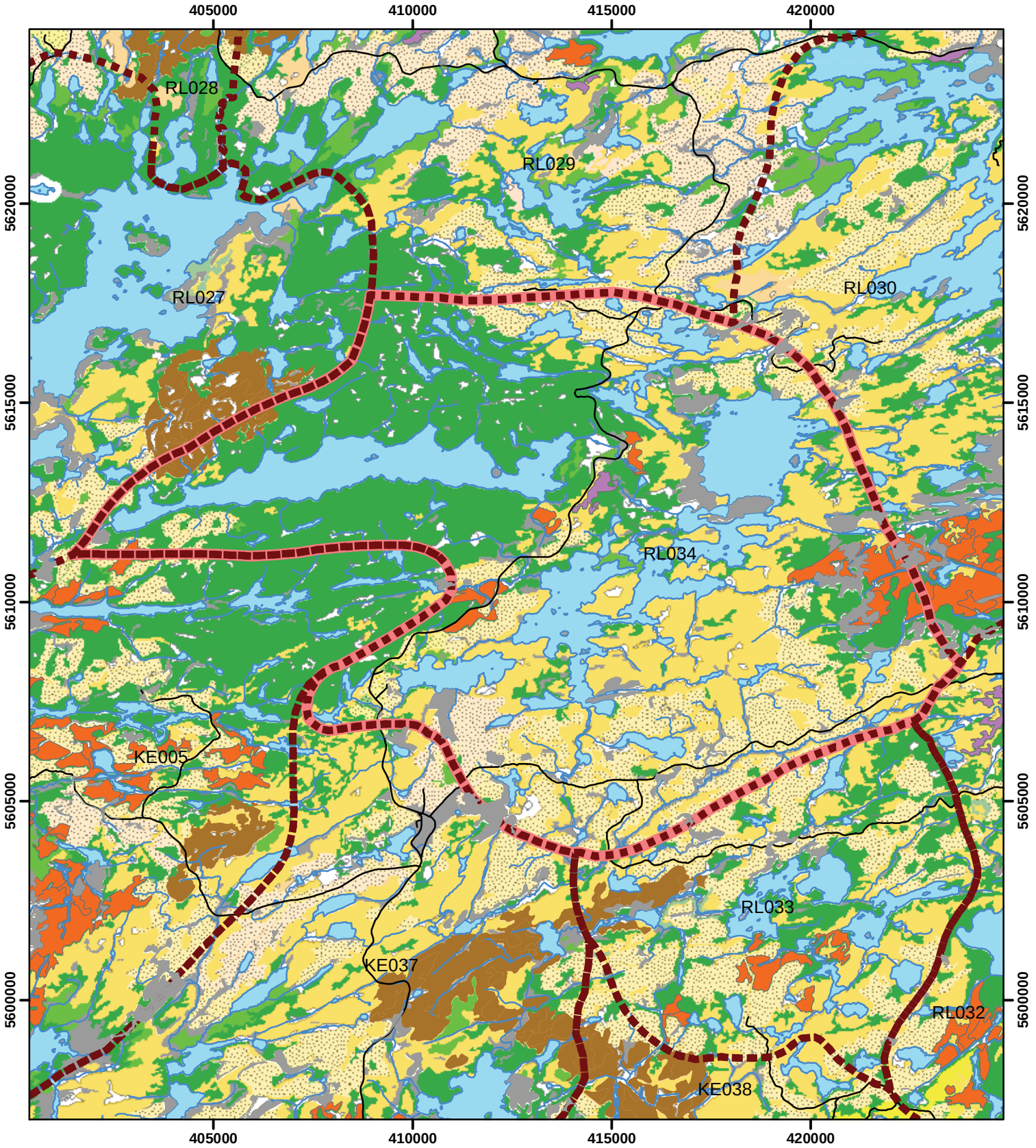
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:139,000

Planned and recent clearcut logging
Trapping Area RL034



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

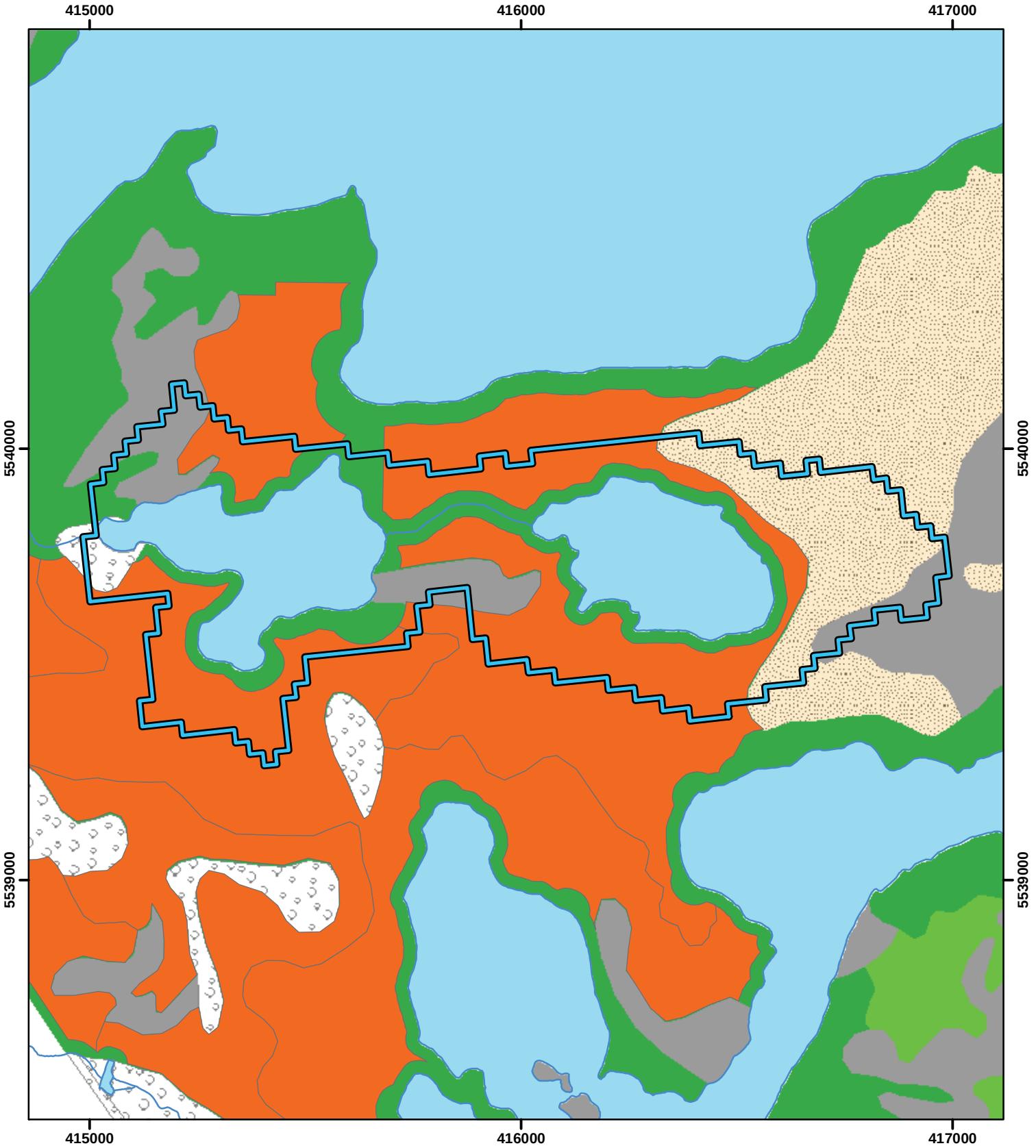
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:130,000

APPENDIX A.2 – WATERSHED AREA MAPS

Planned and recent clearcut logging
Watershed Albert Lake S of Kill Deer L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

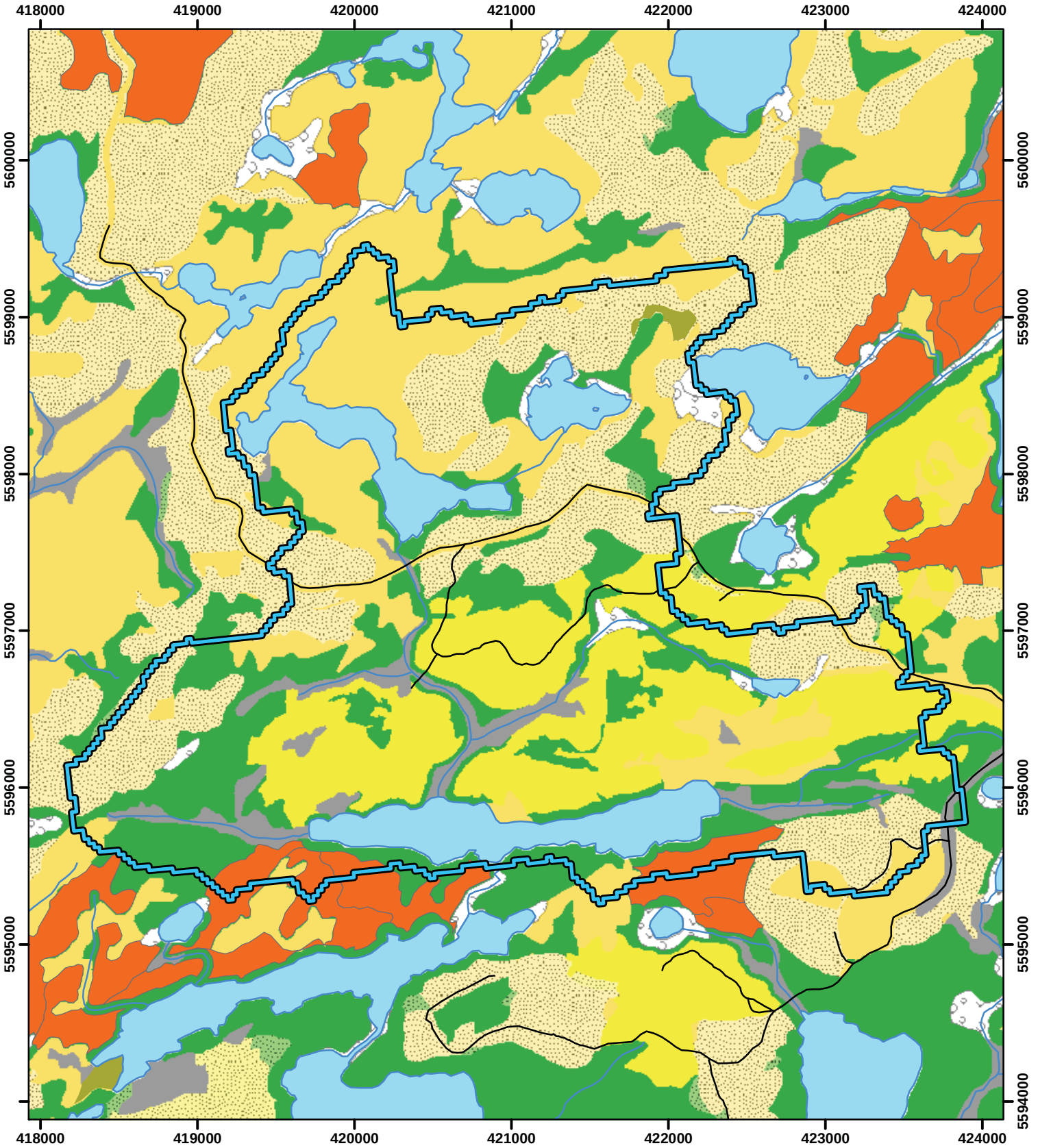
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.1 0.2 0.4 km

1:12,000

Planned and recent clearcut logging
Watershed Campfire R headwaters 3rd order lake



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

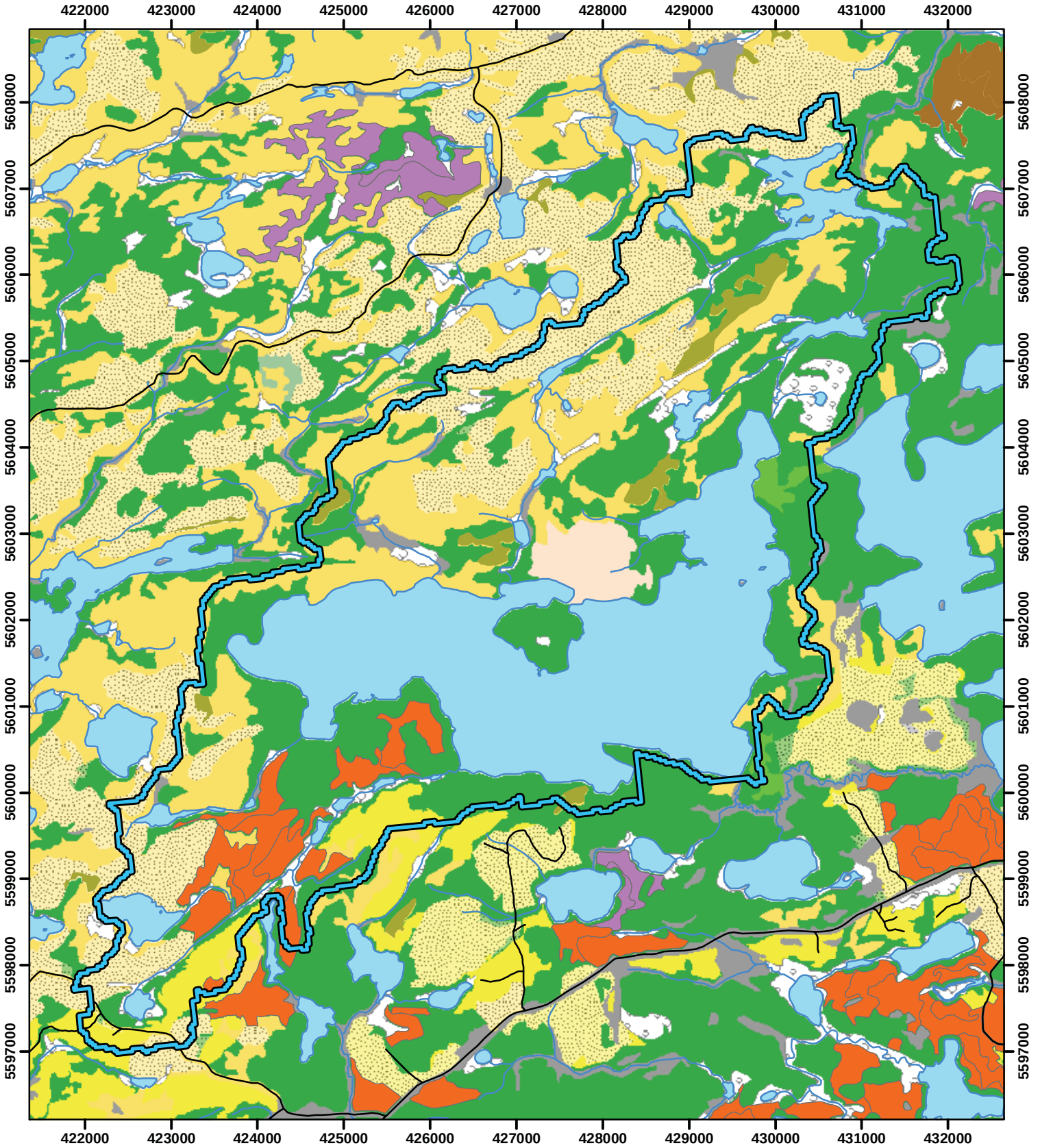
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

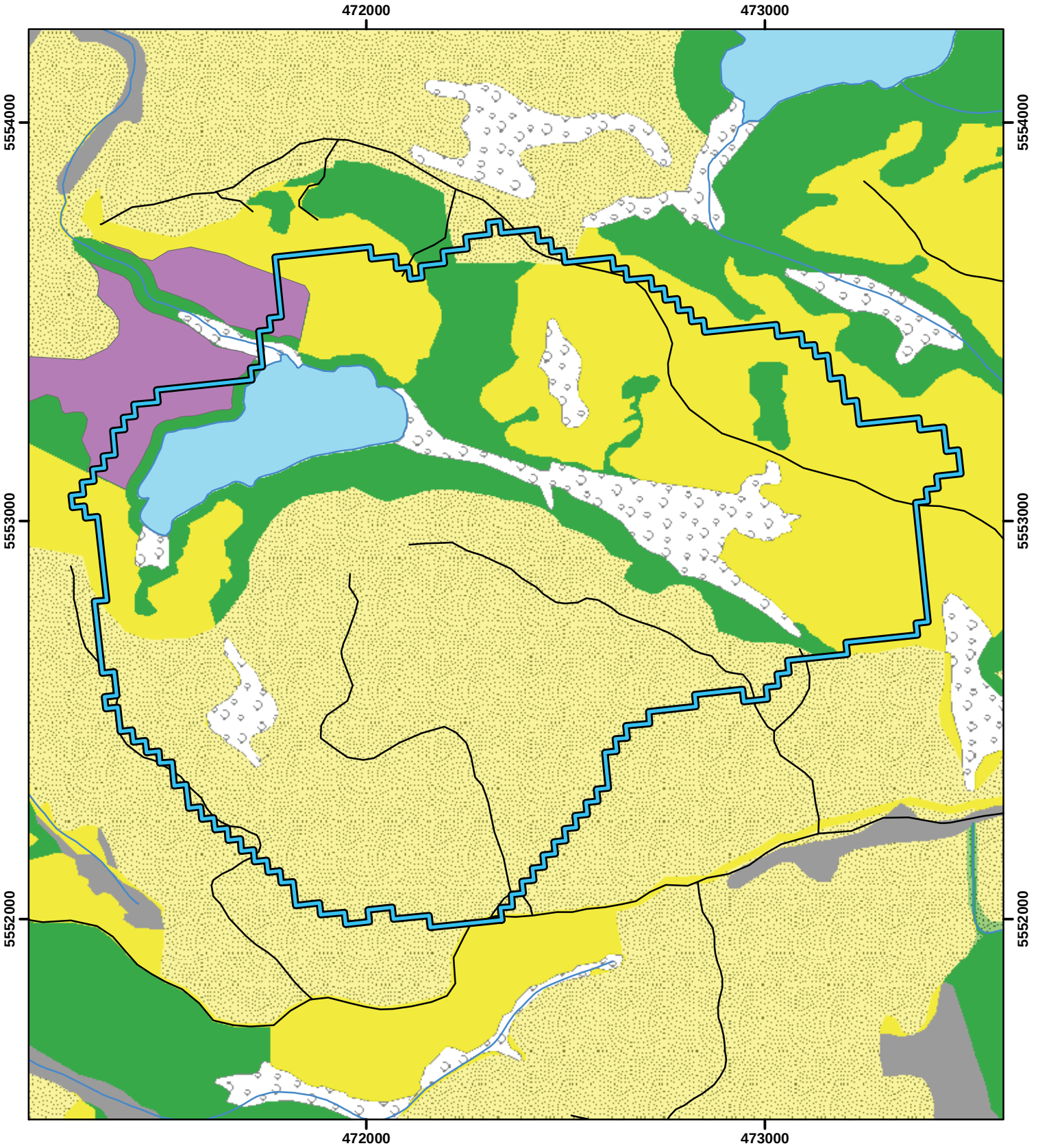
0 0.3 0.6 1.2 km

1:33,000

Planned and recent clearcut logging
Watershed Conifer Lake



Planned and recent clearcut logging
Watershed E of Carter L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

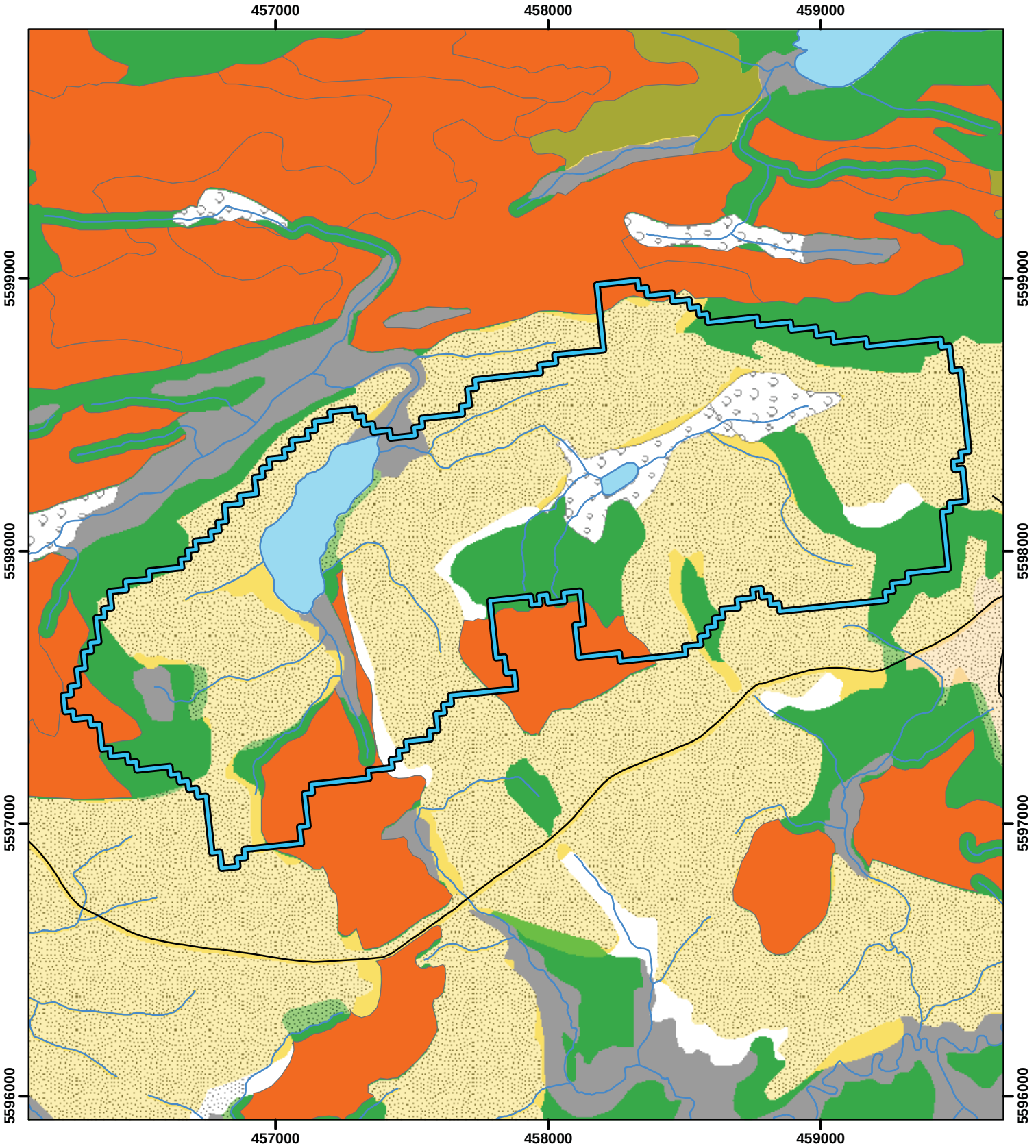
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.125 0.25 0.5 km

1:13,000

Planned and recent clearcut logging
Watershed E of Goose L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

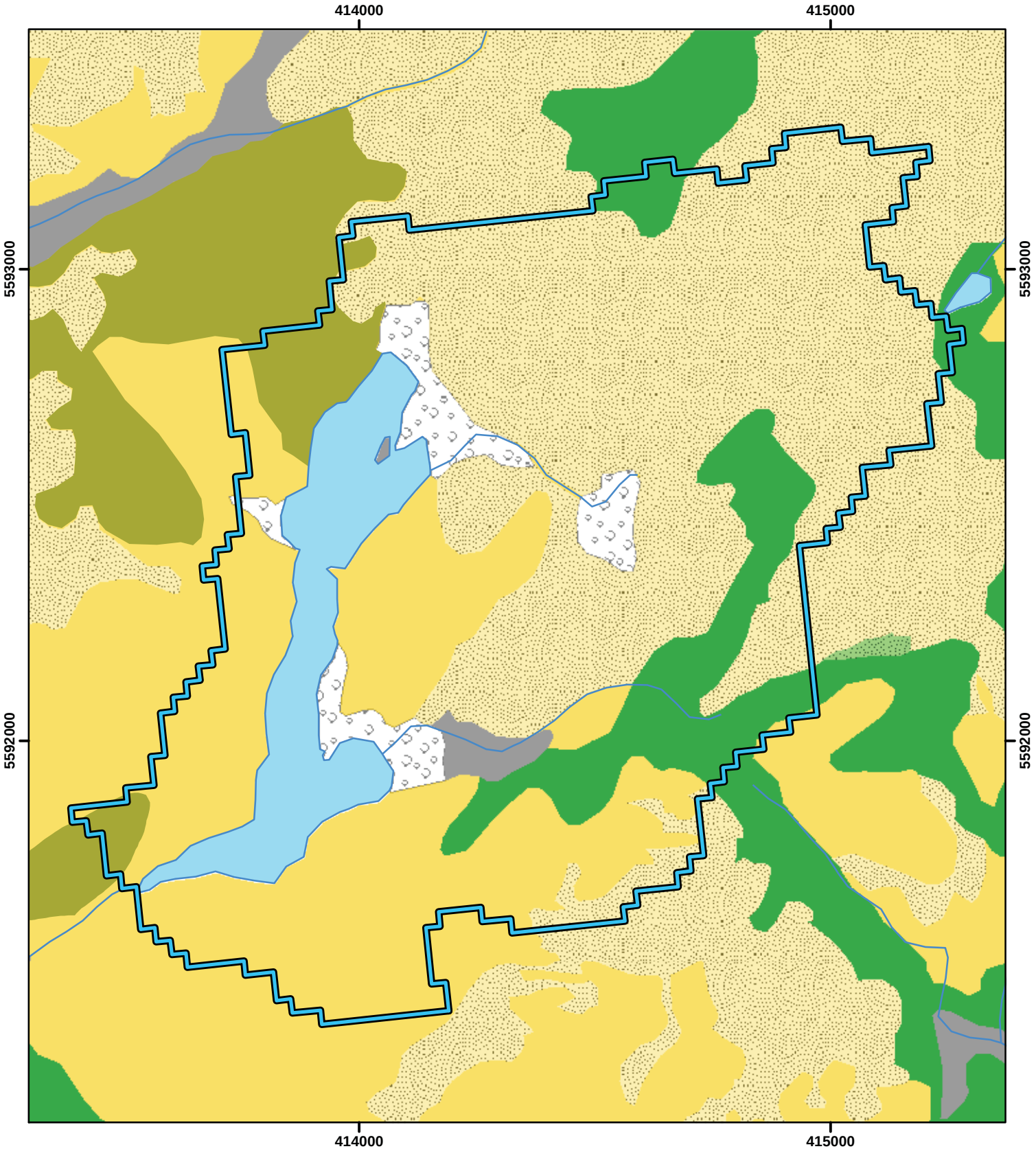
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.175 0.35 0.7 km

1:19,000

Planned and recent clearcut logging
Watershed E of Roger L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

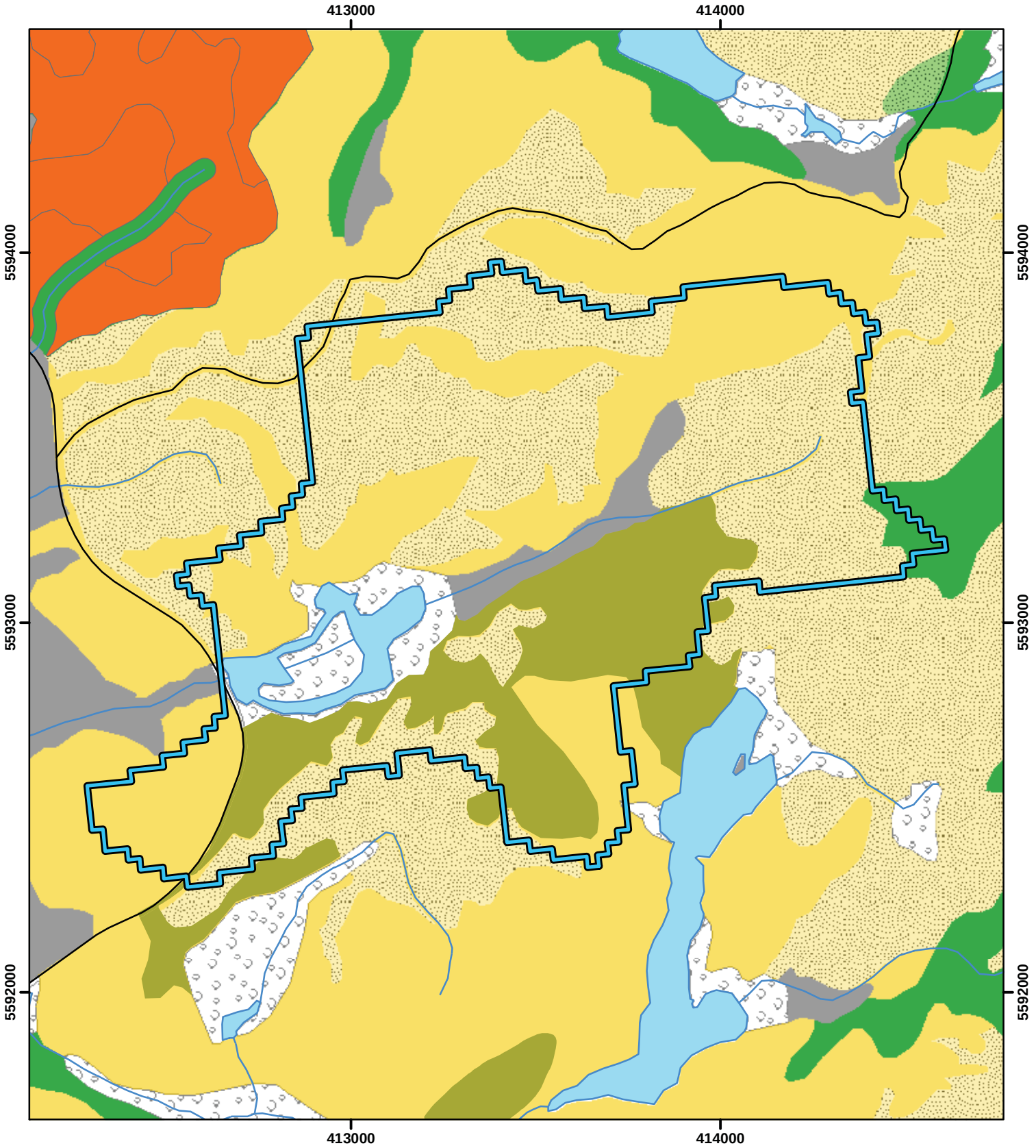
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.1 0.2 0.4 km

1:11,000

Planned and recent clearcut logging
Watershed E of Roger L 2



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

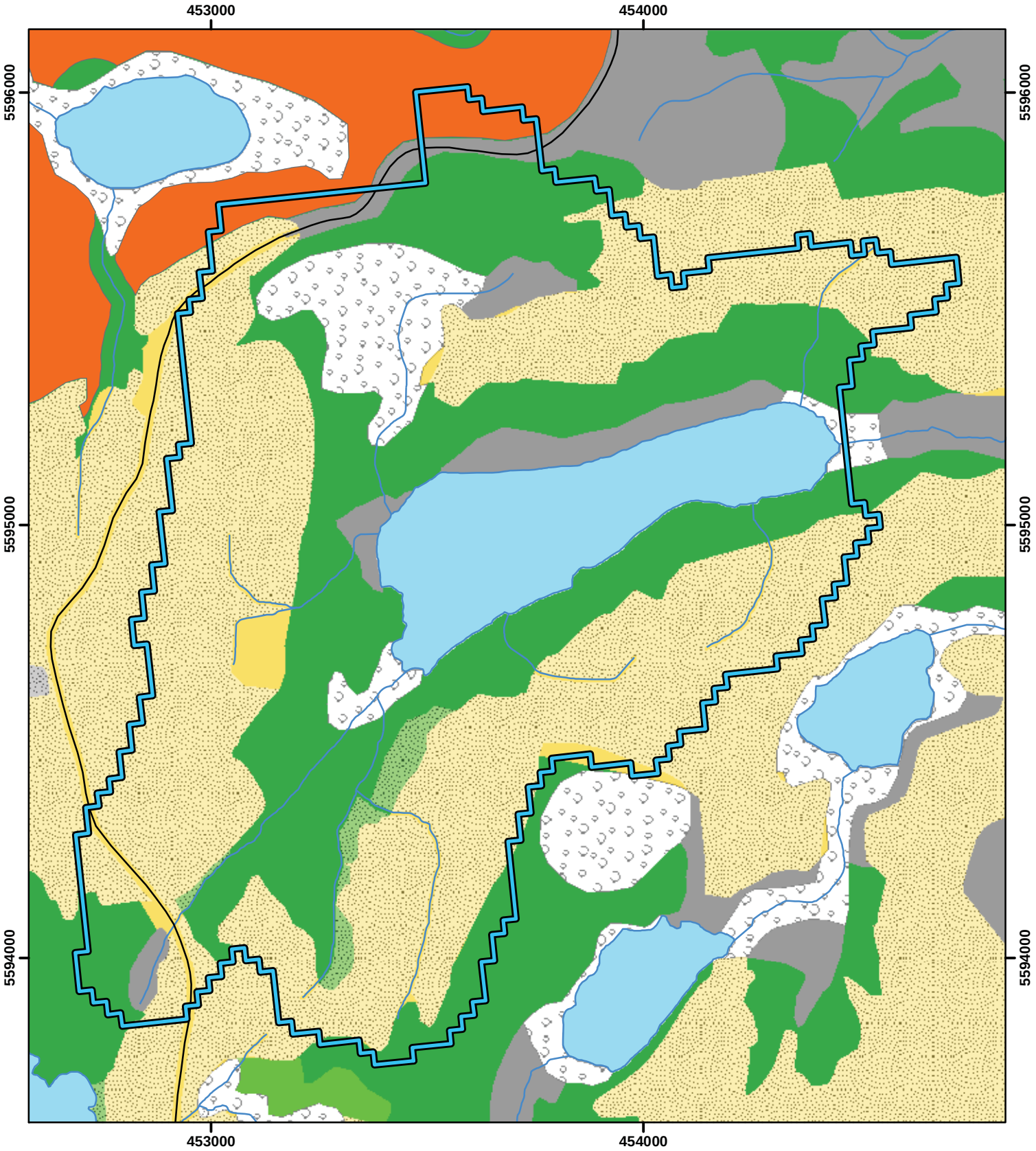
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.125 0.25 0.5 km

1:14,000

Planned and recent clearcut logging
Watershed E of Wilcox L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

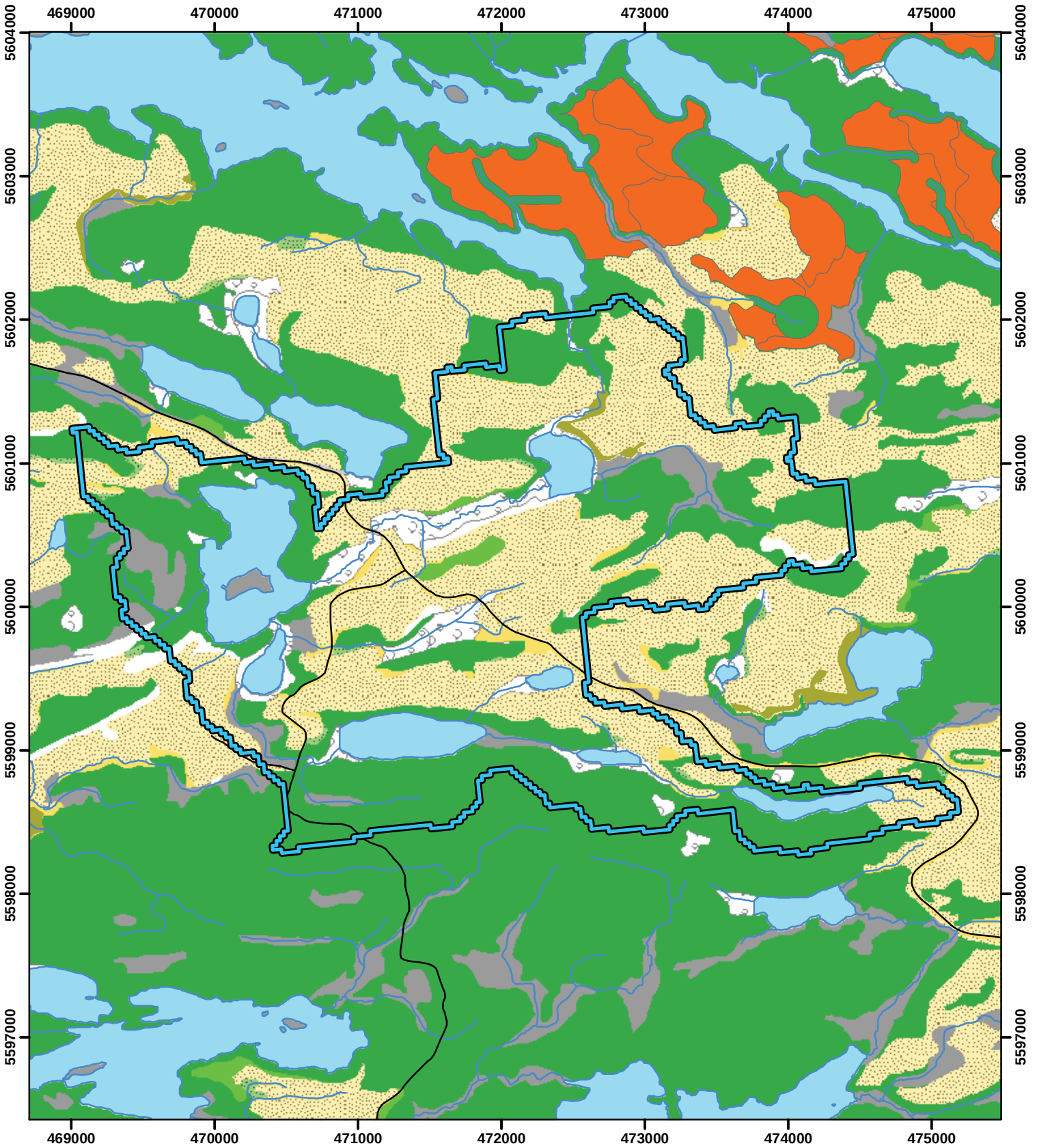
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.1 0.2 0.4 km

1:12,000

Planned and recent clearcut logging
Watershed English R tributary



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

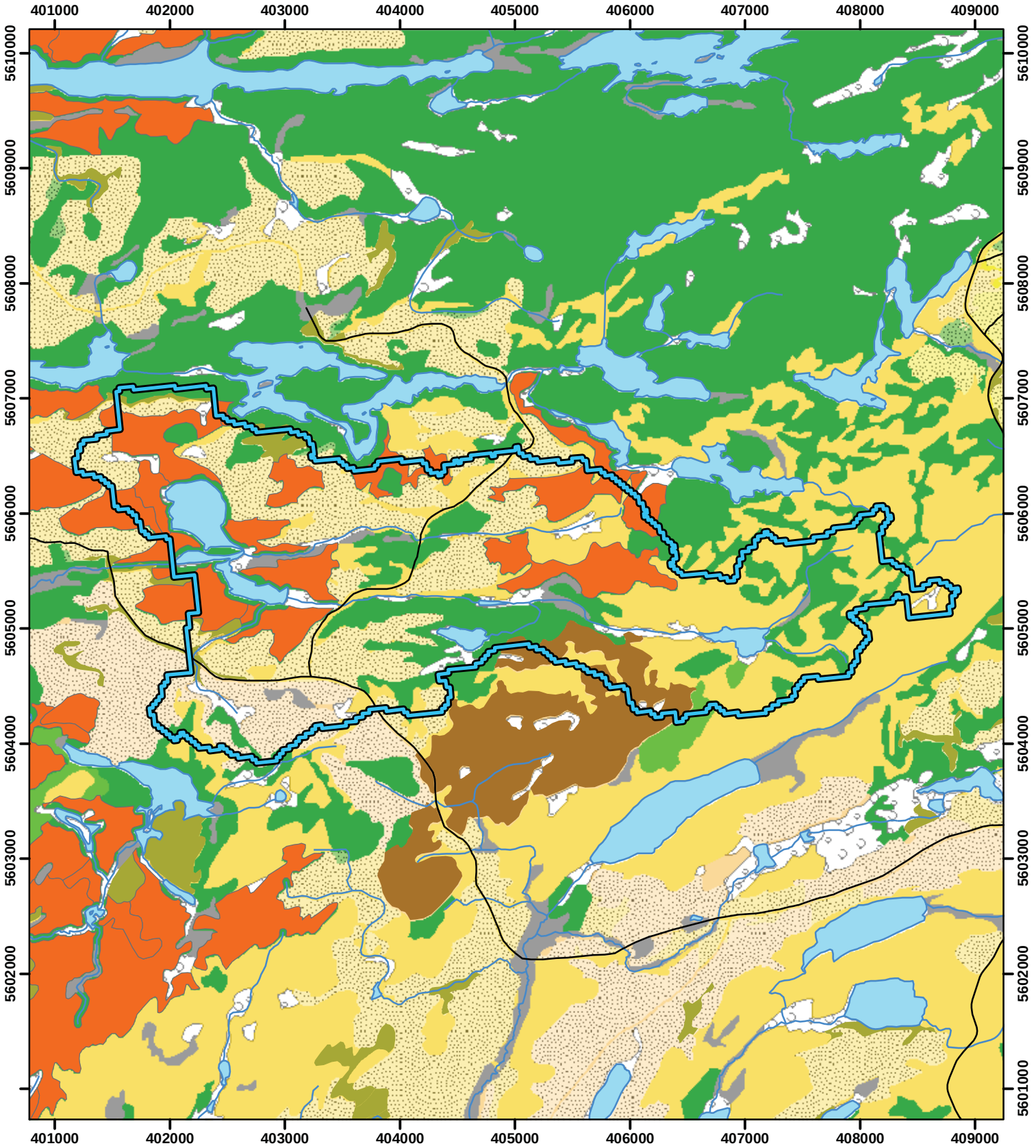
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.35 0.7 1.4 km

1:36,000

Planned and recent clearcut logging
Watershed Hat Lake



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

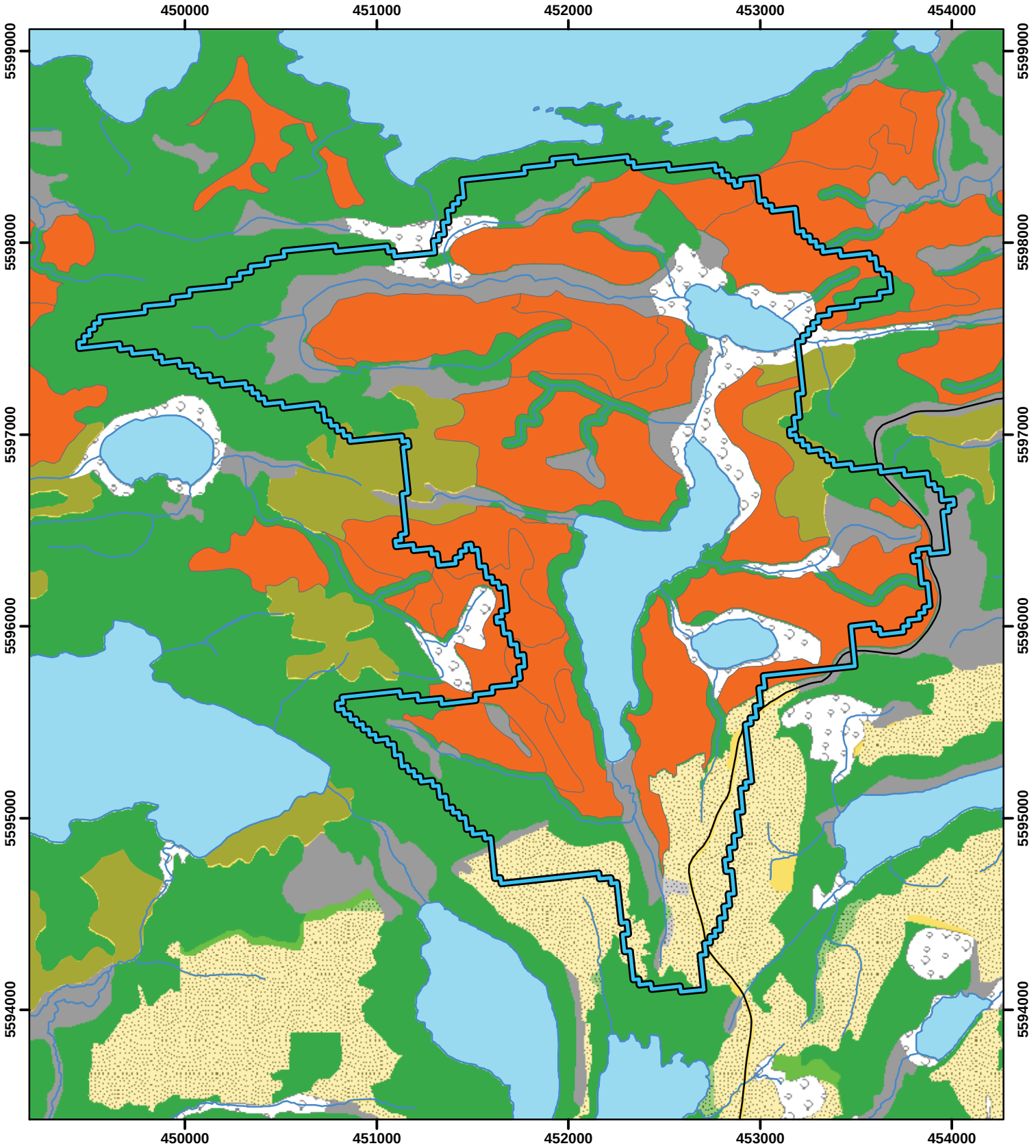
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

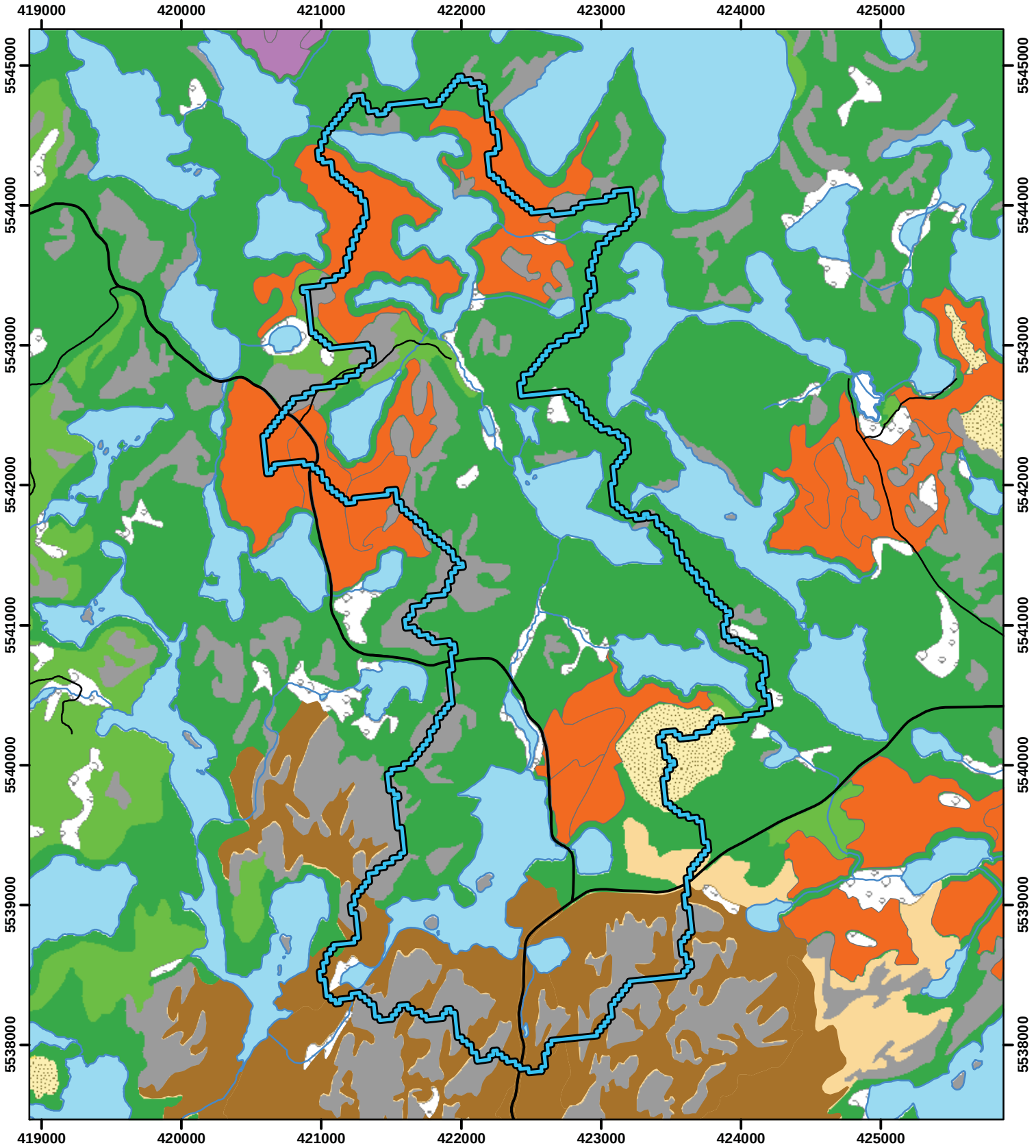
0 0.425 0.85 1.7 km

1:45,000

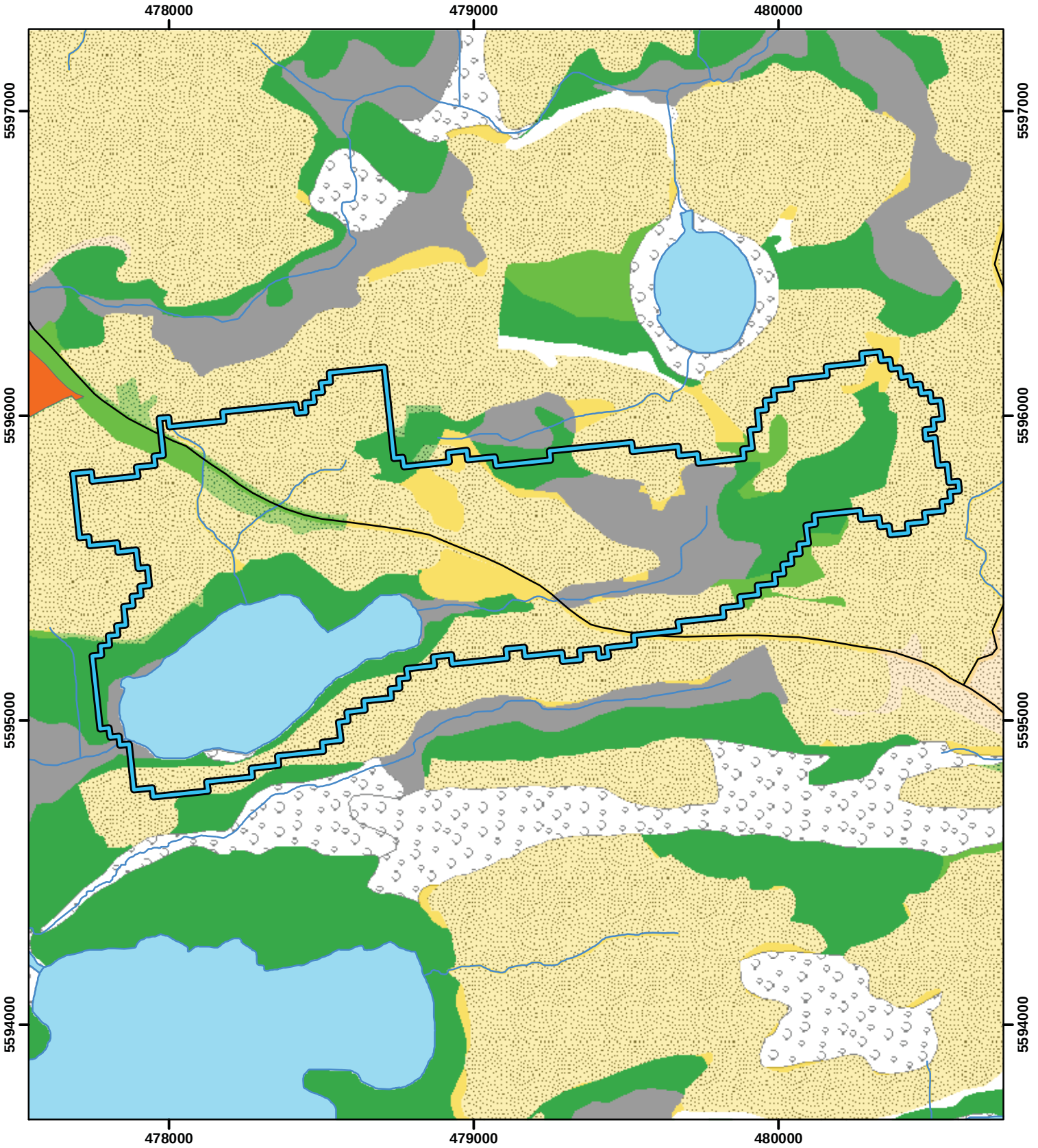
Planned and recent clearcut logging
Watershed Keewatin 1



Planned and recent clearcut logging
Watershed Mermaid L watershed



Planned and recent clearcut logging
Watershed N of Anishinabe R



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

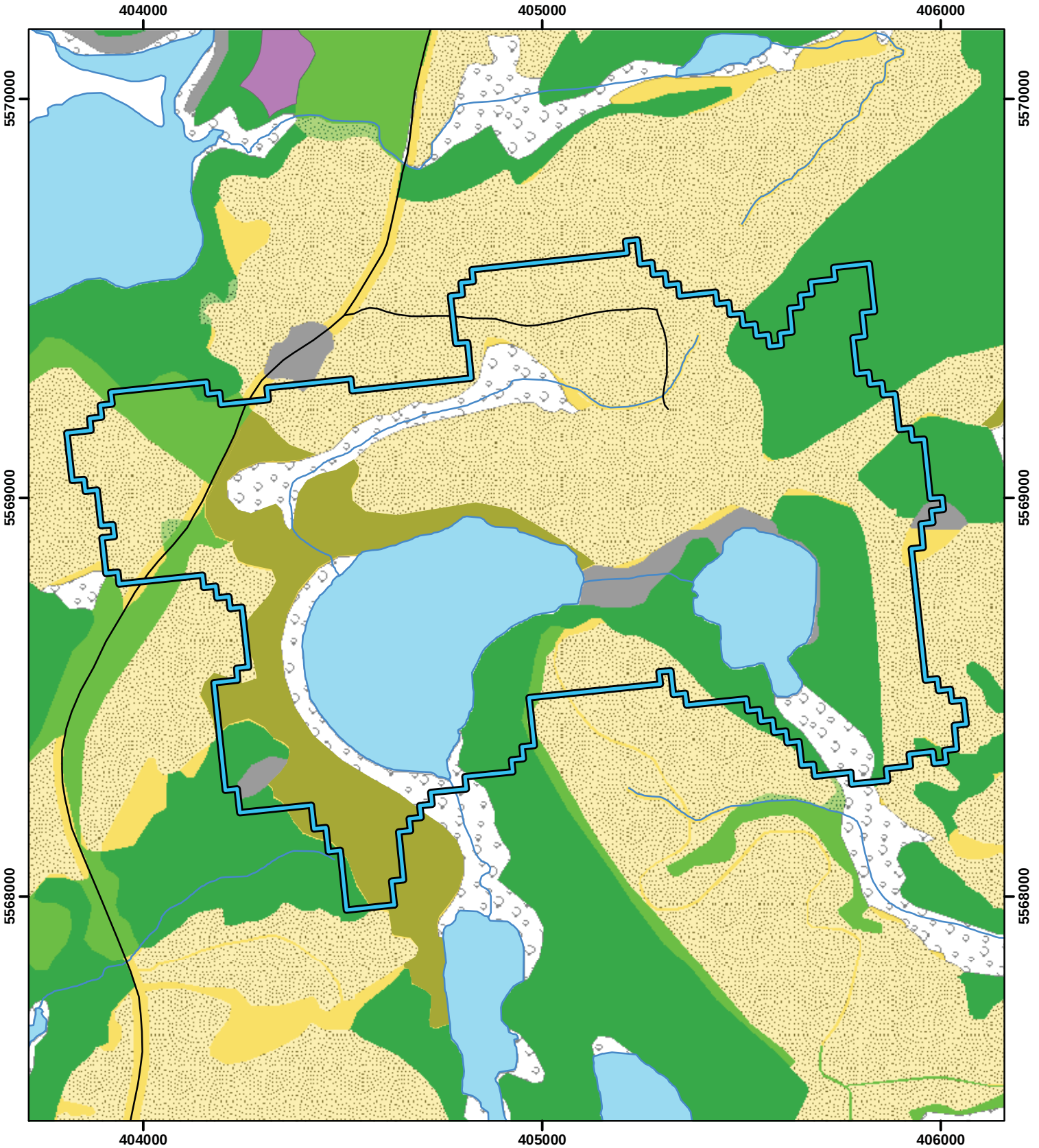
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.15 0.3 0.6 km

1:17,000

Planned and recent clearcut logging
Watershed N of Brown Bear L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

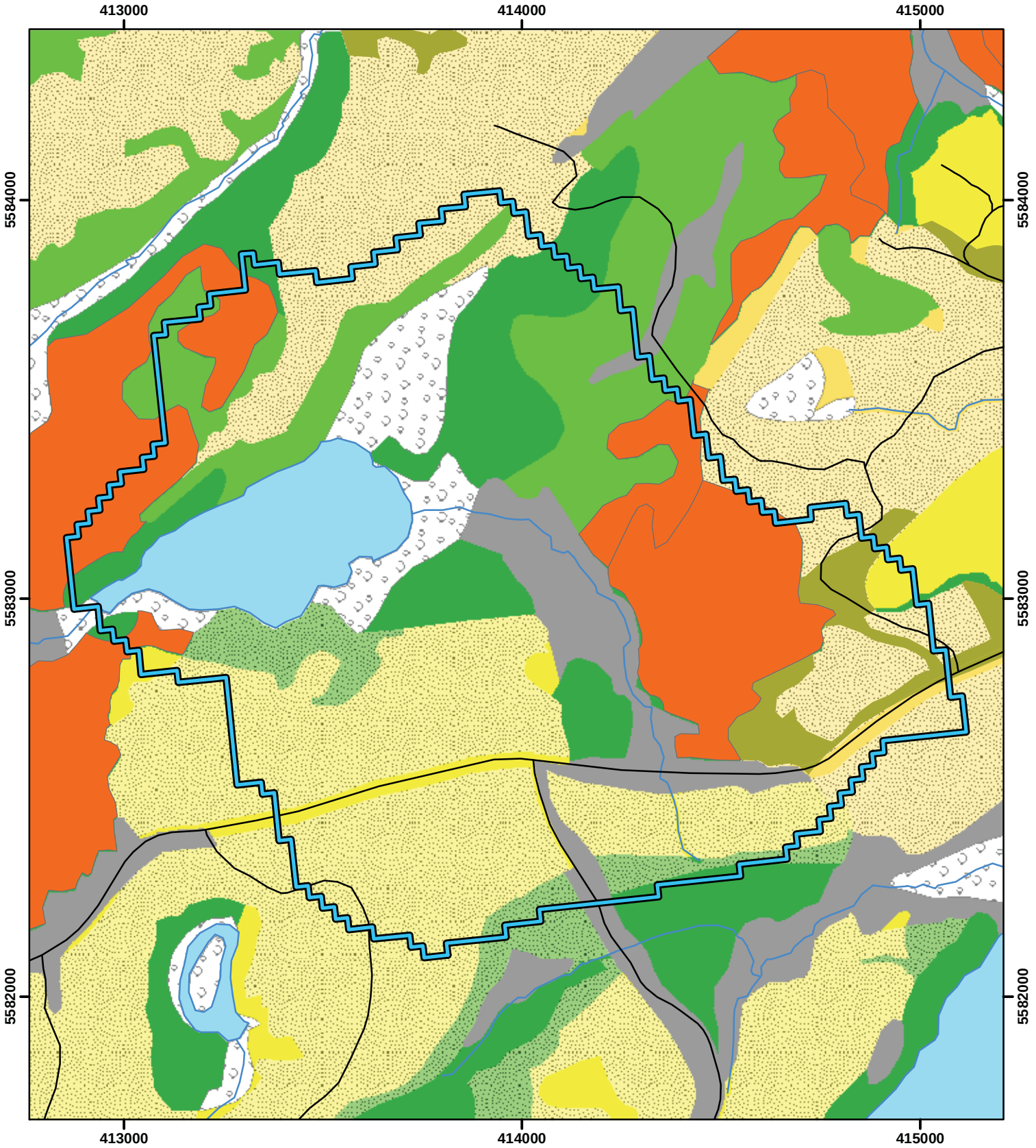
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

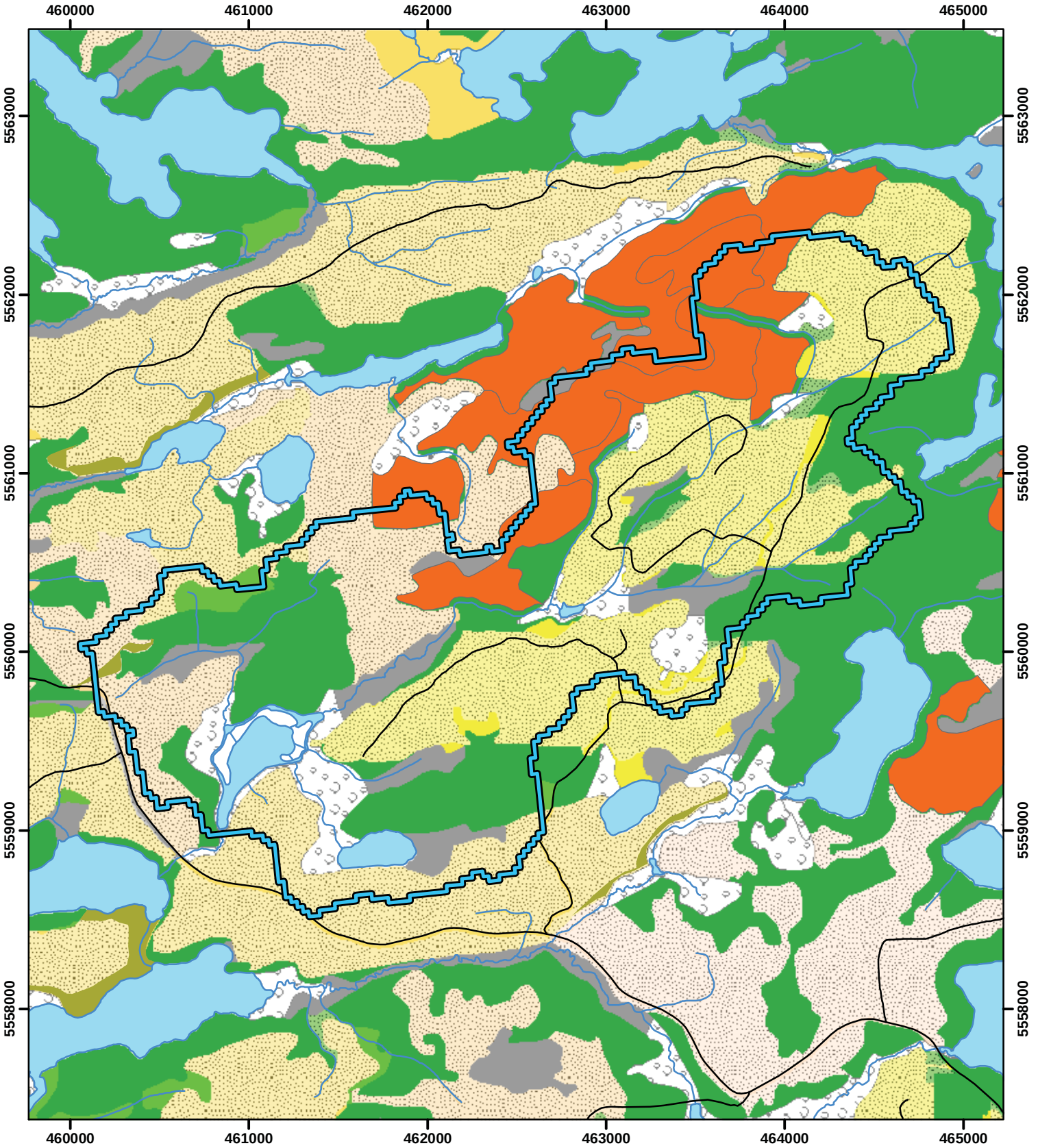
0 0.125 0.25 0.5 km

1:13,000

Planned and recent clearcut logging
Watershed N of Heider L



Planned and recent clearcut logging
Watershed N of Noname L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

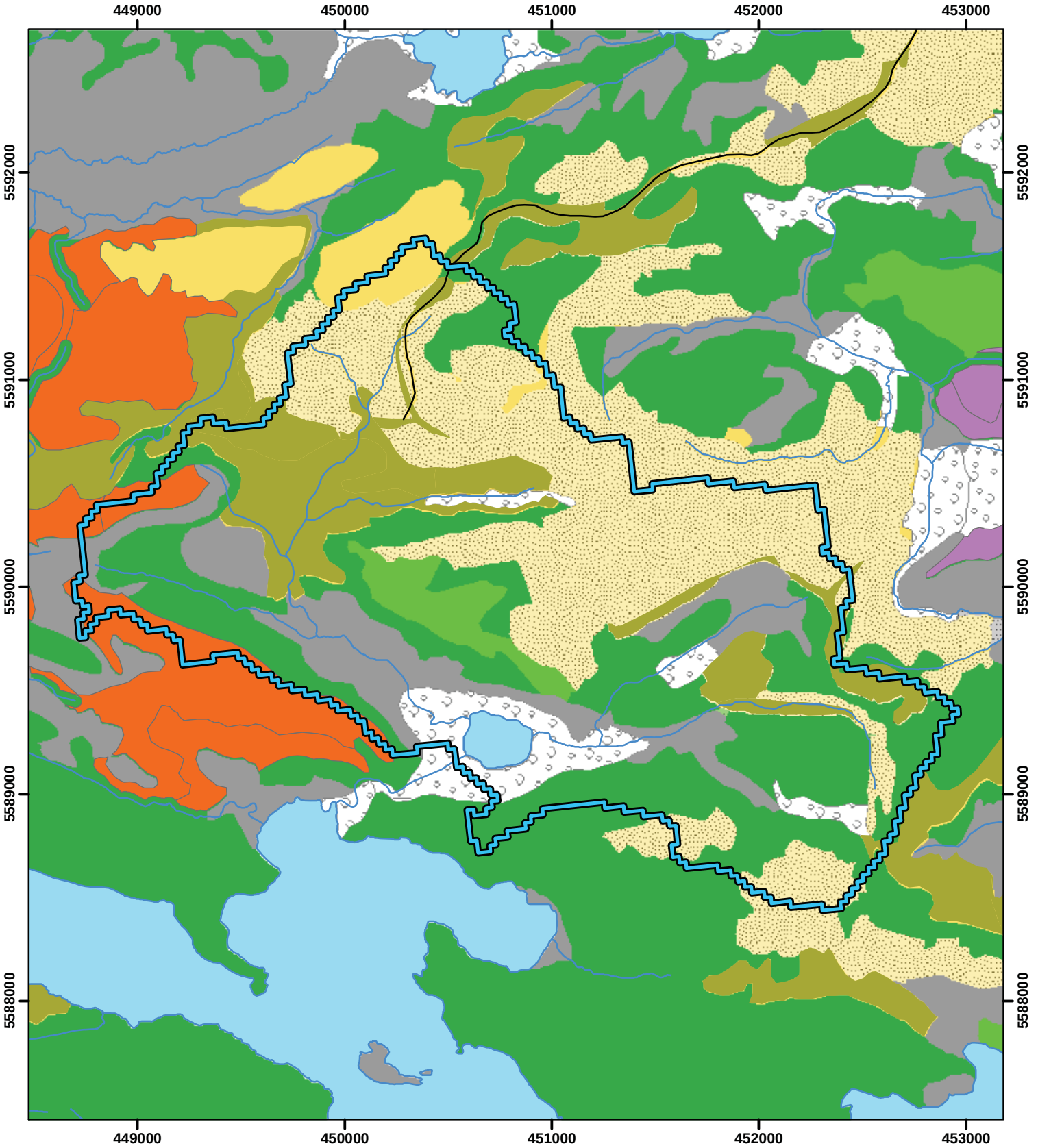
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.275 0.55 1.1 km

1:29,000

Planned and recent clearcut logging
Watershed N of Oak L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

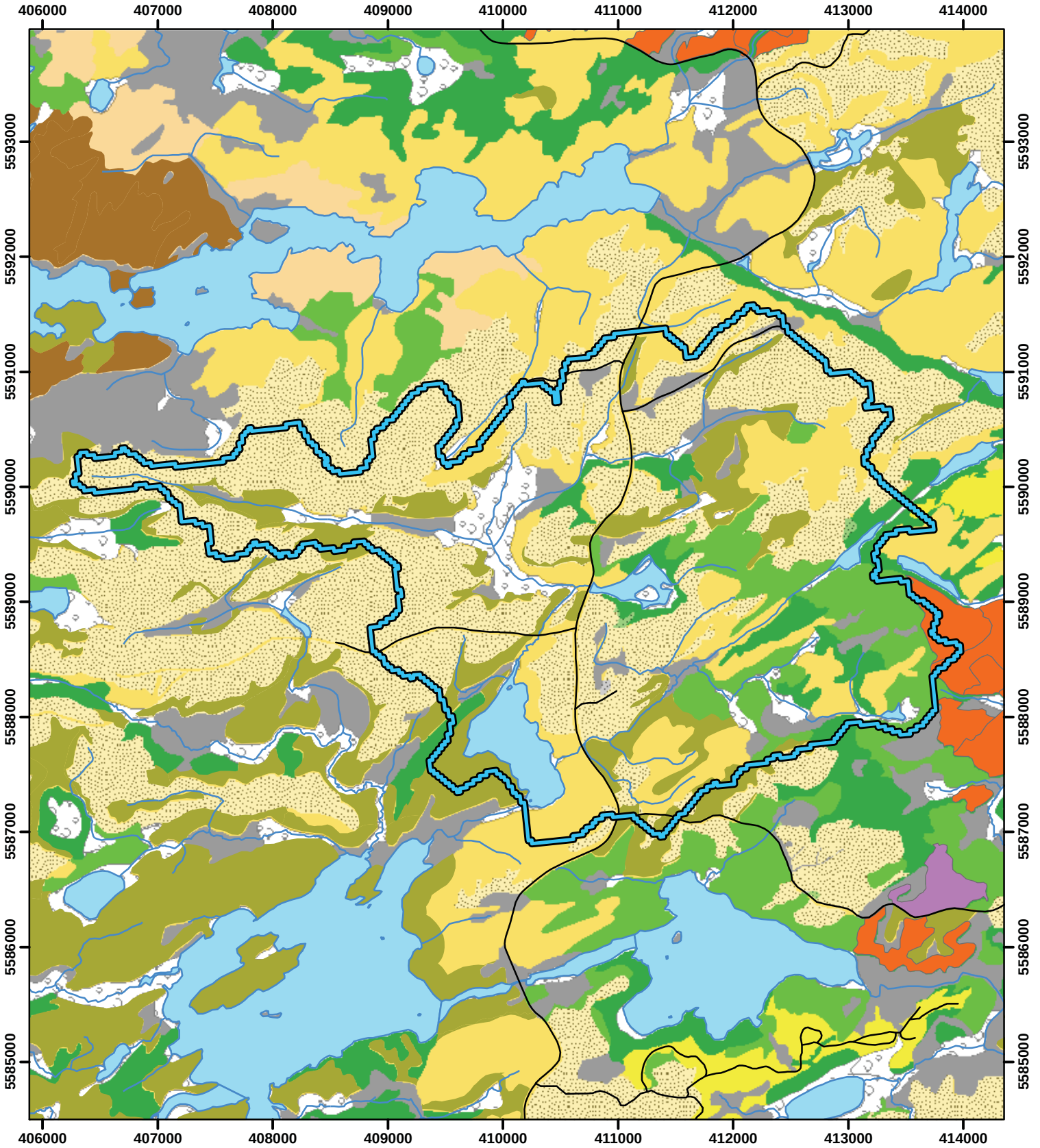
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.225 0.45 0.9 km

1:25,000

Planned and recent clearcut logging
Watershed N of Paintpot L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

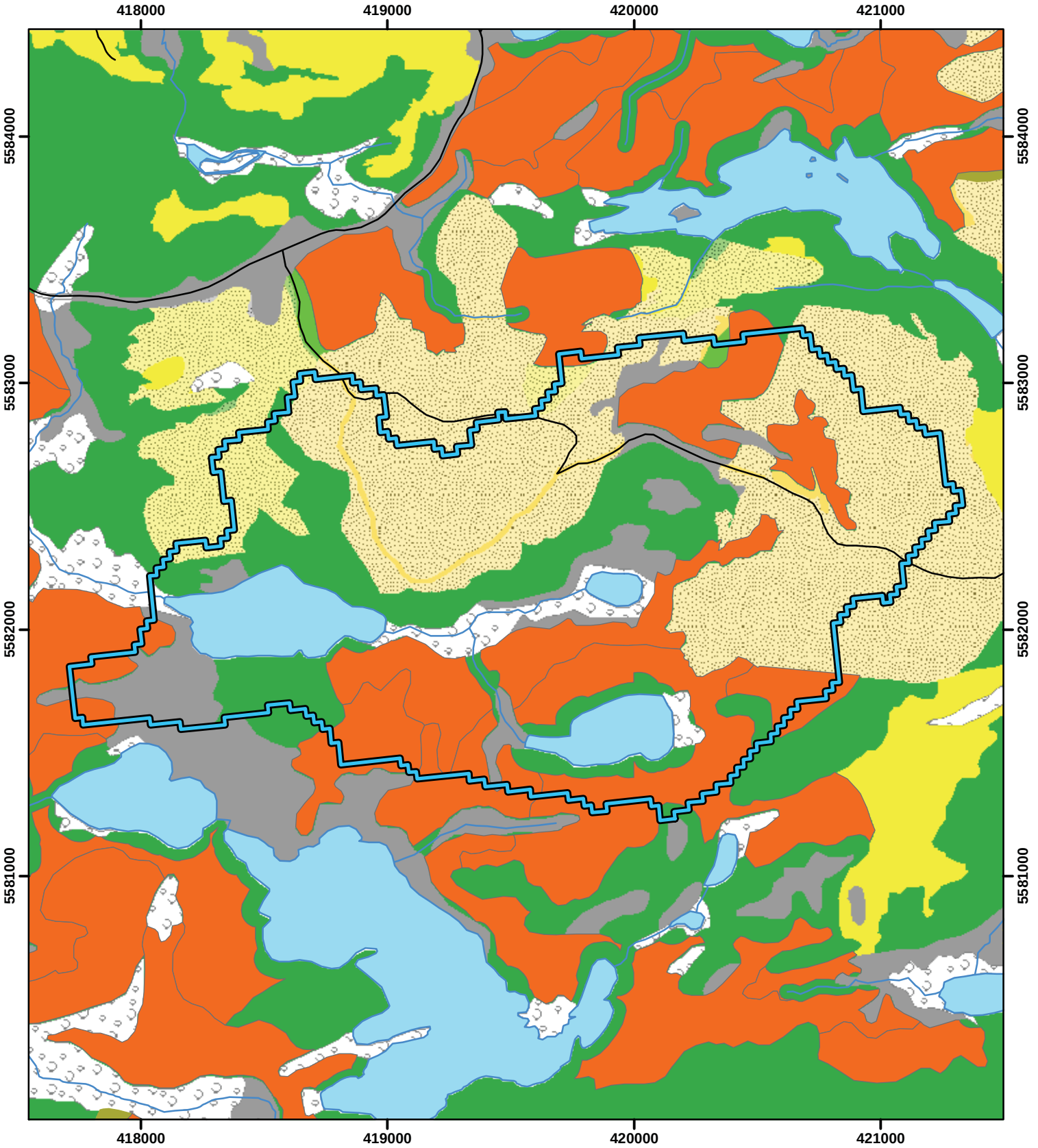
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.425 0.85 1.7 km

1:45,000

Planned and recent clearcut logging
Watershed N of Scotty Lake



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

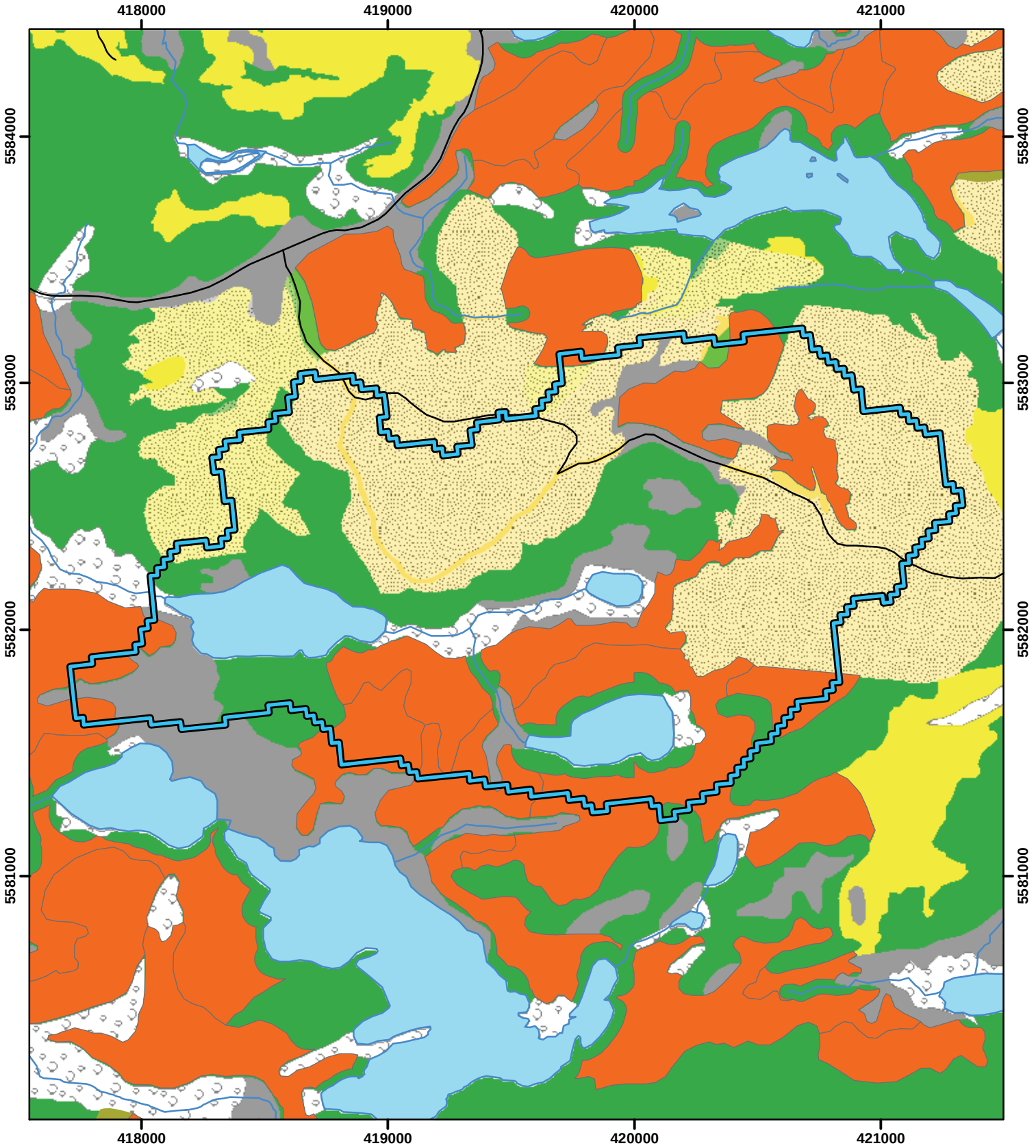
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.2 0.4 0.8 km

1:21,000

Planned and recent clearcut logging
Watershed N of Scotty Lake 2



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

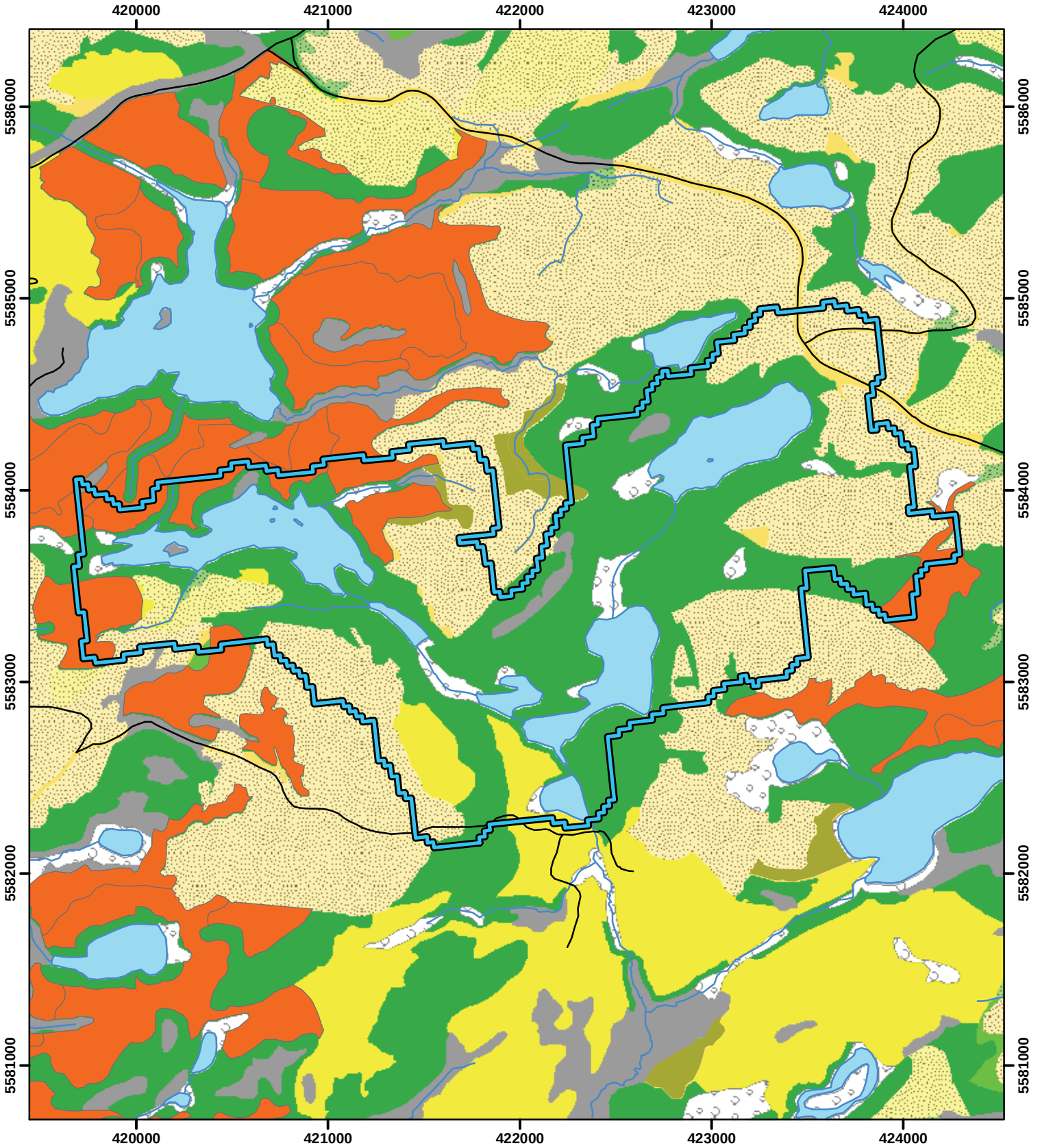
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.2 0.4 0.8 km

1:21,000

Planned and recent clearcut logging
Watershed N of Scotty Lake 4 not 1st order



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

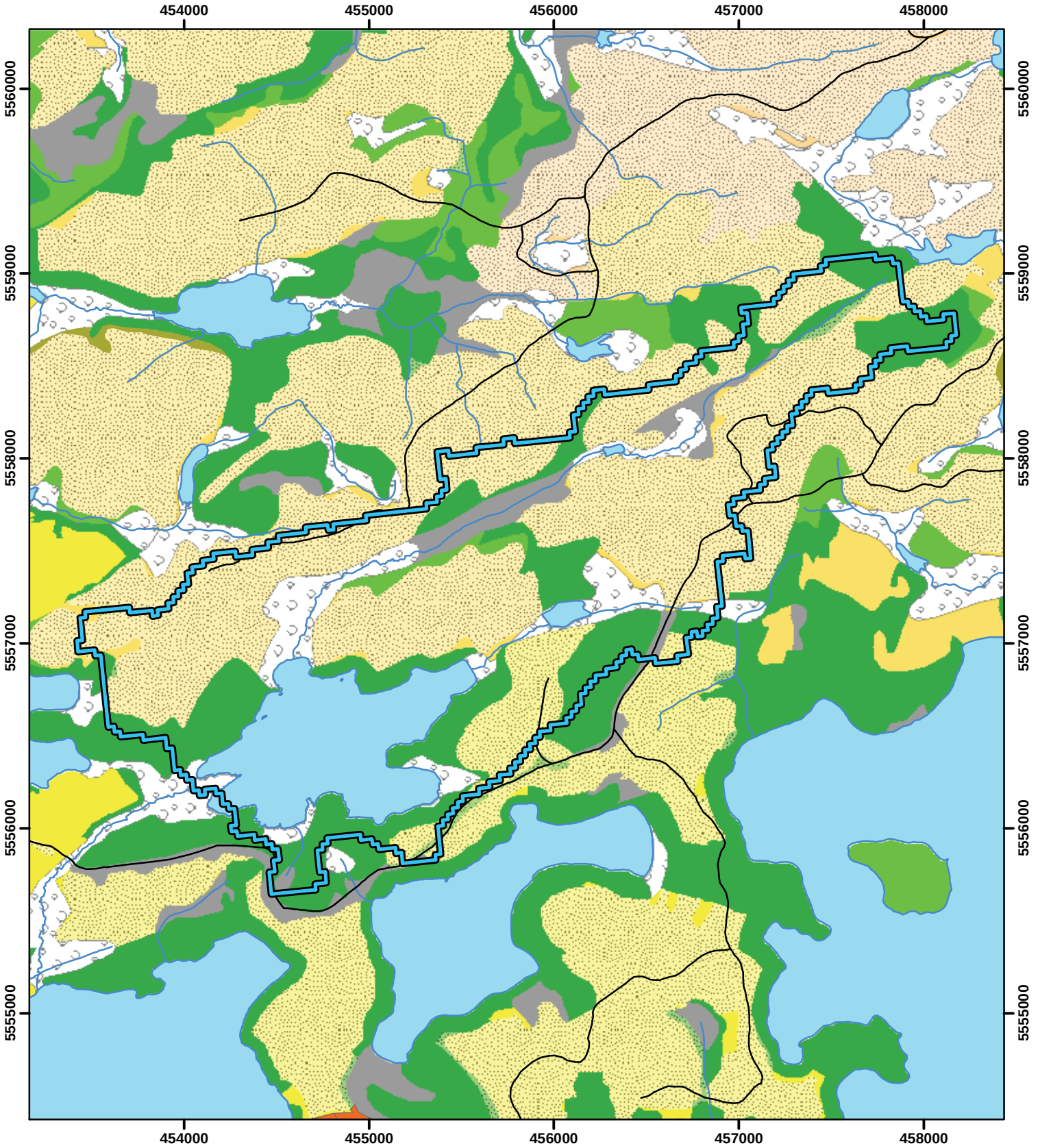
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.25 0.5 1 km

1:27,000

Planned and recent clearcut logging
Watershed N of Wabigoon L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

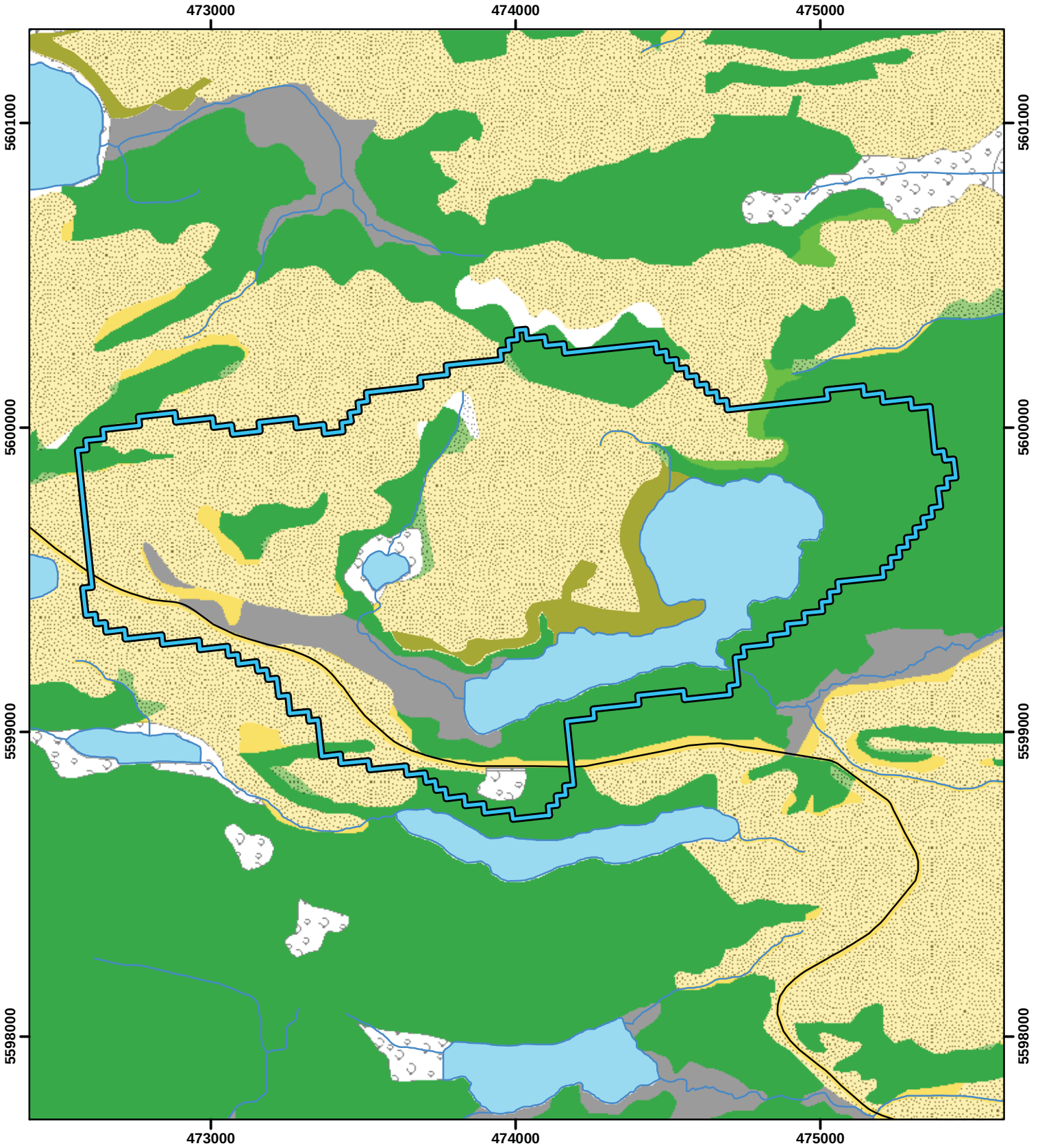
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.25 0.5 1 km

1:28,000

Planned and recent clearcut logging
Watershed N of Windfall Rd



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

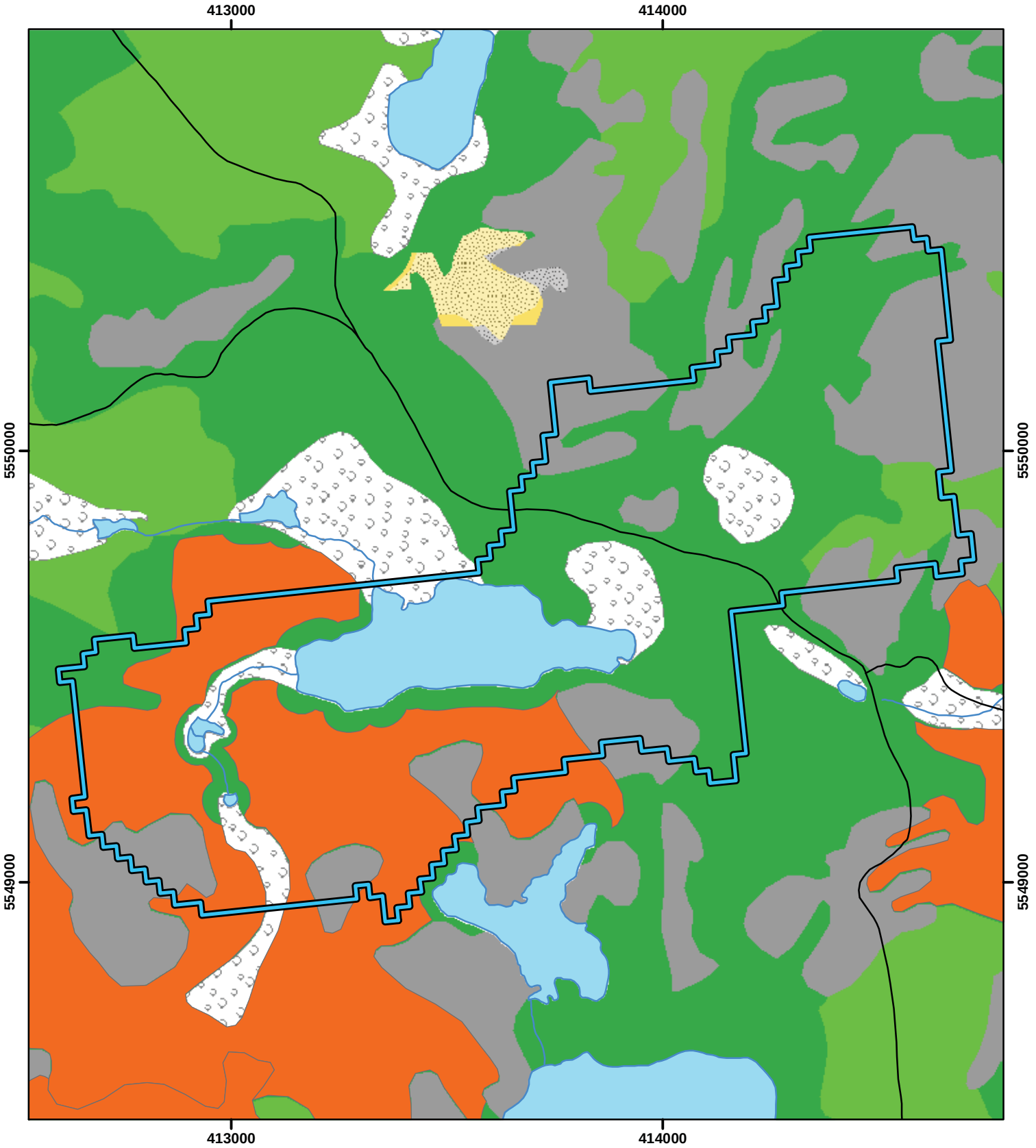
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.15 0.3 0.6 km

1:17,000

Planned and recent clearcut logging
Watershed No Name 01 W of Wonderland L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

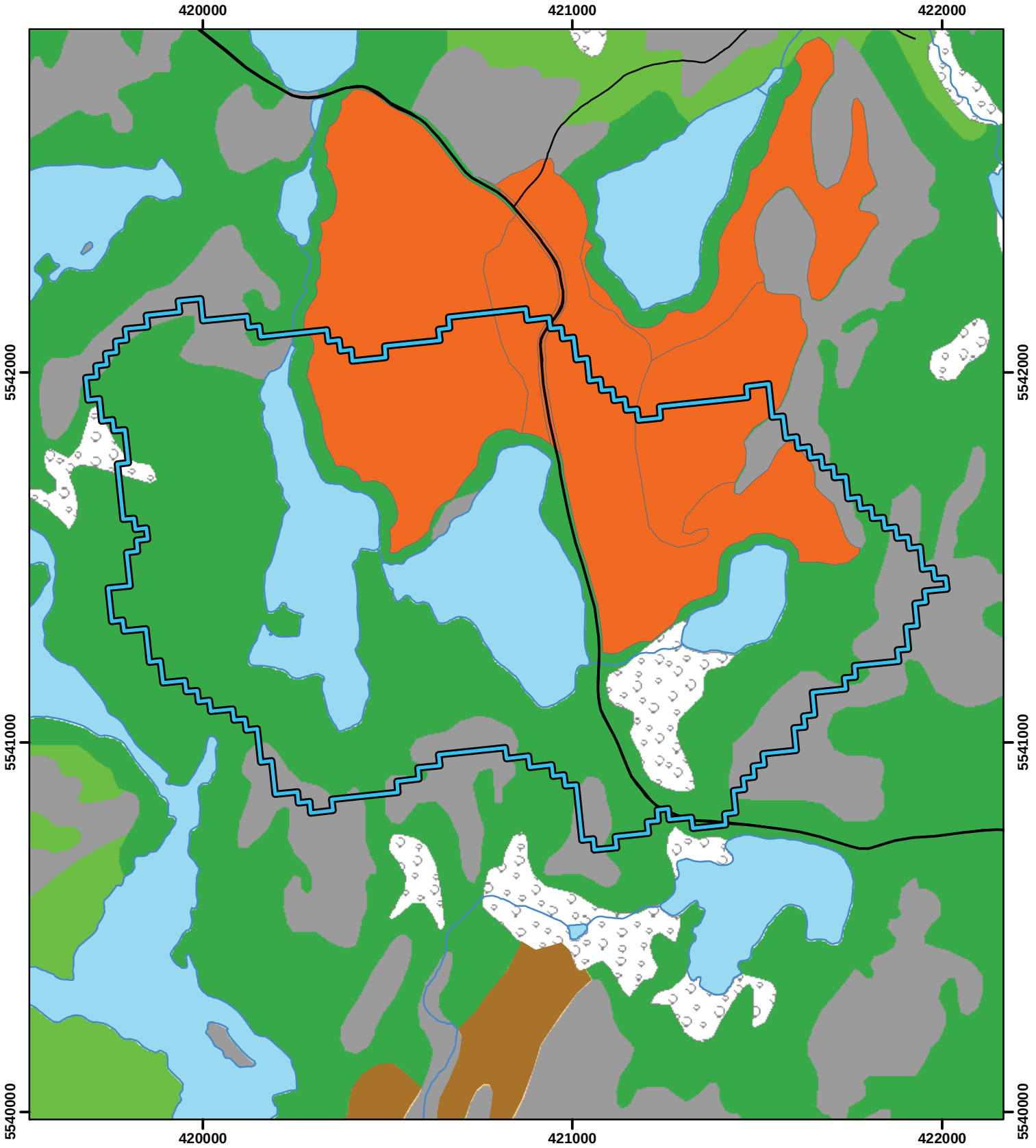
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.1 0.2 0.4 km

1:12,000

Planned and recent clearcut logging
Watershed NoName 02 E of Kill Deer L W of road



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

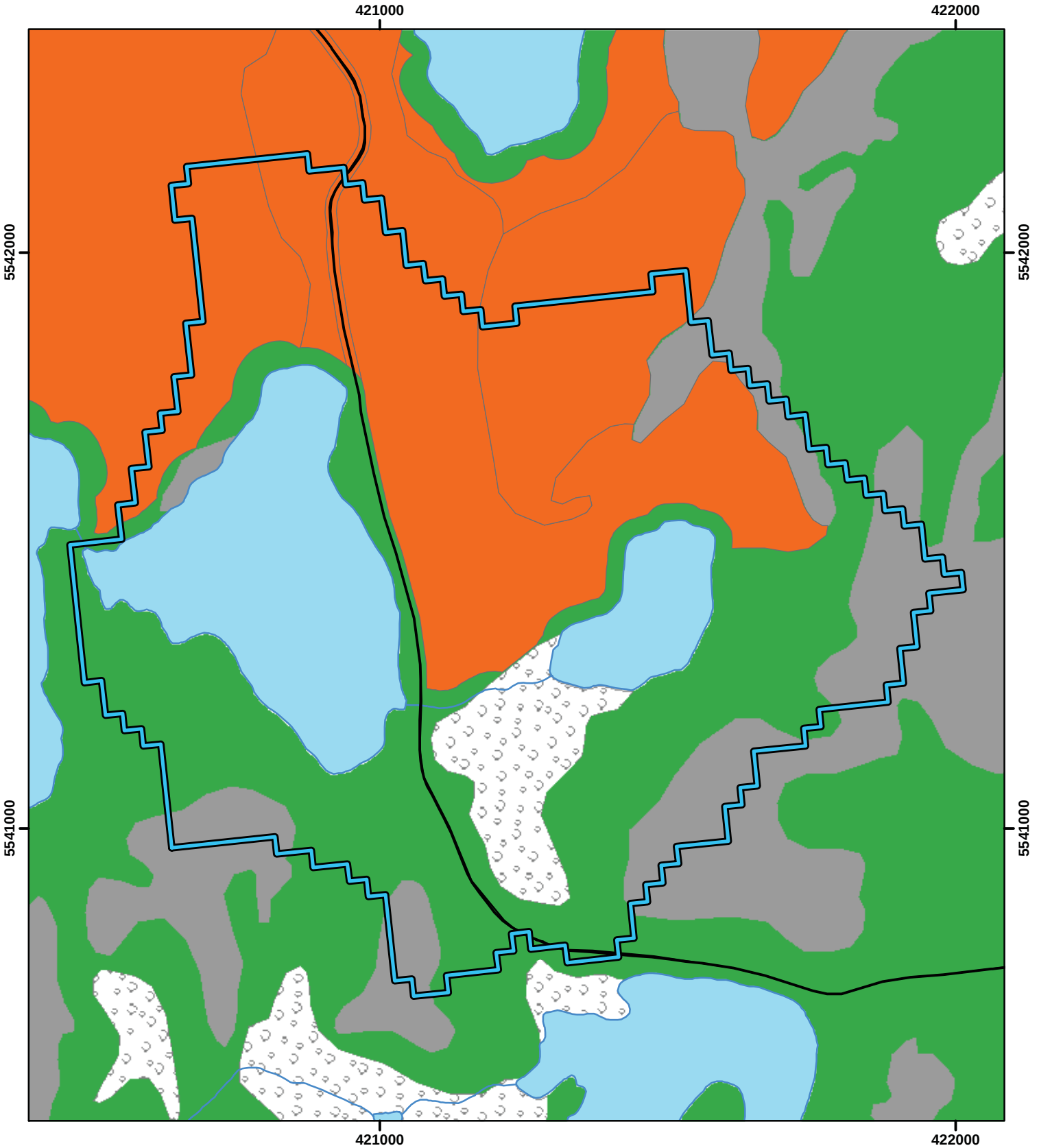
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.125 0.25 0.5 km

1:14,000

Planned and recent clearcut logging
Watershed Noname 03 near Red Deer Lake



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

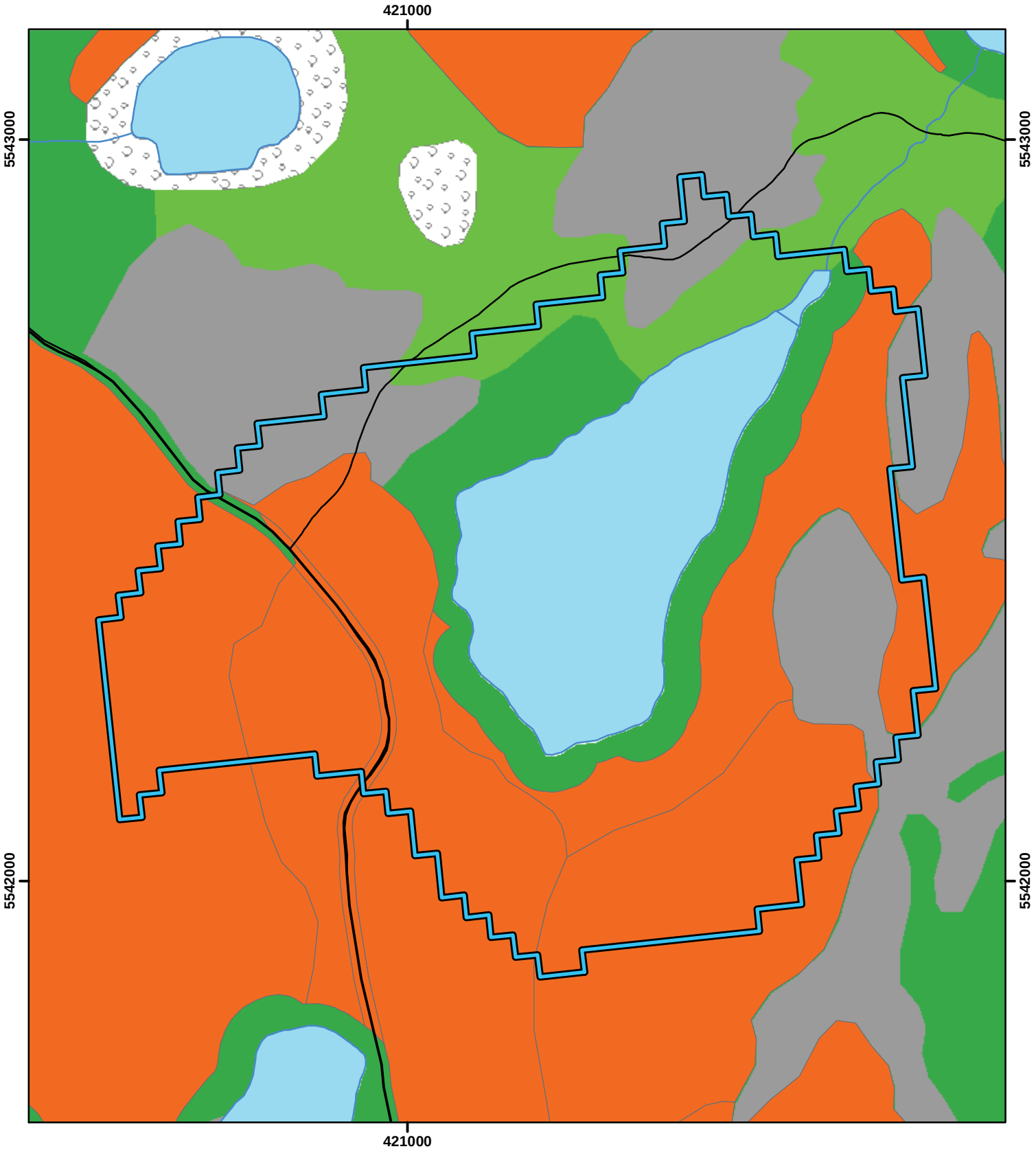
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.075 0.15 0.3 km

1:9,000

Planned and recent clearcut logging
Watershed Noname 04 near Red Deer Lake



Watershed Limits

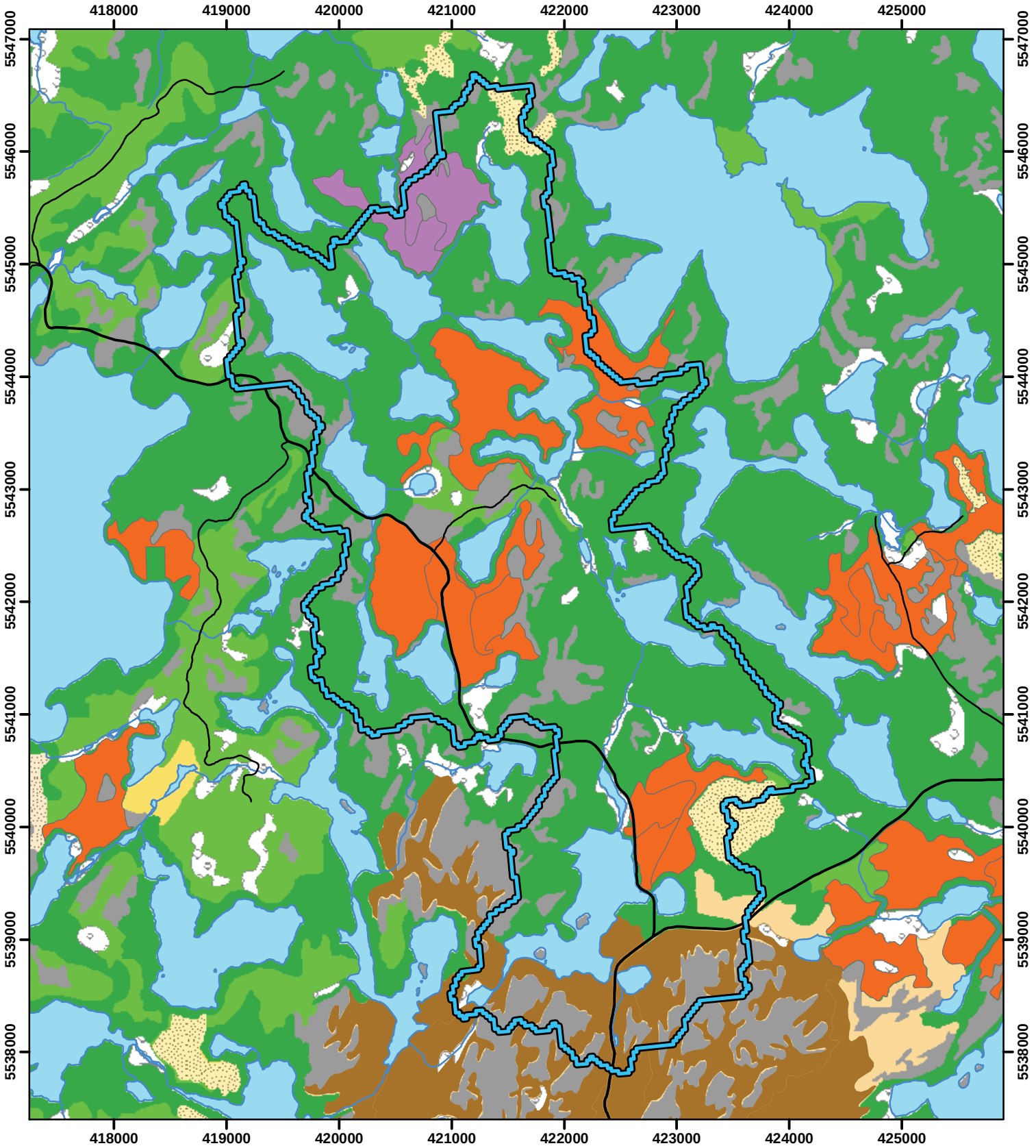
Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.05 0.1 0.2
km
1:7,000

Planned and recent clearcut logging
Watershed NoName 06 S of Wonderland



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

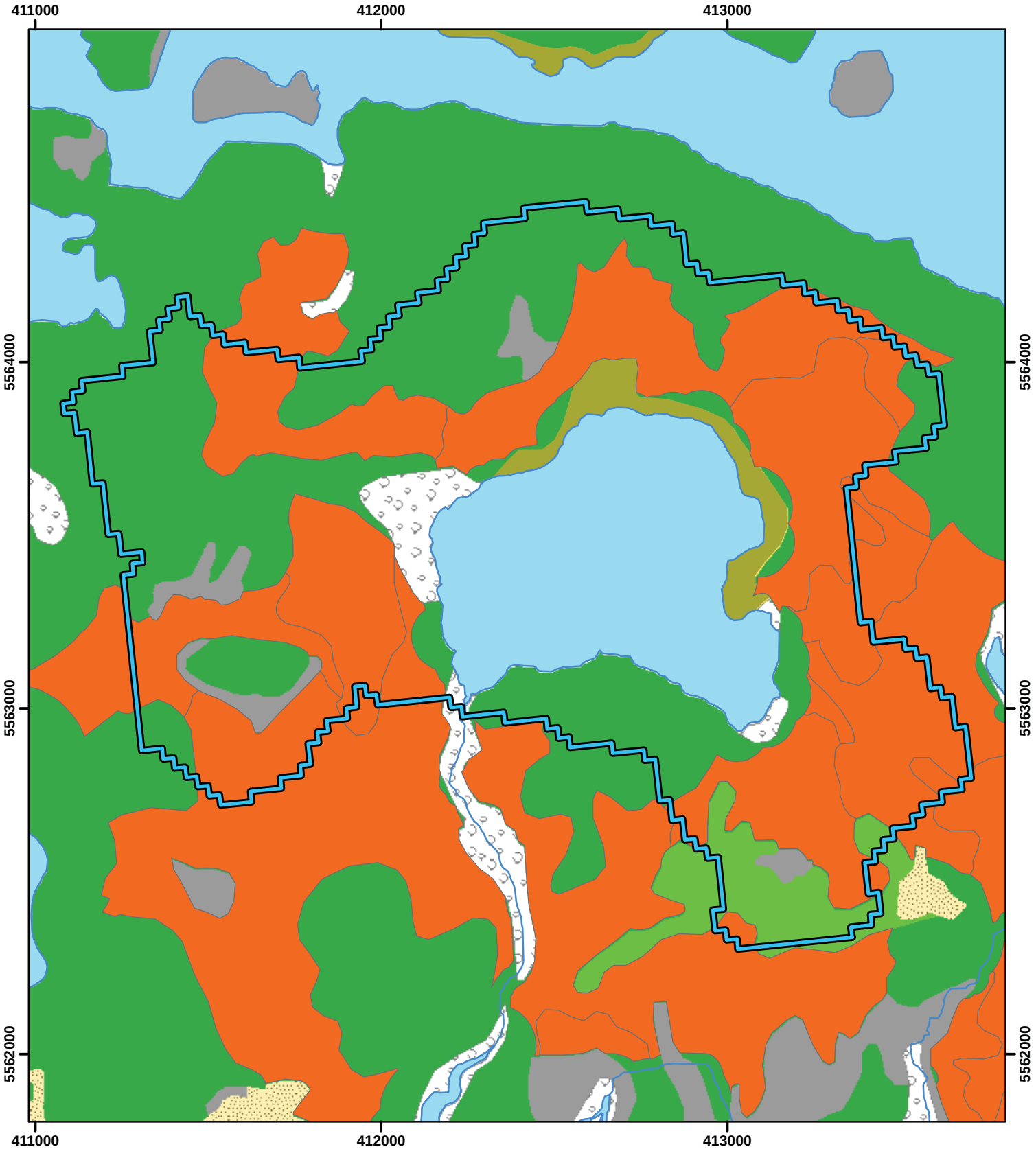
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.45 0.9 1.8 km

1:46,000

Planned and recent clearcut logging
Watershed NoName 11 S of Scenic L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

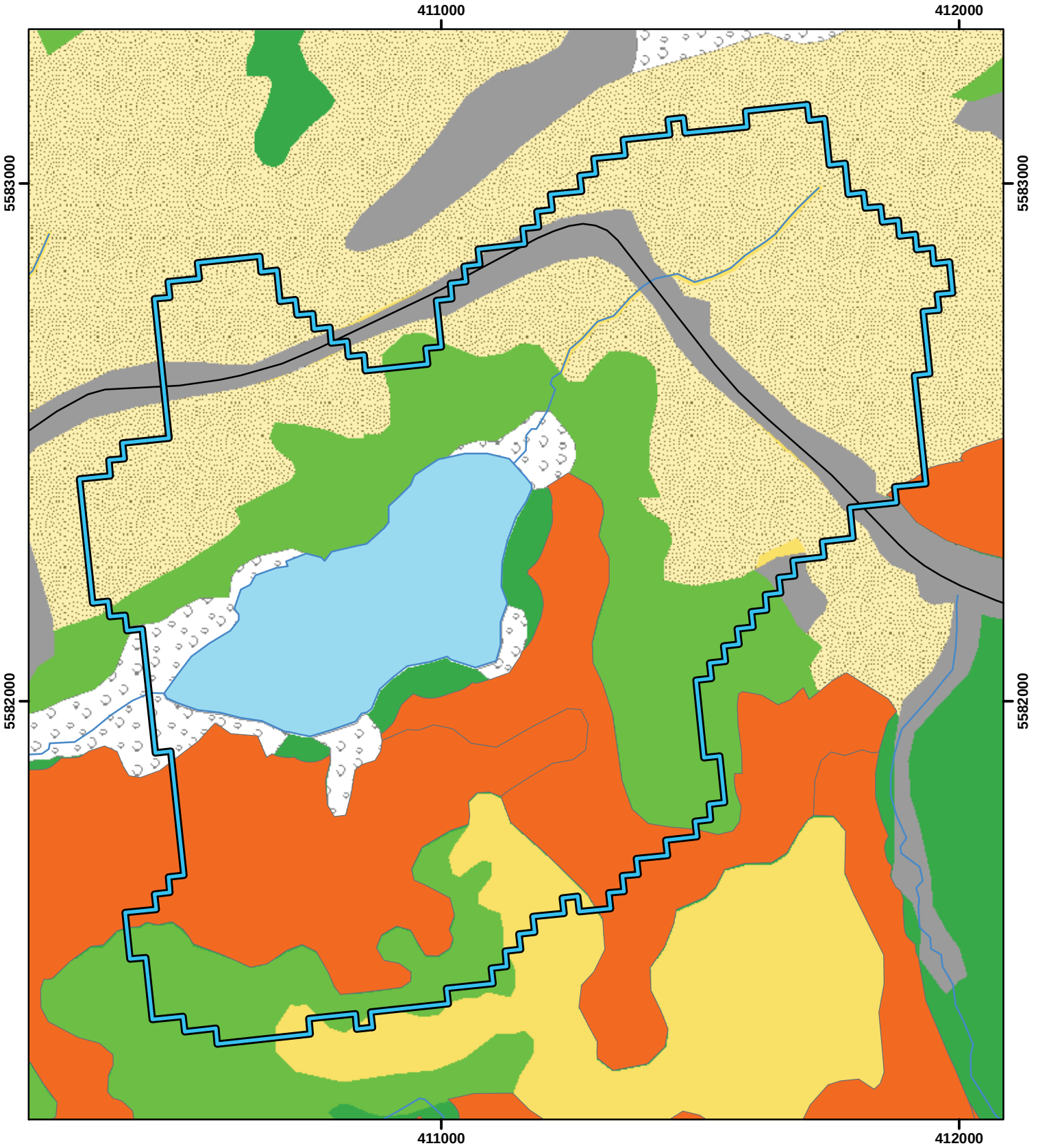
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.125 0.25 0.5 km

1:15,000

Planned and recent clearcut logging
Watershed NoName 15 SE of Paintpot L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

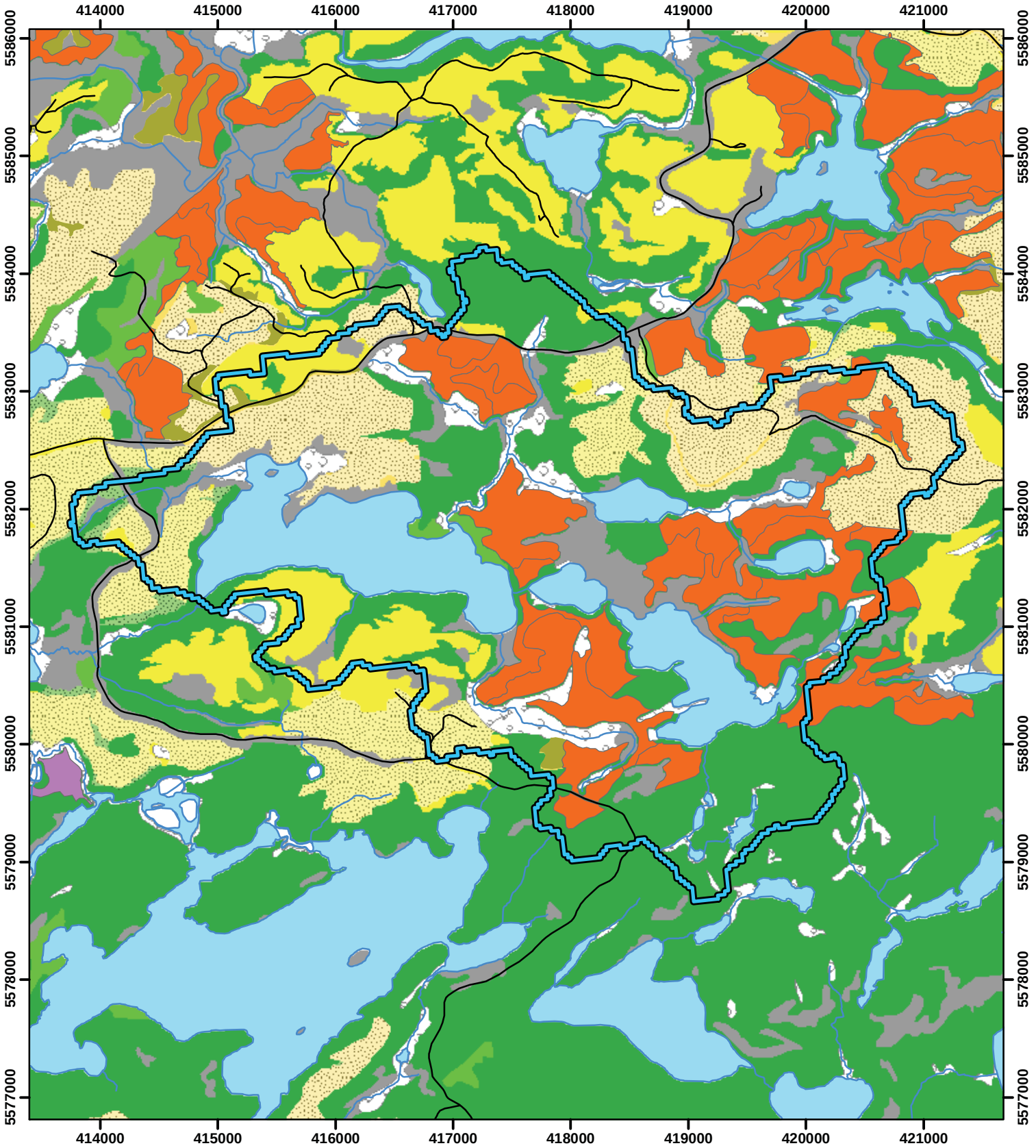
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.075 0.15 0.3 km

1:10,000

Planned and recent clearcut logging
Watershed NoName 17 N of Helder L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

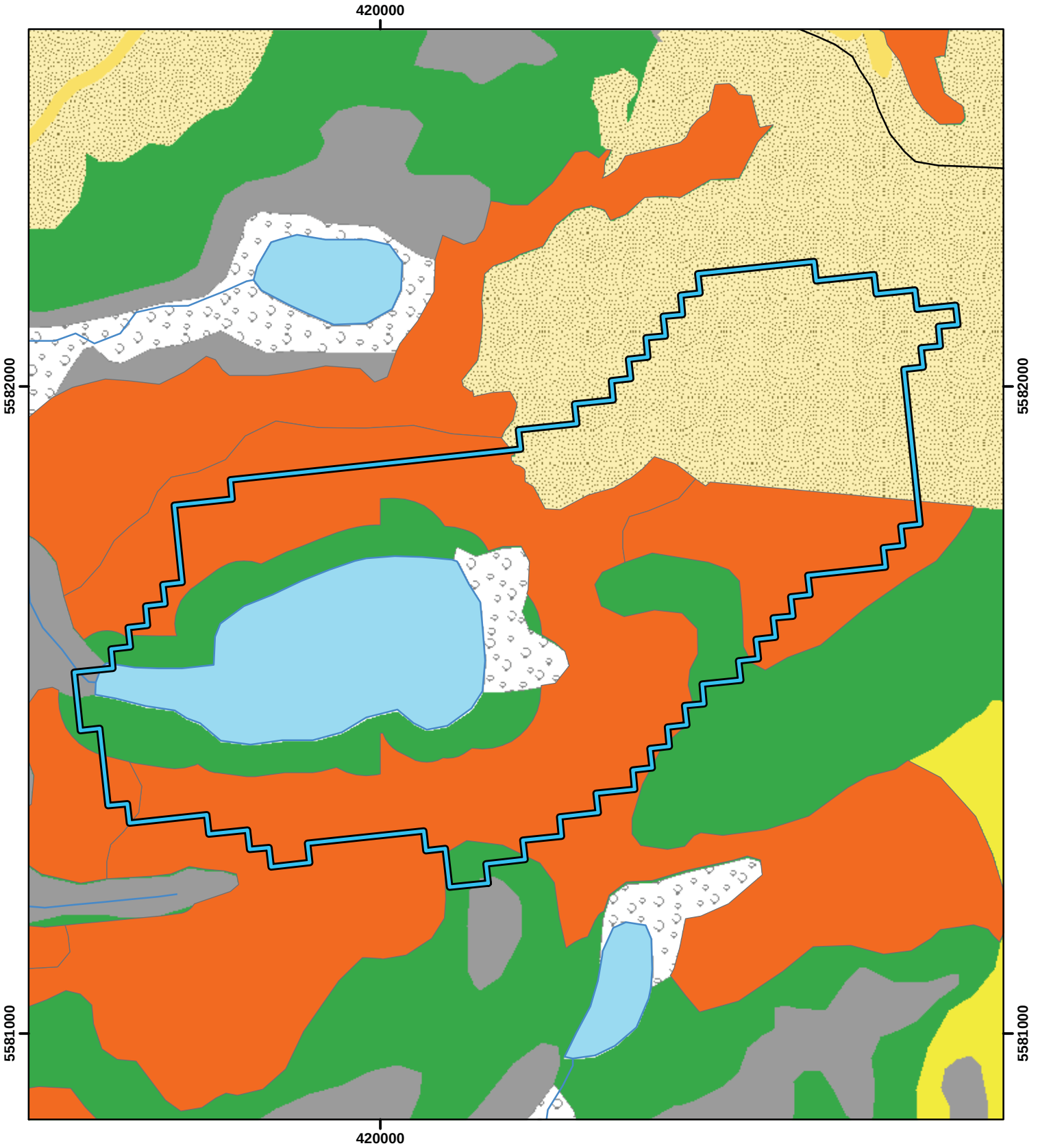
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.425 0.85 1.7 km

1:44,000

Planned and recent clearcut logging
Watershed NoName 19 S of Campfire L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

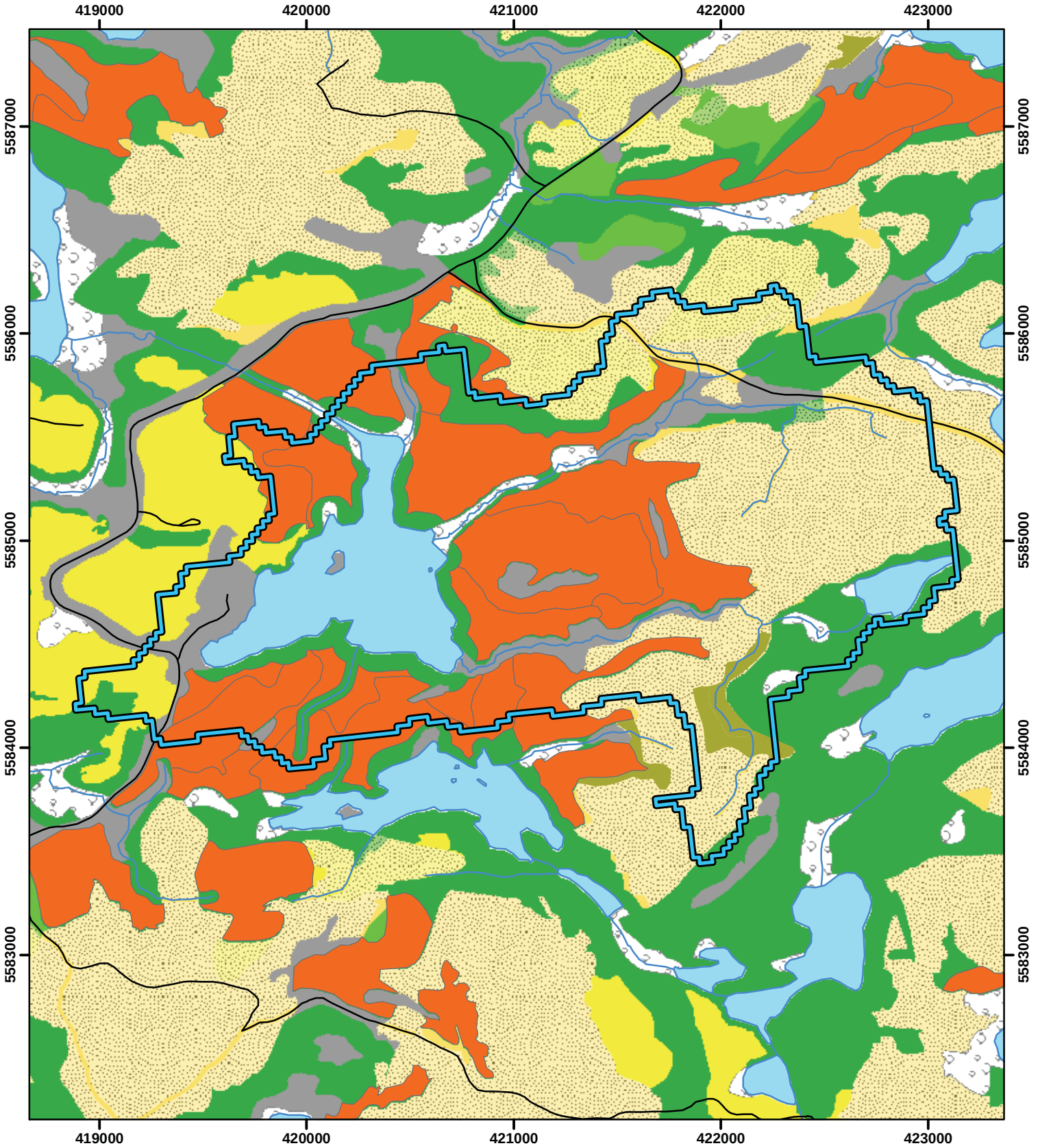
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.075 0.15 0.3 km

1:8,000

Planned and recent clearcut logging
Watershed Noname 20 near Campfire Lake



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

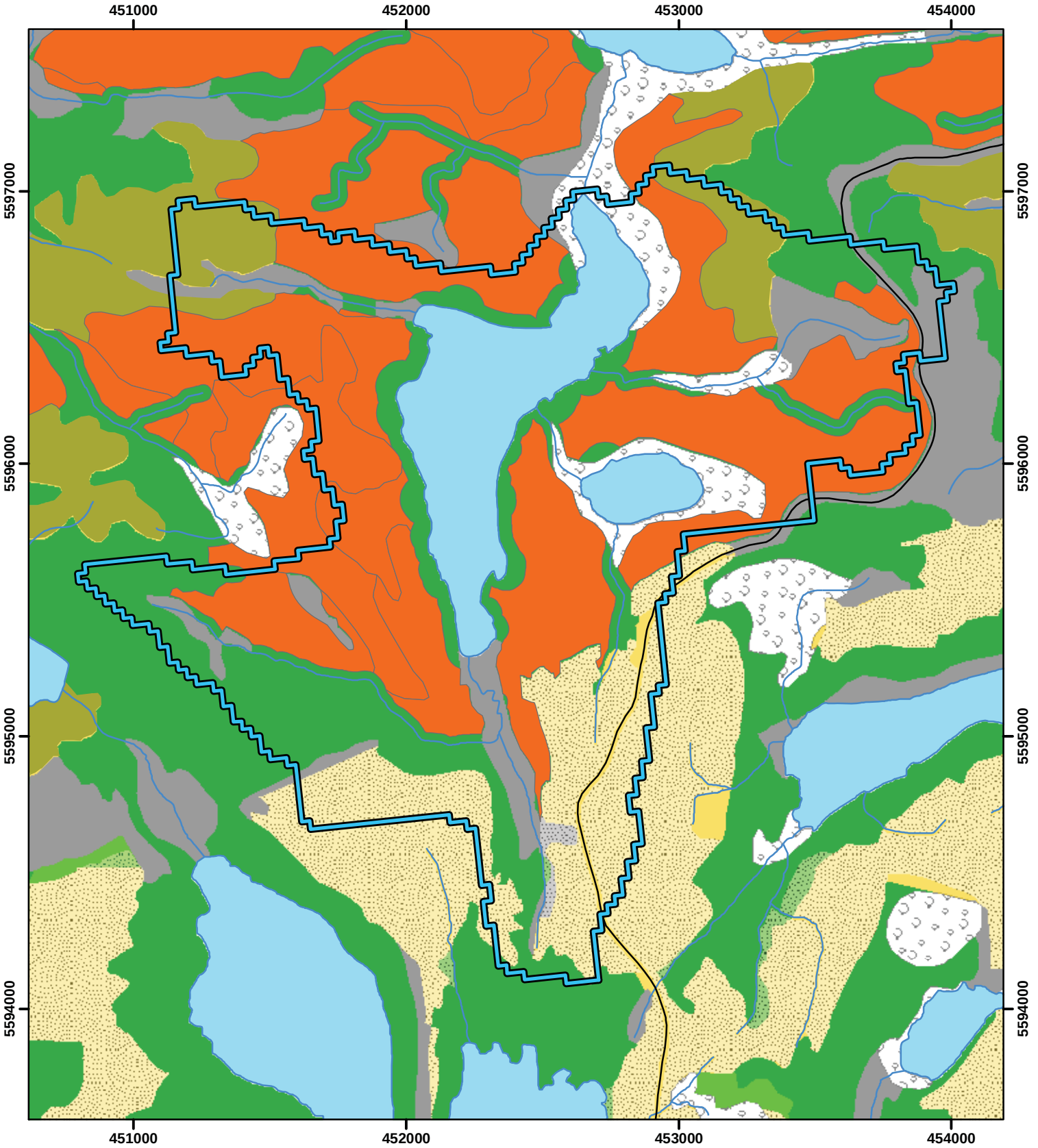
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.225 0.45 0.9 km

1:25,000

Planned and recent clearcut logging
Watershed Noname 24 near Wilcox Lake



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

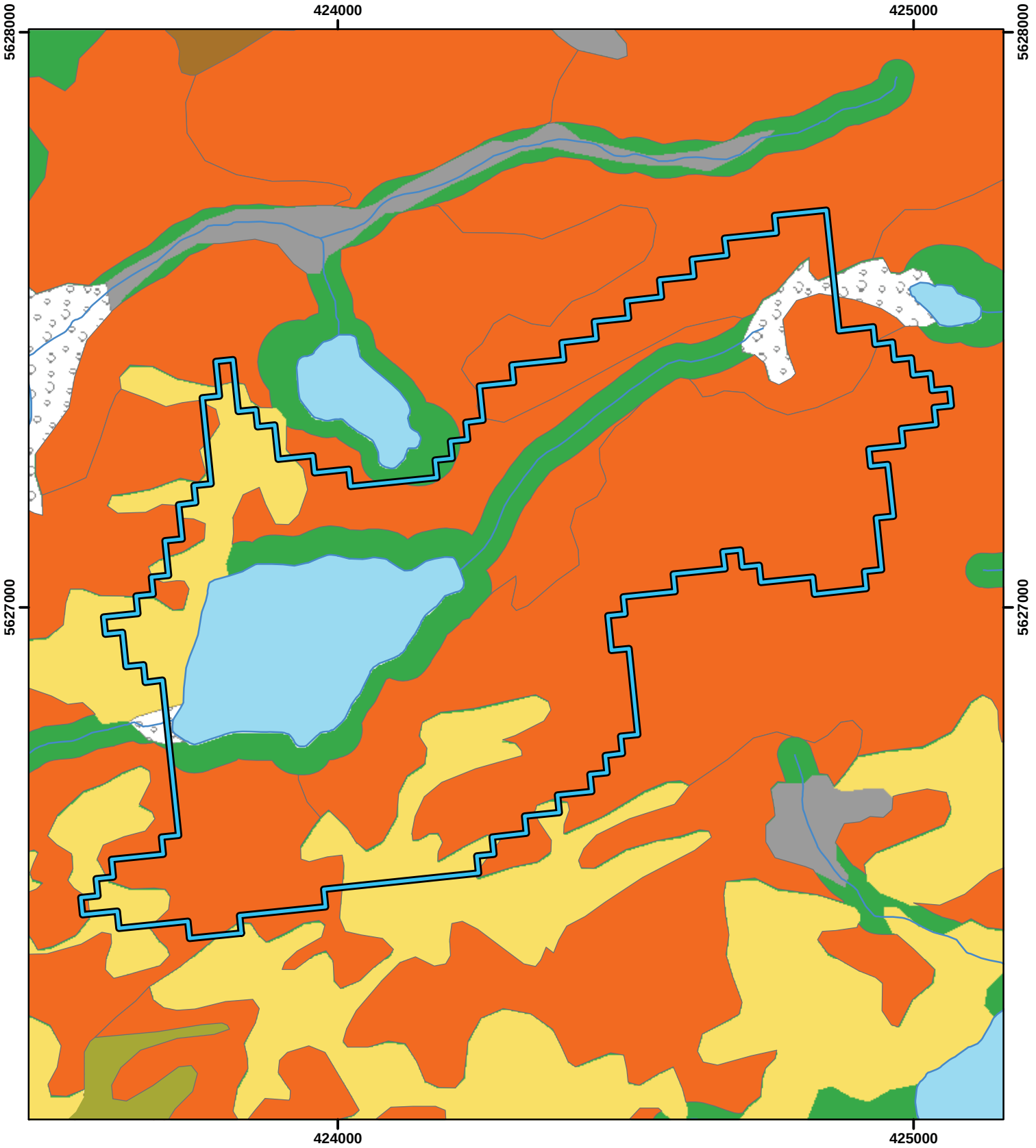
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.175 0.35 0.7 km

1:19,000

Planned and recent clearcut logging
Watershed NoName 26 N of Longlegged L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

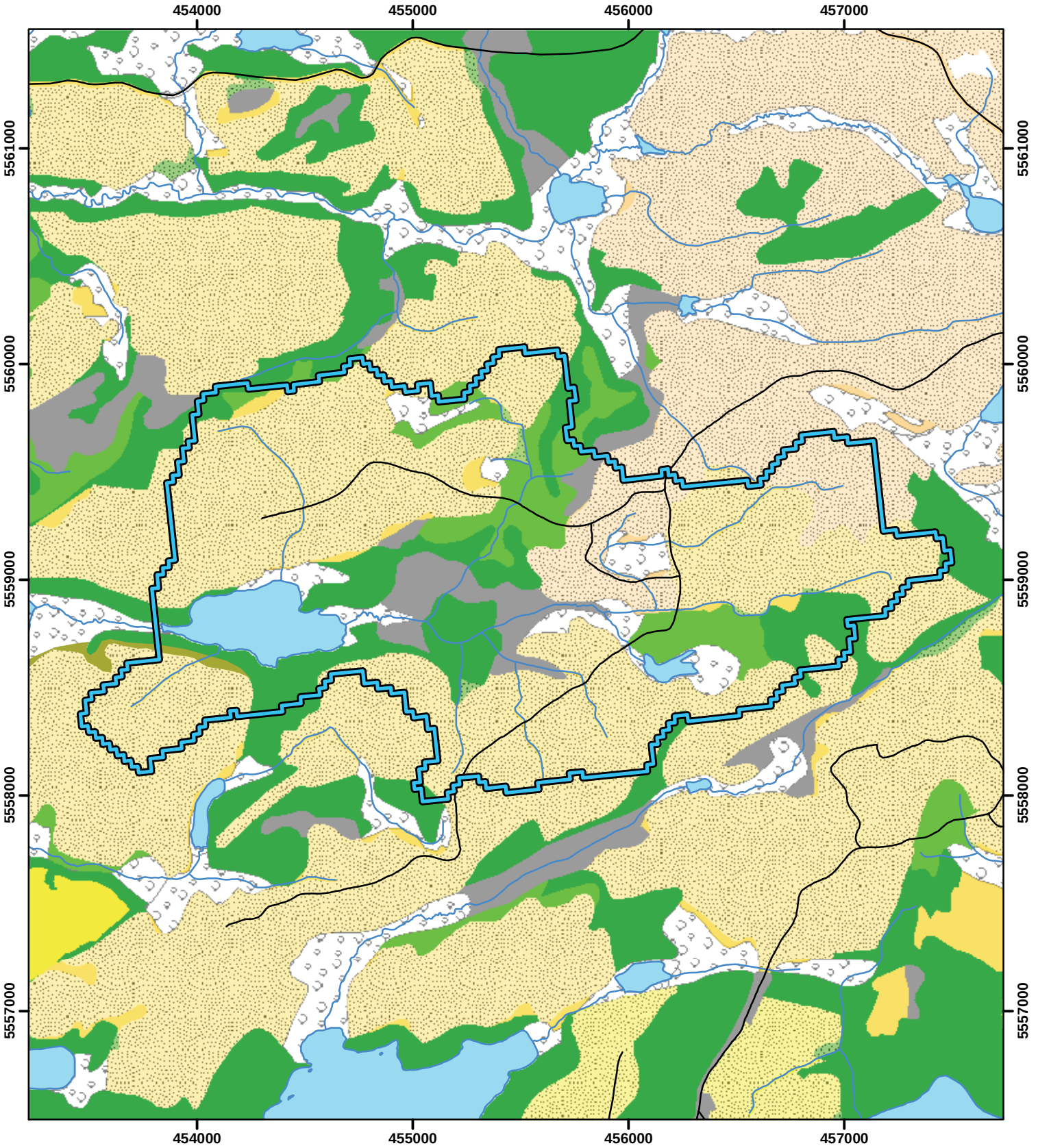
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.075 0.15 0.3 km

1:9,000

Planned and recent clearcut logging
Watershed NW of Segise L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

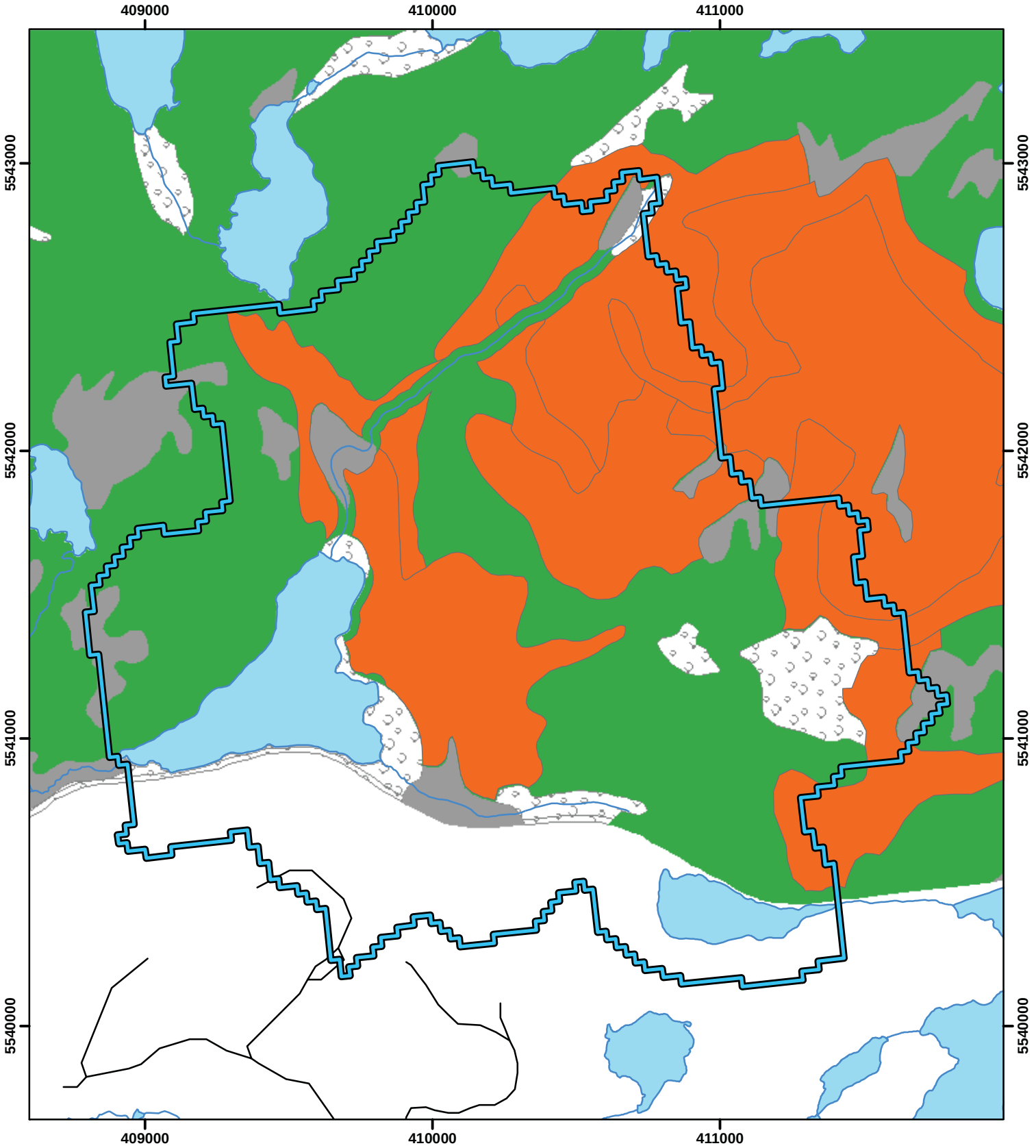
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.225 0.45 0.9 km

1:24,000

Planned and recent clearcut logging
Watershed Rocky Lake



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

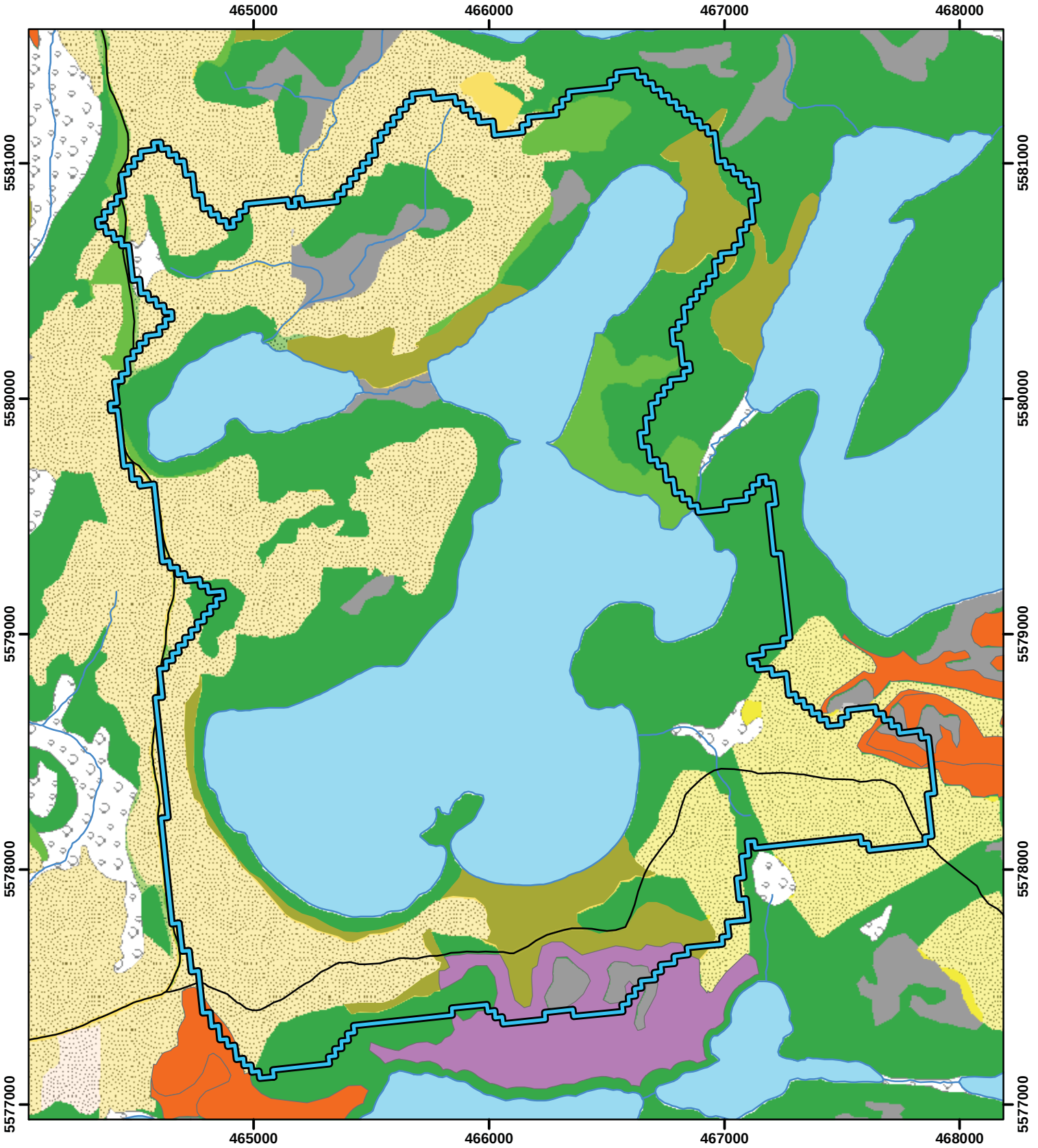
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.175 0.35 0.7 km

1:18,000

Planned and recent clearcut logging
Watershed S of Anishinabe L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

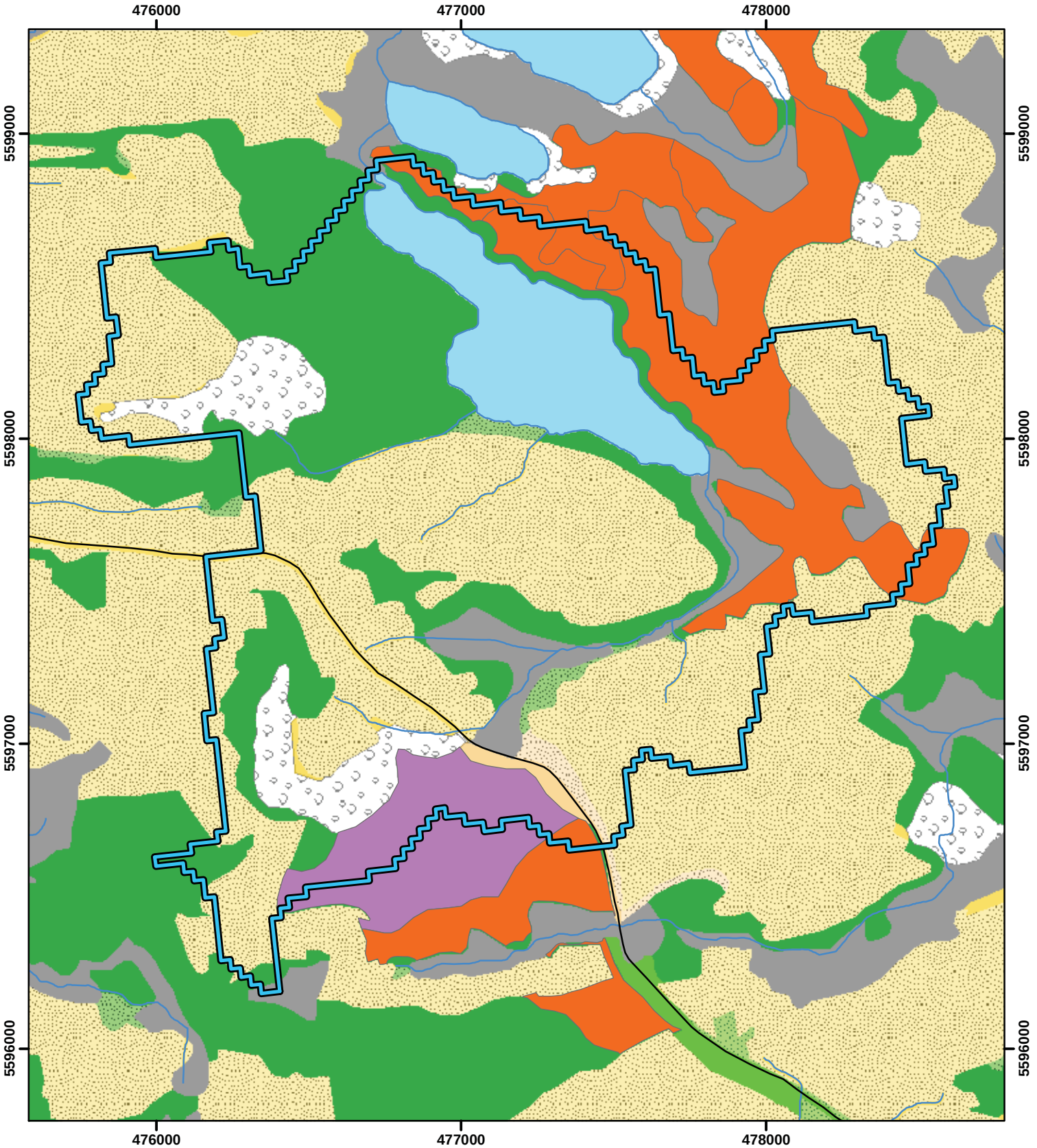
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.2 0.4 0.8 km

1:22,000

Planned and recent clearcut logging
Watershed S of Rice L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

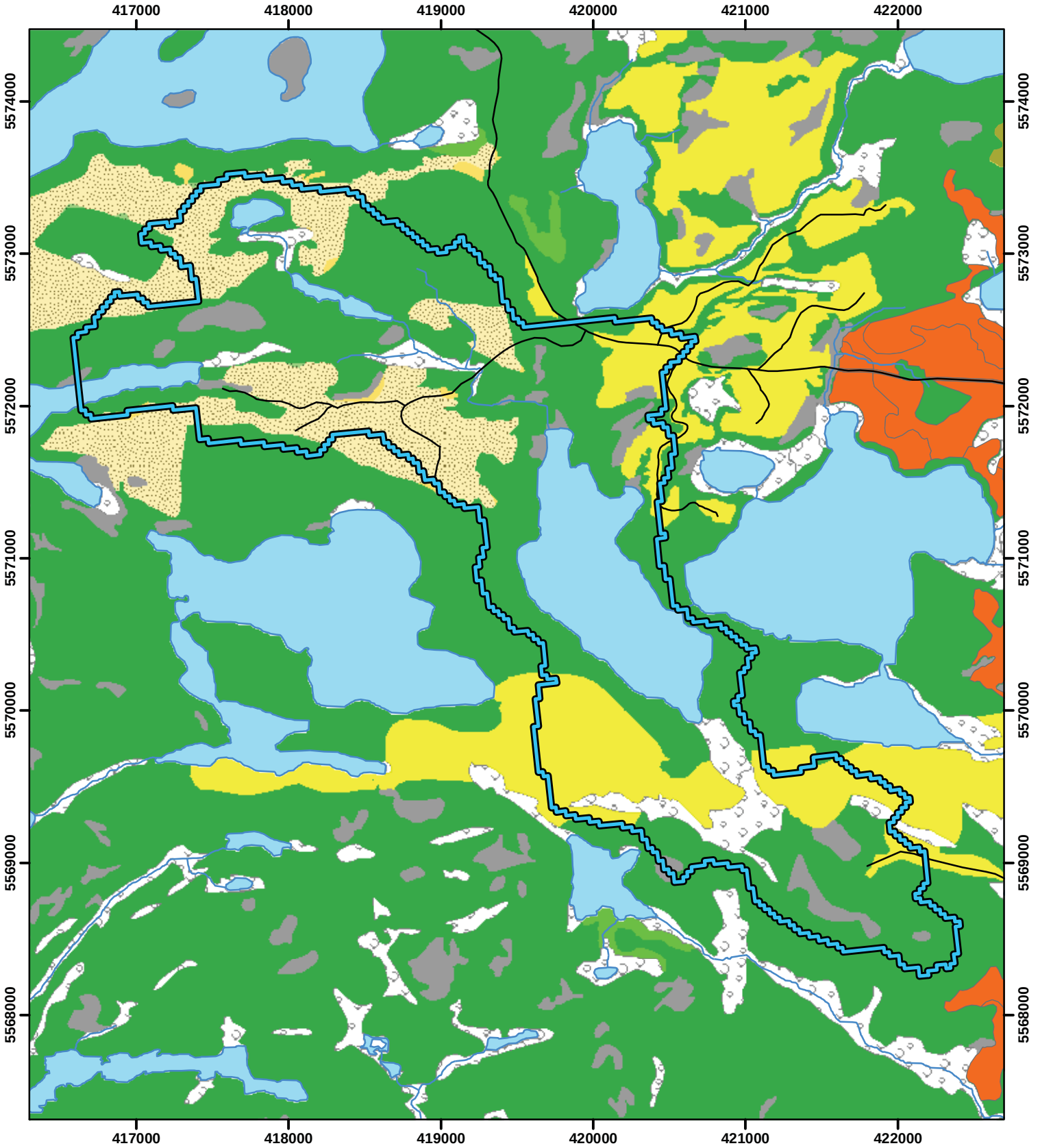
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.15 0.3 0.6 km

1:17,000

Planned and recent clearcut logging
Watershed SE of Lennan L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

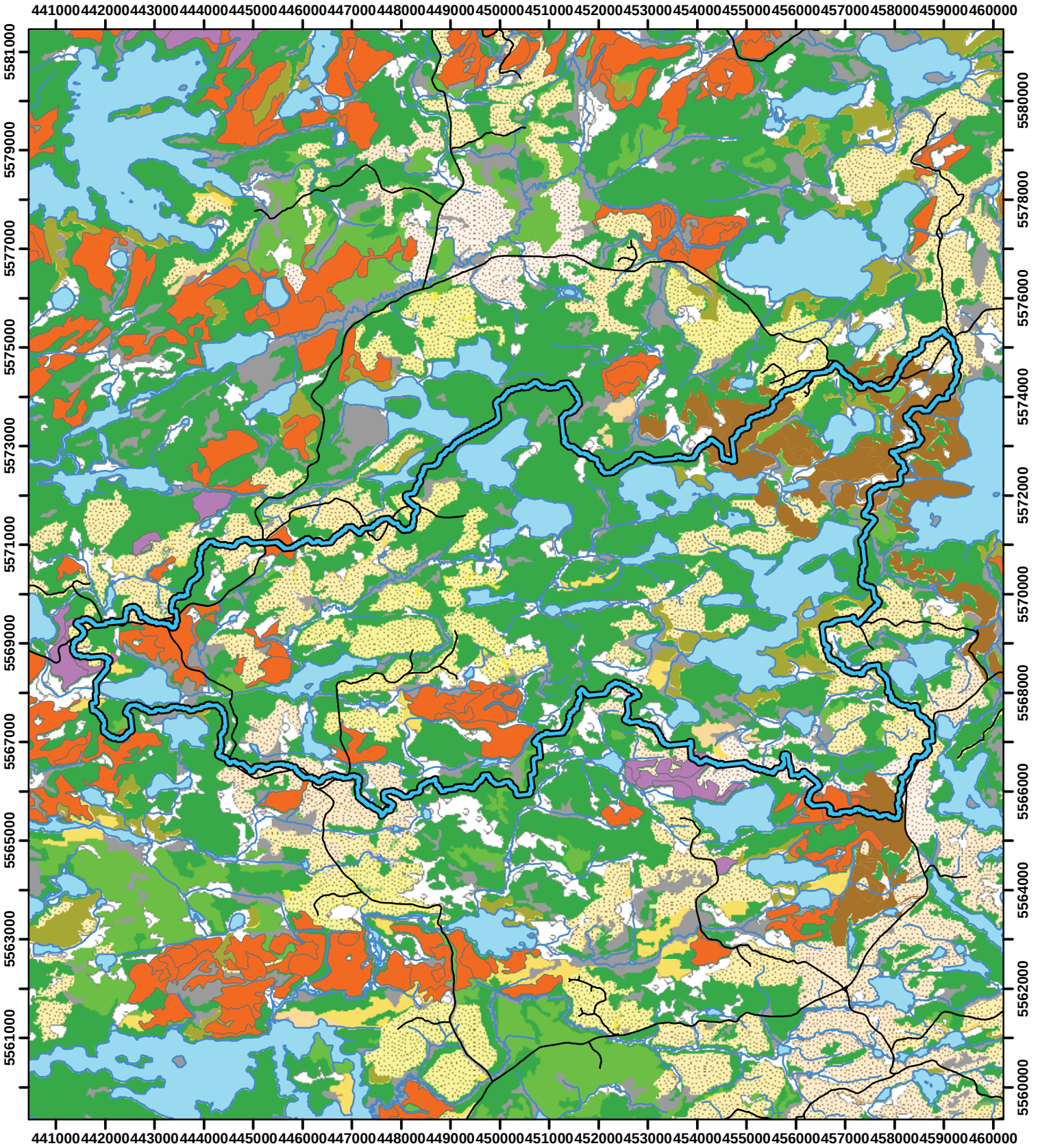
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

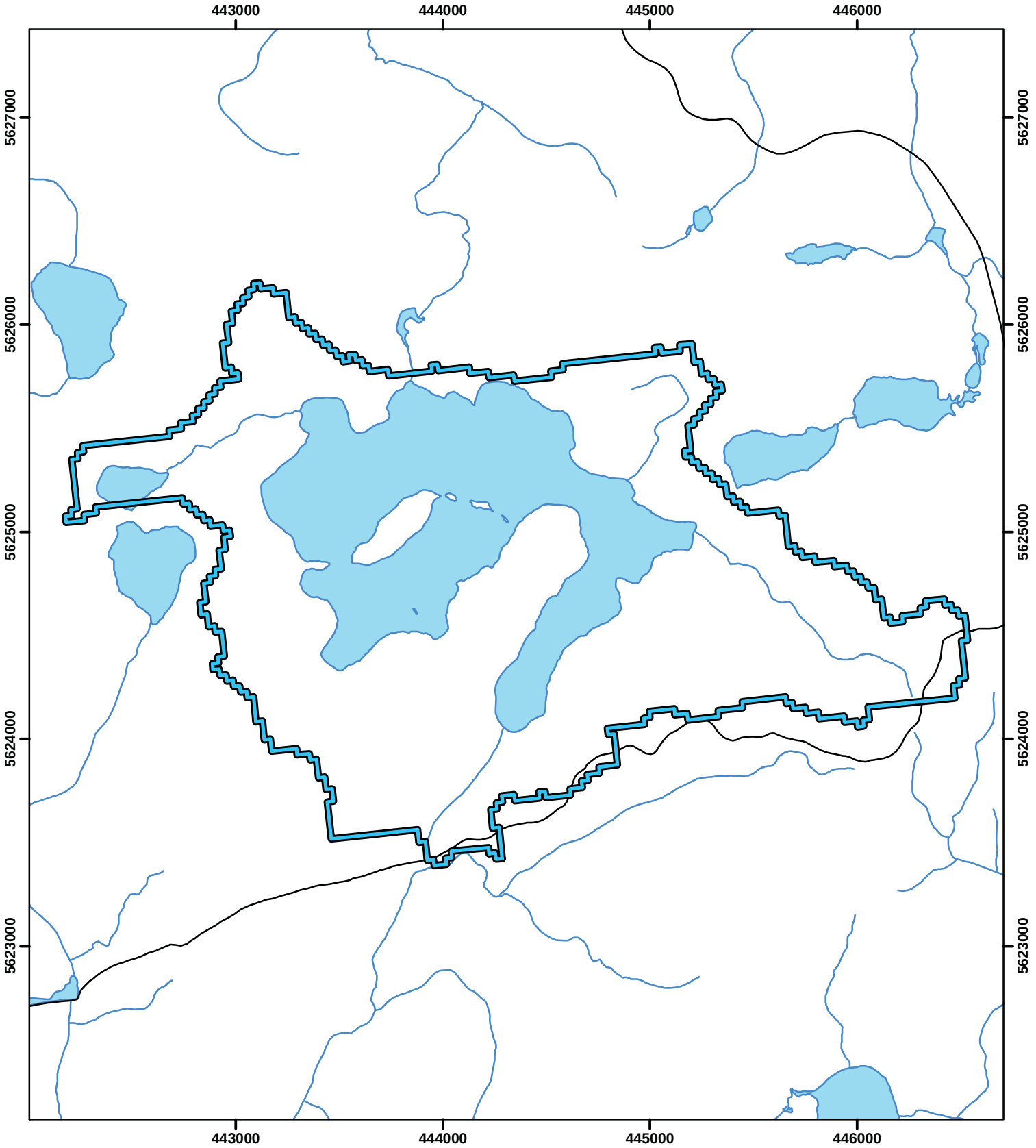
0 0.325 0.65 1.3 km

1:34,000

Planned and recent clearcut logging
Watershed Stewart L watershed



Planned and recent clearcut logging
Watershed SW of Dixie L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

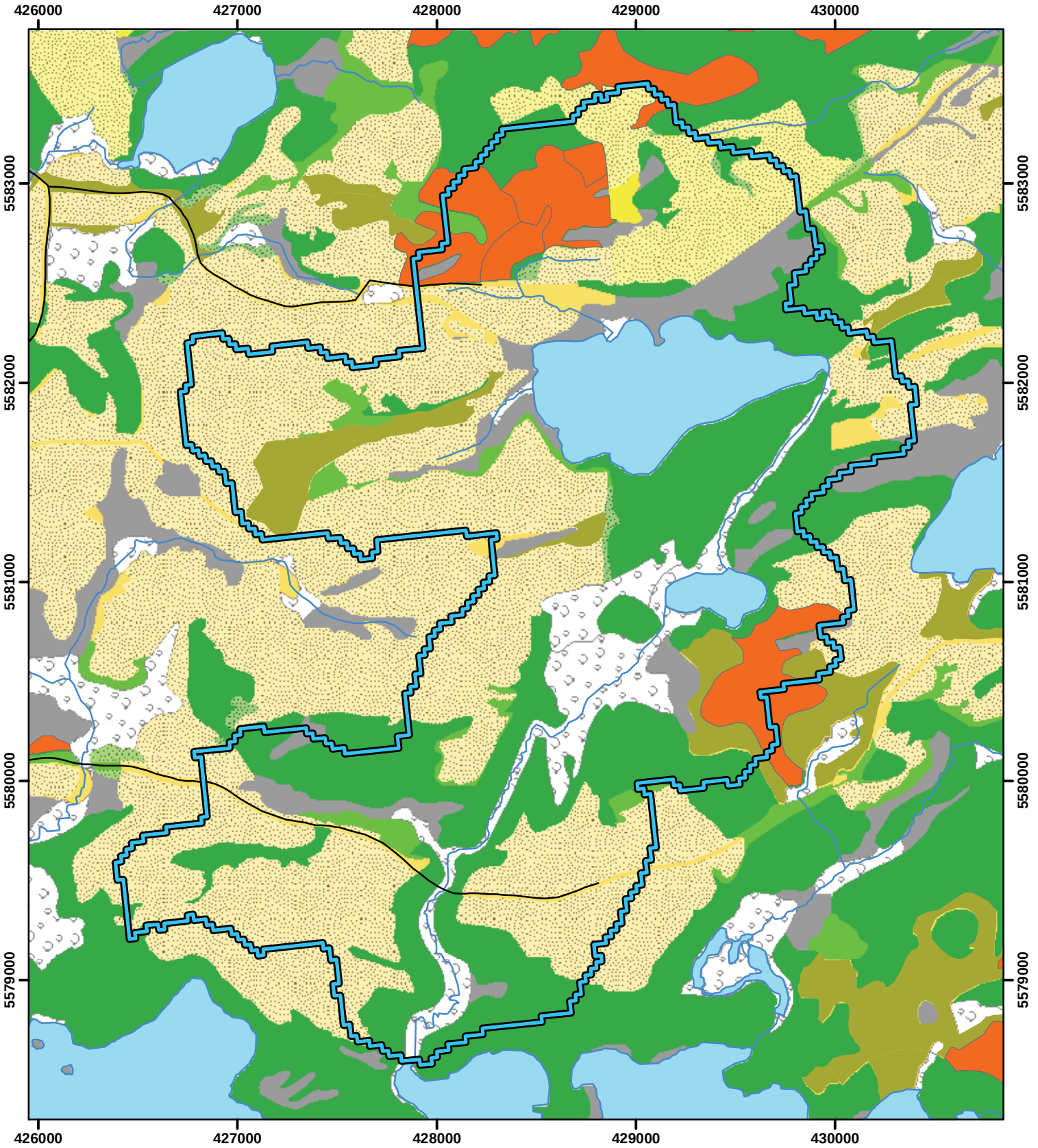
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.225 0.45 0.9 km

1:25,000

Planned and recent clearcut logging
Watershed Tributary of Tide L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

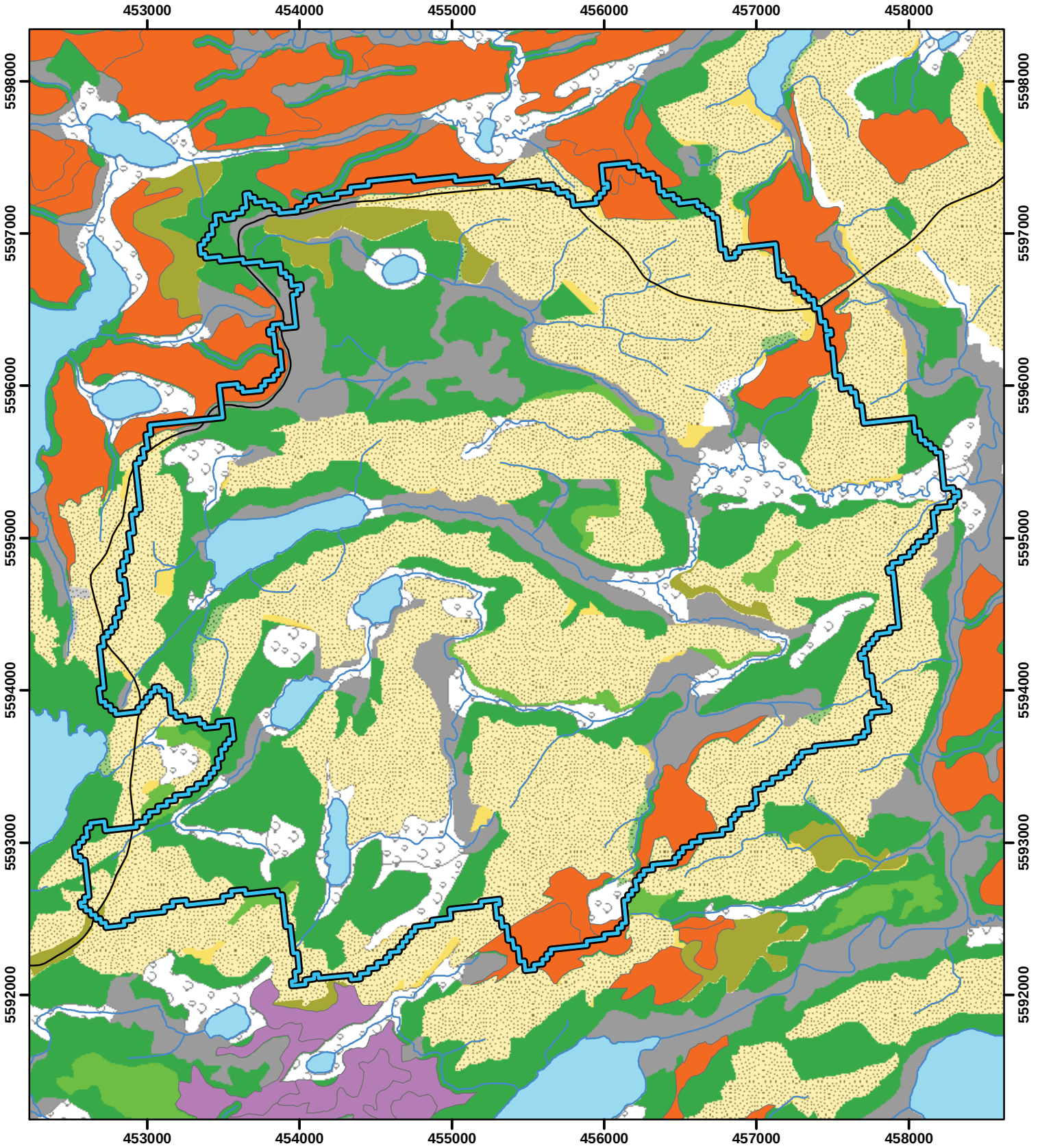
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.25 0.5 1 km

1:26,000

Planned and recent clearcut logging
Watershed Tributary of Zizania Creek



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

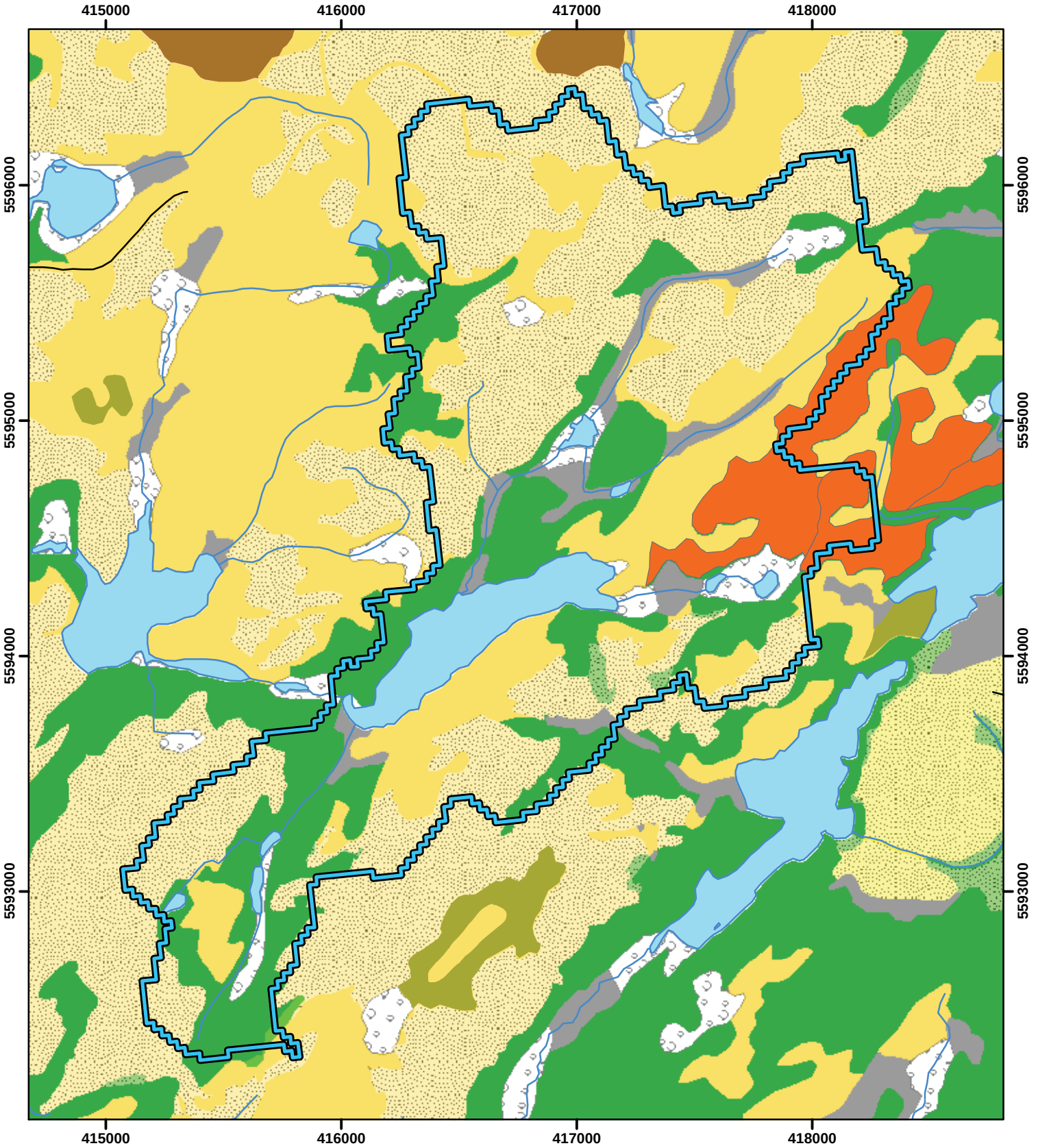
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.325 0.65 1.3 km

1:34,000

Planned and recent clearcut logging
Watershed W of Campfire River



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

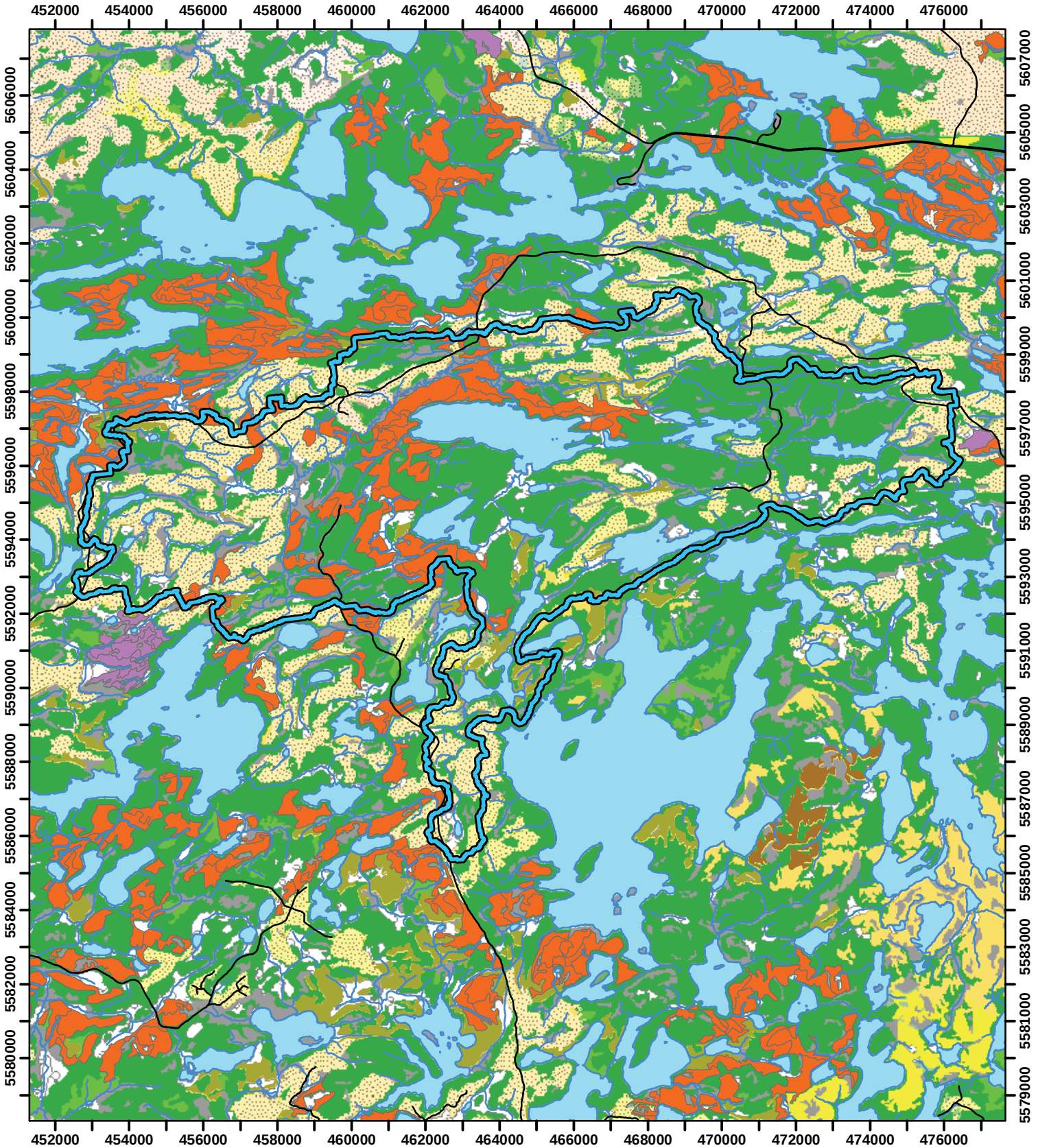
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.2 0.4 0.8 km

1:22,000

Planned and recent clearcut logging
Watershed Zizania Creek watershed whole



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:140,000

APPENDIX B – CURRICULUM VITAE

Stephen A. Kilburn, *BES, MA, MCIP, RPP*

Education

M.A., Regional Planning and Resource Development
University of Waterloo, Waterloo, Ontario, Canada 1996

Bachelor of Environmental Studies, Honours Urban and Regional Planning
University of Waterloo, Waterloo, Ontario, Canada 1988

Memberships

Registered Professional Planner (RPP), Ontario Professional Planning Institute

Member, Canadian Institute of Planners (MCIP)

Selected Work Experience

Wolasoqey Nation Energy East Proposal Impact Assessment
St. Mary's, Woodstock, Tobique, Madawaska, Kingsclear, and Oromocto, New Brunswick 2015-present

Cheam Indian Band and Chawathil First Nation Trans Mountain Pipeline Twinning Proposal Impact Assessment
Rosedale and Hope, British Columbia 2015

Pimicikamak Manitoba Hydro Proposal Impact Assessment
Cross Lake, Manitoba 2014-2015

Migmawei Mawiomi Secretariat Port-Daniel-Gascons Cement Plant EA
Berens River, Manitoba 2013-2016

Sagamok Use-and-Occupancy Project
Sagamok Anishnawbek, Massey, Ontario 2013-present

Berens River First Nation Hydro Dam Environmental Assessment
Berens River, Manitoba 2014

Nunavik Marine Region Plan Development
Nunavik Marine Region Planning Commission, Kuujjuak, Quebec 2011-present

Kitchenuhmaykoosib Inninuwug Cultural Mapping and Spatial Aspects of Traditional Ecological Knowledge Projects
Kitchenuhmaykoosib Inninuwug Lands and Environment Unit, Big Trout Lake, Ontario 2010-present

Town of Orangeville Cultural Plan
Town of Orangeville, Ontario 2013-2014

Inuvialuit and Nanuq: Polar Bear and Sea Ice Traditional Knowledge Research Project
Inuvialuit Joint Secretariat, Inuvik, Northwest Territories 2012-2015

Fort Severn First Nation Cultural Mapping Support
Fort Severn First Nation, Fort Severn, Ontario 2012-2014

NMRPC Info Base Project
Nunavik Marine Region Planning Commission, Kuujjuak, Quebec 2012-2013

Kawacatoose First Nation Cultural Research
Kawacatoose First Nation, Raymore, Saskatchewan 2012-2013

Kineepik Métis Local Cultural Research Project
Kineepik Métis Local, Pinehouse, Saskatchewan 2011-2013

Cultural Land Use Mapping Project Workshop
Grand Council of the Crees (Eeyou Istchee), Mistissini, Quebec 2013

Land Use Planning Workshop
Nunavik Marine Region Planning Commission, Kuujjuaq, Quebec 2011

Wolf Lake First Nation and Timiskaming First Nation Data Audit
Algonquin Nation Secretariat, Timiskaming, Ontario 2011

James Smith Cree Nations Use-and-Occupancy Support
Kitchenuhmaykoosib Inninuwug Lands and Environment Unit, Big Trout Lake, Ontario 2010-2011

Geomatics Training Guide and Hands-On Exercises for Aboriginal Communities
Geoconnections/NRCan, Ottawa, Ontario 2010

Kitchenuhmaykoosib Inninuwug Use-and-Occupancy Support
Kitchenuhmaykoosib Inninuwug Lands and Environment Unit, Big Trout Lake, Ontario 2010

Mikisew Cree First Nation LARP/Use-and-Occupancy Support
MCFN Government and Industry Relations Department, Fort McMurray, Alberta 2010

Nunavut Planning Commission use and occupancy mapping support
Nunavut Planning Commission, Yellowknife, NWT, Cambridge Bay, Nunavut 2007-2011

Good Practices Guide for Aboriginal Geomatics
Geoconnections/NRCan, Ottawa, Ontario 2009-2010

Treaty 8 Tribal Association Connecting Communities application development
Treaty 8 Tribal Association, Fort St. John, British Columbia 2007-2009

GeoConnections Aboriginal Community Land and Resource Management assessment
Makivik Corporation, Kuujjuaq, Quebec 2008

Northern Village of Pinehouse Bush Cabin Mapping Survey support
Northern Village of Pinehouse, Saskatchewan 2008

Namgis First Nation use and occupancy mapping support
Alert Bay, British Columbia 2007

Doig River First Nation Treaty Land Entitlement Land Selection
Doig River First Nation, Rose Prairie, British Columbia 2005; 2006; 2007

Pic River First Nation Use and Occupancy Mapping and Land Claim Support
Pic River First Nation, Ontario 2005-present

Heiltsuk First Nation Traditional Use Study GIS
Heiltsuk First Nation, Waglisla, British Columbia 2002-2004, 2007-present

Implement Security for OGC-WMS application
Land Information Ontario 2004

Upgrade and Enhance OGC-WMS application
Land Information Ontario 2003-2004

SuperBuild Website Map Interface Enhancements
Land Information Ontario/SuperBuild 2002-2003

ArcIMS 3.0 to ArcIMS 4.0 Application Migration
Land Information Ontario 2002-2003

OGC-WMS Connector OGC-WMS 1.1 upgrade specification
Ontario Land Information Infrastructure/Land Information Ontario 2001-2002, 2003

Rural Economic Development Data and Intelligence Application
Land Information Ontario/Ontario Ministry of Agriculture, Food, and Rural Affairs 2002

One Window Screening Tool
Ontario Ministry of Municipal Affairs and Housing/Land Information Ontario 2000-2001

Miawpukek Mi'kamawey Mawi'omi First Nation TUO GIS
Conne River, Newfoundland 2000-2001

Earth Resource and Mineral Exploration Web Sites (ERMES) Application
Ontario Ministry of Northern Development and Mines/Land Information Ontario 2000-2001

Internet Map Browser Application for Ontario Land Information Warehouse
Land Information Ontario 1999-2000

Natural Resource Values Information System (NRVIS)
Ontario Ministry of Natural Resources 1996-1999

Fort Providence and Kakisa Draft Integrated Resource Management Plan
Deh Gáh Got'ie Koe Dene Band, Fort Providence, Northwest Territories 1996

Muskrat Dam Harvest Study GIS
Muskrat Dam First Nation 1989-1990

Lake Nipigon Ojibway Timber Management EA Support
Ontario Metis and Aboriginal Association 1989

Volunteer / Advisory

Mapping and website advisor, Friends of Homewood Grounds, Guelph, Ontario 2015-present

Representative, Comité de concertation des utilisateurs, Le plan de gestion concertée du lac Kipawa 2013

Advisor, Heiltsuk Cultural Education Centre 2007-present

Publications, Presentations, and Workshops

Armitage, Peter and Stephen Kilburn. 2015. *Conduct of Traditional Knowledge Research—A Reference Guide*. Whitehorse [YT]: Wildlife Management Advisory Council (North Slope). ISBN 978-0-9880009-3-3. Available at http://www.wmacns.ca/resources/publications/.

Armitage, Peter and Stephen Kilburn. 2015. Seminar: "Toward Best Practices for the Conduct of TK Research." Memorial University Aboriginal Studies Seminar Series. 27 March 2015.

Kilburn, Stephen A. 2014. Presentation: "Data Management Systems: Bedrock Principles." Inuvialuit Settlement Region Community Based Monitoring Program Data Management Systems (DMS) Workshop. 22-23 September 2014. Whitehorse, Yukon.

Kilburn, Stephen A. and Neil Gauthreau. 2014. Presentation: "Mapping for the Long Term: Lessons from the Lhoosk'uz Dene Nation." Indigenous Mapping Workshop, Department of Anthropology, University of Victoria, 25-28 August 2014.

GeoConnections. 2011. *Geomatics Training Guide and Hands On Exercises for Aboriginal Communities* Jointly written with David Carruthers (PlanLab Ltd.), Adam Lewis (Nunavik Geomatics), and Valter Blazevic (Strata360 Ltd.).

GeoConnections. 2010. *Good Practices Guide: Success in building and keeping an Aboriginal mapping program*. Jointly written with David Carruthers (PlanLab Ltd.), Adam Lewis (Nunavik Geomatics), Valter Blazevic (Strata360 Ltd.),

and Steven DeRoy (CIER), Available at http://www.geoconnections.org/publications/Key_documents/CIER_Good_Practices_Guide_lowRes.pdf

Kilburn, Stephen A. and Sydney Nestel. 2005. "Securing OGC Web Map and Feature Services Using SAML." GeoTec Event 2005: Providing Perspective, Gaining Insight. Vancouver, British Columbia, Canada, 13-16 February 2005.

Kilburn, Stephen A., Clare Wastenays and Norman Ragetlie. 2004. "Web-based Economic Analysis Mapping Using a Remote OGC WMS Server." GeoTec Event 2004: Pathways To Integration. Toronto, Canada, 28-31 March 2004.

Kilburn, Stephen A. Workshop: 2002. "The Heiltsuk Traditional Use GIS: Moving Forward." Workshop hosted by Heiltsuk Cultural Education Centre. Waglisla, British Columbia, Canada, 18-22 November 2002.

Kilburn, Stephen A. 1999. Workshop: "Moving TUS Information Into GIS: Challenges and Methods." Workshop hosted by The Aboriginal Mapping Network and the Tsleil-Waututh Nation, Vancouver, British Columbia, 26-27 July 1999.

Kilburn, Stephen A. 1999. "Applying GIS for Traditional Use Studies: Database Design Issues." GIS99: "GeoSolutions: Integrating Our World," First Nations GIS track, Vancouver, Canada, 1-4 March 1999.

Kilburn, Stephen A. 1997. *Use of GIS for Integrated Resource Management Planning in Fort Providence, Northwest Territories*. M.A. thesis, University of Waterloo.

Michalenko, G., G. B. Hall, T. Tobias, S. A. Kilburn. 1992. "Coming of Age Between the Giants and the Trees: A Young Indian Village in Northern Canada Struggles to Maintain Land and Resources." Commonwealth Geographical Bureau, Workshop on Indigenous Land Rights, Wellington and Christchurch, New Zealand, February 1992.

Hall, G. B. and Stephen A. Kilburn. 1991. "Design and Implementation of ESRI Canada's pcMunicipal Module for pcARC/INFO." The Annual Conference of the Australasian Urban and Regional Information Systems Association, Wellington, New Zealand, 19-22 November 1991.

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO),
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

ACKNOWLEDGEMENT OF EXPERT'S DUTY

1. My name is Stephen Kilburn. I live in Guelph in the Province of Ontario.

2. I have been engaged by or on behalf of Grassy Narrows First Nation to provide evidence in relation to the above-noted court proceeding.

3. I acknowledge that it is my duty to provide evidence in relation to this proceeding as follows:

   (a) to provide opinion evidence that is fair, objective and non-partisan;

   (b) to provide opinion evidence that is related only to matters that are within my area of expertise; and

   (c) to provide such additional assistance as the court may reasonably require, to determine a matter in issue.

4. I acknowledge that the duty referred to above prevails over any obligation which I may owe to any party by whom or on whose behalf I am engaged.

Date: _____ _____

Stephen Kilburn

Court File No. 446/15

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

AFFIDAVIT OF STEPHEN KILBURN

CANADIAN ENVIRONMENTAL LAW ASSOCIATION
130 SPADINA AVE., SUITE 301
TORONTO, ONTARIO M5V 2L4

Telephone: (416) 960-2284
Facsimile: (416) 960-9392

Joseph F. Castrilli (LSUC No. 26123A)
Richard D. Lindgren (LSUC No. 28529E)
Jacqueline Wilson (LSUC No. 60330R)

Solicitors for the Applicants

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

AFFIDAVIT OF STEVEN FOBISTER, SENIOR

I, STEVEN FOBISTER, SENIOR, of Grassy Narrows, in the District of Kenora, AFFIRM AS FOLLOWS:

1. I am a member of Grassy Narrows First Nation ("Grassy Narrows"). At various times I have served my people as the Deputy Chief of the Grassy Narrows Band Council, the elected Chief of Grassy Narrows, and the Grand Chief of Treaty Three. As such, I have knowledge of the matters hereinafter deposed to.

2. Clearcut logging recently was approved by the Respondents as part of a Forest Management Plan for the Whiskey Jack Forest for the period 2012 to 2022 (the "Plan"). Most of the Whiskey Jack Forest is the traditional territory of our people. My whole life, I have eaten fish from the many lakes, streams, and waters that form part of the watershed of the English-Wabigoon River System, which runs through the Whiskey Jack.

3. I was born in 1952 at the hospital in Dryden and have lived on Grassy Narrows' traditional territory for most of my life. I was raised the traditional Anishinaabe way. Growing up, I lived primarily on my family's trapline eating a traditional diet rich in fish and wild plants, with some wild game. We moved frequently throughout our traditional territory according to the seasons and the availability of food. Although poor in material goods, we were spiritually rich and felt our connection to the land deeply. The land gave us food and shelter, and it always sustained us. I loved that life.

4. Our way of life followed a circle. In the spring we hunted migratory birds; in the summer I would guide American sport fishers. There was really good subsistence and commercial fishing in the fall. In the winter we went to our traplines.

5. I am intimately familiar with the land in my trapline area and the areas where I used to guide sport fishers, including lakes whose watersheds are scheduled for clearcutting under the Plan. For example, the lake identified in the watershed and trapline maps found behind Exhibit "A" to this affidavit is in my trapline area. The maps come from Stephen Kilburn's Expert Report, and I am very familiar with the area identified in the maps. The

lake identified in the maps as watershed Noname 20 near Campfire Lake is named Zagaatigooning-zaaga'iganish – in English, the Little Lake of the Dense Woods. It is a beautiful little lake. It is a good place to camp, and when I was younger I used to camp there all the time. It lies at the end of a long portage from Campfire Lake and it is crystal clear, surrounded by old growth forest. There are lots of fish in this lake – in fact, all of the lakes in this area are incredibly productive. I used to catch trout from the stream entering this lake with a snare. Besides being a good lake for fishing, Zagaatigooning-zaaga'iganish is a good place to harvest traditional medicines. The area KE038 shown in the second map in Exhibit "A" is my trapline area where I sustained myself and earned my livelihood as a young man. I know that area well and I have traveled, fished, trapped, and hunted throughout the area. I hope to pass that area on to my grandchildren so that they can enjoy it as I have.

6. The forest around Zagaatigooning-zaaga'iganish is slated for heavy clearcutting under the Plan, as shown in the maps behind Exhibit "A". I fear that this clearcutting will not only destroy the beauty and cultural value of a place I cherish, but will also increase the mercury levels in the water and in the fish that live there.

7. I ate fish almost every day growing up, and when I was guiding I would often eat fish multiple times a day. I would also bring home fish for my wife and children. I mostly ate walleye, but I would eat other fish too. Walleye is my favourite; it tastes better than the other fish.

8. The full impact of the mercury pollution hit us in 1970, when the government announced that the Dryden plant had contaminated our waters. After that we couldn't live off the land anymore. The guiding industry slowed to a trickle and our commercial fisheries had to close. Where we had been self-sufficient, we were forced to become dependent on welfare. Our community suffered greatly.

9. I continued to work as a sport fishing guide for years after the mercury was discovered. Unemployment was very high and I felt lucky to have work. The tourist camp operators encouraged us to eat fish to show our guests that it was safe. I kept eating fish as frequently as I had before the mercury was discovered.

10. I continue to eat fish from the English-Wabigoon River System to this day because it is an important part of my culture. Also, my precarious financial situation means I cannot afford to cut wild fish out of my diet.

11. I believe that my exposure to mercury has affected me terribly. My body is breaking down one piece at a time. I experience shaking and loss of balance. I have difficulty swallowing, weakness in my hands, and my speech is slurred. I have difficulty walking and I need to use a riding lawnmower to get around because I don't have a motorized wheelchair. I feel deep sadness and depression about the loss of my health and my traditional way of life due to mercury pollution and logging. When I look at the land, look at our situation, I feel despair. There are so many sick people here, so much

destruction of our land and our way of life. You can't imagine how it feels when the land and water that have always sustained you can suddenly kill you.

12. I have been examined by the Mercury Disability Board and diagnosed with symptoms consistent with mercury poisoning. I receive $250.00 each month from the Mercury Disability Board. Dr. Masazumi Harada examined me in 2010 and diagnosed me with mercury poisoning. I have now also been diagnosed with amyotrophic lateral sclerosis (ALS).

13. In April 2010, I was interviewed by the CBC regarding the effects I have experienced due to exposure to mercury. Exhibit "B" to my affidavit contains excerpts of my comments to the CBC in 2010. The CBC included some footage from a much earlier interview in the 2010 piece, and I identify the source of each comment in this paragraph. In the earlier interview, I stated: "I don't think, you know, it's right to say, look, you know, you don't have to go trapping. You can live on welfare." In my comments to the CBC in 2010, I stated: "My whole nervous system is out of whack, you know, I can't barely walk and, you know, I have to hold my jaw to talk because my muscles are practically gone…[As a fishing guide, he] had [to eat what he caught even after the mercury was discovered.] We had to do this in order to appease our guests that the fish was ok. The tourist camp owners encouraged us to do it. […] [I recall Dr. Harada during his return to Grassy Narrows in March 2010 saying to me,] 'You know you have some kind of a metal poisoning,' and the closest definition to [Harada's] examination…it's got to be mercury. […] I only have one granddaughter. She's the one who kind of possesses violent

seizures." I have reviewed these excerpts and they are true and accurate. I have clarified in the remarks that appear in the next to last square bracket what was unclear about who was speaking as set out in Exhibit "B". These excerpts were included in a larger document Grassy Narrows filed with the Ministry of the Environment in September, 2014 in an attempt to persuade the Ministry to examine the effects of mercury from clearcut logging authorized by the Respondents for the Plan.

14. Also contained in Exhibit "B" are excerpts from a 2003 interview of me by a reporter for the Toronto Star regarding the mercury issue. I advised the reporter that I have serious neurological disease: "I can't hardly tie my shoes anymore." I also said that I blame clearcut logging in the area for the continuing high levels of mercury contamination. These excerpts were also included in the September 2014 document referred to above. I have reviewed these excerpts and they are true and accurate.

15. I fear that continued clearcutting in our traditional territory will expose us to further mercury poisoning. I am extremely concerned about future mercury exposure if additional mercury is released from the forest as a result of clearcutting. I am afraid of the physical effects of exposing our bodies to yet another round of mercury, and I am also afraid of the psychological effects. For me and for many others, the psychological effects of mercury poisoning – including, but not limited to, depression and anxiety – are unspeakably painful. Being out on the land and water allows us to escape, however briefly, from the negative mental and emotional states that are associated with living in a community struggling with mercury poisoning. I fear clearcutting would add to our

mercury burden, which would add to the negativity, and also raze the forest, thereby removing a vital form of retreat and healing.

16. I also fear for the health of our land and our ability to practice an Anishinaabe lifestyle if clearcutting is allowed to continue under the Plan. Large portions of the forest on my trapline area have already been clearcut. The map entitled KE038 in Exhibit "A" is my trapline area, and this map shows the extent of the planned and recent clearcutting for the area. I want my great-grandchildren and great-great-grandchildren to have a safe environment so they can grow up healthy and strong in our Anishinaabe traditions. I am strongly opposed to any Forest Management Plan that includes clearcutting. If the clearcut logging recently authorized by the Respondents under the Plan goes ahead, I fear it will release yet more mercury into the English-Wabigoon watershed, poison the fish we eat from those waters, and harm our health and well-being. This would violate our rights under the *Canadian Charter of Rights and Freedoms*. We have a right to be secure from the threats to us posed by mercury. By imposing clearcutting in our traditional territory, the government risks our health and discriminates against us because of our way of life, which includes fishing for walleye, and eating the fish we catch, as a central core of our identity as Anishinaabe people.

17. Clearcut logging on our territory is destroying our way of life. Our forest and our people need a break, we've had enough. We're going to stand up. My health is deteriorating, and I can feel that this may be my last fight. But after I have passed on, my children, grand-

children, and great-grand-children will continue to fight to preserve our land, our health, and way of life.

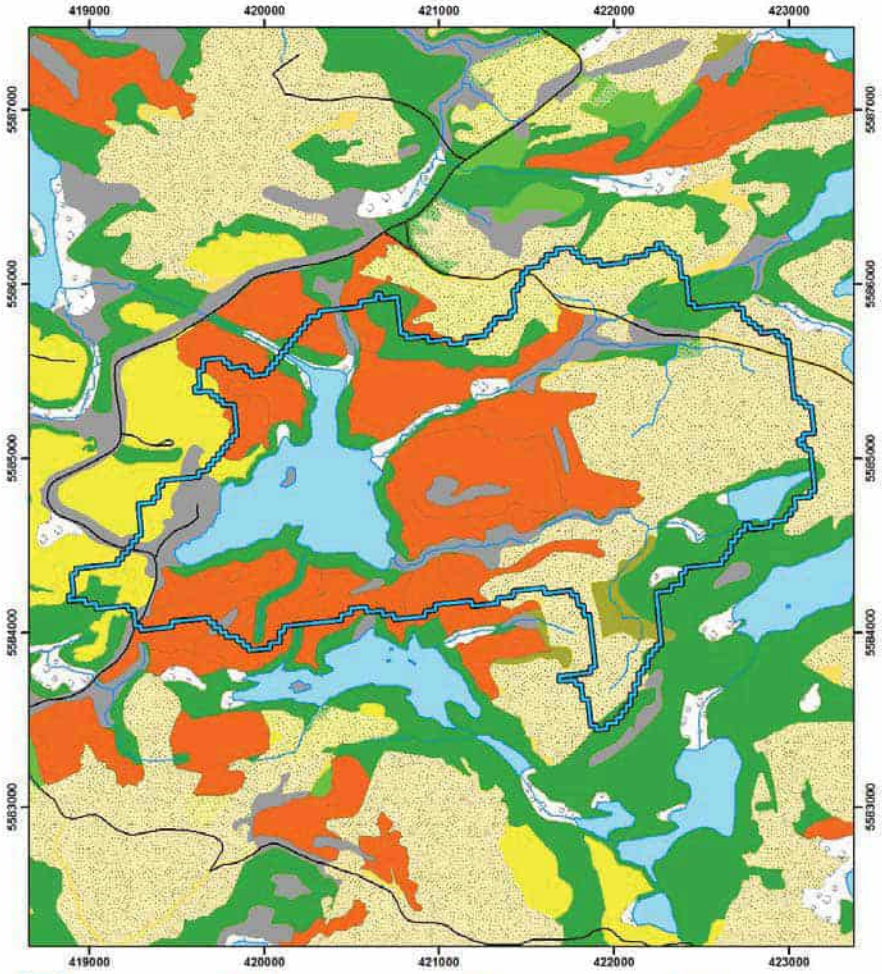
18. I affirm this affidavit in support of the within application for judicial review, and for no other or improper purpose.

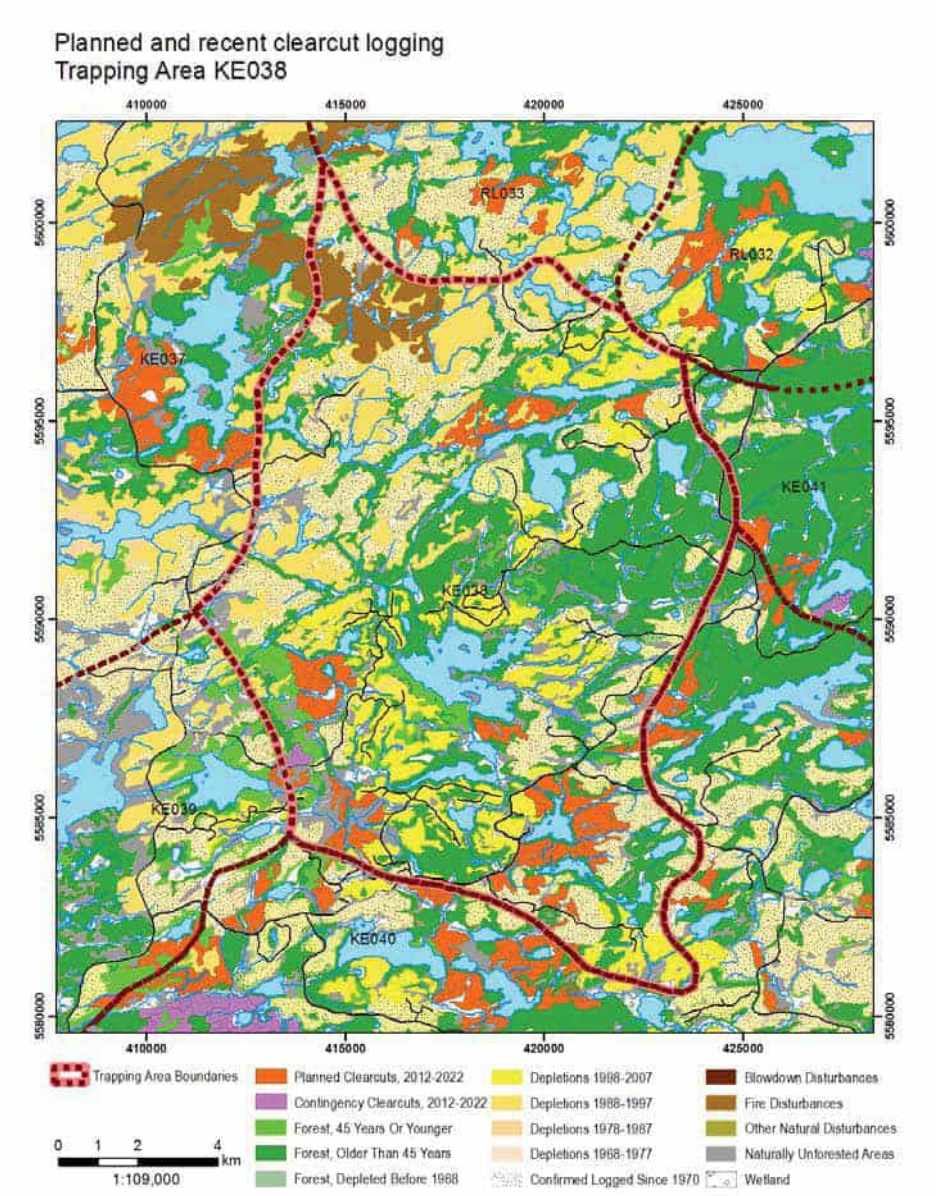
AFFIRMED before me in the District of Kenora, in the Province of Ontario, this ___ day of _____, 2016.

A Commissioner, etc.

_____
Steven Fobister, Senior

Planned and recent clearcut logging
Watershed Noname 20 near Campfire Lake




Planned and recent clearcut logging
Trapping Area KE038
410000
415000
420000
425000
5600000
5595000
5590000
5585000
5580000
RL033
RL032
KE037
KE041
KE038
KE039
KE040
Trapping Area Boundaries
Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1988
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland
0 1 2 4
km
1:109,000

July 28, 2003

Thirty years after a Japanese researcher identified Canada's biggest case of mercury poisoning, he has returned to discover that the problem is far from resolved and may be getting worse. Masazumi Harada's new research raises troubling fresh questions about the sources and effects of mercury contamination present in water and fish in many parts of the country. The results of Harada's study are particularly sobering for aboriginal people who depend on a diet rich in fresh fish. It had been expected that the health of First Nations people on the Grassy Narrows and White Dog reserves near Kenora would improve after a mill stopped dumping mercury in the English and Wabigoon river systems in 1970. But when Harada returned to the area last fall, he found evidence of continuing, pervasive health problems consistent with Minamata disease, a neurological disorder caused by mercury. The results of Harada's study have not been published but were summarized by Steve Fobister Sr., deputy chief of ...Grassy Narrows, who has seen them. Of approximately 60 First Nations people who were examined at the Grassy Narrows and White Dog reserves last fall, 70 per cent showed symptoms of neurological disorder, said Fobister. Symptoms included blurred vision, slurred speech, twitching, numbness, shaking, and poor muscle co-ordination. The symptoms of eight people who were part of the study in the 1970s had become more severe.

---

[1] <http://freegrassy.net/wp-content/uploads/2010/03/LettersJan99_ToWashingtonPost_ToMinNR_Enviro_WJF99-04.pdf>

[2] < http://freegrassy.net/wp-content/uploads/2010/03/Copy_of_Letter19May99_CAMinEnvr_2Keesick_Dasilva.pdf >.

Fobister says that he himself has serious neurological disease. "I can hardly tie my shoes any more", he said in an interview. Even children in the community are showing serious problems, including seizures, he said. Fobister blames clear-cut logging in the area for the continuing high levels of mercury contamination – a theory for which there is some scientific support, although debate continues. A University of Montreal researcher reported in 2001 that mercury levels were up to 100 per cent higher in heavily logged watersheds than in lakes where there was no logging nearby. The theory is airborne mercury from sources such as coal-fired power plants and incinerators tends to be held in the soil and foliage of an intact forest, but runs into waterways in areas that have been clear-cut. Health Canada is funding a new study of neurological disease in the Grassy Narrows area in the light of the recent research developments. "It is alarming to see there are so many people still suffering neurological symptoms in this community after 30 years", said Laurie Chan of McGill University, who is leading the study.[3]

[3] D. Bueckert, "Mercury poisoning issue back 30 years later, disease signs present in Indians", The Toronto Star (July 28, 2003).

[4] CBC, "Ontario reserves demand inquiry into mercury poisoning" (September 4, 2004); < http://www.cbc.ca/news/canada/ontario-reserves-demand-inquiry-into-mercury-poisoning-1.515484 >.

[5] "Forestry firms under fire at Grassy Narrows", February 28, 2006. Globe and Mail (online?); < http://freegrassy.net/2006/02/28/forestry-firms-under-fire-at-grassy-narrows/#sthash.zzdz53a4.dpuf >

Apr. 5, 2010 CBC reports on continuing impacts of mercury in Grassy Narrows, including impacts on children. [This is a 5-page transcript – the following excerpts cover just the statements of three people interviewed – Sherry Fobister, a Grassy Narrows resident, Bill Fobister, former Chief of Grassy Narrows, and Steve Fobister, Grassy Narrows Chief in 1983]. "Sherry Fobister: 'I feel angry knowing that something that happened in the '60s, you know...Like, how it affected my

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[3] D. Bueckert, "Mercury poisoning issue back 30 years later, disease signs present in Indians", The Toronto Star (July 28, 2003).

[4] CBC, "Ontario reserves demand inquiry into mercury poisoning" (September 4, 2004); < http://www.cbc.ca/news/canada/ontario-reserves-demand-inquiry-into-mercury-poisoning-1.515484 >.

[5] "Forestry firms under fire at Grassy Narrows", February 28, 2006. Globe and Mail (online?); < http://freegrassy.net/2006/02/28/forestry-firms-under-fire-at-grassy-narrows/#sthash.zzdz53a4.dpuf >

family....' . Bill Fobister: 'During the '60s, we were in full bloom, fishing, guiding, everything, that we did and we thought everything was okay. But not until we're seeing some of our fish acting weird and dying off, that's when ...there is something wrong.' Bill Fobister: 'My symptoms is my numbness and loss of sensation and my vision. My speech is kind of getting pretty sloppy. My taste, I lost my taste. I lost my smell. I can't smell any more.' Steve Fobister: 'I don't think, you know, it's right to say, look, you know, you don't have to go trapping. You can live on welfare....My whole nervous system is out of whack, you know, I can't barely walk and, you know, I have to hold my jaw to talk because my muscles are practically gone...[As a fishing guide, he] had [to eat what he caught even after the mercury was discovered] We had to do this in order to appease our guests that the fish was ok. The tourist camp owners encouraged us to do it...[Dr. Harada, during his return to Grassy Narrows in March 2010, said to Steve Fobister] 'You know you have some kind of a metal poisoning' And the closest definition to [Harada's] examination...it's got to be mercury'...'I only have one granddaughter. She's the one who kind of possesses violent seizures.' Sherry Fobister: '[Ms Fobister ate fish when she was pregnant]...it's [eating fish] a part of life, you know...I love eating fish. It's a delicacy...it's part of our lifestyle. I don't know, I still eat it to this day. [no one told her not to eat fish when she was pregnant].[6]

[6] CBC Television, The National (Transcript), "Years of mercury poisoning have not been kind to the people of Grassy Narrows" (Toronto: CBC, Apr. 5, 2010).
[7] < http://freegrassy.net/wp-content/uploads/2010/01/River_Run_Press_Release_April_71.pdf >.

Court File No. 446/15

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

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Court File No. 446/15

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

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PROCEEDING COMMENCED AT TORONTO

SUPPLEMENTARY APPLICATION RECORD

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Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, CHIEF SIMON FOBISTER
and
former CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO),
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

APPLICATION UNDER Section 2(1)
of the *Judicial Review Procedure Act*
R.S.O. 1990, c. J.1

SUPPLEMENTARY APPLICATION RECORD
VOLUME 2 OF 3

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Lawyers for the Applicants

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

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Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
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on their own behalf and on behalf of all other members of
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-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

AFFIDAVIT OF ANNA WILLOW

I, ANNA WILLOW, of the City of Delaware, in the State of Ohio, in the country of the United States of America, MAKE OATH AND SAY AS FOLLOWS:

1. I hold a master's and a doctorate in anthropology from the University of Wisconsin as well as a master's in natural resources and environment from the University of Michigan. I am currently an associate professor of anthropology at Ohio State University. My professional training and research experience have been in the areas of cultural and

environmental anthropology especially concerning Anishinaabe environmental relationships, uses and values. I have broad experience and expertise concerning boreal forest First Nations peoples and cultures and knowledge about their sociocultural responses to environmental transformations resulting from natural resources extraction. I have conducted multiple independent research projects, including long-term ethnographic participant-observation research at Grassy Narrows First Nation. I also have published a book, numerous peer-reviewed journal articles, professional reports, and delivered numerous papers at conference proceedings in my field of study. A copy of my curriculum vitae is attached to Exhibit "A", below.

2. In February 2015 I was asked by counsel for Grassy Narrows to answer certain questions in a report on the importance of fishing and the consumption of fish as part of the traditional cultural activity and identity of the people of Grassy Narrows First Nation. The questions and my answers to them appear as part of my February 2016 expert report attached as Exhibit "A" to my Affidavit.

3. A copy of my Acknowledgement of Expert's Duty form is attached as Exhibit "B" to my Affidavit.

SWORN BEFORE ME in the City of Marion, in the State of Ohio, in the United States of America, this ___ day of _____, 2016.

A Commissioner, etc.

_____
Anna Willow

EXPERT REPORT

Grassy Narrows First Nation and Sherry Fobister, William Fobister, Senior, Simon Fobister and Chief Roger Fobister, Senior on their own behalf and on behalf of all other members of Grassy Narrows First Nation v. Minister of Natural Resources and Forestry (Ontario) and Minister of the Environment and Climate Change (Ontario), and the Attorney General of Ontario

Ontario Superior Court of Justice
(Divisional Court)

Prepared for

Joseph F. Castrilli and Richard D. Lindgren
Counsel, Canadian Environmental Law Association
130 Spadina Avenue, Suite 301
Toronto, Ontario
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The Importance of Fishing and the Consumption of Fish as Part of the Traditional Cultural Activity and Identity of the People of Grassy Narrows First Nation: An Anthropological Perspective

Dr. Anna Willow, Associate Professor,
Ohio State University, Department of Anthropology
1465 Mt. Vernon Avenue, Marion, OH 43302 USA

Date: February 3, 2016

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I. Area of Expertise and Qualifications

My professional training and extensive research experience qualify me as an expert in the areas of cultural and environmental anthropology, especially concerning Anishinaabe environmental relationships, uses, and values. I have broad expertise concerning boreal forest First Nations peoples and cultures and I am knowledgeable about sociocultural responses to environmental transformations resulting from natural resource extraction. I earned a PhD in Anthropology from the University of Wisconsin (2008). Additionally, I hold two Masters Degrees, one from the University of Wisconsin in the field of Anthropology (2003) and the other from the University of Michigan in the field of Natural Resources and Environment (2001). Since the autumn of 2009, I have been employed at the Ohio State University. I was promoted from assistant to associate professor of anthropology in June of 2015. I have conducted multiple independent research projects, including long-term ethnographic participant-observation research at Grassy Narrows First Nation (which took place mainly from June 2004 to April 2005, with additional shorter visits between May 2003 and August 2007). As my CV (Appendix B) details, I have to date published one book, thirteen peer-reviewed journal articles, and two professional reports in the areas of my expertise. I have also delivered numerous papers at professional conferences in my field of study.

The report that follows combines extensive reviews of published ethnohistorical and social scientific literature with observations and conversations derived from my time at Grassy Narrows First Nation. Some of the material contained in this report is excerpted and adapted from my own previously published works, especially including the following three items:

Willow, Anna. 2012. *Strong Hearts, Native Lands: Anti-Clearcutting Activism at*

Grassy Narrows First Nation. Winnipeg: University of Manitoba Press (Concurrently published in the United States as *Strong Hearts, Native Lands: The Cultural and Political Landscape of Anishinaabe Anti-Clearcutting Activism.* Albany: State University of New York Press).

Willow, Anna. 2011. Conceiving Kakipitatapitmok: The Political Landscape of Anishinaabe Anti-Clearcutting Activism. *American Anthropologist* 13(2):262-276.

Willow, Anna. 2009. Clear-cutting and Colonialism: The Ethnopolitical Dynamics of Indigenous Environmental Activism in Northwestern Ontario. *Ethnohistory* 56(1):35-67.

II. Instructions, Nature of Opinion Sought, and Questions

I have been asked by Joseph F. Castrilli and Richard D. Lindgren of the Canadian Environmental Law Association to prepare an expert report that answers twelve questions. The primary purpose of this report is to describe the importance of fishing and the consumption of fish as part of the traditional cultural activity and identity of the people of Grassy Narrows First Nation. My answers to the questions are contextualized by my anthropological understanding of Grassy Narrow First Nation's cultural and geographic affiliation, Anishinaabe subsistence patterns of the past and present, and broader patterns of human-environment relationships among the indigenous peoples of the Canadian boreal region. The report documents the ongoing relevance of traditional Anishinaabe culture, the importance of fishing as a form of land-based subsistence, and the continuing cultural impacts of mercury contamination.

I was provided with and asked to review four relevant documents (Item A):

A. The Grassy Narrows-Earthroots request, dated January 2014, of the Ministry of the Environment for an individual environmental assessment (IEA) on the Whiskey Jack Forest Management Plan (2012-2022), and the supplementary submissions made to the Ministry dated May, July, September and November 2014 insofar as they relate to your area of expertise and the subject matter for your report.

B. The Lovisek Report, dated June 2008.

C. *Keewatin v. Ontario*, 2011 selected factual findings from the trial judgment pertinent to your report (Exhibit "A").

D. Ontario Ministry of Natural Resources and Forestry approved 2012-2022 Forest Management Plan for the Whiskey Jack Forest.

I was also asked to answer twelve questions in four general areas. I list the twelve questions here and include my summary and full detailed answers—along with reasons for those answers—in the subsequent section.

A: General

1. For the documents referred to in item A, above, please indicate if the views expressed in those documents that relate to the subject matter of this report, and/or that are attributed to you, are accurate in every material respect? If not, please indicate in your report the corrections that should be made with respect thereto. In responding to this question, please also address the questions that follow.

B: Historical Importance of Fishing

2. What factual findings are made in the 2011 trial judgment of Keewatin v. Ontario, if any, that are relevant to the subject matter of your report respecting:

a. The traditional activities the ancestors of Grassy Narrows engaged in with respect to the Grassy Narrows Homeland/Traditional Land Use Area ("TLUA") before and following their signing of Treaty No. 3?

b. The definition of the historical seasonal round of Grassy Narrows and, in particular and to the extent not discussed in response to question 2(a) above, the historical importance of fishing to the culture, sustenance, and economy of Grassy Narrows?

3. If not answered in response to question 2(b) above what has been the historical importance of fishing, if any, to the culture, economy, and sustenance of the people of Grassy Narrows?

C: Contemporary Importance of Fishing

4. How important today is fishing to the culture, economy, and sustenance of the people of Grassy Narrows and, if not discussed in response to questions 1, 2, or 3 above, the relationship of the TLUA of Grassy Narrows to the Whiskey Jack Forest?

5. Which fish species are eaten by the people of Grassy Narrows, from which geographic areas, and why? In particular, what traditional factors, if any, apply to the bodies of water, and fish species a member of Grassy Narrows may fish for in the area?

6. What role, if any, does fishing play in the identity and society of the people of Grassy Narrows? Is this role different, and if so how, from non-aboriginal Canadian society in the region, and from the urban aboriginal population in the region?

7. Taking into account your responses to the above questions regarding the importance of fishing and the consumption of fish caught, how effective have been measures used by the federal or provincial governments, such as consumption advisories and the provision of freezer fish, in protecting the people of Grassy Narrows from mercury impacts? Please explain your answer.

D: Impacts of Mercury Exposure on the Culture and Community of the People of Grassy Narrows

8. What has been the impact of past mercury exposure from industrial discharges on the culture and community of Grassy Narrows, and what inferences can be drawn from this history when considering future activities, such as clear-cut logging, and whether they could introduce new sources of mercury exposure through fish consumption?

9. If not answered in response to question 8 above, what have been the community level psychological impacts of past mercury exposure from industrial discharges on the people of Grassy Narrows and what additional community level psychological impacts are currently experienced or anticipated from planned future activities, such as clear-cut logging, and whether they could introduce new sources of mercury exposure?

10. Are the impacts at the community level in Grassy Narrows from past mercury exposure, and those anticipated in future from new sources of mercury exposure, experienced differently by gender and age and, if so, how?

11. If not answered in response to questions 8, 9 and 10 above, how does the experience at Grassy Narrows compare with the documented experience of other aboriginal communities that have faced environmental contamination problems?

12. What community level responses have occurred in response to past mercury exposure, and what community level responses are possible in future to activities that could add mercury to bodies of water used by the people of Grassy Narrows for fishing and other traditional pursuits?

III. Summary and Full Answers to Questions and Reasons for Opinions

In this core section of the report, I provide both summary and full answers to the questions I was asked to consider and explain the reasons—based on my review of the relevant literature and on observations made as a trained anthropological observer—for my opinions.

A: General

1. For the documents referred to in item A, above, please indicate if the views expressed in those documents that relate to the subject matter of this report, and/or that are attributed to you, are accurate in every material respect? If not, please indicate in your report the corrections that should be made with respect thereto. In responding to this question, please also address the questions that follow.

Summary Answer:

Regarding all of these documents, I agree with the information that is within my area of expertise to assess. I found no errors related to the subject matter of this report.

Full Answer:

A. The Grassy Narrows-Earthroots Request

Concerning the Grassy Narrows-Earthroots request of January 2014 for individual environmental assessment (IEA) and its subsequent supplementary submissions, I agree with the information that is within my area of expertise to assess and found no errors related to the subject matter of this report. I am not qualified to offer an expert opinion regarding the effects of clearcutting on mercury levels, nor on its implications for wildlife or human physiology. I would like to reiterate the importance and accuracy of several of the points contained in the Grassy Narrows-Earthroots submissions as they relate to my area of expertise:

1. The initial request (dated January 22, 2014) draws attention to the fact that the English and Wabigoon watersheds and their Aboriginal residents have already experienced serious harm as a result of mercury contamination (p. 1, p. 22). Because impacts on indigenous subsistence and culture are cumulative in nature, any future activities that could adversely impact the subsistence and culture of First Nations residents must be considered in this light.

2. The initial submission states that fish caught in the waters surrounding Grassy Narrows and consumed by community residents already have mercury levels that are above or approaching limits for safe human consumption (p. 6). This has long been the case and is well-known among environmental management professionals and environmental social science researchers in Canada.

3. The initial submission states that Grassy Narrows has consistently objected to the OMNRF's planning process (p. 10). Based on my experience at Grassy Narrows, I can attest to community members' long-term concern with the planning process, with public objections dating back to the late 1990s and internally-voiced complaints possibly extending further back in time. As described below, the residents of Grassy Narrows have also expressed specific concerns about mercury contamination for many years.

4. The initial submission points out that the people of Grassy Narrows have experienced multiple, mutually-compounding industrial activities that have been harmful to their health, culture, and livelihood (p. 22). Based on my knowledge of the case, I know this to be accurate.

5. The September 8, 2014 supplementary submission states that people at Grassy Narrows continue to perceive the risk of mercury pollution to be high, that sufficient levels of communication and trust have not been developed between Grassy Narrows residents and scientific/health professionals, and that the detrimental consequences of mercury contamination extend beyond its effects on physical health (p. 5). The report that follows supports and elaborates on these points.

6. The supplementary submission dated November 14, 2014 states that the impacts of mercury have been disproportionately experienced by those Grassy Narrows residents who practice a traditional way of life that includes fishing (p. 5). I agree with this point and elaborate on its significance below.

7. I agree with the points set out in the supplementary submission dated November 14, 2014 regarding the inappropriate nature of sports fishing consumption guidelines for First Nations peoples (p. 10-11) and the general importance of fishing for the people of Grassy Narrows (p. 18-19). I elaborate on these topics below.

B. *Keewatin v. Ontario,* 2011: Selected Factual Findings from the Trial Judgment Arising from the Lovisek Report

Regarding the Lovisek Report, dated June 2008, I found the material that is within my area of expertise (Anishinaabe ethnohistory and subsistence) to be accurate.

It is noteworthy that the ability to access and utilize the region's rich fisheries was viewed as especially important by Anishinaabe negotiators to Treaty Three, so much so that Commissioner Simon Dawson noted the following in his report:

> I am in a position to say that, as an inducement to the Indians to sign the Treaty, the commissioners pointed out to them that, along with the land reserves and money payments, they would forever have the use of their fisheries. This point was strongly insisted on and it had great weight with the Indians, who for some years previously had persistently refused to enter into any Treaty (Dawson 1873:50; cited on p. 161 of the Lovisek report).

Twine for the manufacture of fishing nets, Lovesick accordingly points out, was a key Saulteaux demand (p. 87, 91, 119). In short, when Anishinaabe negotiators signed Treaty Three in 1873, they did so with the confidence that their people would retain the ability to utilize the region's rich fisheries as a healthy and traditional dietary staple. For Anishinaabe people today, the ability to access and safely consume fish and other traditionally harvested resources throughout their customary Land Use Area (or traditional territory) remains extremely important.

One way in which I diverge with Lovisek is not a matter of accuracy, but one of preferred ethnonym. Because it is their own self-designation, I use the terms *Anishinaabe* and *Anishinaabeg* (plural) throughout this report to refer to the Aboriginal people also known in the literature as Ojibwe/a, Ojibway, and Saulteaux. This reflects our different disciplinary backgrounds (ethnohistory vs. cultural anthropology) and temporal research emphasis (historical documents vs. contemporary speech). Where I cite the work or documents of others, I use the term found in the original.

I also agree with the three selected excerpts that were identified as pertinent to this report (paragraphs 475, 772, and 773), reproduced here:

> [475] Lovisek gave evidence that in 1873, the Ojibway were primarily concerned about preserving their way of life, including their right to continue hunting, fishing and trapping as in the past. They valued their seasonal round, the pursuit of their livelihood through traditional harvesting. Their culture and

> identities were intimately connected with hunting, trapping, fishing and harvesting wild rice as their ancestors had done since time immemorial.
>
> [772] The Treaty 3 Ojibway loved their lives and their country (Lovisek, November 16, 2009 at p. 39). They relished their way of life, including their seasonal round of trapping, hunting, fishing and harvesting over the breadth of their territories. They valued their customs and were not prepared to give them up….
>
> [773] I accept the evidence of Lovisek…that they were prepared to embrace a Euro-Canadian presence **only** if it would be compatible with their cherished way of life, and would not cause serious interference with their hunting, fishing and trapping – central aspects of their distinctive culture central to their identity.

Furthermore, I found accurate and relevant information in the trial judgment regarding the Ojibway seasonal round (paragraphs 229-230, 1153, 1158-1164) and the assumed compatibility of Aboriginal and Euro-Canadian uses of the land (paragraphs 913, 1233). These paragraphs are reproduced in Appendix C of this report.

D. 2012-2022 Forest Management Plan for the Whiskey Jack Forest

Silviculture and forest management planning are outside my area of expertise and I am not qualified to identify inaccuracies in this area. However, as an anthropologist concerned with the sociocultural elements of systems that include both ecological and human components, I note the following matters relevant to my report:

> 1. There is no mention in the Forest Management Plan of the previous opposition of Grassy Narrows First Nation members to clearcutting within their Traditional Land Use Area (traditional territory), which has included high-profile direct action protest as well as sustained opposition to the forest management planning process itself. The Plan notes that "Abitibi surrendered the Whiskey Jack Forest SFL to MNR in 2009" (p. 18), but the context of that surrender (which was informed, among other factors, by years of protest by members of Grassy Narrows First Nation and the entry into a memorandum of understanding to initiate formal negotiations to resolve the ongoing dispute) is not mentioned in any manner. This lack is again conspicuous on pages 109-111 in the Forest Management Plan's very general section on Aboriginal Interests.
>
> This contrasts with an independent audit that notes that a separate process is now underway to address Grassy Narrows community members' concerns about forest management. The independent audit supports Grassy Narrows First Nation's view that the Forest Management Planning process, as currently practiced, does not constitute

adequate consultation. The *Whiskey Jack Forest Independent Forest Audit, 2004-2009* draws attention to "fundamental differences in the viewpoints between GNFN and MNR regarding forest management principles and practices" and goes on to state:

> "it is the audit team's opinion that these differences cannot be resolved without the Province setting aside many of the requirements to manage the Whiskey Jack Forest under the CFSA and the FMPM, and relinquishing significant authority to the First Nation to manage portions of the Whiskey Jack Forest according to the desires of the GNFN community. The audit team further believes that the forest management planning process did not anticipate, nor was it designed to resolve the type of dispute currently being experienced on the Whiskey Jack Forest" (KBM Forestry Consultants 2010:7).

2. The Plan notes that 84% of the area in question falls into the category of "Managed, Crown land" (p. 20). While this is technically accurate, there is no mention of the fact that this overlaps considerably with the area Grassy Narrows residents understand to be their Traditional Land Use Area or traditional territory.

3. Although the region's important fisheries resource is discussed (p. 68-70), there is no mention of mercury in the report. First Nations fishing is discussed briefly (p. 102), but the English-Wabigoon River's serious mercury problem is not noted. This is especially concerning because the contamination case is well-known in northwestern Ontario and among environmental and social science researchers across Canada.

4. The Plan includes summaries of the demographic profiles of communities that "receive significant social and economic benefits from the Whiskey Jack Forest" (p. 86), but does not acknowledge the possibility that these communities might also face significant social and environmental risks or harms as a result of the activities described in the Forest Management Plan. While the concept of "net impact" is recognized with regards to recreation and tourism (p. 218), there is no explicit consideration of the possibility that Aboriginal communities could be adversely impacted by forestry activities. This is in spite of the fact that supplementary documentation in the Plan itself acknowledges that "subsistence hunting, fishing, and gathering of resources from within the forest are an integral part of community existence" (p. 26).

5. While wildlife habitat, visual aesthetics, tourism agreements, and fuelwood are included in the Plan's Harvest Selection Criteria (p. 187-189), Aboriginal Interests are not.

B: Historical Importance of Fishing

2. What factual findings are made in the 2011 trial judgment of Keewatin v. Ontario, if any, that are relevant to the subject matter of your report respecting:

a. The traditional activities the ancestors of Grassy Narrows engaged in with respect to the Grassy Narrows Homeland/Traditional Land Use Area ("TLUA") before and following their signing of Treaty No. 3?

Summary Answer:

Factual findings from the trial judgement concerning the acknowledged importance of subsistence harvesting at the time of the Treaty are relevant to the subject of this report. Treaty commissioners knew that traditional harvesting—specifically including fishing—was essential to Anishinaabe people.

Full Answer:

In addition to the selected excerpts noted above, the following additional findings in the *Keewatin v. Ontario* judgment are relevant to the historical importance of fishing at Grassy Narrows First Nation:

1. It was widely understood by the Treaty Three Commissioners that traditional harvesting was of the utmost importance to the Anishinaabe and that they would be unlikely to agree to a treaty if harvesting was not protected. As stated at Paragraph 747, "All three Treaty Commissioners understood the importance of harvesting to the Ojibway and therefor the importance of promising continuing Harvesting Rights to induce the Ojibway to enter into the Treaty."

2. The judgment accepts that the Treaty Commissioners knew most of the Treaty Three area was unsuitable for agriculture. They were aware of the general pattern of Anishinaabe subsistence and expected it to continue. Along these lines, paragraph 750 states that "Morris made it clear to the treaty 3 Ojibway that he expected their gardening <u>to supplement, not replace</u>, their traditional harvesting." Similarly, paragraph 759 states, "…from Canada's perspective, the continuation of the hunting, trapping and fishing rights was important to ensuring that the Ojibway did not become dependent upon relief or welfare delivered by the Department of Indian Affairs"

b. The definition of the historical seasonal round of Grassy Narrows and, in particular

and to the extent not discussed in response to question 2(a) above, the historical importance of fishing to the culture, sustenance, and economy of Grassy Narrows?

Summary Answer:

Factual findings concerning the centrality of fishing to the Anishinaabe seasonal round are relevant to the subject of this report. Fishing was historically—and remains today—a staple subsistence activity at Grassy Narrows First Nation.

Full Answer:

Findings relevant to the historical seasonal round, especially fishing, are also present in *Keewatin v. Ontario:*

1. Paragraph 229 gives a broad overview of the Anishinaabe subsistence strategy, emphasizing seasonal mobility and adaptability to the availability of diverse boreal forest resources. The following paragraph (Paragraph 230) quotes a letter from Simon Dawson to the Minister of Public Works (dated December 19, 1870) which states that in summer, "the grand occupation is fishing, and this is to them the happiest season of the year" and goes on to broadly but accurately describe the activities undertaken in each season.

2. While not specific to the people of the English-Wabigoon River region, Paragraph 1053 describes complaints following Treaty Three made by Anishinaabe leaders of the Rainy River, Rainy Lake, and Seine River Bands who were in 1909 experiencing opposition to their traditional subsistence activities. The loss of hunting grounds and interference by outsiders with hunting is noted. Regarding fishing, the1909 petition includes the following statement: "We also wish to Fish for ourselves all the year and no reserve seasons for us. It's our daily food."

3. The evidence of William Fobister (Paragraphs 1153-1164) presents an accurate description of recent historical Anishinaabe subsistence patterns. Fobister describes the early summer gardening season at the pre-relocation Reserve, the summer blueberry harvest, the late summer wild rice harvest, the garden harvest, travel to the winter trapline, and the hunting and trapping of autumn and winter. The judgment also notes based on Fobister's evidence, which states:

   > "The Grassy Narrows people fished for their own consumption and for sale to others until 1970, when mercury poisoning was discovered in the Wabigoon and English River system and adjacent lakes. Fish were

declared unsafe to eat. Fishing ended. The tourist industry, formerly the main employer in the area, collapsed. Welfare was introduced for the first time" (Paragraph 1173).

I believe this assessment to reflect what Fobister witnessed in the early 1970s. Today, however, many people at Grassy Narrows do continue to fish for their own subsistence, in ways and for reasons that are outlined below. Commercial fishing continues to be curtailed by contamination. Guiding for the tourist industry, although less significant than prior to mercury contamination, continues to employ some Grassy Narrows residents. Grassy Narrows members now work as fishing guides employed by Ball Lake Lodge and Grassy Narrows Lodge, both which are owned by the Grassy Narrows band. There also exists at least one independent family-owned guiding business.

4. The trial judge acknowledges that "In the case of the Grassy Narrows Ojibway, the life of Fobister is illustrative of the continuing reality that they were still pursuing the seasonal round without significant Euro-Canadian influence, at least into the 1960s and that Euro-Canadian uses and traditional harvesting were compatible" (Paragraph 1233).

3. If not answered in response to question 2(b) above what has been the historical importance of fishing, if any, to the culture, economy, and sustenance of the people of Grassy Narrows?

Summary Answer:

Since time immemorial, fishing has provided a primary source of food for Anishinaabe residents of Grassy Narrows and the surrounding region. Historically, it was an essential component of Grassy Narrows First Nation's economy as well as an important aspect of Anishinaabe cultural life.

Full Answer:

Fishing has been a significant activity and a staple source of food for countless generations of Grassy Narrows citizens. In both the traditional hunting-gathering economy and the more recent mixed economy, the role of fishing is central. Historically, fishing was an essential component of the seasonal round, with summer activities revolving around fishing and seasonal residence locations chosen based on proximity to productive fishing grounds. When reminiscing about times on the trapline in decades past, Grassy Narrows elders speak of fishing with nets (with walleye and northern noted as the main edible catch) as a principal activity. Beginning in the 1940s and continuing until the 1970 discovery of mercury, commercial fishing also became an

important source of wage labor income for Grassy Narrows residents. Employment of community members as fishing guides for the tourist industry began in the same period and continues today.

Prior to Euro-Canadian interference, Grassy Narrows Anishinaabeg lived a semi-nomadic lifestyle, moving within their homeland according to seasonal patterns of resource availability. In northwestern Ontario, the traditional Anishinaabe land-based seasonal subsistence cycle (or "annual round") (see Densmore 1979 [1929], Danziger 1979) shared many similarities with that observed in other parts of the North American subarctic. Through December, January, February, and March, primary subsistence activities included ice fishing and the trapping of furbearers. With families dispersed for the season, some opportunistic large game hunting also took place in the winter. In late April and early May, waterfowl returning to boreal forest lakes or passing through along their migration routes to more northerly destinations offered a welcome source of food. As soon as the ice broke up, people began fishing the waters of the English-Wabigoon River, often concentrating their earliest efforts on rapids or known spawning zones. From its commencement in May until the waters turned icy with fall, open water fishing was the dominant subsistence activity. With many families gathered together at prime fishing locations, summer was also the most social of the seasons. Late summer was a time of particular bounty. In August, Anishinaabeg picked several varieties of berries and harvested the annual crop of wild rice. Both resources, together with dried meat and fish, were processed for storage in underground caches. With fall's arrival, hunting for migratory waterfowl once again became a central activity. Large mammals—moose, white-tailed deer, and bear—were hunted most intensively in the autumn months. As fall gave way to winter, families once again dispersed, resuming trapping and recommencing the annual cycle.

Throughout most of the eighteenth and nineteenth centuries, Anishinaabe people moved within their homeland according to the seasons and the demands of the fur trade (see *Keewatin v. Ontario* paragraph 230). Family and extended family groups traveled with the seasons and land-based subsistence was the core of economic life (Hickerson 1970). Over time, particular groups became associated with specific trading posts operated by the Hudson Bay Company, where they traded furs for firearms, steel traps, cloth, and other provisions each spring and often remained to fish through the summer months. One of these posts, located just up the English River from present-day Grassy Narrows at Lac Seul, attracted a loose confederacy of Anishinaabe families (Shkilnyk 1985). At the time Treaty Three was signed in 1873, the Anishinaabeg gathered at Lac Seul were under the traditional hereditary leadership of Chief Sakatcheway. In the years following the Treaty, the government established reserves for each group of signatory Indians. In 1882, the people associated with Lac Seul were divided into the two groups that became Grassy Narrows and the smaller Wabauskang First Nation. The two communities remain closely linked today through ties of family and friendship.

Participation in the fur trade implied the emergence of a mixed economy (i.e., a living made through a combination of traditional land-based subsistence and wage/cash income) but in no way undermined the forest-based way of life. Anishinaabe people continue to hunt, fish, and gather as in generations past. Through the first half of the twentieth century, people from Grassy Narrows sold furs and blueberries for cash and a handful participated in various types of wage labor, but the bulk of the community's subsistence still came directly from the forest and from the region's lakes and rivers. A small Hudson Bay Company store operated on the Old Reserve (the common term used to denote the pre-relocation community), but its limited inventory and high prices meant that Grassy Narrows residents purchased only basic supplies—equipment to facilitate land-base subsistence, flour, sugar, and lard—regularly. The people of Grassy Narrows remained highly mobile and spent most of their winters out on their traplines. Contacts with non-Native Canadian society in this era were limited to semi-annual visits from Indian Health Service doctors and ceremonial Treaty Day visits from an Indian Agent and RCMP officer (Shkilnyk 1985).

It was only in the late 1940s that wage labor came to play a significant role in Grassy Narrows First Nation's local economy. Following World War II, a businessman from Minnesota built a luxurious lodge on Ball Lake, located several kilometers upriver from Grassy Narrows. From that time on, men from the First Nation community participated seasonally in a burgeoning tourism industry, working as fishing guides for wealthy anglers. Commercial fishing was also economically important in this period.

C: Contemporary Importance of Fishing

4. How important today is fishing to the culture, economy, and sustenance of the people of Grassy Narrows and, if not discussed in response to questions 1, 2, or 3 above, the relationship of the TLUA of Grassy Narrows to the Whiskey Jack Forest?

Summary Answer:

Fishing remains essential to the culture, economy, and sustenance of Grassy Narrows First Nation residents. As a key component of a land-based Anishinaabe way of life, fishing overlaps with many other traditional activities and reinforces enduring ties the community's Traditional Land Use Area.

Full Answer:

Fishing remains a very important part of life at Grassy Narrows and must be understood as a key component of a land-based way of life which also includes many other complementary activities. The economy and diet experienced by contemporary Grassy Narrows residents differs from that of past generations, yet First Nation members' land-based subsistence activities diverge more in

quantity than in quality from the historical pattern described above. Every family group still includes individuals who hunt, fish, and/or trap. Many community members continue to gather each season's characteristic wild resources despite the social and economic upheavals of the past fifty years (i.e., relocation and road construction in the 1960s, mercury contamination in the 1970s, clearcut logging in the 1990s and beyond). Furthermore, those who are unable to participate regularly in land-based subsistence eagerly await traditional products shared by others and maintain genuine respect for community members who engage frequently in traditional subsistence pursuits.

At Grassy Narrows today, trapping remains the dominant cold-season subsistence activity, although ice fishing also takes place during the winter. Grassy Narrows trappers hold over 30 registered traplines scattered throughout the Traditional Land Use Area surrounding the community. Travel to and within traplines usually occurs by snowmobile and trips are usually completed in one day, although some trappers maintain cabins that make longer stays feasible. In these cases, people fish and hunt for much of their food during their time out on the trapline. In addition to registered trapline holders, official "assistants" and younger relatives frequently accompany trappers in order to develop their own skills. The most commonly sought furbearers include beaver—trapped not only for fur but also as a food source—and members of the weasel family: pine marten, river otter, fisher, mink, and wolverine. Red fox, lynx, wolf, and muskrat are also trapped periodically. Trapping provides supplementary income for many Grassy Narrows families.

In late summer, people at Grassy Narrows eagerly await the ripening of two important wild foods: wild rice and blueberries. The availability of these resources varies according to weather conditions. Additionally, a large portion of the region's wild rice remains at the mercy of the dams that now constrain the English-Wabigoon River system; if water levels are raised while the rice is still in its vulnerable floating leaf stage, an entire harvest can be damaged beyond recovery. If, however, conditions have been favorable, both crops can be remarkably rich. Harvesting wild rice requires access to a boat and considerable skill, but a handful of Grassy Narrows residents collect the aquatic grain each year and share the products of their labor widely. Abundant and accessible, hundreds of First Nation residents take part in the seasonal harvest of wild blueberries.

In the fall—and to a lesser extent throughout winter and into early spring—First Nation members hunt moose and white-tailed deer by firearm. Most frequently, two or three people set out together in the morning or evening, hunting with the aid of a boat or vehicle for transportation. Meat from these large animals is shared widely while fresh and frozen for consumption throughout the year. In both fall and spring, migratory waterfowl are also harvested.

Despite anxiety about mercury and other toxic substances, fishing is the dominant warm-season subsistence activity and is undertaken by Grassy Narrows residents of all ages on waterbodies

throughout the Traditional Land Use Area, including the English-Wabigoon River and its constituent lakes as well as headwater lakes. Men, women, and children fish with rod and reel (this usually means jigging from boats or casting from the rocky shoreline with inexpensive jigheads and rubber lures) and some gather to snare fish with wire during the spring spawning season. In spring, people travel long distances by truck to reach areas of moving water (i.e. rapids) which are already free of ice and where they can fish from shore.[1] In summer, those who are able travel by truck and car to widely scattered sites that are known to be productive shore-fishing sites and by boat to numerous productive locations away from shore. Nets are set for the procurement of fish in both the summer and winter seasons and are especially important when a large number of fish are needed for a feast event.

In addition to the consumption of fish for household-level subsistence, some individuals at Grassy Narrows earn money through participation in fishing-related labor, although the commercial fishery and guiding industries are smaller than they were prior to the 1970 announcement of mercury contamination. The continuing significance of commercial fishing income and the continuing severity of mercury contamination in the waters of the English-Wabigoon River system are both substantiated by the 2006 conviction of a Grassy Narrows First Nation commercial fisherman who attempted to sell "tainted" fish caught in Grassy Narrows Lake to a fish processing plant in Kenora. The charged individual held an approved license for commercial fishing on Oak Lake, located north of Grassy Narrows within the community's Traditional Land Use Area (Kenora Daily Miner and News 2006). Statistics Canada data from 2006 indicate that of 415 individuals at Grassy Narrows over the age of 15, 75 were in the labor force but unemployed and 195 were not in the labor force. The official unemployment rate of 33.3% does not account for the numerous individuals who have removed themselves from the search for employment. The same data set shows that of the 190 individuals included in the experienced labor force, 70 listed sales and service as their occupation, which would include fishing and guiding.[2]

Although a large portion of food consumed at Grassy Narrows now comes from the supermarkets of Kenora, it would be highly erroneous to assume that wild foods are inconsequential for sustenance. Indeed, wild foods—especially including fish—are the most valued part of contemporary Grassy Narrows residents' diet. Wild foods are viewed as more nutritious than store-bought foods, especially the highly-processed items typically accessible on a small budget. Fresh foods are unavailable for purchase in Grassy Narrows and obviously non-nutritious convenience and snack items (e.g., chips, soda pop, candy) are ubiquitous in the community, especially among youth and families with children.

[1] Fieldnotes, April 29, 2004.
[2] See http://www12.statcan.gc.ca/census-recensement/2006/dp-pd/prof/92-594/details/Page.cfm?Lang=E&Geo1=CSD&Code1=3560058&Geo2=PR&Code2=35&Data=Count&SearchText=Grassy&SearchType=Begins&SearchPR=01&B1=All&Custom= (accessed April 22, 2015).

For some families in some parts of the year, wild meat, fish, wild rice, and berries complete many meals. While I was in Grassy Narrows, I regularly witnessed (and more frequently heard about) households running out of money and food as the end of the payment month approached. For many Grassy Narrows residents, the experience of scarcity is a recurring, taken-for-granted part of life. Statistics Canada data from 2005 show a median income at Grassy Narrows First Nation of only $6,112, with 66.7% from earned income and 31.9% from government transfers. Grassy Narrows residents have a significantly lower median income than recorded for Aboriginal Ontario residents as a whole ($18,808), as well as a lower percentage of earned income and a higher percentage of government transfers (the figures for all Aboriginal residents of Ontario indicate 77.2% of income from earnings and 16.6% of income from government transfers).[3] For comparison, the mean income for all residents of Canada in 2005 was $30,000 for females and $46,900 for males.[4] Grassy Narrows residents thus look to fish at times when they are unable to afford other foods. Given the high unemployment rate in the community and the fact that welfare payments are insufficient to meet many families' needs, catching fish often means the difference between hunger and satiation. This point is especially important because while other wild foods are unharvestable at certain times of the year, fish are available year round.

Despite its continuing importance, there are several factors that limit First Nation members' participation in time-intensive and geographically-dispersed forms of land-based subsistence. Children, for one thing, must remain close to school. In my time at Grassy Narrows, I heard of a few parents who took their children out of school for a land-based subsistence event they deemed important, but on no known occasion did this extend beyond a day or two. Travel into the bush also requires transportation in the form of a snowmobile, boat, and/or truck as well as the gas to get it there. This requires money. Somewhat paradoxically, the same adults who hold regular jobs are most able to afford such travel, but are often too busy with other demands to undertake it regularly. As described below, local walleye fishing is not limited in these ways.

The people of Grassy Narrows have a close and enduring relationship with a large territory known as the "Grassy Narrows Traditional Land Use Area," which has been occupied by their forbearers since time immemorial (see *Keewatin v. Ontario* paragraph 475). I have viewed the map that shows the "Area of Requestors IEA Request" and found the delineated region to be consistent with my knowledge of the Traditional Land Use Area. Based on historical reports, publications, and my observations of active use, I believe the entire Area of Interest to be included within Grassy Narrows First Nation's area of traditional land use, but also note that this Area does not necessarily include all of land historically and currently utilized by Grassy Narrows First Nation members.

[3] See http://www12.statcan.gc.ca/census-recensement/2006/dp-pd/prof/92-594/details/Page.cfm?Lang=E&Geo1=CSD&Code1=3560058&Geo2=PR&Code2=35&Data=Count&SearchText=Grassy&SearchType=Begins&SearchPR=01&B1=All&Custom= (accessed April 22, 2015).
[4] See http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/labor01a-eng.htm (accessed October 12, 2015).

For present day citizens of Grassy Narrows, connection to this homeland is enacted through land-based subsistence and comprehended through stories told by living elders of seasonal movements throughout the region and life prior to the community's relocation in the early 1960s. Although considerably overlapped by the OMNRF-designated Whiskey Jack Forest, the Grassy Narrows Traditional Land Use Area is essential for the livelihood and cultural identity of the people of Grassy Narrows. It is the setting in which the vast majority of traditional land-based subsistence takes place and provides a material base on which Grassy Narrows residents are able to learn and live traditional Anishinaabe culture. Fishing is a critical part of these place-based activities and, as noted above, supplementary documentation within the Forest Management Plan itself acknowledges that "subsistence hunting, fishing, and gathering of resources from within the forest are an integral part of community existence" (p. 26).

5. Which fish species are eaten by the people of Grassy Narrows, from which geographic areas, and why? In particular, what traditional factors, if any, apply to the bodies of water, and fish species a member of Grassy Narrows may fish for in the area?

Summary Answer:

Walleye is the favored and most consumed fish species at Grassy Narrows. While Grassy Narrows residents fish throughout their entire Traditional Land Use Area, the English-Wabigoon River system that flows through the contemporary reserve community is the most accessible and, therefore, the most widely utilized and productive source of fish.

Full Answer:

Walleye are Grassy Narrows residents' most often consumed, most favored, and most important species of fish. Especially in the months of open water, walleye are consumed very frequently (the exact frequency depends on the individual or family in question, but most people I came into contact with ate walleye at least once a week and some ate considerably more). Fish species such as trout, whitefish, and pike are also occasionally consumed by Grassy Narrows residents, but much less frequently than walleye. This is partially because not all fish species are found in all areas. Lake trout and whitefish, for example, tend to occur only in cold deep lakes, whereas pike and walleye inhabit relatively warmer and more accessible lakes and rivers. And while walleye are a favored food source, pike are not a desirable food species and are sometimes returned to the water if caught. While walleye can be caught easily with a simple rod and reel—sometimes only steps from most Grassy Narrows residents' front doors—species such as whitefish and trout require a boat and/or net. Given the level of poverty on the reserve, many people do not have consistent access to these items and, compared to walleye, these species are rarely harvested.

Grassy Narrows First Nation members fish on all of the waterbodies within their Traditional Land Use Area. Fishing continues to be an important activity for those who spend time on traplines, with Grassy Narrows residents utilizing of all of the small lakes within their own trapline areas and readily acknowledging that other residents do the same. While smaller headwater lakes that are not fed by the river system are especially important to families who customarily use and/or have registered traplines in their vicinity, several factors—including (1) traditional family use patterns, (2) officially registered (OMNRF) traplines, (3) existing commercial fishing licenses, (4) the availability of vehicles/boats/trailers, (5) knowledge of waterways and their hazards, (6) expertise concerning the harvest of particular species, and (7) the availability of fishing gear—combine to constrain fishing location options. Critically, people at Grassy Narrows are not able to relocate to other fisheries within or outside of their traditional territory if the waterbodies they customarily fish become contaminated, as they now have been for decades. If Grassy Narrows residents were to travel outside of their own traditional territory to harvest fish or other resources, they would require the consent of the First Nation whose territory they seek to utilize. Furthermore, their treaty-guaranteed traditional harvesting rights may not necessarily be protected outside of their own territory.

Grassy Narrows residents are thus limited in the species they can catch due to tradition, taste, knowledge concerning the locations and time of year particular species can be caught, access to sites and required equipment, and proficiency with equipment. While all lakes and rivers are utilized by some residents at some time, the English-Wabigoon River is the most easily accessible body of water to the reserve community. Every home on the reserve is within easy walking distance of the river and fishing from shore can occur even in the absence of prohibitively costly vehicles, boats, gasoline, and specialized equipment. While not the First Nation's only source of fish, the river is thus the most widely utilized and the most productive.

6. What role, if any, does fishing play in the identity and society of the people of Grassy Narrows? Is this role different, and if so how, from non-aboriginal Canadian society in the region, and from the urban aboriginal population in the region?

Summary Answer:

Fishing is an essential component of contemporary Anishinaabe cultural identity as well as an important intergenerational social and educational activity for Grassy Narrows residents. Its deeply emplaced social significance differs from fishing practices and meanings among non-aboriginal Canadians and urban Aboriginal populations.

Full Answer:

The relationship between the harvest and consumption of wild foods is extremely important to Anishinaabe cultural identity, which is critical to community members' collective psychological

well-being. For many people at Grassy Narrows, land-based subsistence is much more than simply a source of livelihood; it is deeply symbolic of a way of life. Anthropologists identify land-based subsistence as the most quintessential aspect of indigenous subarctic peoples' cultural lives. As Paul Nadasdy (2003:63) explains, "to First Nations people living in the Arctic and Subarctic, hunting is synonymous with life itself."[5] Kirk Dombrowski (2001) similarly points out that subsistence is both an identity and a livelihood, both a way of life and a way to live. In the past, the truth of these statements was quite literal. While the transitions of recent decades mean that a mixed economy emphasizing land-based subsistence supplemented with a small amount of wage labor and other sources of monetary income has become a mixed economy in which (at least from a strictly material point of view) the reverse is true, indigenous peoples of the north continue to depend on land-based subsistence for physical as well as psychological sustenance. Like other Aboriginal boreal forest residents, the people of Grassy Narrows hold wild foods—including walleye and other fish, moose meat, venison, beaver, wild rice, and blueberries—in much higher regard than the commodities available for purchase, not only for their nutritional value, but also for the links to cultural identity and healthy-living they imply.

Not only do they consider such items healthier, but the acts of gathering and consuming wild foods are important markers of contemporary Anishinaabe identity. By fishing and trapping, by gathering berries and rice, people at Grassy Narrows are able to forge tangible and embodied connections to their heritage. Critically, land-based subsistence also constructs an affirmative Anishinaabe sense of self and gives people a way to define themselves that breaks free of mainstream society's pessimistic comparisons and categorizations. The devastating poverty of Canada's First Nations has been well documented (e.g. York 1990), even if not fully grasped by the general Canadian public. Although they lament the blatant economic disparities that divide them from their Euro-Canadian neighbors, many Anishinaabe people feel that their cultural, spiritual, and social richness far outweighs their material poverty. Keeping culturally distinct patterns of land-based subsistence alive lies at the core of this perceived wealth.

Given the centrality of fishing to the land-based Anishinaabe way of life, arguments about the inextricability of subsistence, culture, and identity clearly apply to the harvest, consumption, and sharing of fish. As Peter Usher et al. state, "fish are part of the Ojibwa heritage, and like other country food, have meaning beyond simply eating. This meaning lies in the skills, knowledge and labor of obtaining food, as well as the social links which are perpetuated by sharing it. Fish are the end product of a way of life" (1979:11). I concur with Usher et al. on this point and believe it to be just as relevant in the twenty-first century as it was 35 years ago.

At Grassy Narrows today, fishing remains an intensely social activity, with the harvesting and eating of fish both occurring communally. Unlike large-game hunting and trapping (both which require extensive training and supplies), fishing is undertaken by a very large portion of Grassy Narrows First Nation's population. Fishing is a source of pride; a way for any individual of any

[5] Hunting in this statement categorically includes fishing and trapping activities.

age or status to proudly supply food for his or her family. Frequently taking place in intergenerational family groups, fishing is a way of socializing children as well as a vehicle for the fulfillment of culturally distinctive economic bonds and obligations (also noted by Usher et al. 1979:364). Today as in years past, fish are shared widely among Anishinaabe people. In many cases, when an individual catches more than he or she can consume, a portion of the catch is given to family members, friends, and/or elders. Fish are also shared in a larger-scale and more intentional manner as a ubiquitous dish at ceremonial and social feasts.

This is quite different from the role of fishing among members of non-Aboriginal Canadian society in the region. In my experience (which includes significant interactions with Euro-Canadian residents of Kenora, Ontario), non-Aboriginal individuals fish for several reasons. Most often, they fish for sport and recreation. In some cases, non-Aboriginal people do consume and appreciate the nutritional value of the fish they catch. Time spent fishing is seen as a valuable form of social interaction and intergenerational learning by some (but certainly not all) non-Aboriginal fishers. However, there are significant sociocultural differences between non-Aboriginal and Grassy Narrows Anishinaabe fishing behavior. Unlike non-Aboriginals, Grassy Narrows residents associate fishing with attachment to homeland, assertion of cultural rights, and expression of cultural identity; those who maintain such connections are perceived to enjoy a higher level of wellbeing than those who do not. Fish are also less likely to be consumed in social settings or shared in communal feasts among non-Aboriginal citizens. My experience with urban Aboriginal populations is limited to individuals who are affiliated with Grassy Narrows (i.e., people who have relatives at Grassy Narrows and/or have previously lived on the reserve). My general sense is that while urban Aboriginal residents may also experience poverty and fish for subsistence when and where it is possible as well as for family enjoyment, they tend not to experience the deep connections to specific places and the social significance of fishing described above unless it is within the context of their home reserve community.

7. Taking into account your responses to the above questions regarding the importance of fishing and the consumption of fish caught, how effective have been measures used by the federal or provincial governments, such as consumption advisories and the provision of freezer fish, in protecting the people of Grassy Narrows from mercury impacts? Please explain your answer.

Summary Answer:

Measures employed in attempt to limit or replace Grassy Narrows residents' consumption of contaminated fish have been ineffective due to the irreplaceability of distinctive social and cultural values associated with the harvesting of local fish.

Full Answer:

For several reasons, measures taken to limit Grassy Narrows residents' consumption of fish from the English-Wabigoon River have been ineffective, both in the past and the present. Following the discovery of mercury, people at Grassy Narrows had trouble coming to terms with the enormity of the crisis they faced. Throughout the 1970 season, the government attempted to discourage people from eating the contaminated fish. Signs that read "Fish for Fun" in bold letters and featured an image of a fish in a frying pan with an "X" over it were posted at boat landings (Troyer 1977). It didn't take the media long to point out that the Fish for Fun campaign did Native commercial and subsistence fishers no good (CBC 1970). Many of the signs were quickly marked by graffiti or ripped down and none were posted in subsequent years. Most Grassy Narrows residents continued doing what they had always done—eating fish—even after hearing of its potential toxicity.

Few people I spoke with between 2003 and 2005 about the initial announcement of mercury recalled the community's reaction as a dramatic one. Several factors may explain their response (or lack thereof). The river's large and plentiful walleye had long been a favored source of protein. Additionally, fish were one the most accessible remaining sources of wild food on the post-relocation reserve. Compounding these factors, First Nation residents observed as tourists continued to eat their catch with no adverse effects (Hutchison and Wallace 1977). Furthermore, as described above, harvesting and consuming fish made it possible for people at Grassy Narrows to maintain a culturally distinct Anishinaabe identity associated with a land-based way of life.

Today, a disconcerting number of Grassy Narrows residents are able to recite offhand the parts-per-billion (ppb) of mercury in their own bodies.[6] And, as they have now for decades, harvesters continuously weigh the economic and cultural benefits of consuming wild foods against the known physical risks.[7] They struggle to reconcile their desire to retain their land-based way of life with the risks inherent in eating the products of their labor. At Grassy Narrows, fish in the absence of fishing (i.e., the consumption of frozen fish harvested elsewhere and supplied to the community) lack the critical cultural and social connections associated with fish harvested locally by community residents. Connections to cultural identity, history, and socialization derived from the process of fishing cannot be replaced by freezer fish. Nor can the pride of self-sufficiency. If we acknowledge that fishing accomplishes much more than just the production of fish, the choice of many Grassy Narrows residents to continue consuming fish harvested from the contaminated English-Wabigoon River begins to make sense. Some Grassy Narrows residents state that they persist in consuming fresh fish from the river because the available frozen fish are not of the type or quality they are accustomed to. Beyond such matters of preference, however, the profound social and cultural importance (described above) of the harvesting/preparation/consumption process cannot be replaced.

[6] Fieldnotes, June 17, 2004.
[7] Fieldnotes, June 2, 2003.

Even as people at Grassy Narrows remain deeply concerned about the presence of mercury in fish (and potentially in other wild foods) and insist that these risks be minimized, many feel that the benefits of consuming such items thus outweigh the risks. Grassy Narrows residents' reactions to the health risks associated with toxins in the environment highlight the cultural significance of land-based subsistence. Judy DaSilva—a well-known community leader and mother of five children—once expressed her concerns about contaminants at a public forum. An outsider attending the event suggested a simple solution: Why, he asked, didn't they simply stop eating wild foods? Judy had been taken aback. Reflecting on this exchange, she emphatically told me, "It's not just something you quit. It's not just food for us; it's spiritual."[8]

D: Impacts of Mercury Exposure on the Culture and Community of the People of Grassy Narrows

8. What has been the impact of past mercury exposure from industrial discharges on the culture and community of Grassy Narrows, and what inferences can be drawn from this history when considering future activities, such as clear-cut logging, and whether they could introduce new sources of mercury exposure through fish consumption?

Summary Answer:

The effects of past mercury exposure at Grassy Narrows have been severe and have included serious health problems, challenges to traditional subsistence and cultural identity, economic hardship, and social strain within the community. Newly introduced mercury would exacerbate these detrimental effects.

Full Answer:

Until the discovery of mercury in 1970, the local fishery was central to Grassy Narrows First Nation's economic production, supplying household subsistence as well as commercial fishing income (Usher et al. 1979:364). The original request for Individual Environmental Assessment more fully describes the history and health impacts of mercury contamination at Grassy Narrows. Based on my knowledge of the case, I agree with these submissions. The mercury originated in effluent released by a factory located in far upstream Dryden, Ontario. From 1962 to 1970, roughly 20,000 pounds of the substance entered the river and followed its gradual northwesterly course (Erickson and Vecsey 1980; Shkilnyk 1985; Troyer 1977). As the water flowed on, anaerobic bacteria in the riverbed transformed the mercury from the comparatively benign inorganic compound released by the plant into a deadly bioaccumulating form. Already facing

[8] Fieldnotes, January 29, 2005.

the detrimental impacts of relocation, mercury contamination was a major blow for the community.

After relocation, the community's transition from a relatively independent, subsistence livelihood to participation in the wider wage labor economy accelerated. Citizens of Grassy Narrows depended on the river more than ever before for their living, with a majority of the First Nation's employed population earning wages either in the local commercial fishery or in the tourism and guiding industry. These economic opportunities evaporated after the discovery of mercury. By the spring of 1970, fish from ten lakes within the English-Wabigoon River system—including Clay, Ball, Indian, and Grassy Narrows Lakes—were deemed unsafe for consumption. Almost overnight, unemployment at Grassy Narrows jumped from twenty to eighty percent due to mercury related job losses (Troyer 1977) and an estimated ninety percent of men in the community were out of work (Erikson and Vecsey 1980). The welfare economy tightened its grip on the people of Grassy Narrows, so that by 1977 the community was economically dependent upon steadily increasing transfer payments from the Canadian government, with 37.2 percent of all income deriving from unearned sources and the government functioning as the community's principal employer (Shkilnyk 1985:148).

Significant physical, economic, and psychological (described below) repercussions of mercury contamination continue to this day. I am not trained to trace the pathways of mercury through ecological systems, but based on what I know regarding (1) mercury's bioaccumulation and persistence over time, (2) the sound science linking clearcutting to increased levels of mercury in waterways, (3) the specific history of adverse impacts in the English-Wabigoon River region, and (4) the cumulative effects of numerous additional threats to the Anishinaabe way of life, any activity that increases mercury levels in the traditional diet of Grassy Narrows Anishinaabeg will have serious detrimental impacts. These impacts may entail enduring health effects for adult residents, lives curtailed by health problems for today's children, and anxiety for the health of those who are not yet born. Collective consequences may also include continued affronts to traditional subsistence and cultural identity, economic hardship, and mounting frustration over a long-term problem left inadequately unaddressed.

Two key facts make Grassy Narrows First Nation's case unique. First of all, the historical and contemporary pattern of land-based subsistence—which includes as its centerpiece the practice of fishing on the English-Wabigoon River—must be taken into consideration. Second, the people of Grassy Narrows have been forced to face the persistent physical and cultural impacts of mercury contamination for 45 years. In other words, citizens of Grassy Narrows not only rely on fish and other wild foods as a crucial component of their diet and essential element of their culture, but they have also been previously exposed to mercury. For these reasons, a healthy future for the people of Grassy Narrows and for generations yet to come requires that industrial activities do not increase mercury levels in the fish harvested by Grassy Narrows First Nation residents.

9. If not answered in response to question 8 above, what have been the community level psychological impacts of past mercury exposure from industrial discharges on the people of Grassy Narrows and what additional community level psychological impacts are currently experienced or anticipated from planned future activities, such as clear-cut logging, and whether they could introduce new sources of mercury exposure?

Summary Answer:

Due to the presence of mercury in the English-Wabigoon River system, residents of Grassy Narrows have experienced substantial fear and anxiety for their health. Cultural beliefs about reciprocal relationships between Anishinaabe people and non-human components of the environment and the perceived ability to live a traditional way of life have been jeopardized.

Full Answer:

The impact of mercury contamination was both cultural and material; to this day, the once sustaining English-Wabigoon River is perceived by some Grassy Narrows residents as a "river of poison."[9] I agree with previously submitted material stating that the experience of mercury poisoning has caused serious psychological problems among Grassy Narrows residents, especially including fear and anxiety (noted in Supplementary Submissions, based on Donnan 1986), but also confusion, grief, suspicion, and anger. While I am not a psychologist, it is within my disciplinary area of expertise to document shared socio-cultural trauma. Community-level effects that follow a distressing event or process often result in what Kai Erikson calls *collective trauma*, described as "a blow to the basic tissues of social life" (Erikson 1976:154). Such trauma has undoubtedly occurred at Grassy Narrows First Nation. I also find Usher et al.'s assessments to be both correct and highly relevant today; Usher et al. conclude that mercury pollution stands out as a major event in the First Nation's history, one "which eliminated a central economic activity and a major source of income, and endangered health and aroused anxiety in regard to the same" (Usher et al. 1979:368).

On page 23 of this report, I stated that most Grassy Narrows residents I talked to between 2003-2005 did not recall the initial announcement of mercury as a dramatic event. Over time, however, Grassy Narrows residents began to correlate the unusual medical symptoms they and their loved ones had suffered in recent years with the presence of *pijibowin*—poison. In the fall of 1972, Tom Strong, a forty-two-year-old trapper and fishing guide, died unexpectedly (Hutchison and Wallace 1977). Although Strong had always been healthy, he began to experience slurred speech, weight loss, and chest pains in the summer of that year. He was camped with his family harvesting the annual crop of wild rice when he died of an apparent

[9] Fieldnotes, September 1, 2004.

massive heart attack. In the same year, a boy was born to a fishing guide and his wife with what looked like a full-blown case of acute mercury poisoning, also known as Minamata disease. It was not lost on Grassy Narrow residents that, in both cases, the victims and their families were heavy consumers of fish.

Erikson and Vecsey made the following observation regarding mercury poisoning at Grassy Narrows:

> The discovery of mercury in the local waters has presented a psychological and perhaps even spiritual problem, for the apprehensions and uncertainties that follow such a discovery can affect the mind as surely as the poison itself can affect the body. This process is a subtle one and difficult to document, but it takes the form of a pervasive fear that the world of nature and the world of men are now contaminated and can no longer be trusted in the old way (1980:159).

At Grassy Narrows, the cultural consequences of mercury contamination were substantial. People at Grassy Narrows felt powerless to control their situation. Their customary comprehension of human-environment relationships taught that respectful reciprocity with powerful "other-than-human persons" was necessary to the achievement of *bimaadiziwin*—a good life free of illness and misfortune (Hallowell 1975, 1992; Nesper 2002).[10] But mercury contamination defied patterns of explanation and order that had served them well in their boreal forest homeland for hundreds of years. Human beings, distant both geographically and culturally, had unleashed the toxins that were now disrupting Anishinaabe lives. Most individuals at Grassy Narrows had no knowledge of the Dryden mill and no use for its products. They had done nothing to upset their delicately balanced relationship with the natural world nor to diminish the river's capacity to sustain life.

Although the fundamental cultural ties that bind Grassy Narrows residents to their homeland remain strong, important changes have taken place. Critically, many contemporary Grassy Narrows residents feel that the positive, sustaining nature of their environment can no longer be unreservedly trusted. Relied upon for generations to provide for their people, the river is now a source of *pijibowin* and a site of trepidation. Instead of offering nourishment and the satisfaction of self-sufficiency, the river can now make them sick. It is significant that those within the community who continue to practice traditional Anishinaabe subsistence to the greatest degree are most impacted—and most troubled—by the presence of mercury in the environment.

If additional mercury is allowed to enter the regional ecosystem, these effects can be expected to persist and probably worsen over time. Detrimental consequences of additional mercury

[10] This term has been spelled in various ways, including *pīmädäzīwin* (Hallowell 1975) and *pimadiziwin* (Nesper 2002). I use the double-vowel spelling found in Nichols and Nyholm's *Concise Dictionary of Minnesota Ojibwe* (1995).

exposure are likely to parallel those seen at Grassy Narrows since 1970 and can be expected to include fear, anxiety, and grief associated with a loss of connection to emplaced cultural activities. When communication about risks is not sufficient or trusted, confusion, suspicion, and anger are also likely to ensue. Recent press releases from the community suggest that fear and anxiety are already increasing as a result of the Forest Management Plan's allowance of additional clearcutting. In a release issued in response to the rejection of the community's request for an Individual Environmental Assessment in late 2014, Joseph (J.B.) Fobister stated:

> "Ontario has ignored our voices and is planning to force more devastating clearcuts on our people without even applying their own Individual Environmental Assessment process...It makes me sad that our people will become even sicker if the government allows the logging industry to poison the fish that we eat."

Grassy Narrows residents' association with their traditional landbase must be understood as a comprehensive and holistic package of land-based subsistence and culture rather than as a series of distinct, isolated harvesting activities. As a result, the aggregate impacts of hydroelectric dams, mercury contamination, and clearcutting are greater than the sum of their parts. A trapper who no longer feels safe obtaining fish while out on the trapline may spend less time in the bush. An Anishinaabe youth who experiences anxiety due to the presence of mercury while at a land-based healing camp may rejoin friends partying on the reserve. Mercury contamination—alone as well as in conjunction with other known challenges—poses a serious threat to the Anishinaabe way of life.

10. Are the impacts at the community level in Grassy Narrows from past mercury exposure, and those anticipated in future from new sources of mercury exposure, experienced differently by gender and age and, if so, how?

Summary Answer:

Based on their roles as primary caregivers, their ability to bring new life into the world, and their cultural duties as protectors of water, women at Grassy Narrows are disproportionately impacted by past, present, and future mercury exposure.

Full Answer:

In addition to its disproportionate effects on traditional harvesters and their families, mercury's impacts on the women of Grassy Narrows have been especially profound. Gender roles and family structures at Grassy Narrows largely follow a traditional Anishinaabe pattern (see Landes 1997 [1938]). Historically, subsistence pursuits among the Anishinaabe proceeded according to a gendered division of labor, with men the primary hunters and trappers and women completing the bulk of gathering and domestic work. While some women at Grassy Narrows do work

outside the home (especially in office and education service positions), this is still largely the case regarding land-based subsistence activities. In my time at Grassy Narrows, I observed members of both genders participate regularly in fishing and in the processing of animal products, while men remained the most frequent hunters and trappers and women remained the most common gatherers of wild plant products. Following from generations past, when women were in charge of the construction of *wiigiwaaman*—dwellings (Densmore 1979 [1929]), contemporary Anishinaabe women have primary obligation for maintenance of the home.

As bearers of the next generation and primary caretakers of children, disabled individuals, and elders, women bear a burden over and above others in the community. This includes the additional time, effort, and stress associated with caring for those who are disabled (or less-abled) as a result of mercury's physical and/or psychological effects. It also includes the anxiety and fear catalyzed by the congenital effects of mercury contamination (i.e., worries that a fetus will be born with defects as a result of the mother's consumption of fish) and the disproportionate impacts of mercury on the developing brains of children.

The customary relationship between Anishinaabe women and water merits special mention. Water is perceived by many Anishinaabeg to be the source of all life and is viewed by individuals of both genders as "women's business." Women's symbolic duty as protectors or "carriers" of water is enacted through the central role of women in traditional water ceremonies. Anishinaabe women explain their relationship with water in reference to the prominence of water in the processes of bringing new life into being (i.e., through pregnancy and childbirth). By extension, Anishinaabe people comprehend rivers as metaphorically equivalent to the veins of mother earth.[11] Given this context of belief, women's traditional capacity is greatly disrupted by the degradation of water resources and waterborne contamination. When water is contaminated, upholding these traditional duties becomes more onerous.

11. If not answered in response to questions 8, 9 and 10 above, how does the experience at Grassy Narrows compare with the documented experience of other aboriginal communities that have faced environmental contamination problems?

Summary Answer:

While other First Nations communities have experienced mercury contamination, Grassy Narrows has faced sustained and persistent environmental transformations over many years that have resulted in cumulative detrimental effects.

Full Answer:

[11] Fieldnotes, June 22, 2004.

In many ways, Grassy Narrows residents' experience of mercury has been similar to other communities facing such contamination. Ronald Niezen (1998:88), for example, describes comparable reactions to the discovery of mercury among the James Bay Cree (a group related linguistically and culturally to the Grassy Narrows Anishinaabe), pointing out that "such dramatic changes to the land as flooding and contamination of fish can only lead to a sense of sorrow or spiritual malaise among those accustomed to a careful scrutiny of human relationships with animals and the environment." Although the origin of mercury contamination in the James Bay region differed from the English-Wabigoon River's industrial pollution, the anxiety and sense of vulnerability—as well as the widespread refusal to cease harvesting and consuming fish—that resulted from the substance's presence did not.[12] Margaret Wheatley suggests that among First Nations peoples, the social and cultural impacts of mercury contamination are often more severe than the physical risks and often serve to amplify them (1997). While not specific to mercury, reactions of anxiety, confusion, and the need to weigh risks and benefits of traditional land-based subsistence have been documented among Aboriginal populations at Walpole Island (VanWynsberge 2002), Aamjiwnaang (Jackson 2011), and Akwesasne (Grande and Johansen 1995) as well as among American Indian peoples facing contamination in the United States (see Grinde and Johansen 1995; LaDuke 1999).

Still, the Grassy Narrows case is unique in the cumulative and persistent nature of environmental impacts. Grassy Narrows First Nation's recent history has been punctuated by several episodes of unsolicited—and largely undesirable—change, which have combined to create aggregate effects more damaging than even the most dramatic alteration could produce independently. The people of Grassy Narrows saw their immediate environment transformed without their consent for the first time in the late 1920s, when hydroelectric dams were constructed along the English River to generate power for Euro-Canadian settlements and industries (Kenora Daily Miner and News Staff and the Canadian Press 1984). These dams led to localized flooding and unpredictable water-level fluctuations. More recently, Grassy Narrows has faced large-scale industrial logging throughout its Traditional Land Use Area. These changes compound one another by limiting access to some areas and by reducing community members' trust in the land to provide for their needs. Since the late 1990s, residents have responded to industrial logging within their territory with formal letters of complaint, media campaigns, litigation, and a peaceful direct action blockade.

12. What community level responses have occurred in response to past mercury exposure, and what community level responses are possible in future to activities that could add mercury to bodies of water used by the people of Grassy Narrows for fishing and other traditional pursuits?

[12] Mercury became a problem in the James Bay region following hydroelectric development and subsequent flooding. Richard Scott (2001) traces the James Bay Cree experience of mercury poisoning as well as the history of mercury poisoning in Canadian First Nations more generally.

Summary Answer:

Residents of Grassy Narrows are extremely worried about the presence of mercury in the environment and in their own bodies. They have worked for many years to draw attention to the mercury contamination that has impacted their community and are deeply concerned by the documented relationship between clearcutting and increased mercury levels.

Full Answer:

Based on my firsthand experience at Grassy Narrows, I can attest that people in the community are extremely worried about the continuing impacts of mercury contamination on their health and their immediate environment. They have discussed this issue publically for many years in many different forums. I witnessed numerous discussions reflecting these concerns between 2003 and 2007 and have continued to follow developments since that time.

During my period of research at Grassy Narrows, mercury was a topic of frequent conversation and a matter of collective concern. Specifically, I was present for one of Dr. Harada's visits to Grassy Narrows, which was attended by dozens of Anishinaabe citizens who came to the reserve clinic to be examined by the doctor and his team. [13] All were searching for solutions to health problems they believed to be associated with mercury contamination. I also observed activities related to a community wild food contaminant study, which was designed to shed light on the specific quantities of mercury and other toxins in wild foods and help harvesters understand which species were at risk of contamination.[14] After 2007, Grassy Narrows residents continued to voice concern regarding mercury. While not witnessed firsthand, I am aware of several more recent events designed to draw attention to mercury contamination that have been organized by Grassy Narrows residents—most notably the River Runs of 2010 and 2012—as a result of my use of Facebook and other electronic media. As they did during the previous period of intensive clearcutting and proposed cutblocks within the Traditional Land Use Area that ended in 2008, many residents of Grassy Narrows are already experiencing detrimental anticipatory anxiety. They are fearful that portions of their homeland and way of life may be further degraded as a result of additional clearcutting and associated mercury contamination. As Deputy Chief Randy Fobister recently declared "That's all we know—fishing. Mercury destroyed that once. If they allow more cutting, we'll never be able to sustain ourselves" (Porter 2015).

Residents of Grassy Narrows have been concerned about mercury contamination for 45 years and about clearcutting for 20 years. Since at least 2010, members of the community have publically discussed the link between the two sources of industrial impact (see initial submission, p. 10-11). Furthermore, Anishinaabe people believe strongly that the various components of the

[13] Fieldnotes, August 29, 2004. For Dr. Harada's findings, see Harada et al. 2005.
[14] Fieldnotes, July 29, 2004.

boreal forest ecosystem are interconnected and have long observed and voiced concern regarding logging's impacts on water quality and the habitats of forest species.

For the people of Grassy Narrows First Nation, firsthand experience with environmental degradation—most especially the discharge of mercury into the English-Wabigoon River system—instilled a harsh lesson: if the environment becomes further degraded, traditional land-based subsistence and the rich set of cultural beliefs and practices that are bound to it will be severely curtailed. Based on my experience at Grassy Narrows, I believe community members wish to avoid being forced to choose between (1) giving up traditional activities that are central to their individual and collective identity by ceasing to eat fish they catch in the area in order to protect their health and (2) exposing themselves to further harm caused by exposure to new sources of mercury in order to continue eating fish as part of their traditional way of life.

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Appendix B: Author's CV

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Education

Ph.D., Anthropology
University of Wisconsin-Madison
2008

M.A., Anthropology
University of Wisconsin-Madison
2003

M.S., Natural Resources and Environment-Behavior and Education
University of Michigan-Ann Arbor
2001

B.A., Anthropology, Environmental Studies Certificate
University of Wisconsin-Madison
1998
Graduated with Distinction (Cumulative GPA 3.97)

Also attended: San Francisco Art Institute

Academic Positions

Associate Professor
Current Position
The Ohio State University
Department of Anthropology/Marion Campus
Courses taught at the Ohio State University: Anthropology 2202/202: Peoples and Cultures: Introduction to Cultural Anthropology; Anthropology 3420/421.08: Indians of North America; Anthropology 620: Anthropology of Religion; Anthropology 699: Undergraduate Research; Anthropology 5624: The Anthropology of Food: Culture, Society, and Eating; Anthropology 3525: History of Anthropological Theory

Assistant Professor
Fall 2009-Spring 2015
The Ohio State University
Department of Anthropology/Marion Campus

Lecturer and Honorary Fellow
2008-2009
University of Wisconsin-Madison
Anthropology and American Indian Studies
Courses: Anthropology 343: The Anthropology of Religion; American Indian Studies 450: American Indians and the Environment: Environmental Justice

Lecturer
Spring 2006, Spring 2007, Fall 2007
University of Wisconsin Colleges
Department of Anthropology and Sociology
Fond du Lac and Fox Valley Campuses
Courses*:* Anthropology/American Indian Studies 314: The Indians of North America

Teaching Assistant
Fall 2001, Spring 2002, Fall 2005, Spring 2008
University of Wisconsin-Madison
Department of Anthropology
Courses**:** Anthropology 104: Cultural Anthropology and Human Diversity, Anthropology/American Indian Studies 314: The Indians of North America

Project (Research) Assistant
2007
University of Wisconsin-Madison
Department of Anthropology
Project**:** Big Lake/Rice Creek Traditional Cultural Property Analysis (Cultural Resource Management in collaboration with the Lac du Flambeau Band of Lake Superior Chippewa (Ojibwe) and the Bureau of Land Management). *Supervisor*: Dr. Larry Nesper

2002-2004
University of Wisconsin-Madison
Department of Anthropology
Project**:** A Cultural Analysis of Kluane First Nation Land Claims. Negotiations. *Supervisor*: Dr. Paul Nadasdy

Grants, Awards, and Honors

Wenner-Gren Foundation for Anthropological Research. To aid research on "Contested Developments and Cumulative Effects: Understanding Diverse Responses to Energy Resource Development in British Columbia's Peace River Region." $16,500. **2016-2017.**

Coca-Cola Critical Difference for Women Grant. "Gendering Extraction: Experiences of Unconventional Energy Development in Ohio." $4,000. **2014-2015.**

Ohio State University Regional Campus Faculty Research Grant. "Gendering Extraction: Experiences of Unconventional Energy Development in Ohio." $2,000. **2014-2015.**

Ohio State University Regional Campus Faculty Research Grant. "A Sociocultural Analysis of Shale Energy Development in Ohio." $1,629. **2013-2014.**

Wenner-Gren Foundation for Anthropological Research. To aid research on "The Politics of Environmental Alliance: A Multi-sited Ethnography of the Boreal Leadership Council." $17,810. **2012-2013.**

Beth Wilder Dillingham Award (Central States Anthropological Society). $400. **2007.**

Vilas Travel Grant, University of Wisconsin-Madison. $600. **2006.**

J. William Fulbright Foreign Scholarship Board, Canada-US Fulbright Award. $15,000. **2004-2005.**

Canadian Embassy Graduate Research Fellowship. $6,500. **2004-2005.**

University of Wisconsin-Madison Departmental Research Travel Award. $500. **2003.**

Elected to Phi Beta Kappa, Phi Kappa Phi, and the Golden Key Honor Society. **1998.**

Publications (all single author unless otherwise noted)

Book

Strong Hearts, Native Lands: Anti-Clearcutting Activism at Grassy Narrows First Nation. Winnipeg, MB, University of Manitoba Press (Published concurrently in the United States by the State University of New York Press as *Strong Hearts, Native Lands: The Cultural and Political Landscape of Anishinaabe Anti-Clearcutting Activism*). **2012.**

Journal Articles

Boreal Forest Prospects and Politics: Paradoxes of First Nations Participation in Multi-Sector Conservation. *Conservation and Society***. In Press.**

Gendering ExtrACTION: Expectations and Identities in Women's Motives for Shale Energy Opposition (with undergraduate student Samantha Keefer). *Journal of Research in Gender Studies* 5(2):93-120. **2015.**

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Chapters in Edited Volumes

Where Nature and Culture Meet: Culturally Significant Natural Resources. In *A Companion to Cultural Resource Management.* Thomas F. King, ed. Pp. 114-127. Malden, MA: Wiley-Blackwell. **2011.**

Reviews

Review of *Cultures of Energy: Power, Practices, Technology* by Sara Strauss, Stephanie Rupp, and Thomas Love. *Culture, Agriculture, Food, and Environment (CAFE) Journal* 35(1): 67-69. **2013.**

Review of *Anishinaabe Syndicated: A View from the Rez* by Jim Northrup. *American Indian Culture and Research Journal* 37(1): 169-172. **2013.**

Review of *Ogimaag: Anishinaabeg Leadership, 1760-1845* by Cary Miller. *American Indian Culture and Research Journal* 36(4): 188-190. **2012.**

Review of *This Elusive Land: Women and the Canadian Environment* by Melody Hessing, Rebecca Raglon, and Catriona Sandilands (editors). *American Review of Canadian Studies* 36(1): 149-151. **2006.**

Technical Reports

With Larry Nesper. *Big Lake and Rice Creek: A Traditional Cultural Property Analysis.* Report compiled for the Bureau of Land Management (Milwaukee Field Office) and the Lac du Flambeau Band of Lake Superior Chippewa Indians. **2008.**

With Tom King and Larry Nesper. *The Mushgigagamongsebe District: A Traditional Cultural Property of the Sokaogon Ojibwe Community*. Report submitted to the Army Corps of Engineers, St. Paul District, by the Mole Lake Sokaogon Community of the Great Lakes Chippewa Indians. Crandon, Wisconsin. **2002** (Kindle publication **2012**).

A Resting Place for the Ducks: A Multidisciplinary Analysis of Floodplain Restoration of the Hennepin Levee District, Illinois. University of Michigan Masters Project, School of Natural Resources and Environment. **2001.**

Conference Presentations

"Shale Energy and Waterscape Transformation in Ohio." Presented at the 75th Society for Applied Anthropology Annual Meeting. Pittsburgh, PA. March 27, **2015**.

"Collaborative Conservation as a Survival Strategy: New Contexts of Indigenous Resistance in Canada's Boreal Forest." Presented at the 113th American Anthropological Association Annual Meeting. Washington, DC. December 7, **2014**.

"Hydraulic Fracking and the New Politics of Environmental Degradation." Presented at the 112th American Anthropological Association Annual Meeting. Chicago, Illinois. November 21, **2013**.

"The Contested Landscape of Hydraulic Fracking: Unconventional Energy and Reimagined Environments in Ohio's Shale Gas Regions." Presented at the 111th American Anthropological Association Annual Meeting. San Francisco, California. November 15, **2012**.

"Degradation, Disempowerment, and Vulnerability: Cultural Responses to Uninvited Environmental Change." Presented at the 4th International Eco-Summit. Columbus, Ohio. October 1, **2012**.

"Re(con)figuring Alliances: Environmental Protection and Indigenous Empowerment in Canada's Boreal Forest." Presented at the Central States Anthropological Society Annual Meeting. Toledo, Ohio. March 23, **2012**.

"Indigenizing Invasive Species Management: Native North Americans and the Emerald Ash Borer (EAB) Beetle." Presented at the 109th American Anthropological Association Annual Meeting. New Orleans, Louisiana. November 19, **2010**.

"American Indians, Cultural Anthropologists, and the Search for Common Ground." Presented at the First Annual Workshop on American Indian Issues. Ohio State University. Columbus, Ohio. April 23, **2010**.

"Negotiating Scientific Management, Political Historicity, and the Black Ash Basketry Tradition: Native North American Responses to the Invasive Emerald Ash Borer (EAB) Beetle." Presented at the Central States Anthropological Society Annual Meeting. Madison, Wisconsin. April 9, **2010**.

"Culture and Power at Kakipitatapitmok: Reflections on Landscape Anthropology and Anishinaabe Anti-Clearcutting Activism." Presented at the 108th American Anthropological Association Meeting. Philadelphia, Pennsylvania. December 2-6, **2009**.

"Convergence and Collaboration: Cultural Revitalization in Anthropological and Indigenous Discourse." Presented at the 107th American Anthropological Association Annual Meeting. San Francisco, California. November 19-22, **2008**.

"Drawing a Political Landscape: The Grassy Narrows Traditional Land Use Area." Presented at the Central States Anthropological Society Spring Meeting. Minneapolis, Minnesota. April 13, **2007**.

"Confronting Colonialism: The Processes and Politics of Environmental Change and Contemporary Activism in an Ojibwe Community." Presented at the 105th American Anthropological Association Annual Meeting. San Jose, California. November 15-19, **2006**.

"Engaging with Environmentalism: Transformational Politics and Indigenous Activism in Northwestern Ontario." Presented at the Society for Cultural Anthropology Conference. Milwaukee, Wisconsin. May 6, **2006**.

"(Re)Presenting Indigenous Environmental Activism: On Histories of Management and Sovereign Futures at Grassy Narrows First Nation." Presented at Annual American Society for Ethnohistory Conference. Chicago, Illinois. October 30, **2004**.

"(Re)Presenting Indigenous Environmental Activism: Images and Their Uses at Grassy Narrows First Nation, Ontario." Presented at the 81st Annual Meeting of the Central States Anthropological Society. Milwaukee, Wisconsin. April 17, **2004**.

"The Context of Resistance: Articulating an Ethnohydrology in Wisconsin's Indian Country." Presented at the Committee for Intercollegiate Cooperation (CIC) Conference for American Indian Studies. Chicago, Illinois. April 25, **2003**.

"Animals in Anishinaabe Life: A Diachronic Cultural Perspective." Presented at the Committee for Intercollegiate Cooperation Conference for American Indian Studies. East Lansing, Michigan, April 19, **2002**.

Main Research and Teaching Interests

Environmental Anthropology
Native North American/American Indian Studies
Anishinaabe/Ojibwe Studies
Cultural Resource Management/Traditional Cultural Properties
Sociocultural Consequences of Natural Resource Extraction

Professional Service

Reviewer for the National Science Foundation and for *American Ethnologist*, *Anthropology Today*, *Cambridge Archeological Journal*, *Current Anthropology*, *Environmental Management*, *Human Ecology*, *Human Organization*, *Left History*, *Local Environment*, *PoLAR: Political and Legal Anthropology Review*, and *Rural Sociology.*

Appendix C: Relevant factual findings from *Keewatin v. Ontario*, 2011

[229] From season to season, the Ojibway moved from area to area, travelling by birch bark canoe in summer, snow shoe in winter. They gathered resources for their sustenance whenever and wherever they were available.

[230] In a letter to the Minister of Public Works dated December 19, 1870 [Ex. 1, Vol. 4, tab 103], to which I have earlier referred in other respects in the section on Euro-Canadian perspective, Dawson, anticipating that after the Treaty was made, the Ojibway would be treated as minors and that they would come under the care of the Dominion Government, provided a detailed description of their habits and means of obtaining their subsistence:

> In spring, as the navigation opens, the Indians leave their hunting grounds, and betake themselves to the Lakes and Rivers and, as the fish literally swarm in these inland waters, in the early part of Summer, they then have no difficulty in obtaining food, and the means of communication being easy to their light canoes, they can congregate in considerable numbers. Rainy River is the Chief resort, and it is there that their Councils are held, and their Feasts celebrated, but Rainy River, although the Sturgeon abound in its waters, cannot support the whole tribe, and the number which assemble there is generally limited to 600 or a thousand people, including men, women and children. Last summer, however, the number was greater than usual, there having been at one time full 1500 people in the vicinity of Fort Frances.
> …
> … early in Summer, the grand occupation is fishing, and this is to them the happiest season of the year, as they have then an opportunity of uniting after a long winter of isolation. Food is abundant and the time passes pleasantly under circumstances of peculiar fascination to the Savage. With his gun in readiness for the wild fowl, and his spear for the fish, he can, with little labour, secure enough for his immediate wants, and the future troubles him not. The produce of the winter's hunt affords him the means of renovating his garments and bedecking himself to his tastes; marriages and dances are the order of the day with the young, and the old and experienced meet in Council to deliberate on the affairs of the Community, while matrons with some regard to the future, dry the flesh of the sturgeon in the sun, and store it past a day of want.
>
> The fishing season lasts til the rivers began to fall, in the beginning of July, and the busy season commences, numbers then proceed to sandy plains, or rocky islets, where blueberries are in such abundance. These the women and children gather in great quantities and dry in the sun, or compress into cakes which they store past for future use; but a still more important harvest than that of berries soon waits them, and the whole tribe sets off for the rice fields.

> In certain parts of the Lake of the Woods, and on the upper reaches of the Winnipeg, the water spreads out into vast lagoons or shallow marshes, and in these the wild rice grows up from the bottom and rises high over the water, covering extensive areas ... When this crop is ripe, the canoes are perfectly watertight and pushed at will through the standing rice, the method of securing it being to bend it over the gunwale and thresh the ears out with sticks, the grain falling on mats prepared to receive it in the bottom of the canoe; meantime the harvest is disputed by other gleaners in the shape of vast flocks of aquatic fowl, and of these the Indians can easily secure all that they can consume.
> At the time of the rice harvest, the authority and patience of the Chiefs are put to the test, in deciding disputed claims and meting out justice to all ...
>
> It may be maintained that the rice is not always a sure crop. If the water should be too high, it in a measure fails, and even when it promises well, if heavy rains and strong gales occur when it is ripening, it is beaten down to the water and rendered valueless, and the moment it begins to ripen the wild fowl attack it, sometimes in such numbers as to impair the harvest.
>
> Besides the resources as far enumerated, the Indians have crops other than those which nature unaided produces. When the first French explorers came among them they found them growing maize on the banks of the Rainy River, and on the islands of the Lake of the Woods. Two centuries have since elapsed and Indian corn is still grown in the little gardens which produced it then, although not to the same extent. But the Indians have now added to the growth of maize, the culture of potatoes and this at least shows some taste for farming operations, which if properly encouraged, might lead to important results.
>
> When the rice harvest is gathered, and autumn approaching, the Indians having provided themselves with ammunition, and such articles of clothing as they can get at the trading posts, set out for their hunting grounds, in single families, and are once more separated, not to meet again until the following summer. …

[913] The Ojibway understood they were agreeing to share the use of their whole territory and resources with Euro-Canadians, so long as the sharing would not significantly interfere with their own Harvesting Rights. They did not agree to give up their means of making a living, i.e., their own use of resources or their continuing rights to subsistence harvesting on that land. The Commissioners recognized that that was their condition for entering into the Treaty, and they expressly promised the Ojibway could keep those rights to induce them to do so.

[1153] Into the 20th century, the Indian Agents reported every year that the principal activities of the Ojibway at Grassy Narrows were hunting, fishing, berry picking and the harvesting of wild rice.

[1158] **Seasonal Round.** From May to June, the family would be at the Reserve, where they planted potatoes, corn, cabbage and onions in their gardens. In July, they would paddle and portage a freighter canoe to a location about 30 kilometres from the Reserve. They would spend

two to three weeks there, living in tents and harvesting blueberries that they canned or dried over the open fire for winter use or for sale to others.

[1159] After the blueberry harvest, his family would return to the Reserve for a week or so to check on their gardens. Then they would journey 10-15 kilometres in another direction to harvest and preserve wild rice, living in tents or cabins. A great deal of work was involved. One family member would sit in front of a canoe and paddle. Another would sit at the back and hit the rice into the canoe with a stick. While the rice dried, they would dig holes. Then they would place the dried rice in them and dance on the rice to remove the husks. They would sell some of the wild rice and keep some for winter use.

[1160] After that harvest, they would return to the Reserve to harvest their gardens. His parents, who did not have a root cellar, would bury the produce, surrounded with dry grass, in a hole in a sandy area of the bush to preserve it until the winter.

[1161] In mid-September, after they had gathered and stored wood for the older family members who wintered at the Reserve, the family travelled two-three days by freighter canoe to their winter trap line. Along the way, they would hunt and trap. After reaching their trap line, they would ensure their cabin was well maintained, and gather and store wood for the winter. His older brothers helped their father hunt, setting traps and snares to catch beaver, otter, mink and other animals.

[1162] When he was very young, Fobister would remain in the cabin with his mother and learn from her how to preserve animal pelts. He would help her bring in wood and haul water. She made moccasins, gloves, jackets and pants from the pelts. His father sold fur and pelts to the HBC.

[1163] They lived on their trap line throughout the winter and into the spring, eating deer, moose, beaver, lake trout, walleye, northerns and sucker meat, supplemented with wild rice, dried blueberries and produce preserved from their gardens. A dog team was used to haul wood and meat and to travel to buy food at the closest store, about 15-20 kilometres away.

[1164] In April after the wolf and fox moulted, the family would move to another location to trap muskrat, otter and beaver. They would then return to the Reserve and prepare the garden for another year.

[1233] In the case of the Grassy Narrows Ojibway, the life of Fobister is illustrative of the continuing reality that they were still pursuing the seasonal round without significant Euro-Canadian interference, at least into the 1960s and that Euro-Canadian uses and traditional harvesting were compatible.

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO),
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

ACKNOWLEDGEMENT OF EXPERT'S DUTY

1. My name is Anna Willow. I live in Delaware in the State of Ohio.

2. I have been engaged by or on behalf of Grassy Narrows First Nation to provide evidence in relation to the above-noted court proceeding.

3. I acknowledge that it is my duty to provide evidence in relation to this proceeding as follows:

   (a) to provide opinion evidence that is fair, objective and non-partisan;

   (b) to provide opinion evidence that is related only to matters that are within my area of expertise; and

   (c) to provide such additional assistance as the court may reasonably require, to determine a matter in issue.

4. I acknowledge that the duty referred to above prevails over any obligation which I may owe to any party by whom or on whose behalf I am engaged.

Date: _____ _____

Anna Willow

Court File No. 446/15

GRASSY NARROWS FIRST NATION, *et al.*	v.	**MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***
Applicants		Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

AFFIDAVIT OF ANNA WILLOW

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Jacqueline Wilson (LSUC No. 60330R)

Solicitors for the Applicants

2025

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

AFFIDAVIT OF JUSTIN PODUR

I, JUSTIN PODUR, of the City of Toronto, in the Province of Ontario, MAKE OATH AND SAY AS FOLLOWS:

1. I hold a master's and a doctorate in forestry from the University of Toronto. I am currently an associate professor at the Faculty of Environmental Studies, York University. My teaching, research and writing have focused on forest fires in Ontario, including their spatial and temporal patterns, increases in their numbers and area burned.

My research methods in this field of study have included using mathematical and computer models to study fire and ecological problems. I have published in a variety of peer and non-peer reviewed journals on the subject of forest fires, including the Canadian Journal of Forest Research, Ecological Modeling, Ecological Applications, and the International Journal of Wildland Fire. I am also affiliated with the University of Toronto Forest Fire Management Systems Laboratory. A copy of my curriculum vitae is attached to Exhibit “A”, below.

2. In February 2015 I was asked by counsel for Grassy Narrows to answer certain questions in a report on fire in the northwestern Ontario boreal forest, in particular, natural and human-caused disturbances. The questions and my answers to them appear as part of my December 2015 expert report attached as Exhibit “A” to my Affidavit.

3. A copy of my Acknowledgement of Expert's Duty form is attached as Exhibit “B” to my Affidavit.

SWORN BEFORE ME in the City of Toronto, in the Province of Ontario, this ___ day of _____, 2015.

A Commissioner, etc.

_____
Justin Podur

EXPERT REPORT

Grassy Narrows First Nation and Sherry Fobister, William Fobister, Senior, Simon Fobister and Chief Roger Fobister, Senior on their own behalf and on behalf of all other members of Grassy Narrows First Nation v. Minister of Natural Resources and Forestry (Ontario) and Minister of the Environment and Climate Change (Ontario), and the Attorney General of Ontario

Ontario Superior Court of Justice
(Divisional Court)

Prepared for
Joseph F. Castrilli and Richard D. Lindgren
Counsel, Canadian Environmental Law Association
130 Spadina Avenue, Suite 301
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Fire in the northwestern Ontario boreal forest: natural and human-caused disturbances

Prepared by

Justin Podur, PhD
Associate Professor
Faculty of Environmental Studies
York University

Date: December 10, 2015

_____
Justin Podur

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Introduction

I hold a masters and a doctorate in forestry from the University of Toronto. I am currently an associate professor at the Faculty of Environmental Studies, York University. My teaching, research and writing have focused on forest fires in Ontario, including their spatial and temporal patterns, increases in their numbers and area burned. My research methods in this field of study have included using mathematical and computer models to study fire and ecological problems. I have published in a variety of peer and non-peer reviewed journals on the subject of forest fires, including the Canadian Journal of Forest Research, Ecological Modeling, Ecological Applications, and the International Journal of Wildland Fire. I am also affiliated with the University of Toronto Forest Fire Management Systems Laboratory. My curriculum vitae appears in Appendix A of this Expert Report.

I have been asked by Joseph F. Castrilli and Richard D. Lindgren of the Canadian Environmental Law Association on behalf of Grassy Narrows First Nation to prepare an expert report that responds to several questions. I am solely responsible for the preparation of this report.

Questions

1. For the documents referred to below, please indicate on a document by document basis if the views expressed in those documents that relate to the subject matter of this expert report, and/or that are attributed to you, are accurate in every material respect? If not, please indicate in your expert report the corrections, if any, that should be made with respect thereto:

> A. The Grassy Narrows-Earthroots request, dated January 2014 (pages 16-19), of the Ministry of the Environment for an individual environmental assessment (IEA) on the Whiskey Jack Forest Management Plan (2012-2022), and the supplementary submissions made to the Ministry dated May (pages 3-5, 13-14, 19-21), and November 2014 (pages 8-9) insofar as they relate to your area of expertise and the subject matter for your report.

2. What are your views on matters within your area of expertise and the subject matter of this report that are addressed under the heading “Fire vs harvest impacts on Hg dynamics” in the Ministry of Natural Resources and Forestry July 2014 response to the Grassy Narrows-Earthroots May 2014 submissions?

3. What proportion:

> (a) of the boreal landscape in Ontario is burned by large vs. small fires in a “natural” scenario?;
>
> (b) of the boreal landscape in the specific eco-climatic fire zone in which the Whiskey Jack Forest is situated is burned by large vs. small fires in a “natural” scenario?

4. What proportion:

(a) of the boreal landscape in Ontario is burned by large vs. small fires in a fire suppression scenario?;

(b) of the boreal landscape in the specific eco-climatic fire zone in which the Whiskey Jack Forest is situated is burned by large vs. small fires in a fire suppression scenario?

5. Is there a relationship between fire size and fire intensity and severity? If so, what is that relationship?

6. How are fire size, frequency, and intensity expected to change, if at all, as a result of climate change in:

(a) the boreal forest of Ontario?;

(b) in the area of the Whiskey Jack Forest?

7. What amount of mercury, if any, would you expect to be volatized into the atmosphere from Grassy Narrows Traditional Territory in an average fire decade?

8. What are the implications of the natural fire regime for the Whiskey Jack Forest on mercury levels in soil, and on mercury bio-accumulation in fish?

9. How does this compare to the mercury impacts of the logging and fire suppression cycle on mercury levels in soil, and on mercury bio-accumulation in fish?

10. Overall, do logging and fire have similar, or dis-similar, impacts on mercury in the boreal forest?

Organization of Expert Report

The Expert Report is organized into two parts. Part 1 provides short summary answers to the questions that are listed above. Part 2 of the Expert Report is designed to provided greater detail in support of the summary answers set out in Part 1.

Part 1

Summary Answers to Questions

1. For the documents referred to below, please indicate on a document by document basis if the views expressed in those documents that relate to the subject matter of this expert report, and/or that are attributed to you, are accurate in every material respect? If not, please indicate in your expert report the corrections, if any, that should be made with respect thereto:

A. The Grassy Narrows-Earthroots request, dated January 2014 (pages 16-19), of the Ministry of the Environment for an individual environmental assessment (IEA) on the Whiskey Jack Forest Management Plan (2012-2022), and the supplementary submissions made to the Ministry dated May (pages 3-5, 13-14, 19-21), and November 2014 (pages 8-9) insofar as they relate to your area

of expertise and the subject matter for your report.

Answer to Question 1: The Grassy Narrows-Earthroots request for an IEA is accurate in every material respect as it relates to forest fires. The supplementary submissions made to the Ministry dated May, and November 2014 are accurate in every material respect as they related to forest fires.

2. What are your views on matters within your area of expertise and the subject matter of this report that are addressed under the heading "Fire vs harvest impacts on Hg dynamics" in the Ministry of Natural Resources and Forestry July 2014 response to the Grassy Narrows-Earthroots May 2014 submissions?

Answer to Question 2: The MNRF July 2014 response argues that the statement that "logging and forest fire have nearly opposite impacts on mercury", "is not supported by scientific studies". Elsewhere, the response argues that there is a lack of evidence "that mercury levels of fish differ consistently between lakes with harvested watersheds and those with intensively or extensively burned watersheds."

The MNRF response ignores the physical and chemical changes caused by the combustion of forest fuels, as well as the changes to the forest due to the removal of biomass due to harvesting. Large-scale boreal fires of the kind that account for 90% or more of burned areas, result in atmospheric emissions of mercury that travel long distances before being redeposited, thus reducing the total pool of mercury in the local watershed. Whereas forestry (clearcutting) operations release mercury into local water bodies.

3. What proportion:

(a) of the boreal landscape in Ontario is burned by large vs. small fires in a "natural" scenario?;

(b) of the boreal landscape in the specific eco-climatic fire zone in which the Whiskey Jack Forest is situated is burned by large vs. small fires in a "natural" scenario?

Answer to Question 3:

a) 1.3% of fires larger than 200 ha burned 96% of the area for the period 1976-2004 in the portion of boreal Ontario under active fire suppression. For a "natural" scenario I would expect the proportion of area burned by large fires to be even higher.

b) In the Whiskey Jack Forest for the period 1960-2013, 1.1% of large fires burned 95% of the area. For a "natural" scenario I would expect the proportion of area burned by large fires to be even higher.

4. What proportion:

(a) of the boreal landscape in Ontario is burned by large vs. small fires in a fire suppression scenario?;

(b) of the boreal landscape in the specific eco-climatic fire zone in which the Whiskey Jack Forest is situated is burned by large vs. small fires in a fire suppression scenario?

Answer to Question 4:

a) 1.3% of fires larger than 200 ha burned 96% of the area for the period 1976-2004 in boreal Ontario.

b) In the Whiskey Jack Forest for the period 1960-2013, 1.1% of large fires burned 95% of the area.

5. Is there a relationship between fire size and fire intensity and severity? If so, what is that relationship?

Answer to Question 5: There is a positive correlation between fire size and fire intensity and severity. Most of the boreal forest is under active fire suppression. It is more intense fires that tend to become large fires. These fires are also more severe and tend to leave fewer unburned islands.

6. How are fire size, frequency, and intensity expected to change, if at all, as a result of climate change in:

(a) the boreal forest of Ontario?;

(b) in the area of the Whiskey Jack Forest?

Answer to Question 6:

a) Fire size, frequency, and intensity are all expected to increase as a result of climate change. All forest fire models, when run with climate change simulation model data, predict increased fire size, frequency, and intensity. This is equally true for the entire boreal forest and for b) the area of the Whiskey Jack Forest.

7. What amount of mercury, if any, would you expect to be volatized into the atmosphere from Grassy Narrows Traditional Territory in an average fire decade?

Answer to Question 7:

There is a high amount of variability in decadal area burned, but the historical figures range from 498 g in the 2000s to 56 000 g in the 1980s.

8. What are the implications of the natural fire regime for the Whiskey Jack Forest on mercury levels in soil, and on mercury bio-accumulation in fish?

Answer to Question 8:

Because of the role of combustion in volatilizing mercury into the atmosphere, the natural fire regime results in an amount of mercury released into the atmosphere proportional to the area burned. Larger, more intense, and more severe fires all result in a higher amount of mercury being removed into the atmosphere.

9. How does this compare to the mercury impacts of the logging and fire suppression cycle on mercury levels in soil, and on mercury bio-accumulation in fish?

Answer to Question 9:

Harvesting operations increase mercury output into water bodies, and hence increase mercury bio-accumulation in fish.

10. Overall, do logging and fire have similar, or dis-similar, impacts on mercury in the boreal forest?

Answer to Question 10:

Overall, fire and logging have dissimilar impacts on mercury in the boreal forest.

Part 2

Forest management and fire: two distinct types of disturbance

In the comparison of natural disturbance with forest management, there are stand-level and landscape-level considerations. These are discussed in a general way by Bergeron et al. (1999).

Stand-level considerations

Stand level considerations include the effect on forest soils and the exposure of the soil post-fire vs. post-logging, the amount of wood volume and snags left behind after the disturbance, which depends on the intensity of the fire, and the presence of residual trees or unburned islands after a fire. With these considerations in mind, a fire in a jack pine, spruce, or aspen/poplar stand can be contrasted to a clear-cut with retention. In the clear cut, the soil has not been burned, the wood volume is decreased relative to the surface fire, and snags are absent, post clear-cut.

Landscape-level considerations

Greater differences appear at the landscape level. These include differences in age-class, size-class, and spatial distributions of stands.

Age-class distribution. The purpose of logging is the extraction of trees from the forest for their economic value. It is economically wasteful to allow trees above the rotation age to remain in the forest. The age structure, or age-class distribution, of a managed forest will, in the long-term, contain stands that are, at their oldest, the rotation age (typically planned to be 60-100 years in the boreal). By contrast, because the probability of burning is independent of stand age, the age-class distribution of a forest under a natural fire regime will have a large portion (Bergeron et al. 1999 give a figure of 37%, citing Johnson and Van Wagner 1985b) of stands that are older than the rotation age.

Size-class distribution. The spatial pattern of logging activity is organized by forest management principles, including ease of access and removal as well as age-class considerations discussed above. By contrast, fire is a random, or stochastic process, which produces a random distribution of fire sizes. Fire size has been modeled as a Pareto distribution (Ward et al. 2001), a Weibull distribution (Reed and McKelvey 2002), and others (cited in Podur et al. 2009), and aggregate area burned by a compound Poisson distribution (Podur et al. 2009). The random pattern of different sizes of fires distributed on the landscape results in a mosaic of patches, some of which are small, some of which can be very large. Different spatial mosaics have different implications for wildlife habitat, among other considerations.

Shape and distribution of burned stands. The stochastic nature of the fire process goes beyond fire size distribution, however, as the shapes of the stands and their physical distribution across the landscape is an even more complex process involving topography, wind, and forest fuel conditions at the times that the fires took place.

Two distinct types of disturbance

Because of all of these important differences, logging and fire are viewed by forest landscape and fire ecologists as completely distinct ecological processes in the boreal forest landscape. The OMNR produces guidelines for forest management with the intent to make forest management emulate natural disturbance with tree retention, specific types and shapes of cuts, a range of clearcut sizes, and the retention of downed woody debris (OMNR 2014). All of these measures may increase the ecological integrity of logged stands, but fire and logging remain distinct disturbances from an ecological point of view.

A natural fire regime in the boreal forest

The boreal forest of Ontario is characterized by a fire regime that includes a high proportion of area burned by a small number of large, high-intensity fires.

Area burned is dominated by large fires

Stocks et al. (2002), studying the Canadian boreal forest, found for 1959-1997 that fires over 200 ha in size were 3% of the fires occurring in Canada but 97% of the total area burned. Podur and Wotton (2010) studied the zones of active fire suppression in Ontario for 1976-2004 and found that only 1.3% of fires grew to > 200 ha, but these fires resulted in 96% of the area burned in the region. In areas not under fire suppression, an even higher proportion of area burned would be due to large fires, as fewer fires would naturally stop at a small size.

Weather drives large fires more than fuels or suppression

Podur and Martell (2009) studied the fuels, or forest types, burned by fires for 594 fires larger than 40 ha that occurred in Ontario's boreal forest between 1996-2006, finding that fuels burned in the proportion they were available. This suggests that weather is dominant in controlling large fires. Podur and Martell (2007) found that fire suppression does, however, reduce area burned, even in large fires, by suppressing a class of fires that would have escaped had there been no suppression. In severe fire years, however, there remain a number of fires that are too intense for suppression to succeed, and these fires, which become large in size and have high burn severity, make up the most important portion of area burned. Podur and Wotton (2010) found that the number of these large, uncontrollable fires was likely to increase under climate change, with the potential to overwhelm fire suppression capacity.

Weather drives large fires. These studies all found that weather drives large fires and that large fires drive area burned. This is true throughout boreal Ontario, in managed forests and unmanaged, in forests where fire suppression is active and in areas where fire is monitored and not actively suppressed. This includes the Whiskey Jack forest in northwestern Ontario.

Differences between fire and logging in mercury (Hg) release

Large fires release Hg into the atmosphere

Sigler et al. (2003) studied a series of fires in the severe 2002 Quebec fire season, in which 250 fires burned 1,000,000 ha over a 1-month period. They measured gaseous mercury (Hg) at the Harvard Forest and provided a measure of Hg emissions from large-scale boreal forest fires. Scaling up, they provide global estimates of Hg emissions from boreal forest fires. The important point here is that large-scale boreal forest fires of the kind that account for 90% or more of the area burned result in atmospheric emissions of Hg. Turetsky et al. (2006) reinforce this point, quantifying organic soil Hg stocks in the boreal forest and estimating atmospheric emission of Hg due to increased boreal forest fire activity under climate change. They conclude that increased fire activity will result in greater release of Hg from boreal forest soils into the atmosphere.

Logging operations release Hg into local water bodies

Bishop et al. (2009) summarized a series of studies showing Hg accumulation downstream of forestry operations, finding a "forestry effect" on Hg accumulation in fish. In a study of Hg concentrations in fish in 38 boreal lakes, Garcia and Carignan (2005) found higher Hg concentrations in fish from logged and "partially burnt" lakes (i.e., lakes where small-scale fires had occurred).

The Whiskey Jack Forest - historical fires and estimated mercury emissions

The part of the Whiskey Jack Forest subject to the Grassy Narrows legal action is 631 413 ha in extent. The National Fire Database lists a total of 1222 fires in this area for the period 1960-2013. These fires burned a total of 18 541 ha. 17 662 ha, or 95% of the area, of this was burned by 14 fires, or 1.1% of the fires, which were larger than 200 ha. The pattern of large fires driving area burned also applies here. A higher number of large fires and a higher area burned would be expected in a natural fire scenario with no fire suppression.

The overall mean burn fraction for the boreal zone of Ontario calculated from the national fire database is 0.001 (the median burn fraction for the boreal zone of Ontario is much lower, 0.0003).

The burn fraction in all years except four for the study area was less than 0.001. The highest burn fraction was 0.016 (in 1983). The other three years were 1988 (0.005), 1976 (0.004), and 1980 (0.002). These low and highly variable burn fractions illustrate the difficulty of estimating a quantity like fire return interval or fire cycle from the burn fraction. Reed (2006) recommended the abandonment of the concept of fire cycle based on these difficulties, though the concept continues to be used: MNR analysts estimate a pre-suppression fire cycle of 81 years, or a burn fraction of 0.01, compared to a post-suppression fire cycle of 299 years, or a burn fraction of 0.003. The mean burn fraction in the region based on the national fire database (1960-2013) was 0.0007 - on average, 0.07% of the study area burned each year. The median burn fraction in the study area was 0.00001, an order of magnitude smaller.

Decadal average area burned and burn fraction for the study area are summarized in Table 1 below.

Table 1. Decadal average area burned for the study area

Decade	Area Burned (ha)	Burn fraction
1960-1969	810	0.0005
1970-1979	6143	0.0039
1980-1989	37330	0.0239
1990-1999	1117	0.0007
2000-2009	332	0.0002
2010-2013	84.3	0.00005
Totals	45817	0.0294

Using Turetsky et al. (2006) figure of 2.62 mg/m2 or 3.8 g/ha Hg stocks in upland forest soils, we arrive at an estimate of about 5.92 t of Hg in the soil of the study area. Sigler et al. (2003) estimate an Hg flux density of 1.5g Hg/ha. This means that a conservative estimate for the decadal mercury

emissions into the atmosphere from the study area ranged between 498g in the 2000s to 55995g, or 56kg in the 1980s. This is a conservative estimate because Turetsky (2006) calculates higher Hg stocks for boreal peatlands (25.14 mg/m2 in a drought scenario).

There is much higher Hg volatilization to the atmosphere in a natural non-fire suppression scenario, than in a fire suppression scenario with harvesting. Woodruff and Cannon (2010) found that high soil burn severity has the potential to reduce the concentration of mercury in burned soils for tens to hundreds of years post-fire. In Prince Albert National Park, Saskatchewan, Friedli et al. (2007) measured an increase in mercury stock from 1.01 mg/m2 for a 39-year old stand to 3.45 mg/m2 for a 130-year old stand. MNR analysts estimate a pre-suppression fire cycle of 81 years, or a burn fraction of 0.01, compared to a post-suppression fire cycle of 299 years, or a burn fraction of 0.003. If these estimates are correct and suppression results in older stands, higher mercury stocks are to be expected in these stands.

In a "natural fire" scenario a high proportion of these stocks are released into the atmosphere. In a suppression + harvesting scenario, a larger proportion of these mercury stocks are released into the water.

The Whiskey Jack Forest - estimated mercury release in a logging scenario

Bishop et al. (2009) estimate that if 100% of an area is harvested (clearcut), a two- to fourfold increase in loading and bioaccumulation of Hg can be expected in fish in the logged catchment area for 10 years. In the total landscape with 1% harvested annually, they estimate an increase of 10-30% in bioaccumulation compared to an unmanaged landscape, and an even higher increase if silviculture activities such as soil scarification and thinning also have mercury impacts. Bishop et al. (2009) provide untested silvicultural recommendations to minimize the impacts on Hg bioaccumulation after forestry operations, but possible reductions due to these impacts have not been quantified - we cannot know how much these silvicultural changes will reduce Hg bioaccumulation.

Conclusions

Forestry and forest fires are ecologically different processes at stand and landscape levels. The area affected by forest fires is primarily due to a small number of large, intense, severe fires. In these large fires, Hg is released into the atmosphere, traveling long distances before being redeposited, reducing the total mercury pool in the local watershed. In forestry operations, Hg is released into local water bodies. A small portion of the Whiskey Jack Forest has been affected by fire since 1960, releasing a small amount of Hg into the atmosphere. Projected forestry operations in the Whiskey Jack Forest can be expected to release a larger amount of Hg into local water bodies.

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Woodruff, Laurel G., and William F. Cannon. "Immediate and long-term fire effects on total mercury in forests soils of Northeastern Minnesota." *Environmental science & technology* 44.14 (2010): 5371-5376.

Appendix A – Curriculum Vitae

PERSONAL

Dr. Justin Podur, Associate Professor, Faculty of Environmental Studies, York University

DEGREES

2006 Ph.D., University of Toronto, Faculty of Forestry.

2001 MSc.F., University of Toronto, Faculty of Forestry.

1999 Honours BSc in Physics, University of Toronto, Department of Physics.

EMPLOYMENT HISTORY

2011- Associate Professor, Faculty of Environmental Studies, York University

2013 - Hony. Visiting Professor, Jamia Millia Islamia, Delhi (Jan-April)

2006-2011 Assistant Professor, Faculty of Environmental Studies, York University.

2011 Visiting Professor, Universite Evangelique en Afrique (July)

2008 Fellow, Iqbal Institute at International Islamic University – Islamabad (July).

2005-2006 Instructor, Faculty of Journalism, Ryerson University, Toronto.

2001-2006 Doctoral Candidate, Faculty of Forestry, University of Toronto. Supervisor: David L. Martell.

1999-2002 Teaching Assistant, Department of Physics, University of Toronto.

1999-2001 MSc.F. Candidate, Faculty of Forestry, University of Toronto. Supervisor: David L. Martell

1998 Undergraduate Summer Researcher, Department of Physics, University of Toronto. Supervisor: James R. Drummond

HONOURS AND AWARDS

2008-10 NSERC Discovery Grant (3-year, $15 000/yr)

2006 Columbia University Earth Institute Fellowship (2-year, $48 000/yr, declined)

2004-5 Frank A. MacDougall Fellowship

2000-4 Natural Sciences and Engineering Research Council (NSERC) Canadian Forest Service (CFS) Supplement

2002-4 NSERC Post Graduate Scholarship (PGS) B

2001-2 Ontario Graduate Scholarship

1999-2001 NSERC PGS A

SCHOLARLY AND PROFESSIONAL CONTRIBUTIONS

PUBLICATIONS

In preparation

Podur, Justin J., Arabian, J., Nigro, J., Merritt, W., Wang, W.H., Ruddick, S., Timmins, T. 2015. "Human wildlife encounters in the Greater Toronto Area: methods for studying urban relationships of conflict and coexistence". To be submitted to *Landscape and Urban Planning.*

Articles in refereed journals

Podur, Justin J., Wotton, B.M. (2011). "Defining fire spread event days for fire growth modeling". International Journal of Wildland Fire 20, 497-507.

Podur, Justin J., Wotton, B.M. (2010). "Will climate change overwhelm fire management capacity?" Ecological Modeling 221 (2010): 1301-1309.

Podur, Justin J., Martell, David L., Stanford, David A. (2010). "A compound Poisson model for the annual area burned by forest fires in the province of Ontario". Environmetrics 21 (5): 457-469, August 2010.

Podur, Justin J., Martell, David L. (2009). "The influence of weather and fuel type on the fuel composition of the area burned by forest fires in Ontario 1996-2006". Ecological Applications 19 (5) pp. 1246-1252.

Podur, Justin J., Martell, David L. (2007). "A simulation model of the growth and suppression of large forest fires in Ontario." International Journal of Wildland Fire 16, 285-294.

Hirsch, Kelvin G., Podur, Justin J., Janser, Robert F., and McAlpine, Robert S. (2003). "Productivity of Initial Attack Fire Crews: Results of an Expert Judgement Elicitation Study." Canadian Journal of Forest Research 34 (3) pp. 705-716.

Podur, Justin J., Martell, David L., and Csillag, Ferenc (2003) "Spatial Patterns of Lightning Caused Forest Fires in Ontario, 1976-1998". Ecological Modeling 164 (2003) pp.1-20.

Podur, Justin J., Martell, David L., and Knight, Keith (2002) "Statistical quality control analysis of forest fire activity in Canada". Canadian Journal of Forest Research 32 (2) pp.195-205.

CONFERENCE PAPERS

Invited Presentation: Podur, Justin J., Arabian, J. , Merritt, W., Nigro, J., Wang, W. (2015). "Studying human-wildlife encounters in the Greater Toronto Area: conflict and coexistence." May 18, 2015. International Urban Wildlife Conference May 17-20, Chicago.

Invited Presentation: Podur, Justin J., McAlpine, R.A. (2012). "What if we couldn't fight fire?" Wildland Fire Canada 2012, Kananaskis, Alberta, October 1-5, 2012.

Invited Presentation: Podur, Justin J. (2012). "Nature, capital, and commodification: Ecology and the Capital as Power framework." Capitalizing Power: The Qualities and Quantities of Accumulation. 3rd annual forum on Capital as Power, York University, September 29-30, 2012.

Invited Presentation: Podur, Justin J., Wotton, B.M., Saliola, A. (2010). "Incorporating a spread event model defined by MODIS hot spots into fire growth modeling." Wildland Fire Canada 2010, Waterloo, October 5-7, 2010.

Invited Presentation: Podur, Justin J., Wotton, B.M. (2009). "Weather associated with fire-ending events." 4th International Congress on Fire Ecology & Management, Savannah, GA December 1-4, 2009.

Invited Presentation: Podur, Justin J., Wotton, B.M. (2009) "Can increased fire suppression resources reduce area burned under climate change?" CORS Conference, Toronto, June 14-17 2009.

Invited Presentation: Podur, Justin J., Wotton, B.M. (2008). "Modeling weather associated with forest fire "spread events" using MODIS satellite data". CMOS Conference, Kelowna, BC. May 26-29, 2008.

Invited Presentation: Podur, Justin J., Wotton, B.M. (2008). "Climate change and future area burned in Ontario." BIRS Workshop, Banff, Ontario. May 4-9, 2008.

Presentation: Podur, Justin J., Martell, D.L., Stanford, D. (2007) "A compound Poisson model for aggregate area burned in Ontario." CORS Conference, London, Ontario. May 13-16, 2007.

Presentation: Podur, Justin J., Martell, D.L. (2005) "A Simulation Model for the Growth and Suppression of Large Forest Fires in Ontario." INFORMS Applied Probability Conference. Ottawa, Ontario. July 6, 2005.

Conference Paper: Podur, Justin J., Martell, D.L., Csillag F. (2000). "Spatial Point Pattern Analysis of Lightning-caused forest fires in the Boreal Forest region of Ontario." Systems Analysis in Forestry conference, September 28, 2000. Appears in the proceedings of "Eighth Symposium on Systems Analysis in Forest Resources". Snowmass, Colorado, USA. September 28-October 1, 2000. (Refereed)

UNPUBLISHED PROFESSIONAL REPORTS

Technical report: Podur, Justin J., Martell, D.L. (2000). "Fireline construction rate productivity study: report on statistical analysis". Conducted for the Fire Science and Technology Unit, Aviation, Flood and Fire Management Branch, Ontario Ministry of Natural Resources. September 1, 2000.

Drummond, J.R., Quine, B., Yu, Z. (1998). GENSPECT: A radiative transfer code, by James R. Drummond, Ben Quine, and Zhen Yu. I contributed to the development of this code during work in the summer of 1998.

PROFESSIONAL SERVICE

Reviewing activities

Ecological Applications (2015)

Applied Mathematical Modeling (2015)

International Journal of Wildland Fire (2007-present)

Climatic Change (Winter 2011)

The Forestry Chronicle (Winter 2011)

Journal of Applied Geography (Fall 2010)

Forest Science (Fall 2010)

Jones and Bartlett Press (Spring 2009)

Journal of Climate (Spring 2006)

Ecological Modeling (Winter 2008)

Between the Lines Press (Winter 2008)

INFORMS (Winter 2008)

Canadian Journal of Forest Research (Winter 2008)

Computers & Geosciences (Winter 2007, Spring 2008)

External Reviewer, Greenpeace Climate Report (Spring 2007)

External Reviewer, NSERC Strategic Grants Program (Fall 2007)

Other

Session Chair (Modeling in Forestry) Canadian Operations Research Society Conference June 14-17 2009

Professional memberships

Board member, nonprofit organization Pueblos En Camino

FUNDING

External research funding

Year	Source	Amount	Purpose
2013-2016	SSHRC Insight Grant: co-investigator with Leesa Fawcett and Susan Ruddick (U of T)	$179,590.00	Crossing Boundaries: Encounters with Urban Wildlife in the GTA
2008-2010 (deferred to 2012)	NSERC Discovery Grant	$15,000/yr for three years	Modeling forest fires and area burned for sustainable forest management
2006	Columbia University Earth Institute Fellowship (declined)	$48,000/yr for two years (declined offer)	Postdoctoral fellowship

2004-5	Frank A. MacDougall Fellowship (Faculty of Forestry, University of Toronto)	$18,000/yr	Support for PhD studies (operating)
2000-4	NSERC CFS Supplement	$5,000/yr	Research related to Canadian Forest Service Interests (operating)
2002-4	NSERC PGS B	$21,000/yr for 2 years	PhD support (operating)
2001-2	Ontario Graduate Scholarship	$19,000 for 1 year	PhD support (operating)
1999-2001	NSERC PGS A	$19,000/yr for 2 years	MSc.F. support (operating)

Internal research funding

Year	Source	Amount	Purpose
2011	FES Research Release	N/A	Fall Term Research
2007	FES Small Travel Grant	$500	CORS Conference, London ON, May 2007

TEACHING

UNDERGRADUATE

Courses:

2016
ENVS 2400 Environmental Management (W)

2015
ENVS 4520 Advanced GIS* (W)

Fall 2014 parental leave

2014
ENVS 4520 Advanced GIS*(W)

2012-2013 sabbatical

2012
ENVS 4520 Advanced GIS* (W)
ENVS 4810 Field Course in Tropical Ecology (Costa Rica) (S)

2011
ENVS 4520 Advanced GIS* (W)
ENVS 4810 Field Course in Tropical Ecology (Costa Rica) (S)

2010
ENVS 2100 Environment and Culture (W)
ENVS 4520 Advanced GIS* (W)
ENVS 4810 Field Course in Tropical Ecology (Costa Rica) (S)
ENVS 3710 Landscape Ecology* (F)

2009

ENVS 2100 Environment and Culture (W)

ENVS 3710 Landscape Ecology* (F)

2008

ENVS 3710 Landscape Ecology* (F)

Independent directed reading: ENVS 3900: Political Economy and Communication

2007

ENVS 3710 Landscape Ecology* (F)

2006

ENVS 4750 Landscape Theory* (F)

GRADUATE

Courses:

Fall 2014 parental leave

2012-2013 sabbatical

2012

ENVS 4810 Field Course in Tropical Ecology (Costa Rica) (S)

2011

ENVS 4810/6599 Costa Rica Field Course (S)

2010

ENVS 6119 Ecological Restoration (S)

ENVS 4810/6599 Costa Rica Field Course (S)

2009

ENVS 6119 Ecological Restoration (S)

2008

ENVS 6189 Geographic Information Systems (W)

ENVS 6119 Ecological Restoration (S)

2007

ENVS 6119 Ecological Restoration (S)

GRADUATE SUPERVISION AND INDEPENDENT STUDY SUPERVISION

Directed over 40 MES independent study or reading courses between 2007 and 2015

Since 2007 have advised and supervised approximately 70 MES and PhD candidates within the Faculty of Environmental Studies and participated as external examiner for additional masters and PhD candidates in other York faculties or at other universities.

COURSES TAKEN

Web Applications 9-week immersive. Bitmaker Labs. June-July 2014. Skills: Ruby on Rails, Javascript, JQuery, CSS, HTML.

Supervising Graduate Students - SEDA certified - June 2014. Teaching Commons, York University. Facilitator: Celia Popovic.

Instructional Skills Workshop (ISW): November 25-27, 2013. Teaching Commons, York University. Facilitator: Mandy Frake-Mistak

COURSES TAUGHT AT OTHER INSTITUTIONS

2014

"GIS and Urban Design", Lecturer, York University Asia Business and Management Program (ABMP), Toronto, December 9, 2014 (single lecture).

2013

"MA International Politics Seminar", Instructor, Jamia Millia Islamia, Delhi, India, Winter 2013 (sabbatical).

2011

"GIS Applications in Forest Management", Instructor, Universite Evangelique en Afrique Master's in Environmental Management Program, Bukavu, South Kivu, DRC, June 2011

"Globalization and Development", Instructor, Universite Evangelique en Afrique Master's in Environmental Management Program, Bukavu, South Kivu, DRC, June 2011

2003-2010

Instructor, Z Media Institute, Woods Hole MA. Supervisor: Michael Albert

2008

"Critical Thinking" Fellow, Iqbal Institute, International Islamic University, Islamabad, July 2008

2006

"Critical Issues in Journalism" Instructor, Faculty of Journalism, Ryerson University, Toronto. Supervisor: John Miller

2005

"Online Journalism" Instructor, Faculty of Journalism, Ryerson University, Toronto. Supervisor: Joyce Smith

2000-2002

"The Way of Physics", Teaching Assistant, Department of Physics, University of Toronto. Supervisor: David Harrison

1999

"Physics Laboratory" Teaching Assistant, Department of Physics, University of Toronto. Supervisor: Ruxandra Serbanescu

SERVICE

UNIVERSITY SERVICE

2015-16

Coordinator, GIS Certificate Program, Faculty of Environmental Studies

Senator, York University

Member, BES Curriculum Committee, Faculty of Environmental Studies

Member, YUFA Bargaining Team

2015

Graduate Program Director, Faculty of Environmental Studies (Winter)

Chair, Grade Assessment Committee, Faculty of Environmental Studies

Chair, MES Curriculum Committee, Faculty of Environmental Studies

Member, PhD Program Committee, Faculty of Environmental Studies

Member, Executive Committee, Faculty of Environmental Studies

Member, Faculty of Graduate Studies Council

Member, Las Nubes Committee

Member, YUFA Bargaining Team

Fall 2014 - parental leave

2013-2014

Graduate Program Director, Faculty of Environmental Studies

Chair, Grade Assessment Committee, Faculty of Environmental Studies

Chair, MES Curriculum Committee, Faculty of Environmental Studies

Member, PhD Program Committee, Faculty of Environmental Studies

Member, Executive Committee, Faculty of Environmental Studies

Member, Faculty of Graduate Studies Council

Member, Las Nubes Committee

2012-2013

Sabbatical

2011-12

Graduate Program Director, Faculty of Environmental Studies

Chair, Awards Committee, Faculty of Environmental Studies

Chair, MES Curriculum Committee, Faculty of Environmental Studies

Member, PhD Program Committee, Faculty of Environmental Studies

Member, Executive Committee, Faculty of Environmental Studies

Coordinator, FES GIS Certificate Program

Member, ad-hoc Information Technology Committee

Member, IRIS Executive Committee

Senator, York University

Member, Las Nubes Committee

2010-2011

Graduate Program Director, Faculty of Environmental Studies

Chair, Awards Committee, Faculty of Environmental Studies

Chair, MES Curriculum Committee, Faculty of Environmental Studies

Member, PhD Program Committee, Faculty of Environmental Studies

Member, Executive Committee, Faculty of Environmental Studies

Coordinator, FES GIS Certificate Program

Member, ad-hoc Information Technology Committee

Member, IRIS Executive Committee

Senator, York University

Member, Faculty Appointments Advisory Committee (FAAC)

2009-2010

Coordinator, FES GIS Certificate Program

Member, University Green Paper Working Group on Teaching & Learning

Member, FES Planning Programs Subcommittee

Member, Undergraduate Curriculum Committee

Member, ad-hoc Information Technology Committee

Member, IRIS Executive Committee

Senator, York University

2008-2009

Member, Sustainable Writing Lab Postdoctoral Fellows Selection Committee

Member, file preparation committee for Lewis Molot's advancement to full professor

Member, ad-hoc Information Technology (Moodle) Committee for ENVS 5101

Member, Undergraduate Curriculum Committee

Member, Research and Awards Committee (RAC)

Member, IRIS Executive Committee

Member, York University Senate Committee on Libraries & Information Technology

Member, York Geomatics User Group

2007-2008

Member, York University Senate Committee on Libraries & Information Technology

Member, FES Faculty Appointments Committee, Urban Ecologies & Environmental Planning search

Member, York Geomatics User Group

Shadow member, FES Risk Assessment Review Committee

Member, ad-hoc committee to draft Applied Ecology position job ad

Member, FES Planning Programs Subcommittee

2006-2007

Member, FES Planning Programs Subcommittee

Member, ad-hoc YUFA Merit Exercise Advisory Committee

FES Representative to York University Senate Committee on Libraries & Information Technology

Member, FES Faculty Appointments Committee, Environmental Policy and Climate Change search

Date c.v. prepared: Dec 2, 2015

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO),
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

ACKNOWLEDGEMENT OF EXPERT'S DUTY

1. My name is Justin Podur. I live in Toronto in the Province of Ontario.

2. I have been engaged by or on behalf of Grassy Narrows First Nation to provide evidence in relation to the above-noted court proceeding.

3. I acknowledge that it is my duty to provide evidence in relation to this proceeding as follows:

   (a) to provide opinion evidence that is fair, objective and non-partisan;

   (b) to provide opinion evidence that is related only to matters that are within my area of expertise; and

   (c) to provide such additional assistance as the court may reasonably require, to determine a matter in issue.

4. I acknowledge that the duty referred to above prevails over any obligation which I may owe to any party by whom or on whose behalf I am engaged.

Date: _____ _____

Justin Podur

Court File No. 446/15

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

AFFIDAVIT OF JUSTIN PODUR

CANADIAN ENVIRONMENTAL LAW ASSOCIATION
130 SPADINA AVE., SUITE 301
TORONTO, ONTARIO M5V 2L4

Telephone: (416) 960-2284
Facsimile: (416) 960-9392

Joseph F. Castrilli (LSUC No. 26123A)
Richard D. Lindgren (LSUC No. 28529E)
Jacqueline Wilson (LSUC No. 60330R)

Solicitors for the Applicants

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

AFFIDAVIT OF STEPHEN KILBURN

I, STEPHEN KILBURN, of the City of Guelph, in the Province of Ontario, AFFIRM AND SAY AS FOLLOWS:

1. I hold a Bachelor's degree in Environmental Studies, Urban and Regional Planning and a Master's degree in Regional Planning and Resources Development from the University of Waterloo. I am a Registered Professional Planner and member of the Ontario Professional Planning Institute and the Canadian Institute of Planners. I am a consultant

specializing in the application of geographic information system (GIS) methods in the fields of resource management and planning. GIS is a computer technology that allows users to store, manage, manipulate, analyze, and interact with geospatial information, and to create maps and other information products. I have provided GIS and related services to federal, provincial, territorial, municipal, and First Nation governments and agencies across Canada. I have also published and spoken widely in this field. A copy of my curriculum vitae is attached to Exhibit “A”, below.

2. In April 2015 I was asked by counsel for Grassy Narrows to prepare a series of maps on planned and recent clearcut logging in the Whiskey Jack Forest. The maps and a short report explaining the methodology I used in preparing them appear as part of my January 2016 expert report attached as Exhibit “A” to my Affidavit.

3. A copy of my Acknowledgement of Expert's Duty form is attached as Exhibit “B” to my Affidavit.

AFFIRMED BEFORE ME in the City of Toronto, in the Province of Ontario, this 29th day of January, 2016.)

A Commissioner, etc.)

_____
Stephen Kilburn

EXPERT REPORT

Grassy Narrows First Nation and Sherry Fobister, William Fobister, Senior, Simon Fobister and Chief Roger Fobister, Senior on their own behalf and on behalf of all other members of Grassy Narrows First Nation v. Minister of Natural Resources and Forestry (Ontario) and Minister of the Environment and Climate Change (Ontario), and the Attorney General of Ontario

Ontario Superior Court of Justice
(Divisional Court)

Prepared for
Joseph F. Castrilli and Richard D. Lindgren
Counsel, Canadian Environmental Law Association
130 Spadina Avenue, Suite 301
Toronto, Ontario
M5V 2L4

Watershed Map Series of Planned and Recent Clearcut Logging of Whiskey Jack Forest

Prepared by

Stephen Kilburn, BES, MA, MCIP, RPP
Guelph, Ontario

Date: January ___, 2016

_____
Stephen Kilburn

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Introduction

I hold a Bachelor's degree in Environmental Studies, Urban and Regional Planning and a Master's degree in Regional Planning and Resource Development from the University of Waterloo. I am a Registered Professional Planner and member of the Ontario Professional Planning Institute and the Canadian Institute of Planners. I am a consultant specializing in the application of geographic information system (GIS) methods in the fields of resource management and planning. GIS is a computer technology that allows users to store, manage, manipulate, analyze, and interact with geospatial information, and to create maps and other information products. I have provided GIS and related services to federal, provincial, territorial, municipal, and First Nation governments and agencies across Canada. I have also published and spoken widely in this field. My curriculum vitae appears in Appendix B of this Expert Report.

I have been asked by Joseph F. Castrilli and Richard D. Lindgren of the Canadian Environmental Law Association, on behalf of Grassy Narrows First Nation, to prepare a report and a series of watershed maps of planned and recent clearcut logging in the Whiskey Jack Forest of northwestern, Ontario. I am solely responsible for the preparation of this report and the accompanying maps.

Documentation for Maps in this Report

The following is an explanation of the data sources and methods used to create the maps in this report.

In the description below, sections of the document Ministry of Natural Resources (2009), *FIM Forest Management Planning Technical Specifications 2009* are referenced to provide reference for the meaning of attribute values. The abbreviation "FMPTS 2009" is used for this document.

The maps were prepared using ArcGIS software, version 10.1, SP1. Maps all use NAD 1983 datum and Universal Transverse Mercator (UTM) zone 15 north projection.

Two categories of maps are included behind Appendix A: trap line area maps (Appendix A.1), and watershed area maps (Appendix A.2). The former have been included because they cover a larger geographic area and, therefore, provide greater context for the location of the latter. For example, the trap line area map entitled "Trapping Area KE038" contains the watershed area entitled "Watershed Noname 20 near Campfire Lake". A blown-up version of the latter may be viewed by examining the separate watershed area map entitled "Watershed Noname 20 near Campfire Lake".

Base Features

Base features were mapped using the following data sources:

- Water lines and water areas were sourced from Land Information Ontario OHNWCRS and OHNWBDY datasets.

- Roads were sourced from Land Information Ontario MNRRDSEG.
- Wetland areas were extracted from the Whisky Jack Forest Management Plan (FMP) Planning Composite Inventory (PCI) using the attribute definition *POLYTYPE in ('TMS', 'OMS')* (i.e., treed muskeg and open muskeg, respectively [FMPTS 2009, A1.1.4]).
- Trapping areas were sourced from Land Information Ontario TRAPLINE.
- Watershed areas were sourced from Ontario Flow Assessment Tool III.
- Planned clearcuts and contingency clearcuts for 2012-2022 were extracted from the Whisky Jack FMP 2012-2022 dataset MU490_12PHR00.

Areas of Relevance

Areas of relevance for forestry planning and mercury impacts were mapped from the following sources:

- **Naturally Unforested Areas:** These were extracted from the PCI by excluding polygons with the POLYTYPE attributes 'TMS', 'OMS', 'FOR', 'WAT' (treed muskeg, open muskeg, productive forest, and water, respectively). This category includes exposed rock, brush and alder, islands less than 8 hectares in size. As well, it includes areas with the attribute definition *"DEVSTAGE" = 'LOWNAT' AND "YRDEP" < 1968* (i.e., areas disturbed before 1968 by natural causes where the area currently is below regeneration standards).
- **Forest:** Naturally forested areas were extracted from the PCI using the attribute definitions *POLYTYPE = 'FOR'* (i.e., productive forests, [FMPTS 2009, A1.1.4]); *YRDEP<1* (i.e., no recorded disturbance year [FMPTS 2009, A1.1.11]); and *DEVSTAGE ='FTGNAT'* (i.e., free-to-grow mainly natural regeneration, which includes both naturally regenerated forests and original forest [FMPTS 2009, A1.1.10]). Subsets younger and older than 45 years were extracted using the additional attribute queries *AGE<46* and *AGE>45*, respectively.
- **Forest, Depleted Before 1968:** Forested areas depleted before 1968 were extracted using the attribute definitions *YRDEP < 1968* and *YRDEP > 0* (i.e., areas that have recorded depletions before 1968); and *DEVSTAGE in (FTGPLANT, FTGSEED, FTGNAT)* (free-to-grow planted, seeded, and natural regeneration [FMPTS 2009, A1.1.10]).
- **Depletions After 1967:** This category is the best approximation of historical logging using the data provided by MNRF (see discussion below about the data provided). Depletion areas were extracted with subsets being defined using YRDEP attribute ranges (1968-1977, 1978-1987, 1988-1997, and 1998-2007) and using the attribute definition *NOT (DEVSTAGE in ('DEPNAT', 'LOWNAT')*, (i.e., areas with recorded disturbance years in the specified ranges where the original disturbance was not recorded as natural). In addition, the following natural depletion areas were excluded.

- **Fire Disturbances:** This identifies areas disturbed by fire based on the FIRE_DISTURBANCE_AREA polygons obtained from Land Information Ontario. We considered salvage logged areas to be primarily fire disturbed. To exclude salvage logged areas from the general depletion areas (above), FIRE_DISTURBANCE_AREA polygons were spatially intersected with a subset of the FRI where *YRDEP>0* (i.e., any area with a recorded depletion). From the resulting dataset, any areas where a fire event was recorded (*FIRE_YEAR > 0*) and the last disturbance year recorded in the FMP Land Classification was the same as or within 5 years after the fire year was mapped as fire disturbances.

- **Blowdown Disturbances:** To identify areas of blowdown disturbance, FOREST_ABIOTIC_DAMAGE_EVENT polygons were obtained from Land Information Ontario. These were spatially intersected with the FMP Land Classification Dataset. From the resulting dataset, any areas where a blowdown event was recorded (EVENT_NAME = 'Blowdown') and the last recorded disturbance year was after 1967 were mapped as blowdown disturbances.

- **Other Natural Disturbances:** Areas of potentially productive forest disturbed by natural events that have not met regeneration standards were extracted using the attribute definition *DEVSTAGE='LOWNAT'* and areas recently disturbed by natural events extracted using the attribute definition DEVSTAGE = 'DEPNAT'.

- **Confirmed Logging Since 1970:** There is a map titled "Area Harvested in the Whiskey Jack Forest between 1970 and the Present Time" in the Whiskey Jack Forest 2009-2019 Forest Management Plan 1.1.7.11 Historic Forest Condition, Tab 2, page 26 by David Anderson, Area Forester, Oct 24, 2006. Areas marked as logged in that dataset (shapefile WJF_1970) are marked as "Confirmed Logging since 1970" on our maps.

Discussion

Our primary intention was to produce maps that accurately represent the currently proposed clearcuts and contingency clearcuts in the context of mature productive forested areas, naturally disturbed forested areas, and areas that have been disturbed by previous forest cutting since 1968. The year 1968 was chosen because it likely captures all, or nearly all, historical logging in the area of interest. This is corroborated by the fact that the FMP map of historical logging uses 1970 as a start date.

A challenge to achieving this was presented by omission of an important attribute from the FMP land classification data (Planning Composite Inventory) provided by the MNRF. According to an MNRF presentation, "The Enhanced Forest Resources Inventory, January 22nd, 2013," (available online from the Canadian Institute of Forestry, http://www.cif-ifc.org/wp-content/uploads/2014/05/Banton.pdf), the FRI data should include a depletion type attribute (DEPTYPE) that "identifies the disturbance that occurred in the year recorded in the companion attribute YRDEP," (p.40) and includes entries that would allow harvest disturbances to be differentiated from natural disturbances.

When we requested the DEPTYPE attribute data The MNRF wrote to us that “The external link to the Forest Management Planning Tech Spec. http://www.ontario.ca/document/forest-management-planning-technical-specifications. This applies to the Planning Composite Inventory (PCM) that was provided as part of the current approved 2012 Whiskey Jack plan. The forest resource inventory (FRI) that this PCM was based upon unfortunately did not include a DEPTYPE field. The original FRI was developed prior to FIM and as such did not have an appropriate Tech. Spec.”

Because we lacked this attribute, we were forced to attempt to differentiate harvest depletions from natural depletions using other attributes. As well, at the recommendation of the MNR we obtained from Land Information Ontario the complementary datasets FIRE_DISTURBANCE_AREA, FOREST_ABIOTIC_DAMAGE_EVENT, FOREST_DISEASE_DAMAGE_EVENT, FOREST_INSECT_DAMAGE_EVENT, and FOREST_MISC_DAMAGE_EVENT. Of these, only the fire disturbance area dataset appears to be complete. As documented above, we made use of the abiotic damage event dataset to map blowdown areas, but note that the earliest recorded event is 2001, suggesting that the dataset is not complete. After inspecting their content, we determined that we could not make use of the other three datasets. The whole content of the disease damage event dataset was five polygons covering 1.82 square kilometres, all denoting “Ink spot of aspen” disease in 2009 and 2010. Even the subset of polygons in the insect damage event dataset for “Spruce Budworm” damage appear to be grossly generalized and not amenable to use with data of the accuracy of the FRI; and cover an area of approximately 295,000 square kilometres – nearly one third of the WJ Forest. The miscellaneous damage event dataset comprised five polygons covering 175,000 square kilometres, all denoting “Aspen decline” in 2009 and 2010.

Recent depletions that are not marked as confirmed logging likely reflect logging after the endpoint of the data used for “Area Harvested in the Whiskey Jack Forest between 1970 and the Present Time.” The presence of a road network in these areas corroborates this. Old depletions that are not marked as confirmed logging are likely natural disturbances but may be old logging overlooked in the FMP map

Conclusions

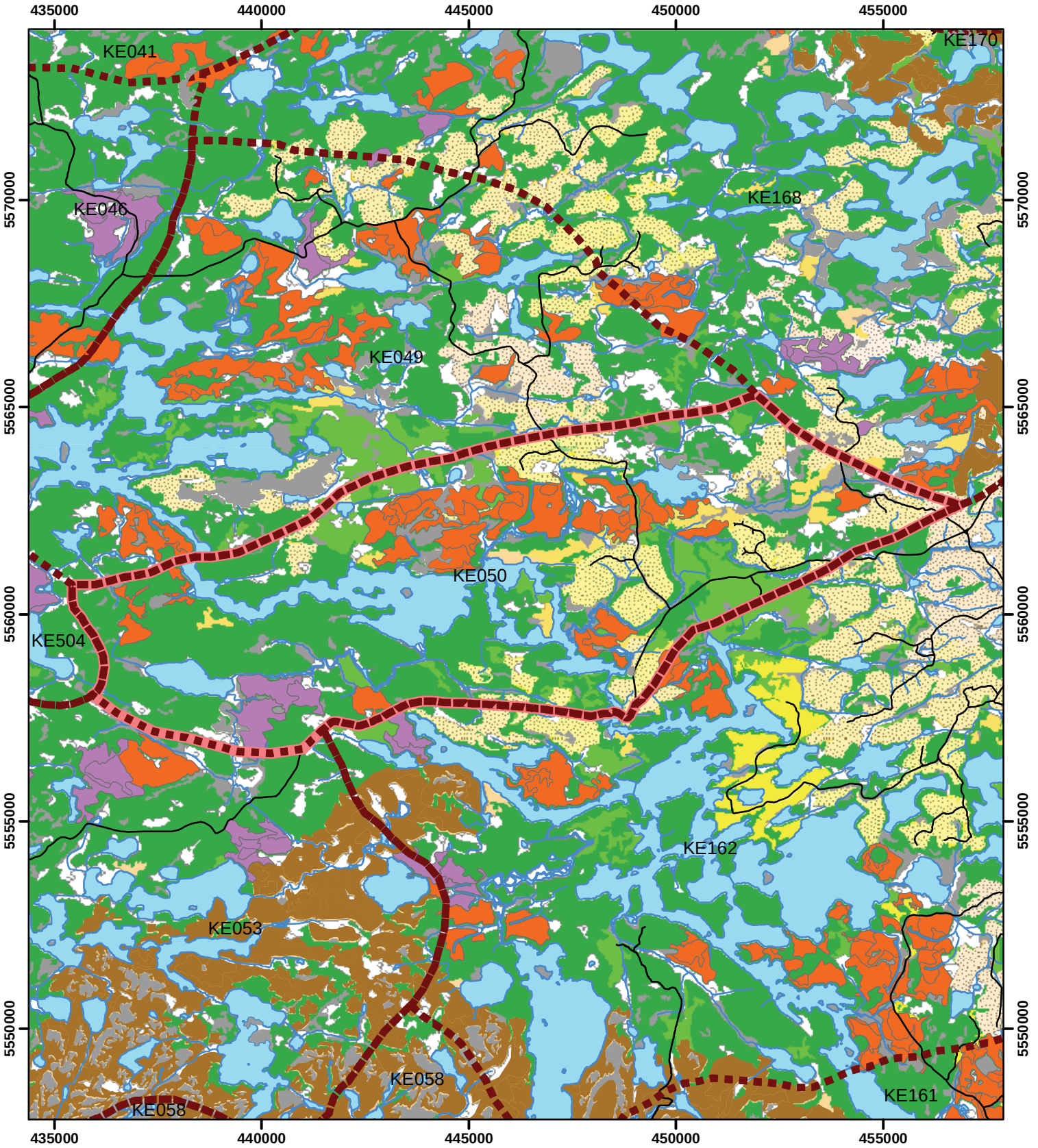
Despite these challenges we are confident that our mapping reasonably represents the landscape and the depletions that have occurred since 1968 to the best of our ability using the data that the MNRF has shared. Most importantly, the planned and contingency cutblocks are represented as accurately as in the FMP data.

Stephen Kilburn

APPENDIX A – MAPS

APPENDIX A.1 – TRAP LINE AREA MAPS

Planned and recent clearcut logging
Trapping Area KE050



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

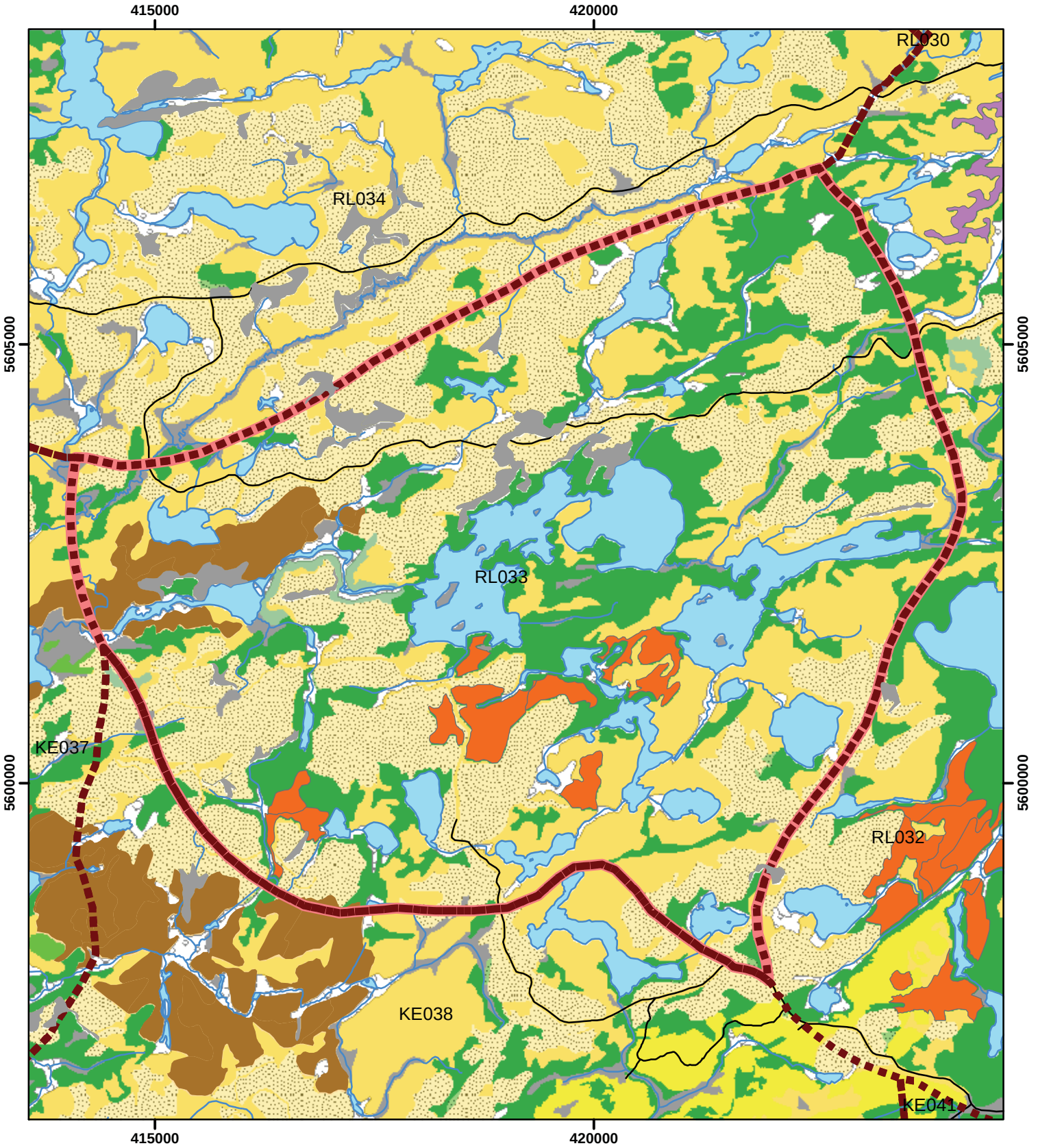
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:125,000

Planned and recent clearcut logging
Trapping Area RL033



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

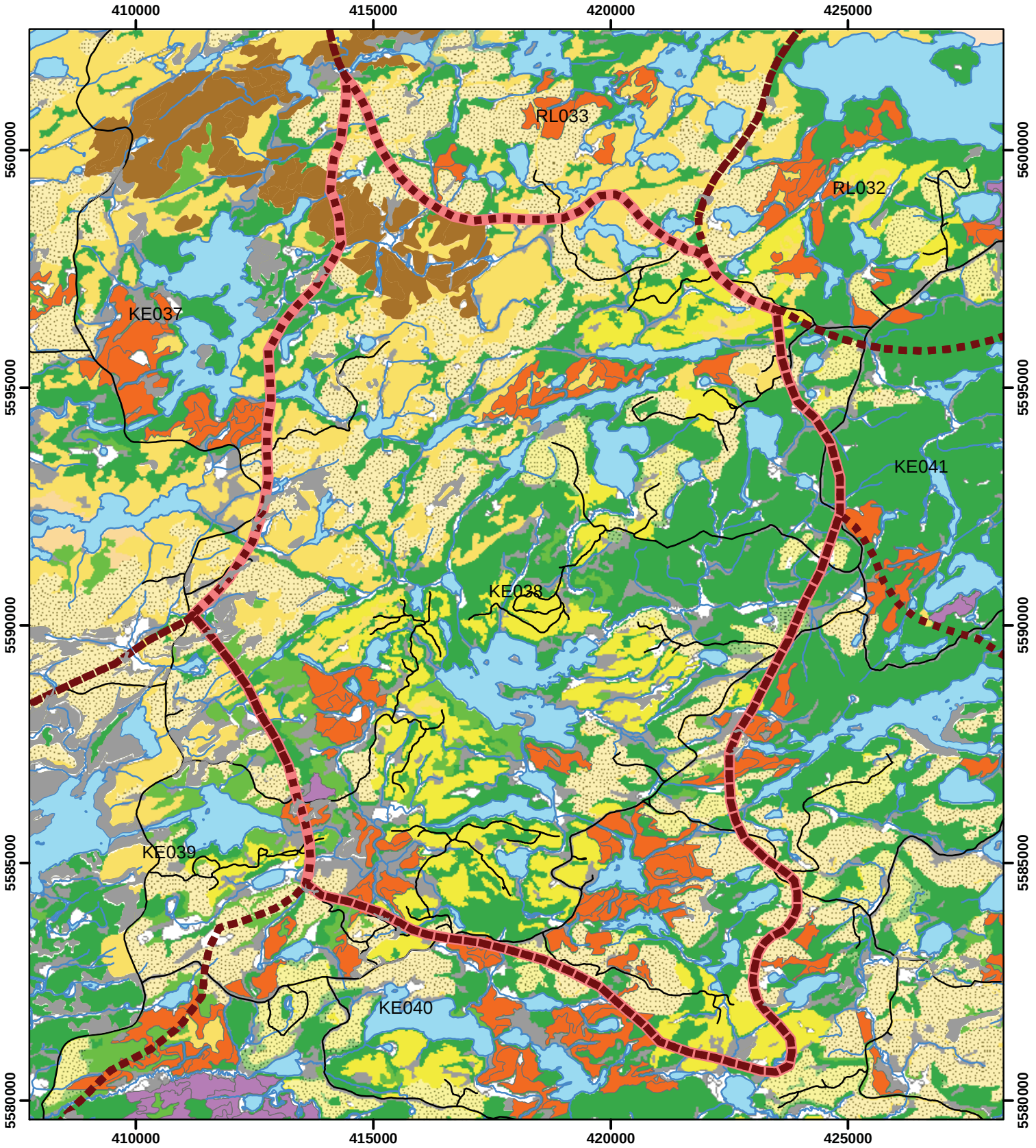
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.5 1 2 km

1:59,000

Planned and recent clearcut logging
Trapping Area KE038

2069



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

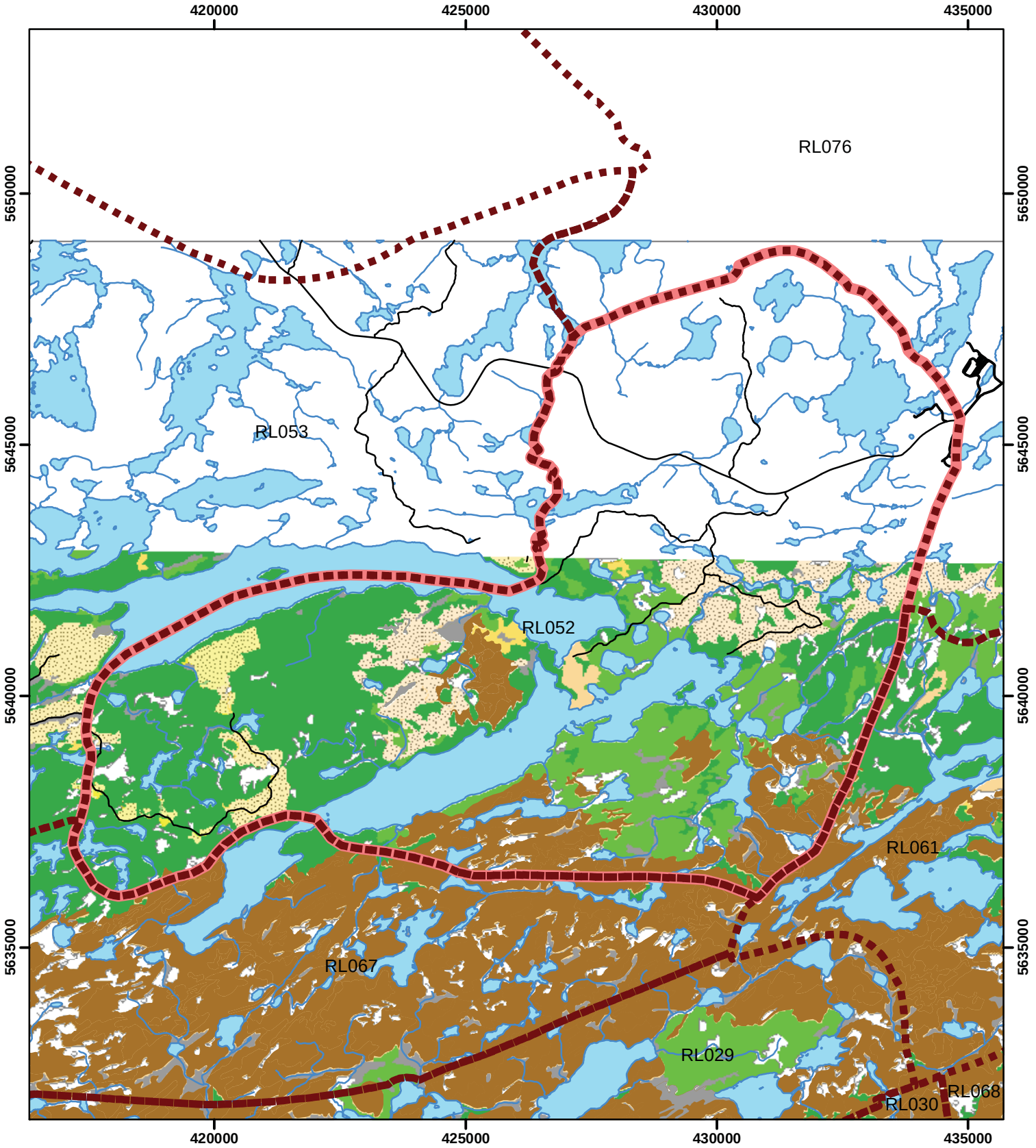
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:109,000

Planned and recent clearcut logging
Trapping Area RL052

2070



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

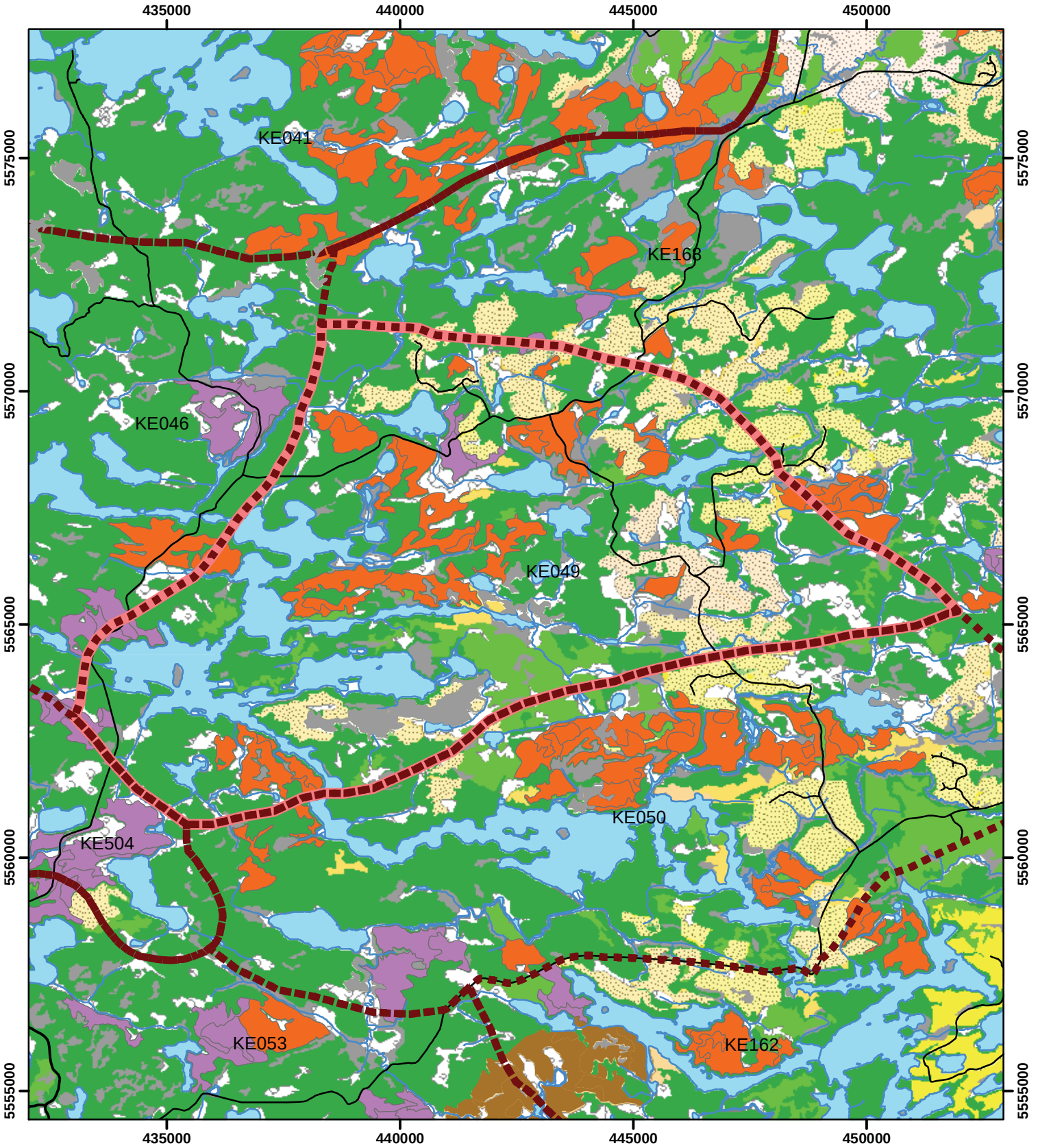
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:103,000

Planned and recent clearcut logging
Trapping Area KE049



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

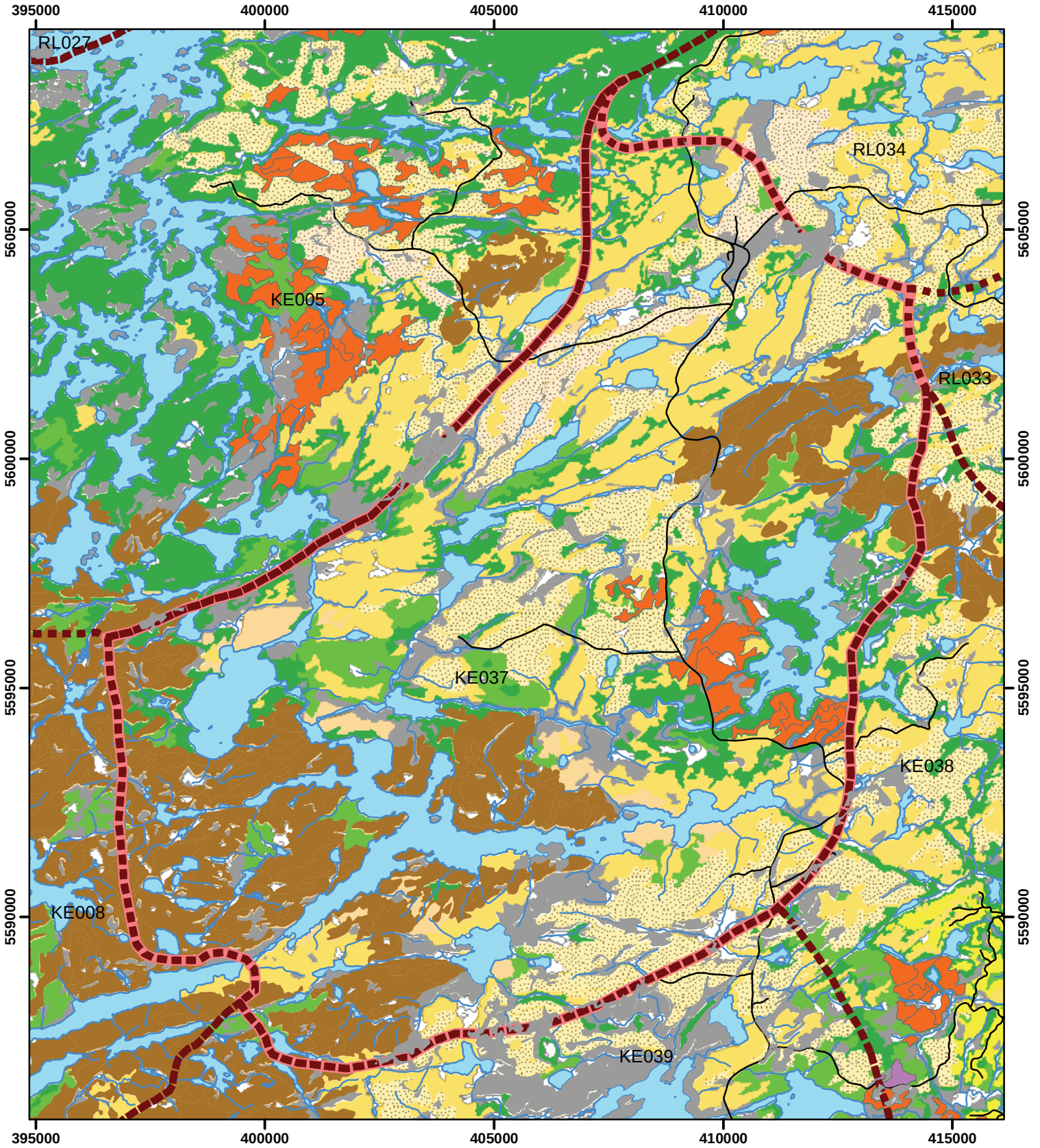
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:111,000

Planned and recent clearcut logging
Trapping Area KE037

2072



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

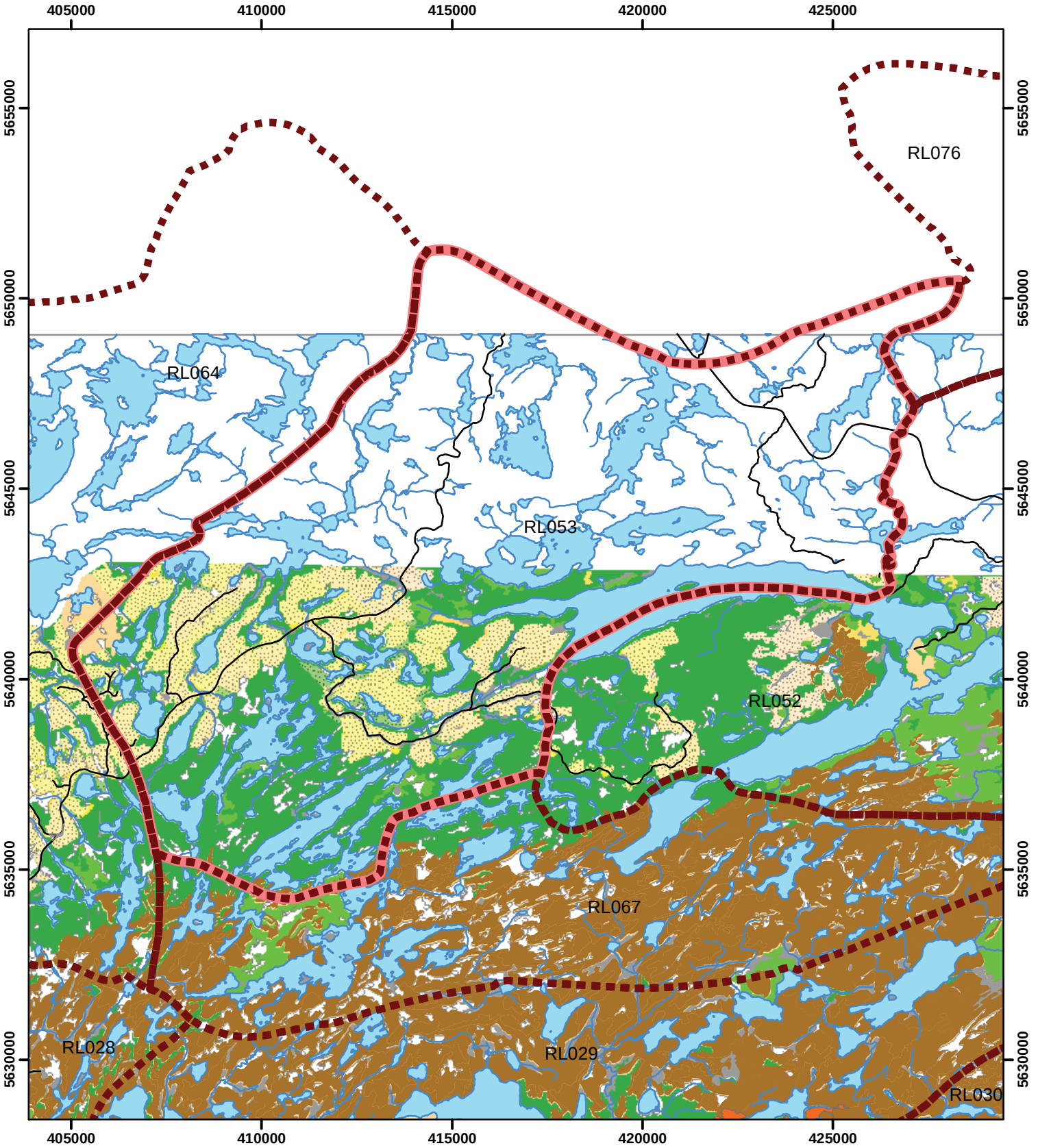
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:113,000

Planned and recent clearcut logging
Trapping Area RL053



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

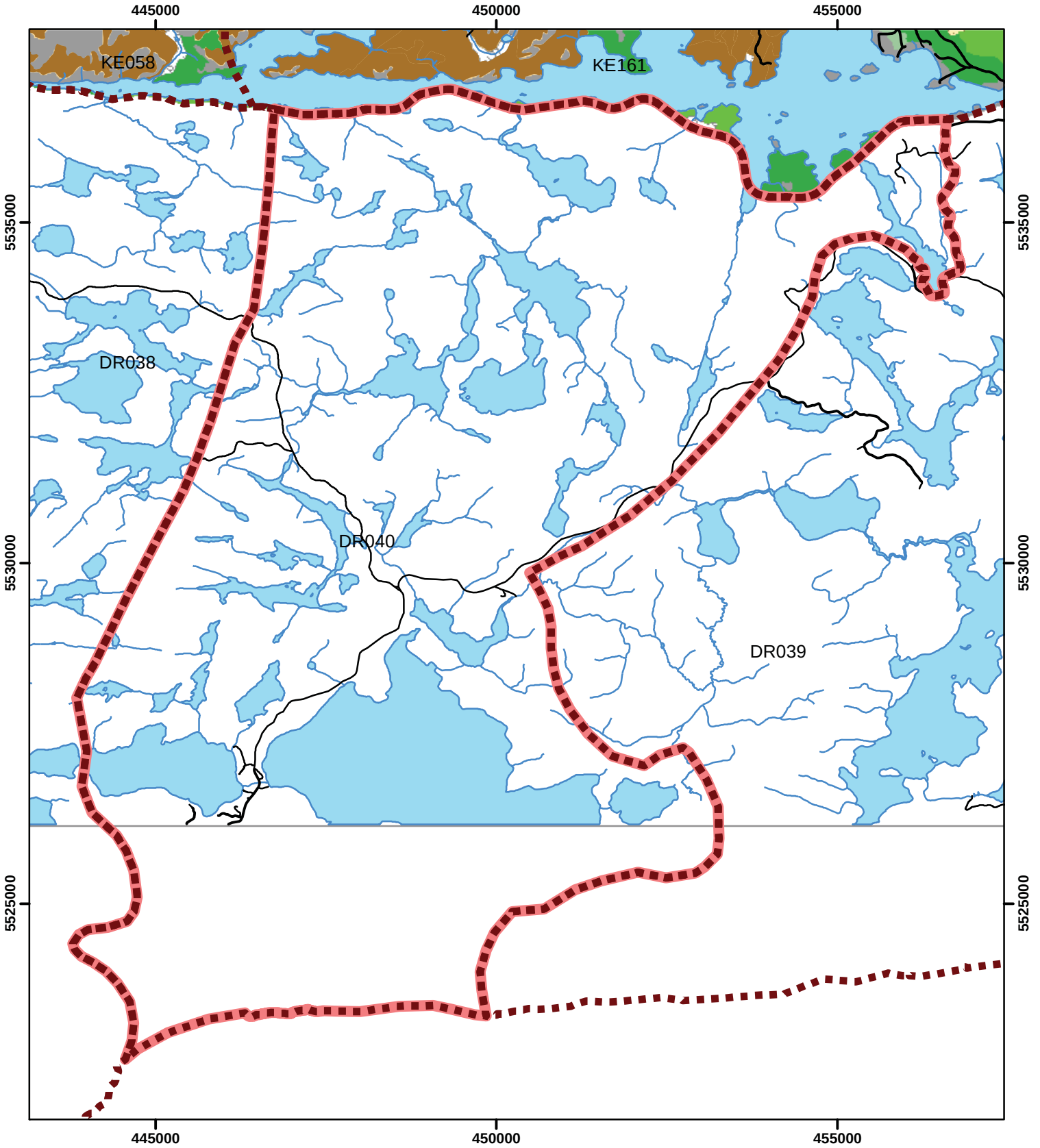
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:136,000

Planned and recent clearcut logging
Trapping Area DR040

2074



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

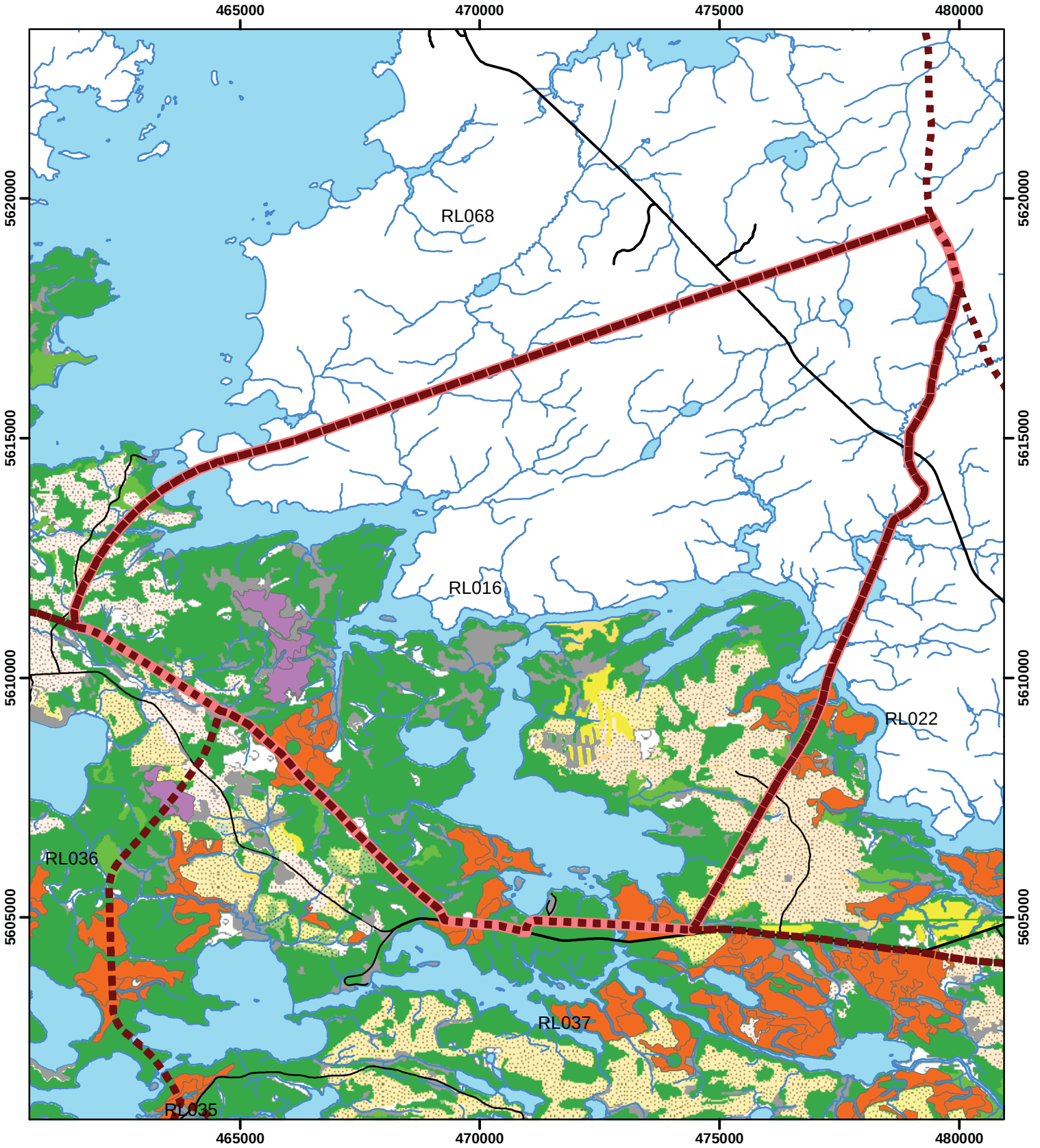
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.5 1 2 km

1:76,000

Planned and recent clearcut logging
Trapping Area RL016



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

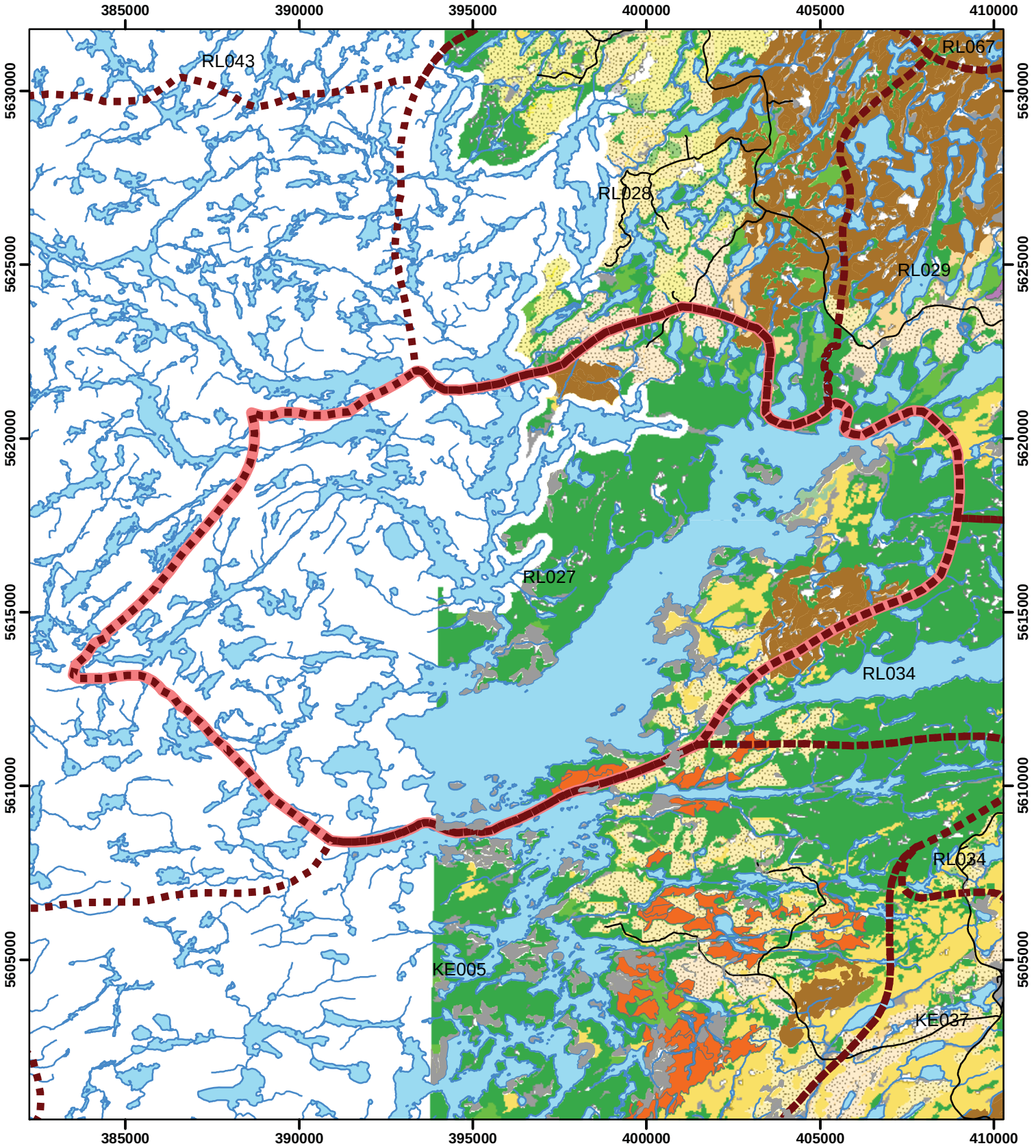
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:108,000

Planned and recent clearcut logging
Trapping Area RL027



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

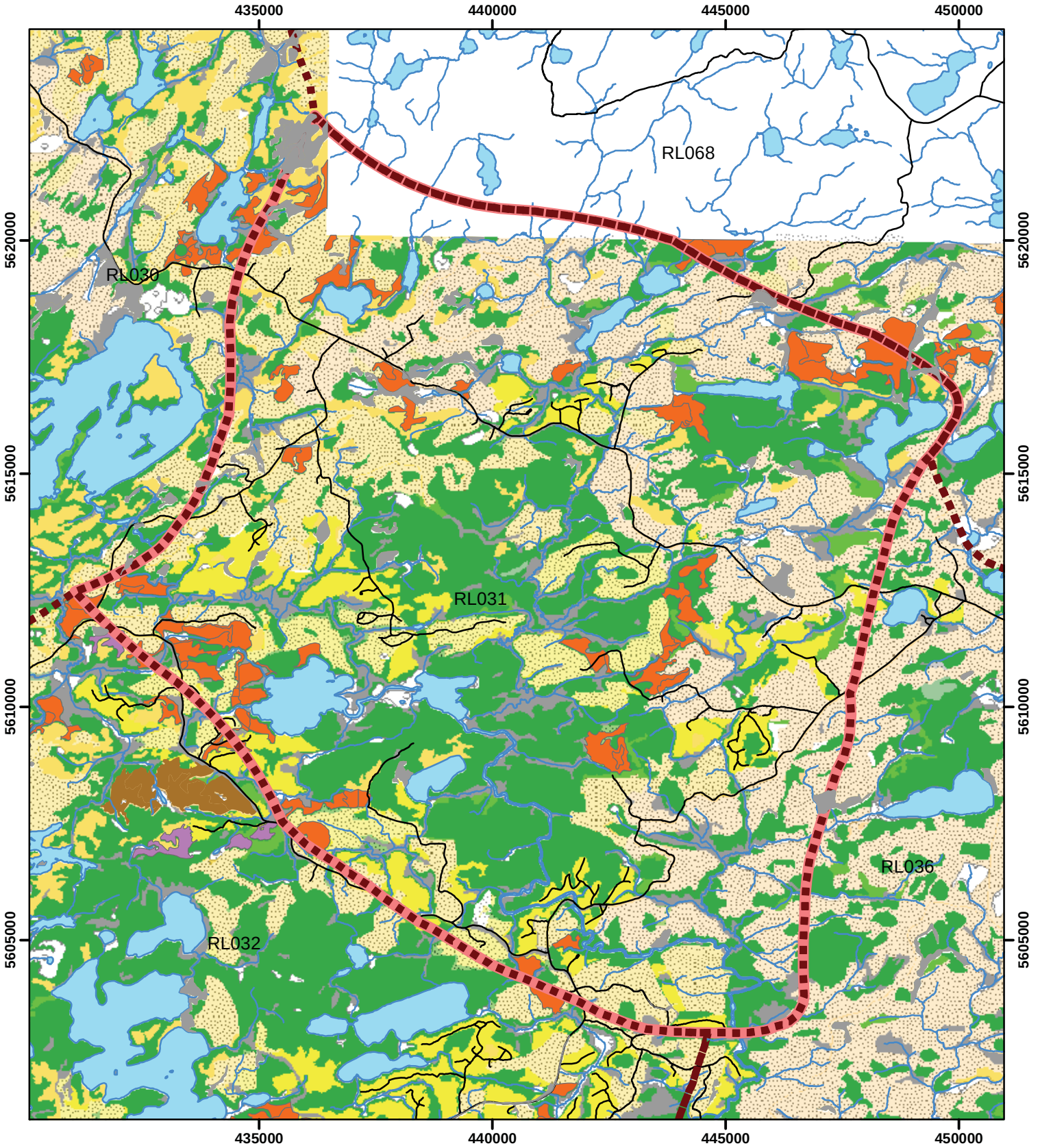
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:149,000

Planned and recent clearcut logging
Trapping Area RL031



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

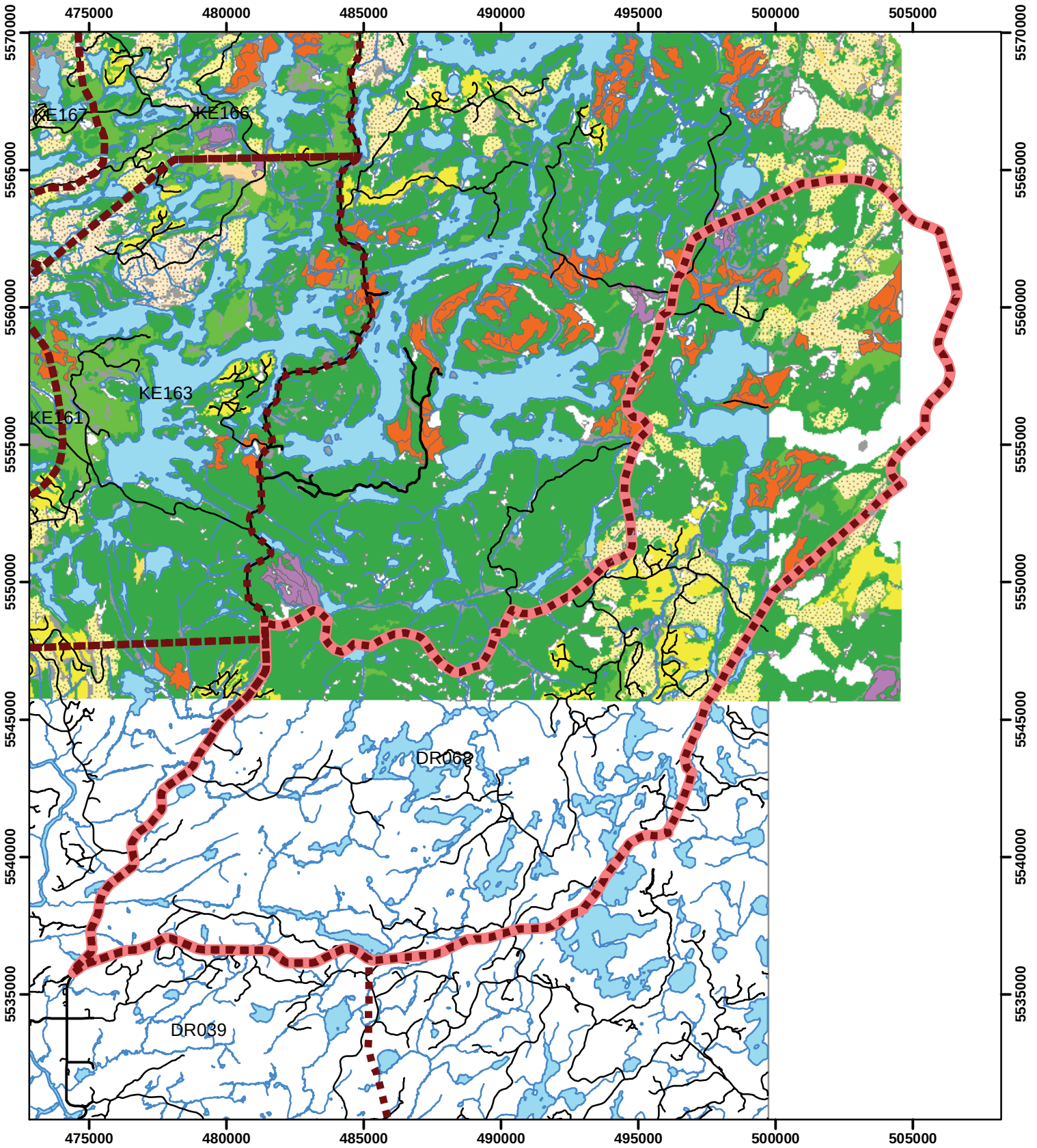
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:111,000

Planned and recent clearcut logging
Trapping Area DR068



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

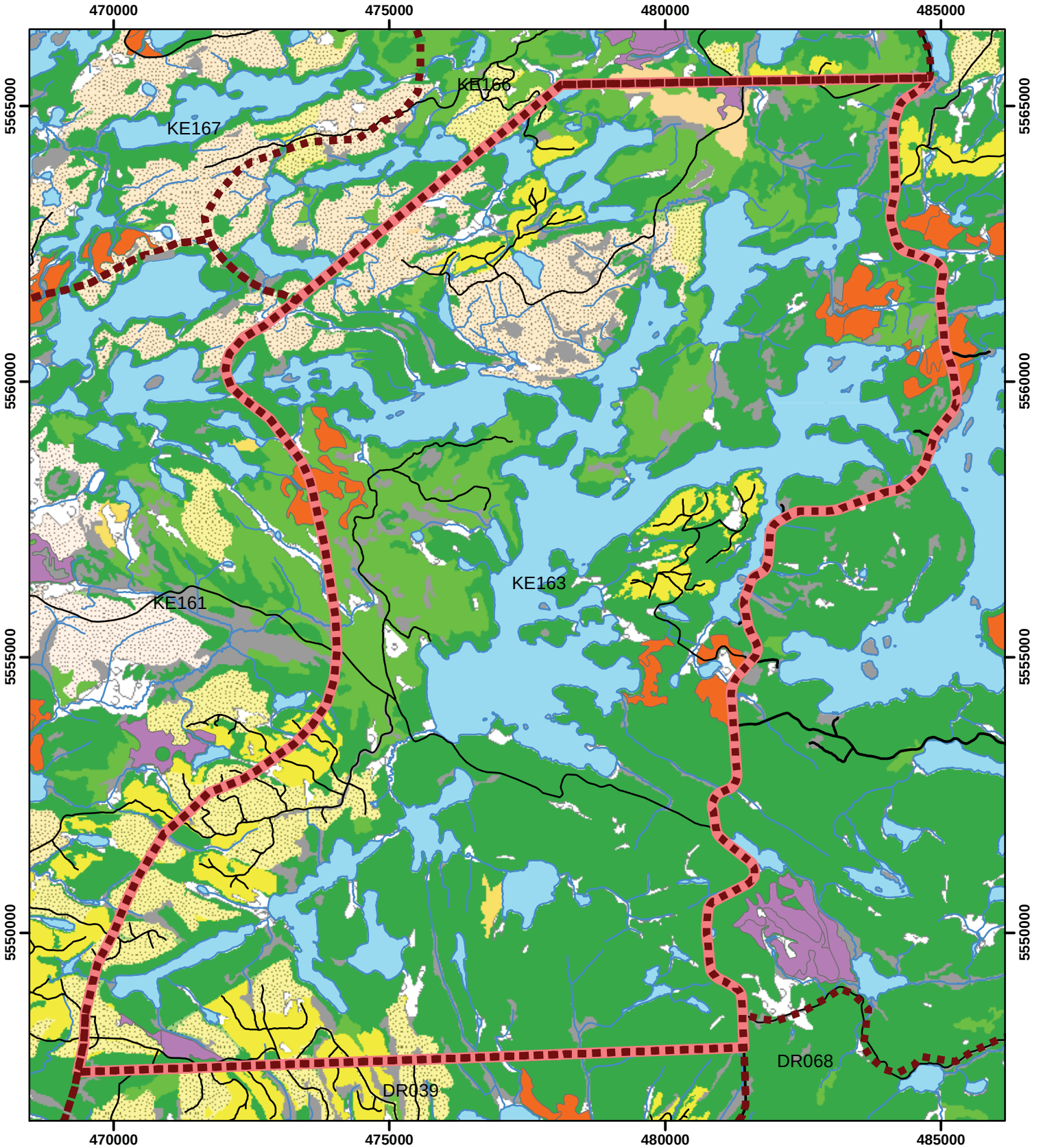
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.75 3.5 7 km

1:188,000

Planned and recent clearcut logging
Trapping Area KE163



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

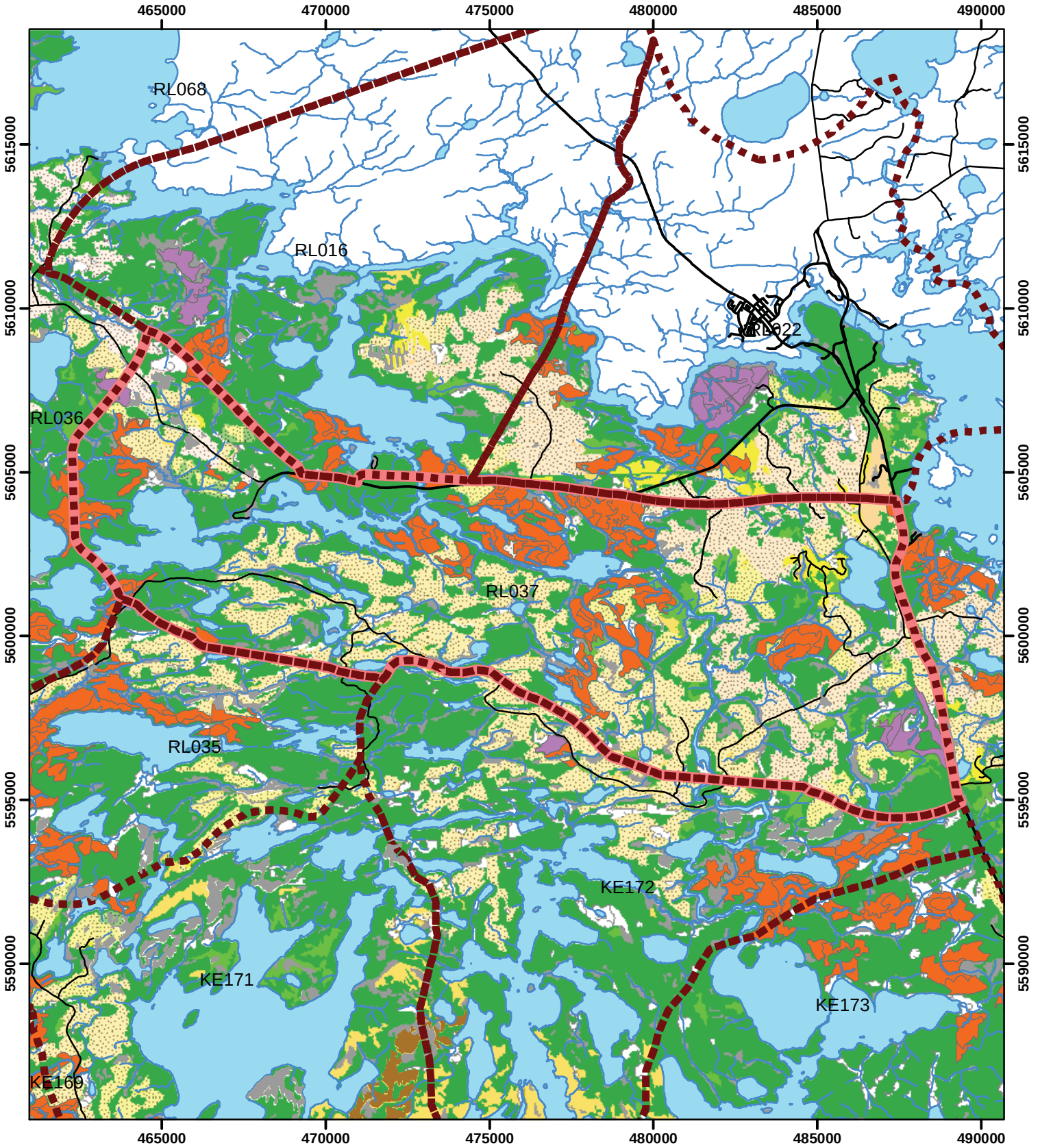
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:94,000

Planned and recent clearcut logging
Trapping Area RL037



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

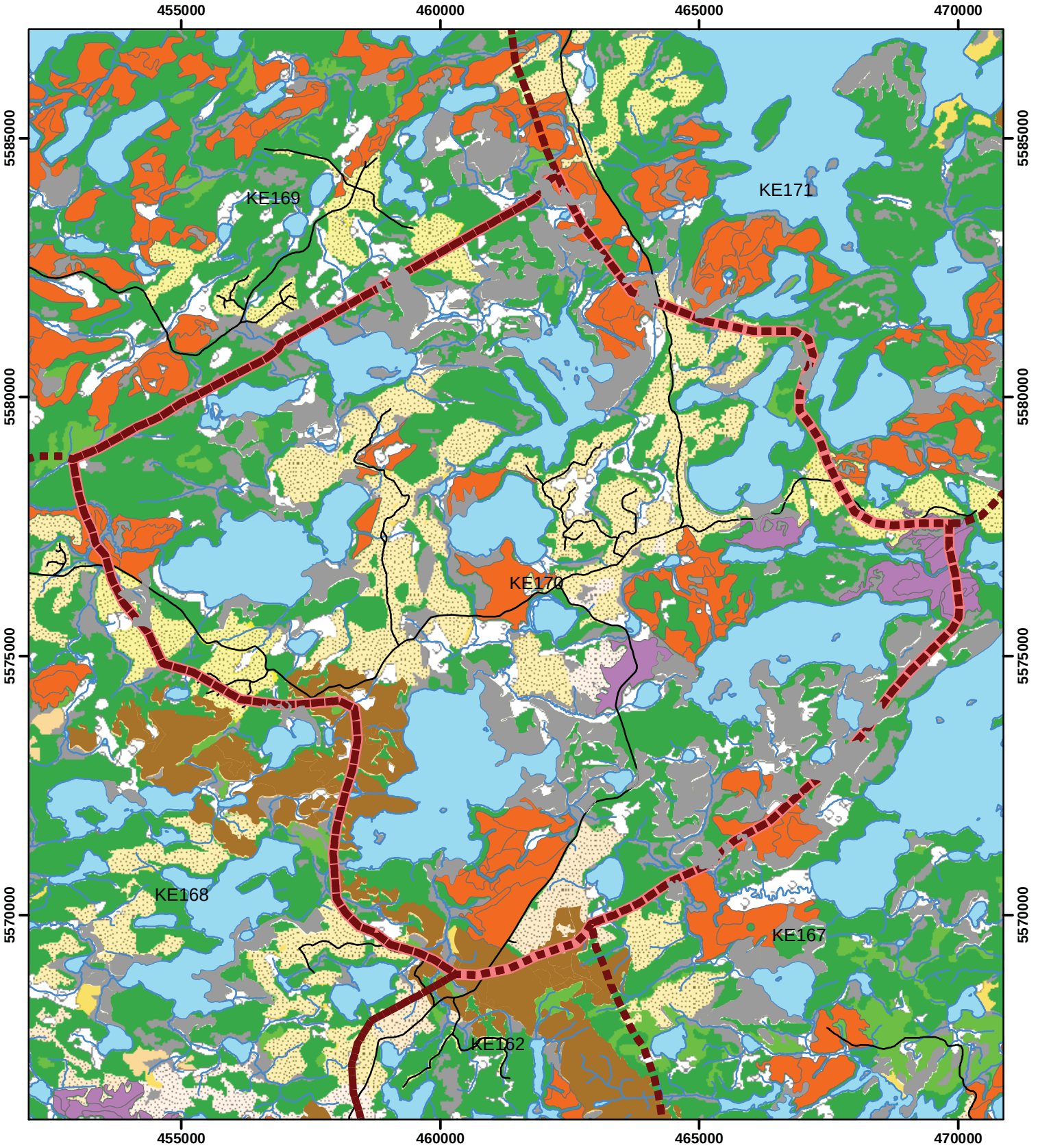
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.5 3 6 km

1:158,000

Planned and recent clearcut logging
Trapping Area KE170



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

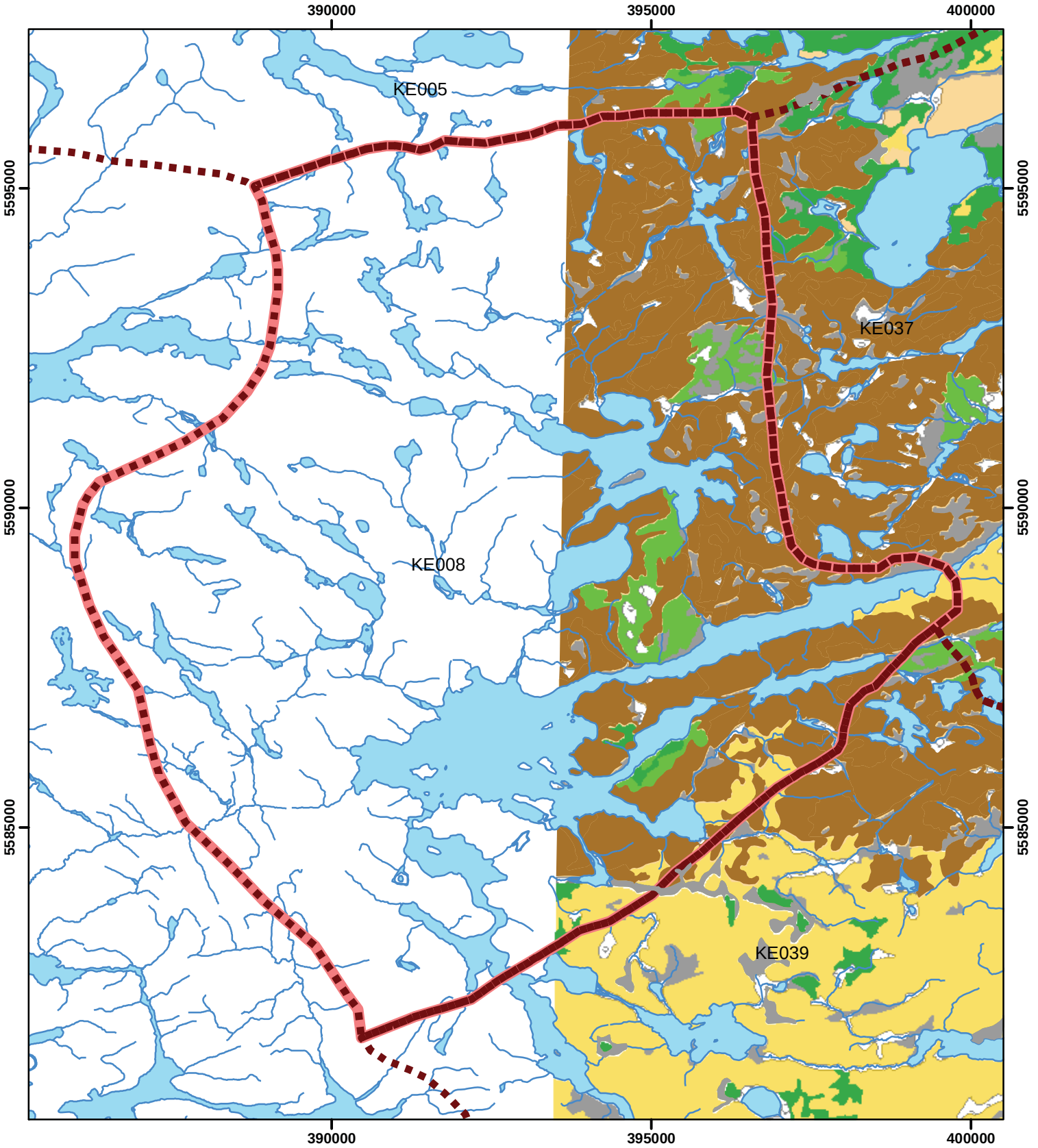
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:100,000

Planned and recent clearcut logging
Trapping Area KE008



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

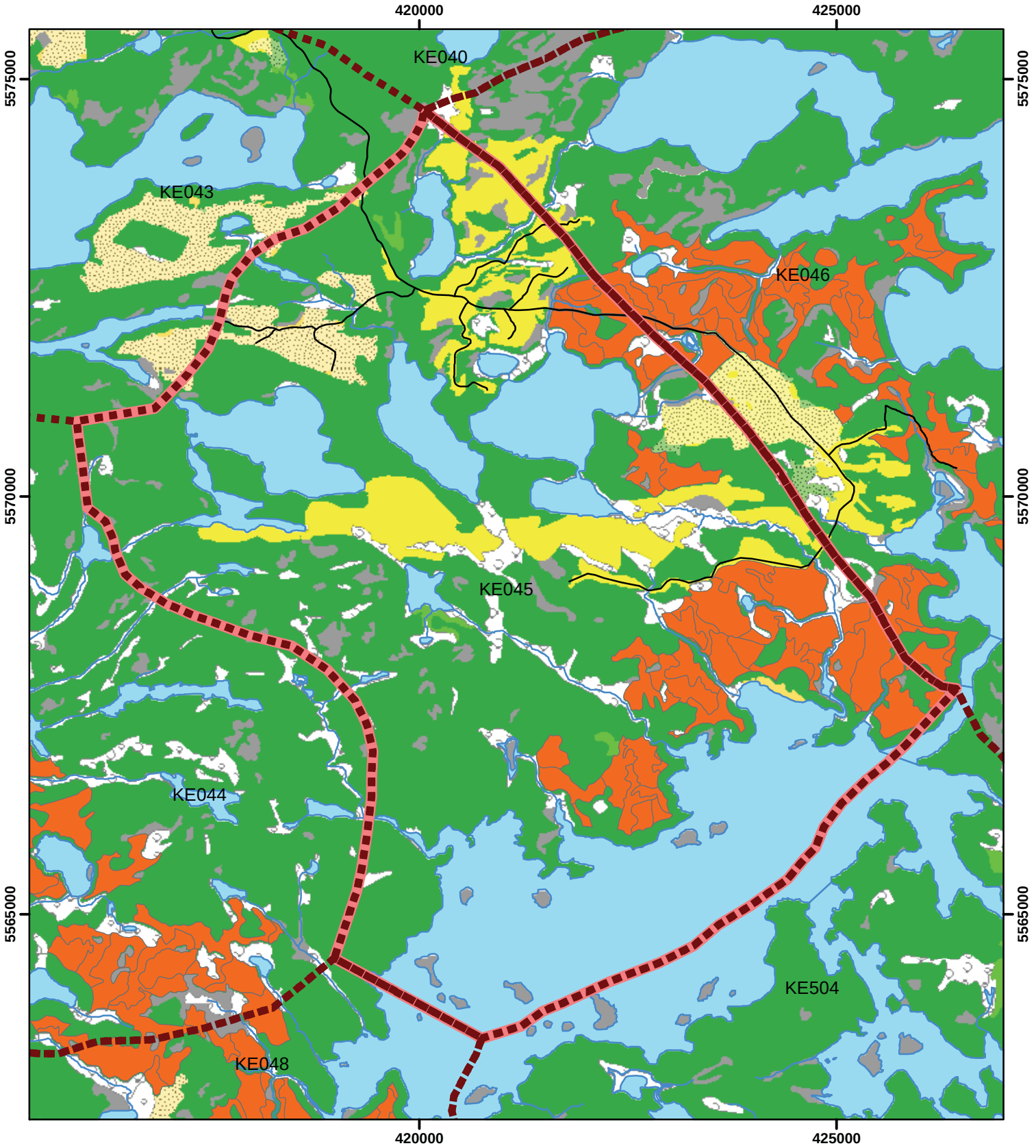
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:81,000

Planned and recent clearcut logging
Trapping Area KE045

2083



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

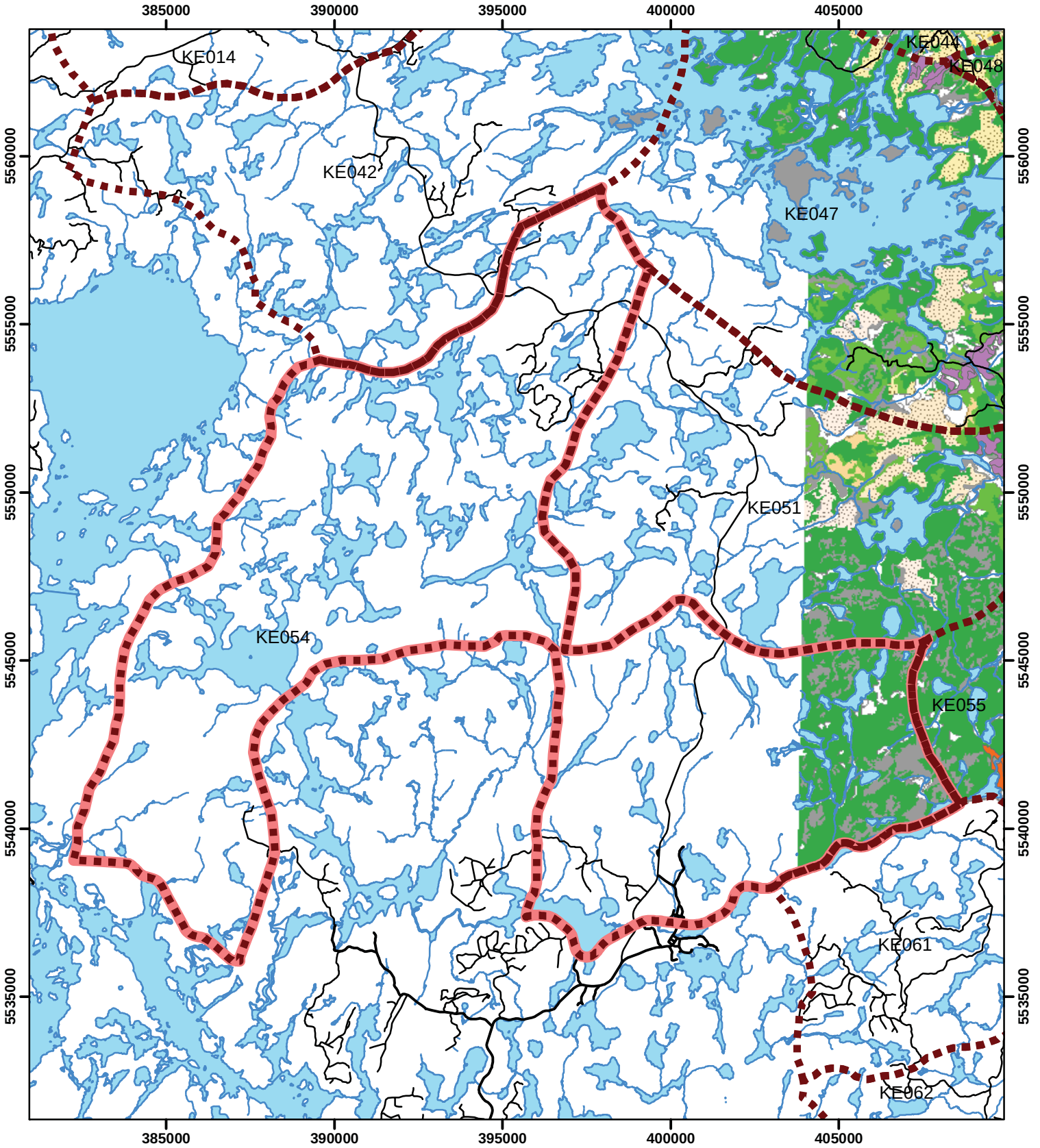
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.5 1 2 km

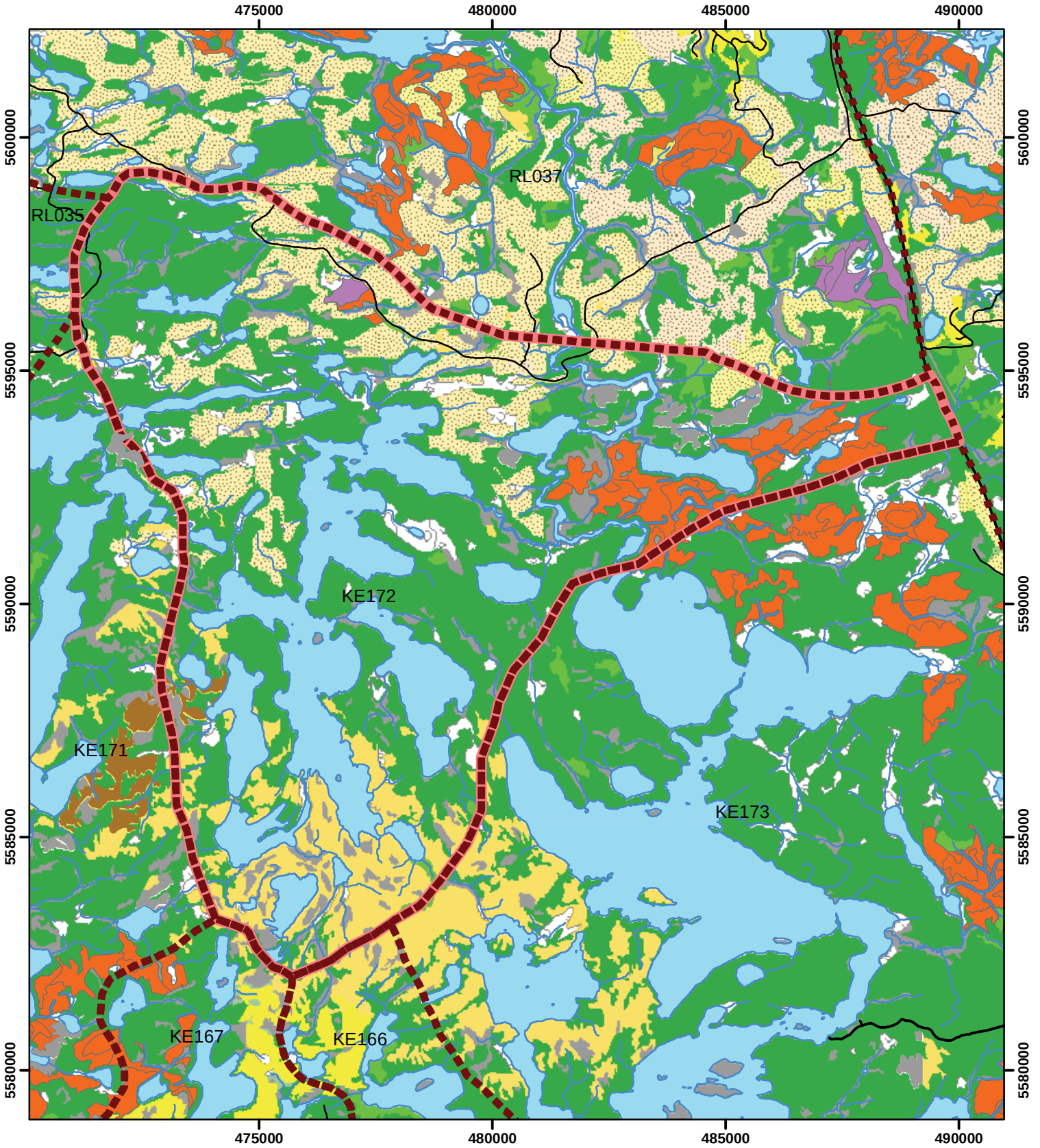
1:62,000

Planned and recent clearcut logging
Trapping Area KE054



Planned and recent clearcut logging
Trapping Area KE172

2085



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

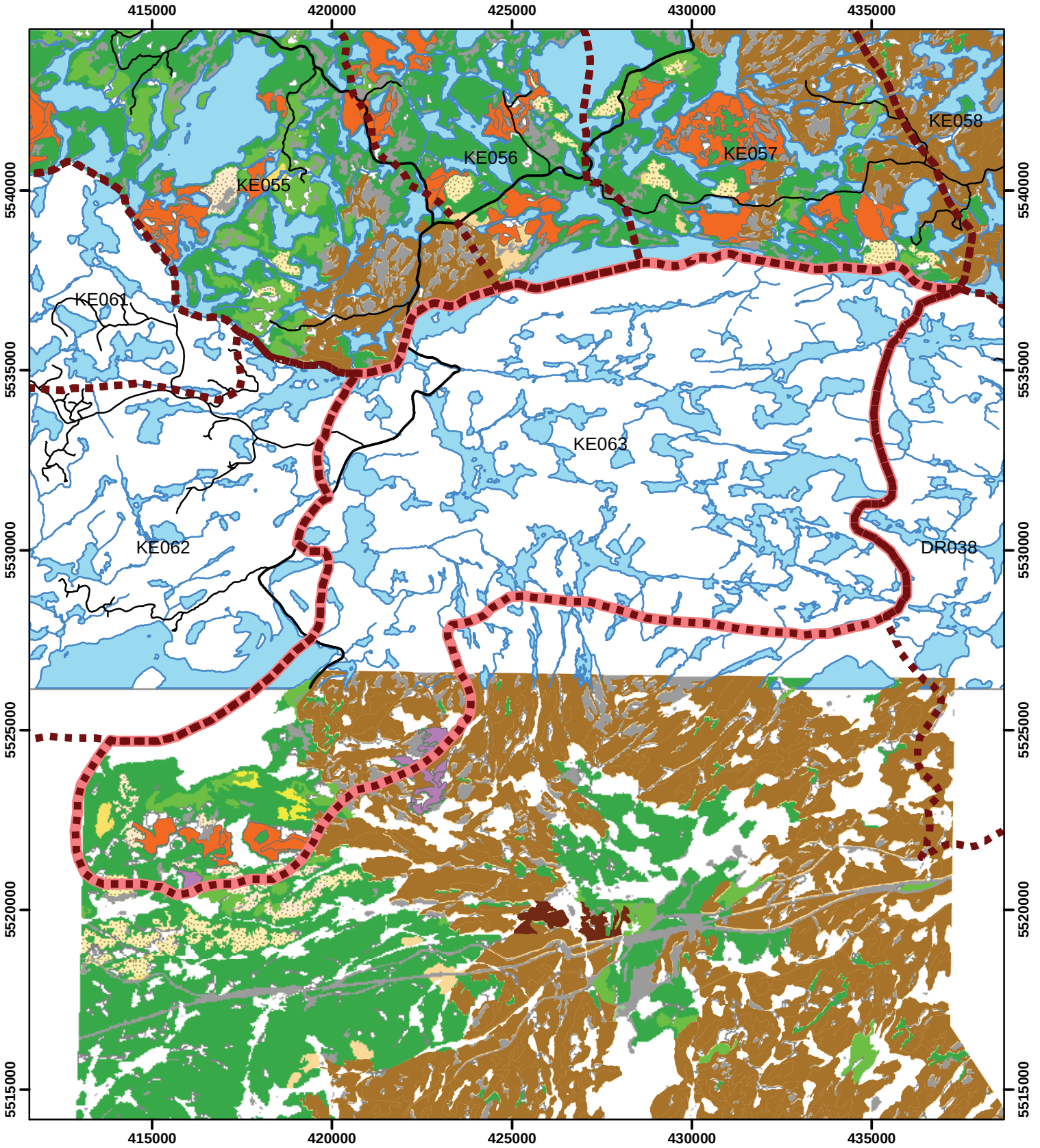
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:111,000

Planned and recent clearcut logging
Trapping Area KE063

2086



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

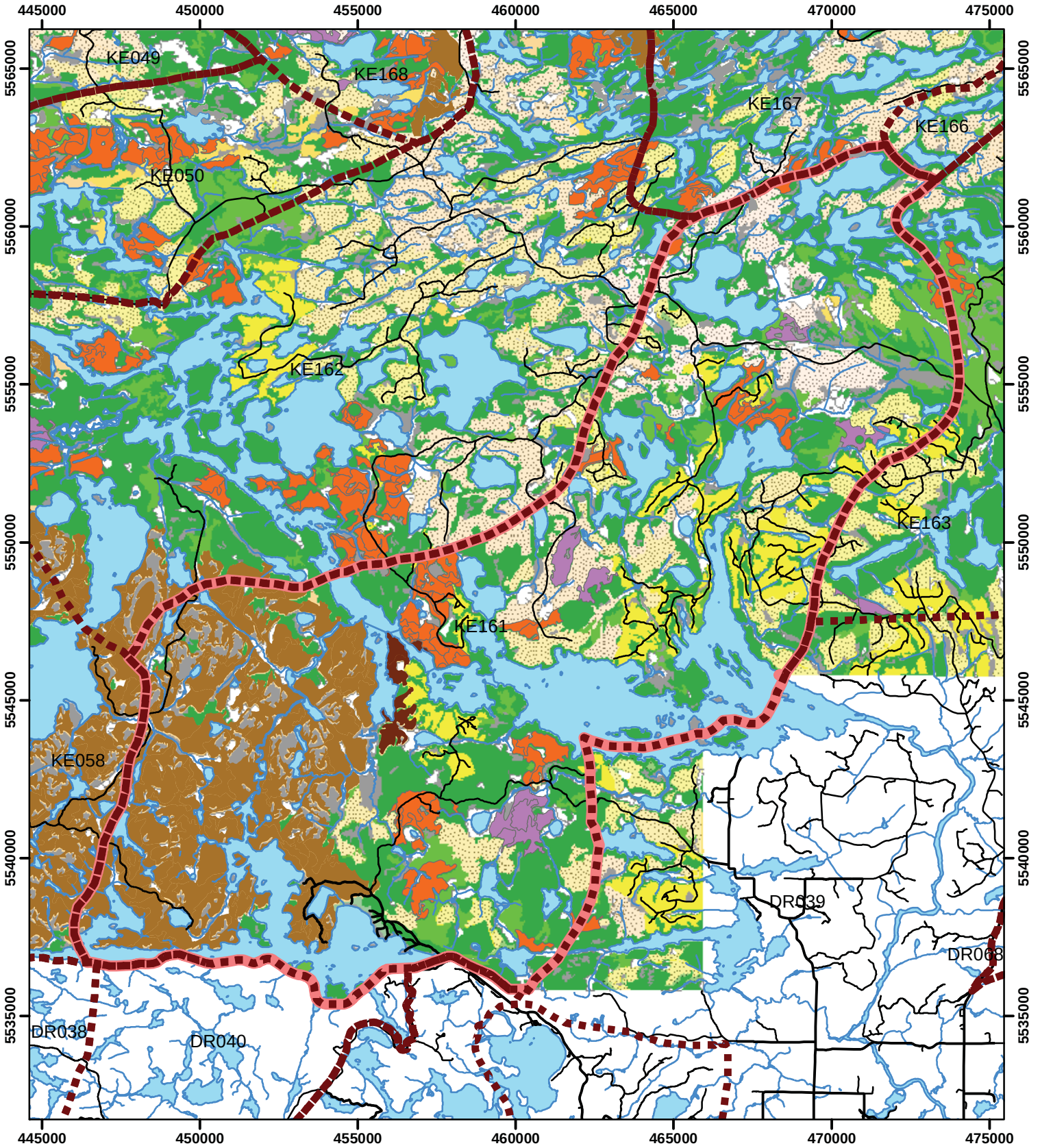
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:144,000

Planned and recent clearcut logging
Trapping Area KE161



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

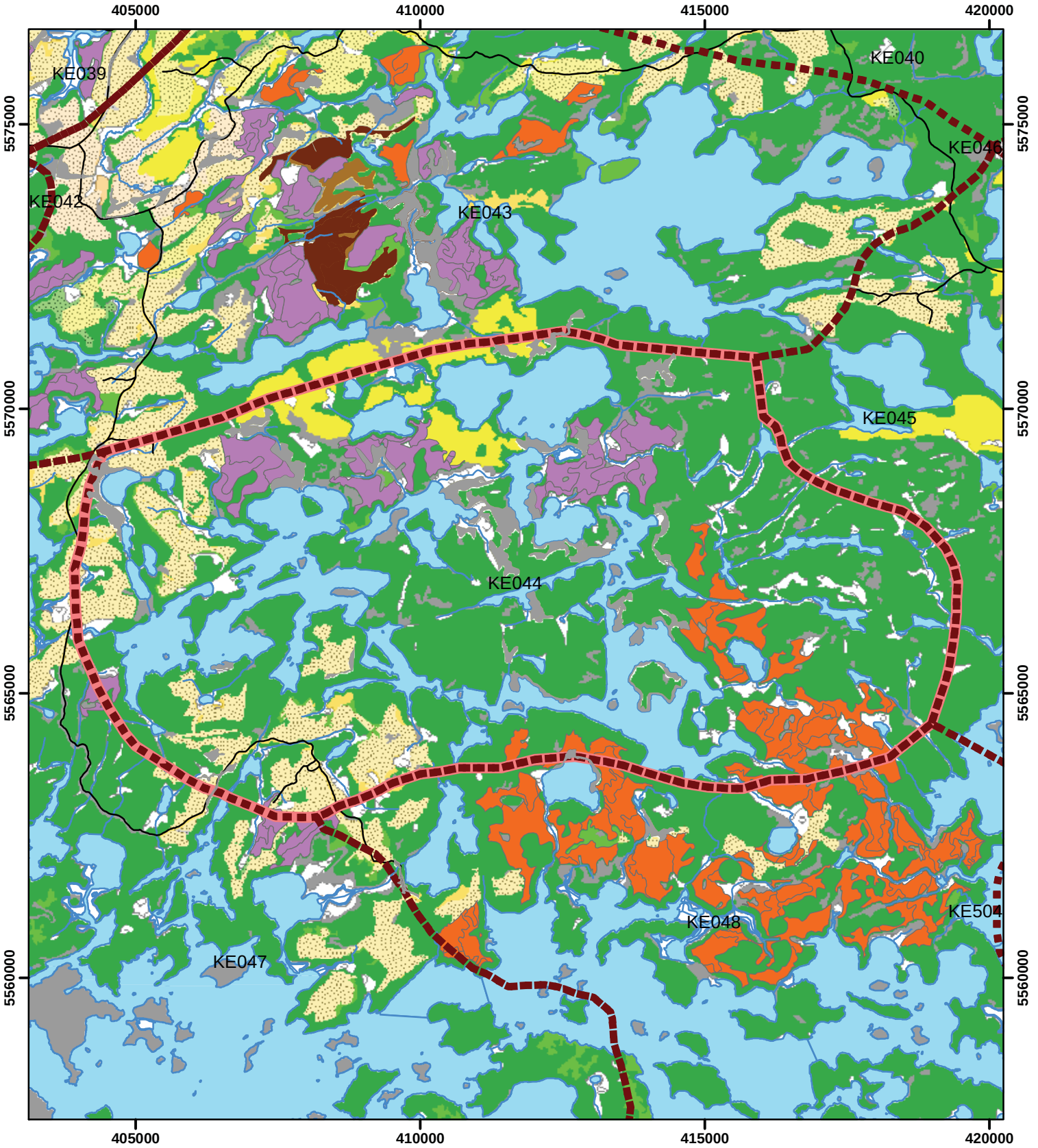
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.5 3 6 km

1:164,000

Planned and recent clearcut logging
Trapping Area KE044



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

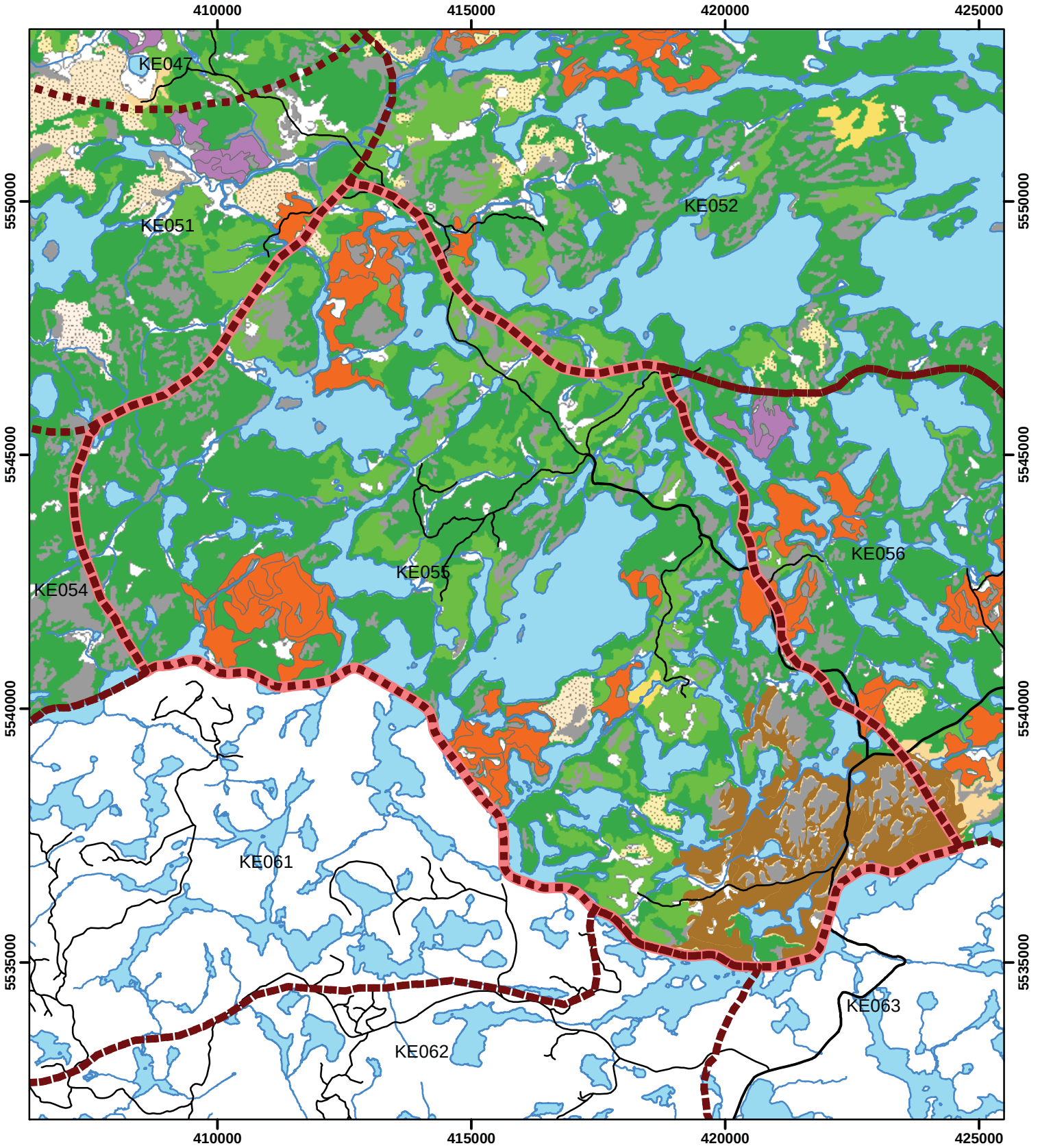
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:91,000

Planned and recent clearcut logging
Trapping Area KE055



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

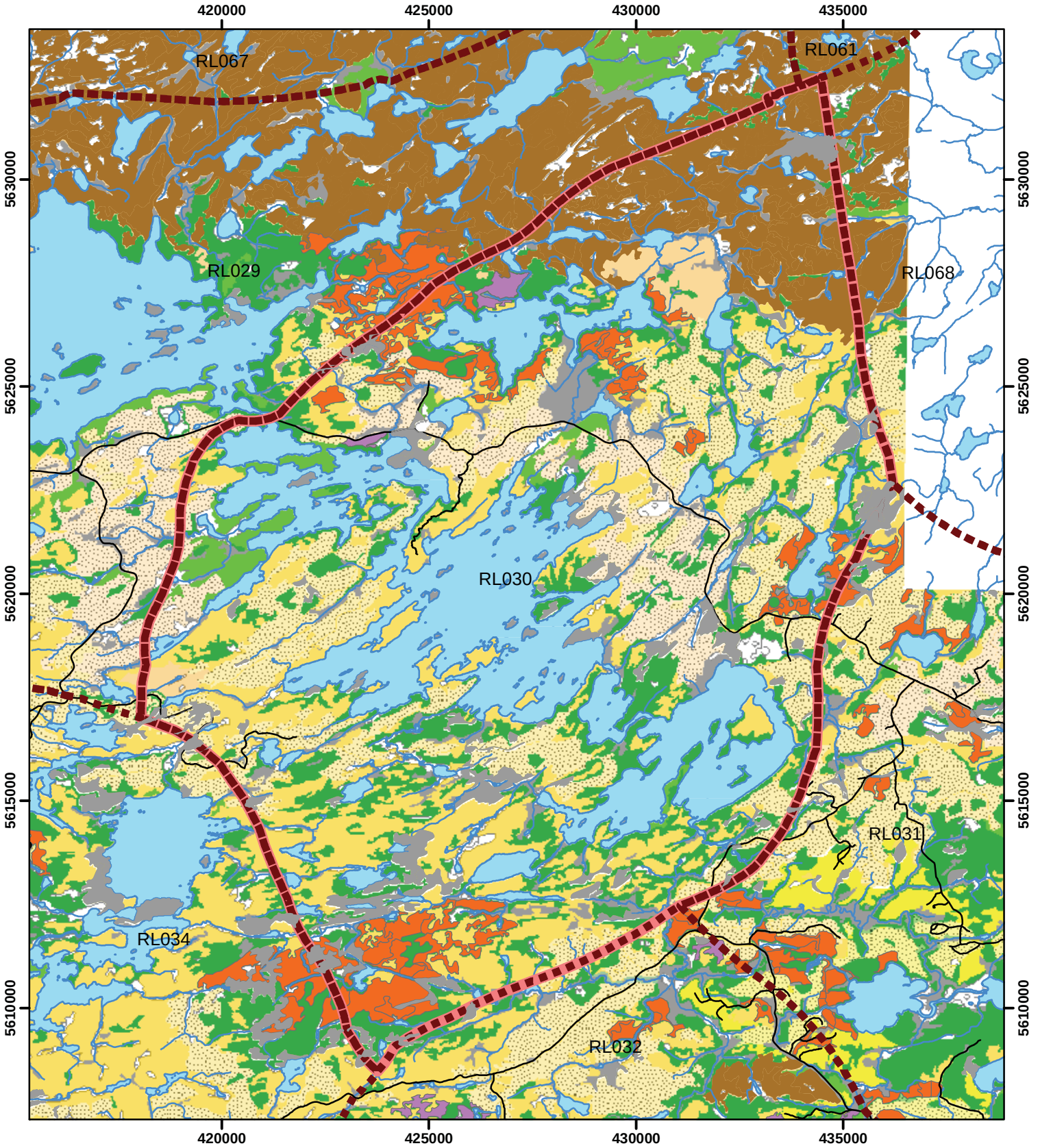
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:102,000

Planned and recent clearcut logging
Trapping Area RL030

2090



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

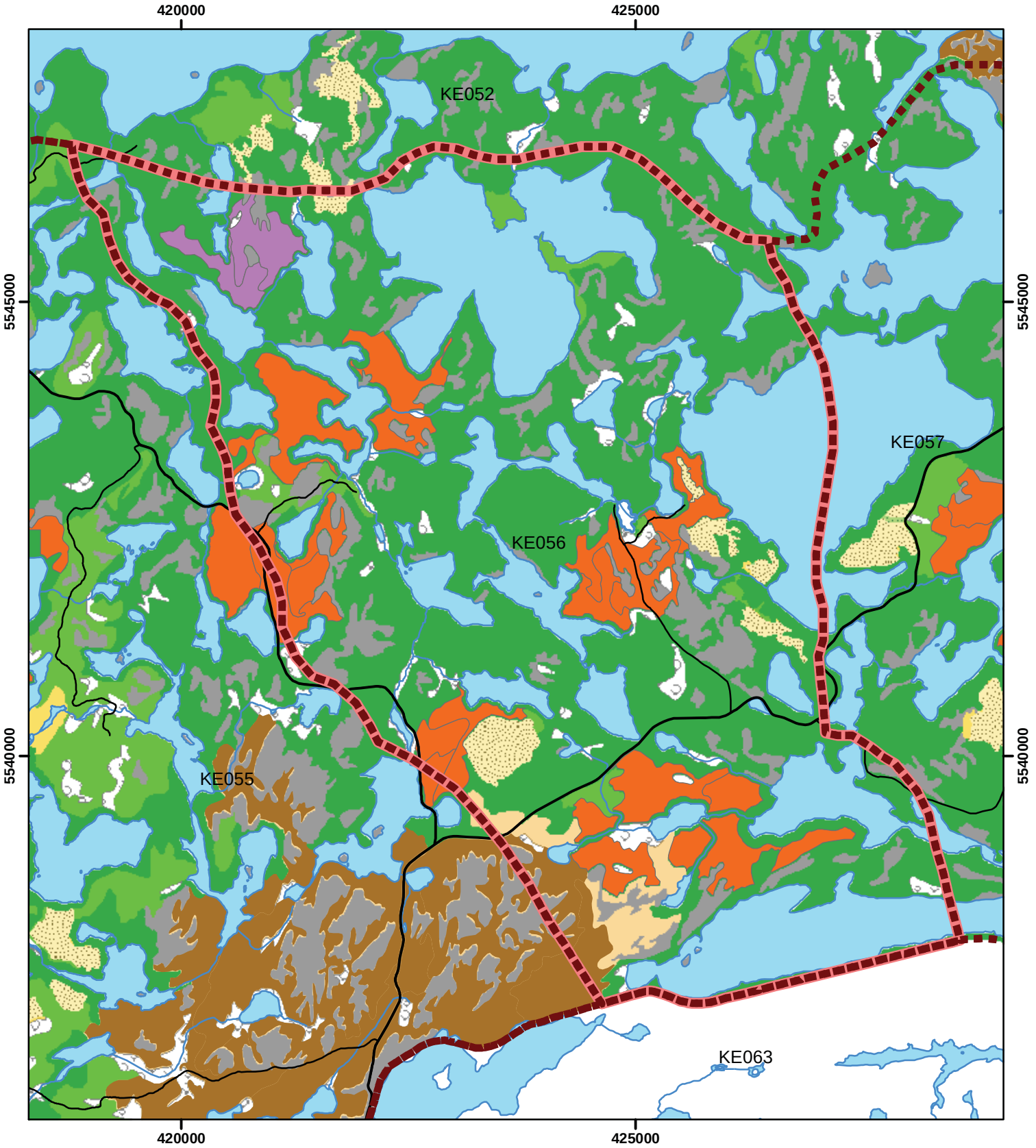
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:125,000

Planned and recent clearcut logging
Trapping Area KE056



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

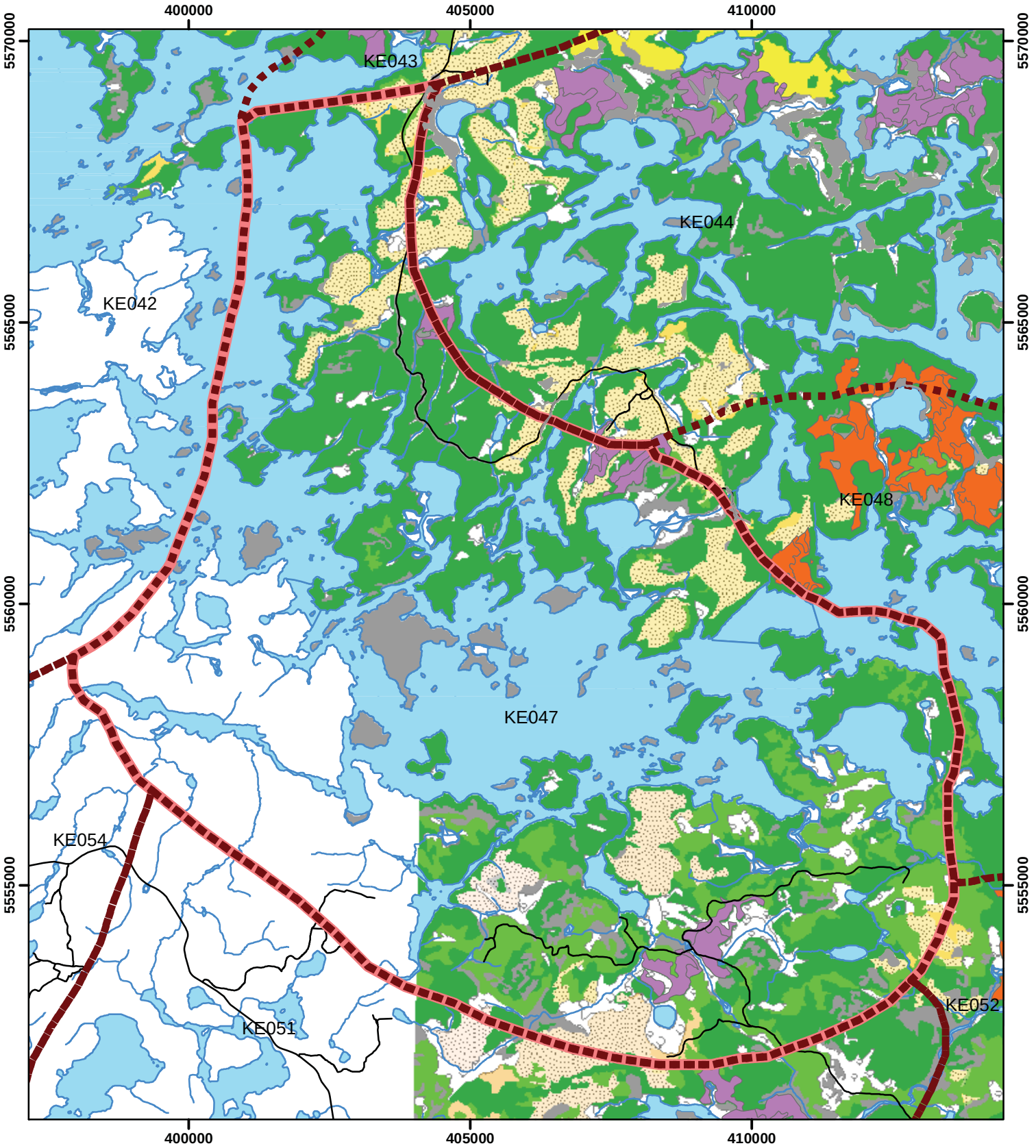
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.5 1 2 km

1:57,000

Planned and recent clearcut logging
Trapping Area KE047



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

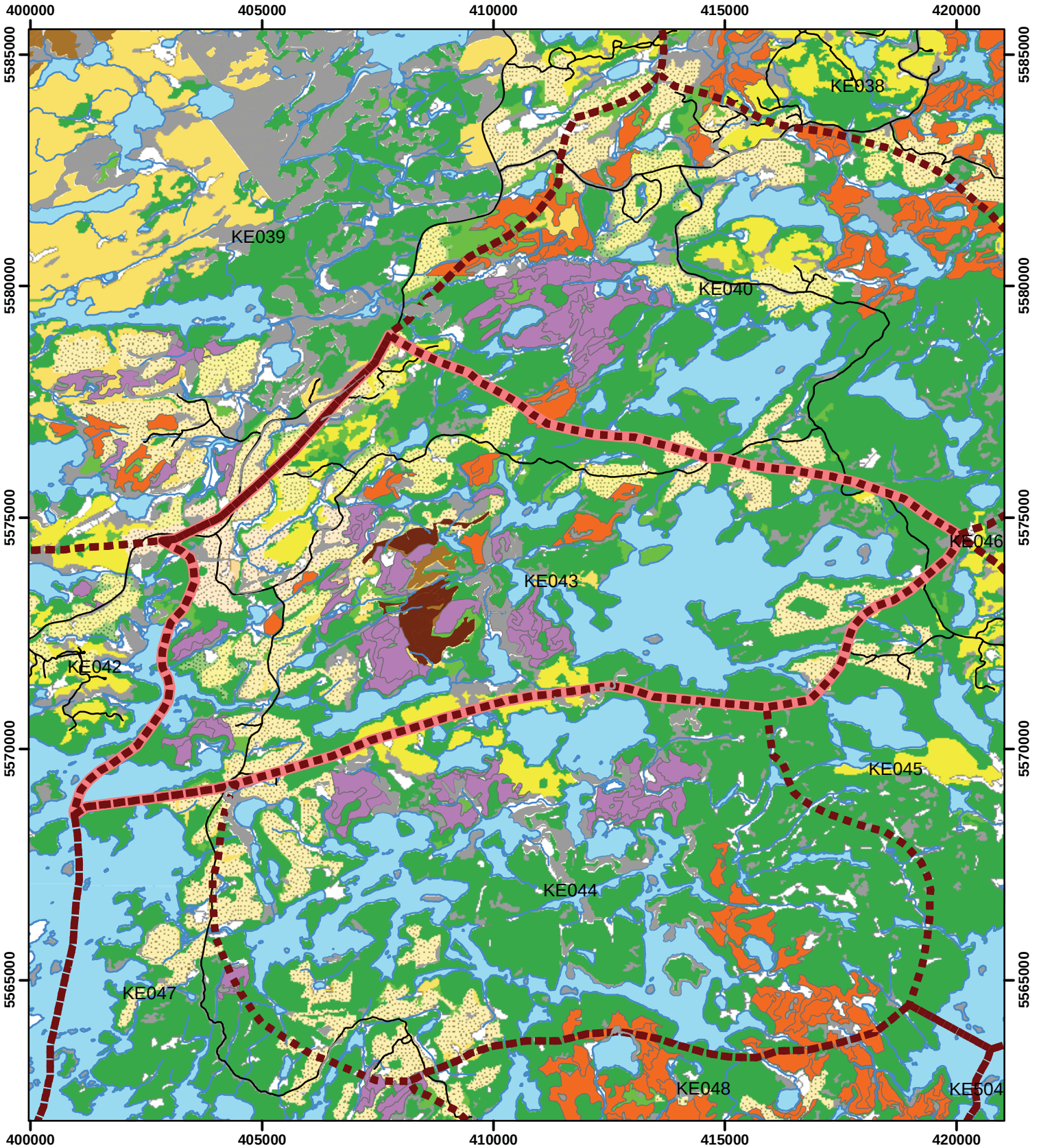
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:92,000

Planned and recent clearcut logging
Trapping Area KE043



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

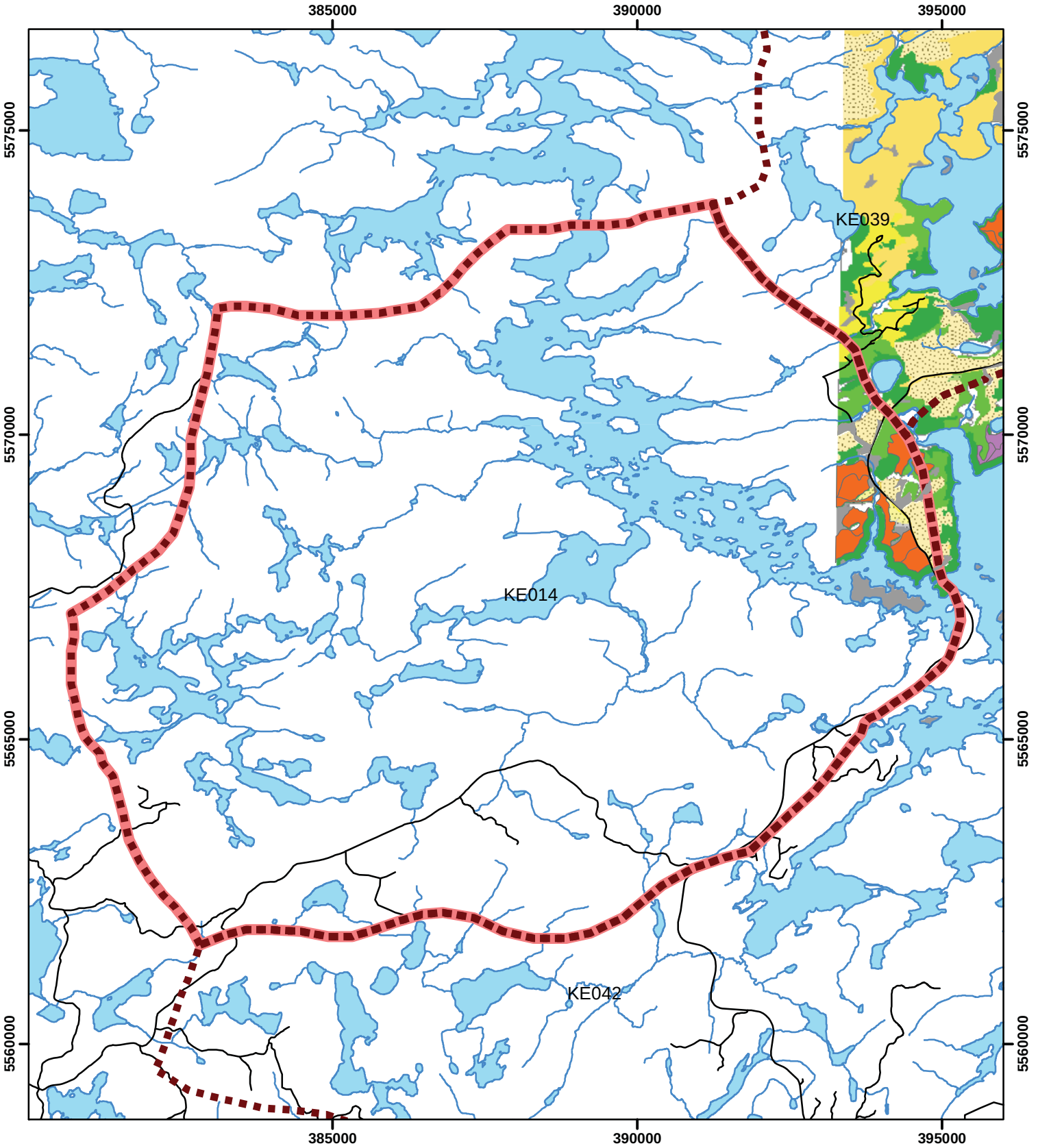
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:112,000

Planned and recent clearcut logging
Trapping Area KE014



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

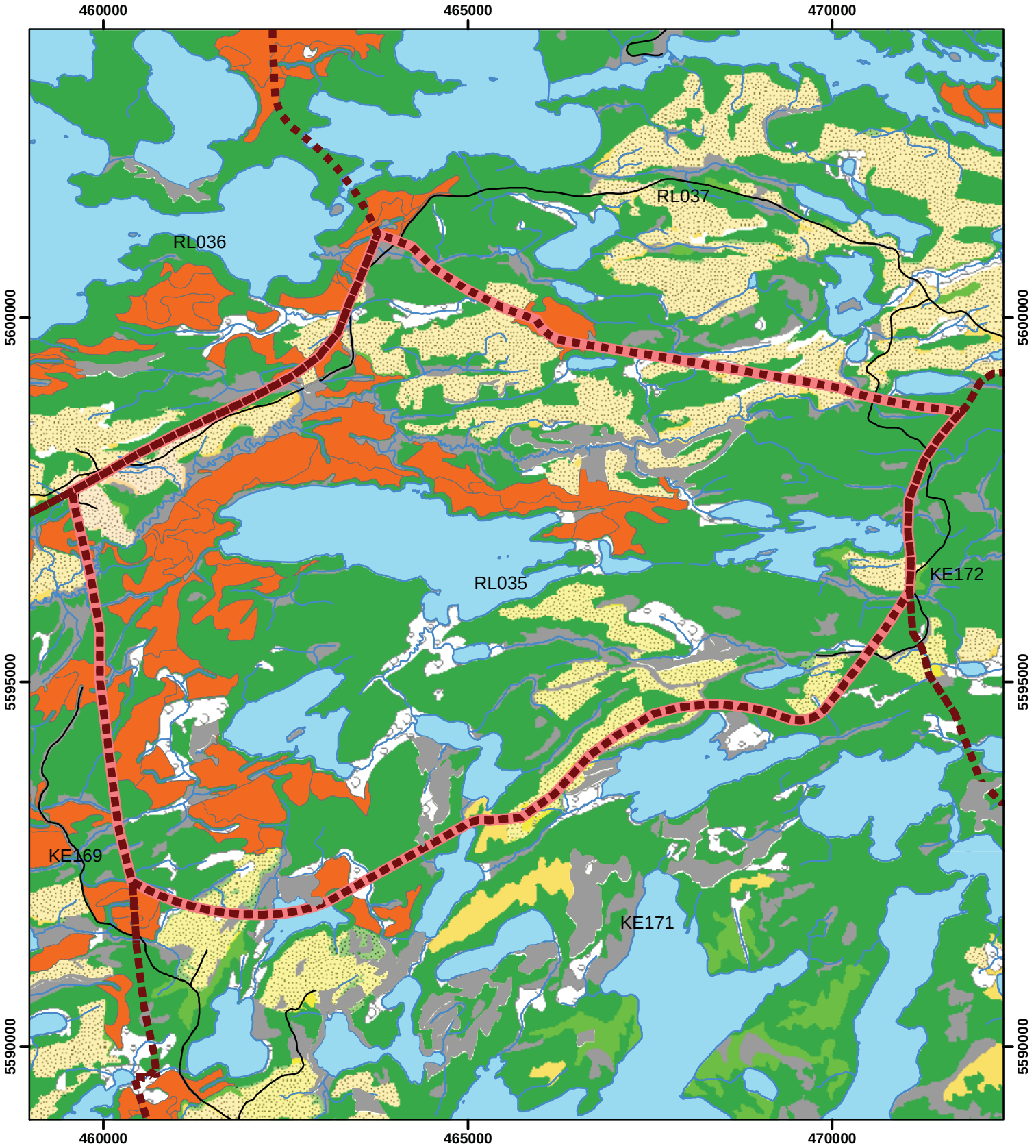
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:85,000

Planned and recent clearcut logging
Trapping Area RL035

2095



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

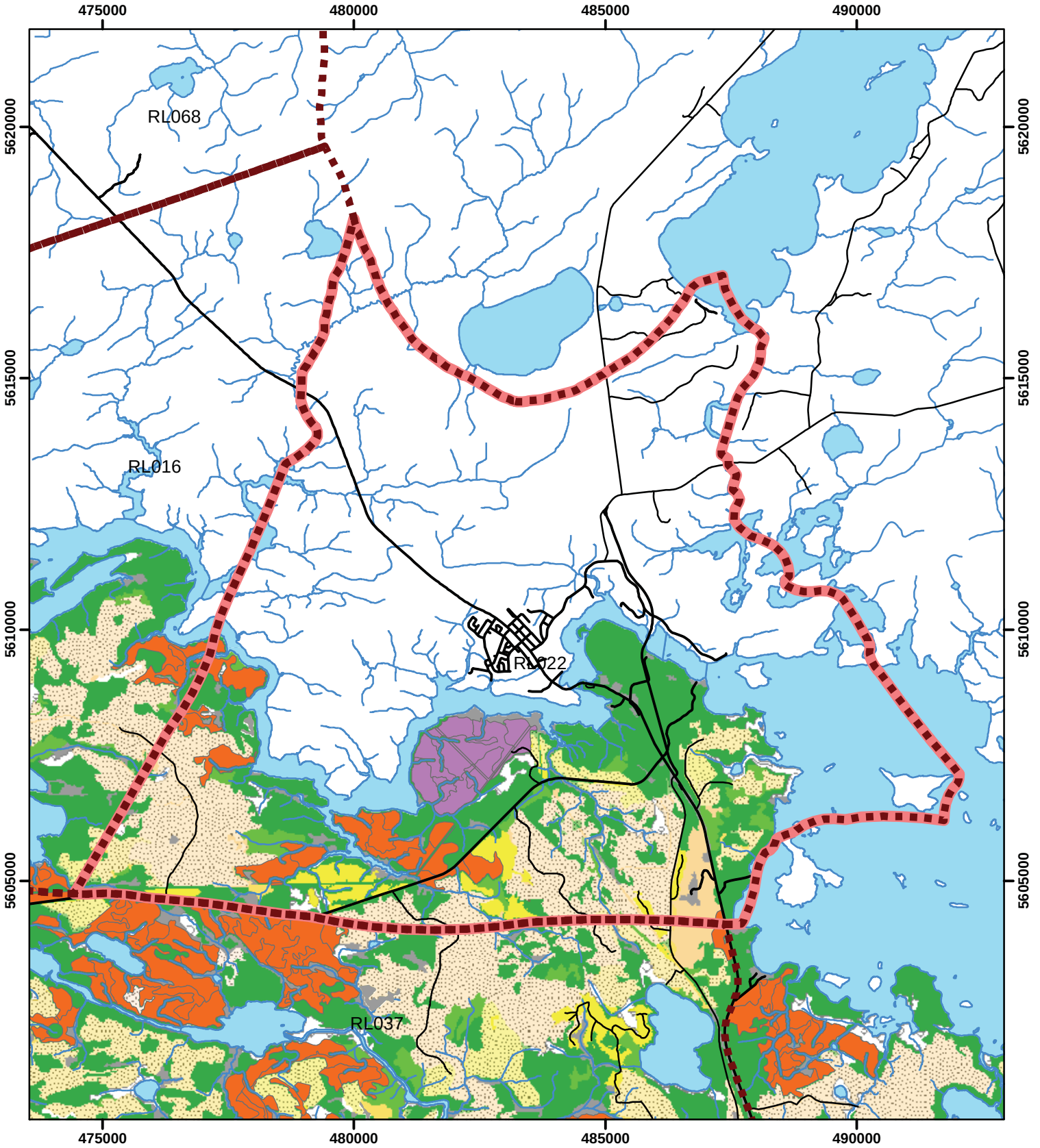
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.5 1 2 km

1:71,000

Planned and recent clearcut logging
Trapping Area RL022

2096



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

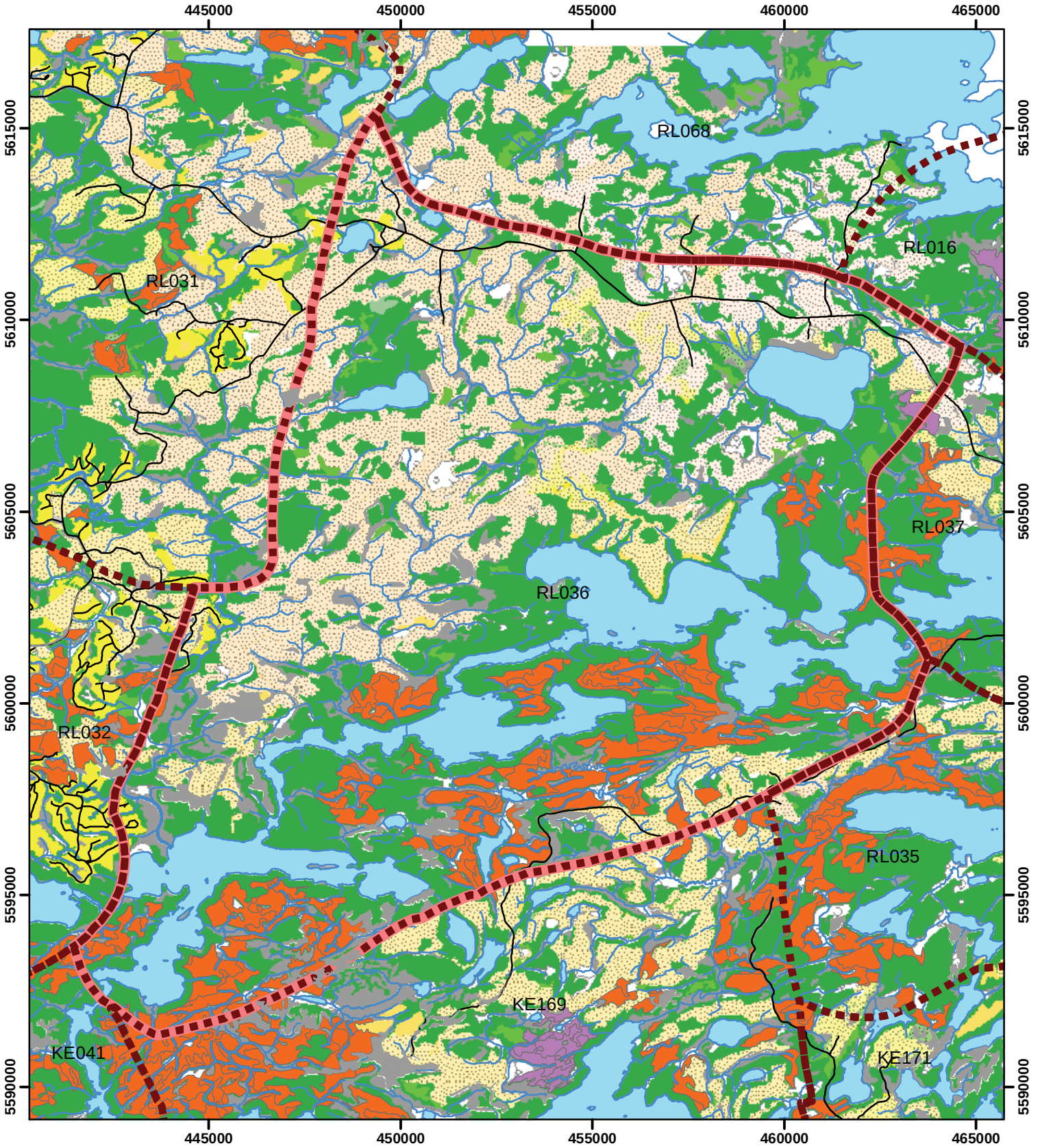
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:103,000

Planned and recent clearcut logging
Trapping Area RL036



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

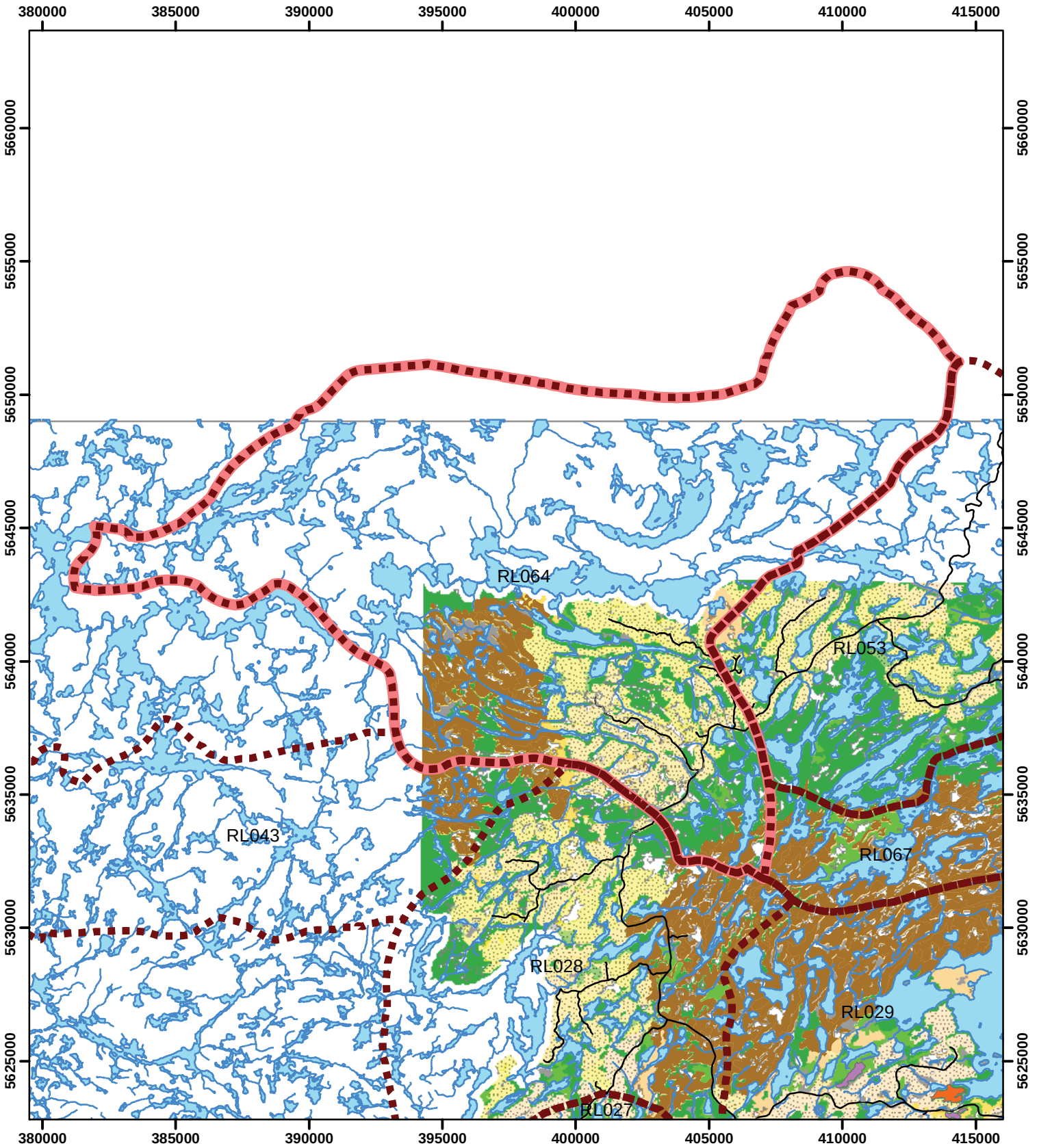
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:135,000

Planned and recent clearcut logging
Trapping Area RL064



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

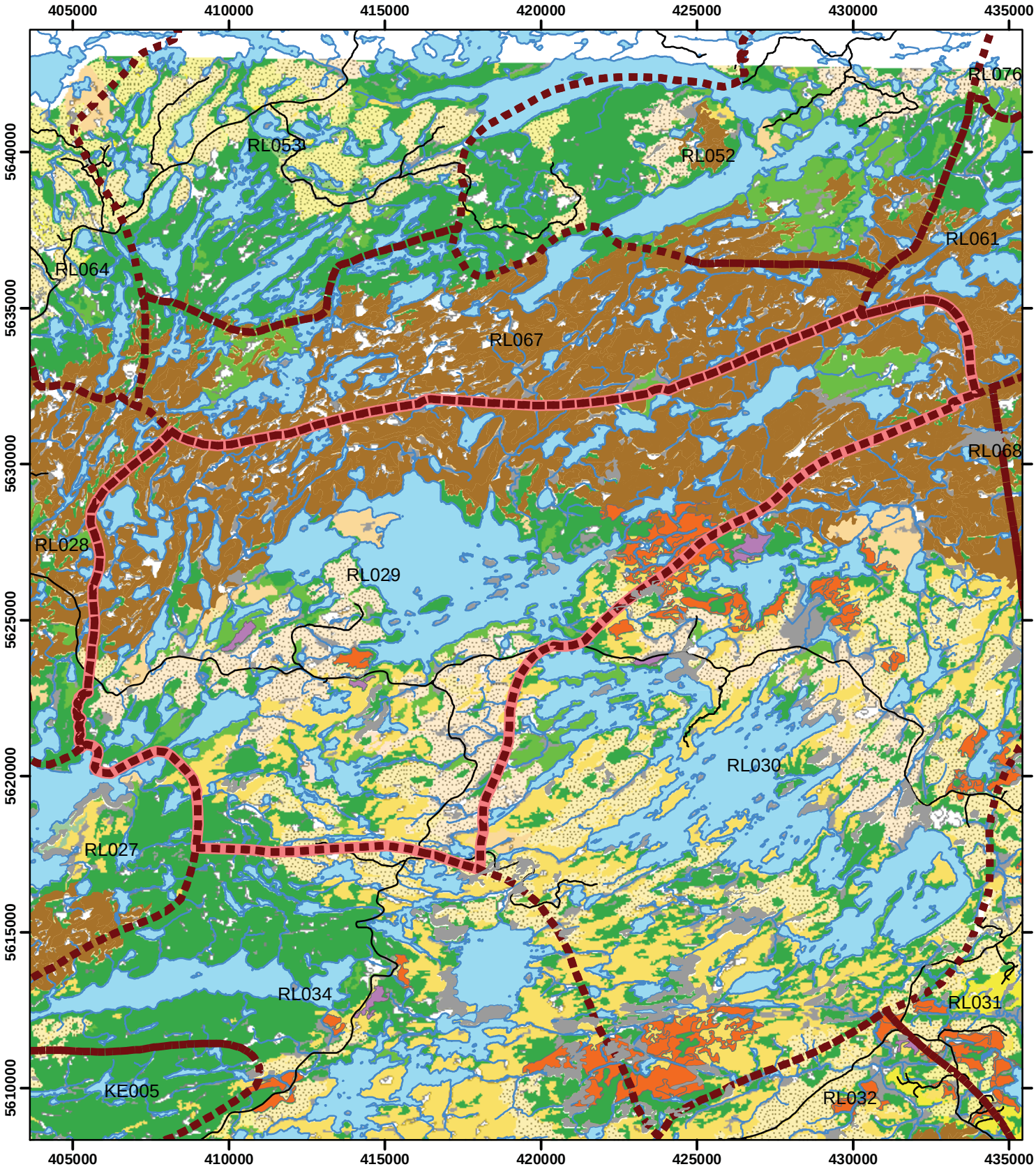
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.75 3.5 7 km

1:194,000

Planned and recent clearcut logging
Trapping Area RL029



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

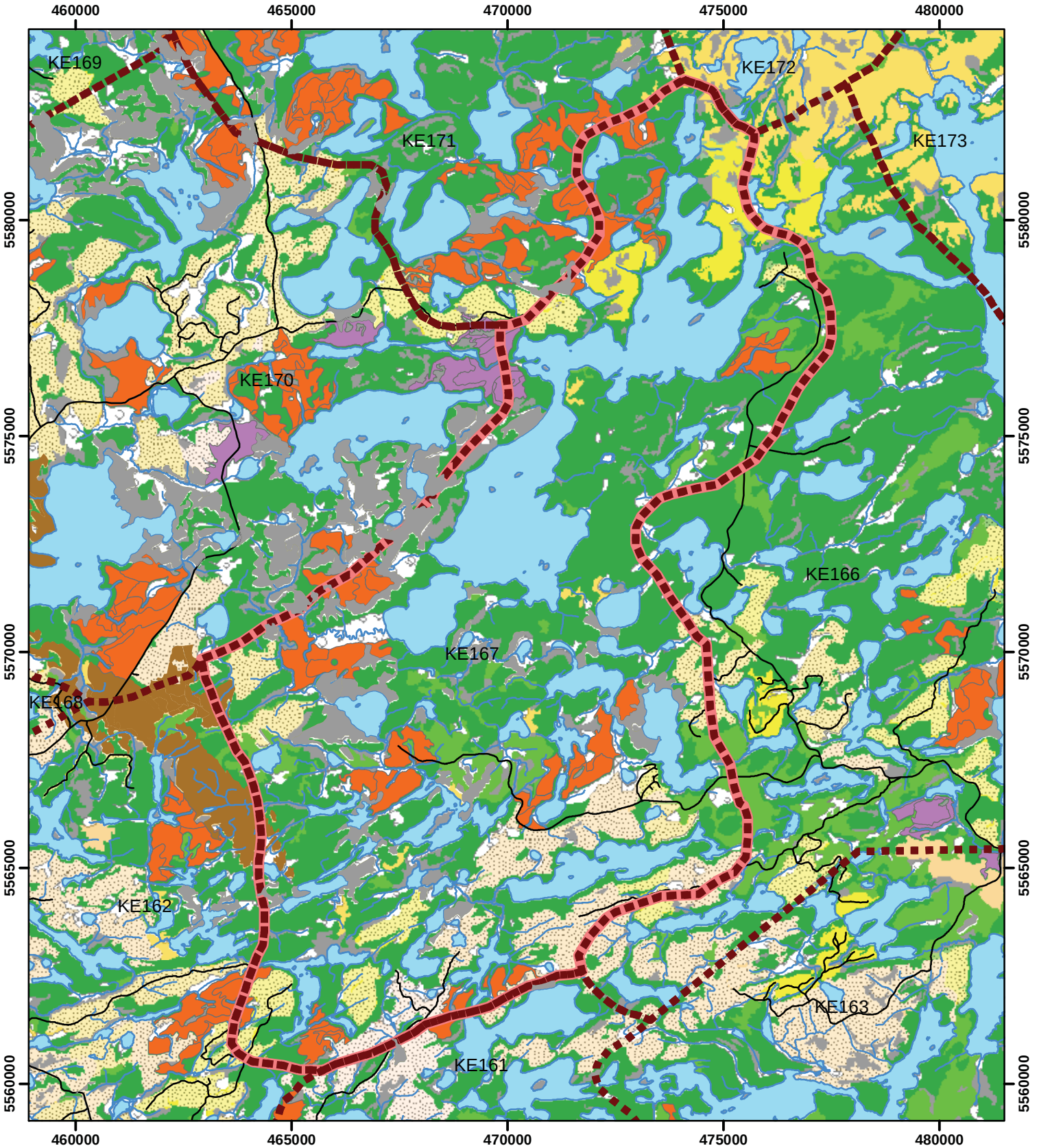
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.5 3 6 km

1:169,000

Planned and recent clearcut logging
Trapping Area KE167



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

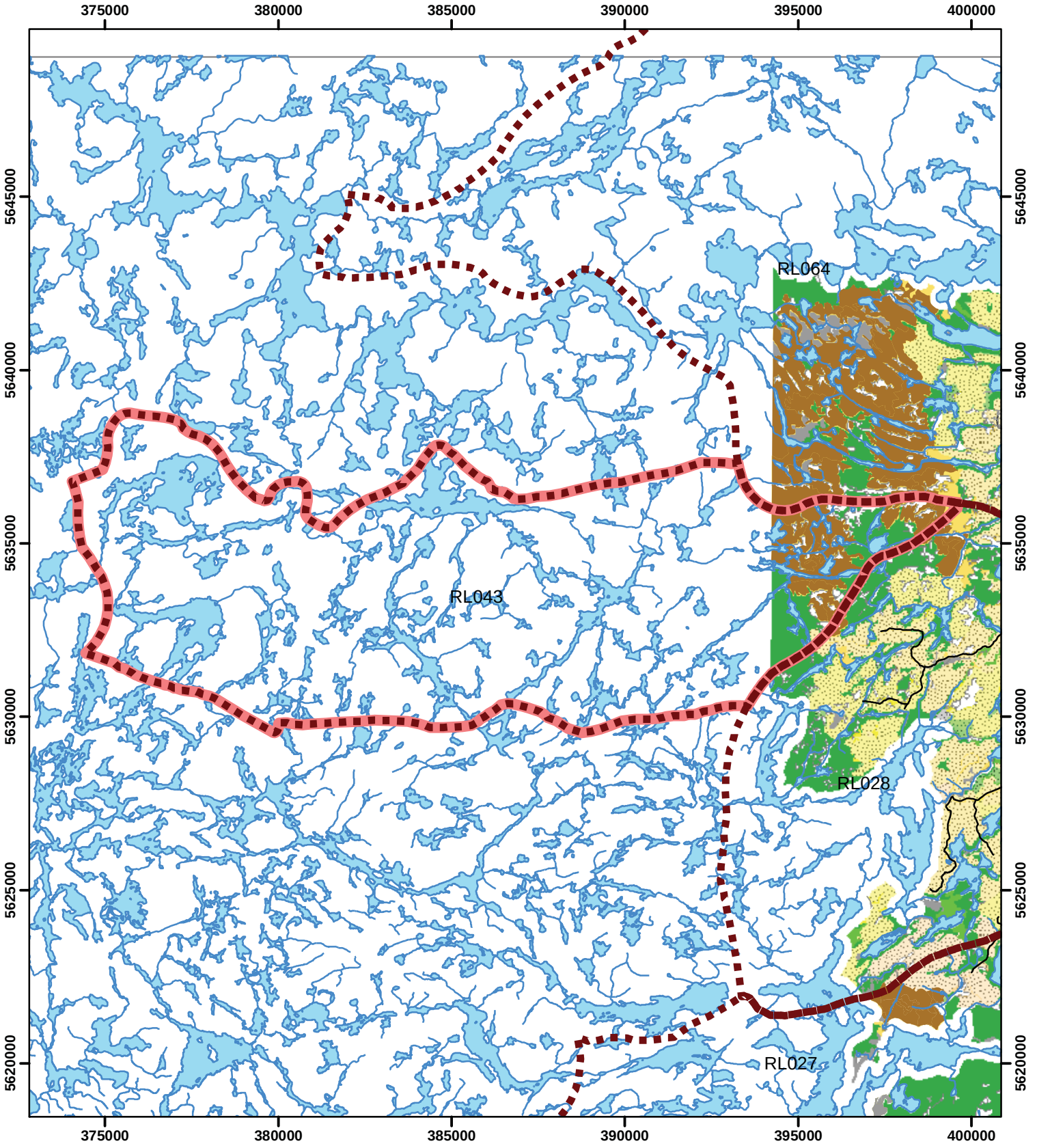
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:120,000

Planned and recent clearcut logging
Trapping Area RL043

2101 3 1



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

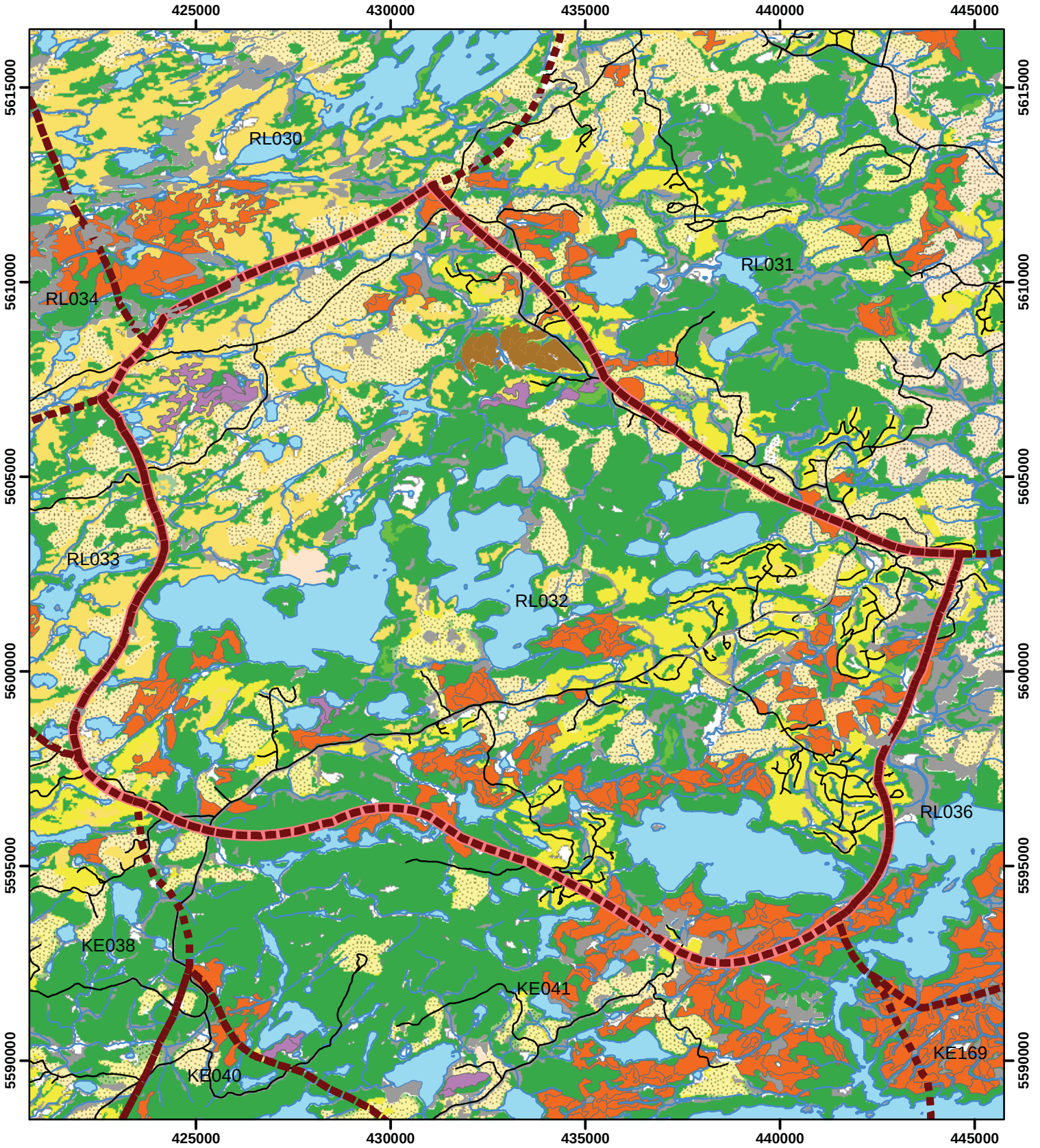
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:149,000

Planned and recent clearcut logging
Trapping Area RL032



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

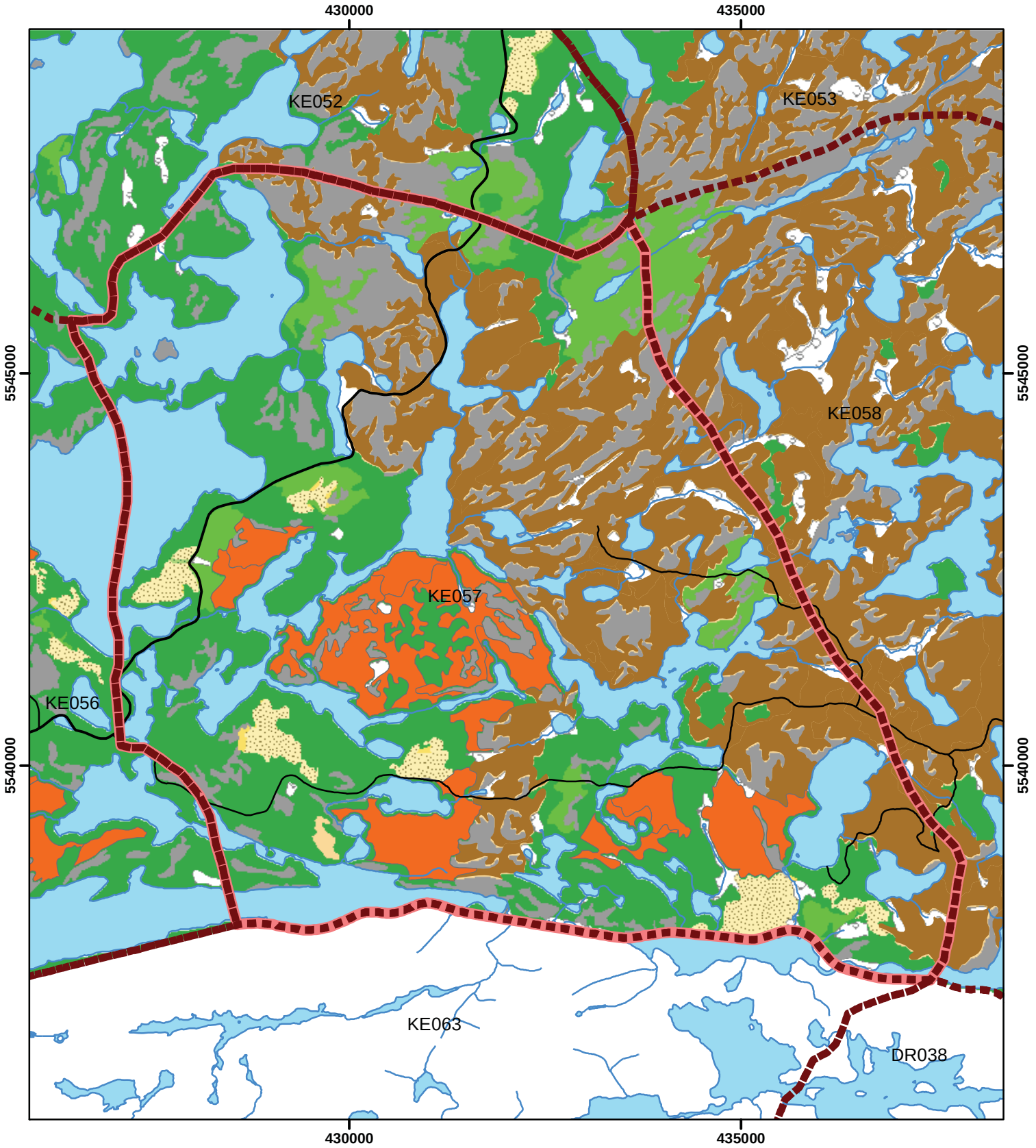
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:133,000

Planned and recent clearcut logging
Trapping Area KE057



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

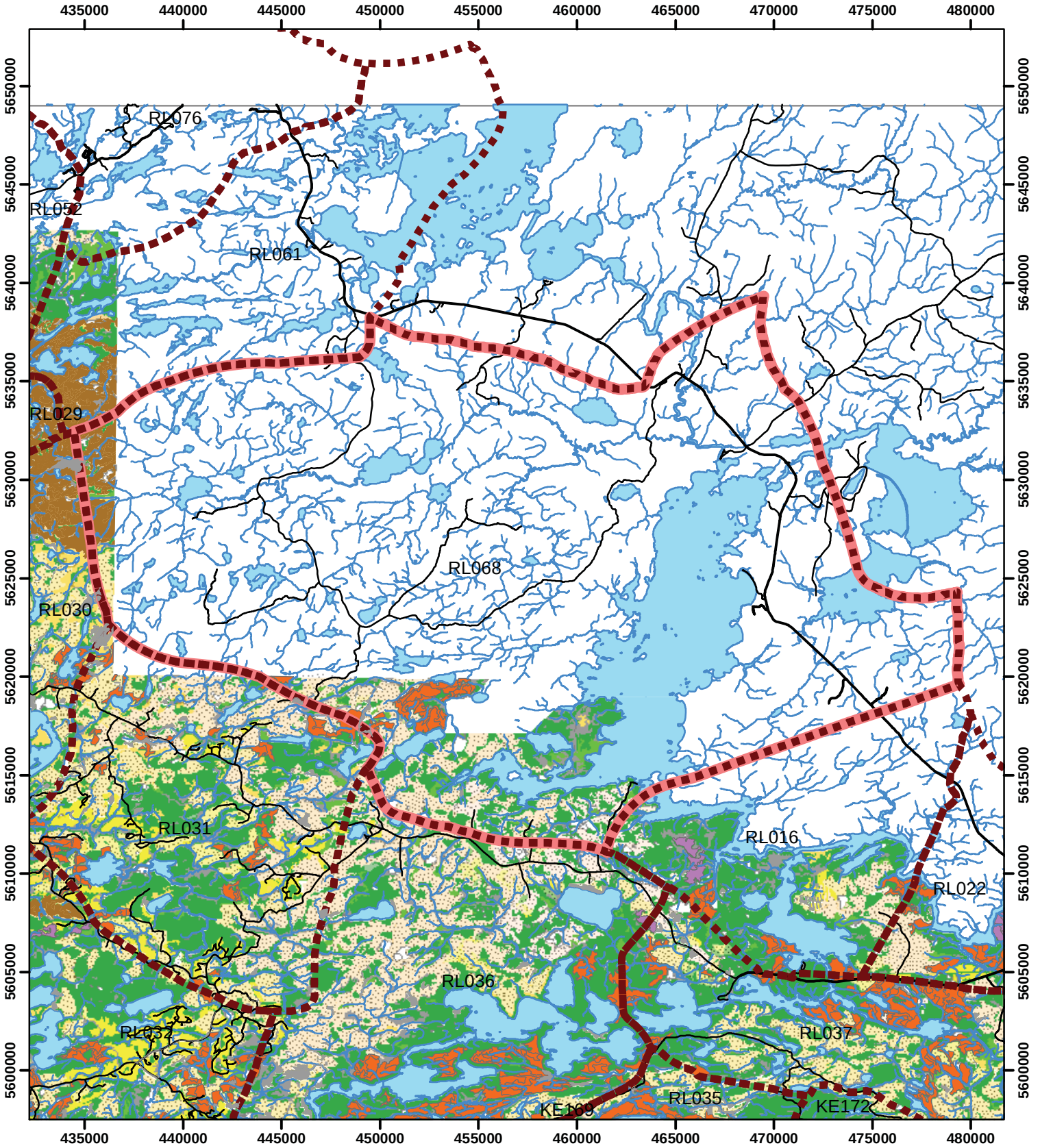
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.5 1 2 km

1:66,000

Planned and recent clearcut logging
Trapping Area RL068

2104



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

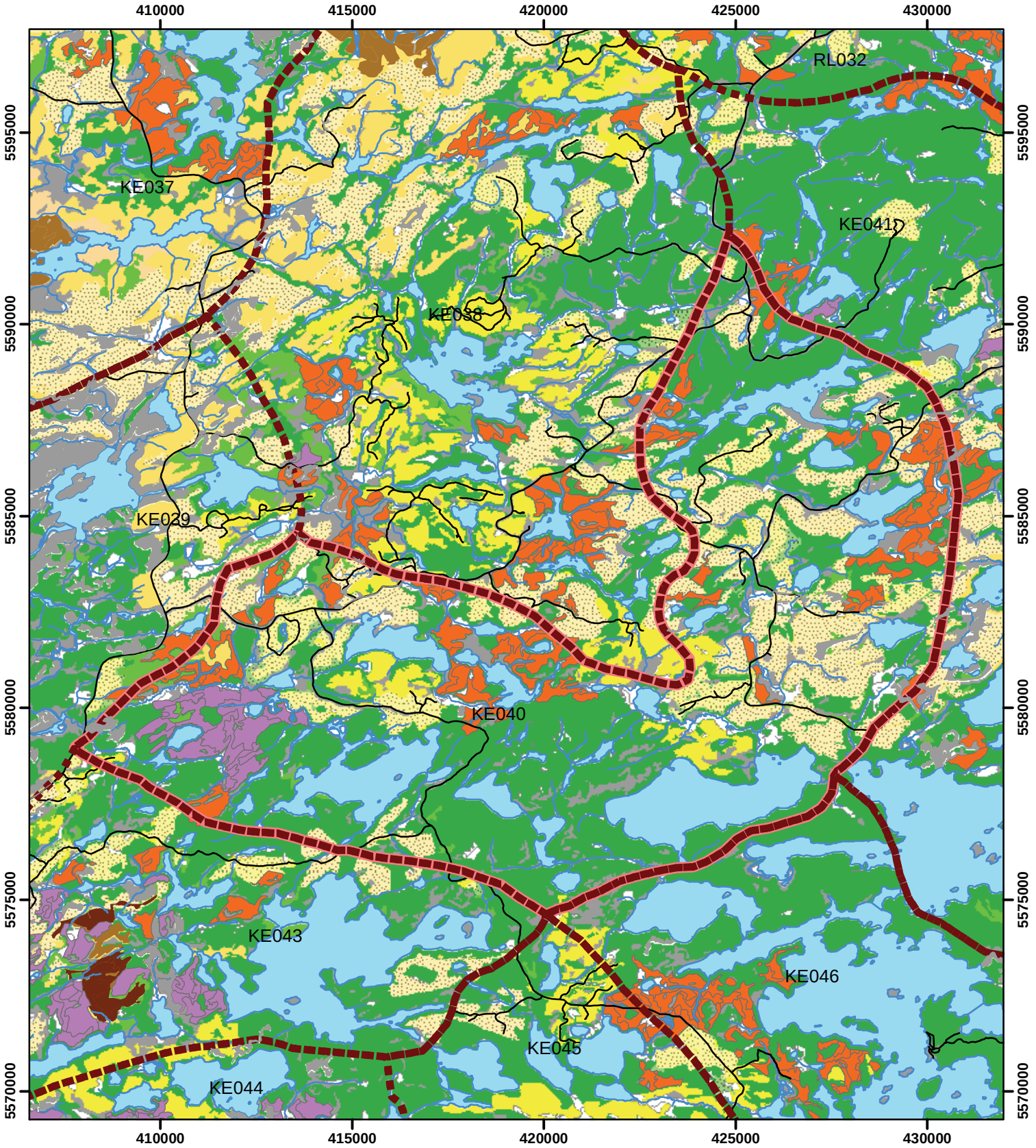
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 2.5 5 10 km

1:263,000

Planned and recent clearcut logging
Trapping Area KE040



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

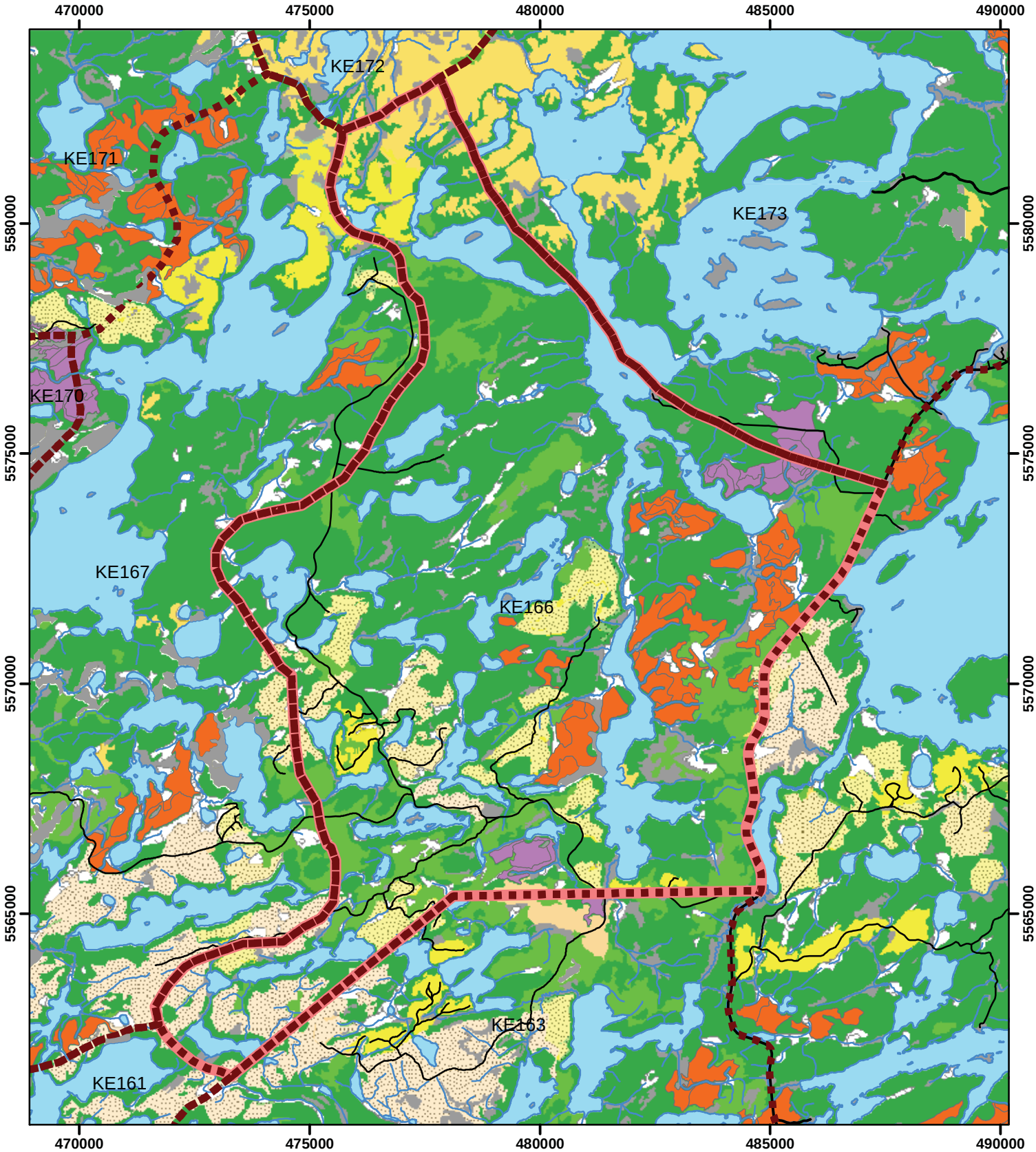
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:135,000

Planned and recent clearcut logging
Trapping Area KE166



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

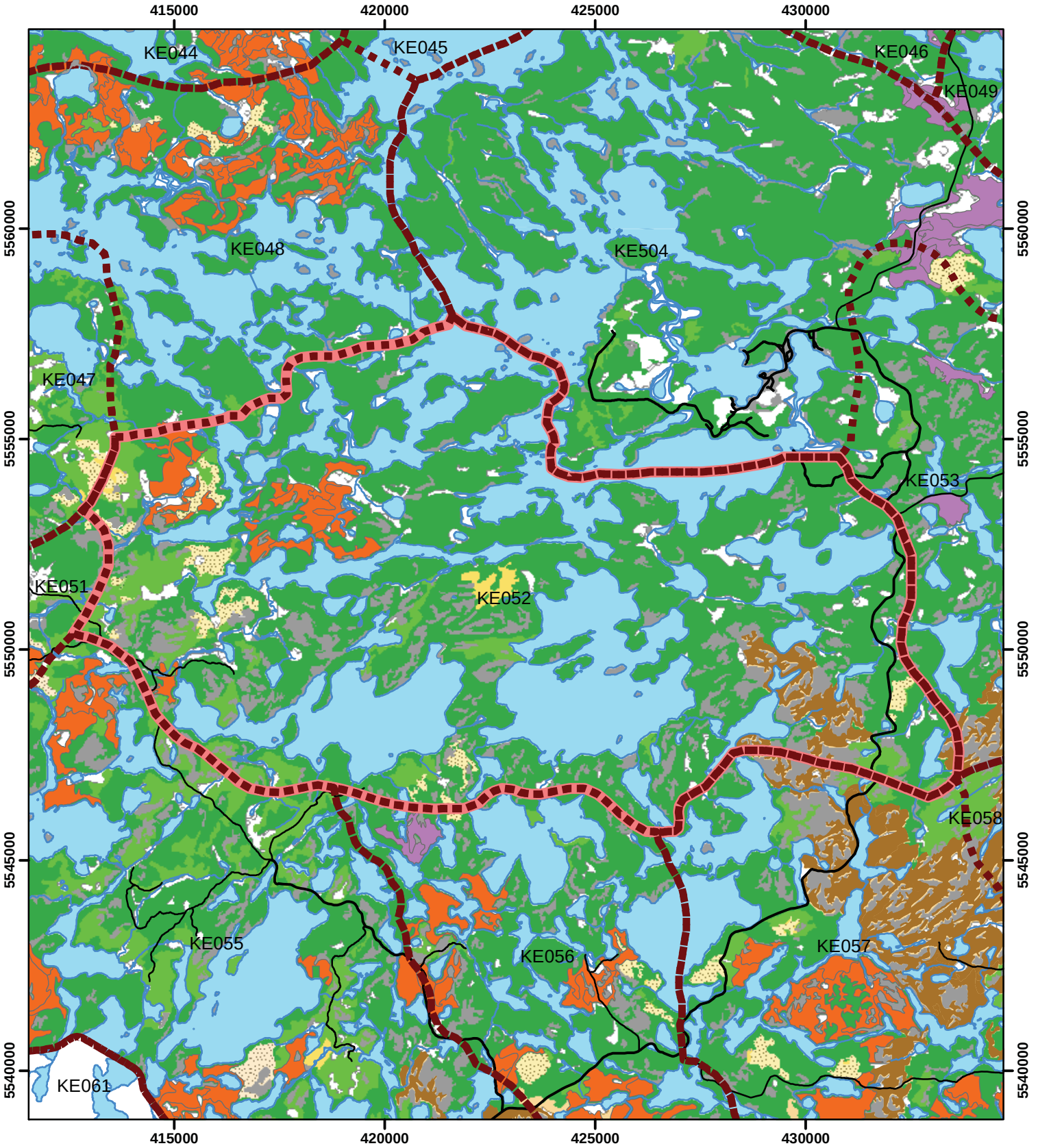
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

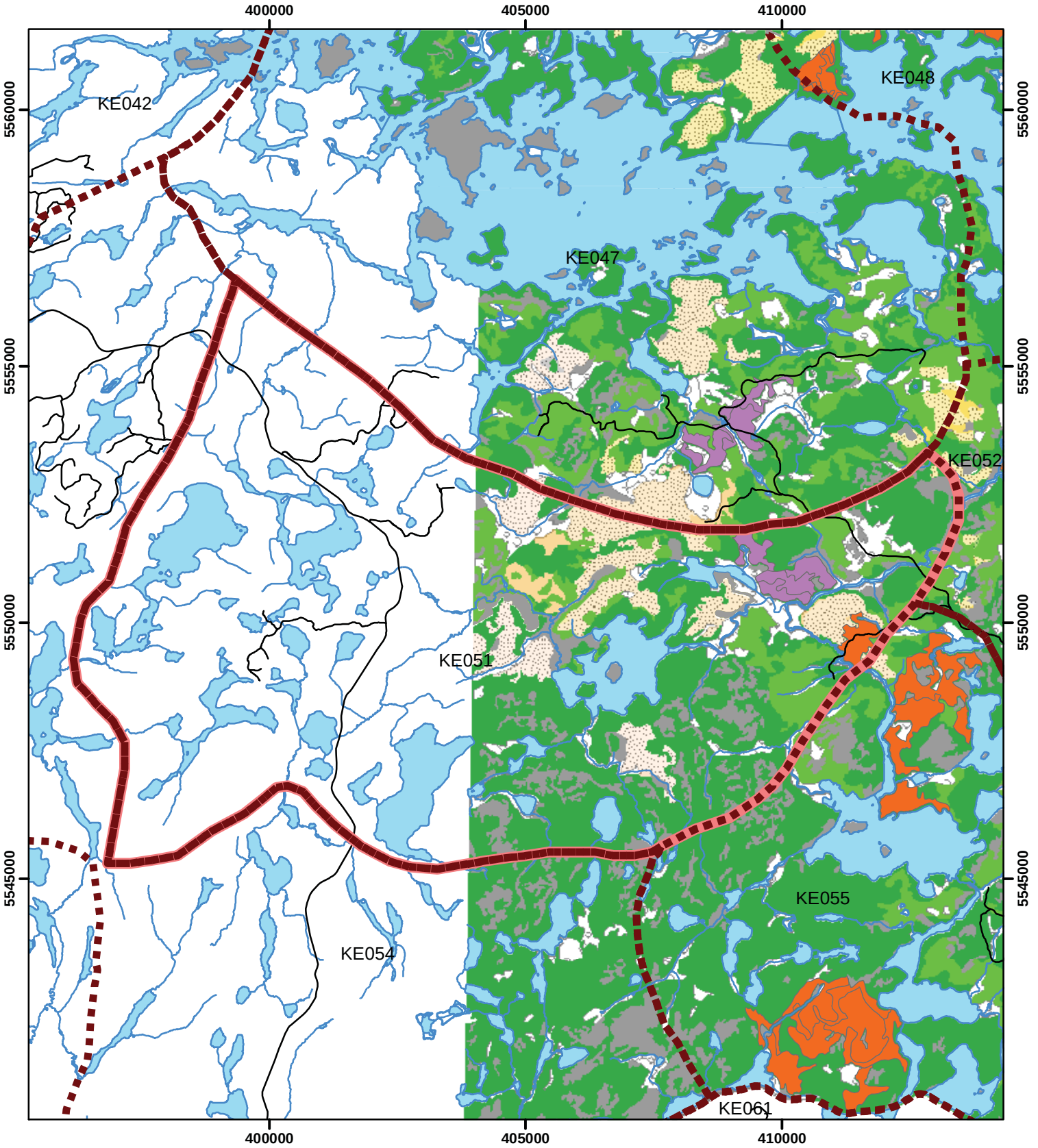
0 1 2 4 km

1:113,000

Planned and recent clearcut logging
Trapping Area KE052



Planned and recent clearcut logging
Trapping Area KE051



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

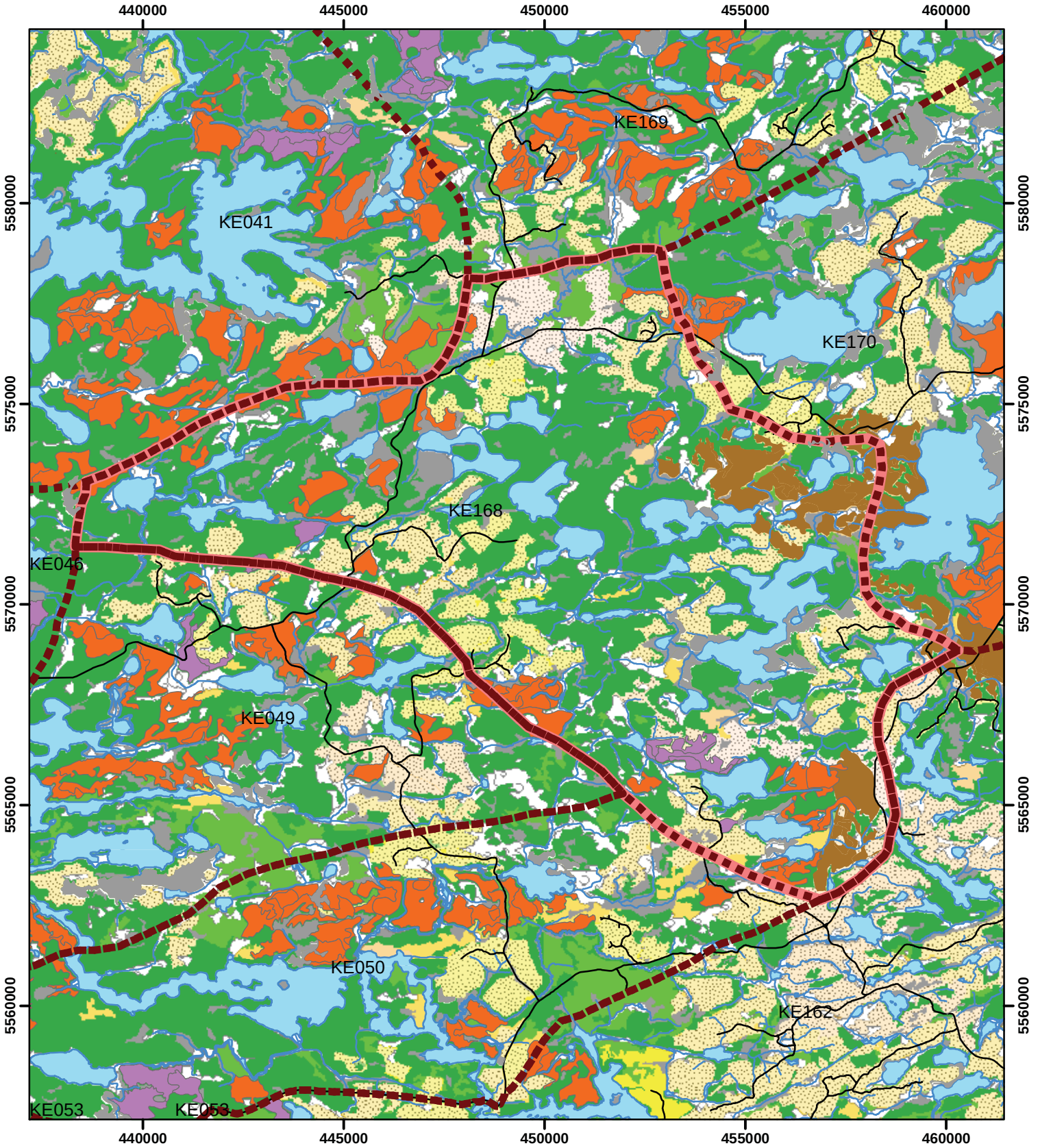
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:101,000

Planned and recent clearcut logging
Trapping Area KE168



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

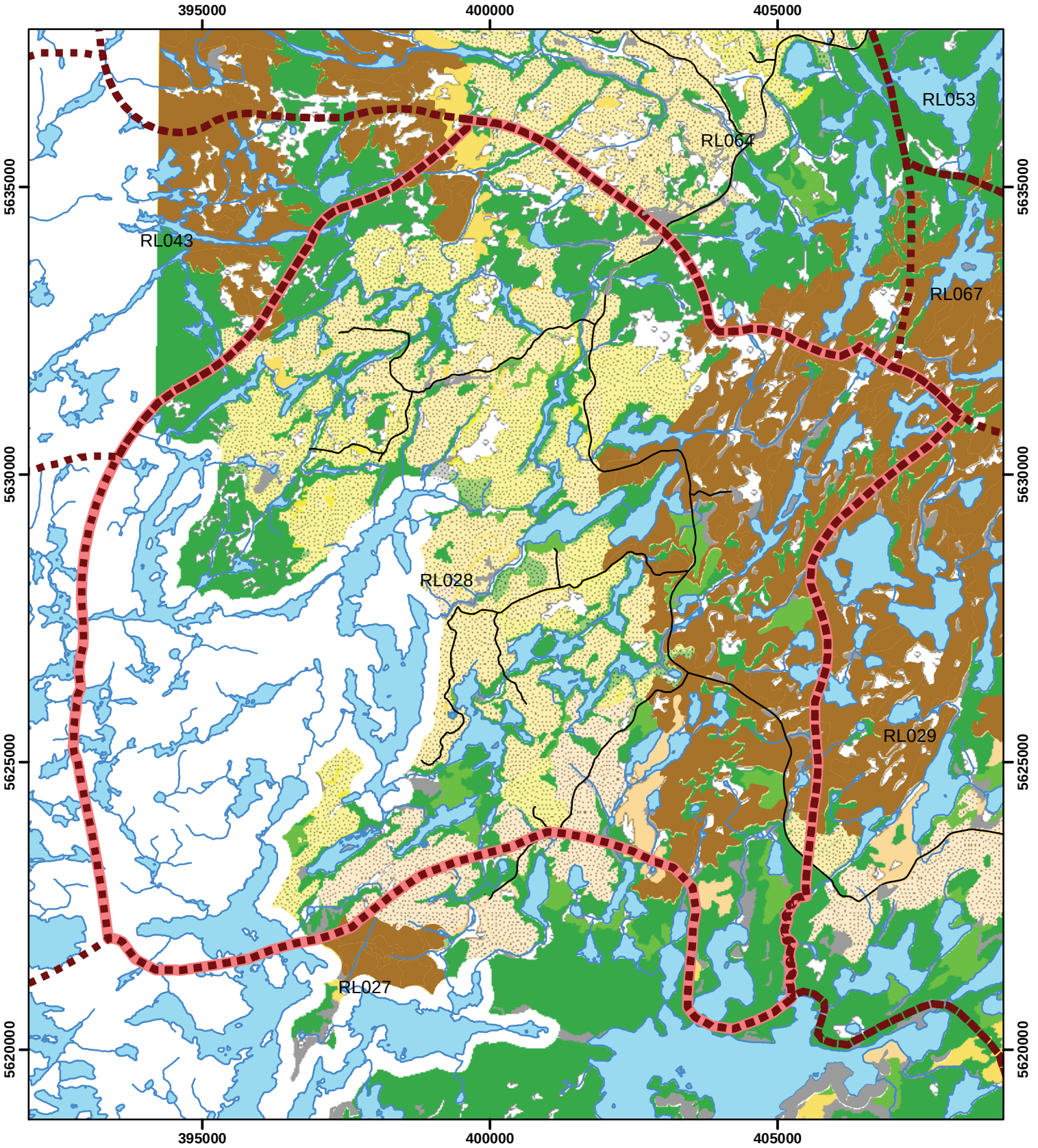
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:129,000

Planned and recent clearcut logging
Trapping Area RL028



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

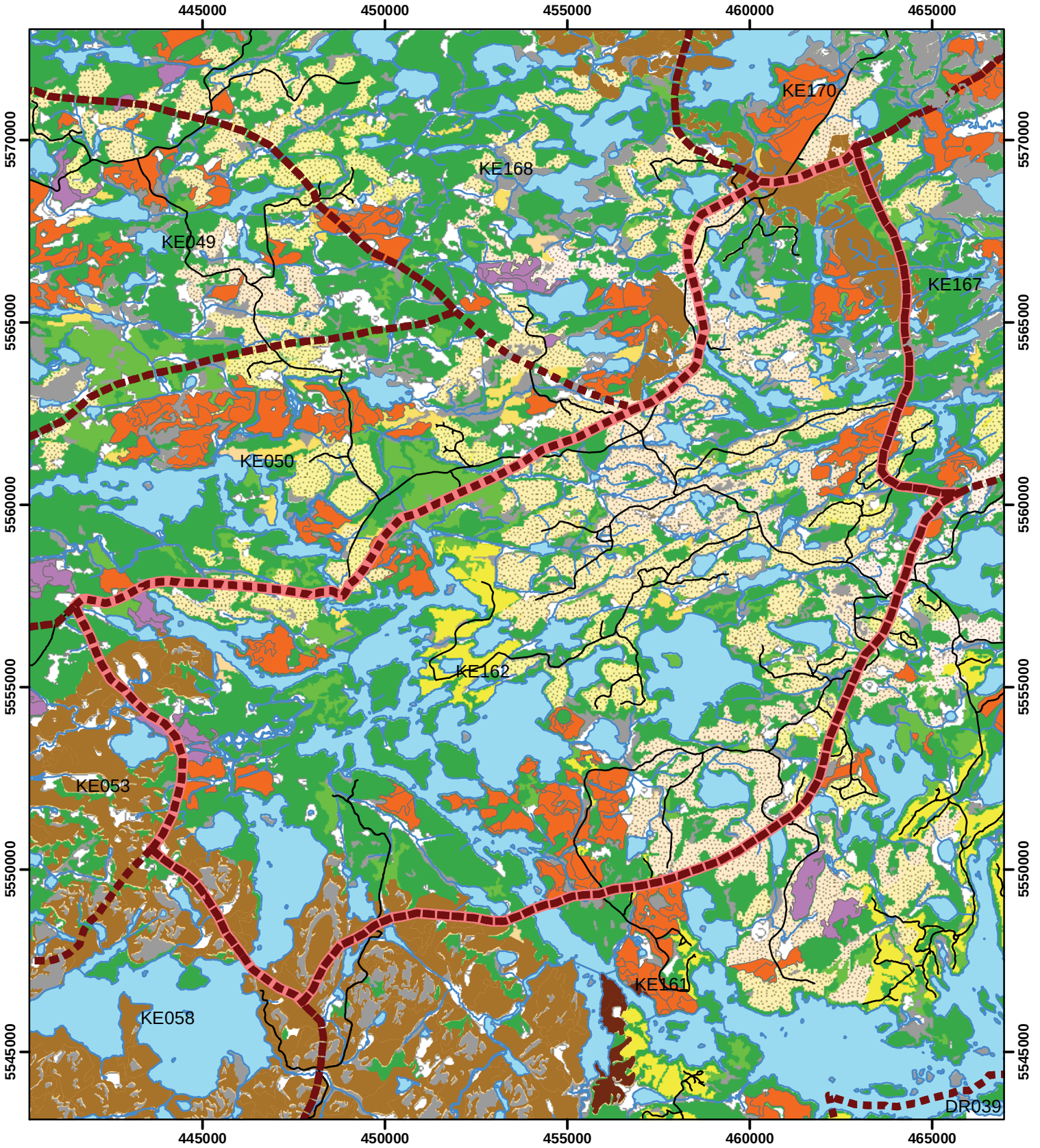
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:90,000

Planned and recent clearcut logging
Trapping Area KE162



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

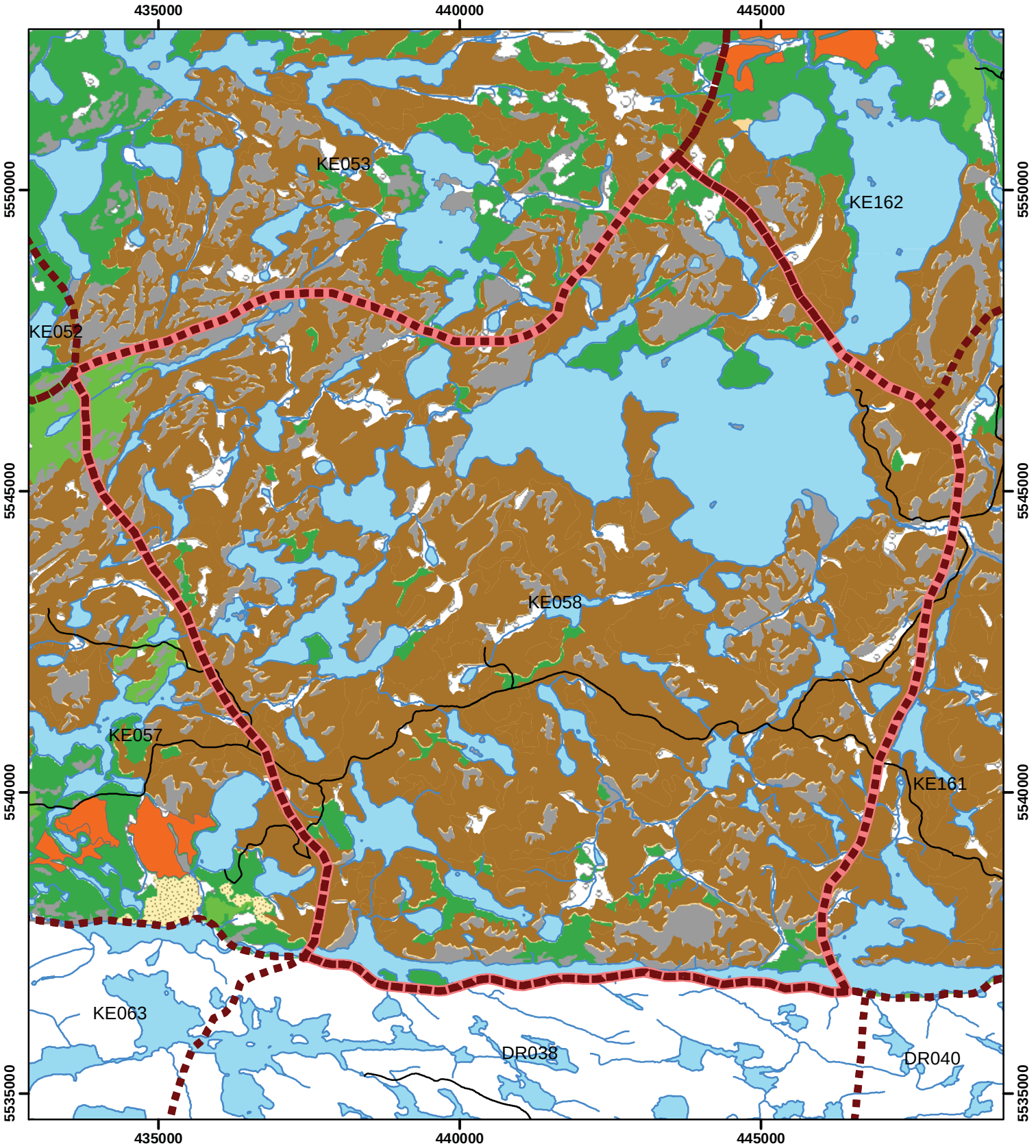
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:142,000

Planned and recent clearcut logging
Trapping Area KE058



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

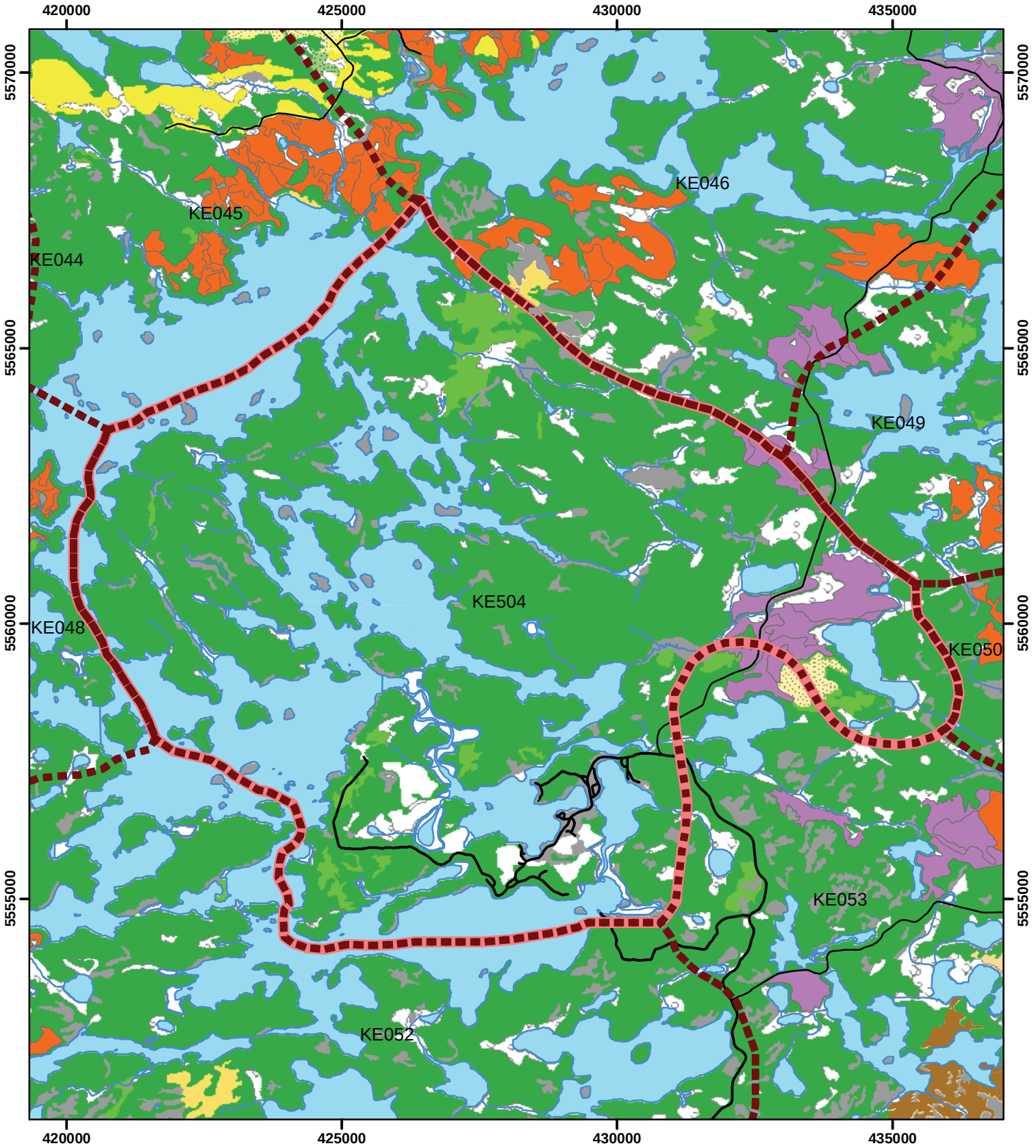
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:86,000

Planned and recent clearcut logging
Trapping Area KE504



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

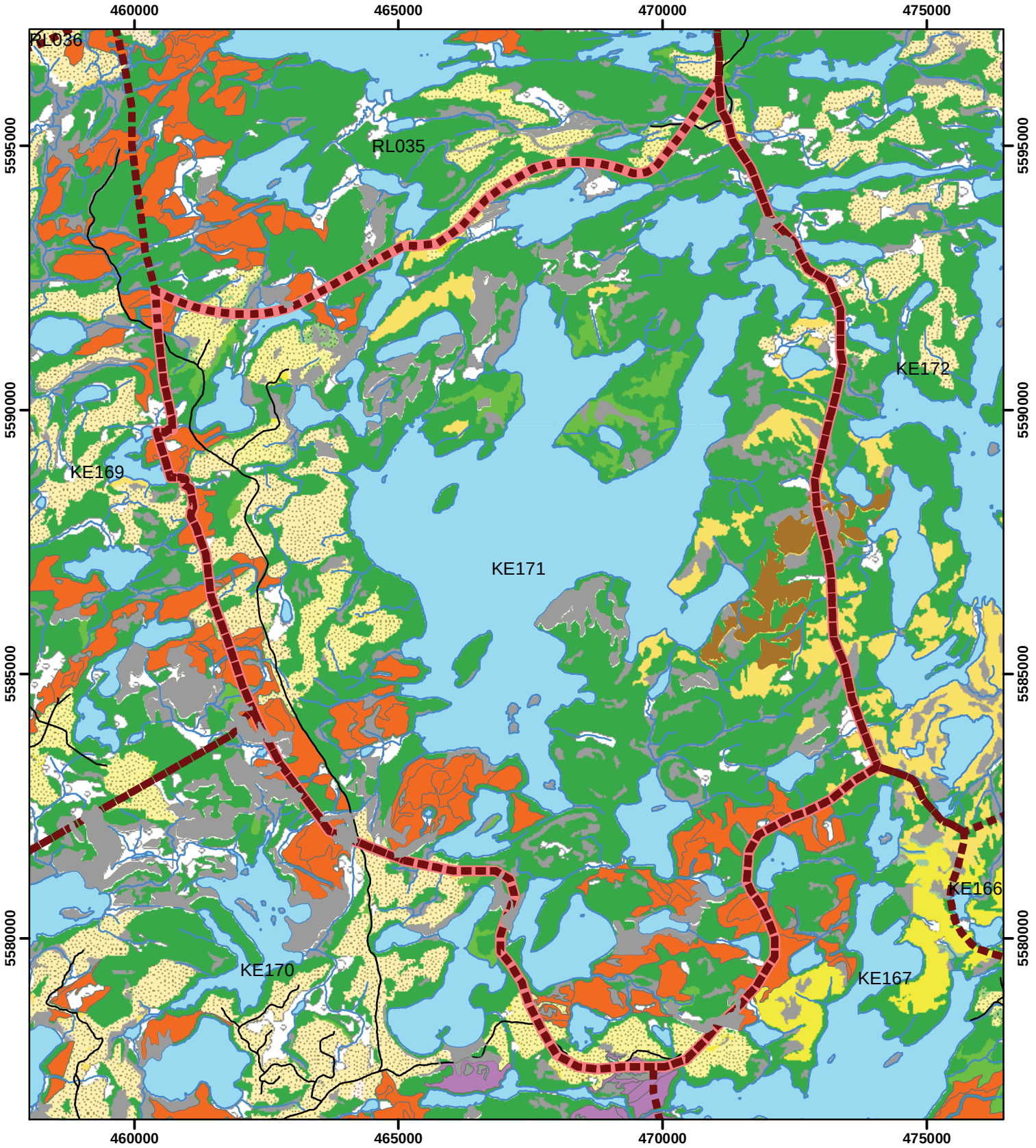
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

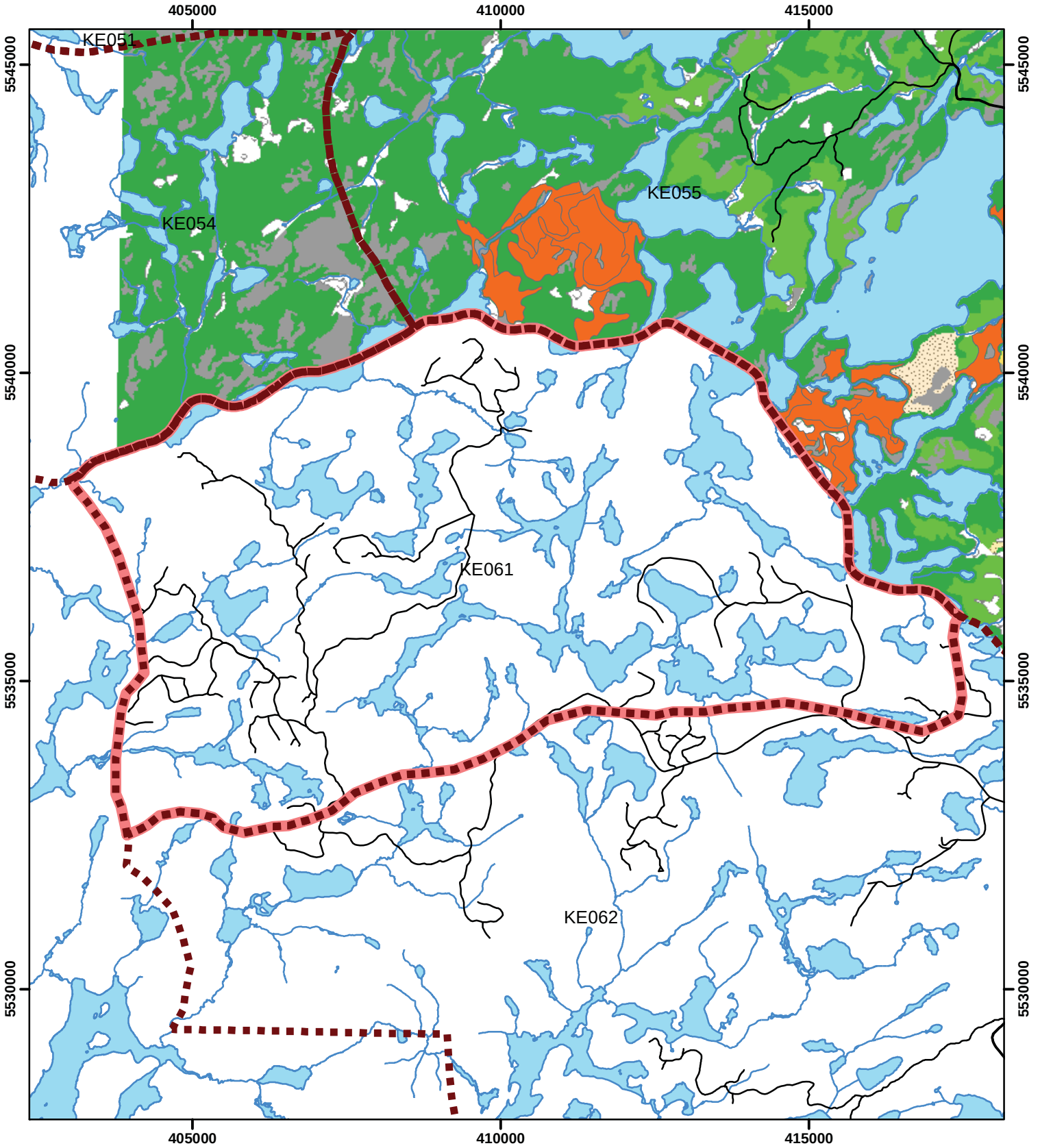
0 0.75 1.5 3 km

1:94,000

Planned and recent clearcut logging
Trapping Area KE171



Planned and recent clearcut logging
Trapping Area KE061



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

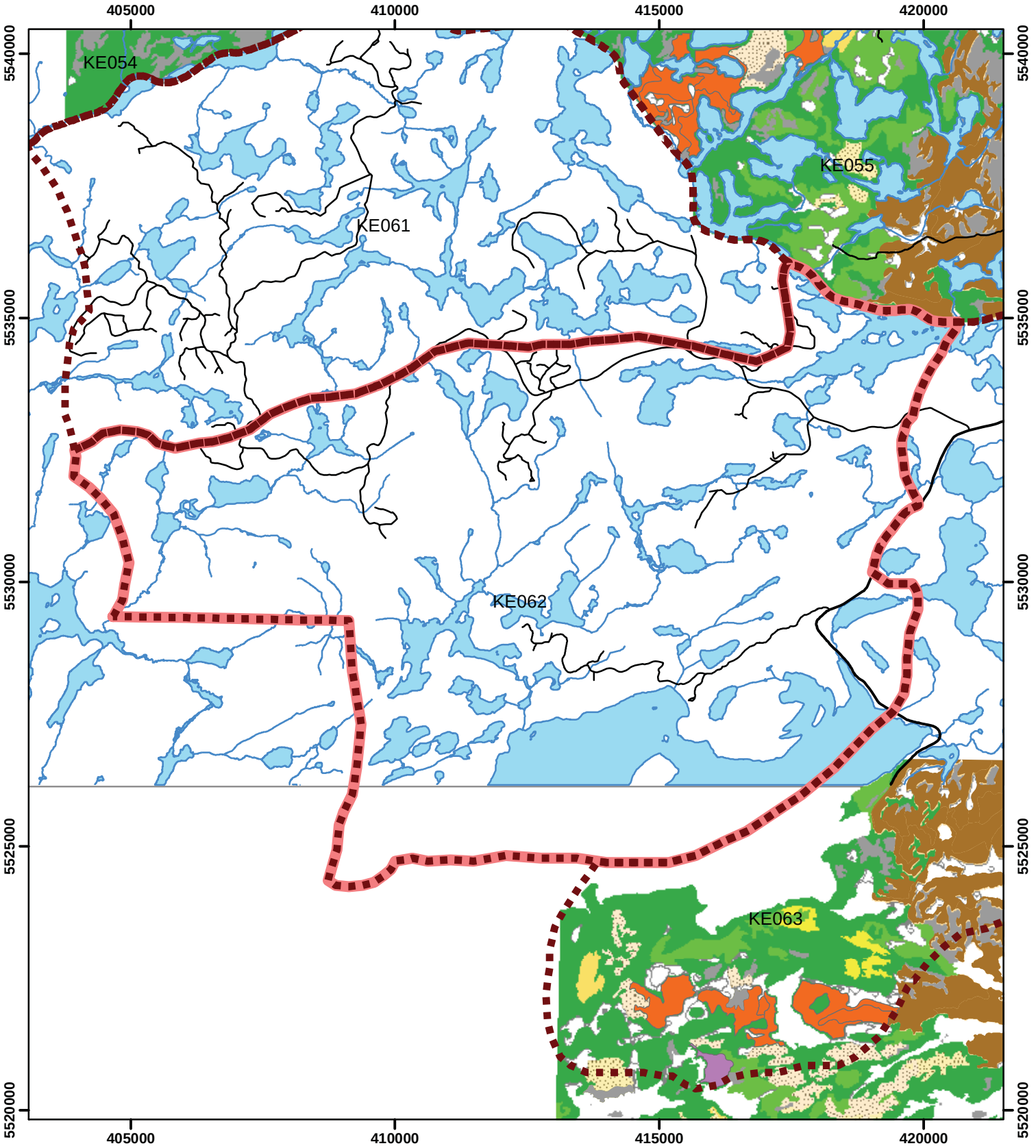
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:84,000

Planned and recent clearcut logging
Trapping Area KE062



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

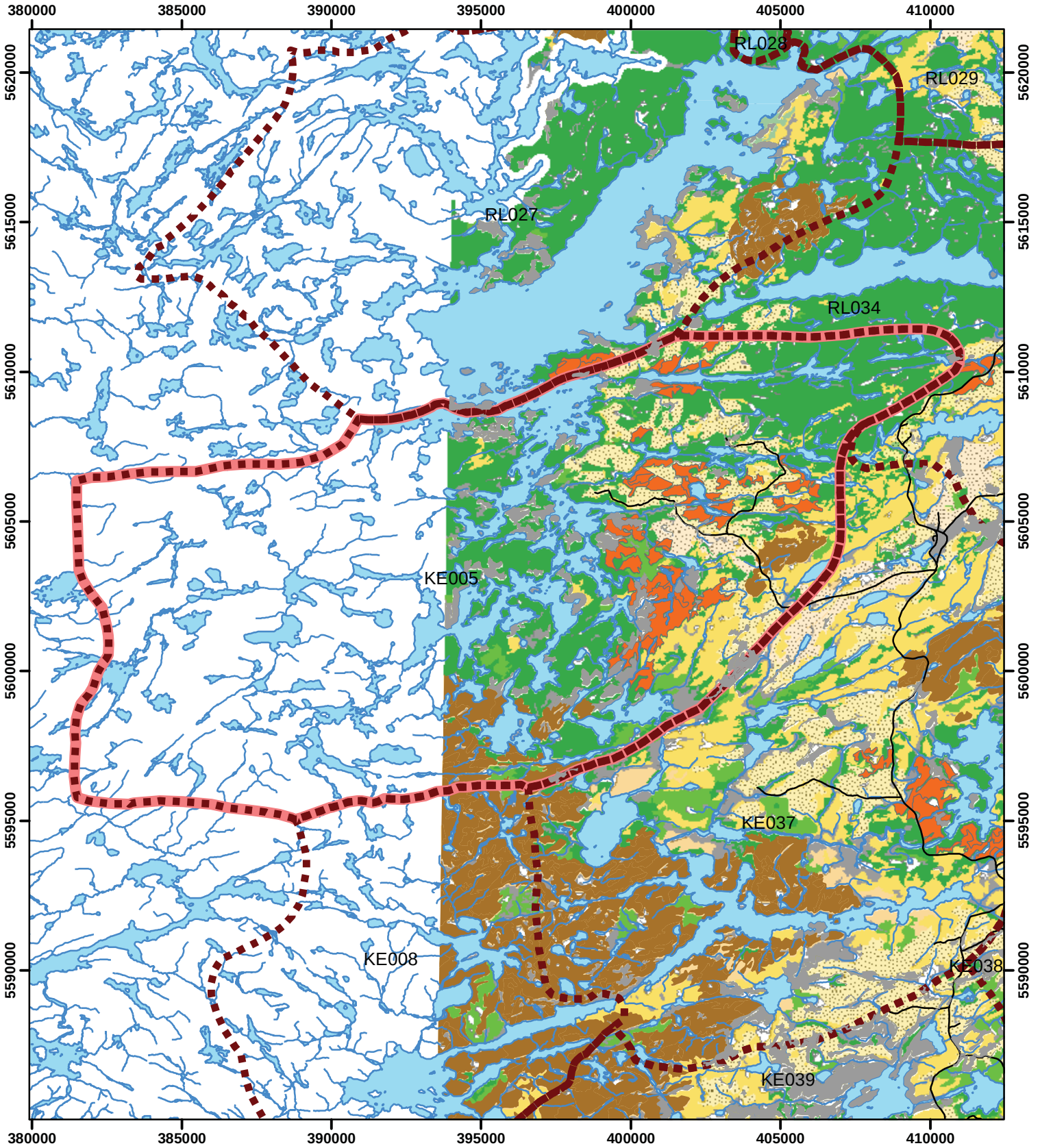
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:98,000

Planned and recent clearcut logging
Trapping Area KE005



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

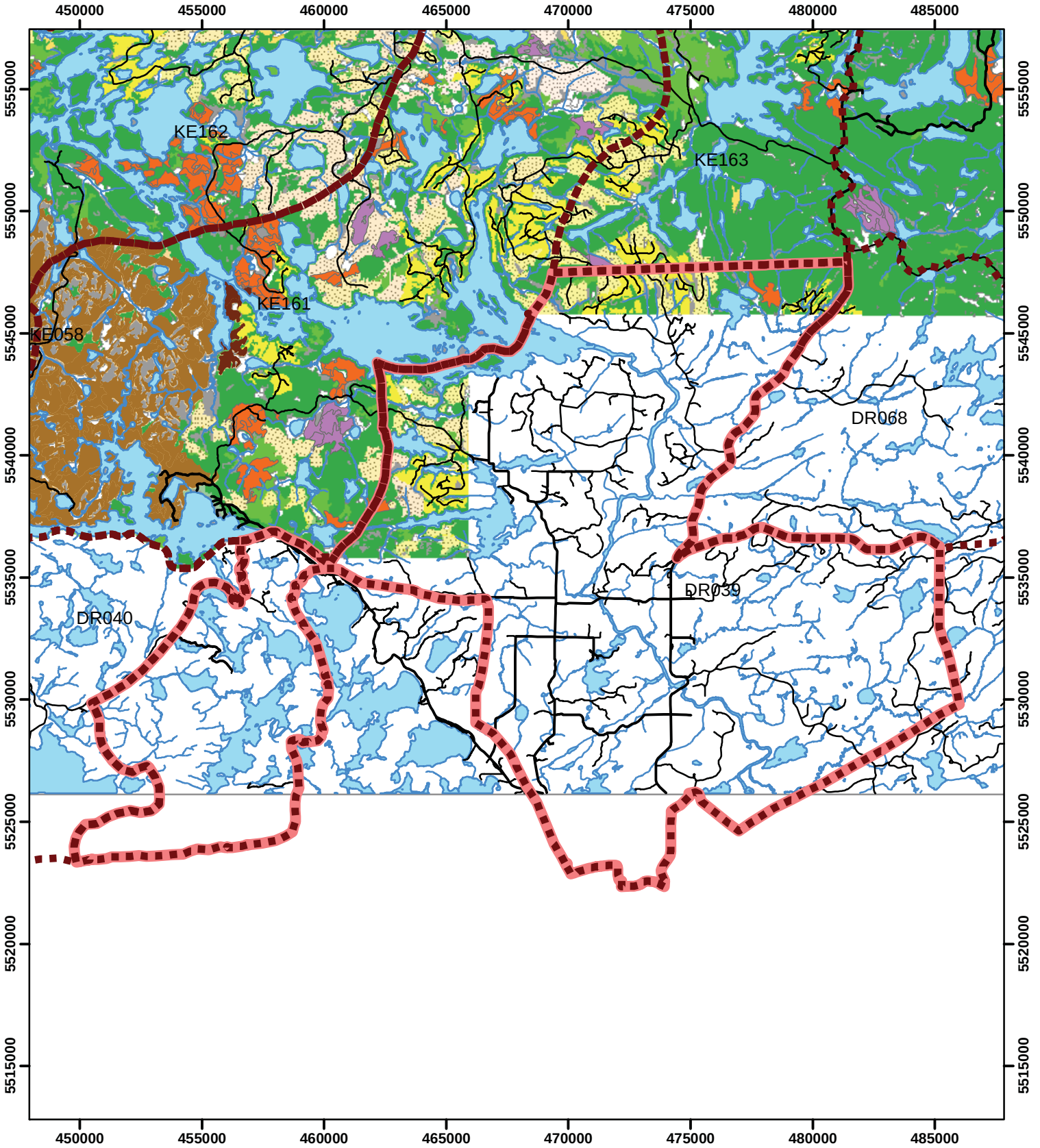
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.5 3 6 km

1:173,000

Planned and recent clearcut logging
Trapping Area DR039



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

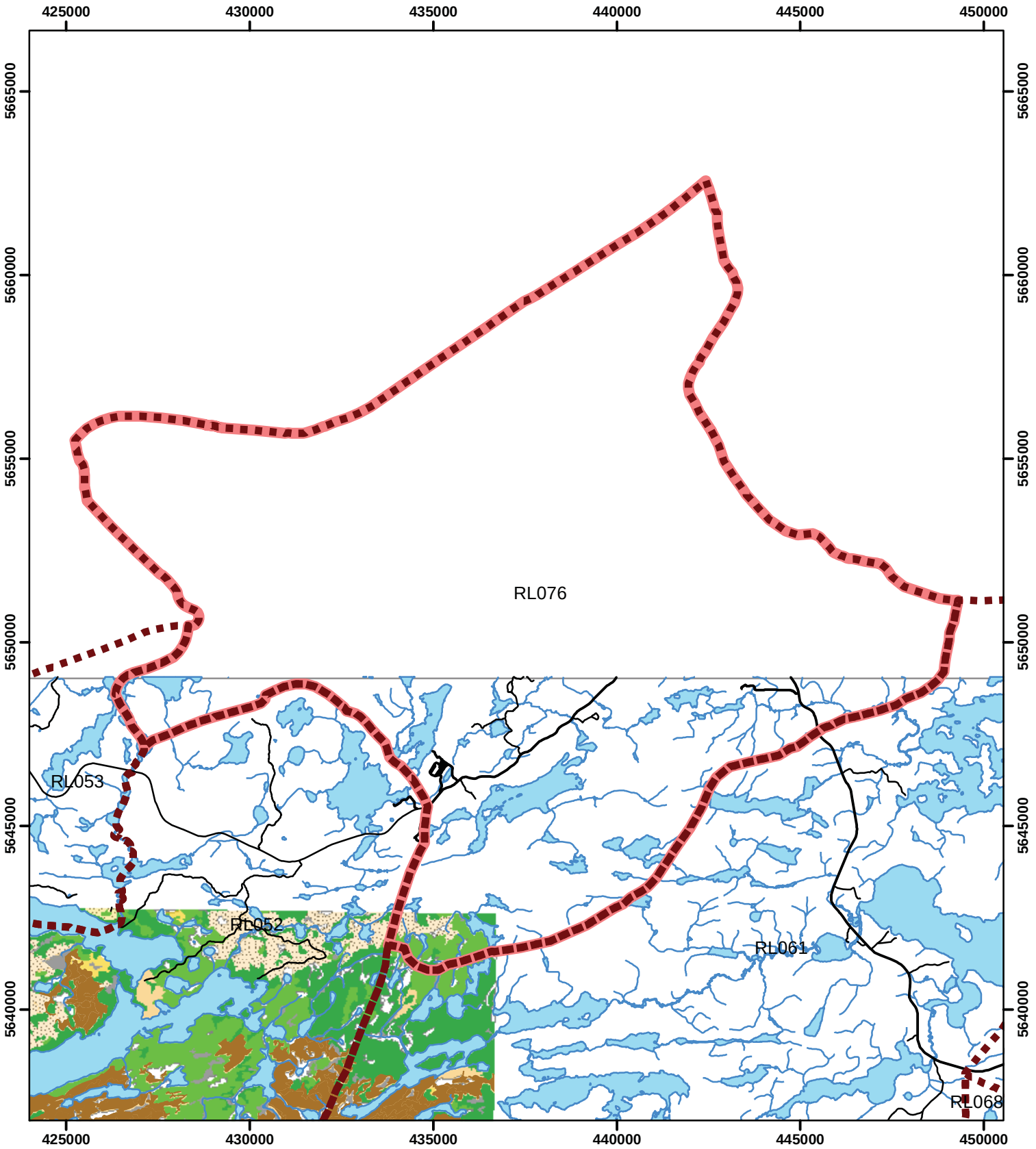
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 2 4 8 km

1:212,000

Planned and recent clearcut logging
Trapping Area RL076

2119



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

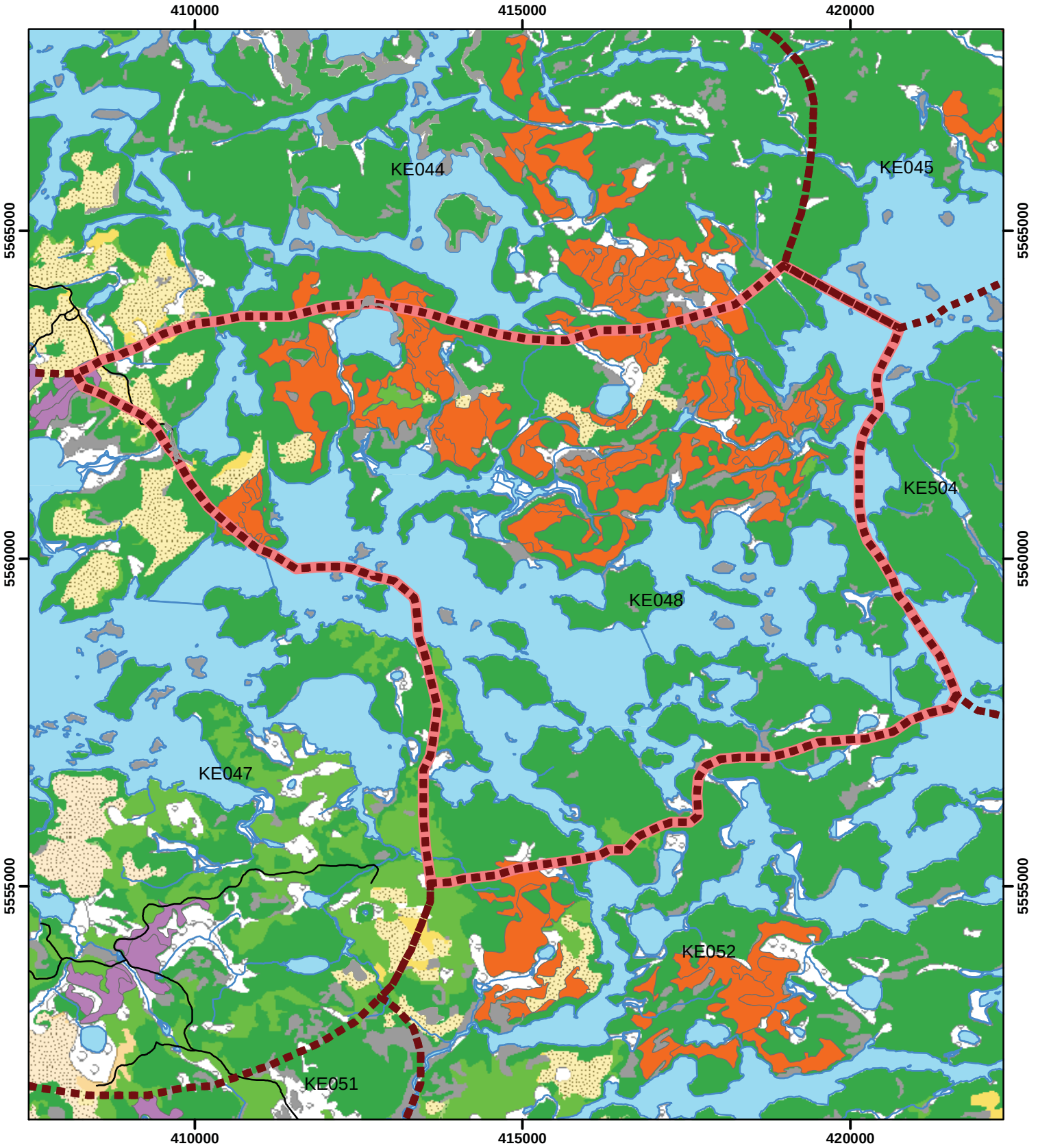
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:141,000

Planned and recent clearcut logging
Trapping Area KE048



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

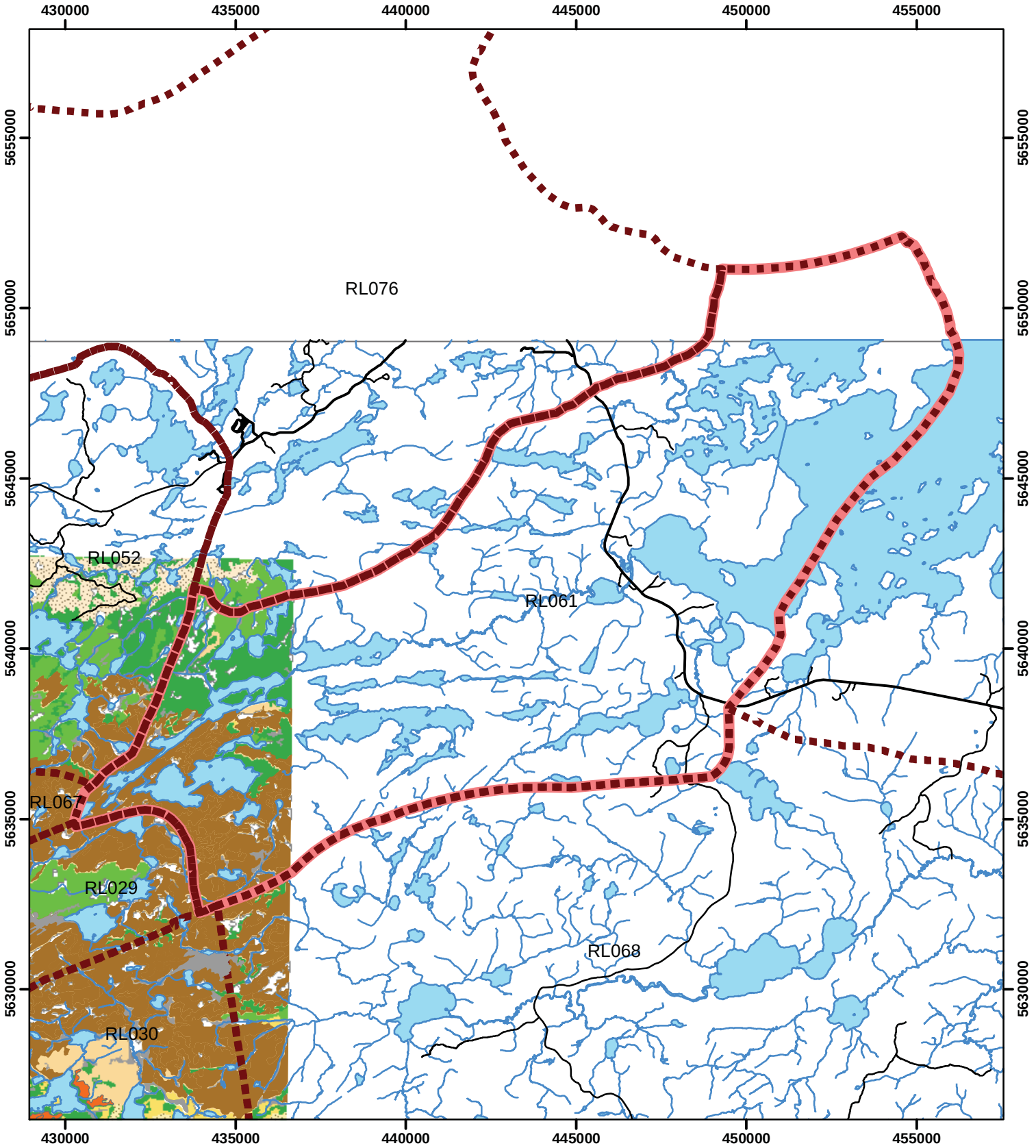
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:79,000

Planned and recent clearcut logging
Trapping Area RL061



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

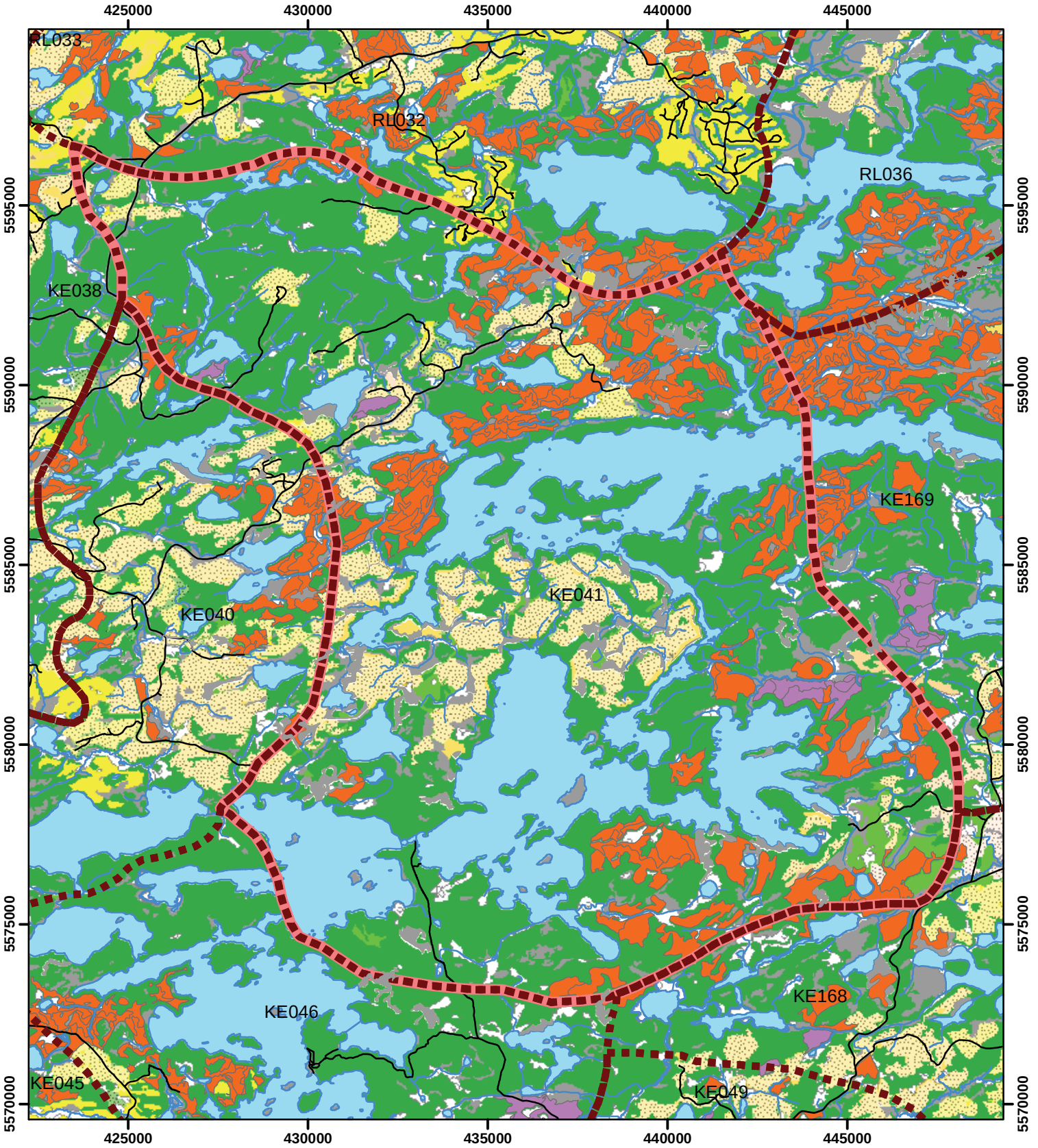
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:152,000

Planned and recent clearcut logging
Trapping Area KE041



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

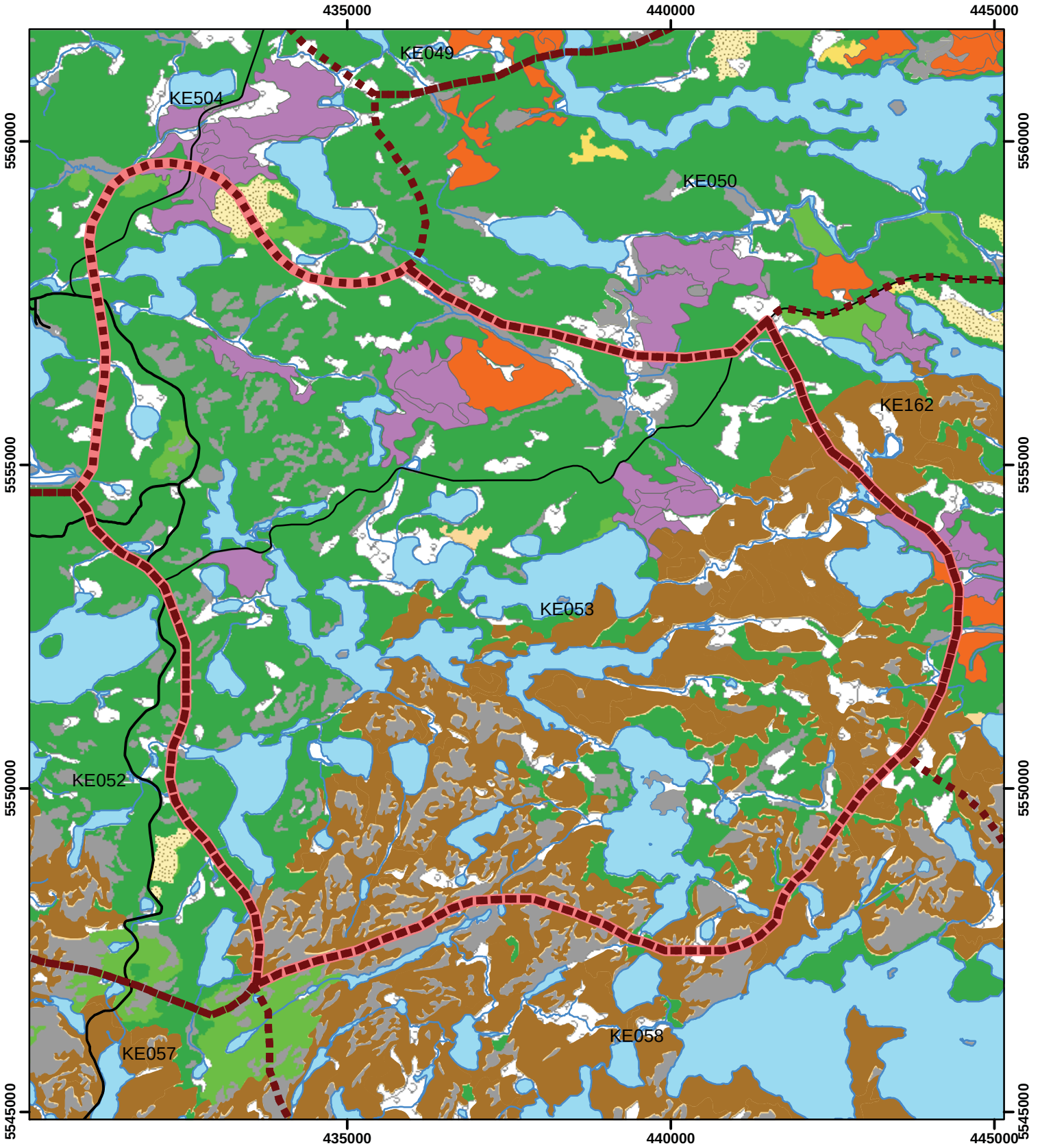
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:144,000

Planned and recent clearcut logging
Trapping Area KE053



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

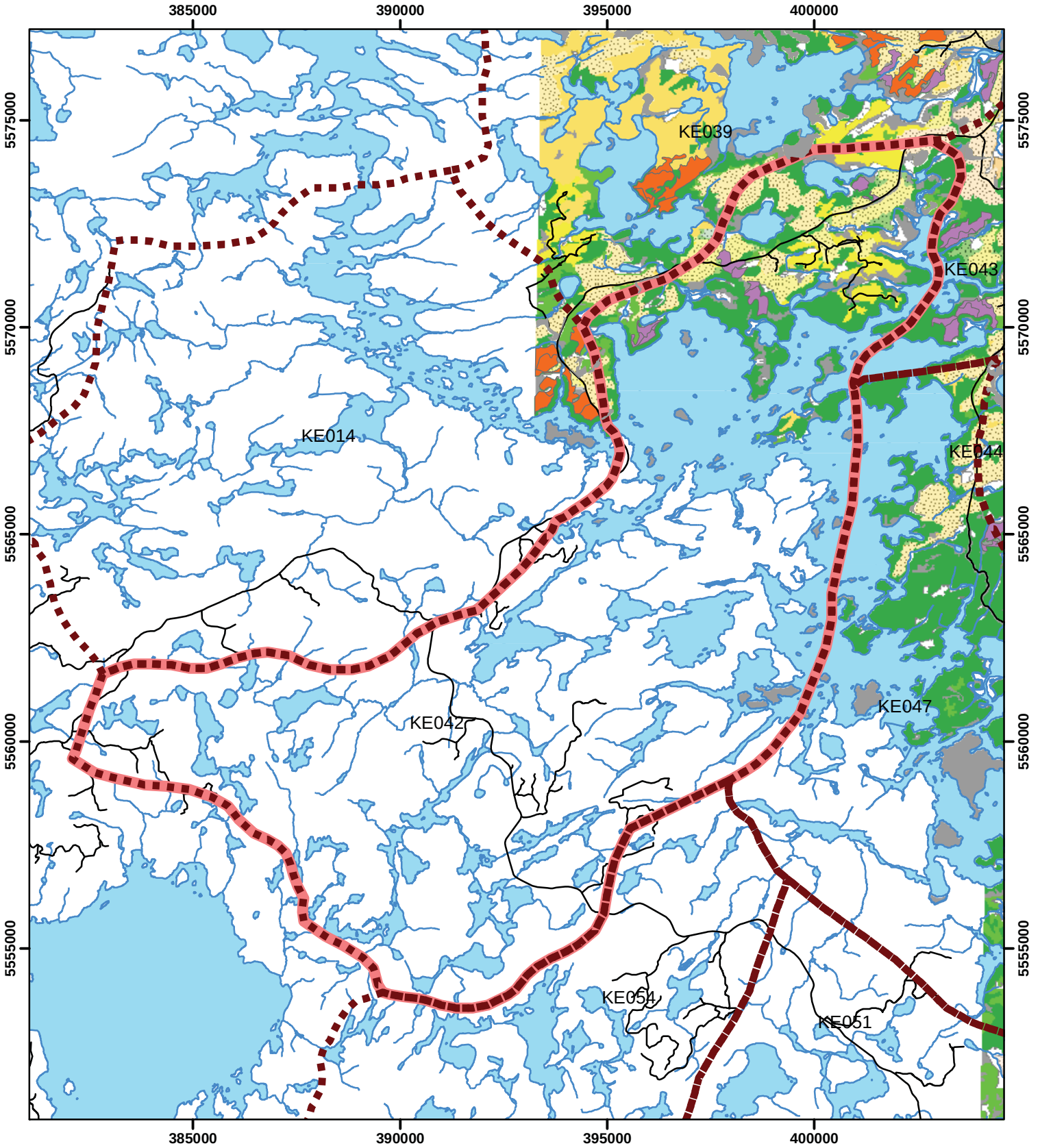
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:80,000

Planned and recent clearcut logging
Trapping Area KE042



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

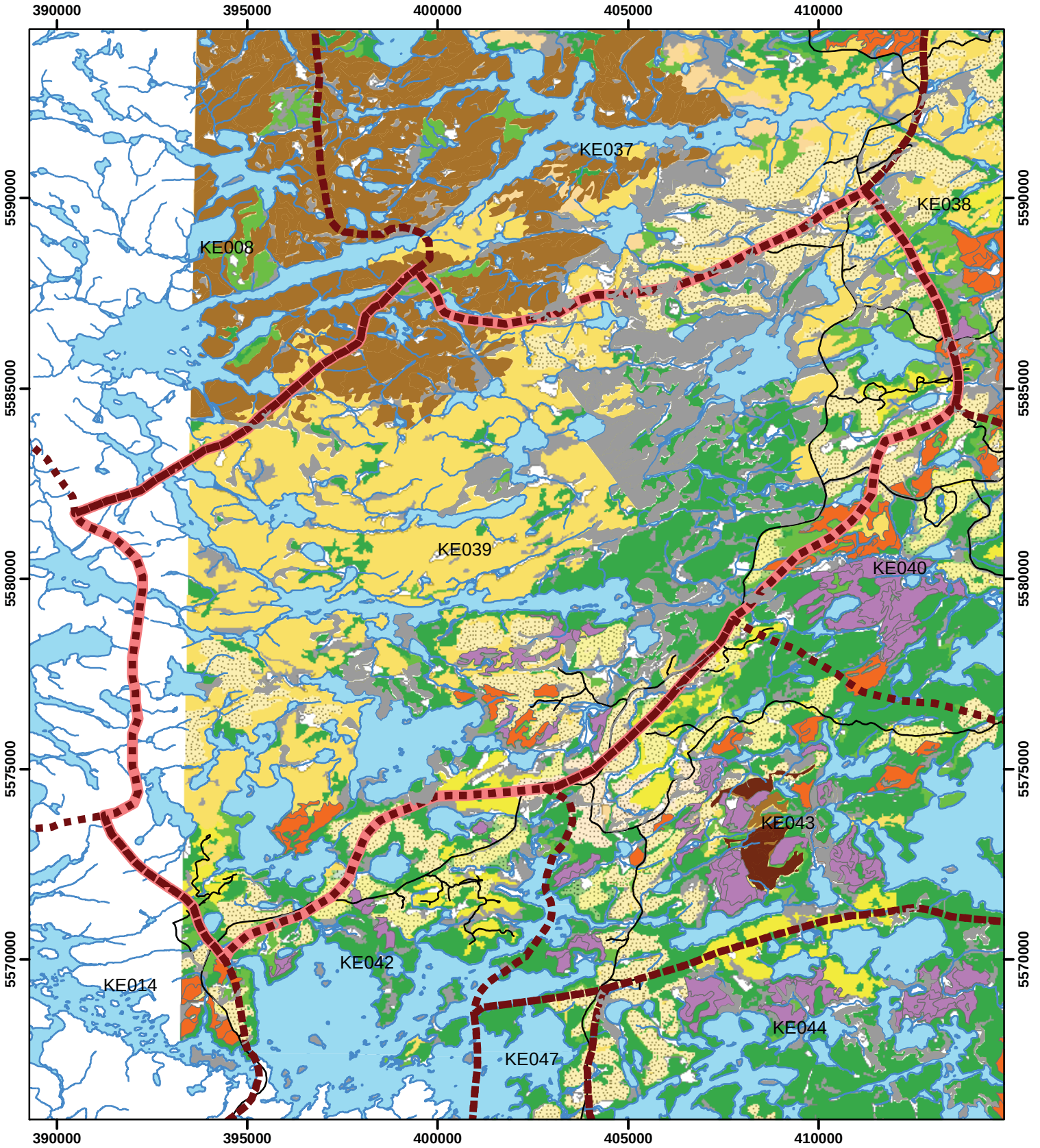
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:125,000

Planned and recent clearcut logging
Trapping Area KE039



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

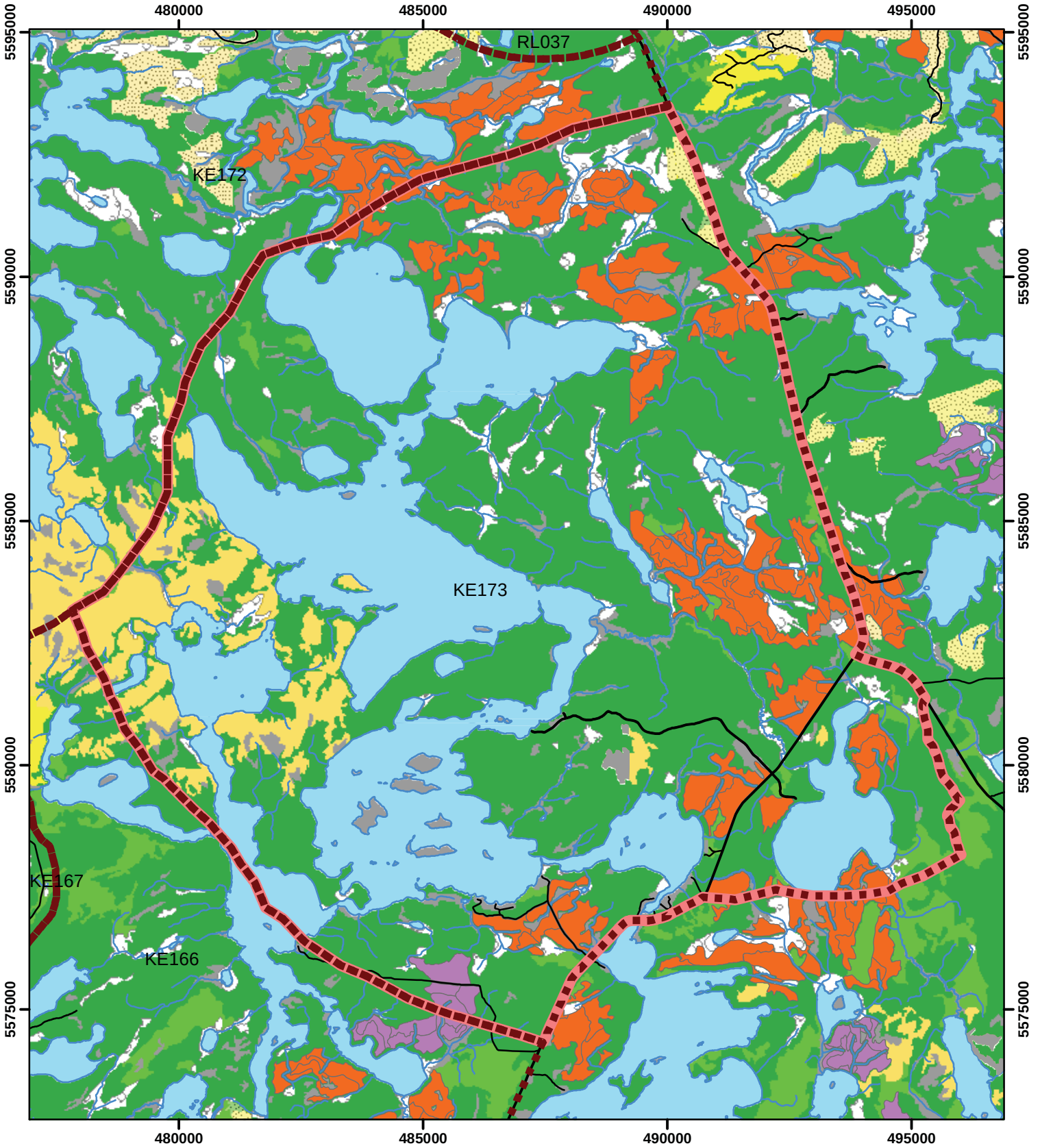
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:136,000

Planned and recent clearcut logging
Trapping Area KE173



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

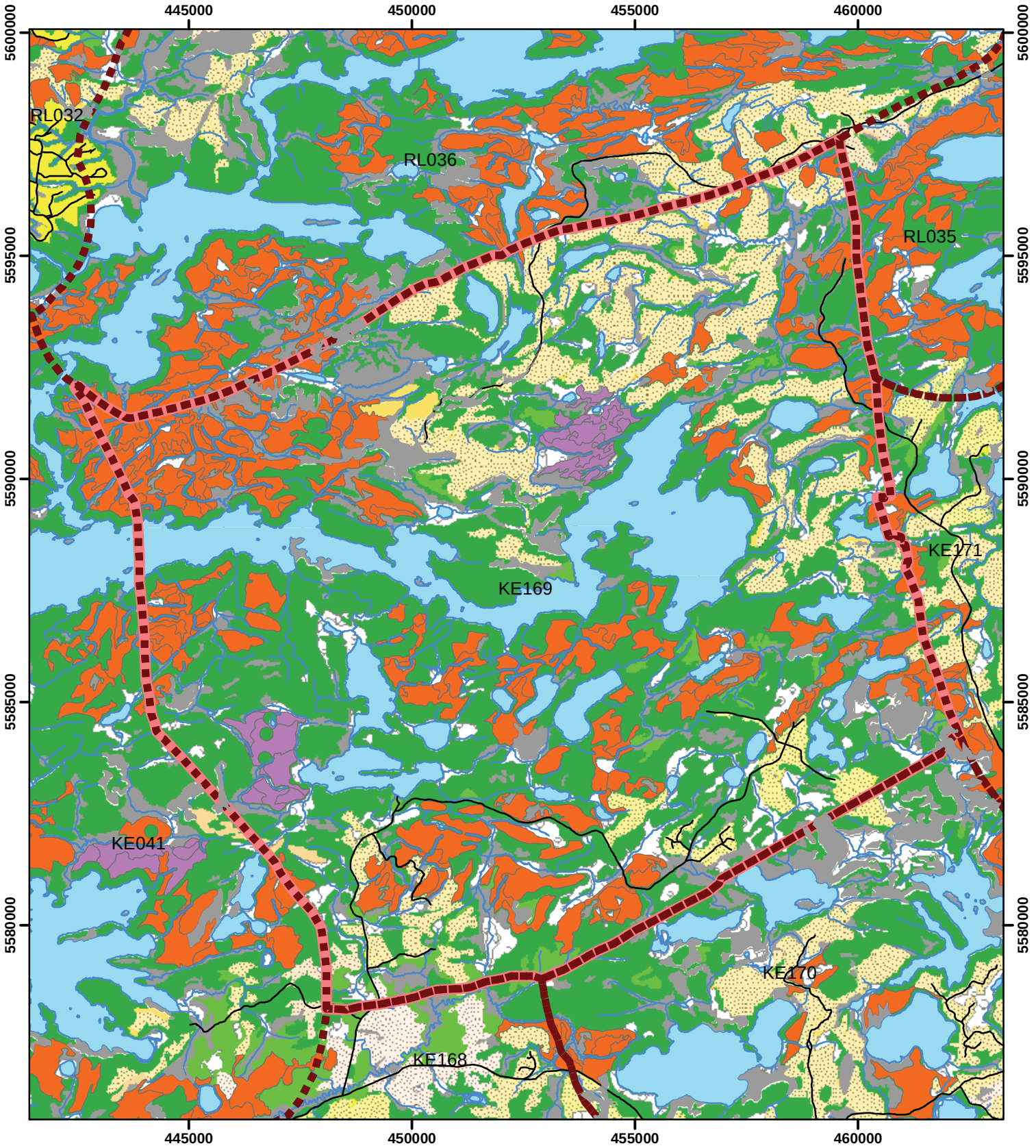
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

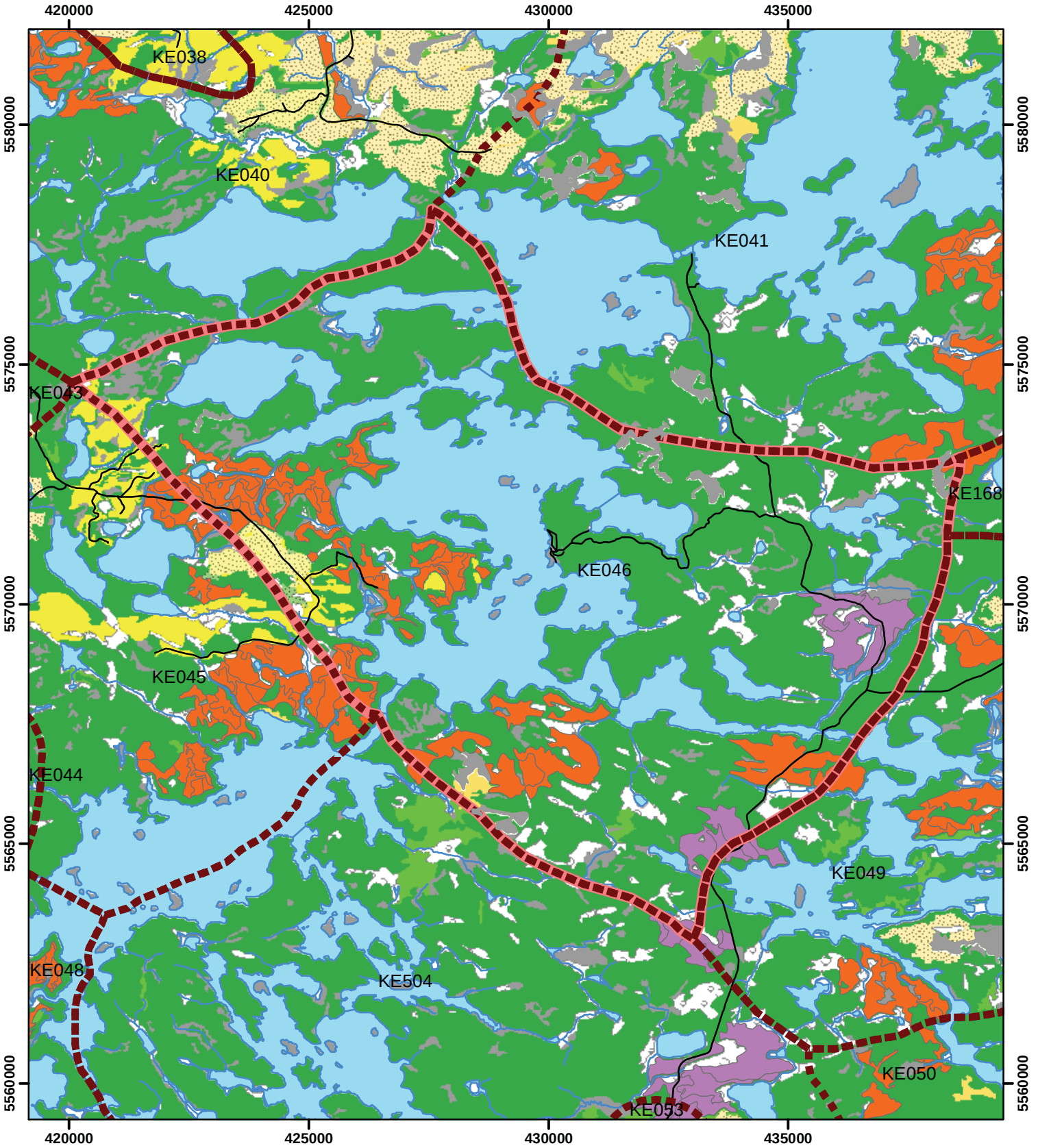
0 1 2 4 km

1:106,000

Planned and recent clearcut logging
Trapping Area KE169



Planned and recent clearcut logging
Trapping Area KE046



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

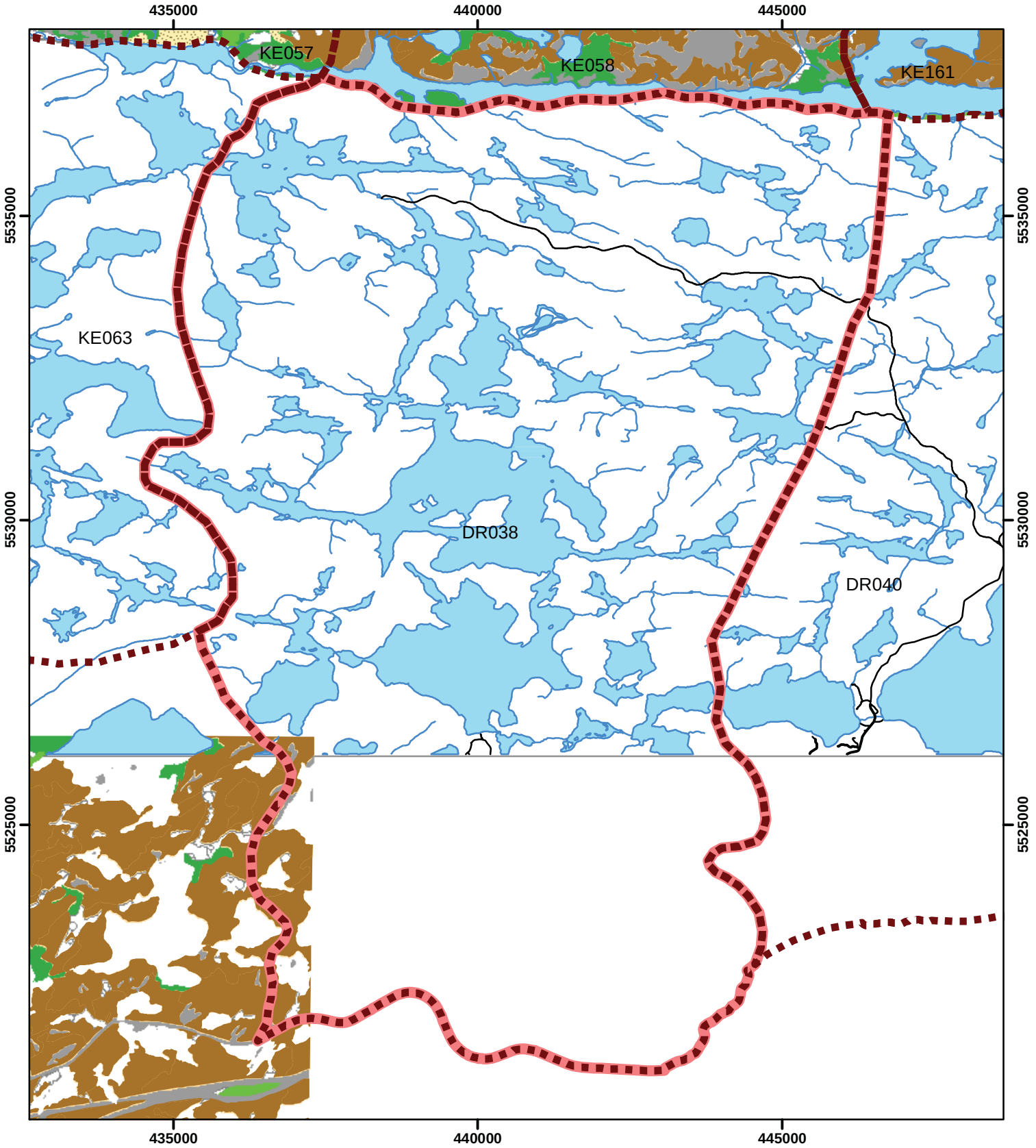
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1 2 4 km

1:108,000

Planned and recent clearcut logging
Trapping Area DR038



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

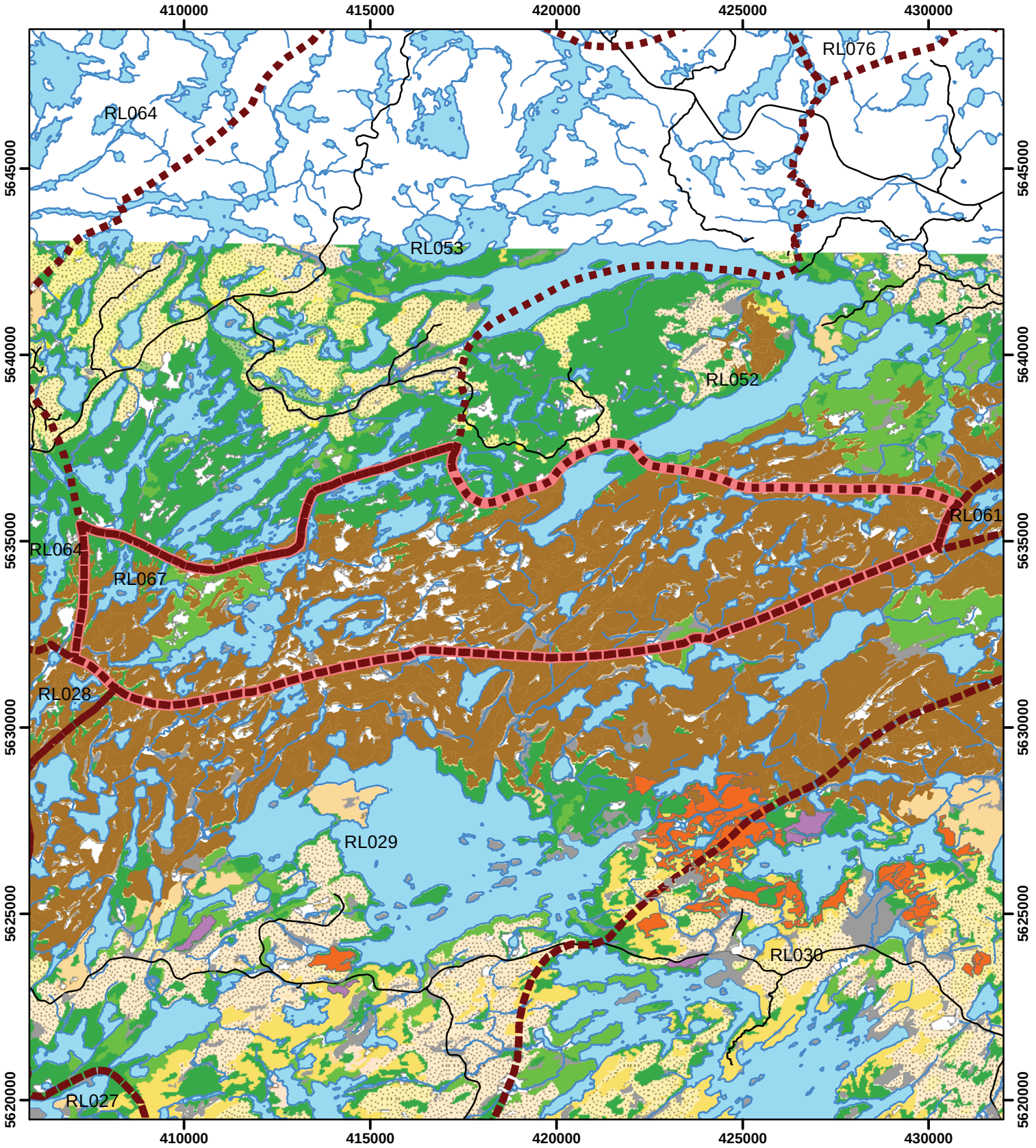
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.75 1.5 3 km

1:85,000

Planned and recent clearcut logging
Trapping Area RL067



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

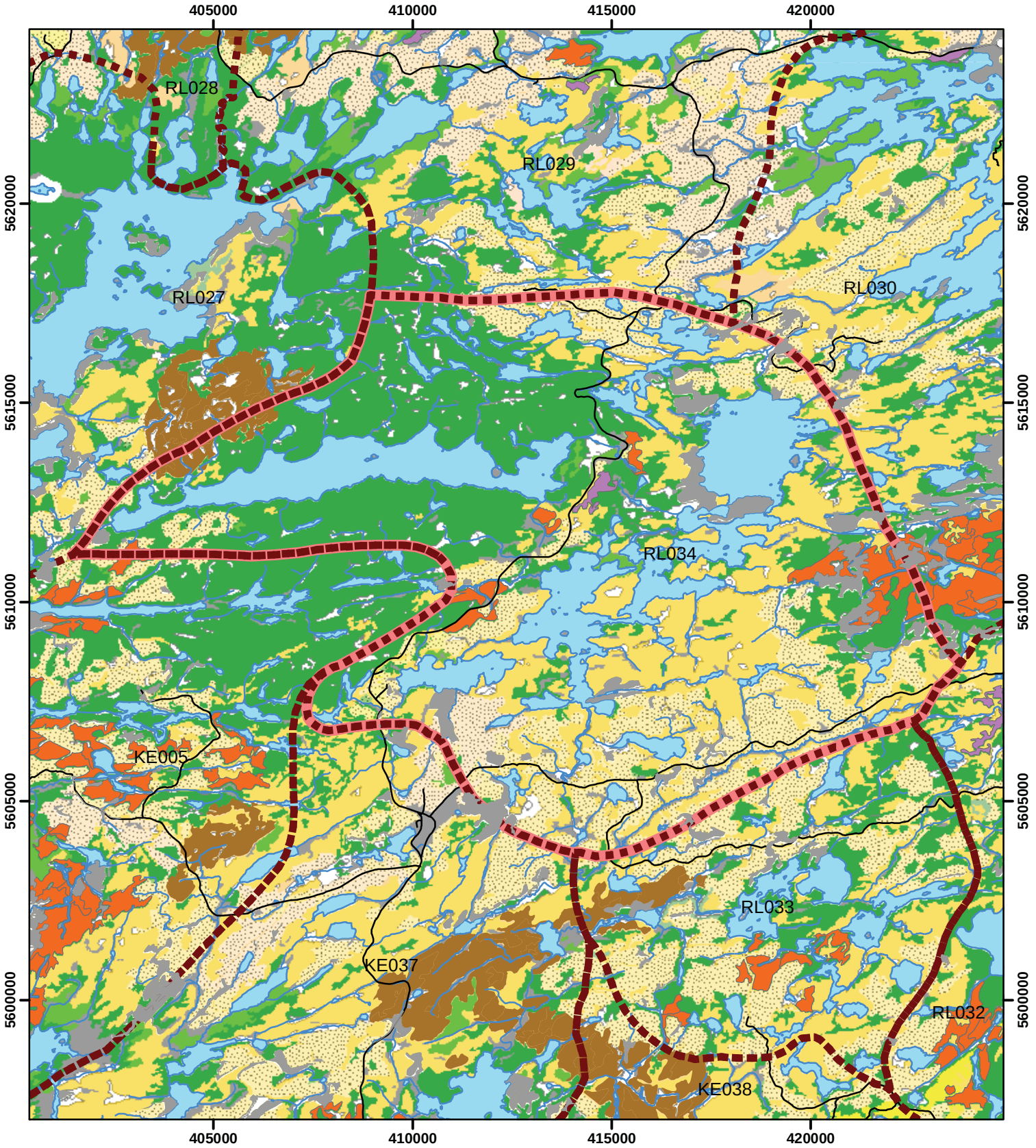
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:139,000

Planned and recent clearcut logging
Trapping Area RL034



Trapping Area Boundaries

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

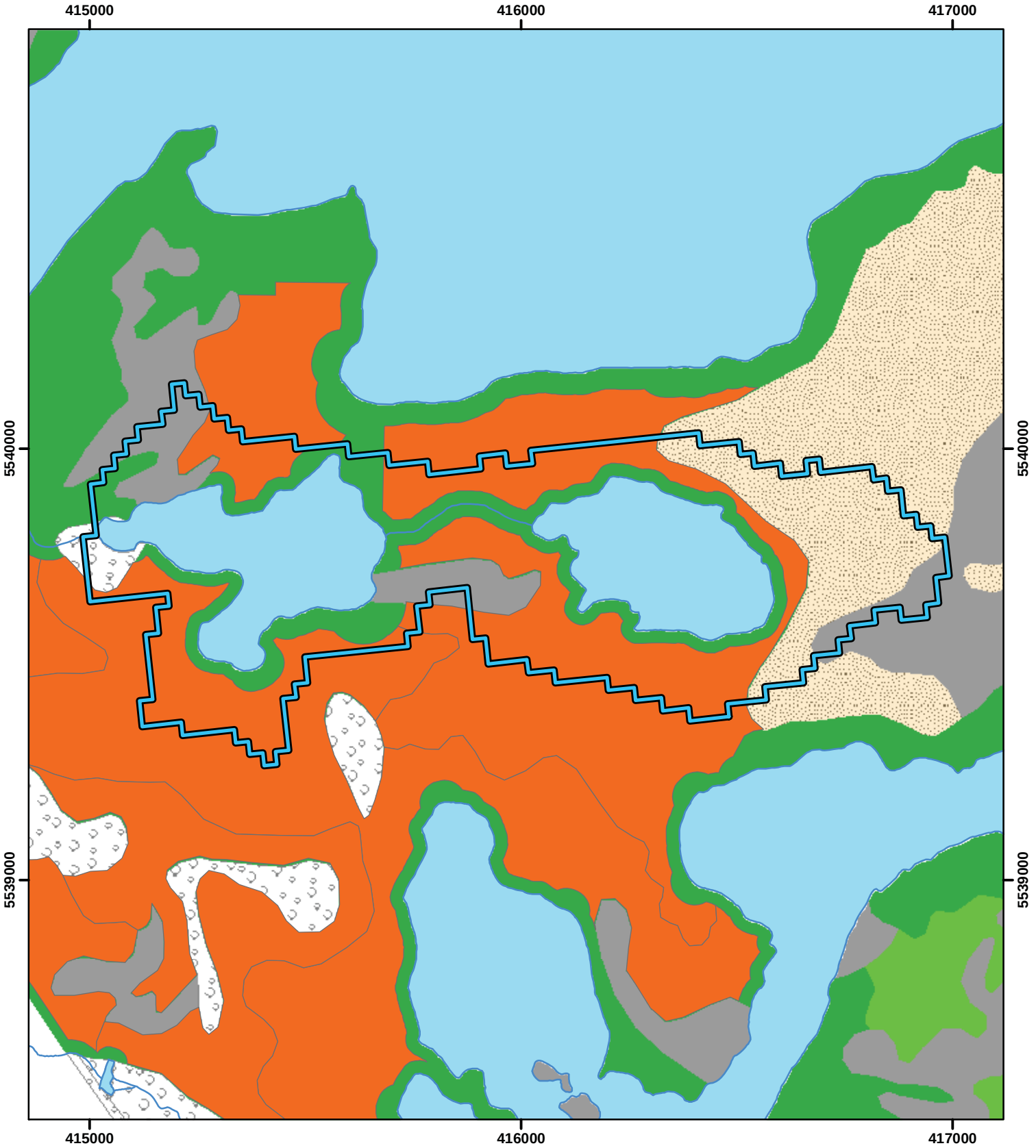
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:130,000

APPENDIX A.2 – WATERSHED AREA MAPS

Planned and recent clearcut logging
Watershed Albert Lake S of Kill Deer L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

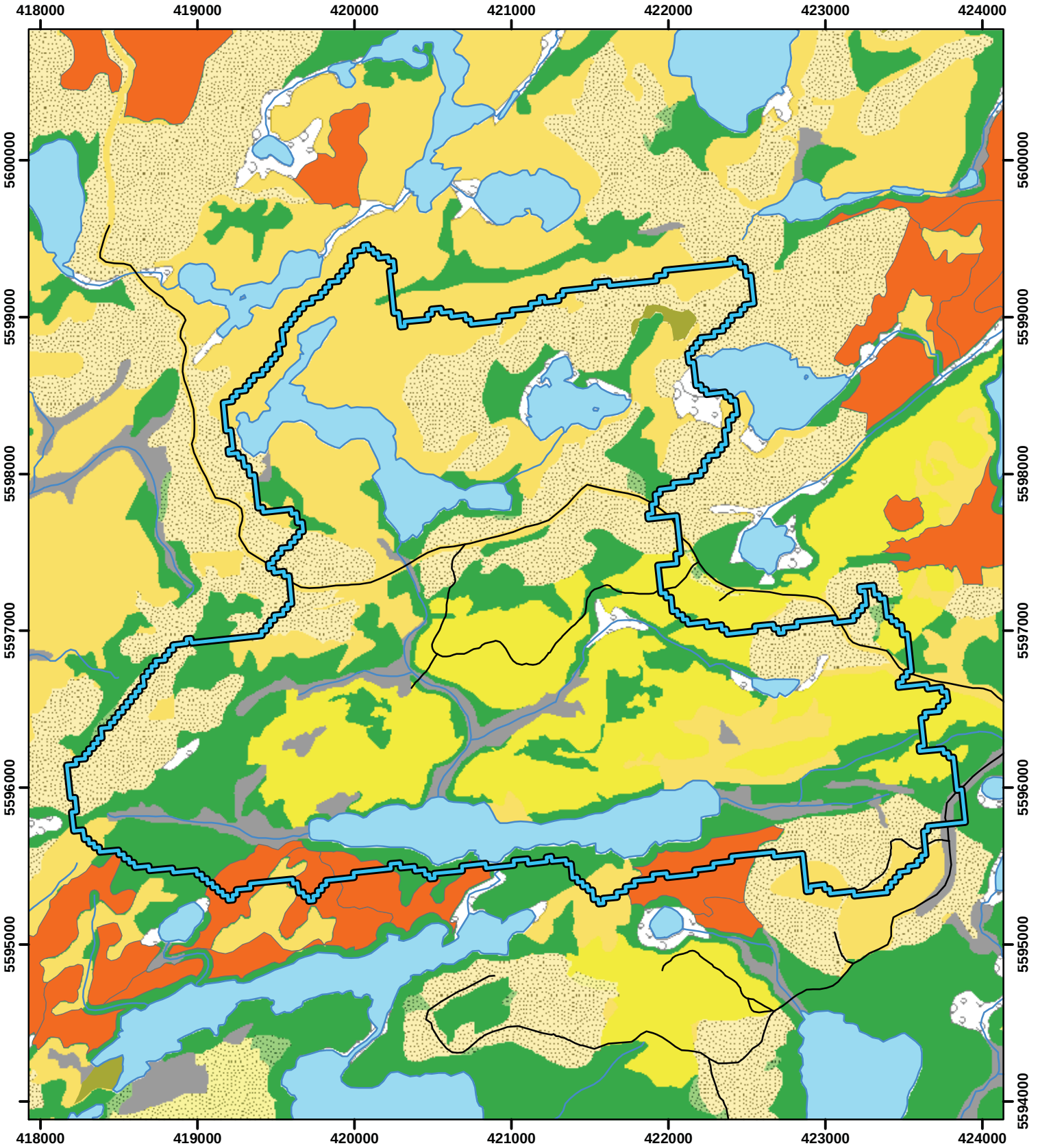
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.1 0.2 0.4 km

1:12,000

Planned and recent clearcut logging
Watershed Campfire R headwaters 3rd order lake



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

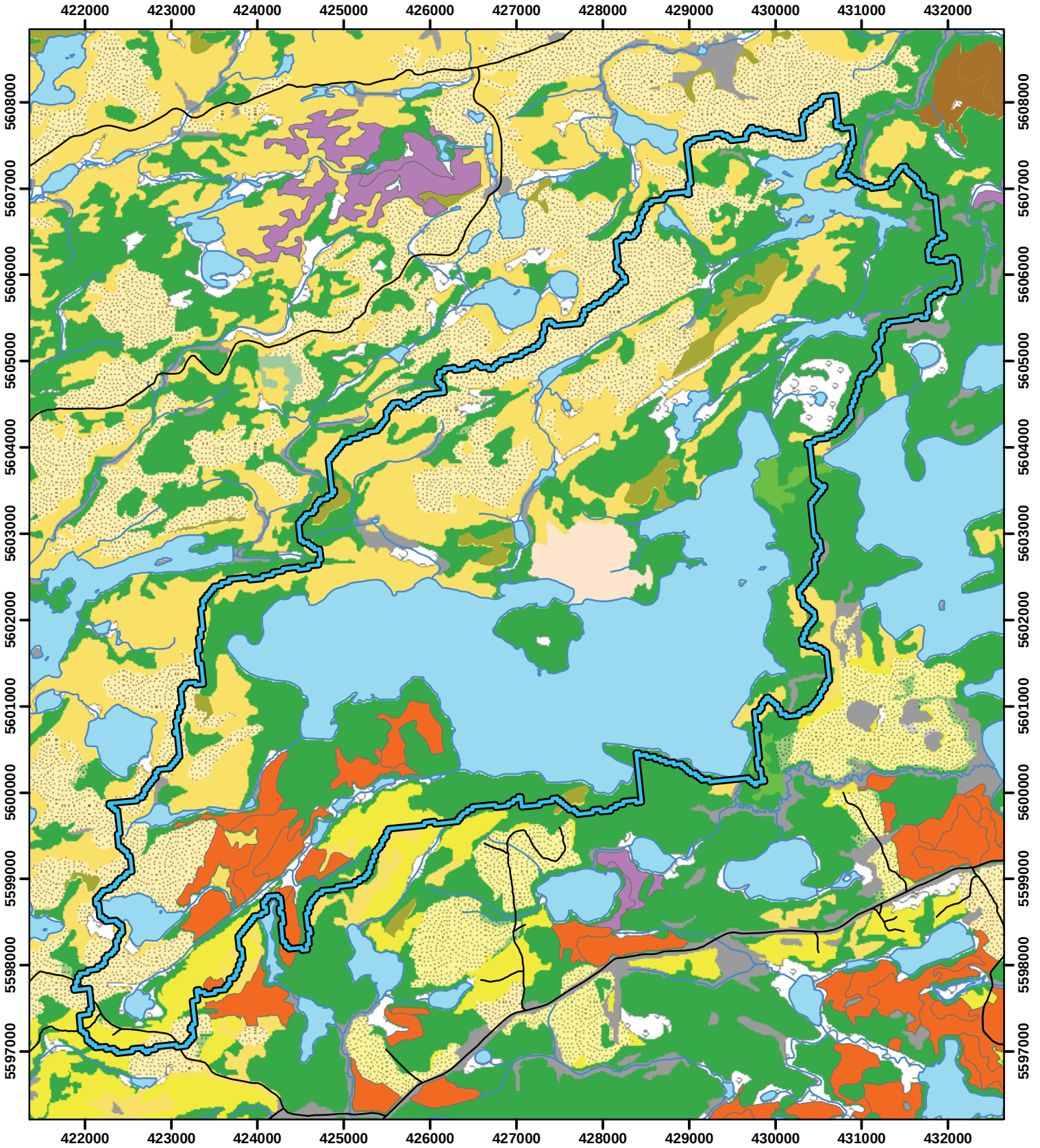
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

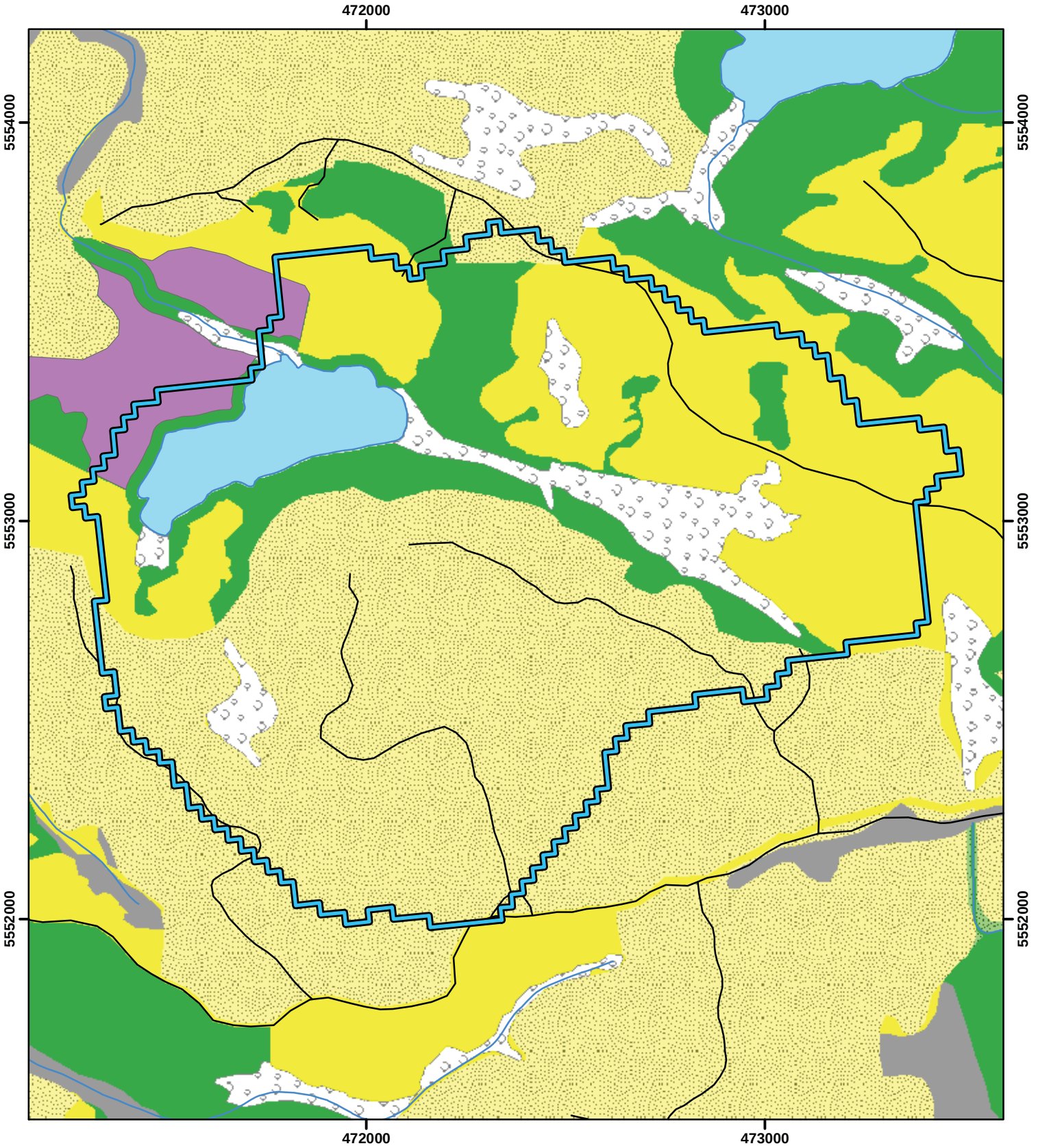
0 0.3 0.6 1.2 km

1:33,000

Planned and recent clearcut logging
Watershed Conifer Lake



Planned and recent clearcut logging
Watershed E of Carter L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

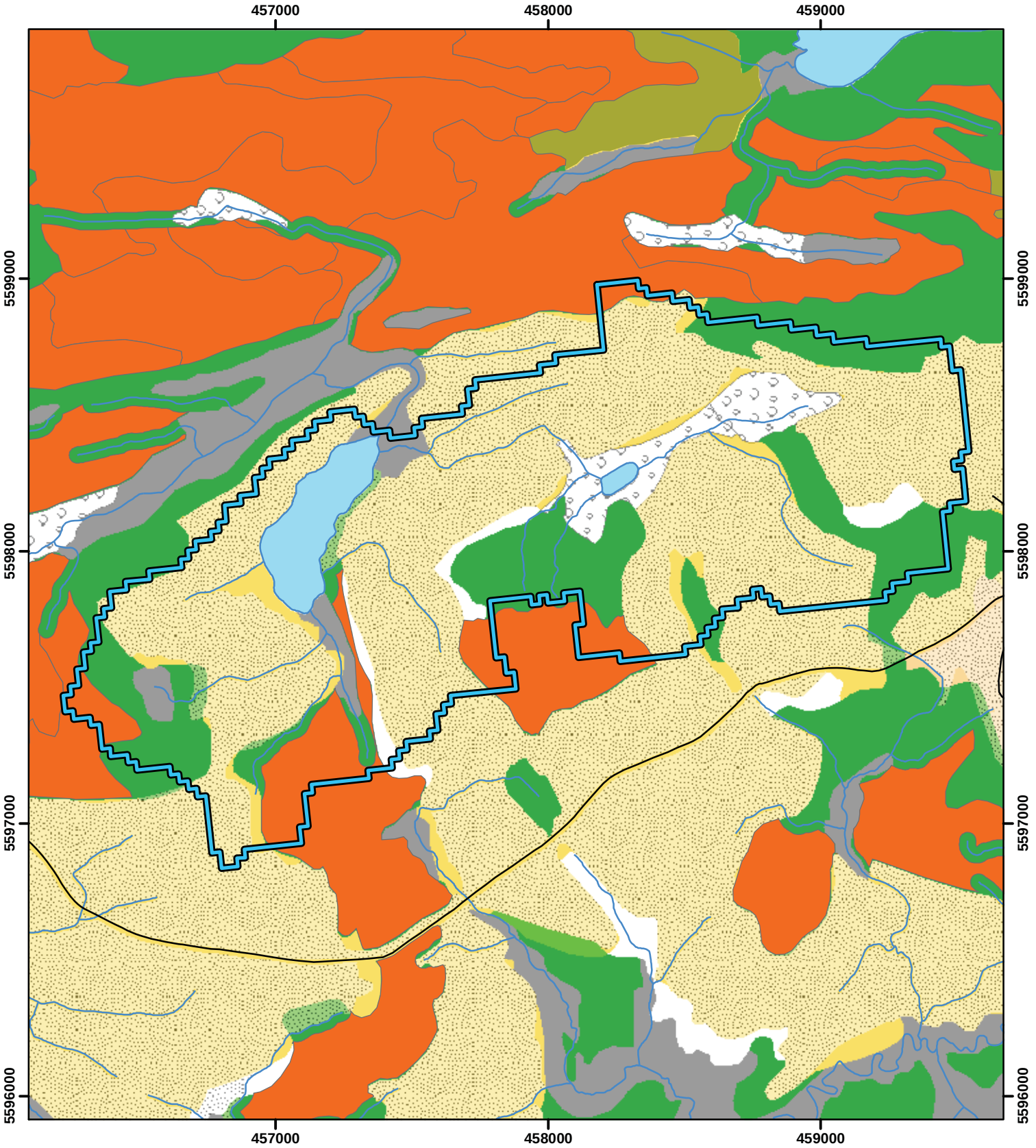
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.125 0.25 0.5 km

1:13,000

Planned and recent clearcut logging
Watershed E of Goose L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

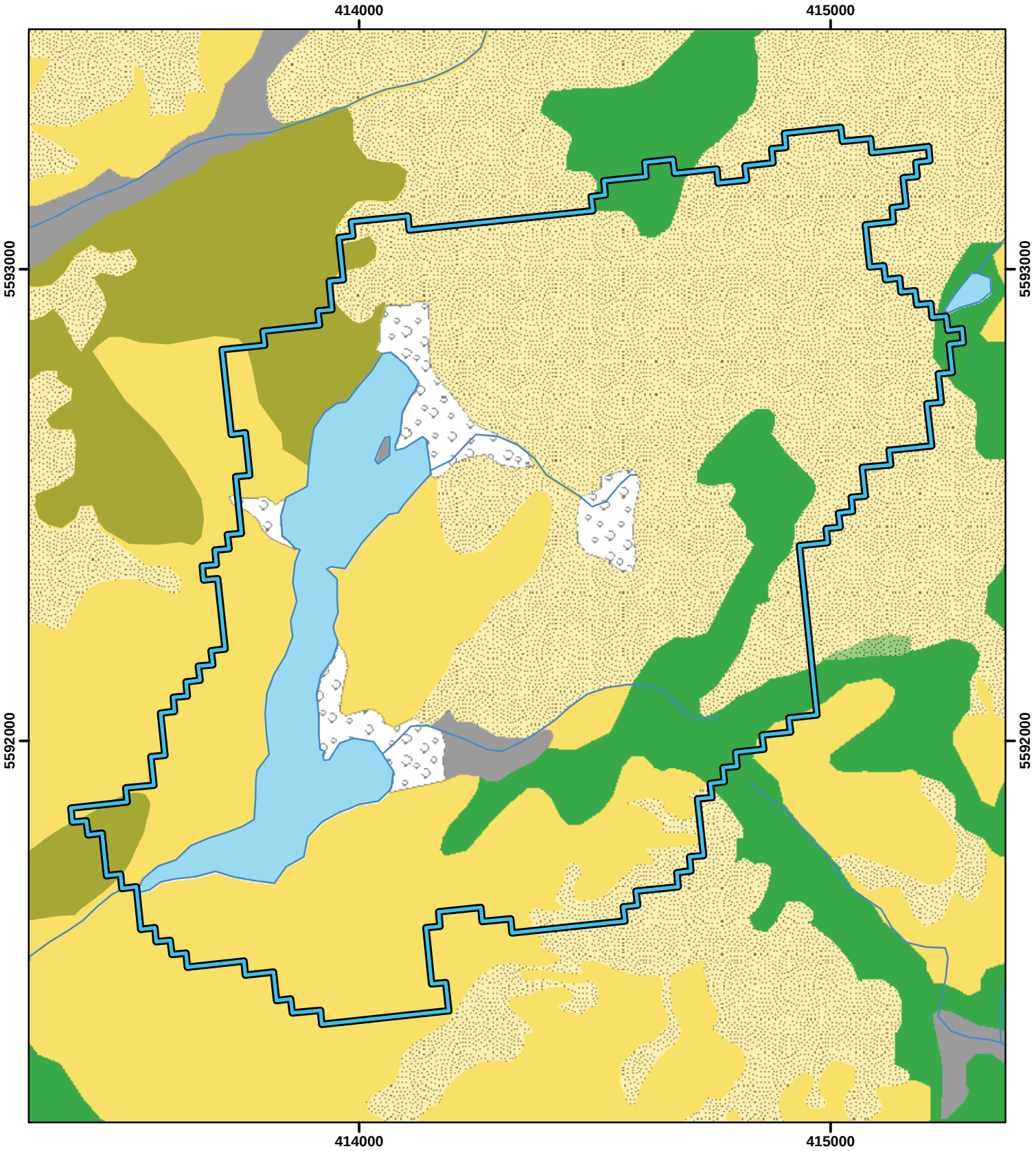
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.175 0.35 0.7 km

1:19,000

Planned and recent clearcut logging
Watershed E of Roger L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

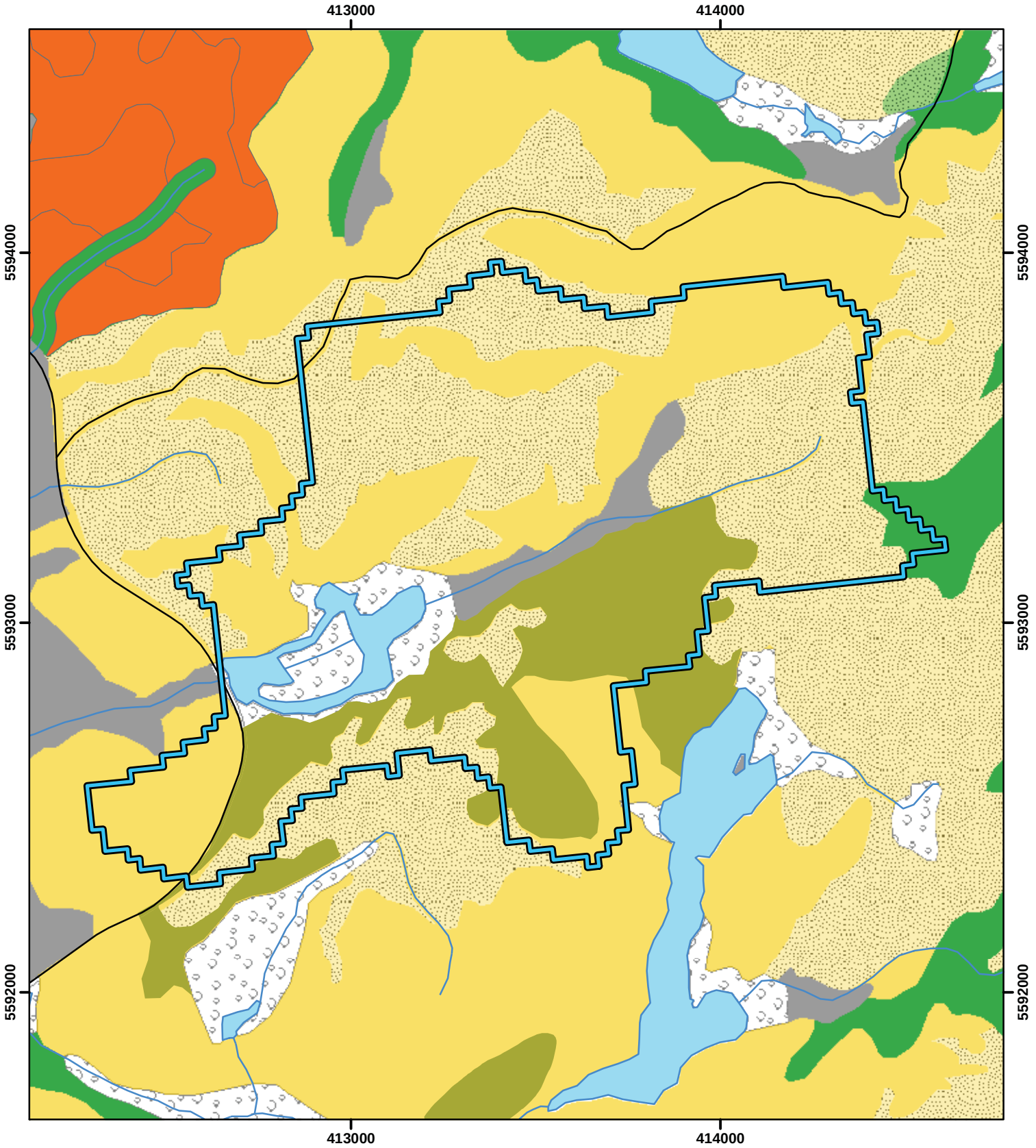
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.1 0.2 0.4 km

1:11,000

Planned and recent clearcut logging
Watershed E of Roger L 2



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

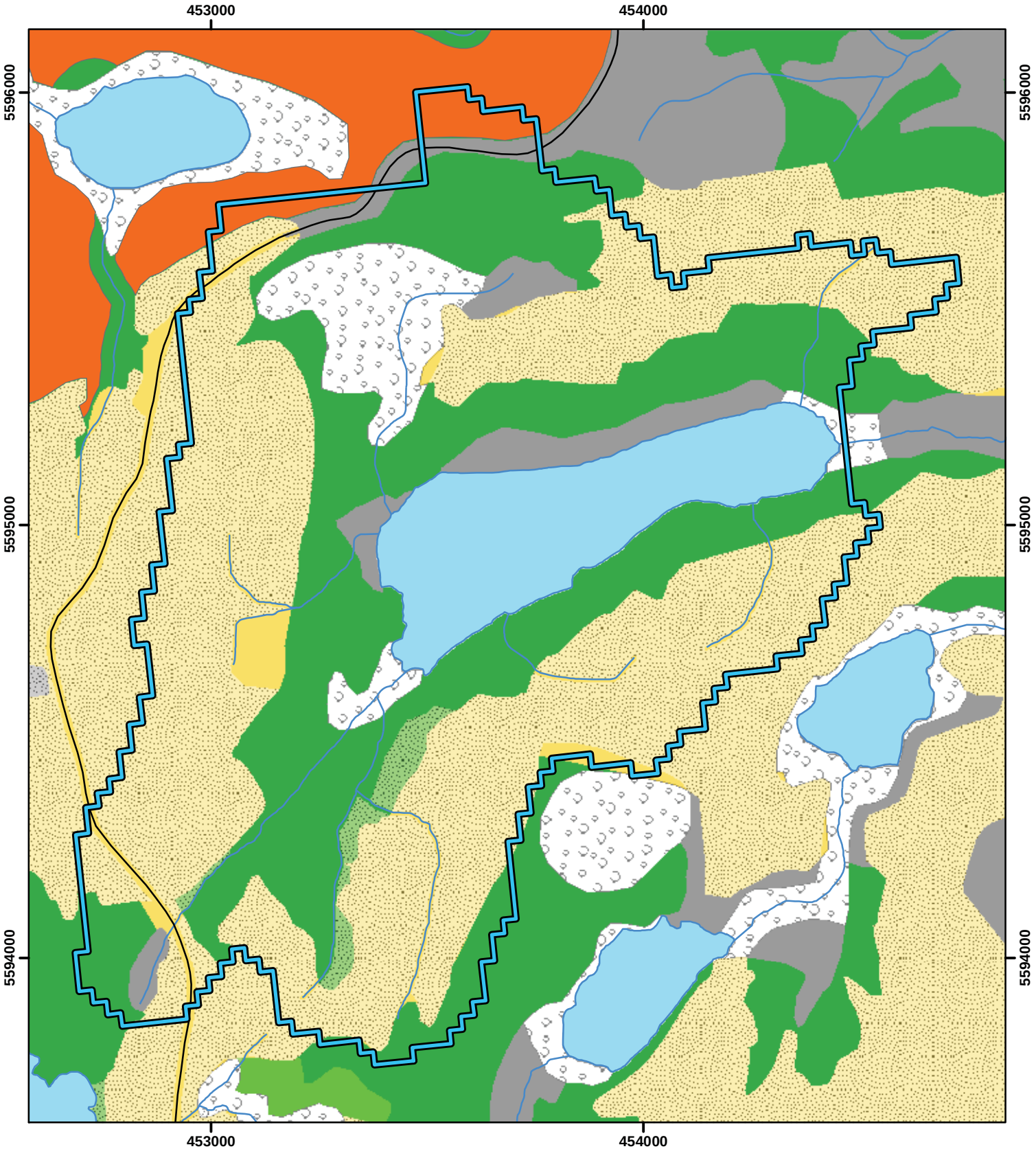
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.125 0.25 0.5 km

1:14,000

Planned and recent clearcut logging
Watershed E of Wilcox L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

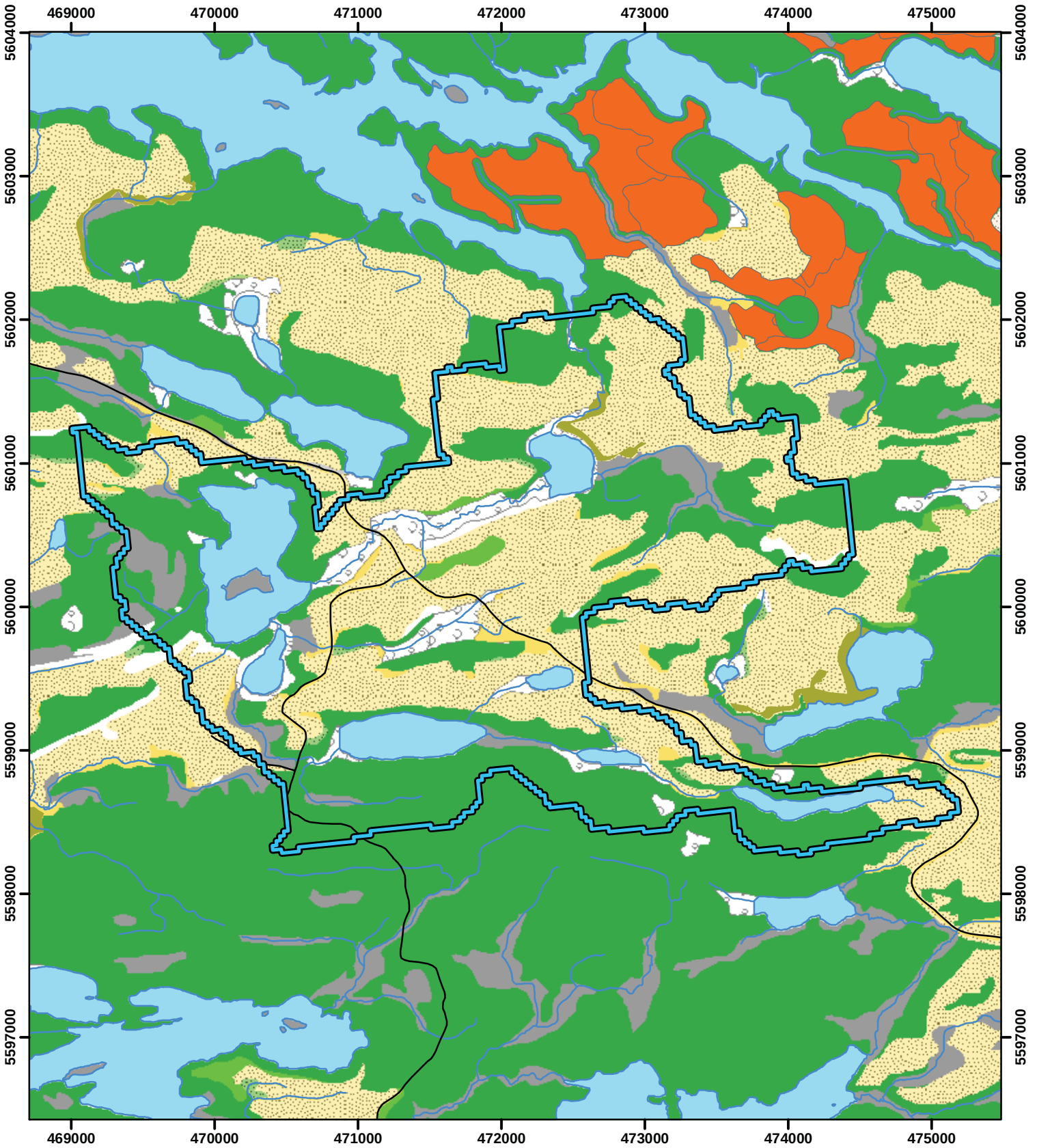
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.1 0.2 0.4 km

1:12,000

Planned and recent clearcut logging
Watershed English R tributary



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

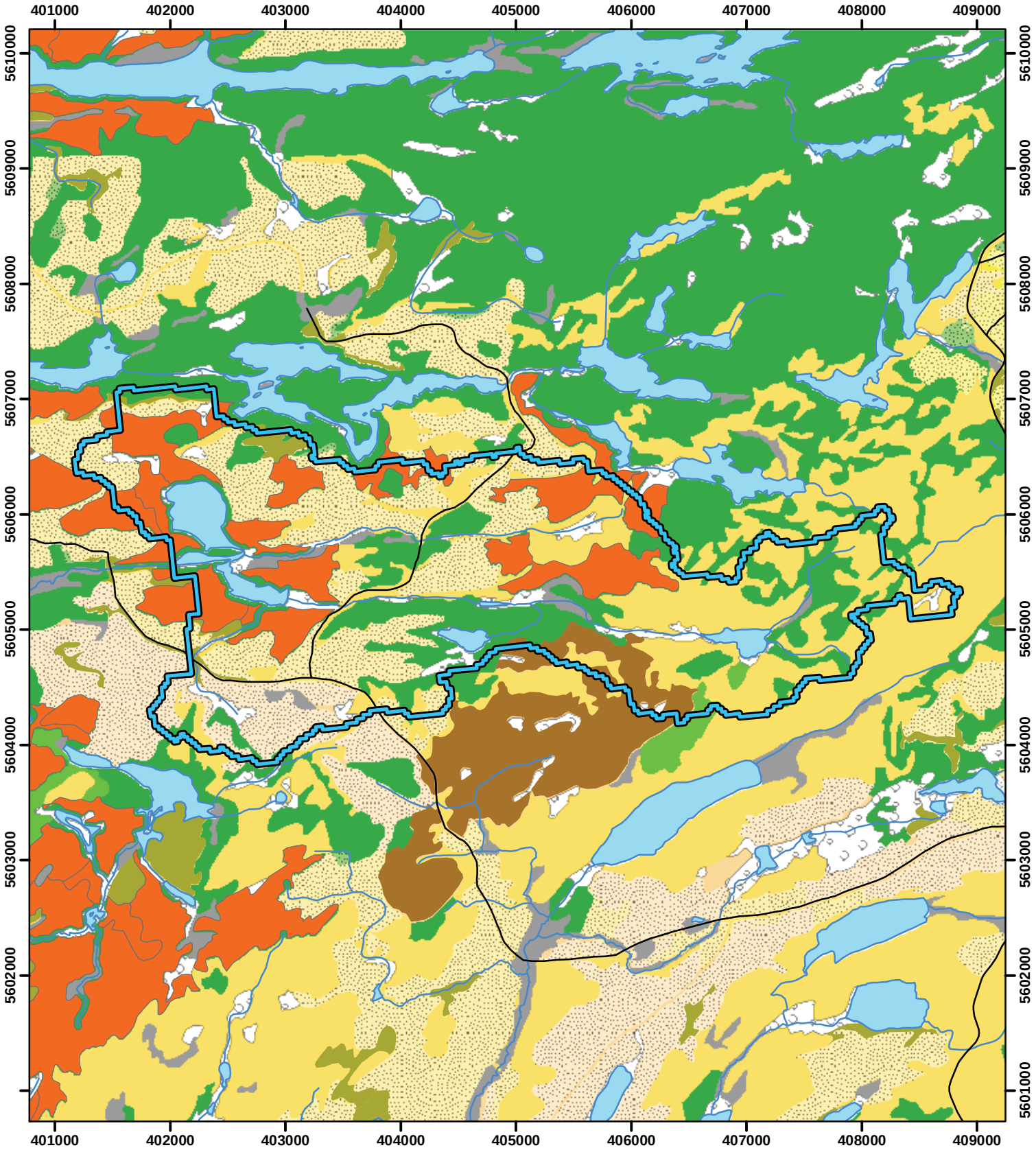
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.35 0.7 1.4 km

1:36,000

Planned and recent clearcut logging
Watershed Hat Lake



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

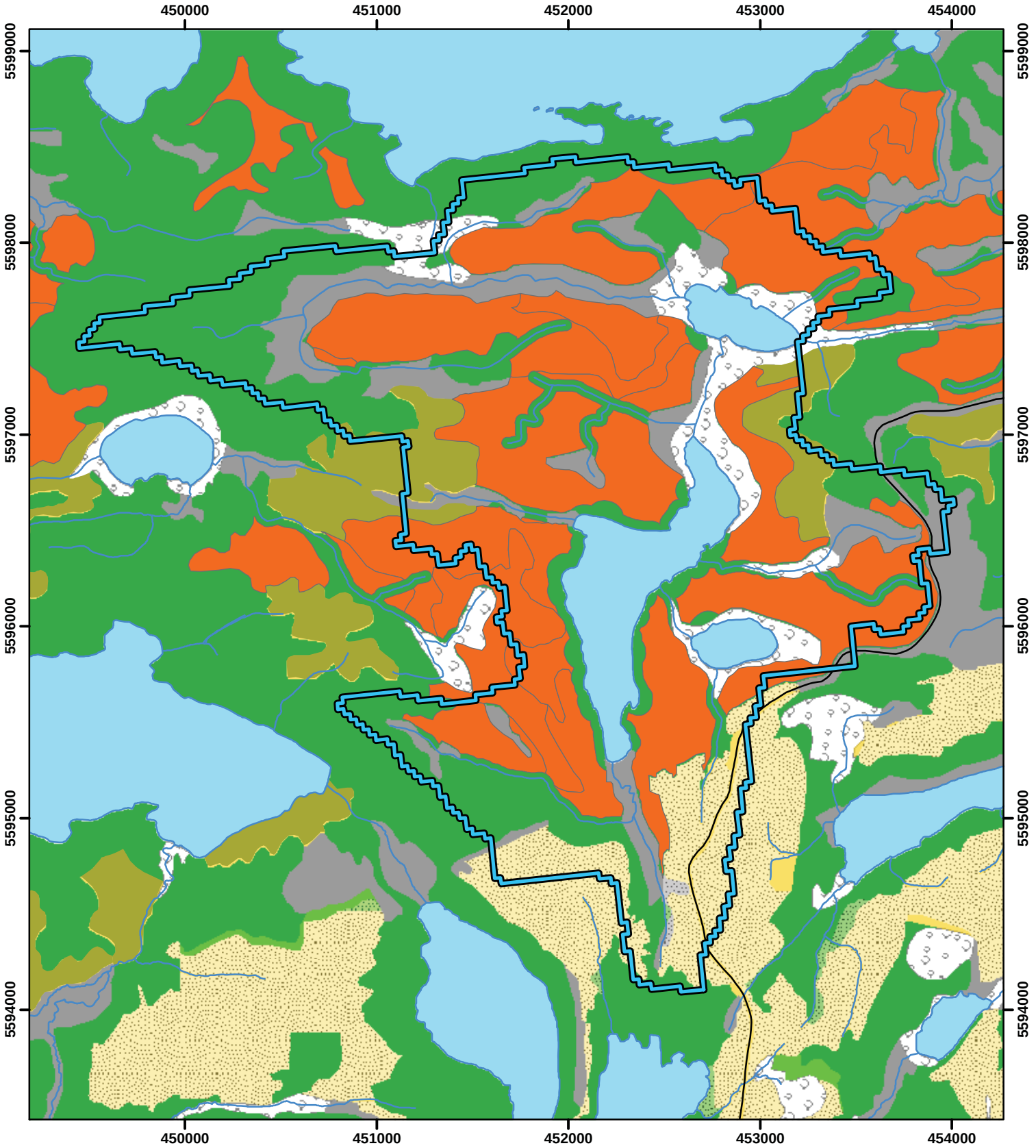
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

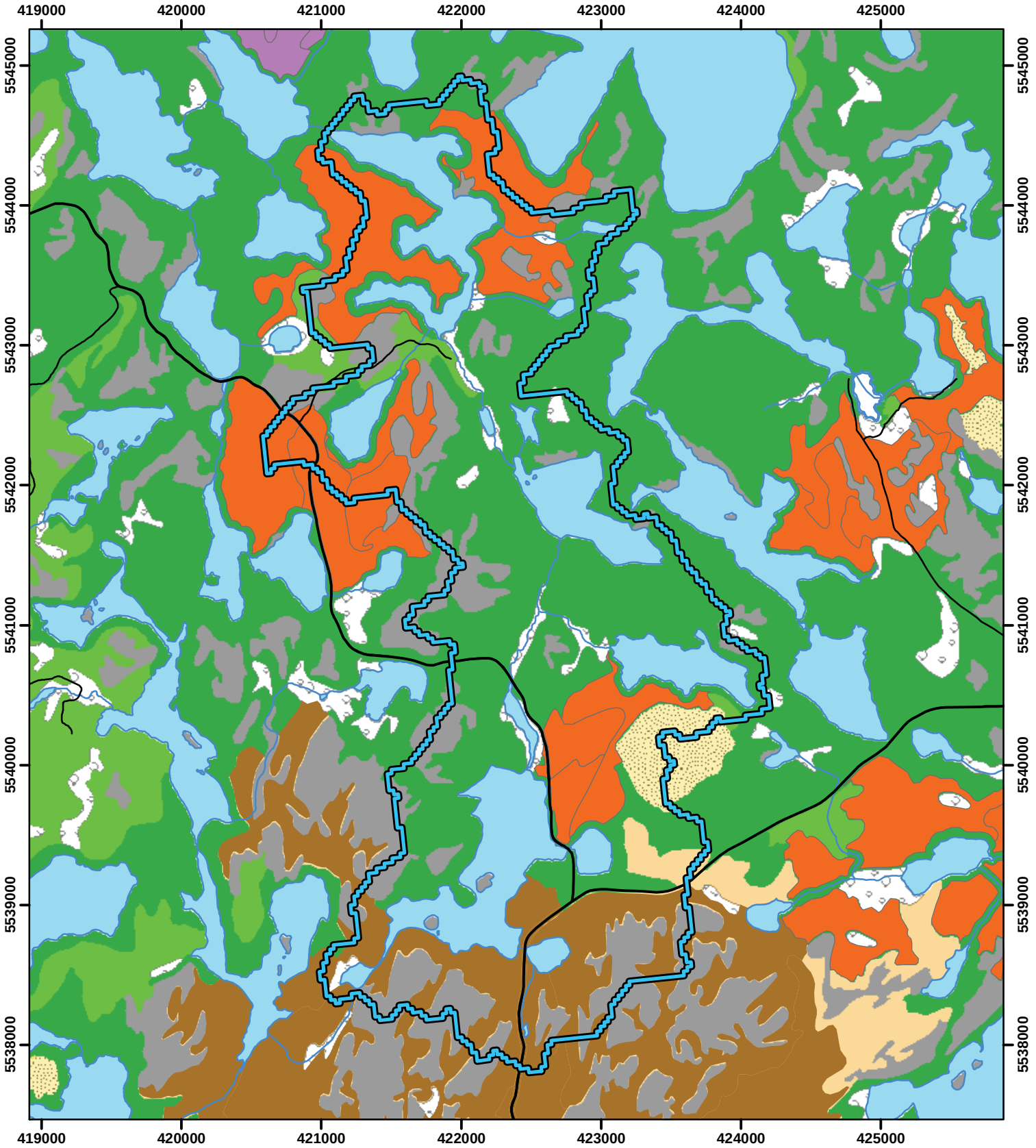
0 0.425 0.85 1.7 km

1:45,000

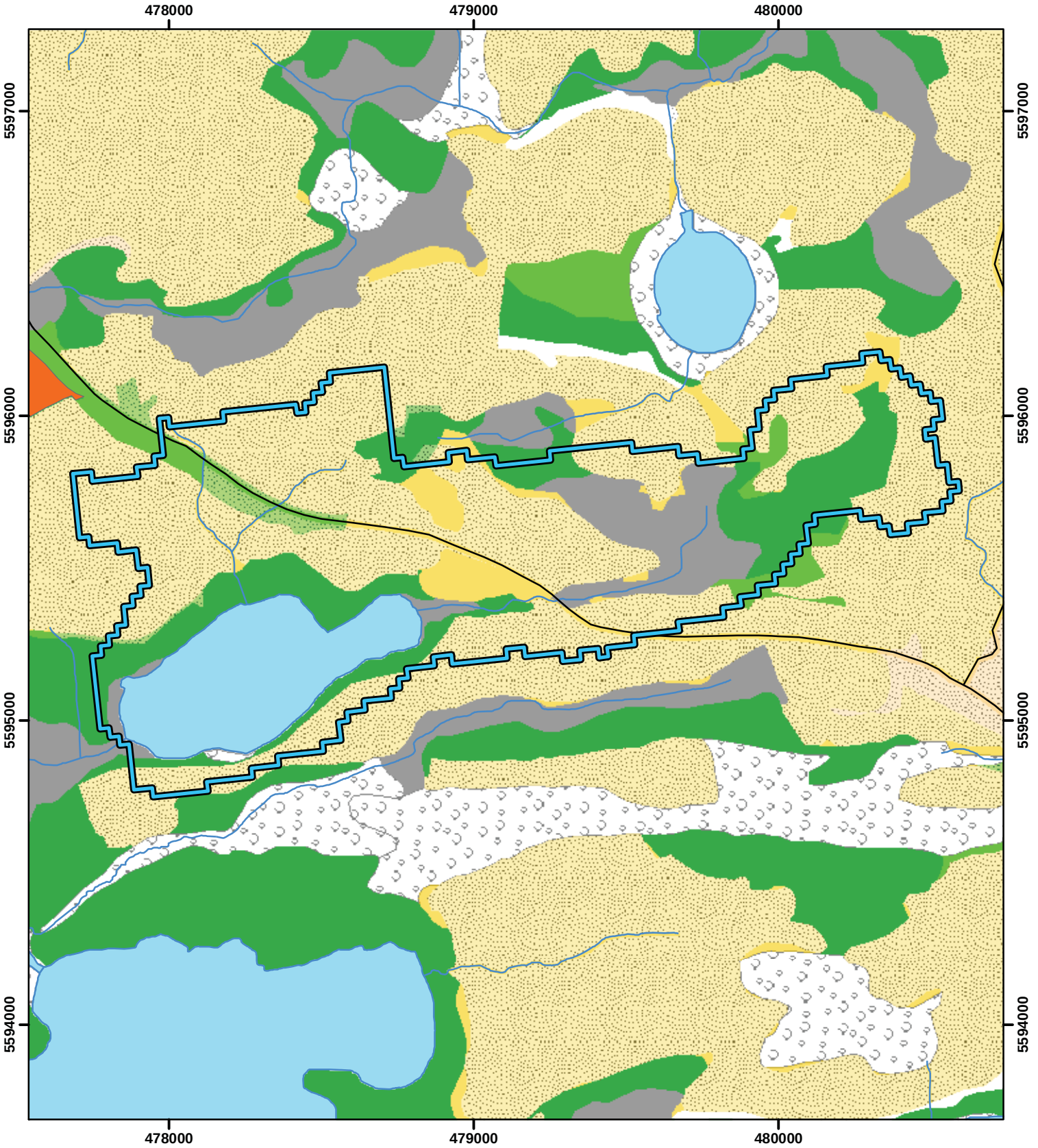
Planned and recent clearcut logging
Watershed Keewatin 1



Planned and recent clearcut logging
Watershed Mermaid L watershed



Planned and recent clearcut logging
Watershed N of Anishinabe R



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

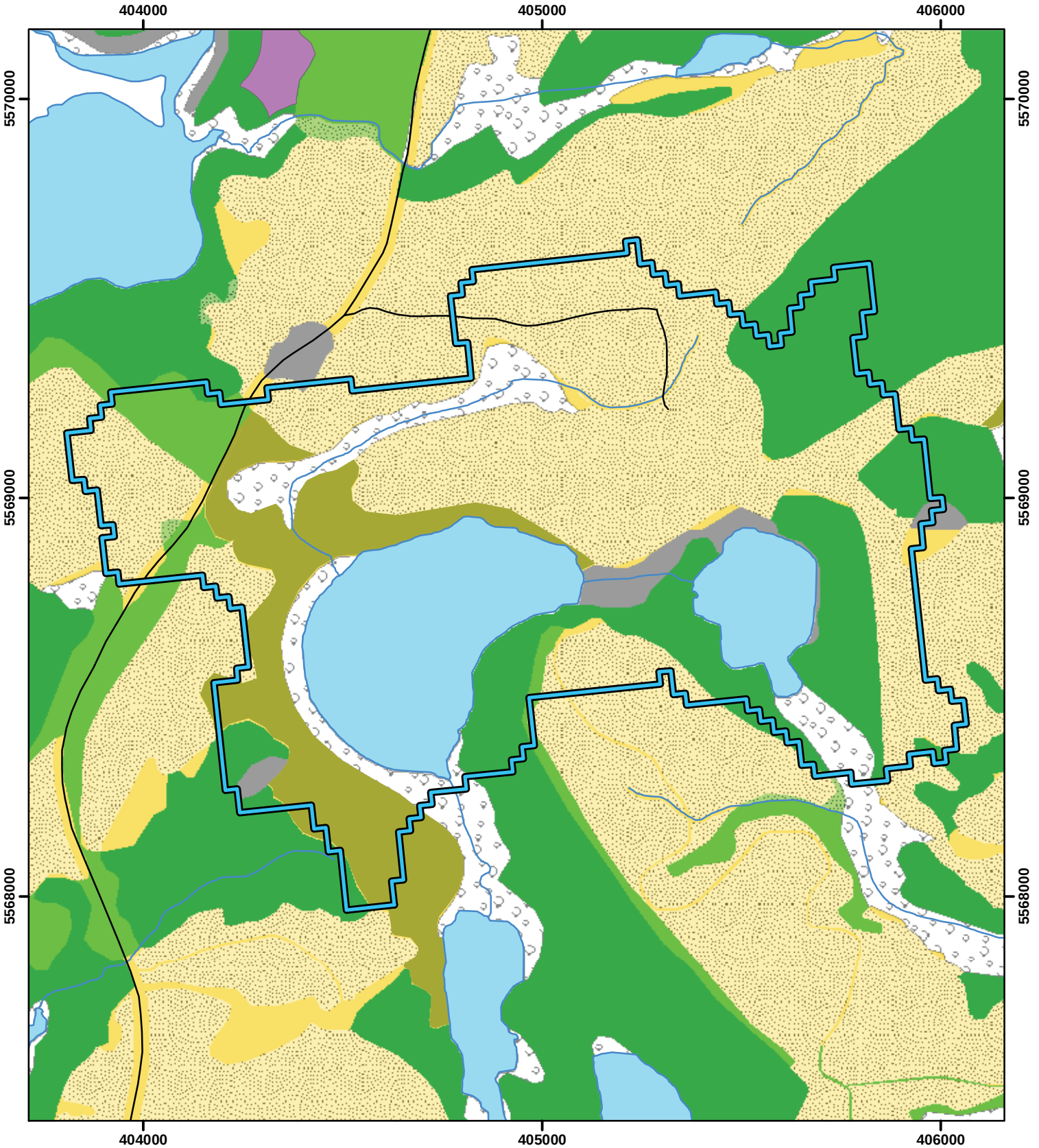
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.15 0.3 0.6 km

1:17,000

Planned and recent clearcut logging
Watershed N of Brown Bear L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

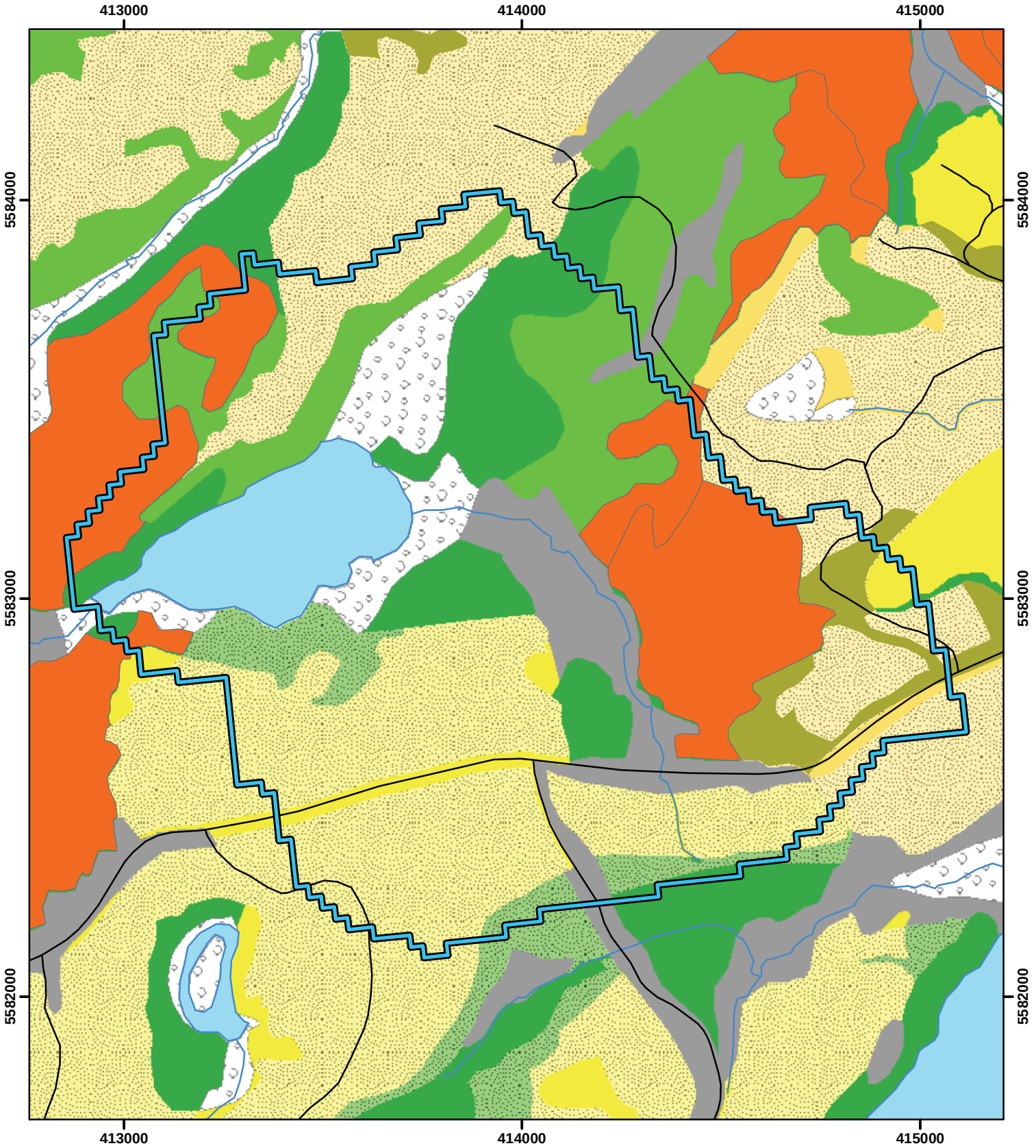
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

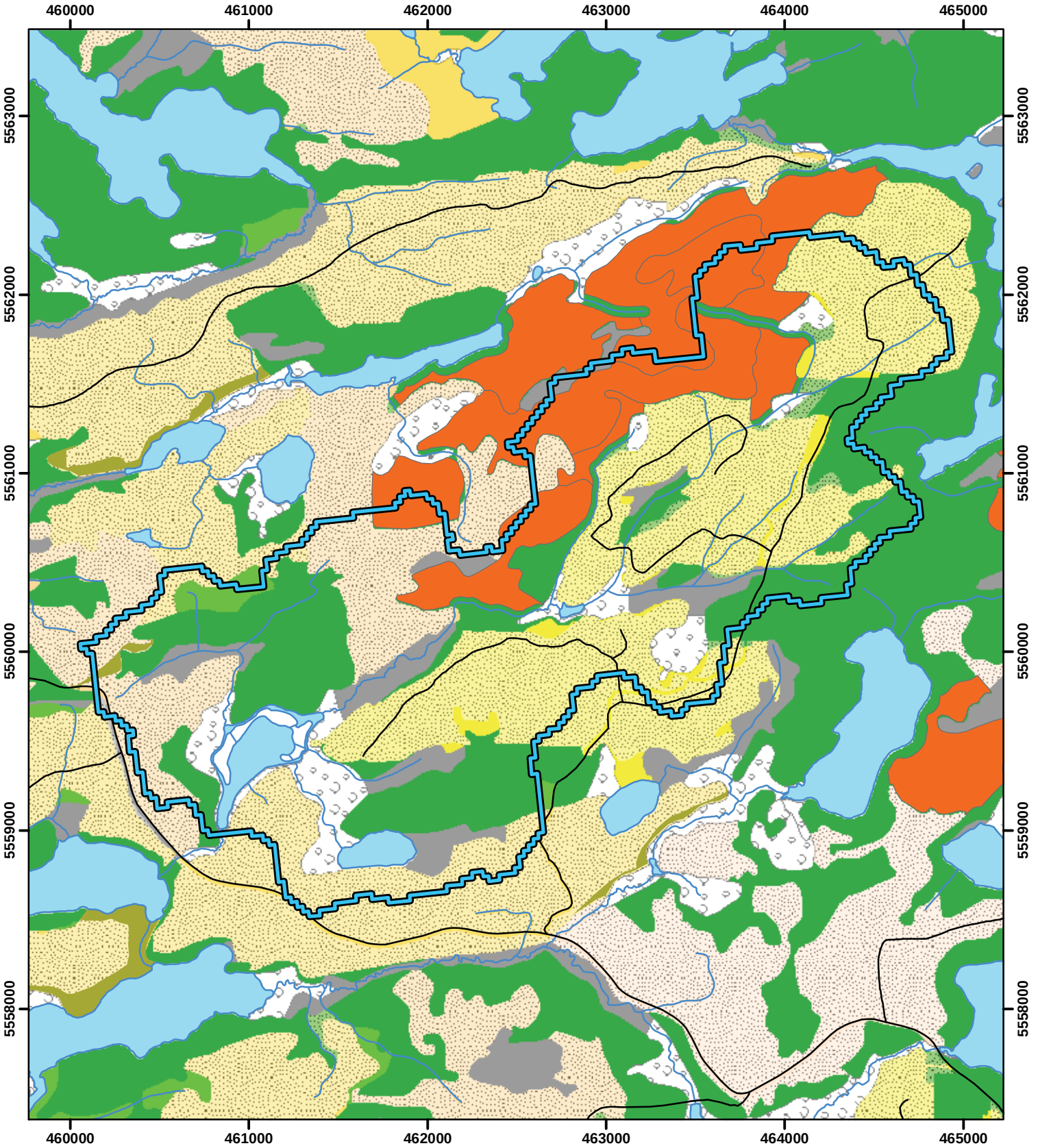
0 0.125 0.25 0.5 km

1:13,000

Planned and recent clearcut logging
Watershed N of Heider L



Planned and recent clearcut logging
Watershed N of Noname L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

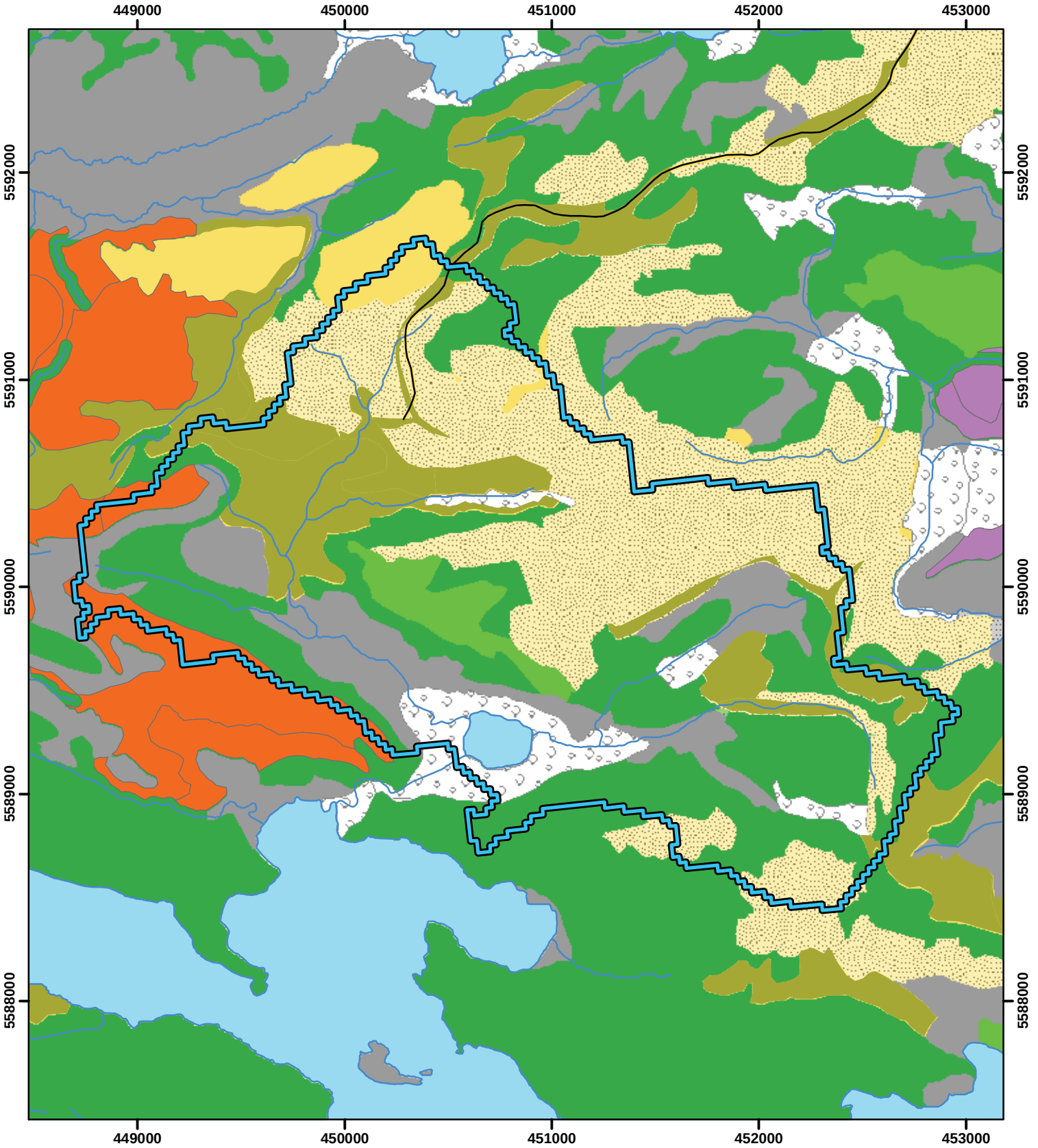
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.275 0.55 1.1 km

1:29,000

Planned and recent clearcut logging
Watershed N of Oak L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

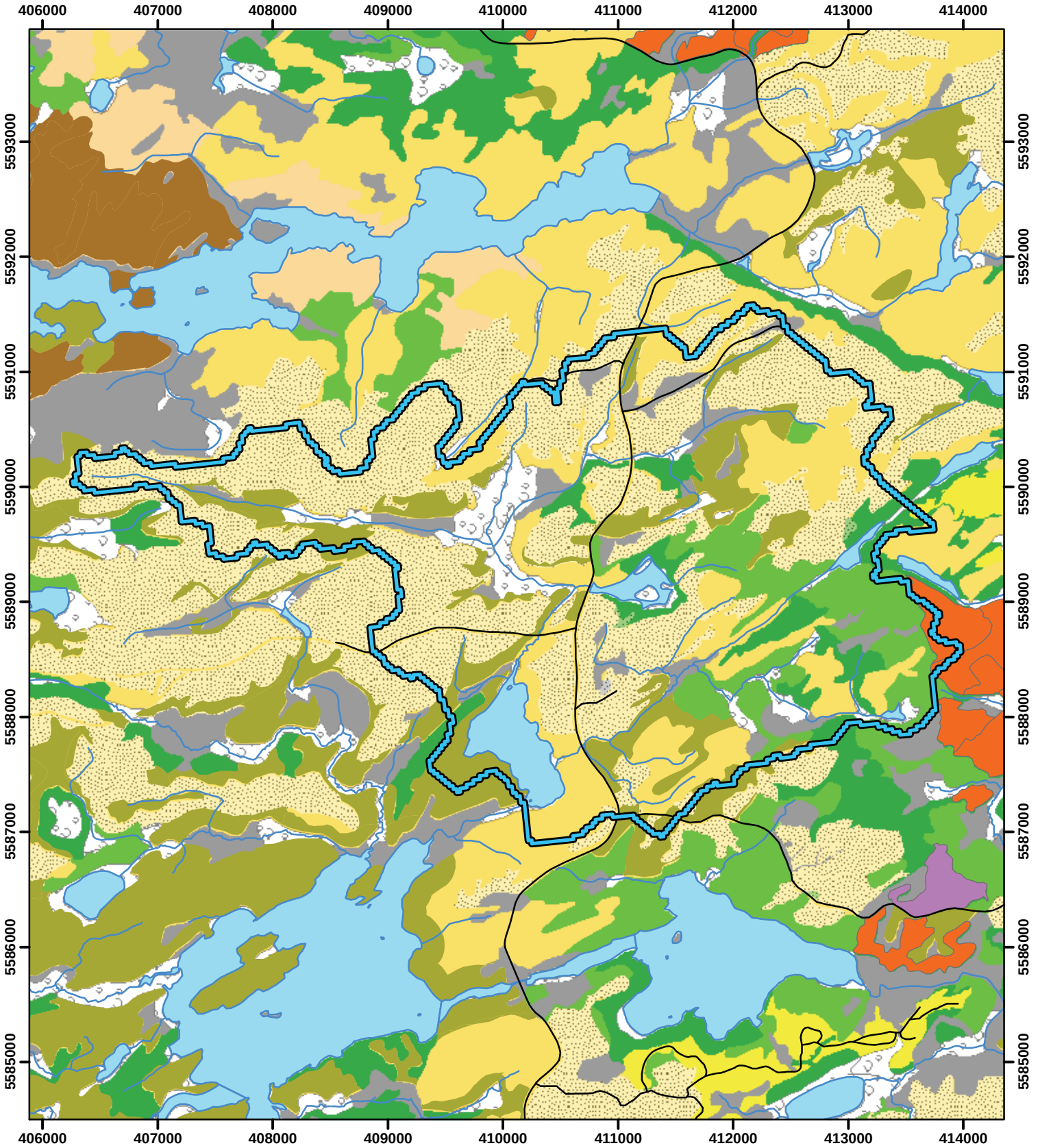
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.225 0.45 0.9 km

1:25,000

Planned and recent clearcut logging
Watershed N of Paintpot L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

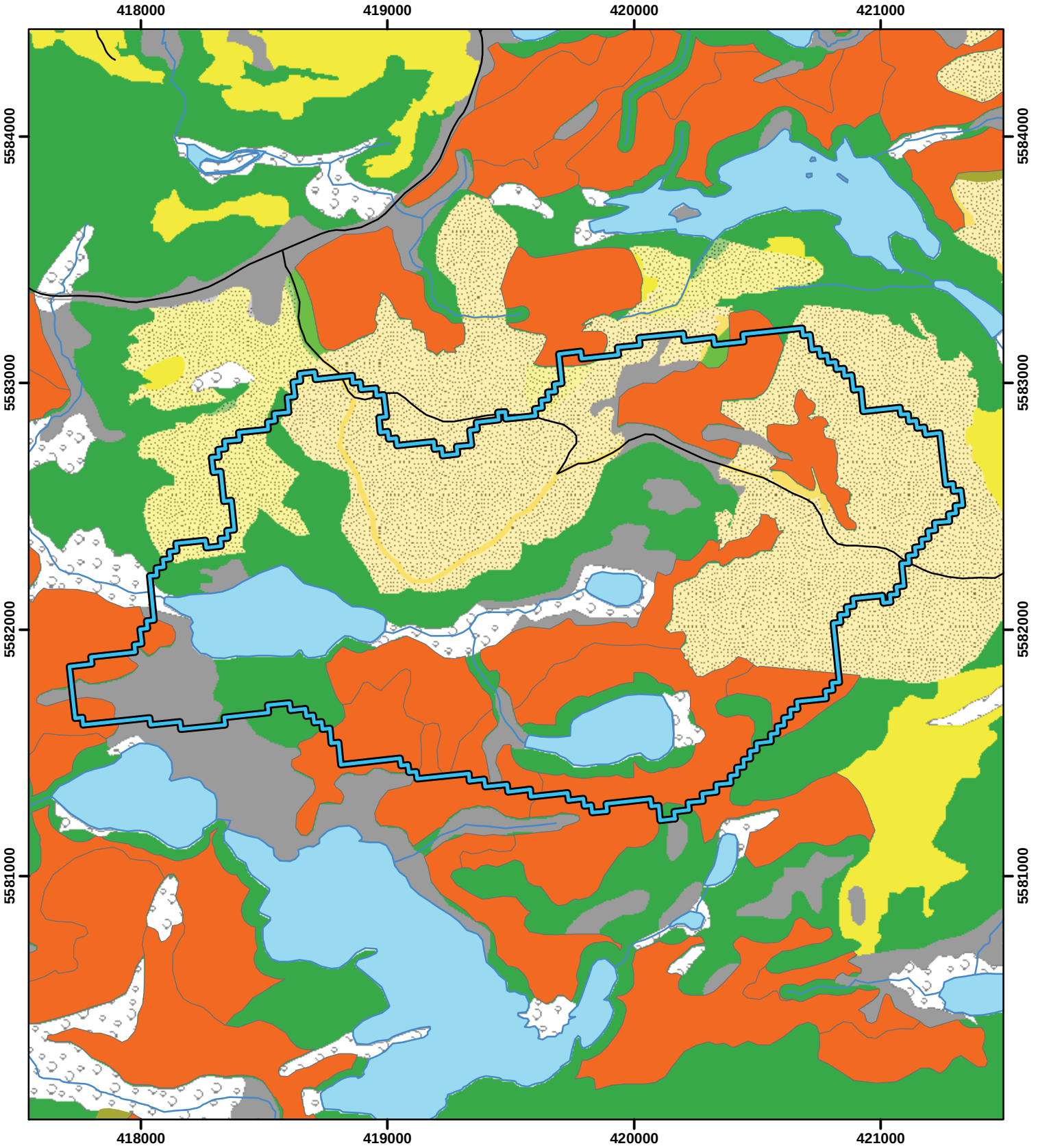
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.425 0.85 1.7 km

1:45,000

Planned and recent clearcut logging
Watershed N of Scotty Lake



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

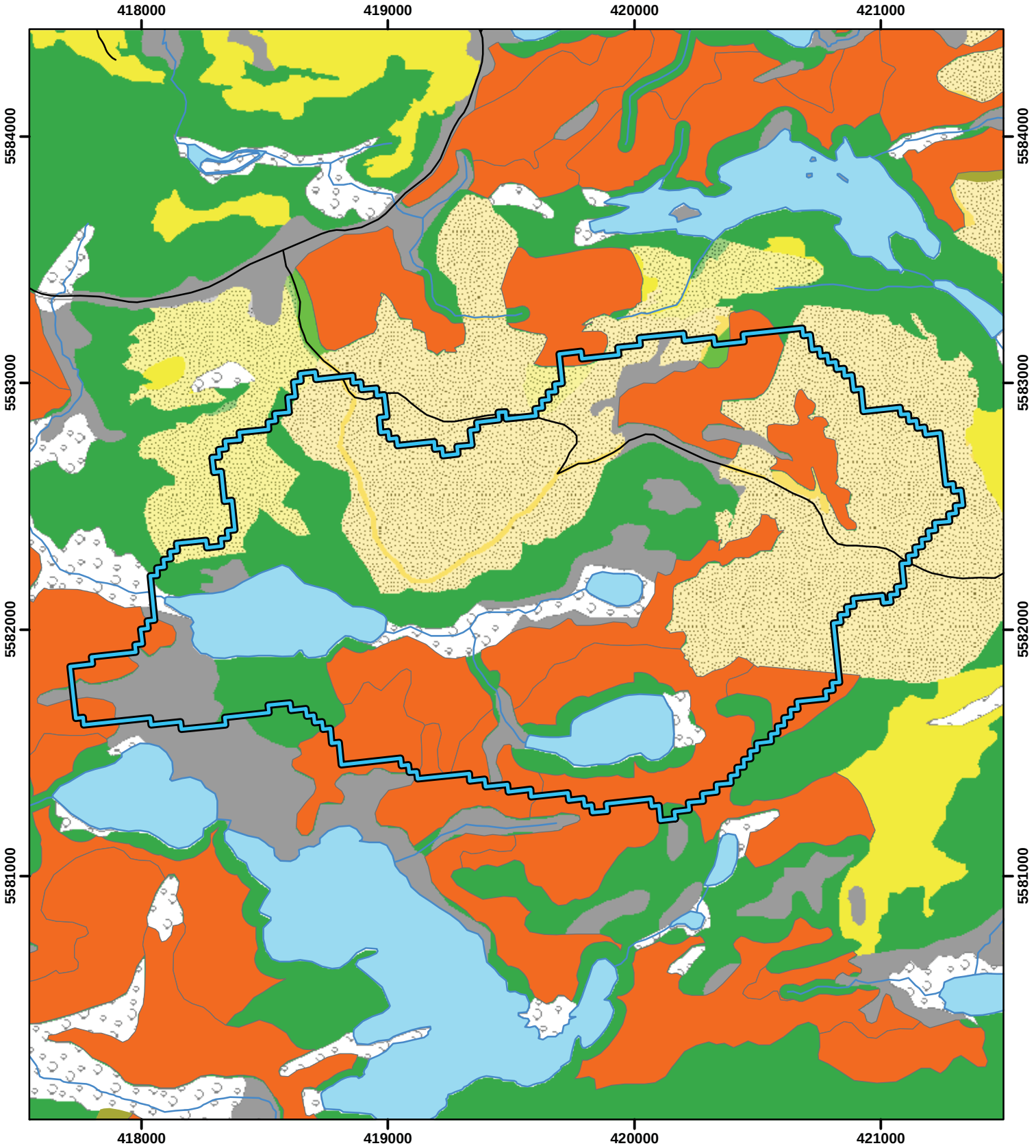
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.2 0.4 0.8 km

1:21,000

Planned and recent clearcut logging
Watershed N of Scotty Lake 2



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

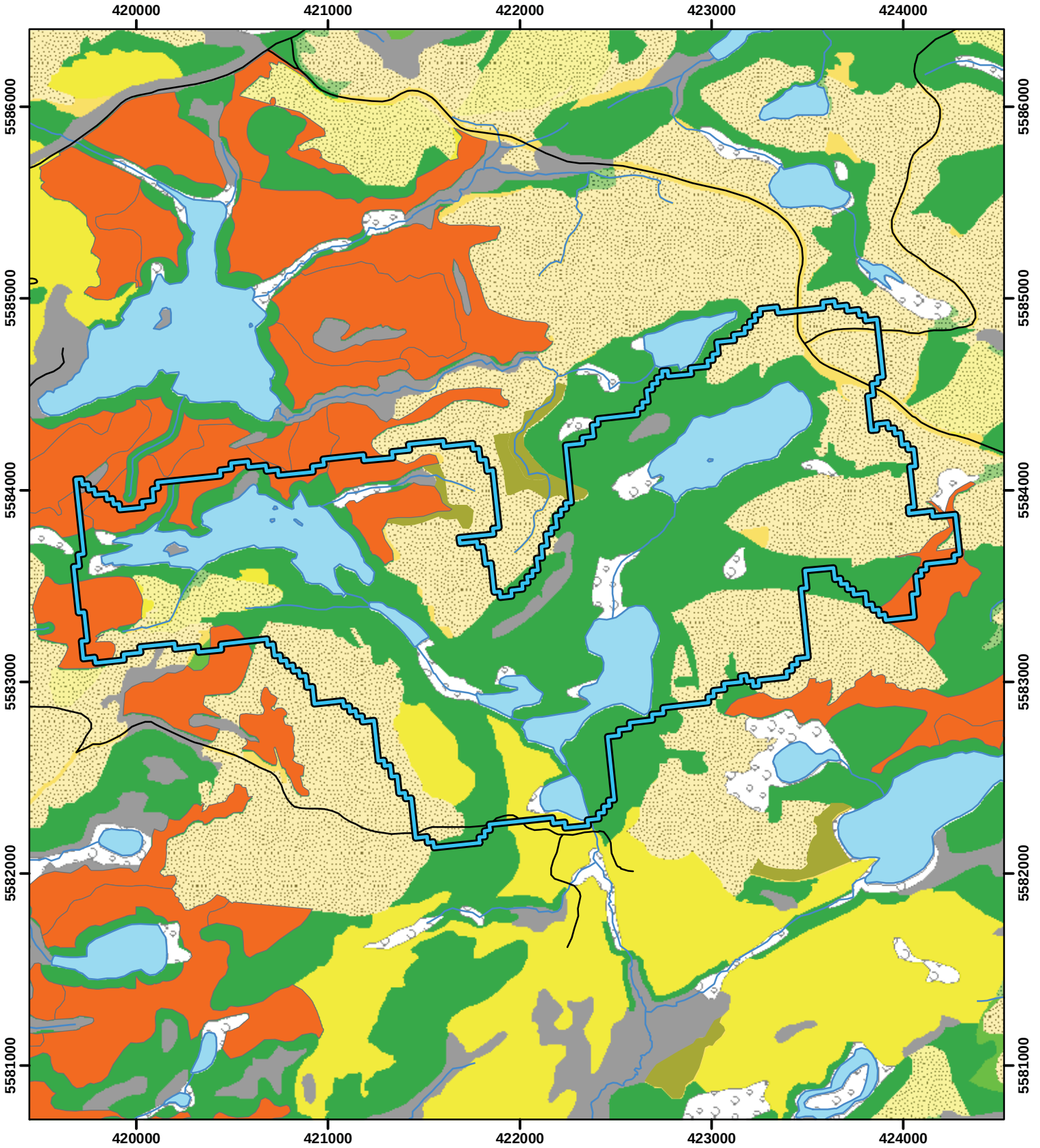
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.2 0.4 0.8 km

1:21,000

Planned and recent clearcut logging
Watershed N of Scotty Lake 4 not 1st order



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

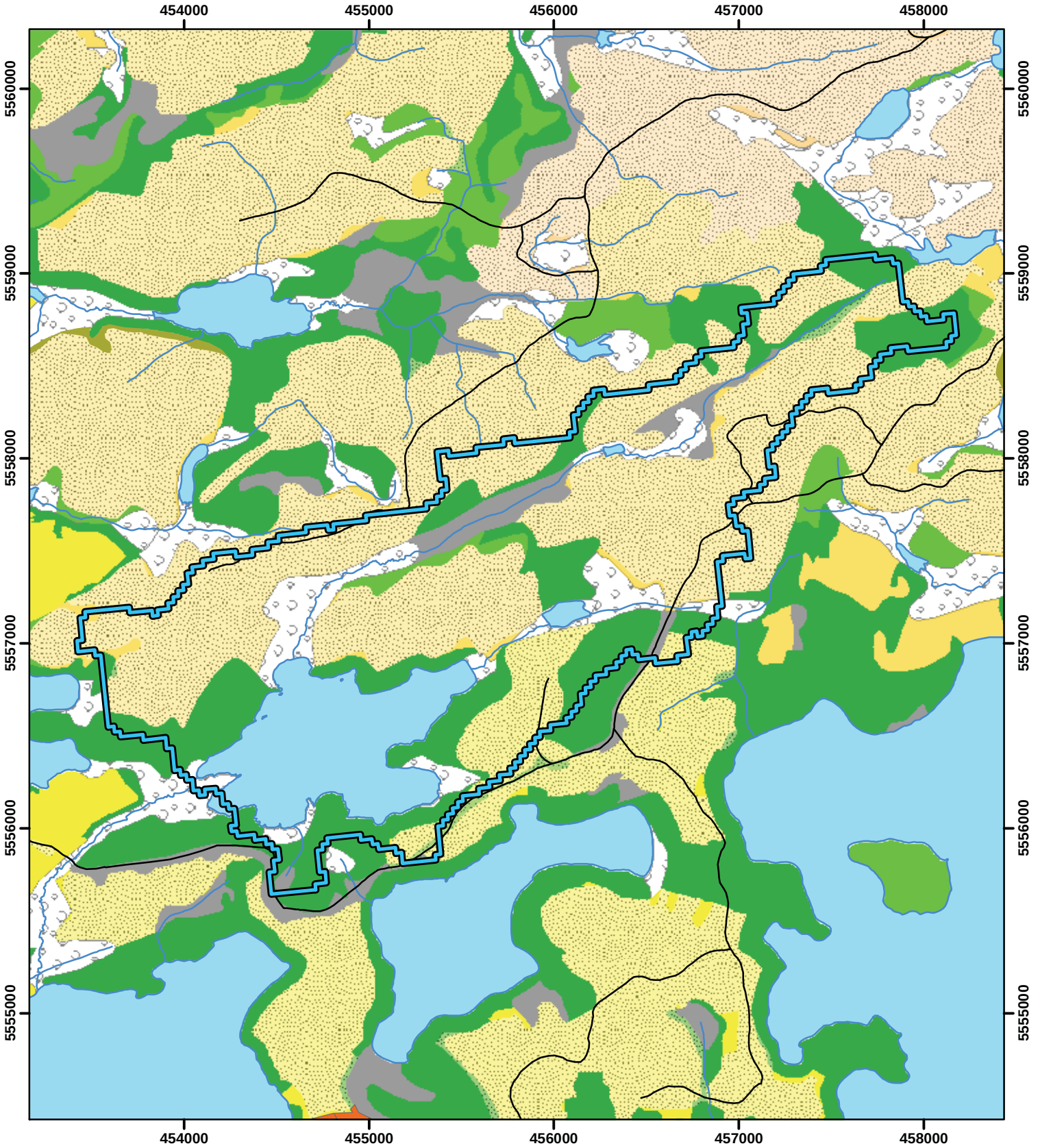
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.25 0.5 1 km

1:27,000

Planned and recent clearcut logging
Watershed N of Wabigoon L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

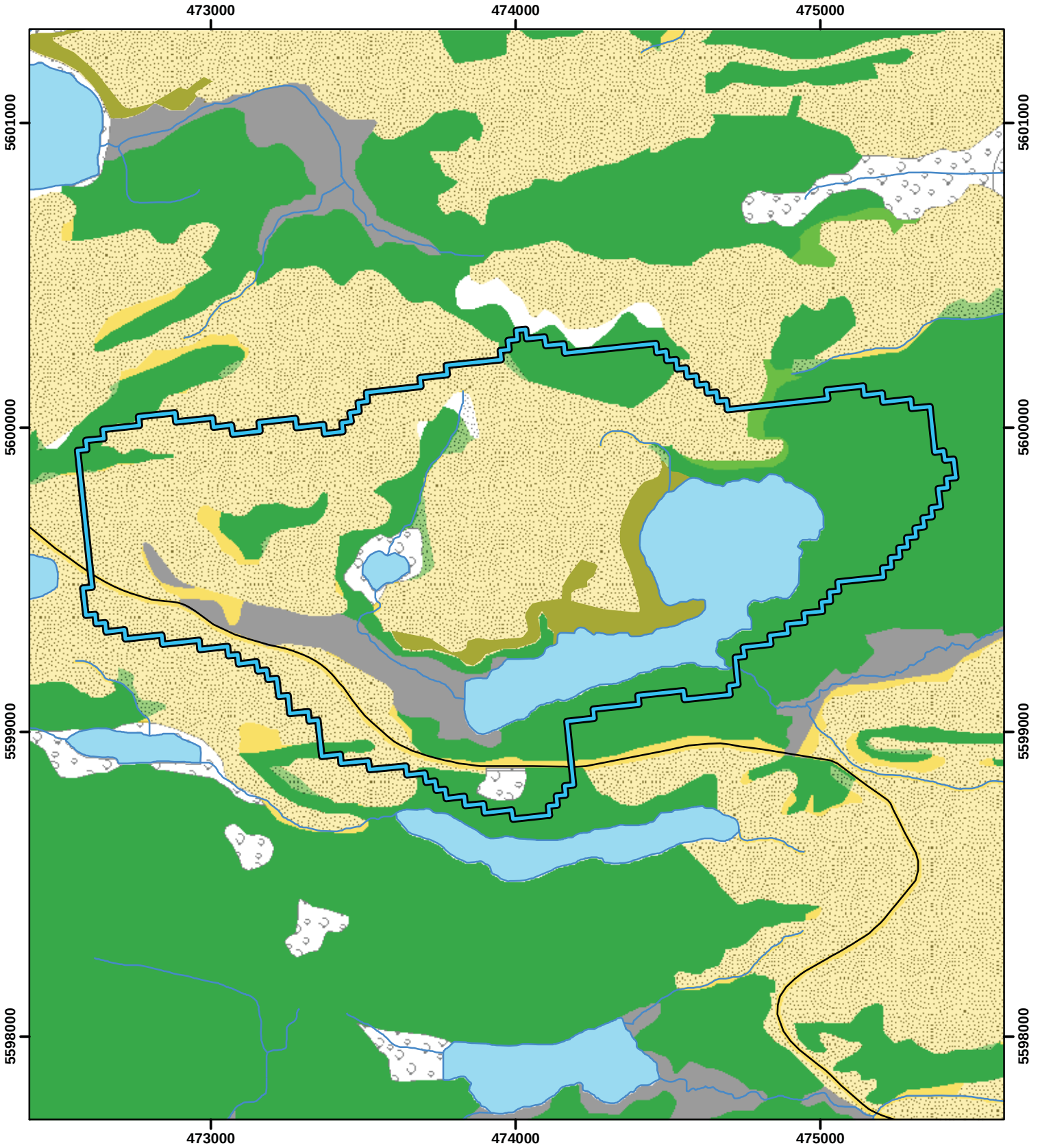
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.25 0.5 1 km

1:28,000

Planned and recent clearcut logging
Watershed N of Windfall Rd



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

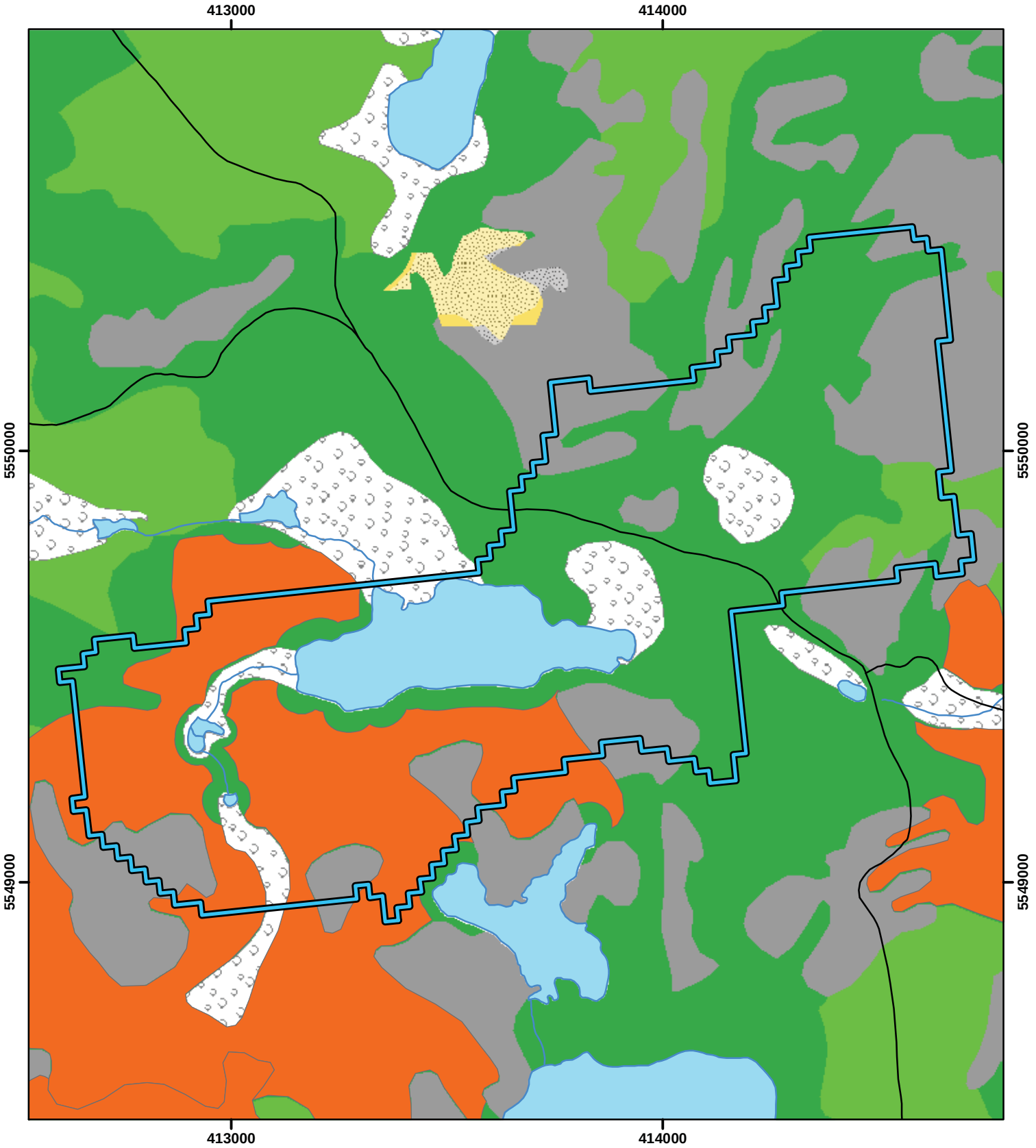
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.15 0.3 0.6 km

1:17,000

Planned and recent clearcut logging
Watershed No Name 01 W of Wonderland L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

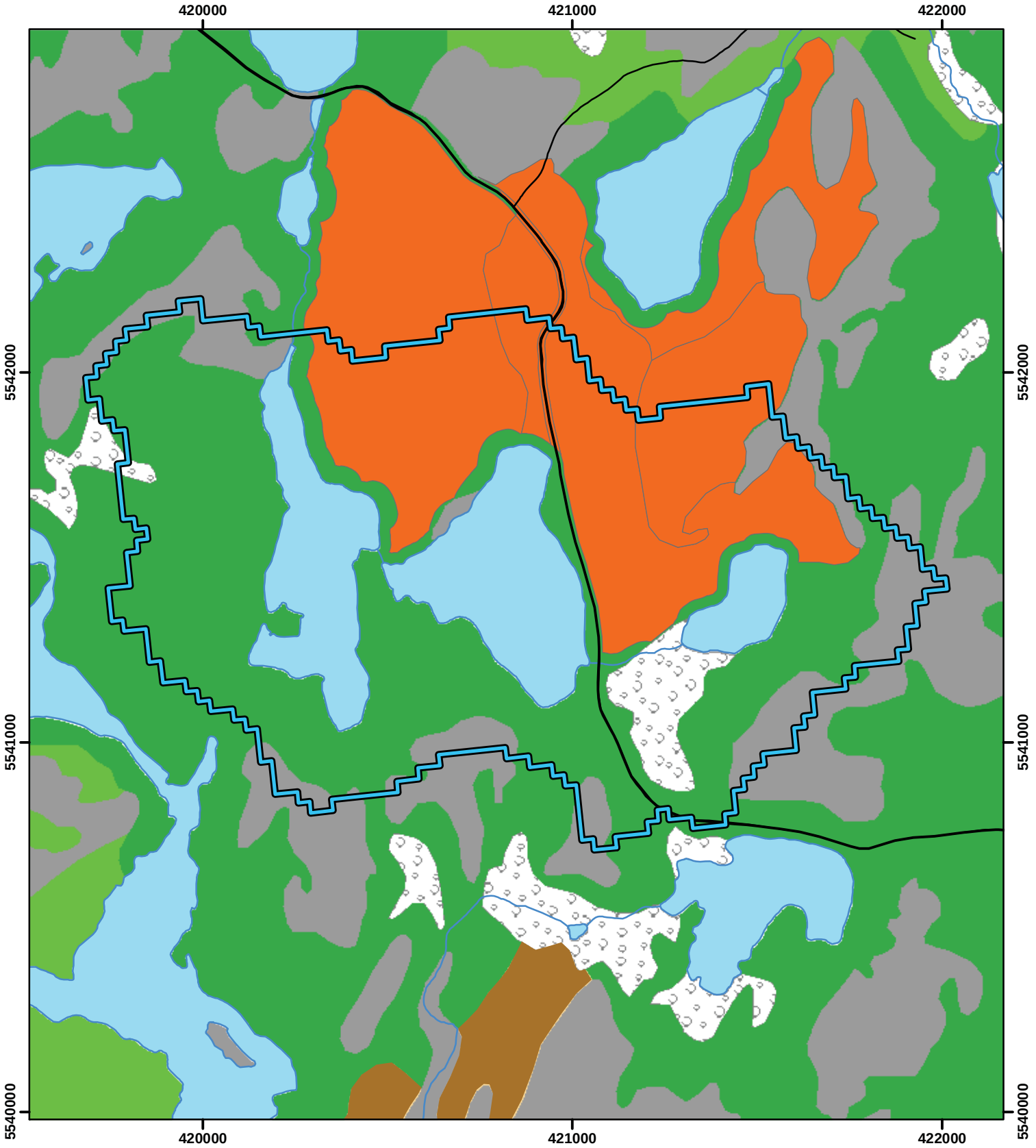
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.1 0.2 0.4 km

1:12,000

Planned and recent clearcut logging
Watershed NoName 02 E of Kill Deer L W of road



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

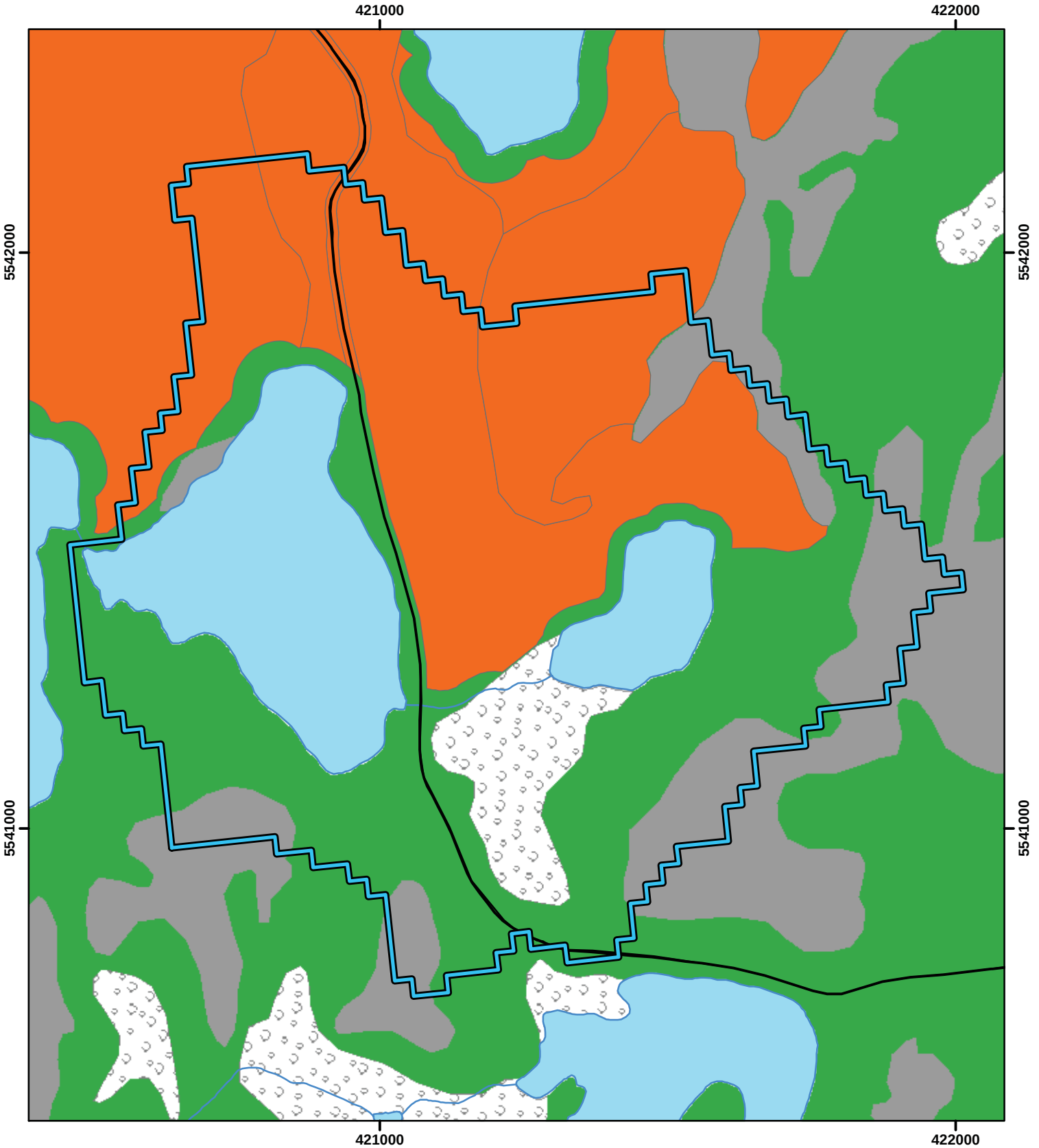
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.125 0.25 0.5 km

1:14,000

Planned and recent clearcut logging
Watershed Noname 03 near Red Deer Lake



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

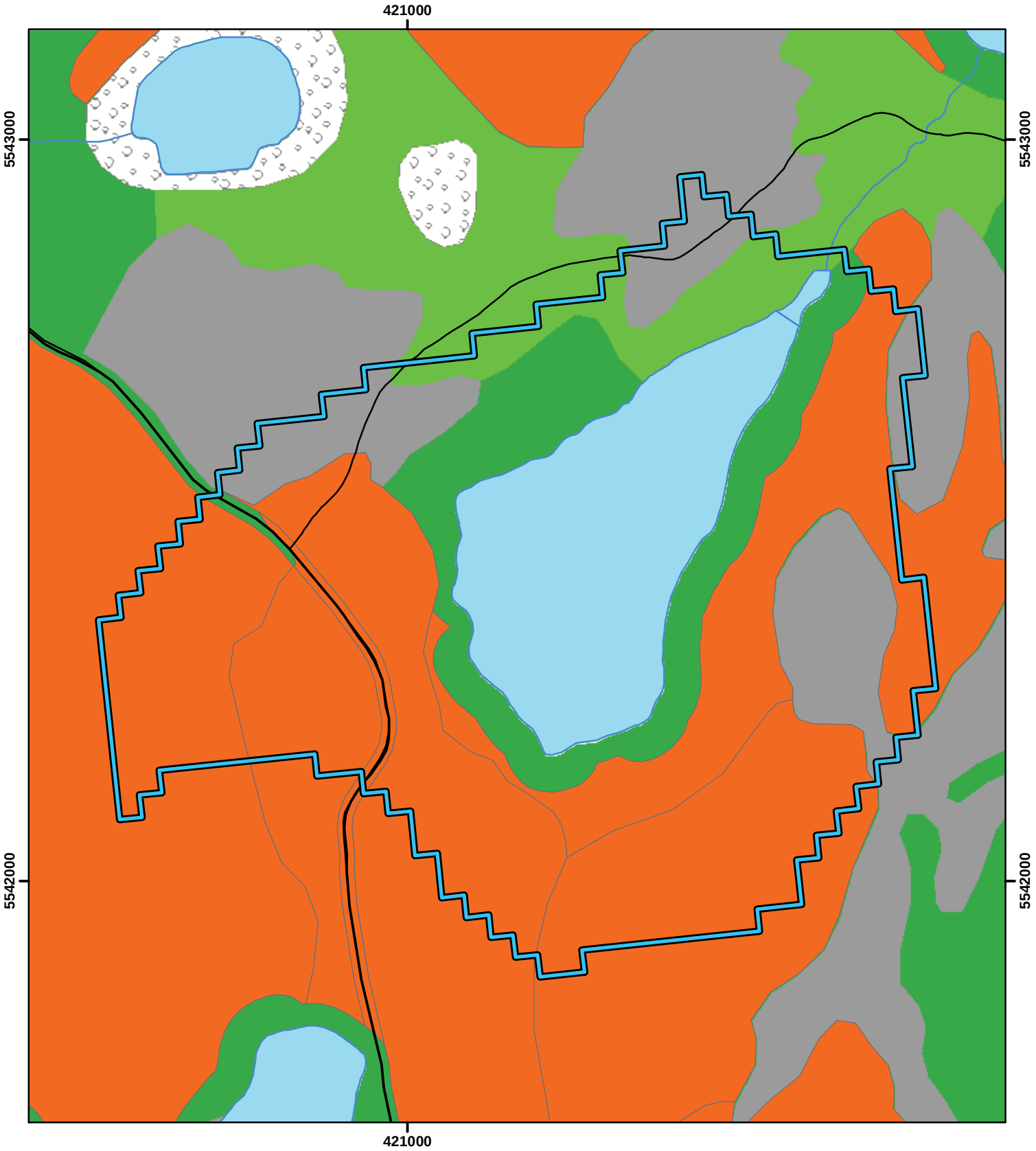
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.075 0.15 0.3 km

1:9,000

Planned and recent clearcut logging
Watershed Noname 04 near Red Deer Lake



Watershed Limits

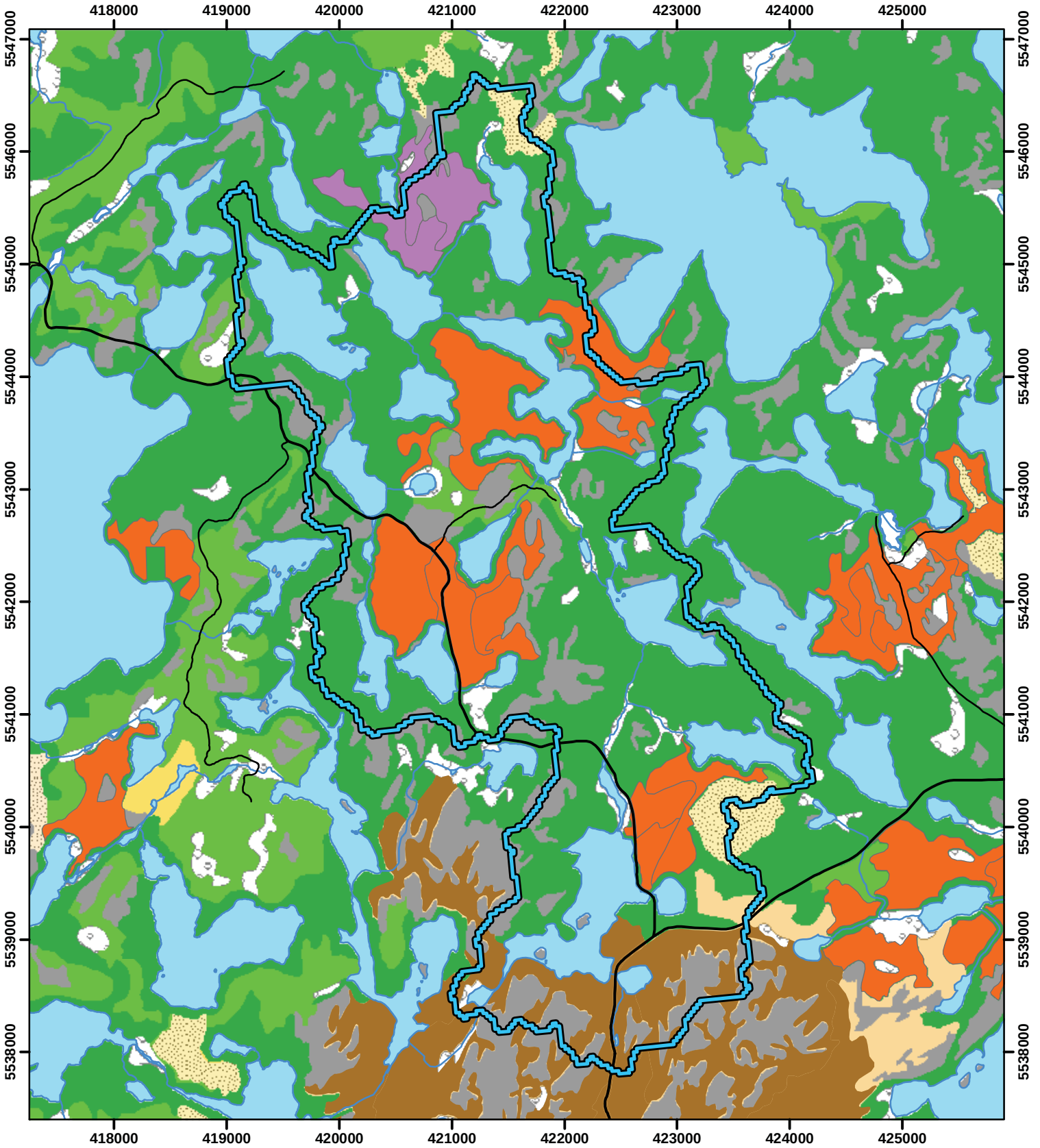
Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.05 0.1 0.2
km
1:7,000

Planned and recent clearcut logging
Watershed NoName 06 S of Wonderland



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

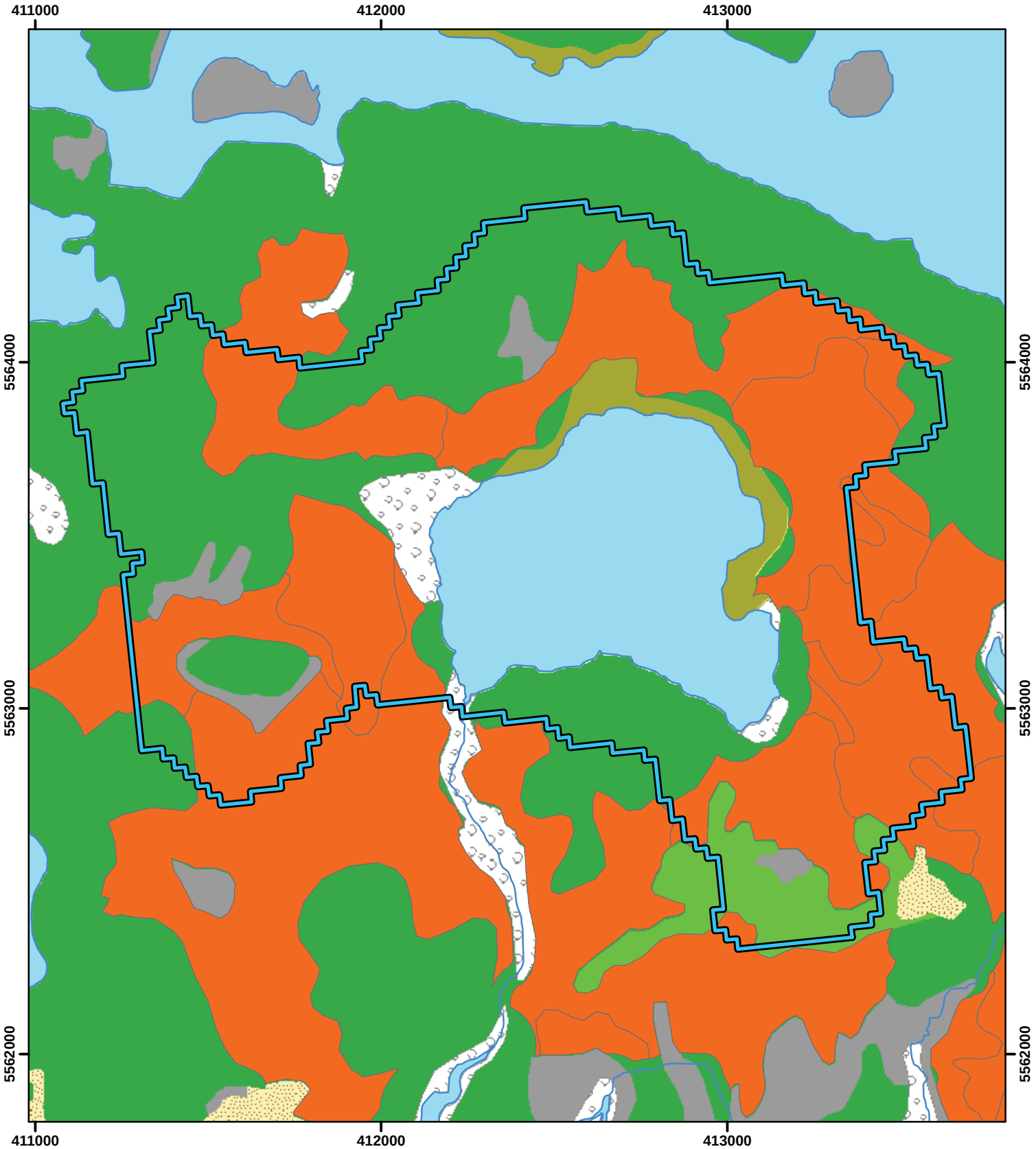
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.45 0.9 1.8 km

1:46,000

Planned and recent clearcut logging
Watershed NoName 11 S of Scenic L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

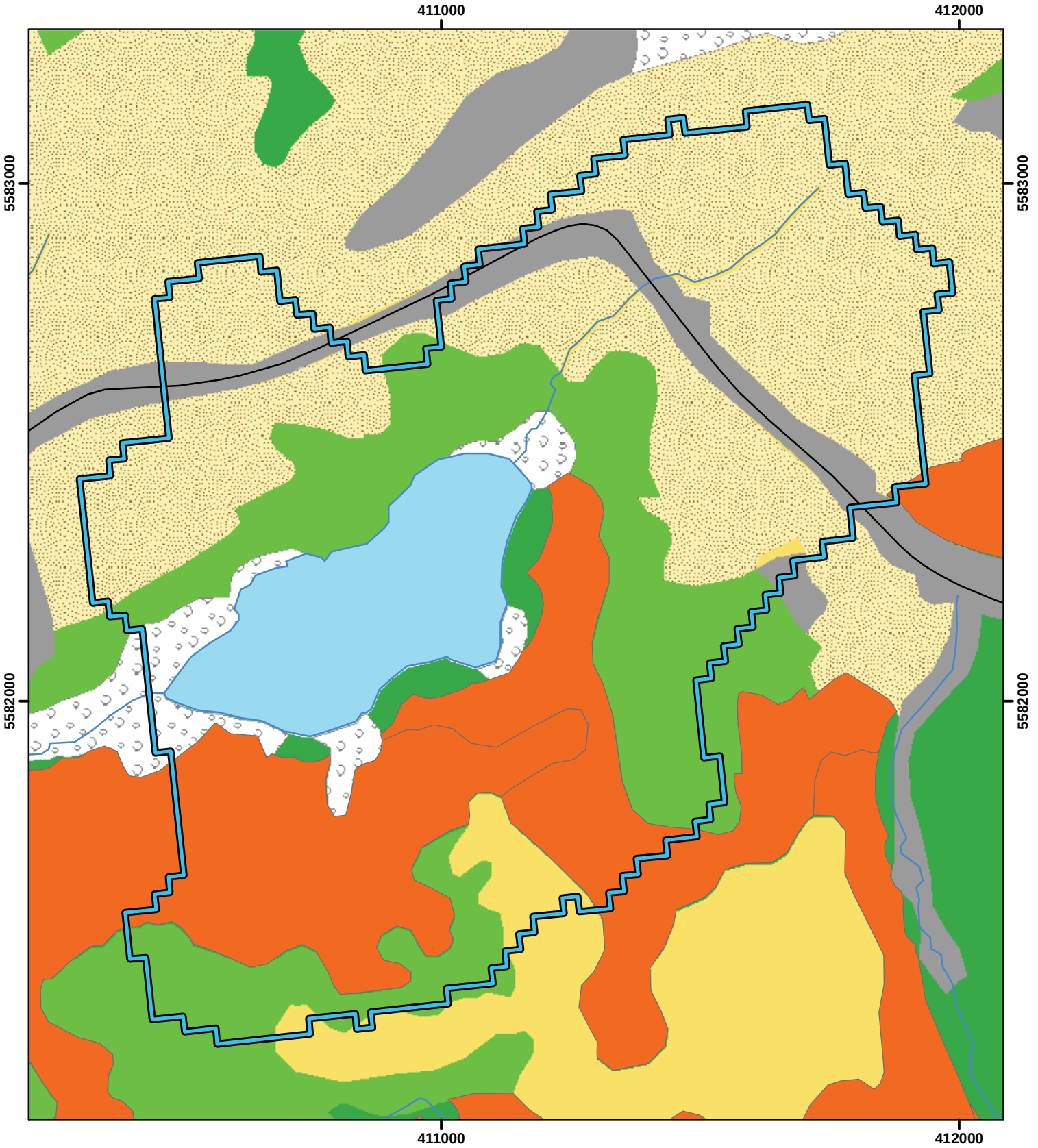
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.125 0.25 0.5 km

1:15,000

Planned and recent clearcut logging
Watershed NoName 15 SE of Paintpot L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

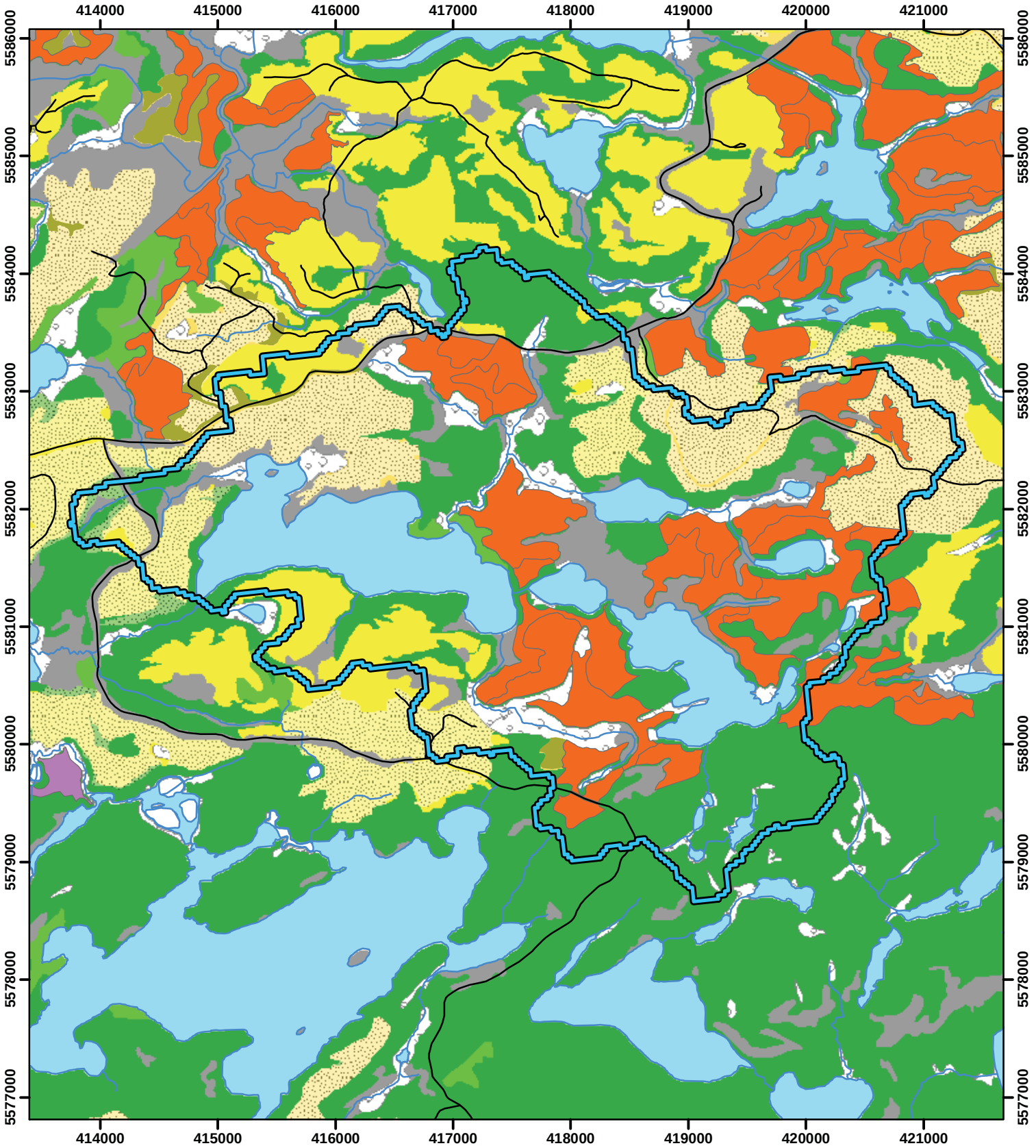
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.075 0.15 0.3 km

1:10,000

Planned and recent clearcut logging
Watershed NoName 17 N of Helder L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

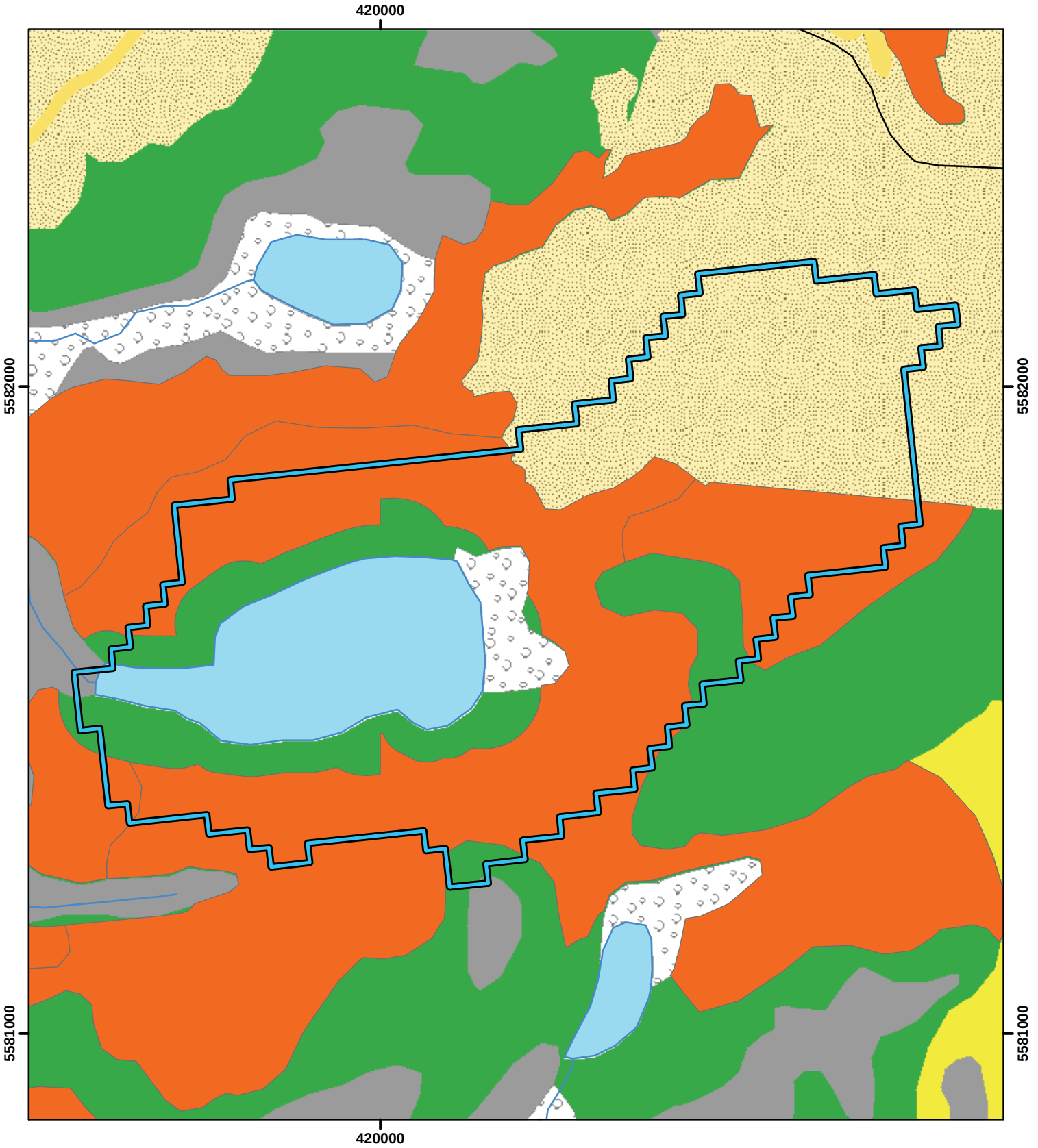
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.425 0.85 1.7 km

1:44,000

Planned and recent clearcut logging
Watershed NoName 19 S of Campfire L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

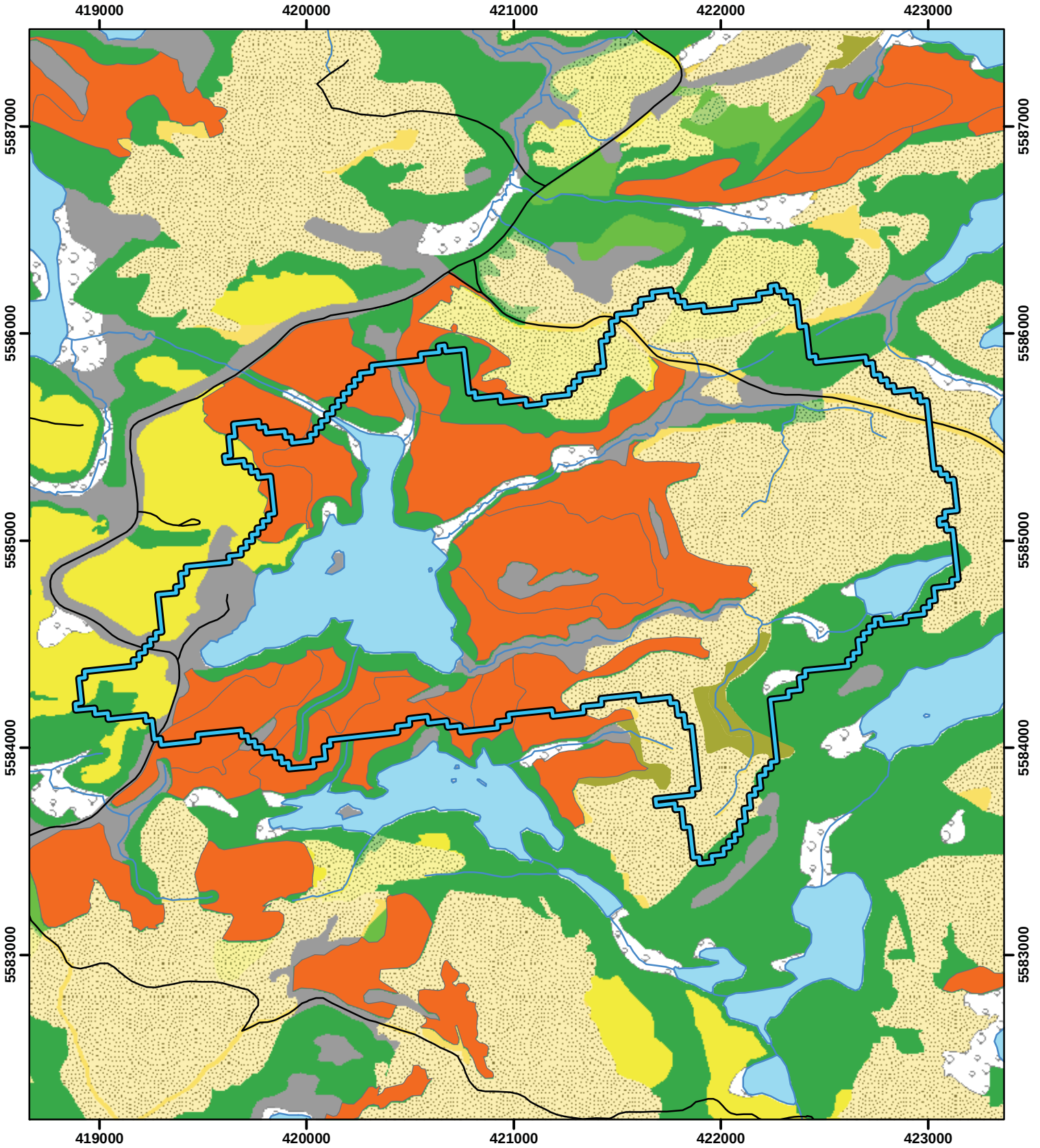
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.075 0.15 0.3 km

1:8,000

Planned and recent clearcut logging
Watershed Noname 20 near Campfire Lake



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

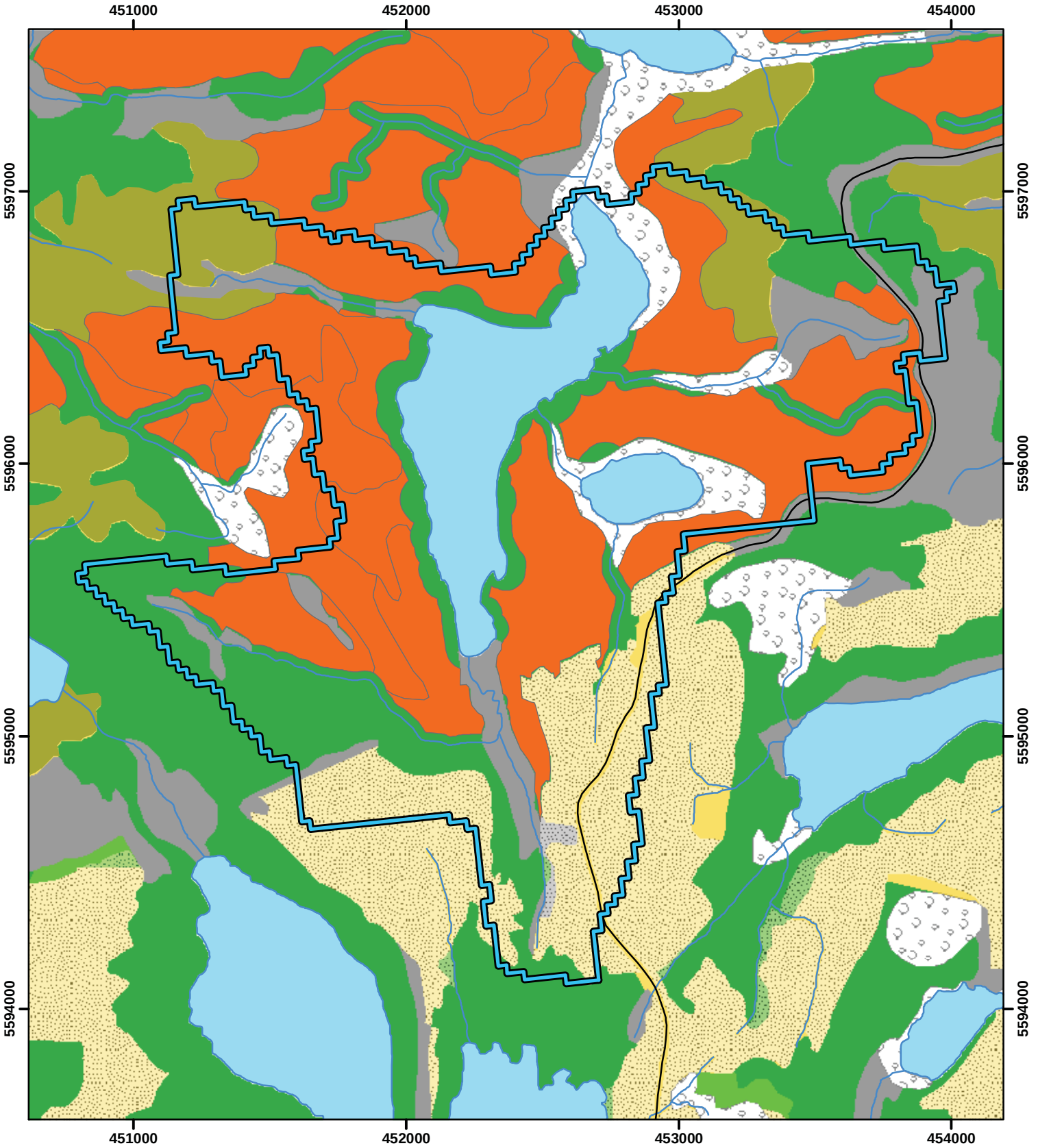
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.225 0.45 0.9 km

1:25,000

Planned and recent clearcut logging
Watershed Noname 24 near Wilcox Lake



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

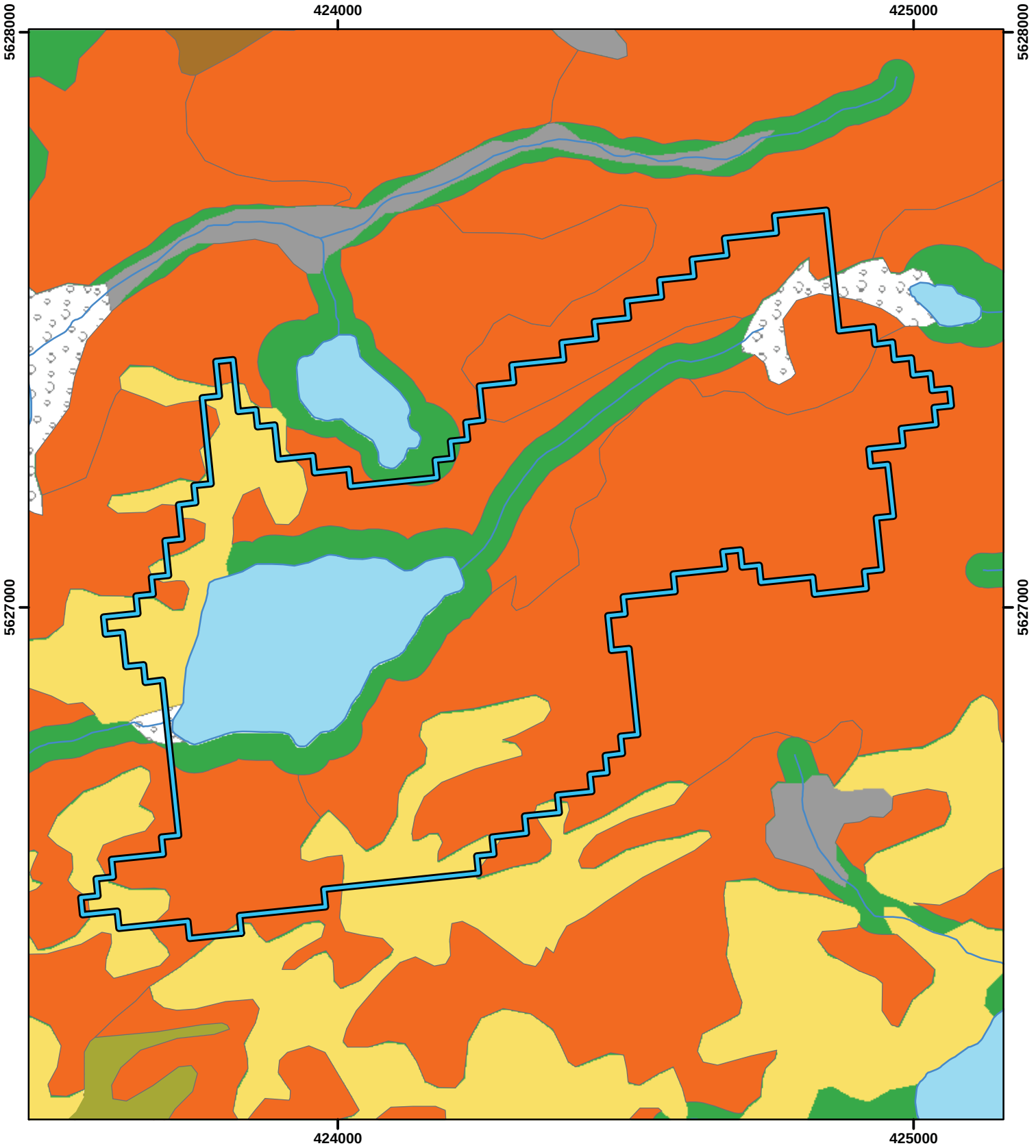
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.175 0.35 0.7 km

1:19,000

Planned and recent clearcut logging
Watershed NoName 26 N of Longlegged L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

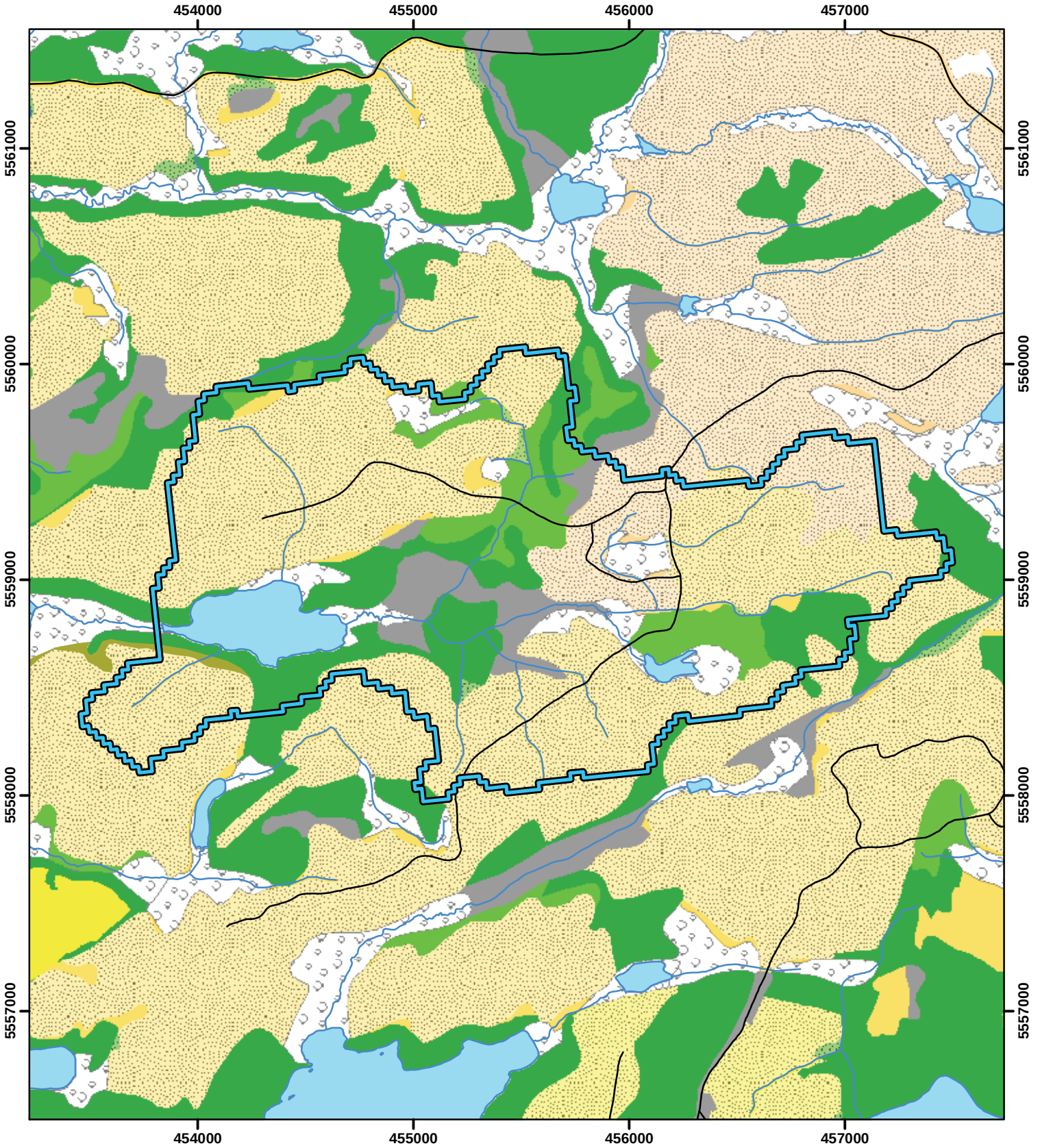
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.075 0.15 0.3 km

1:9,000

Planned and recent clearcut logging
Watershed NW of Segise L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

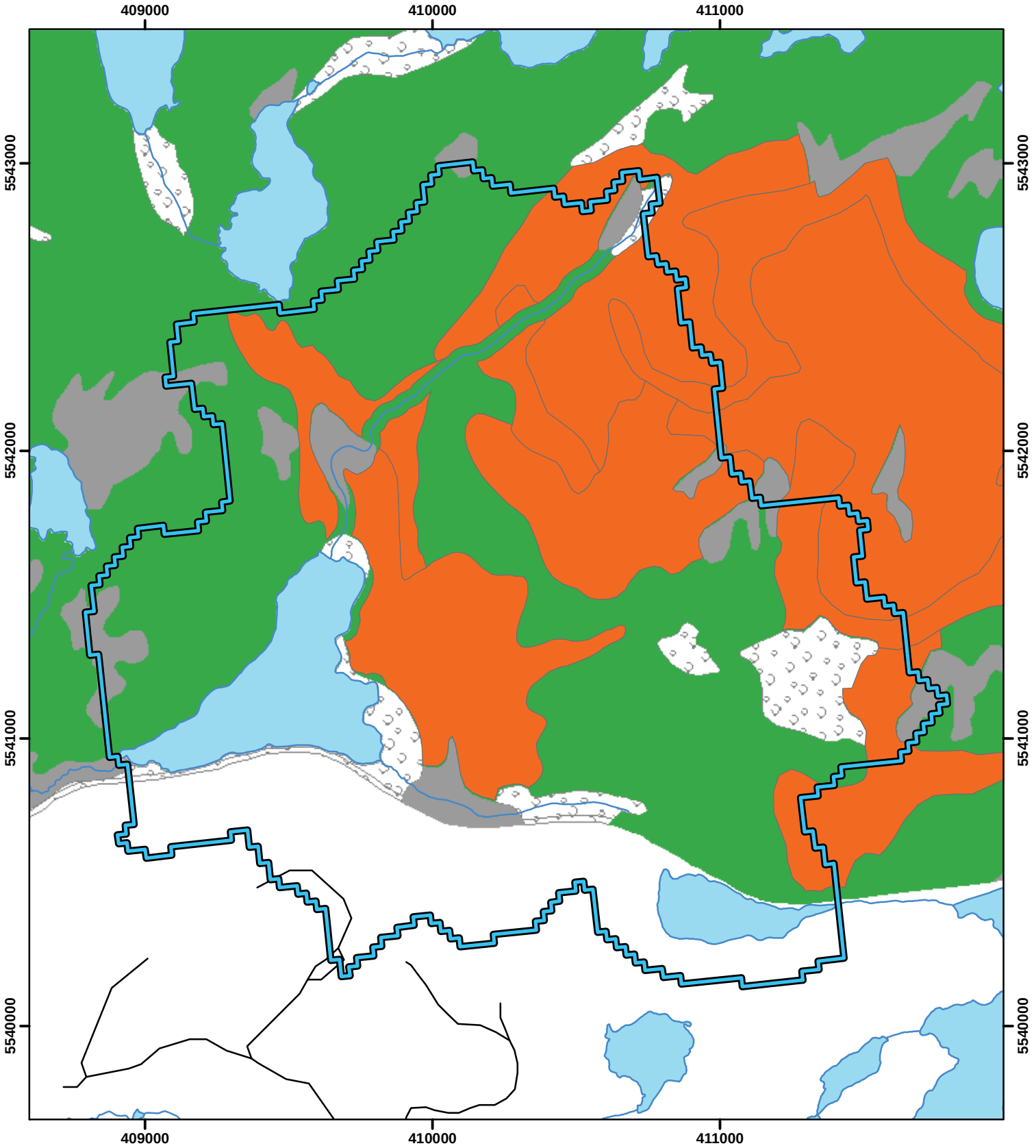
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.225 0.45 0.9 km

1:24,000

Planned and recent clearcut logging
Watershed Rocky Lake



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

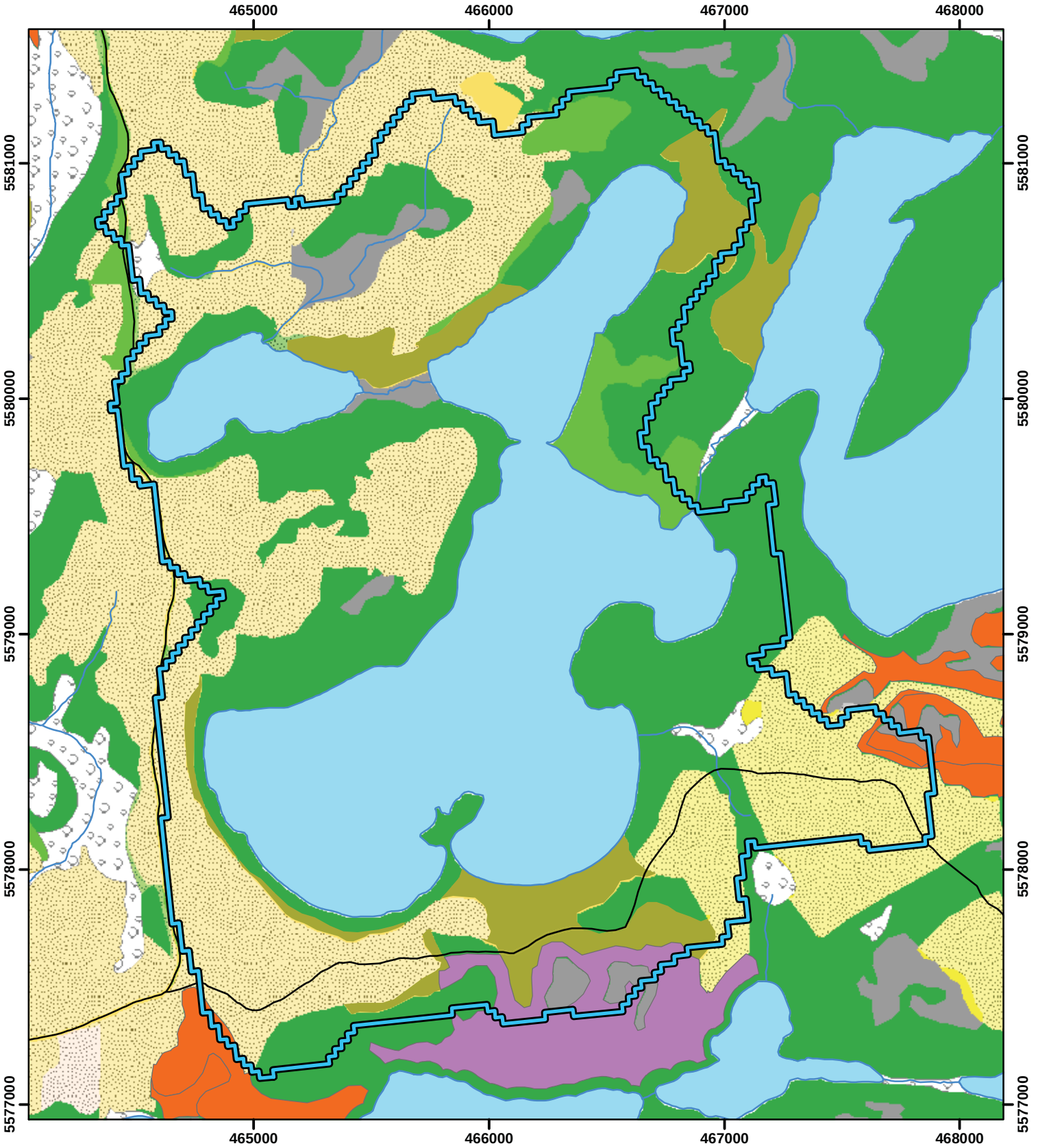
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.175 0.35 0.7 km

1:18,000

Planned and recent clearcut logging
Watershed S of Anishinabe L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

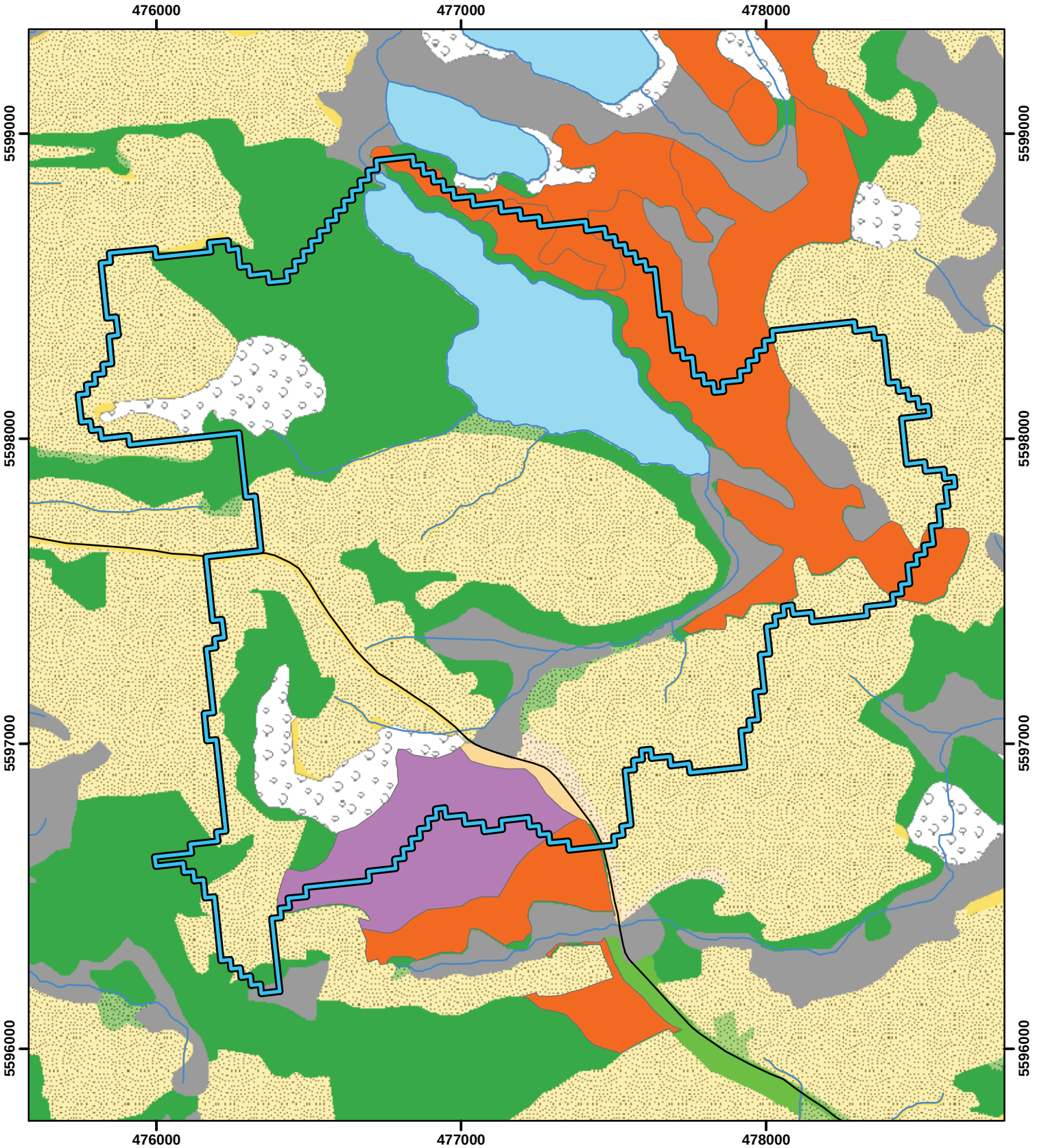
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.2 0.4 0.8 km

1:22,000

Planned and recent clearcut logging
Watershed S of Rice L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

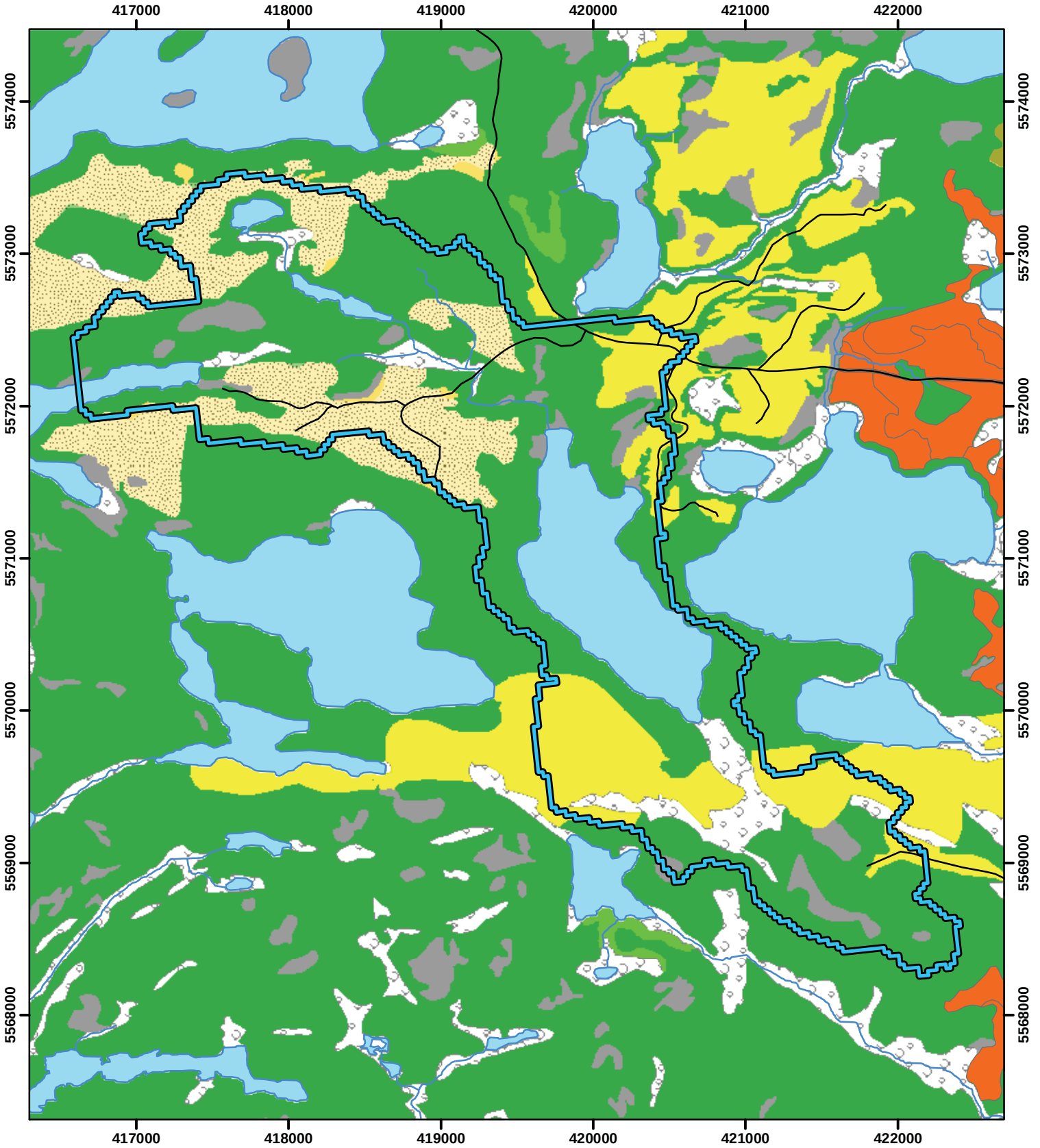
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.15 0.3 0.6 km

1:17,000

Planned and recent clearcut logging
Watershed SE of Lennan L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

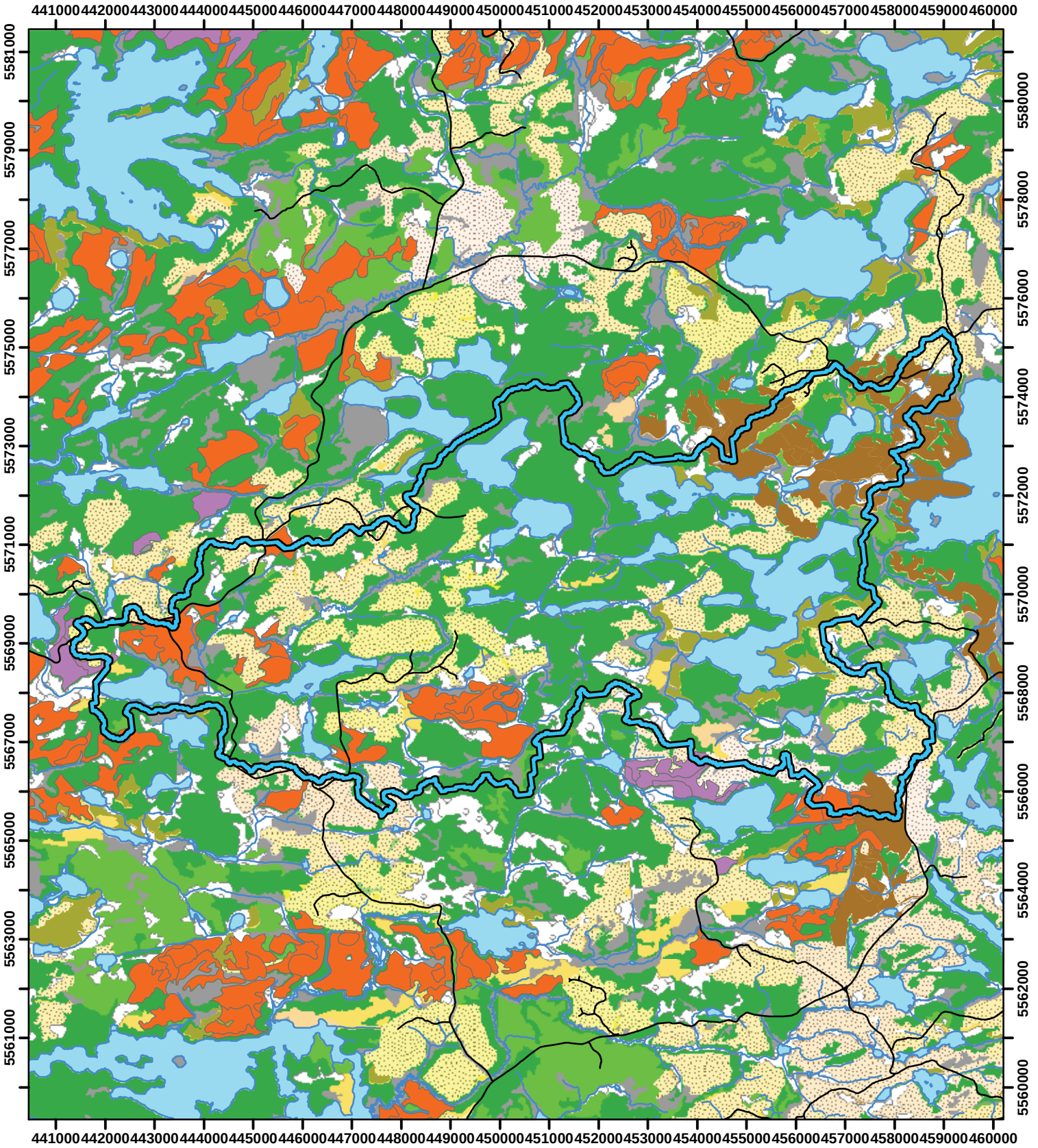
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

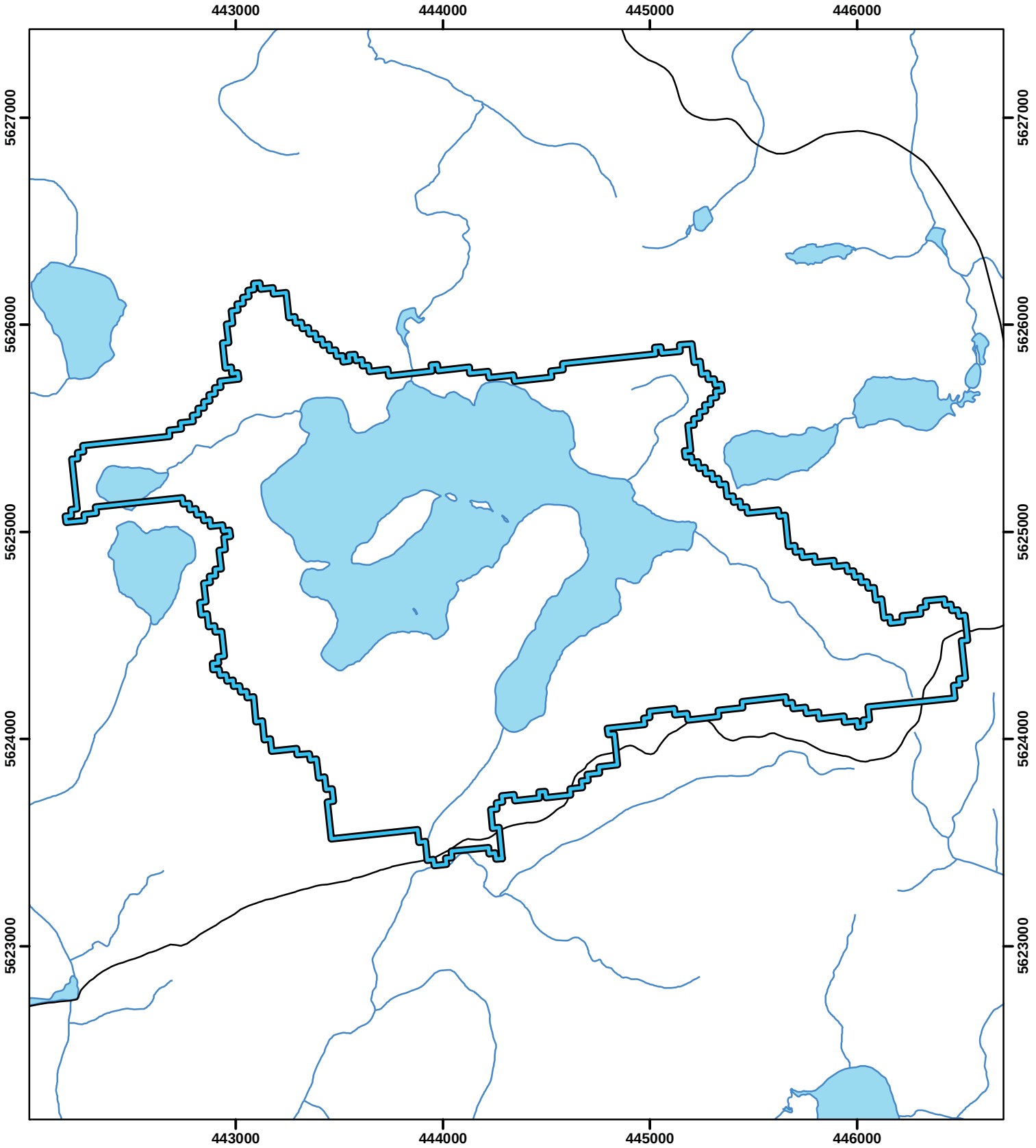
0 0.325 0.65 1.3 km

1:34,000

Planned and recent clearcut logging
Watershed Stewart L watershed



Planned and recent clearcut logging
Watershed SW of Dixie L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

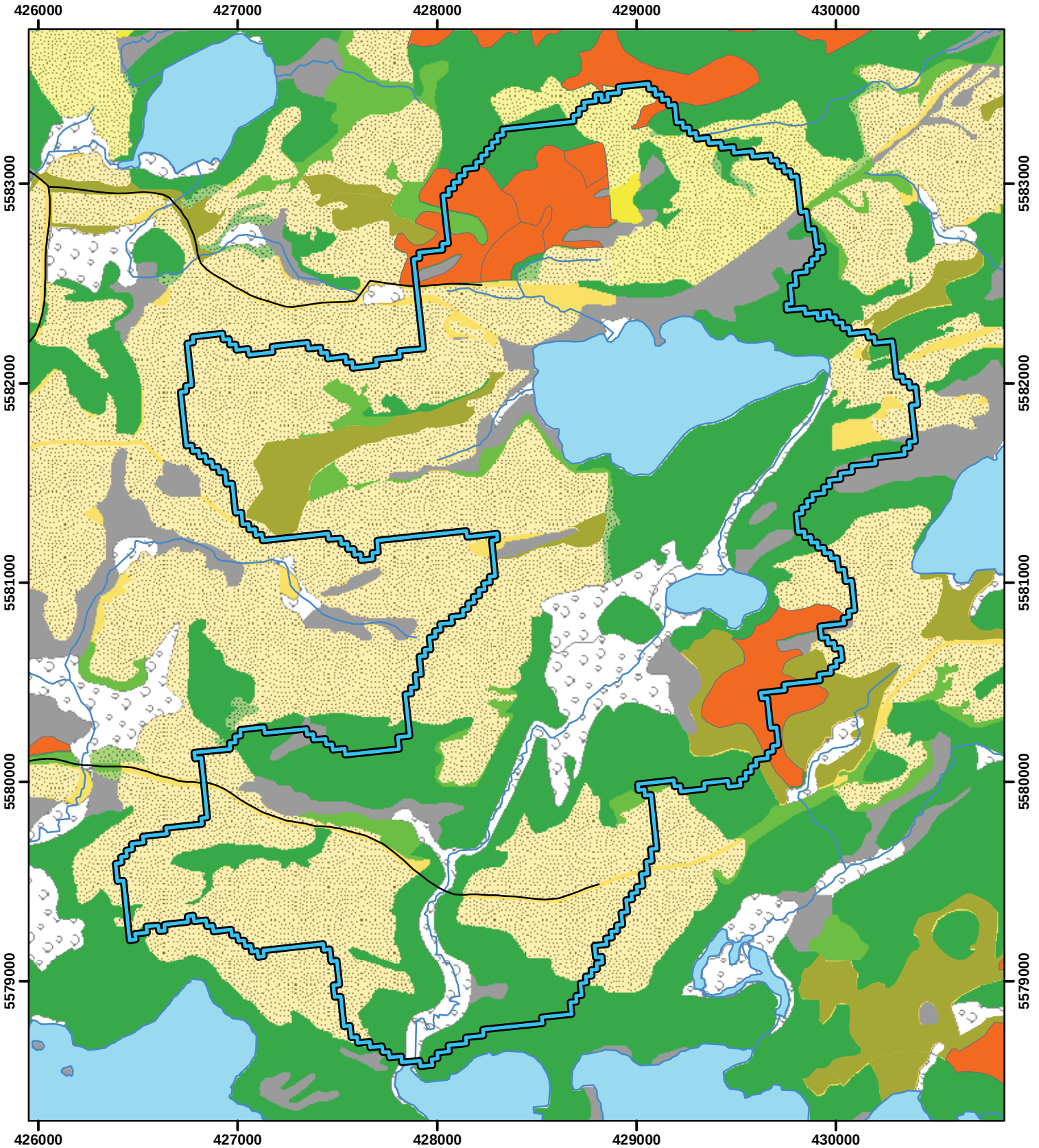
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.225 0.45 0.9 km

1:25,000

Planned and recent clearcut logging
Watershed Tributary of Tide L



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

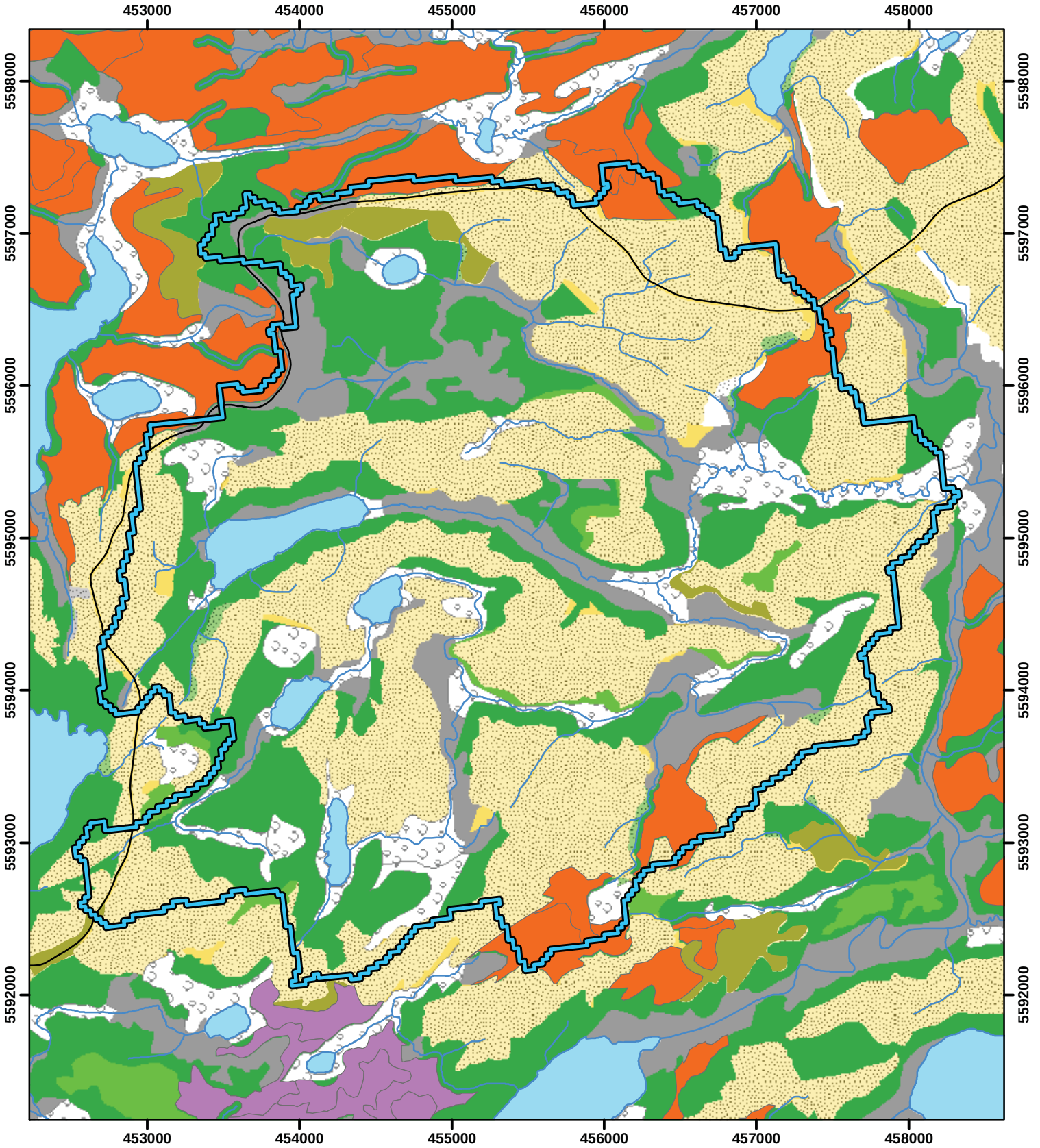
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.25 0.5 1 km

1:26,000

Planned and recent clearcut logging
Watershed Tributary of Zizania Creek



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

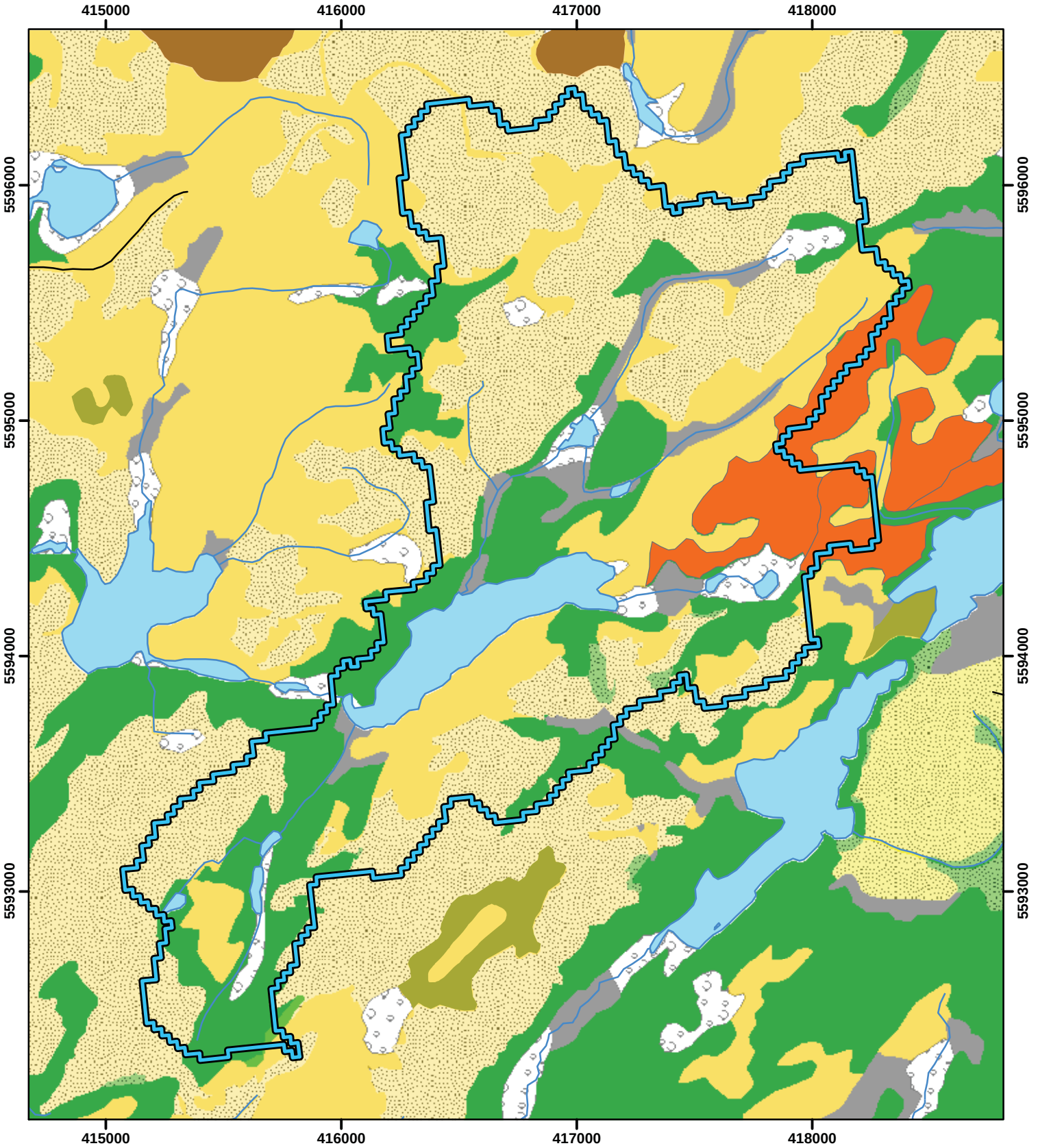
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.325 0.65 1.3 km

1:34,000

Planned and recent clearcut logging
Watershed W of Campfire River



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

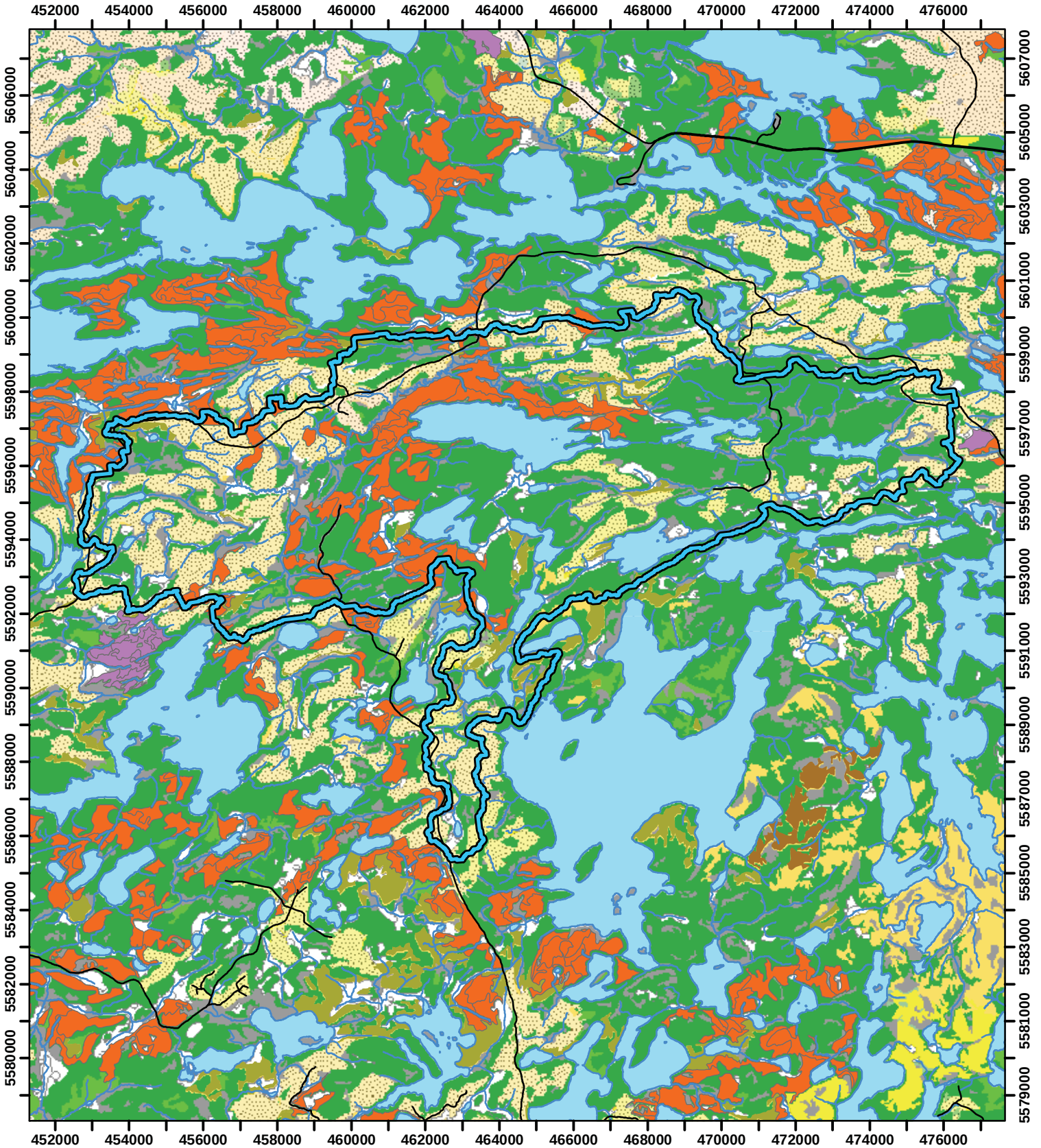
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 0.2 0.4 0.8 km

1:22,000

Planned and recent clearcut logging
Watershed Zizania Creek watershed whole



Watershed Limits

Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1968

Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970

Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland

0 1.25 2.5 5 km

1:140,000

APPENDIX B – CURRICULUM VITAE

Stephen A. Kilburn, *BES, MA, MCIP, RPP*

Education

M.A., Regional Planning and Resource Development
University of Waterloo, Waterloo, Ontario, Canada 1996

Bachelor of Environmental Studies, Honours Urban and Regional Planning
University of Waterloo, Waterloo, Ontario, Canada 1988

Memberships

Registered Professional Planner (RPP), Ontario Professional Planning Institute

Member, Canadian Institute of Planners (MCIP)

Selected Work Experience

Wolasoqey Nation Energy East Proposal Impact Assessment
St. Mary's, Woodstock, Tobique, Madawaska, Kingsclear, and Oromocto, New Brunswick 2015-present

Cheam Indian Band and Chawathil First Nation Trans Mountain Pipeline Twinning Proposal Impact Assessment
Rosedale and Hope, British Columbia 2015

Pimicikamak Manitoba Hydro Proposal Impact Assessment
Cross Lake, Manitoba 2014-2015

Migmawei Mawiomi Secretariat Port-Daniel-Gascons Cement Plant EA
Berens River, Manitoba 2013-2016

Sagamok Use-and-Occupancy Project
Sagamok Anishnawbek, Massey, Ontario 2013-present

Berens River First Nation Hydro Dam Environmental Assessment
Berens River, Manitoba 2014

Nunavik Marine Region Plan Development
Nunavik Marine Region Planning Commission, Kuujjuak, Quebec 2011-present

Kitchenuhmaykoosib Inninuwug Cultural Mapping and Spatial Aspects of Traditional Ecological Knowledge Projects
Kitchenuhmaykoosib Inninuwug Lands and Environment Unit, Big Trout Lake, Ontario 2010-present

Town of Orangeville Cultural Plan
Town of Orangeville, Ontario 2013-2014

Inuvialuit and Nanuq: Polar Bear and Sea Ice Traditional Knowledge Research Project
Inuvialuit Joint Secretariat, Inuvik, Northwest Territories 2012-2015

Fort Severn First Nation Cultural Mapping Support
Fort Severn First Nation, Fort Severn, Ontario 2012-2014

NMRPC Info Base Project
Nunavik Marine Region Planning Commission, Kuujjuak, Quebec 2012-2013

Kawacatoose First Nation Cultural Research
Kawacatoose First Nation, Raymore, Saskatchewan 2012-2013

Kineepik Métis Local Cultural Research Project
Kineepik Métis Local, Pinehouse, Saskatchewan 2011-2013

Cultural Land Use Mapping Project Workshop
Grand Council of the Crees (Eeyou Istchee), Mistissini, Quebec 2013

Land Use Planning Workshop
Nunavik Marine Region Planning Commission, Kuujjuaq, Quebec 2011

Wolf Lake First Nation and Timiskaming First Nation Data Audit
Algonquin Nation Secretariat, Timiskaming, Ontario 2011

James Smith Cree Nations Use-and-Occupancy Support
Kitchenuhmaykoosib Inninuwug Lands and Environment Unit, Big Trout Lake, Ontario 2010-2011

Geomatics Training Guide and Hands-On Exercises for Aboriginal Communities
Geoconnections/NRCan, Ottawa, Ontario 2010

Kitchenuhmaykoosib Inninuwug Use-and-Occupancy Support
Kitchenuhmaykoosib Inninuwug Lands and Environment Unit, Big Trout Lake, Ontario 2010

Mikisew Cree First Nation LARP/Use-and-Occupancy Support
MCFN Government and Industry Relations Department, Fort McMurray, Alberta 2010

Nunavut Planning Commission use and occupancy mapping support
Nunavut Planning Commission, Yellowknife, NWT, Cambridge Bay, Nunavut 2007-2011

Good Practices Guide for Aboriginal Geomatics
Geoconnections/NRCan, Ottawa, Ontario 2009-2010

Treaty 8 Tribal Association Connecting Communities application development
Treaty 8 Tribal Association, Fort St. John, British Columbia 2007-2009

GeoConnections Aboriginal Community Land and Resource Management assessment
Makivik Corporation, Kuujjuaq, Quebec 2008

Northern Village of Pinehouse Bush Cabin Mapping Survey support
Northern Village of Pinehouse, Saskatchewan 2008

Namgis First Nation use and occupancy mapping support
Alert Bay, British Columbia 2007

Doig River First Nation Treaty Land Entitlement Land Selection
Doig River First Nation, Rose Prairie, British Columbia 2005; 2006; 2007

Pic River First Nation Use and Occupancy Mapping and Land Claim Support
Pic River First Nation, Ontario 2005-present

Heiltsuk First Nation Traditional Use Study GIS
Heiltsuk First Nation, Waglisla, British Columbia 2002-2004, 2007-present

Implement Security for OGC-WMS application
Land Information Ontario 2004

Upgrade and Enhance OGC-WMS application
Land Information Ontario 2003-2004

SuperBuild Website Map Interface Enhancements
Land Information Ontario/SuperBuild 2002-2003

ArcIMS 3.0 to ArcIMS 4.0 Application Migration
Land Information Ontario 2002-2003

OGC-WMS Connector OGC-WMS 1.1 upgrade specification
Ontario Land Information Infrastructure/Land Information Ontario 2001-2002, 2003

Rural Economic Development Data and Intelligence Application
Land Information Ontario/Ontario Ministry of Agriculture, Food, and Rural Affairs 2002

One Window Screening Tool
Ontario Ministry of Municipal Affairs and Housing/Land Information Ontario 2000-2001

Miawpukek Mi'kamawey Mawi'omi First Nation TUO GIS
Conne River, Newfoundland 2000-2001

Earth Resource and Mineral Exploration Web Sites (ERMES) Application
Ontario Ministry of Northern Development and Mines/Land Information Ontario 2000-2001

Internet Map Browser Application for Ontario Land Information Warehouse
Land Information Ontario 1999-2000

Natural Resource Values Information System (NRVIS)
Ontario Ministry of Natural Resources 1996-1999

Fort Providence and Kakisa Draft Integrated Resource Management Plan
Deh Gáh Got'ie Koe Dene Band, Fort Providence, Northwest Territories 1996

Muskrat Dam Harvest Study GIS
Muskrat Dam First Nation 1989-1990

Lake Nipigon Ojibway Timber Management EA Support
Ontario Metis and Aboriginal Association 1989

Volunteer / Advisory

Mapping and website advisor, Friends of Homewood Grounds, Guelph, Ontario 2015-present

Representative, Comité de concertation des utilisateurs, Le plan de gestion concertée du lac Kipawa 2013

Advisor, Heiltsuk Cultural Education Centre 2007-present

Publications, Presentations, and Workshops

Armitage, Peter and Stephen Kilburn. 2015. *Conduct of Traditional Knowledge Research—A Reference Guide*. Whitehorse [YT]: Wildlife Management Advisory Council (North Slope). ISBN 978-0-9880009-3-3. Available at http://www.wmacns.ca/resources/publications/.

Armitage, Peter and Stephen Kilburn. 2015. Seminar: "Toward Best Practices for the Conduct of TK Research." Memorial University Aboriginal Studies Seminar Series. 27 March 2015.

Kilburn, Stephen A. 2014. Presentation: "Data Management Systems: Bedrock Principles." Inuvialuit Settlement Region Community Based Monitoring Program Data Management Systems (DMS) Workshop. 22-23 September 2014. Whitehorse, Yukon.

Kilburn, Stephen A. and Neil Gauthreau. 2014. Presentation: "Mapping for the Long Term: Lessons from the Lhoosk'uz Dene Nation." Indigenous Mapping Workshop, Department of Anthropology, University of Victoria, 25-28 August 2014.

GeoConnections. 2011. *Geomatics Training Guide and Hands On Exercises for Aboriginal Communities* Jointly written with David Carruthers (PlanLab Ltd.), Adam Lewis (Nunavik Geomatics), and Valter Blazevic (Strata360 Ltd.).

GeoConnections. 2010. *Good Practices Guide: Success in building and keeping an Aboriginal mapping program*. Jointly written with David Carruthers (PlanLab Ltd.), Adam Lewis (Nunavik Geomatics), Valter Blazevic (Strata360 Ltd.),

and Steven DeRoy (CIER), Available at http://www.geoconnections.org/publications/Key_documents/CIER_Good_Practices_Guide_lowRes.pdf

Kilburn, Stephen A. and Sydney Nestel. 2005. "Securing OGC Web Map and Feature Services Using SAML." GeoTec Event 2005: Providing Perspective, Gaining Insight. Vancouver, British Columbia, Canada, 13-16 February 2005.

Kilburn, Stephen A., Clare Wastenays and Norman Ragetlie. 2004. "Web-based Economic Analysis Mapping Using a Remote OGC WMS Server." GeoTec Event 2004: Pathways To Integration. Toronto, Canada, 28-31 March 2004.

Kilburn, Stephen A. Workshop: 2002. "The Heiltsuk Traditional Use GIS: Moving Forward." Workshop hosted by Heiltsuk Cultural Education Centre. Waglisla, British Columbia, Canada, 18-22 November 2002.

Kilburn, Stephen A. 1999. Workshop: "Moving TUS Information Into GIS: Challenges and Methods." Workshop hosted by The Aboriginal Mapping Network and the Tsleil-Waututh Nation, Vancouver, British Columbia, 26-27 July 1999.

Kilburn, Stephen A. 1999. "Applying GIS for Traditional Use Studies: Database Design Issues." GIS99: "GeoSolutions: Integrating Our World," First Nations GIS track, Vancouver, Canada, 1-4 March 1999.

Kilburn, Stephen A. 1997. *Use of GIS for Integrated Resource Management Planning in Fort Providence, Northwest Territories*. M.A. thesis, University of Waterloo.

Michalenko, G., G. B. Hall, T. Tobias, S. A. Kilburn. 1992. "Coming of Age Between the Giants and the Trees: A Young Indian Village in Northern Canada Struggles to Maintain Land and Resources." Commonwealth Geographical Bureau, Workshop on Indigenous Land Rights, Wellington and Christchurch, New Zealand, February 1992.

Hall, G. B. and Stephen A. Kilburn. 1991. "Design and Implementation of ESRI Canada's pcMunicipal Module for pcARC/INFO." The Annual Conference of the Australasian Urban and Regional Information Systems Association, Wellington, New Zealand, 19-22 November 1991.

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO),
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

ACKNOWLEDGEMENT OF EXPERT'S DUTY

1. My name is Stephen Kilburn. I live in Guelph in the Province of Ontario.

2. I have been engaged by or on behalf of Grassy Narrows First Nation to provide evidence in relation to the above-noted court proceeding.

3. I acknowledge that it is my duty to provide evidence in relation to this proceeding as follows:

   (a) to provide opinion evidence that is fair, objective and non-partisan;

   (b) to provide opinion evidence that is related only to matters that are within my area of expertise; and

   (c) to provide such additional assistance as the court may reasonably require, to determine a matter in issue.

4. I acknowledge that the duty referred to above prevails over any obligation which I may owe to any party by whom or on whose behalf I am engaged.

Date: _____ _____

Stephen Kilburn

Court File No. 446/15

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

AFFIDAVIT OF STEPHEN KILBURN

CANADIAN ENVIRONMENTAL LAW ASSOCIATION
130 SPADINA AVE., SUITE 301
TORONTO, ONTARIO M5V 2L4

Telephone: (416) 960-2284
Facsimile: (416) 960-9392

Joseph F. Castrilli (LSUC No. 26123A)
Richard D. Lindgren (LSUC No. 28529E)
Jacqueline Wilson (LSUC No. 60330R)

Solicitors for the Applicants

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

AFFIDAVIT OF STEVEN FOBISTER, SENIOR

I, STEVEN FOBISTER, SENIOR, of Grassy Narrows, in the District of Kenora, AFFIRM AS FOLLOWS:

1. I am a member of Grassy Narrows First Nation ("Grassy Narrows"). At various times I have served my people as the Deputy Chief of the Grassy Narrows Band Council, the elected Chief of Grassy Narrows, and the Grand Chief of Treaty Three. As such, I have knowledge of the matters hereinafter deposed to.

2. Clearcut logging recently was approved by the Respondents as part of a Forest Management Plan for the Whiskey Jack Forest for the period 2012 to 2022 (the "Plan"). Most of the Whiskey Jack Forest is the traditional territory of our people. My whole life, I have eaten fish from the many lakes, streams, and waters that form part of the watershed of the English-Wabigoon River System, which runs through the Whiskey Jack.

3. I was born in 1952 at the hospital in Dryden and have lived on Grassy Narrows' traditional territory for most of my life. I was raised the traditional Anishinaabe way. Growing up, I lived primarily on my family's trapline eating a traditional diet rich in fish and wild plants, with some wild game. We moved frequently throughout our traditional territory according to the seasons and the availability of food. Although poor in material goods, we were spiritually rich and felt our connection to the land deeply. The land gave us food and shelter, and it always sustained us. I loved that life.

4. Our way of life followed a circle. In the spring we hunted migratory birds; in the summer I would guide American sport fishers. There was really good subsistence and commercial fishing in the fall. In the winter we went to our traplines.

5. I am intimately familiar with the land in my trapline area and the areas where I used to guide sport fishers, including lakes whose watersheds are scheduled for clearcutting under the Plan. For example, the lake identified in the watershed and trapline maps found behind Exhibit "A" to this affidavit is in my trapline area. The maps come from Stephen Kilburn's Expert Report, and I am very familiar with the area identified in the maps. The

lake identified in the maps as watershed Noname 20 near Campfire Lake is named Zagaatigooning-zaaga'iganish – in English, the Little Lake of the Dense Woods. It is a beautiful little lake. It is a good place to camp, and when I was younger I used to camp there all the time. It lies at the end of a long portage from Campfire Lake and it is crystal clear, surrounded by old growth forest. There are lots of fish in this lake – in fact, all of the lakes in this area are incredibly productive. I used to catch trout from the stream entering this lake with a snare. Besides being a good lake for fishing, Zagaatigooning-zaaga'iganish is a good place to harvest traditional medicines. The area KE038 shown in the second map in Exhibit "A" is my trapline area where I sustained myself and earned my livelihood as a young man. I know that area well and I have traveled, fished, trapped, and hunted throughout the area. I hope to pass that area on to my grandchildren so that they can enjoy it as I have.

6. The forest around Zagaatigooning-zaaga'iganish is slated for heavy clearcutting under the Plan, as shown in the maps behind Exhibit "A". I fear that this clearcutting will not only destroy the beauty and cultural value of a place I cherish, but will also increase the mercury levels in the water and in the fish that live there.

7. I ate fish almost every day growing up, and when I was guiding I would often eat fish multiple times a day. I would also bring home fish for my wife and children. I mostly ate walleye, but I would eat other fish too. Walleye is my favourite; it tastes better than the other fish.

8. The full impact of the mercury pollution hit us in 1970, when the government announced that the Dryden plant had contaminated our waters. After that we couldn't live off the land anymore. The guiding industry slowed to a trickle and our commercial fisheries had to close. Where we had been self-sufficient, we were forced to become dependent on welfare. Our community suffered greatly.

9. I continued to work as a sport fishing guide for years after the mercury was discovered. Unemployment was very high and I felt lucky to have work. The tourist camp operators encouraged us to eat fish to show our guests that it was safe. I kept eating fish as frequently as I had before the mercury was discovered.

10. I continue to eat fish from the English-Wabigoon River System to this day because it is an important part of my culture. Also, my precarious financial situation means I cannot afford to cut wild fish out of my diet.

11. I believe that my exposure to mercury has affected me terribly. My body is breaking down one piece at a time. I experience shaking and loss of balance. I have difficulty swallowing, weakness in my hands, and my speech is slurred. I have difficulty walking and I need to use a riding lawnmower to get around because I don't have a motorized wheelchair. I feel deep sadness and depression about the loss of my health and my traditional way of life due to mercury pollution and logging. When I look at the land, look at our situation, I feel despair. There are so many sick people here, so much

destruction of our land and our way of life. You can't imagine how it feels when the land and water that have always sustained you can suddenly kill you.

12. I have been examined by the Mercury Disability Board and diagnosed with symptoms consistent with mercury poisoning. I receive $250.00 each month from the Mercury Disability Board. Dr. Masazumi Harada examined me in 2010 and diagnosed me with mercury poisoning. I have now also been diagnosed with amyotrophic lateral sclerosis (ALS).

13. In April 2010, I was interviewed by the CBC regarding the effects I have experienced due to exposure to mercury. Exhibit "B" to my affidavit contains excerpts of my comments to the CBC in 2010. The CBC included some footage from a much earlier interview in the 2010 piece, and I identify the source of each comment in this paragraph. In the earlier interview, I stated: "I don't think, you know, it's right to say, look, you know, you don't have to go trapping. You can live on welfare." In my comments to the CBC in 2010, I stated: "My whole nervous system is out of whack, you know, I can't barely walk and, you know, I have to hold my jaw to talk because my muscles are practically gone…[As a fishing guide, he] had [to eat what he caught even after the mercury was discovered.] We had to do this in order to appease our guests that the fish was ok. The tourist camp owners encouraged us to do it. […] [I recall Dr. Harada during his return to Grassy Narrows in March 2010 saying to me,] 'You know you have some kind of a metal poisoning,' and the closest definition to [Harada's] examination…it's got to be mercury. […] I only have one granddaughter. She's the one who kind of possesses violent

seizures." I have reviewed these excerpts and they are true and accurate. I have clarified in the remarks that appear in the next to last square bracket what was unclear about who was speaking as set out in Exhibit "B". These excerpts were included in a larger document Grassy Narrows filed with the Ministry of the Environment in September, 2014 in an attempt to persuade the Ministry to examine the effects of mercury from clearcut logging authorized by the Respondents for the Plan.

14. Also contained in Exhibit "B" are excerpts from a 2003 interview of me by a reporter for the Toronto Star regarding the mercury issue. I advised the reporter that I have serious neurological disease: "I can't hardly tie my shoes anymore." I also said that I blame clearcut logging in the area for the continuing high levels of mercury contamination. These excerpts were also included in the September 2014 document referred to above. I have reviewed these excerpts and they are true and accurate.

15. I fear that continued clearcutting in our traditional territory will expose us to further mercury poisoning. I am extremely concerned about future mercury exposure if additional mercury is released from the forest as a result of clearcutting. I am afraid of the physical effects of exposing our bodies to yet another round of mercury, and I am also afraid of the psychological effects. For me and for many others, the psychological effects of mercury poisoning – including, but not limited to, depression and anxiety – are unspeakably painful. Being out on the land and water allows us to escape, however briefly, from the negative mental and emotional states that are associated with living in a community struggling with mercury poisoning. I fear clearcutting would add to our

mercury burden, which would add to the negativity, and also raze the forest, thereby removing a vital form of retreat and healing.

16. I also fear for the health of our land and our ability to practice an Anishinaabe lifestyle if clearcutting is allowed to continue under the Plan. Large portions of the forest on my trapline area have already been clearcut. The map entitled KE038 in Exhibit "A" is my trapline area, and this map shows the extent of the planned and recent clearcutting for the area. I want my great-grandchildren and great-great-grandchildren to have a safe environment so they can grow up healthy and strong in our Anishinaabe traditions. I am strongly opposed to any Forest Management Plan that includes clearcutting. If the clearcut logging recently authorized by the Respondents under the Plan goes ahead, I fear it will release yet more mercury into the English-Wabigoon watershed, poison the fish we eat from those waters, and harm our health and well-being. This would violate our rights under the *Canadian Charter of Rights and Freedoms*. We have a right to be secure from the threats to us posed by mercury. By imposing clearcutting in our traditional territory, the government risks our health and discriminates against us because of our way of life, which includes fishing for walleye, and eating the fish we catch, as a central core of our identity as Anishinaabe people.

17. Clearcut logging on our territory is destroying our way of life. Our forest and our people need a break, we've had enough. We're going to stand up. My health is deteriorating, and I can feel that this may be my last fight. But after I have passed on, my children, grand-

children, and great-grand-children will continue to fight to preserve our land, our health, and way of life.

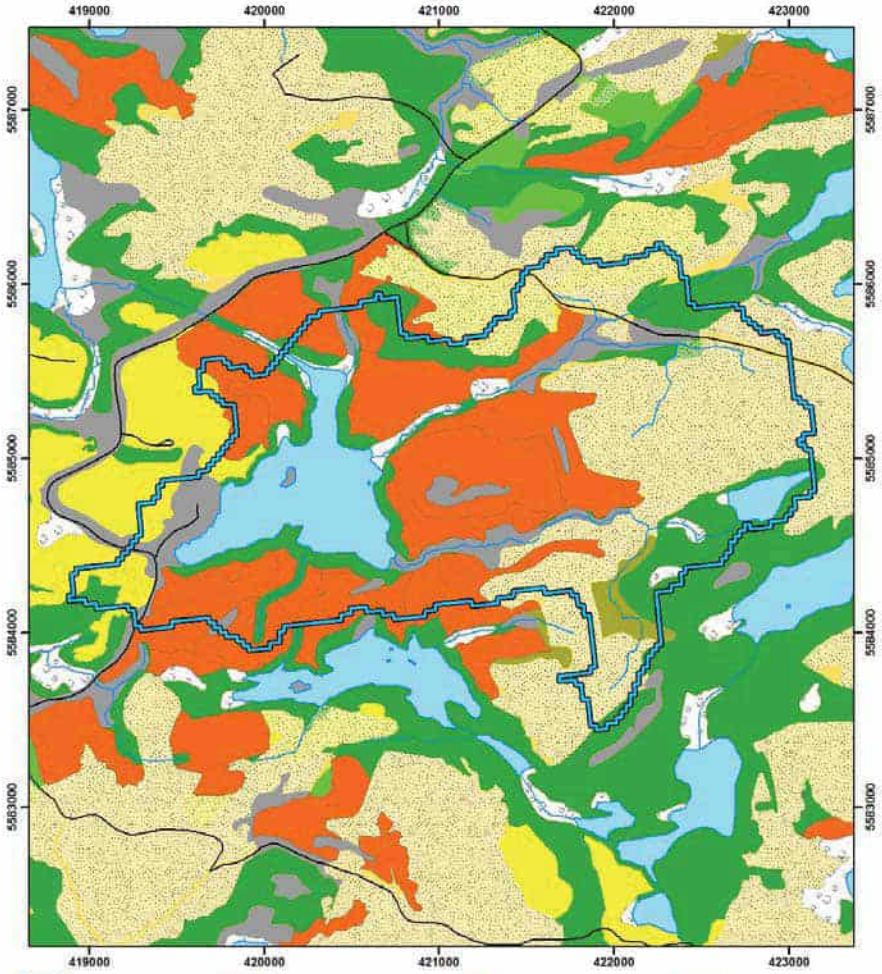
18. I affirm this affidavit in support of the within application for judicial review, and for no other or improper purpose.

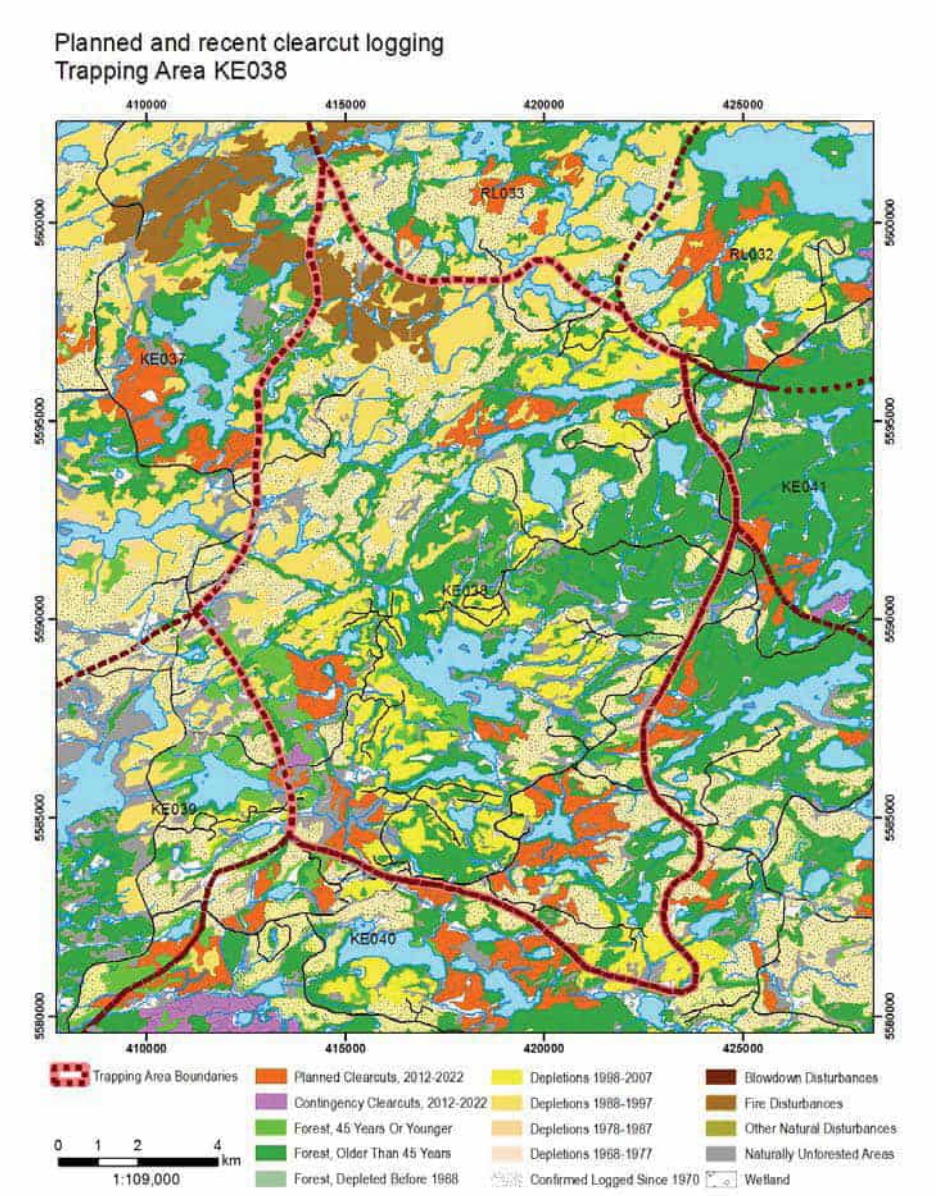
AFFIRMED before me in the District of Kenora, in the Province of Ontario, this ___ day of _____, 2016.

A Commissioner, etc.

_____
Steven Fobister, Senior

Planned and recent clearcut logging
Watershed Noname 20 near Campfire Lake




Planned and recent clearcut logging
Trapping Area KE038
410000
415000
420000
425000
5600000
5595000
5590000
5585000
5580000
RL033
RL032
KE037
KE041
KE038
KE039
KE040
Trapping Area Boundaries
Planned Clearcuts, 2012-2022
Contingency Clearcuts, 2012-2022
Forest, 45 Years Or Younger
Forest, Older Than 45 Years
Forest, Depleted Before 1988
Depletions 1998-2007
Depletions 1988-1997
Depletions 1978-1987
Depletions 1968-1977
Confirmed Logged Since 1970
Blowdown Disturbances
Fire Disturbances
Other Natural Disturbances
Naturally Unforested Areas
Wetland
0 1 2 4
km
1:109,000

July 28, 2003

Thirty years after a Japanese researcher identified Canada's biggest case of mercury poisoning, he has returned to discover that the problem is far from resolved and may be getting worse. Masazumi Harada's new research raises troubling fresh questions about the sources and effects of mercury contamination present in water and fish in many parts of the country. The results of Harada's study are particularly sobering for aboriginal people who depend on a diet rich in fresh fish. It had been expected that the health of First Nations people on the Grassy Narrows and White Dog reserves near Kenora would improve after a mill stopped dumping mercury in the English and Wabigoon river systems in 1970. But when Harada returned to the area last fall, he found evidence of continuing, pervasive health problems consistent with Minamata disease, a neurological disorder caused by mercury. The results of Harada's study have not been published but were summarized by Steve Fobister Sr., deputy chief of ...Grassy Narrows, who has seen them. Of approximately 60 First Nations people who were examined at the Grassy Narrows and White Dog reserves last fall, 70 per cent showed symptoms of neurological disorder, said Fobister. Symptoms included blurred vision, slurred speech, twitching, numbness, shaking, and poor muscle co-ordination. The symptoms of eight people who were part of the study in the 1970s had become more severe.

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[1] <http://freegrassy.net/wp-content/uploads/2010/03/LettersJan99_ToWashingtonPost_ToMinNR_Enviro_WJF99-04.pdf>

[2] < http://freegrassy.net/wp-content/uploads/2010/03/Copy_of_Letter19May99_CAMinEnvr_2Keesick_Dasilva.pdf >.

Fobister says that he himself has serious neurological disease. "I can hardly tie my shoes any more", he said in an interview. Even children in the community are showing serious problems, including seizures, he said. Fobister blames clear-cut logging in the area for the continuing high levels of mercury contamination – a theory for which there is some scientific support, although debate continues. A University of Montreal researcher reported in 2001 that mercury levels were up to 100 per cent higher in heavily logged watersheds than in lakes where there was no logging nearby. The theory is airborne mercury from sources such as coal-fired power plants and incinerators tends to be held in the soil and foliage of an intact forest, but runs into waterways in areas that have been clear-cut. Health Canada is funding a new study of neurological disease in the Grassy Narrows area in the light of the recent research developments. "It is alarming to see there are so many people still suffering neurological symptoms in this community after 30 years", said Laurie Chan of McGill University, who is leading the study.[3]

[3] D. Bueckert, "Mercury poisoning issue back 30 years later, disease signs present in Indians", The Toronto Star (July 28, 2003).

[4] CBC, "Ontario reserves demand inquiry into mercury poisoning" (September 4, 2004); < http://www.cbc.ca/news/canada/ontario-reserves-demand-inquiry-into-mercury-poisoning-1.515484 >.

[5] "Forestry firms under fire at Grassy Narrows", February 28, 2006. Globe and Mail (online?); < http://freegrassy.net/2006/02/28/forestry-firms-under-fire-at-grassy-narrows/#sthash.zzdz53a4.dpuf >

Apr. 5, 2010 CBC reports on continuing impacts of mercury in Grassy Narrows, including impacts on children. [This is a 5-page transcript – the following excerpts cover just the statements of three people interviewed – Sherry Fobister, a Grassy Narrows resident, Bill Fobister, former Chief of Grassy Narrows, and Steve Fobister, Grassy Narrows Chief in 1983]. "Sherry Fobister: 'I feel angry knowing that something that happened in the '60s, you know...Like, how it affected my

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[3] D. Bueckert, "Mercury poisoning issue back 30 years later, disease signs present in Indians", The Toronto Star (July 28, 2003).

[4] CBC, "Ontario reserves demand inquiry into mercury poisoning" (September 4, 2004); < http://www.cbc.ca/news/canada/ontario-reserves-demand-inquiry-into-mercury-poisoning-1.515484 >.

[5] "Forestry firms under fire at Grassy Narrows", February 28, 2006. Globe and Mail (online?); < http://freegrassy.net/2006/02/28/forestry-firms-under-fire-at-grassy-narrows/#sthash.zzdz53a4.dpuf >

family....' . Bill Fobister: 'During the '60s, we were in full bloom, fishing, guiding, everything, that we did and we thought everything was okay. But not until we're seeing some of our fish acting weird and dying off, that's when ...there is something wrong.' Bill Fobister: 'My symptoms is my numbness and loss of sensation and my vision. My speech is kind of getting pretty sloppy. My taste, I lost my taste. I lost my smell. I can't smell any more.' Steve Fobister: 'I don't think, you know, it's right to say, look, you know, you don't have to go trapping. You can live on welfare....My whole nervous system is out of whack, you know, I can't barely walk and, you know, I have to hold my jaw to talk because my muscles are practically gone...[As a fishing guide, he] had [to eat what he caught even after the mercury was discovered] We had to do this in order to appease our guests that the fish was ok. The tourist camp owners encouraged us to do it...[Dr. Harada, during his return to Grassy Narrows in March 2010, said to Steve Fobister] 'You know you have some kind of a metal poisoning' And the closest definition to [Harada's] examination...it's got to be mercury'...'I only have one granddaughter. She's the one who kind of possesses violent seizures.' Sherry Fobister: '[Ms Fobister ate fish when she was pregnant]...it's [eating fish] a part of life, you know...I love eating fish. It's a delicacy...it's part of our lifestyle. I don't know, I still eat it to this day. [no one told her not to eat fish when she was pregnant].[6]

[6] CBC Television, The National (Transcript), "Years of mercury poisoning have not been kind to the people of Grassy Narrows" (Toronto: CBC, Apr. 5, 2010).
[7] < http://freegrassy.net/wp-content/uploads/2010/01/River_Run_Press_Release_April_71.pdf >.

Court File No. 446/15

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

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Court File No. 446/15

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Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, CHIEF SIMON FOBISTER
and
former CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO),
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

APPLICATION UNDER Section 2(1)
of the *Judicial Review Procedure Act*
R.S.O. 1990, c. J.1

SUPPLEMENTARY APPLICATION RECORD
VOLUME 3 OF 3

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SUPPLEMENTARY APPLICATION RECORD
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Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
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on their own behalf and on behalf of all other
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and THE ATTORNEY GENERAL OF ONTARIO

Respondents

SUPPLEMENTARY AFFIDAVIT OF DAVID SONE

I, DAVID SONE, of the City of Toronto, in the Province of Ontario, MAKE OATH AND SAY AS FOLLOWS:

1. I am the Director, Northern Ontario Campaigns at Earthroots Coalition ("Earthroots") and, as such, have knowledge of the matters hereinafter deposed to.

2. I have been with Earthroots since 2010. Earthroots is a non-profit organization dedicated to the conservation of wilderness, wildlife, and watersheds in Canada, with a focus on Ontario.

BACKGROUND

3. As noted at paragraphs 19 and 20 of my affidavit sworn August 21, 2015, and Exhibits "N", "O" and "P" therein, now found at Volume 5, behind Tab 10 of the Applicants' Application Record in the within matter, in January 2015 I submitted requests, under the *Freedom of Information and Protection of Privacy Act* ("*FIPPA*"), for information in the possession of the Ministry of the Environment and Climate Change ("MOECC"). The requested information, identified by MOECC as consisting of information in its confidential and public files, pertained to the issue of potential release of mercury to bodies of water from clearcut logging activity arising from the Ministry of Natural Resources and Forestry ("MNRF") approval of the 2012-2022 Forest Management Plan ("Plan") for the Whiskey Jack Forest ("WJF") in northwestern, Ontario. In particular, information was sought that was in the possession of, or relied on by, MOECC that preceded its December 2014 decision to reject the January 2014 request of Grassy Narrows First Nation ("Grassy Narrows") and Earthroots Coalition ("Earthroots") for a bump-up, or Individual Environmental Assessment ("IEA") under the *Environmental Assessment Act* ("bump-up request" or "IEA request"), of the Plan.

PRELIMINARY INFORMATION RECEIVED FROM MOECC (FILE A-2015-00157) LATE SEPTEMBER 2015 ARISING FROM FIPPA REQUEST

4. In late September 2015, arising from my January 7, 2015 *FIPPA* request (found behind Exhibit "O" referred to above), I received approximately 1,400 pages of information from the MOECC. A copy of pertinent parts of this information, identified as MOECC file A-2015-00157, is attached as **Exhibit "A"** to my affidavit. What the information in Exhibit "A" shows is organized under the sub-headings set out below.

Frequent Contact/Collaboration Between MOECC and MNRF During IEA Request Process in the Absence of Grassy Narrows and Earthroots

5. The information from MOECC contained in Exhibit "A" shows that from the time of the January 2014 IEA request right up to the December 2014 MOECC decision not to grant the request, MOECC and MNRF were in frequent contact and collaborated with each other (by email, telephone/conference call, face-to-face meetings, and via exchange of draft documents) regarding the substance and outcome of, the IEA request, including potential conditions as part of a decision not to grant the request. Neither Grassy Narrows nor Earthroots were privy to these communications or discussions, or advised that such on-going contact and collaboration was taking place. This is exemplified by the following (with any reference in the emails contained in Exhibit "A" to "ENE" or "MOE" being a reference to the MOECC and any reference to "MNR" being to MNRF):

   (a) inquiry by MNRF of MOECC as to whether MOECC has assigned a project evaluator to the IEA request so "MNR[F] and MOE[CC] can begin dialogue on the issues…" (MNRF email to MOECC, January 28, 2014 – page 433 – all page references hereinafter being to those found in the upper right-hand corner of material attached to Exhibit "A");

(b) MNRF sharing a document about mercury with MOECC (MNRF email to MOECC, February 11, 2014 – pages 437, 438-440) that Grassy Narrows/Earthroots was not advised of, or invited to comment upon;

(c) MOECC and MNRF planning a teleconference "to chat about the GN [Grassy Narrows] issue/bump-up" so that they are "on the same page" and "can relay/convey ideas on how to proceed" (MOECC emails, February 18, 2014 – page 442);

(d) MNRF wanting to "facilitate MOE[CC] and MNR[F] science folks getting together for" a discussion "on the mercury issues involved in both IEA requests to see what support we can provide each other" (MNRF/MOECC email exchange, February 18, 2014 – page 443);

(e) MNRF providing MOECC with a "draft science perspective on the issues raised in the IEA requests on the WJF" and seeking an initial response from [MOECC] on whether MOE[CC] believes this additional response is helpful and whether MOECC suggests "any changes/additions/deletions"; MOECC sending its completed review of MNRF's draft science perspective back to MNRF for its review (MNRF/MOECC email exchange, April 16-17, 2014 – page 493; attachment referred to in email was not included by MOECC in *FIPPA* information disclosed);

(f) MOECC forwarding to MNRF the Grassy Narrows/Earthroots May 2014 reply submissions and scheduling a meeting with MNRF so that an "open discussion of relevant information may occur" (MOECC/MNRF email exchange, May 29-30, 2014 – pages 500-502);

(g) MNRF responding to MOECC questions regarding the stand and site guide's treatment of mercury (MNRF email to MOECC, June 3, 2014 – page 506) and MNRF providing information to MOECC on aquatic effects and mercury (MNRF email to MOECC, June 3, 2014 – page 505) that Grassy Narrows/Earthroots was not advised of, or invited to comment upon;

(h) MOECC indicating internally that a July 2014 response it received from MNRF to the May 2014 Grassy Narrows/Earthroots reply submission would be considered by the MOECC director in coming to a decision on the IEA request and Grassy Narrows/Earthroots could go through the *FIPPA* process "to gain access" to the response document (MOECC email exchange, July 15, 17, 2014 – page 512; MNRF email to MOECC, July 10, 2014 – page 508);

(i) MNRF confirming with MOECC conditions respecting the IEA request MOECC proposed during a telephone call with MNRF, and MNRF confirming that the conditions were feasible to implement (MNRF email to

MOECC, October 24, 2014 – page 520; MOECC email, October 22, 2014 – page 517);

(j) MNRF requesting an update from MOECC on the status of the IEA request as it "has been sometime since we had our teleconference on the approach MOECC was taking with making a decision on this request" (MNRF email to MOECC, December 15, 2014 – page 537).

6. Regarding paragraph 5(h), above, and as I stated at paragraph 18 of my affidavit of August 21, 2015, I was not aware of the existence of, and did not obtain, the July 2014 MNRF response document from MOECC until I reviewed MOECC files in January 2015 after the IEA decision had been made. The July 2014 MNRF response document is now attached to my August 21, 2015 affidavit as Exhibit "M" found at Volume 5, Tab 10 of the Applicants' Application Record in the within matter.

Almost Complete Lack of Contact Between MOECC and Grassy Narrows During the Same Time-Period

7. MOECC did not encourage this type of on-going contact with Grassy Narrows/Earthroots during the January-December 2014 period of MOECC's consideration of the IEA request:

(a) MOECC noting in internal email that due to the IEA request, MOECC could not get into the specifics of the review with Grassy Narrows/Earthroots, but could listen to their concerns at a forthcoming meeting (MOECC email, March 26, 2014 – page 465).

8. In fact, Grassy Narrows and Earthroots were advised by MNRF that the IEA process was MOECC's process and it was being conducted, in effect, in an arms-length manner:

    (a) MNRF advising Grassy Narrows and Earthroots that the IEA request, the process for review, and decision-making are out of MNRF's hands and the responsibility of MOECC (MNRF email to Earthroots, October 14, 2014 – page 522).

9. MOECC met with Grassy Narrows/Earthroots once during the 12-month decision-making process surrounding the IEA request. Earthroots initiated the meeting, which I attended in person and Joseph Fobister of Grassy Narrows attended by conference call. The purpose of the meeting was to clarify the substance of the IEA request, answer any questions MOECC might have arising from the IEA request, and address an MNRF request for concurrence by Grassy Narrows that certain non-logging related activities be allowed to occur in the WJF while the IEA request was being considered by MOECC (Earthroots email to MOECC/MNRF, March 12, 2014 – pages 463 and 464; MOECC internal email, March 26, 2014 – page 465). At the meeting, MOECC did not discuss its views on the IEA request or the scientific basis for any decision it might make on the request.

Whiskey Jack Forest is Grassy Narrows' Traditional Territory

10. MOECC acknowledges that "Grassy Narrows…is one of the key Aboriginal communities with hunting and fishing rights in the Whiskey Jack Forest. The Grassy Narrows…reserve is located within the Whiskey Jack Forest Unit; much of the forest is

within the First Nation's asserted traditional land use area. Grassy Narrows is an indigenous Anishinabe community located within the Treaty 3 area" (MOECC, Information Note: Whiskey Jack Forest Management Plan, March 14, 2014 – page 455).

Importance of Fish to Grassy Narrows

11. MOECC acknowledges that: "Fish is a main food source for the [Grassy Narrows] community" (MOECC, Information Note: Whiskey Jack Forest Management Plan, March 14, 2014 – page 454).

Historic Impacts of Mercury on Grassy Narrows

12. MOECC stated during its consideration of, and immediately following its decision respecting, the IEA request that:

    (a) "Grassy Narrows…has had a historic problem with mercury contamination dating back to the Dryden Paper Company in the 1970s. The amount of mercury present in fish as of 2012 was low, but a health advisory remains in effect" (MOECC, Information Note: Whiskey Jack Forest Management Plan, March 14, 2014 – page 454); and

    (b) "The [Grassy Narrows] community has suffered the effects of mercury poisoning" (MOECC internal email, January 8, 2015 – page 543).

Mercury is a Toxic Substance

13. A Questions and Answers document prepared by MOECC for release with its decision refusing to grant the IEA request, contains the following statements about mercury toxicity and exposure pathways:

(a) Mercury is toxic, inherently persistent and bio-accumulative;

(b) In water and sediments mercury can be converted into the highly toxic form known as methylmercury, which accumulates in the tissues of fish and other animal life;

(c) Methylmercury is a potent neurotoxin that may impair brain function and adversely affect neurological development in wildlife and people (especially children);

(d) Fish consumption is one of the main pathways for wildlife and human exposure to methylmercury, and is a major cause of restrictions on fish consumption guidelines, especially for inland lakes and rivers in Ontario (MOECC internal email, December 23, 2014 – page 531 attaching MOECC Questions and Answers, Whiskey Jack Forest: Request for Individual Environmental Assessment – pages 533-534);

Status of Mercury Monitoring Measures

14. MNRF confirmed with MOECC that the: "[Forest Management Plan] contains no requirements for ongoing monitoring of mercury levels in the area affected by the IEA

request to determine if in fact approved forest operations once implemented would (further) elevate mercury levels in catchment areas…MNR[F]'s Forest EA Act approval and the Forest Management Planning Manual (FMPM) contain planning requirements for the monitoring of forest management activities in a forest management plan; however, do not include requirements to monitor specific effects of individual activities" (MNRF email to MOECC/MNRF, May 30, 2014 – page 503).

15. MNRF also confirmed that it contemplates no changes to its current effectiveness monitoring approach other than what might arise as a result of review of the Stand and Site Guide expected to be completed by the end of 2015; MNRF identified mercury, catchment scale effects, and rutting standards as three "known unknowns" it was planning to investigate during the review (MNRF email to MOECC/MNRF, June 3, 2014 – page 506).

FURTHER INFORMATION RECEIVED FROM MOECC (FILE A-2015-00158) EARLY JANUARY 2016 ARISING FROM FIPPA REQUEST

16. In early January 2016, arising from my January 8, 2015 *FIPPA* request (found behind Exhibit "P" of my August 21, 2015 affidavit and referred to above at paragraph 3 of this my supplementary affidavit), I received approximately 1,100 additional pages of information from the MOECC. A copy of pertinent parts of this information, identified as MOECC file A-2015-00158, is attached as **Exhibit "B"** to my affidavit. What the information in Exhibit "B" shows is organized under the sub-headings set out below.

Further Examples of Contact/Collaboration Between MOECC and MNRF During IEA Request Process in the Absence of Grassy Narrows and Earthroots

17. The information from MOECC contained in Exhibit "B" shows further contact and collaboration between MOECC and MNRF, without the knowledge of Grassy Narrows and Earthroots, during the period the IEA request was being considered by MOECC. This is exemplified by the following (with any reference in the emails contained in Exhibit "B" to "ENE" or "MOE" being a reference to the MOECC and any reference to "MNR" being to MNRF):

(a) MOECC confirming its intention to attend a meeting with MNRF, referred to above at paragraphs 5(c) and (d), respecting the Whiskey Jack Forest Management Plan (MOECC emails, February 21, 2014 – page 545);

(b) MNRF setting up a March 20, 2014 meeting between MOECC and MNRF managers to "discuss Hg [mercury] issues", anticipating "that the scientists would meet prior to that date and their outcomes/thoughts would be the basis for our meeting" at which the managers could "discuss gaps in our knowledge" (MOECC/MNRF email exchange, February 28, 2014 – page 546);

(c) reference to meeting between MOECC and MNRF that took place in March 2014 relating to the IEA request where the discussion included "hearing another perspective on Hg [mercury]" than just "focusing so much on water" and considering the "balance between political sensitivity for a specific watershed/community and the implications for forestry management on a

broader provincial scale" (MOECC internal email, March 20, 2014 – page 000547);

(d) MNRF providing MOECC with a "draft science perspective on the issues raised in the IEA request on the WJF" and seeking "an initial response from [MOECC] as to whether [MOECC] believes this additional response is helpful and whether [MOECC]" suggests "any changes/additions/deletions"; MOECC passing MNRF's document on for internal MOECC review (MNRF/MOECC email exchange, April 16, 2014 – pages 548-561; attachment referred to in email included by MOECC in *FIPPA* information disclosed).

18. The information contained in the attachment referred to in paragraph 17(d) above as a "draft science perspective" is a draft of what was filed by MNRF one week later (April 23, 2014) with MOECC as MNRF's official response to the Grassy Narrows-Earthroots January 2014 IEA request. Because of a copying error, an incomplete version of the MNRF April 23, 2014 response document appears in Volume 3, Tab 5, behind Exhibit "E" (Joint Affidavit of Amber Ellis and David Sone, sworn August 21, 2015) of the Applicants' Application Record in the within matter. A copy of the complete version of the April 23, 2014 MNRF response document is attached behind **Exhibit "C"** to this my supplementary affidavit.

Importance of Fish to Grassy Narrows

19. MOECC noting that: "[The community of Grassy Narrows] relies on fish from the [English-Wabigoon] river system…the fish from this system are an important source of food for their community…restrictions on consumption of fish remain in place, yet the community continues to consume fish from their doorstep lakes/rivers…MNRF provides the community with 'clean' fish, but the community has not taken full advantage of the whitefish provided, as culturally they prefer walleye or pike" (MOECC Information Note: Grassy Narrows First Nation Mercury Contamination, September 10, 2014 – page 564).

Mercury and Human Health at Grassy Narrows

20. MOECC noting that: "In September 2002, Dr. Masazumi Harada, a Japanese researcher specializing in mercury poisoning, visited Grassy Narrows…at the request of the [Grassy Narrows] Chief. Dr. Harada found an increase in, and new cases of, mercury poisoning on the reserve". MOECC noting further that: "Harada's research team first visited [the] Grassy Narrows [community] in 1975 and collected hair and blood samples for mercury analyses and assessed…residents for symptoms of Minamata Disease (neurological disorder). Some residents had mercury levels in hair above the 'safety guideline of 50 ppm'" (MOECC Information Note: Grassy Narrows First Nation Mercury Contamination, September 18, 2012 – page 577; and MOECC Information Note: Grassy Narrows First Nation Mercury Contamination, July 28, 2014 – page 593).

Declines of Mercury Levels May Have Slowed Down Because of Logging

21. MOECC acknowledging that "[O]ne of the factors that might have slowed down the [decline of mercury in local waterways despite restrictions placed on mercury releases at the Dryden pulp and paper plant] in the last two decades could be logging activities in the area that began around the 1980s". The "cessation of logging" since 2008 may result in a "resumption of faster downward trend for mercury in fish" (MOECC email exchange, June 6-7, 2012 – pages 597-599; MOECC Information Note: Grassy Narrows First Nation Mercury Contamination, July 28, 2014 – page 593).

Logging Releases Mercury into the Aquatic Environment and it Accumulates in Fish

22. MOECC noting that: "…it's not just possible increased mercury loading due to logging but also other factors such as possible increased loading of organic material may affect how and how much of increased/decreased mercury in the system gets bioaccumulated in fish. Even if overall mercury loading and water (and sediment) 'total' mercury concentrations decline, you may see increased fish mercury levels due to increased methylation under changed conditions (e.g. water chemistry)" (MOECC email exchange, June 6-7, 2012 – pages 597-599).

23. MOECC acknowledging that "ongoing logging will increase Hg [mercury] mobilization and nobody is tracking the downstream implications" (MOECC email exchange, August 7, 2013 – page 600).

24. MOECC being advised in early 2014 that the Grassy Narrows community "is already sensitive to the effects of Hg [mercury]. This should be recognized when logging rights

are being considered in this area, and it should be advised that a precautionary approach be considered. The community [has] peer reviewed studies showing that logging activities can result in the release of Hg [mercury] into the natural environment" (Ministry of Aboriginal Affairs email to MOECC, January 10, 2014 – page 601).

Potential Study of Clearcutting on Mercury Levels in Fish

25. MOECC acknowledging that "Yes, logging introduces Hg [mercury]!" and considering a study on the issue: "Do we have funding to conduct this study (I would love to explore) as this question itself is a research project on its own??!!!" (MOECC email exchange, June 6-7, 2012 – pages 597-599).

26. MOECC acknowledging that in 2012 "MOE and MNR [were] to discuss a potential study looking at the effects of logging and clear cutting on mercury levels in fish"; that Grassy Narrows had expressed concerns that inappropriate logging on Crown land impacts traditional practices; and that there is a "general body of knowledge illustrating that logging practices promote mercury release to rivers; however, any impacts to the English-Wabigoon system [are] unclear and could not be evaluated without further analysis" (MOECC email exchange, September 18, 2012 – pages 570-571; and MOECC Information Note: Grassy Narrows First Nation Mercury Contamination, September 18, 2012 – pages 572-579).

27. MOECC inquiring in 2013 about "Whatever happened to the project you were trying to set up looking [at] the effects of [clearcut] logging on Hg [mercury] concentrations in fish" (MOECC internal email, February 5, 2013 – page 580).

28. MOECC acknowledging in 2013 that it "has been working with MNR to try and set up a study…to see if we see any relationship between different logging practices and Hg [mercury] in fish. This has been a slow process though and we haven't quite managed to get it up and running yet". MOECC Director of Environmental Monitoring and Reporting Branch responding that: "I'm not surprised it's slow…ongoing logging will increase Hg [mercury] mobilization and nobody is tracking the downstream implications" (MOECC email exchange, August 7, 2013 – page 600).

29. MOECC repeating in 2014 what it said in 2012 that "MOE and MNR are discussing a potential study looking at the effects of logging and clear cutting on mercury levels in fish"; that Grassy Narrows "has expressed concerns that inappropriate logging on Crown land impacts traditional practices"; and that there is a "general body of knowledge illustrating that logging practices promote mercury release to rivers; however, any impacts to the English-Wabigoon system [are] unclear and could not be evaluated without analysis" (MOECC Information Note: Grassy Narrows First Nation Mercury Contamination, July 28, 2014 – pages 589-590).

Adequacy of Mercury Monitoring under Approved Whiskey Jack Forest Management Plan

30. MOECC Daily Issues Alert stating, with respect to decision to reject IEA request, that: "The ministry is confident that the Whiskey Jack forest management plan has been developed with monitoring and mitigation measures that will ensure any mercury

migration is limited. As a precaution, we have imposed conditions on the project to reduce mercury movement. Conditions include, monitoring soil disturbances…" (MOECC Daily Issues Alert, December 30, 2014 – pages 603-606).

31. MOECC Director of Environmental Monitoring and Reporting Branch stating with respect to the above statements in the Alert: "Note the 'monitoring' is of soils and not the aquatic ecosystem. Just curious – were we approached by EAAB [Environmental Assessment and Approvals Branch] for any input to the decision re: impacts on mercury in fish?" (MOECC internal email exchange, December 30, 2014 – page 603).

APPEAL OF NON-DISCLOSURE OF CERTAIN DOCUMENTS

32. In September 2015, MOECC indicated that it was only providing partial access to the information I had requested in my January 7, 2015 *FIPPA* request, identified by MOECC as file A-2015-00157. Upon receiving the records and reviewing the decision letter, I filed an appeal under *FIPPA* on or about October 28, 2015. A copy of my appeal letter and material in support of the appeal is attached as **Exhibit "D"**. As of the date of my supplementary affidavit, MOECC has not disclosed further information pursuant to this appeal.

33. In January 2016, MOECC indicated that it was only providing partial access to the information I had requested in my January 8, 2015 *FIPPA* request, identified by MOECC as file A-2015-00158. Upon receiving the records and reviewing the decision letter, I filed an appeal under *FIPPA* on or about January 22, 2016. A copy of my appeal letter

and material in support of the appeal is attached as **Exhibit "E"**. As of the date of my supplementary affidavit, MOECC has not disclosed further information pursuant to this appeal.

34. I swear this supplementary affidavit in support of the within application for judicial review, and for no other or improper purpose.

SWORN before me in the City of Toronto, in the Province of Ontario, this ___ day of _____, 2016.

A Commissioner, etc.

_____
David Sone

Ministry of the Environment and Climate Change

Freedom of Information and Protection of Privacy Office

12th Floor
40 St. Clair Avenue West
Toronto ON M4V 1M2
Tel: (416) 314-4075
Fax: (416) 314-4285

Ministère de l'Environnement et de l'Action en matière de changement climatique

Bureau de l'accès à l'information et de la protection de la vie privée

12e étage
40, avenue St. Clair ouest
Toronto ON M4V 1M2
Tél. : (416) 314-4075
Téléc.: (416) 314-4285

Ontario

September 25, 2015

David Sone
Earthroots
401 Richmond St W, #410
Toronto, ON M5V 3A8

Dear David Sone:

RE: *Freedom of Information and Protection of Privacy Act* Request
Our File # A-2015-00157

This letter is further to your request made pursuant to the *Freedom of Information and Protection of Privacy Act* relating to Records contained in the confidential MOECC file for the Whiskey Jack 2012-2022 Forest Management Plan project, and any other records related to the Ministry's decisions on the request for individual environmental assessment of the Plan.

Attached is a copy of the records.

If you have any questions regarding this matter, please contact Oksana Budjko oksana.budjko@ontario.ca.

Yours truly,

H. Ritscher

Heidi Ritscher
FOI Manager

Attachment

From: Pochailo, Kurt (MNR)
Sent: January-24-14 12:06 PM
To: Wills, Devon (ENE)
Subject: RE: Request for Individual Environmental Assessment of the Whiskey Jack Forest Management Plan 2012-2022

Hello Devon,

I will start to compile some of the consultation record for you and send them off ASAP. If you require any other information please let me know and I will pass it along.

Regards,

Kurt Pochailo, R.P.F.
Management Forester
Whiskey Jack Forest
English River Area
Tel: (807) 468-2597
Fax: (807) 468-2736
E-mail: kurt.pochailo@ontario.ca

From: Wills, Devon (ENE)
Sent: January 24, 2014 10:43 AM
To: Pochailo, Kurt (MNR)
Subject: FW: Request for Individual Environmental Assessment of the Whiskey Jack Forest Management Plan 2012-2022

Hello Kurt,

I am the Project Evaluator assigned to the Whiskey Jack Forest Management Plan Part II Order request. I am not sure if you have received a copy of the request (as you are not on the cc'ed email below), so I am attaching it to this email. The request does not specify a particular area within the Forest Management Plan that the requesters have issue with, but raise the entire Whiskey Jack Forest Management Plan as a concern. The request also outlines concerns with the impacts of logging on mercury levels in fish and water in respect to protection of aboriginal treaty rights. If the MNR has any consultation records/documents that you deem would be beneficial to our review please forward them to me. s.19 Please do not hesitate to contact me if you have further questions.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: david.sone@gmail.com [mailto:david.sone@gmail.com] **On Behalf Of** David Sone
Sent: January 22, 2014 3:34 PM

Cc: simonfobister@gmail.com; Rudy Turtle; Bill Fobister; Christine Pahpasay; Robert Janes; Joseph Fobister; Louis Seymour; Asubpeeschoseewagong NetumAnishinabek; Amber Ellis
Subject: Request for Individual Environmental Assessment of the Whiskey Jack Forest Management Plan 2012-2022

Please find attached a request for Individual Environmental Assessment of the Whiskey Jack Forest Management Plan 2012-2022 from Grassy Narrows First Nation and Earthroots.

In future correspondence on this matter please copy me, and

Asubpeeschoseewagong NetumAnishinabek <ana.op2011@gmail.com>

Sincerely,

David Sone

From: Desautels, Solange (ENE)
Sent: January-30-14 8:55 AM
To: Wills, Devon (ENE)
Subject: FW: Whiskey Jack IEA

FYI

Yours truly,

Solange Desautels

Solange Desautels, (A) Supervisor Project Review Unit
Environmental Assessment Services Section
Environmental Approvals Branch
Phone: 416-314-7237

From: Sullivan, John J. (MNR)
Sent: January 28, 2014 4:45 PM
To: Desautels, Solange (ENE)
Cc: Glassford, Paul (MNR); Pyke, Dan (MNR)
Subject: Whiskey Jack IEA

Hi Solange:

MNR is aware that an IEA request has been submitted jointly from Grassy Narrows First Nation and Earthroots on the 2012-2022 Whiskey Jack FMP. As the 30 day Plan Inspection period plus the 7 day grace period for the public to request an IEA ends tomorrow January 29, 2014, I am assuming that this IEA request will be the only one that MOE will have to review for this FMP. With that said, I was wondering if a project evaluator has been assigned to this IEA request so MNR and MOE can begin dialogue on the issues, geography affected within the request.

Thanks

John

Wills, Devon (MOECC)

From: Wills, Devon (ENE)
Sent: February-06-14 10:58 AM
To: Fletcher, Rachael (ENE)
Subject: RE: Whiskey Jack Forest Part II Order Request

A teleconference with other Ministries to clarify issues is always welcome.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: Fletcher, Rachael (ENE)
Sent: February-06-14 10:38 AM
To: Wills, Devon (ENE)
Subject: Re: Whiskey Jack Forest Part II Order Request

Thank you. I'll be in touch soon to make sure whenever I communicate anything about this I understand the process, have the right messaging, am not misrepresenting you guys in any way or making any promises. Would you guys be open to a teleconference some time with MAA and MNR to discuss the issue?

From: Wills, Devon (ENE)
Sent: Thursday, February 06, 2014 10:33 AM
To: Fletcher, Rachael (ENE)
Subject: RE: Whiskey Jack Forest Part II Order Request

Hello Rachael,

As discussed, here are the main contacts from MNR. They may be able to answer any Project specific inquiries you may have.

Paul Glassford (MNR)
Senior Advisor, Forest Environmental Assessment, Policy Division
(705) 945-6752

John Sullivan (MNR)
Forest EA Implementation Coordinator, Policy Division
(705) 945-6684

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: Fletcher, Rachael (ENE)
Sent: February-06-14 9:47 AM
To: Wills, Devon (ENE)
Subject: Re: Whiskey Jack Forest Part II Order Request

Thanks. I'm just in the community now ... If good reception I will call

From: Wills, Devon (ENE)
Sent: Thursday, February 06, 2014 09:34 AM
To: Fletcher, Rachael (ENE); Desautels, Solange (ENE)
Subject: RE: Whiskey Jack Forest Part II Order Request

Hello Rachael,

Solange is not in today, however I can be reached at the number below to talk about the Whiskey Jack FMP.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: Fletcher, Rachael (ENE)
Sent: February-05-14 6:25 PM
To: Desautels, Solange (ENE); Wills, Devon (ENE)
Subject: Re: Whiskey Jack Forest Part II Order Request

Thanks Solange. Can I call you guys in the morning?

From: Desautels, Solange (ENE)
Sent: Wednesday, February 05, 2014 02:45 PM
To: McDonald, Kathy (ENE); Fletcher, Rachael (ENE)
Cc: Wills, Devon (ENE)
Subject: RE: Whiskey Jack Forest Part II Order Request

Project Evaluator reviewing part II order requests is Devon Wills (416) 314-8259. He can give info on PIIO request process. Keeping in mind we just got requests and have limited

information. If more detail is required about project, she perhaps should speak w John Sullivan and whoever MNR contact there is doing it from there end.

Yours truly,

Solange Desautels

Solange Desautels, (A) Supervisor Project Review Unit
Environmental Assessment Services Section
Environmental Approvals Branch
Phone: 416-314-7237

From: McDonald, Kathy (ENE)
Sent: February 5, 2014 2:18 PM
To: Desautels, Solange (ENE); Fletcher, Rachael (ENE)
Subject: Whiskey Jack Forest Part II Order Request

Hi there,
Solange I received a call from Rachael Fletcher (EMRB Manager) who is on route to Grassy Narrows and she is looking to speak to someone about the file above. Can you email her with a contact name. Rachael is currently on route to Winnipeg and will be touching base with your contact once she lands.

Rachael, Solange is the supervisor who manages the unit that reviews these files so she is the best person to assist you. Hope you two e-connect.
Happy Wednesday and please let me know if you need anything more
Cheers k.

Kathy McDonald
Technical Support Manager
Ministry of the Environment, Northern Region
Suite 1203, 199 Larch Street Sudbury ON
tel: 705 564 3247

Wills, Devon (MOECC)

From: Glassford, Paul (MNR)
Sent: February-11-14 9:18 AM
To: Wills, Devon (ENE)
Subject: Info
Attachments: Document1.docx

Devon:

I was just trying to get myself more informed on the mercury issue and found the attached and thought I would share it with you.

Paul

Mercury Cycling in the Environment

Mercury cycling pathways in aquatic environments are very complex. The various forms of mercury can be converted from one to the next; most important is the conversion to methylmercury (CH3Hg+), the most toxic form. Ultimately, mercury ends up in the sediments, fish and wildlife, or evades back to the atmosphere by volatilization.

Aquatic Mercury Cycle

At right, Figure 6 shows a schematic drawing of mercury cycling in an aquatic ecosystem.[1] With the exception of isolated cases of known point sources, the ultimate source of mercury to most aquatic ecosystems is deposition from the atmosphere, primarily associated with rainfall.

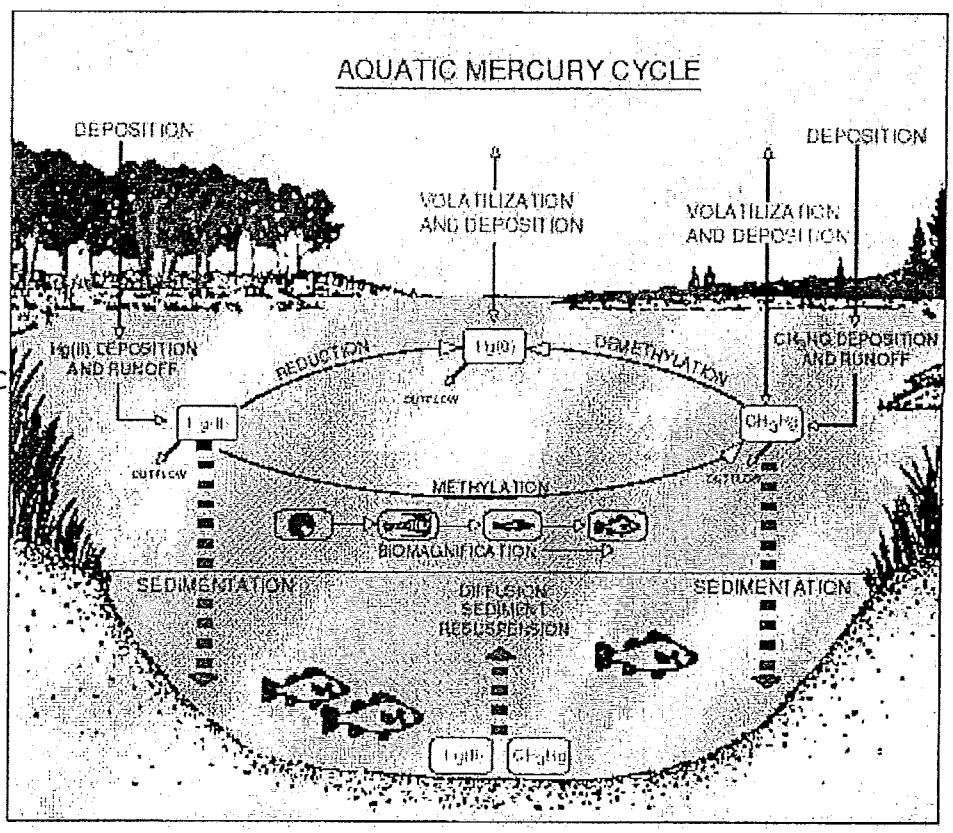

Figure 6. Mercury cycling pathways in aquatic environments are very complex. The various forms of mercury can be converted from one to the next; most important is the conversion to methylmercury (CH_3Hg^+), the most toxic form. Ultimately, mercury ends up in the sediments, fish and wildlife, or evades back to the atmosphere by volatilization. Reprinted with permission from Mercury Pollution: Integration and Synthesis. Copyright Lewis Publishers, an imprint of CRC Press.

As depicted in this figure, atmospheric deposition contains the three principal forms of mercury, although the majority is as inorganic mercury (Hg2+, ionic mercury). Once in surface water, mercury enters a complex cycle in which one form can be converted to another. It can be brought to the sediments by particle settling and then later released by diffusion or resuspension. It can enter the food chain, or it can be released back to the atmosphere by volatilization.

The concentration of dissolved organic carbon (DOC) and pH have a strong effect on the ultimate fate of mercury in an ecosystem. Studies have shown that for the same species of fish taken from the same region, increasing the acidity of the water (decreasing pH) and/or the DOC content generally results in higher body burdens in fish. Many scientists currently think that higher acidity and DOC levels enhance the mobility of mercury in the environment, thus making it more likely to enter the food chain.

Many of the details of the aquatic mercury cycle are still unknown, however, and remain areas of active research.

How does mercury enter the food chain?

The exact mechanism(s) by which mercury enters the food chain remain largely unknown, and probably vary among ecosystems. We do know, however, that certain bacteria play an important early role. Studies have shown that bacteria that process sulfate (SO4=) in the environment take up mercury in its inorganic form, and through metabolic processes convert it to methylmercury. The conversion of inorganic mercury to methylmercury is important for two reasons: (1) methylmercury is much more toxic than inorganic mercury, and (2) organisms require considerably longer to eliminate methylmercury. At this point, the methylmercury-containing bacteria may be consumed by the next higher level in the food chain, or the bacteria may release the methylmercury to the water where it can quickly adsorb to plankton, which are also consumed by the next level in the food chain.

Where does atmospheric mercury come from?

There are many sources of mercury to the environment, both natural and man related. Natural sources include volcanoes, natural mercury deposits, and volatilization from the ocean. The primary human-related sources include: coal combustion, chlorine alkali processing, waste incineration, and metal processing. Best estimates to date suggest that human activities have about doubled or tripled the amount of mercury in the atmosphere, and the atmospheric burden is increasing by about 1.5 percent per year.

Has there always been mercury contamination, or is this a recent problem?

This is a difficult question to answer, in part because of a lack of adequately preserved fish specimens of preindustrial age to compare against

contemporary samples. However, several lines of evidence from recent studies on Wisconsin lakes suggest that increase pemissions to the atmosphere, and subsequent higher deposition rates to lakes, likely translate into higher mercury levels in fish. Although the total amount of mercury delivered to one of these lakes annually is very small it is strongly absorbed by organic material floating in the water such as plankton or bacteria. These microorganisms are consumed by organisms higher in the food chain, or after dying, settle to the bottom of the lake and are incorporated into bottom sediments. Studies of sediment cores show that younger sediments deposited since industrialization have mercury concentrations that are about 3-5 times that of historical sediments. Thus, the fact that these sediments are primarily composed of dead microorganisms that were once the bottom of the food chain would suggest that modern levels of mercury in the food chain are elevated over preindustrial times.

If human-related emissions could be eliminated or reduced, how long would it take for ecosystems to recover?

The only way to attempt to answer this question is to incorporate all the best information currently available on how mercury behaves in the environment into a computer model. Such a model was constructed as part of the research effort on northern Wisconsin lakes. Modeled scenarios predict that if emissions could be reduced by 5 percent, it would take 8 years before any change in fish concentrations would be observed, and the decrease would be small.

Wills, Devon (MOECC)

From: Glassford, Paul (MNR)
Sent: February-18-14 2:45 PM
To: Wills, Devon (ENE)
Cc: Weedon, Deb (MNR); Pochailo, Kurt (MNR); Stevenson, Shawn (MNR); Peterson, Neil (MNR); Sullivan, John J. (MNR); Rose, Lorne M. (MNR)
Subject: Returning IEA Requester's Maps to MOE including Merged Map of Area Affected by IEA Request
Attachments: Map1_Submitted_Traplines_Feb13_2014.jpg; Map2 _Submitted_GNFN_Study_Area_Feb13_2014.jpg; Map3_Submitted_CP_Map_Feb13_ 2014.jpg; 2014_02_18 MNR narative response to IEA Requesters Maps of Affected Areas Whiskey Jack Forest.docx

Devon:

MNR has reproduced the maps you provided using GIS and MNR's information base. This has provided a consistent map base and enabled consolidation of the maps into a final product (i.e., the area affected by the IEA request).

Attached are 5 maps as follows: (Actually only three maps attached, remaining two in subsequent email)

Map 1-3 – IEA requester's original maps
Map 4 – Combined overlay of IEA requester's 3 maps
Map 5 – IEA requester's 3 maps merged into the "area affected by the IEA request".

Also attached is a narrative piece that should help you to understand the maps.

I anticipate that over the next few days you will bring these back to the IEA requesters for confirmation that they meet their intent. After you have confirmed this and the issues in the request, MNR and MOE will meet to discuss the issues in the submission and the area affected and address any outstanding concerns. Please note, MNR does have concerns with respect to the area affected by the IEA request that has been identified by the IEA requesters but will reserve comment until our meeting to discuss Appendix 1. I hope you will be able to get the IEA requester's response within a few days and we should be able to meet this Friday or Monday of next week to walk through our discussion of Appendix 1.

Any thoughts or concerns, let me know.

Paul Glassford
Senior Advisor, Forest EA
Forests Branch

Wills, Devon (MOECC)

From: Wills, Devon (ENE)
Sent: February-18-14 10:59 AM
To: Fletcher, Rachael (ENE)
Subject: RE: Logging

Hello Rachael,

That sounds like a good idea. I ran it by Solange (my supervisor) and she said it would be a good idea to set up another teleconference for MNR. We have been speaking to them as well, but not in a group format so that we can relay/convey ideas on how to proceed. Can you propose a time that you and Paul want to discuss the Project, so that I may run it our staff?

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

-----Original Message-----
From: Fletcher, Rachael (ENE)
Sent: February-18-14 10:06 AM
Cc: Wills, Devon (ENE)
Subject: Logging

Hi Devon. Just wanted to give you the heads up that I spoke to Paul Glassford and he wants to set up a TC to chat about the GN issue/bump up - I guess something similar to what we did last week with hydro? So that we are all on the same page and I know what I should be messaging. Call if you want to chat

Wills, Devon (MOECC)

From: Fletcher, Rachael (ENE)
Sent: February-18-14 11:16 AM
To: Glassford, Paul (MNR); Wills, Devon (ENE)
Subject: Re: IEA Request Issue and Science Discussion

Thanks Paul. I spoke to Devon this morning and he will likely be touching base with you soon

From: Glassford, Paul (MNR)
Sent: Tuesday, February 18, 2014 11:13 AM
To: Fletcher, Rachael (ENE)
Cc: Iwachewski, Ed (MNR); Fiset, Wayne (MNR); Weedon, Deb (MNR)
Subject: IEA Request Issue and Science Discussion

Rachael:

Thank-you for your call on Friday.

I have connected with the two science managers here in MNR that have staff involved in related activities. There may be another manager in our Aquatics section as well that should be linked in and I leave that to Wayne and Ed to figure out.

Bottom line, I want to facilitate MOE and MNR science folks getting together for the discussion we talked about on Friday on the mercury issues involved in both IEA requests to see what support we can provide each other.

I will forward a meeting request later today for a meeting on Thursday or Friday to discuss. Can you please suggest some agenda items or structure for the discussion so we can get everyone on the same page. Much appreciated.

Paul

Wills, Devon (MOECC)

From: Fletcher, Rachael (ENE)
Sent: February-21-14 11:23 AM
To: Wills, Devon (ENE)
Subject: Re: Whiskey Jack FMP

Awesome. Thanks

----- Original Message -----
From: Wills, Devon (ENE)
Sent: Friday, February 21, 2014 11:20 AM
To: Fletcher, Rachael (ENE)
Subject: RE: Whiskey Jack FMP

Thanks Rachael, I got the invite from Paul and will be in attendance.

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

-----Original Message-----
From: Fletcher, Rachael (ENE)
Sent: February-21-14 10:55 AM
To: Wills, Devon (ENE)
Subject: Re: Whiskey Jack FMP

I've just sent you the meeting information.
The meeting is now set for monday at 10.30

----- Original Message -----
From: Wills, Devon (ENE)
Sent: Friday, February 21, 2014 10:18 AM
To: Fletcher, Rachael (ENE)
Subject: Whiskey Jack FMP

Hello Rachael,

Do you know if the MNR meeting that Paul was to schedule is on for today. I have not heard from him.

Thanks,

Devon Wills

Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

Wills, Devon (MOECC)

From: Glassford, Paul (MNR)
Sent: February-25-14 11:04 AM
To: Wills, Devon (ENE)
Cc: Pochailo, Kurt (MNR); Stevenson, Shawn (MNR); Peterson, Neil (MNR)
Subject: 2014 02 24 APPENDIX 1 MNR Final.docx
Attachments: 2014 02 24 APPENDIX 1 MNR Final.docx

Attached is the update Appendix 1 as discussed today on our call.

Paul Glassford

Wills, Devon (MOECC)

From: Stevenson, Shawn (MNR)
Sent: February-26-14 9:32 AM
To: Wills, Devon (ENE)
Cc: Glassford, Paul (MNR); Rose, Lorne M. (MNR)
Subject: Contact Info for MNR Legal RE: Whiskey Jack IEA Request

Devon:

As requested, here is the contact information for Lorne Rose our legal counsel advising us on this request and matters related to Grassy Narrows.

Lorne Rose
Deputy Minister's Office
Legal Services
(416) 314-6911
Lorne.Rose@ontario.ca

Regards

Shawn Stevenson, M.Sc.
Area Supervisor
English River Area
Kenora District
tel: 807 468-2579
shawn.stevenson@ontario.ca

Wills, Devon (MOECC)

From: Sullivan, John J. (MNR)
Sent: March-10-14 4:59 PM
To: Wills, Devon (ENE)
Cc: Glassford, Paul (MNR)
Subject: RE: Whiskey Jack FMP
Attachments: 2014 03 10 APPENDIX 1 MOE_ JOhn comments.docx; 2014 03 10 Appendix 6-Letter_John Comments.docx

Hi Devon:

Attached are my comments on the Appendix 1 and 6 – not much but I think important. We can discuss if you like.

Thanks

John

From: Wills, Devon (ENE)
Sent: March-10-14 4:11 PM
To: Sullivan, John J. (MNR)
Cc: Glassford, Paul (MNR)
Subject: Whiskey Jack FMP

Hello John,

As discussed here is the revised Appendix containing the modified verbiage pertaining to the consultation requirements. Please tell me if the documentation needs further refinements or if we can proceed.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

Wills, Devon (MOECC)

From: Sullivan, John J. (MNR)
Sent: March-10-14 4:40 PM
To: Wills, Devon (ENE)
Cc: Glassford, Paul (MNR)
Subject: RE: Whiskey Jack FMP

Hi Devon:

Thanks for providing the documents. I have a few comments that are minor in nature with both documents. We could fix them up tomorrow very quickly. Paul or I will give you a call in the morning.

Thanks

John

From: Wills, Devon (ENE)
Sent: March-10-14 4:11 PM
To: Sullivan, John J. (MNR)
Cc: Glassford, Paul (MNR)
Subject: Whiskey Jack FMP

Hello John,

As discussed here is the revised Appendix containing the modified verbiage pertaining to the consultation requirements. Please tell me if the documentation needs further refinements or if we can proceed.

Thanks,

Devon Wills
Project Evaluator
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2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

Wills, Devon (MOECC)

From: Sullivan, John J. (MNR)
Sent: March-10-14 4:59 PM
To: Wills, Devon (ENE)
Cc: Glassford, Paul (MNR)
Subject: RE: Whiskey Jack FMP
Attachments: 2014 03 10 APPENDIX 1 MOE_ JOhn comments.docx; 2014 03 10 Appendix 6-Letter_John Comments.docx

Hi Devon:

Attached are my comments on the Appendix 1 and 6 – not much but I think important. We can discuss if you like.

Thanks

John

From: Wills, Devon (ENE)
Sent: March-10-14 4:11 PM
To: Sullivan, John J. (MNR)
Cc: Glassford, Paul (MNR)
Subject: Whiskey Jack FMP

Hello John,

As discussed here is the revised Appendix containing the modified verbiage pertaining to the consultation requirements. Please tell me if the documentation needs further refinements or if we can proceed.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

Wills, Devon (MOECC)

From: Wills, Devon (ENE)
Sent: March-11-14 11:53 AM
To: Glassford, Paul (MNR)
Cc: Sullivan, John J. (MNR)
Subject: Whiskey Jack Forest FMP
Attachments: 2014 03 11 APPENDIX 1 MOE.docx; 2014 03 11 Appendix 6- Letter.docx

Hello,

The Appendix 1 and 6 documents are attached to this email for your review. The documents have been reviewed by staff at the MOE and have been finalized. Is there any further information that MNR would feel beneficial to our review that could be included in Appendix 1- Issue 7 (e.g. issue resolution)? Please convey the additional information required by March 12, 2014, and I will update the document accordingly.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

INFORMATION NOTE:
Whiskey Jack Forest Management Plan
DATE: March 14, 2014

ISSUE

The Ministry of the Environment has received one Part II Order request to require an individual environmental assessment for the Ministry of Natural Resources-proposed Whiskey Jack Forest Management Plan in the northwest region of Ontario.

KEY MESSAGES

- The Ministry of the Environment is working with the Ministry of Natural Resources to ensure that the Whiskey Jack Forest Management Plan is protective of both human health and the environment.
- The province promotes good environmental planning by assessing the potential effects of forest management activities through the Environmental Assessment Act.
- In order to ensure the protection of the environment, proponents of forest management activities of this type are required to follow the process under the Ministry of Natural Resources Class Environmental Assessment for Forest Management on Crown Lands in Ontario.
- This Class Environmental Assessment requires a comprehensive consultation program and is an effective means to evaluate the potential environmental effects of a project.

BACKGROUND

Whiskey Jack Forest

- The Whiskey Jack Forest is approximately 450 kilometres west of Thunder Bay and contains over 1.1 million hectares of forested area. 750,000 hectares are considered to be productive forestlands.
- Communities in or next to the Whiskey Jack Forest include the City of Kenora, Sioux Narrows, Redditt, Vermilion Bay, Ear Falls and Red Lake.
- First Nations communities include Asubpeeschoseewagong Netum Anishinabek (Grassy Narrows First Nation), Wabaseemoong Independent Nations and Ochiichagwe'babigo'inning (Dalles First Nation), Wabauskang First Nation, and Naotkamegwanning (Whitefish Bay First Nation).
- The Whiskey Jack Forest has been a Crown Management Unit since Abitibi Company of Canada surrendered the Sustainable Forest Licence in August 2009.

- The project's forest management planning activities and operations are administered by the Kenora District Ministry of Natural Resources (MNR).

- MNR, in consultation with the public, has the responsibility of completing a forest management plan (FMP) of the Whiskey Jack Forest.

Forest Management Plan

- The primary objective of the FMP on Crown land is to ensure the long-term health of forest ecosystems. MNR's FMP process allows forest managers to ensure that the Crown forests of Ontario will remain healthy enough to provide sustainable benefits such as timber and commercial products, wildlife habitat, and recreation opportunities for Ontarians.

- The planning history for the Whiskey Jack FMP has had many alterations due to changes in strategic planning timeframes and the incorporation of contingency plans.

- The current Whiskey Jack FMP has been prepared for a 10-year period from April 1, 2012 to March 31, 2022. The management plan describes forest management activities, such as timber harvesting, road construction and forest regeneration that will take place during the plan period.

- The Whiskey Jack FMP indicates that 51,941 hectares of forest are expected to be clearcut harvested during the 10-year period. The plan also includes forest renewal and maintenance activities with a total forest regeneration area of 53,470 hectares.

- The preparation of the plan occurs in two phases:
    - Phase I – The strategic, long-term planning and the planning of the first five years of operation
    - Phase II – Details operations for the second five-year phase of this plan, with operational planning starting approximately a year in advance

- Throughout the project, MNR has hosted several meetings and Aboriginal Information Centres.

- On December 23, 2013, MNR posted a notification for the Whiskey Jack FMP providing a 30-day public and agency review period, ending on January 22, 2014.

Part II Order request

- MOE received one combined Part II Order request for the project from the Grassy Narrows First Nation and a non-profit environmental group, Earthroots.

- The main issue raised in the Part II Order request is the concern that clear cutting will cause further mercury contamination issues in local waterways which may potentially affect human and ecosystem health and adversely impact Aboriginal and Treaty rights.

- Grassy Narrows First Nation has had a historic problem with mercury contamination dating back to the Dryden Paper Company in the 1970s. The amount of mercury present in fish as of 2012 was low, but a health advisory remains in effect. Fish is a main food source for the community.

Previous FMP and Part II Order Request

- MNR had a previous 2004-2024FMP for the Whiskey Jack Forest. This FMP was prepared using the 1996 Forest Management Planning Manual and the original Timber Environmental Assessment decision as a basis for planning, requiring a 20-year planning horizon with one five-year operation plan, after which both expire.

- In 2003, the Ministry of the Environment (MOE) amended MNR's FMP framework from a 20-year strategic plan having a five-year operational plan to a strategic plan lasting 10 years with a 5-year operational plan. A five-year plan was implemented in 2004 outlining operational activities until the year 2009. Two consecutive two-year contingency plans were completed in 2010 and 2012 for the Whiskey Jack Forest due to extra consultations with Grassy Narrows First Nation (see Appendix).

- In the previous 2004-2024 Whiskey Jack FMP, the Grassy Narrows First Nation submitted a Part II Order request indicating issues related to:
    - infringement on trapping and hunting rights
    - displaced trappers
    - roads and herbicide application negatively affecting the trappers and hunters
    - habitat guidelines and the class EA planning process
    - inaccurate assumptions about wood supply, regeneration rates and natural disturbance incidences

- That Part II Order request was denied on August 31, 2005, with conditions requiring MNR to:
    - consult with the Grassy Narrows First Nation on native values
    - monitor and assess the impacts of forestry operations on habitat
    - implement Area of Concern prescriptions
    - adhere to the requirements and provisions of the FMP

Request for Concurrence

- A request for concurrence was received by the MOE on March 11, 2014. MNR is seeking approval from the Director, EAB to commence with regular forest operations in areas of the forest management unit that are unaffected by the outstanding Part II Order request. This would allow MNR to engage in access, harvest, renewal, site preparation, and tending operations.

- In areas that are affected by the Part II Order Request, only maintenance of existing roads, renewal and tending operations (i.e. tree planting and thinning) would be permitted in this area.

- MNR has requested the MOE to provide a response on the concurrence request by March 14, 2014, although there is no formal timeframe for doing so. This timeline

would allow the commencement of forestry operations as noted above, by April 1, 2014.

- If concurrence is not granted, MNR notes that this may cause social and economic impact to those that rely on the Whiskey Jack forest industry.

- The Director, EAB is currently reviewing MNR's concurrence request and will advise MNR once a decision is made.

Next Steps

- A decision must be made on the request for concurrence by the Director, EAB.

- MOE is in the process of reviewing documentation and comments from MNR and is currently conducting a risk analysis of the ministry's Duty to Consult.

- A decision must be made on the request for an Individual Environmental Assessment by the Environmental Approvals Branch director within 45 days of receiving all necessary information. A decision is not invalid if not made within the timeframe.

STAKEHOLDER CONSIDERATIONS

Earthroots

- Earthroots is a grassroots, non-profit conservation organization that opposes the project. They are dedicated to the preservation of wilderness, wildlife and watersheds in Canada, with a focus on Ontario.

Grassy Narrows First Nation

- The Grassy Narrows First Nation is one of the key Aboriginal communities with hunting and fishing rights in the Whiskey Jack Forest. The Grassy Narrows First Nations reserve is located within the Whiskey Jack Forest Unit; much of the forest is within the First Nation's asserted traditional land use area. The Grassy Narrows First Nation is an indigenous Anishinabe community located within the Treaty 3 area.

- The Grassy Narrows First Nation is the lead claimant in the landmark case, Keewatin vs. Ontario, disputing whether the Ontario government has the same rights as the federal government (per Treaty 3) to use or permit the use of forest resources in the Treaty area. The project is within the Keewatin litigation lands.

- On September 19, 2013, the Supreme Court of Canada granted Grassy Narrows First Nation leave to appeal the Keewatin vs. Ontario (MNR) decision rendered by the Ontario Court of Appeal on March 18, 2013 which had affirmed Ontario's unilateral right to use the lands.

- The appeal is likely to be heard before the Supreme Court in May 2014.

- Until the Supreme Court of Canada decides the appeal, the decision of the Court of Appeal stands, confirming that Ontario has the jurisdiction to administer the public lands and forests in the Province of Ontario, without federal oversight, and including areas within the Treaty 3.

INVOLVEMENT OF OTHER MINISTRIES

- MNR has undertaken consultation where appropriate for the Whiskey Jack Forest Management Plan as part of the Class Environmental Assessment for Forest Management on Crown Lands in Ontario.

GENERAL INFORMATION	
PREPARED BY: Devon Wills, Project Evaluator, EAB	**TEL.:** 416-314-8259
BRANCH APPROVAL: Agatha Garcia-Wright, Director, EAB	**TEL.:** 416-314-7288
DIVISION APPROVAL: Nancy Matthews, ADM, Operations Division	**TEL.:** 416-314-6366
DIVISION APPROVAL DATE: mm/dd/yy	03/14/14
OTHER CONTACTS:	**TEL.:**

APPENDIX: Whiskey Jack Forest FMP History

Wills, Devon (MOECC)

From: Wills, Devon (MOECC)
Sent: March-24-14 9:43 AM
To: Lashbrook, Ross (MOECC)
Subject: FW: Whiskey Jack Forest Management Plan request for IEA

FYI, Earthroots meeting request.

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: david.sone@gmail.com [mailto:david.sone@gmail.com] **On Behalf Of** David Sone
Sent: March-21-14 5:04 PM
To: Wills, Devon (ENE)
Cc: Joseph Fobister
Subject: Re: Whiskey Jack Forest Management Plan request for IEA

Hi Devon,

I hope that you are doing well.

Can we set up a meeting with Earthroots, yourself, and any other relevant people at the MOE to discuss our IEA request before you make your decision? If possible, the meeting space should have call-in capability so that Joseph Fobister can join us if he wishes.

This would be a opportunity to answer any questions, provide supplementary information or elaboration where required, and discuss the request without prejudice.

I look forward to meeting you in person.

Take care,

David
Earthroots

On Thu, Feb 20, 2014 at 10:25 AM, Joseph Fobister <jbfobister@gmail.com> wrote:

Good Morning,

As David described, the map accurately depicts the area of concern.

Thank you.

On Feb 20, 2014, at 9:05 AM, Wills, Devon (ENE) <Devon.Wills@ontario.ca> wrote:

Hello David,

Due to the nature of the joint Part II Order request (Grassy Narrows and Earthroots), I will need Mr. J.B. Fobister's opinion of the map, before the review can continue.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: david.sone@gmail.com [mailto:david.sone@gmail.com] **On Behalf Of** David Sone
Sent: February-20-14 9:52 AM
To: Wills, Devon (ENE)
Cc: jbfobister@gmail.com
Subject: Re: Whiskey Jack Forest Management Plan request for IEA

Hi Devon,

This map appears to accurately depict the area affected by the IEA request (assuming that the bodies of water are included in the IEA area and that the eastern boundary is based on the Grassy Narrows traplines). This is without prejudice to a proper determination of the extent of Grassy Narrows Territory.

Thanks to you and the MNR for making this map.

Please go ahead with your review.

Take care,

David

On Wed, Feb 19, 2014 at 4:09 PM, Wills, Devon (ENE) <Devon.Wills@ontario.ca> wrote:
Hello,

I have been in contact with the MNR in regards to the three maps you have provided which illustrates your understanding of Grassy Narrows Territory within the Whiskey Jack Forest. The MNR has overlaid the three maps into one map which is an approximation of the area you have outlined. Can you please confirm that the attached map is an accurate depiction of the area affected by the IEA request?

Due to the strict timelines of MNR's Forest Management Class Environmental Assessment, it is important that you provide a response for the above question as soon as possible so that we may move forward with our review. I look forward to hearing your reply.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: david.sone@gmail.com [mailto:david.sone@gmail.com] **On Behalf Of** David Sone
Sent: February-06-14 11:47 AM
To: Wills, Devon (ENE)
Cc: jbfobister@gmail.com
Subject: Re: Whiskey Jack Forest Management Plan request for IEA

Hi Devon,

It is good to meet you. Thank you for your work reviewing our request.

Our request applies to Grassy Narrows Territory within the Whiskey Jack Forest. I do not know of any definitive map of this area. As part of the Iaccobucci Process, Ontario was to fund Grassy Narrows to complete a thorough land use and occupancy study which could have shed light on this question. However, funding was cut off before the completion of that study.

As a provisional measure you may consider the request to apply to the overlay sum of the following three mapped areas:
i) Grassy Narrows MNR trapline areas (first attachmet);
ii) MNR Grassy Narrows Study Area (second attachement);
iii) The area avoided during the creation of the recent Whiskey Jack Contingency Plan (orange, pink, and green areas on the third attachment).

This is without prejudice to any future determination that Grassy Narrows may make about the extent of their Territory.

I believe that the MNR has GIS shapefiles that should make this overlay to visualize.

The specific proposed forest management activities of concern are:
a) harvesting;
b) tending;
c) new road building; and
d) any other activities that may elevate mercury levels in water and fish.

I hope that this provides you with the information that you require.

The best way to contact Earthroots is by contacting me using this email address.

Joseph Fobister is the contact for Grassy Narrows and can be reached by email at jbfobister@gmail.com.

Please copy both Joseph, and me, on any communications regarding our joint request.

If you have any further questions, please do not hesitate to contact us.

Take care,

David Sone
Earthroots

On Tue, Feb 4, 2014 at 4:59 PM, Wills, Devon (ENE) <Devon.Wills@ontario.ca> wrote:
Hello,

I am the Project Evaluator assigned to the Whiskey Jack Forest Management Plan's request for an Individual Environmental Assessment (IEA). In reviewing your joint request, it has come to my attention that your concerns to not outline a specific area within the Whiskey Jack Forest. IEA Requests must include a description of the specific proposed forest management activities of concern, and a description and/ or map that identifies the geographic location of the affected areas. Please provide a map(s) that identify the specific area of concern within the Whiskey Jack Forest that your request for an IEA is related to.

Due to the strict timelines of MNR's Forest Management Class Environmental Assessment, it is important that you provide the required documentation as soon as possible so that we may move forward with our review. Please inform me of the best methods of contacting your organization that will expedite the information gathering process. I look forward to hearing from you shortly.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

Wills, Devon (MOECC)

From: Wills, Devon (MOECC)
Sent: March-24-14 4:00 PM
To: Lashbrook, Ross (MOECC)
Cc: Panko, Dan (MOECC)
Subject: RE: Whiskey Jack Forest concurrence request
Attachments: Draft Earthroots Second Email_1.docx

Hello,

I have attached a draft email.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: Lashbrook, Ross (ENE)
Sent: March-24-14 3:11 PM
To: Wills, Devon (ENE)
Cc: Panko, Dan (ENE)
Subject: FW: Whiskey Jack Forest concurrence request

Hi Devon,

Can you prepare a response for Agatha. Thanks.

Ross Lashbrook | Manager (A) | Environmental Assessment Services | 416.314.7967 F: 416.314.8452 E. Ross.Lashbrook@Ontario.ca

From: Garcia-Wright, Agatha (ENE)
Sent: March 24, 2014 3:10 PM
To: Panko, Dan (ENE); Lashbrook, Ross (ENE)
Subject: FW: Whiskey Jack Forest concurrence request

Can we do response pls

Agatha Garcia-Wright
Director
Environmental Approvals Branch
Ministry of the Environment
2 St. Clair Avenue West, 12A Floor
Toronto, ON M4V 1L5
416-314-7288 (ph)
416-314-7227 (fax)

From: David Sone [mailto:david.sone@gmail.com]
Sent: March 24, 2014 3:00 PM
To: Garcia-Wright, Agatha (ENE)
Subject: Re: Whiskey Jack Forest concurrence request

Dear Ms. Garcia-Wright,

Thank you for your response to my email of March 12.

I understand from your email that the planting in the IEA request area will not involve scarification or mechanical site preparation. Is this correct?

Also, please send me a copy of your decision letter on the MNR's request for concurrence when it is available.

I have contacted Devon Wills to set up a meeting.

Take care,

David Sone
Earthroots

On Fri, Mar 21, 2014 at 2:46 PM, Garcia-Wright, Agatha (ENE) <Agatha.GarciaWright@ontario.ca> wrote:

Good afternoon Mr. David Sone,

We would like to take this opportunity to follow up on your email dated March 12, 2014 (cited below). In this email, Earthroots objects to the use of herbicides and renewal and tending activities leading to increased mercury levels, due to soil disturbance within the Individual Environmental Assessment (IEA) area.

We have been able to confirm with the Ministry of Natural Resources (MNR) that there will be no herbicide application in the IEA request area. Further, the renewal and tending activities in this area will be limited to tree planting and thinning with physical work to be carried out with a brush saw (ie. no heavy machinery), which will not result in soil disturbance.

Operations outside of the IEA request area within the Whiskey Jack Forest will be subject to the forest management activities that are present within the Whiskey Jack FMP.

We would be pleased to meet with you to discuss your IEA request. If you have any questions about the ministry's review of your request or would like to set up a meeting, please contact Mr. Devon Wills, Project Evaluator for this Project, directly at 416-314-8259 or at devon.wills@ontario.ca.

Yours sincerely,

Agatha Garcia-Wright

Director

Environmental Approvals Branch

From: David Sone [mailto:david.sone@gmail.com]
Sent: March 12, 2014 4:15 PM
To: Garcia-Wright, Agatha (ENE)
Cc: Weedon, Deb (MNR); Peterson, Neil (MNR); Glassford, Paul (MNR); Pochailo, Kurt (MNR); simonfobister@gmail.com; Willcocks, Allan (MNR); Parrott, Ian (ENE); Wills, Devon (ENE); Joseph Fobister; Amber Ellis; Pretty, Susan (MNR)

Subject: Re: Whiskey Jack Forest concurrence request

Hi All,

I hope that you are doing well.

Earthroots objects to the part of this request that seeks concurrence to allow all renewal and tending operations to proceed within the area of concern while the IEA request is being considered.

Renewal and tending activities are likely to have mercury impacts due to soil disturbance by scarification/ mechanical site preparation for renewal, and machine access for mechanical tending/thinning (see Bishop et al., 2009).

Tending also often includes the use of herbicides which Grassy Narrows has long objected to for a number of reasons.

It is also plausible that the use of herbicides would pose a mercury risk due to:

a. the increase in decaying organic matter as a result of broad leafed species being killed by the herbicides, which could lead to increased export of dissolved organic carbon;

b. the loss of living root structure and decreased evapotranspiration which could lead to an increase in water flux, erosion, and DOC transport.

We do not object to specific renewal activities that do not involve machine access, including manual planting without site preparation, and aerial seeding.

We believe that the impact of delaying some renewal and tending activities on this area during the IEA would not be significant as these activities can be done later if/when they are determined to be safe.

Earthroots would also like to request a meeting with the MOE to discuss our IEA request without prejudice. This will facilitate effective communication and provide an opportunity for us to help clarify any questions that may have arisen from the request. We presume that the MOE will be meeting with MNR to discuss the IEA request, so it is fair that we also receive an opportunity to discuss the request in person.

Sincerely,

David Sone

Earthroots

On Mon, Mar 10, 2014 at 4:28 PM, Pretty, Susan (MNR) <Susan.Pretty@ontario.ca> wrote:

Please see attached letter signed by Al Wallcocks.

Regards,

Susan Al

Wills, Devon (MOECC)

From: Wills, Devon (ENE)
Sent: March-26-14 9:30 AM
To: Schlag, Michelle (ENE)
Subject: RE: Meeting

No Agenda has been set due to its open informal nature. Earthroots/Grassy Narrows felt that since MNR has been meeting with us, then they should also get a chance. As the Project is under review, we cannot get into the specifics of the review, but will listen to their concerns.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: Schlag, Michelle (ENE)
Sent: March-25-14 11:21 PM
To: Wills, Devon (ENE)
Subject: RE: Meeting

Do you have an agenda?

From: Wills, Devon (ENE)
Sent: Tuesday, March 25, 2014 4:09 PM
To: Schlag, Michelle (ENE)
Subject: RE: Meeting

Done.

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: Schlag, Michelle (ENE)
Sent: March-25-14 4:09 PM
To: Wills, Devon (ENE)
Subject: RE: Meeting

Yes. Send me an invite

Michelle Schlag, *MNRM*
Aboriginal Consultation Advisor
Ministry of the Environment
Phone: 416-326-9608

Please consider the environment before printing this email

From: Wills, Devon (ENE)
Sent: March-25-14 3:28 PM
To: Schlag, Michelle (ENE)
Subject: Meeting

I was wondering if you had time to come to a meeting on Thursday at 3:30 to 4:30 with David Sone of Earthroots and JB Fobister of Grassy Narrows regarding Whiskey Jack FMP. Let me know.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

Wills, Devon (MOECC)

From: Wills, Devon (MOECC)
Sent: March-27-14 9:34 AM
To: Lashbrook, Ross (MOECC)
Subject: FW: Whiskey Jack Forest concurrence request

FYI, Mr. Fobister's response to our email. I have responded to his email with a reminder about our meeting at 3:30 to 4:30 today.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: Joseph Fobister [mailto:jbfobister@gmail.com]
Sent: March-27-14 8:22 AM
To: Wills, Devon (ENE)
Subject: Re: Whiskey Jack Forest concurrence request

Good Morning,

Didn't Earthroots ask for conference call before a decision was made?. That's what I remember and I believe the call is to happen today. Mr Sone hasn't responded to my email yet to confirm.

Thanks, JB

On Mar 26, 2014, at 3:25 PM, Wills, Devon (ENE) <Devon.Wills@ontario.ca> wrote:

Hello Joseph,

Thanks for the follow up. Based on your response, we are of the understanding that Grassy Narrows does not have any outstanding concerns with respect to the concurrence request.

Please confirm that our understanding is accurate, as we want to ensure we fully understand the community's views.

Thanks very much,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

Wills, Devon (MOECC)

From: Wills, Devon (MOECC)
Sent: March-27-14 2:08 PM
To: Lashbrook, Ross (MOECC)
Cc: Panko, Dan (MOECC)
Subject: FW: Whiskey Jack Forest Management Plan request for IEA

FYI

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: David Sone [mailto:david.sone@gmail.com]
Sent: March-27-14 2:07 PM
To: Wills, Devon (ENE)
Subject: Re: Whiskey Jack Forest Management Plan request for IEA

Hi Devon,

I plan to attend the meeting in person. Joseph Fobister and Amber Ellis from Earthroots will call in.

If possible, I would like to play a 10 minute video with audio at the start of the meeting. Is it possible to have a projector connected to a laptop connected to the internet available? I realize this is short notice, and I understand if this is not possible.

I look forward to meeting you.

Take care,

David

On Wed, Mar 26, 2014 at 1:14 PM, Wills, Devon (ENE) <Devon.Wills@ontario.ca> wrote:

Hello David,

I am not sure if you are coming to the meeting tomorrow in person or will join via the teleconference number provided. However if you do wish to meet us in person, please check in with the receptionist on floor 12A (there is no reception area on the 14th floor, as indicated in the meeting request) and ask to see me.

Thanks,

Devon Wills

Project Evaluator

Ministry of the Environment

Environmental Assessment Services

---

2 St. Clair Avenue West

Toronto, Ontario, M4V 1L5

Phone: (416) 314-8259

Fax: (416) 314-2376

From: david.sone@gmail.com [mailto:david.sone@gmail.com] **On Behalf Of** David Sone
Sent: March-24-14 2:54 PM

To: Wills, Devon (ENE)
Cc: Joseph Fobister
Subject: Re: Whiskey Jack Forest Management Plan request for IEA

Hi Devon,

Any time on Thursday afternoon works for Mr. Fobister and me.

I look forward to meeting you, and to discussing the Whiskey Jack FMP.

Take care,

David

On Mon, Mar 24, 2014 at 11:36 AM, Wills, Devon (ENE) <Devon.Wills@ontario.ca> wrote:

Hello David,

We would be happy to meet to discuss issues relevant to the Whiskey Jack FMP. Please propose a time that is convenient for you and Mr. Fobister and I will coordinate things on this end.

Thanks,

Devon Wills

Project Evaluator

Ministry of the Environment

Environmental Assessment Services

---

2 St. Clair Avenue West

Toronto, Ontario, M4V 1L5

Phone: (416) 314-8259

Fax: (416) 314-2376

From: david.sone@gmail.com [mailto:david.sone@gmail.com] **On Behalf Of** David Sone
Sent: March-21-14 5:04 PM
To: Wills, Devon (ENE)
Cc: Joseph Fobister

Subject: Re: Whiskey Jack Forest Management Plan request for IEA

Hi Devon,

I hope that you are doing well.

Can we set up a meeting with Earthroots, yourself, and any other relevant people at the MOE to discuss our IEA request before you make your decision? If possible, the meeting space should have call-in capability so that Joseph Fobister can join us if he wishes.

This would be a opportunity to answer any questions, provide supplementary information or elaboration where required, and discuss the request without prejudice.

I look forward to meeting you in person.

Take care,

David

Earthroots

On Thu, Feb 20, 2014 at 10:25 AM, Joseph Fobister <jbfobister@gmail.com> wrote:

Good Morning,

As David described, the map accurately depicts the area of concern.

Thank you.

On Feb 20, 2014, at 9:05 AM, Wills, Devon (ENE) <Devon.Wills@ontario.ca> wrote:

Hello David,

Due to the nature of the joint Part II Order request (Grassy Narrows and Earthroots), I will need Mr. J.B. Fobister's opinion of the map, before the review can continue.

Thanks,

Devon Wills

Project Evaluator

Ministry of the Environment

Environmental Assessment Services

---

2 St. Clair Avenue West

Toronto, Ontario, M4V 1L5

Phone: (416) 314-8259

Fax: (416) 314-2376

From: david.sone@gmail.com [mailto:david.sone@gmail.com] **On Behalf Of** David Sone
Sent: February-20-14 9:52 AM
To: Wills, Devon (ENE)
Cc: jbfobister@gmail.com
Subject: Re: Whiskey Jack Forest Management Plan request for IEA

Hi Devon,

This map appears to accurately depict the area affected by the IEA request (assuming that the bodies of water are included in the IEA area and that the eastern boundary is based on the Grassy Narrows traplines). This is without prejudice to a proper determination of the extent of Grassy Narrows Territory.

Thanks to you and the MNR for making this map.

Please go ahead with your review.

Take care,

David

On Wed, Feb 19, 2014 at 4:09 PM, Wills, Devon (ENE) <Devon.Wills@ontario.ca> wrote:

Hello,

I have been in contact with the MNR in regards to the three maps you have provided which illustrates your understanding of Grassy Narrows Territory within the Whiskey Jack Forest. The MNR has overlaid the three maps into one map which is an approximation of the area you have outlined. Can you please confirm that the attached map is an accurate depiction of the area affected by the IEA request?

Due to the strict timelines of MNR's Forest Management Class Environmental Assessment, it is important that you provide a response for the above question as soon as possible so that we may move forward with our review. I look forward to hearing your reply.

Thanks,

Devon Wills

Project Evaluator

Ministry of the Environment

Environmental Assessment Services

---

2 St. Clair Avenue West

Toronto, Ontario, M4V 1L5

Phone: (416) 314-8259

Fax: (416) 314-2376

From: david.sone@gmail.com [mailto:david.sone@gmail.com] **On Behalf Of** David Sone
Sent: February-06-14 11:47 AM
To: Wills, Devon (ENE)
Cc: jbfobister@gmail.com
Subject: Re: Whiskey Jack Forest Management Plan request for IEA

Hi Devon,

It is good to meet you. Thank you for your work reviewing our request.

Our request applies to Grassy Narrows Territory within the Whiskey Jack Forest. I do not know of any definitive map of this area. As part of the Iaccobucci Process, Ontario was to fund Grassy Narrows to complete a thorough land use and occupancy study which could have shed light on this question. However, funding was cut off before the completion of that study.

As a provisional measure you may consider the request to apply to the overlay sum of the following three mapped areas:

i) Grassy Narrows MNR trapline areas (first attachmet);

ii) MNR Grassy Narrows Study Area (second attachement);

iii) The area avoided during the creation of the recent Whiskey Jack Contingency Plan (orange, pink, and green areas on the third attachment).

This is without prejudice to any future determination that Grassy Narrows may make about the extent of their Territory.

I believe that the MNR has GIS shapefiles that should make this overlay to visualize.

The specific proposed forest management activities of concern are:

a) harvesting;

b) tending;

c) new road building; and

d) any other activities that may elevate mercury levels in water and fish.

I hope that this provides you with the information that you require.

The best way to contact Earthroots is by contacting me using this email address.

Joseph Fobister is the contact for Grassy Narrows and can be reached by email at jbfobister@gmail.com.

Please copy both Joseph, and me, on any communications regarding our joint request.

If you have any further questions, please do not hesitate to contact us.

Take care,

David Sone

Earthroots

On Tue, Feb 4, 2014 at 4:59 PM, Wills, Devon (ENE) <Devon.Wills@ontario.ca> wrote:

Hello,

I am the Project Evaluator assigned to the Whiskey Jack Forest Management Plan's request for an Individual Environmental Assessment (IEA). In reviewing your joint request, it has come to my attention that your concerns to not outline a specific area within the Whiskey Jack Forest. IEA Requests must include a description of the specific proposed forest management activities of concern, and a description and/ or map that identifies the geographic location of the affected areas. Please provide a map(s) that identify the specific area of concern within the Whiskey Jack Forest that your request for an IEA is related to.

Due to the strict timelines of MNR's Forest Management Class Environmental Assessment, it is important that you provide the required documentation as soon as possible so that we may move forward with our review. Please inform me of the best methods of contacting your organization that will expedite the information gathering process. I look forward to hearing from you shortly.

Thanks,

Devon Wills

Project Evaluator

Ministry of the Environment

Environmental Assessment Services

---

2 St. Clair Avenue West

Toronto, Ontario, M4V 1L5

Phone: (416) 314-8259

Fax: (416) 314-2376

Wills, Devon (MOECC)

From: Panko, Dan (MOECC)
Sent: March-31-14 10:43 AM
To: Lashbrook, Ross (MOECC)
Subject: RE: RUSH: Proactive Update: Whiskey Jack Forest Management Plan - due ASAP

Hey Ross,

Please review.

Thanks

Dan Panko, B.Sc, M.E.S.
Supervisor (A)
Environmental Assessment Services
Environmental Approvals Branch
Ministry of the Environment
2 St. Clair Ave West, Floor 12A
Toronto, ON, M4V 1L5
Phone: 416-314-7241
Email: dan.panko@ontario.ca

From: IssuesManager_EAASIB_EAB (ENE)
Sent: March 31, 2014 9:55 AM
To: Wills, Devon (ENE); Panko, Dan (ENE)
Cc: Lashbrook, Ross (ENE); IssuesManager_EAASIB_EAB (ENE); Garcia-Wright, Agatha (ENE)
Subject: RUSH: Proactive Update: Whiskey Jack Forest Management Plan - due ASAP
Importance: High

Due ASAP
Hi Dan,
s.N/R
Can you please provide responses to the two questions below?
Thanks,
Mark

Question:
Would concurrence pose any risk to the Crown?
Proposed Response:

s.13

the decision was made on the actual IEA request if that request is ultimately denied (and again, the nature of the challenge would likely be that the decision was unreasonable).
Duty to consult: There is a low risk of successful challenge based on a failure to discharge the duty to consult because the effect of the specific decision (i.e. the decision on the part of MNR to request concurrence and the decision on the part of MOE to grant the concurrence) would only permit the operations identified in the FMP (assuming that the FMP process discharged its duty to consult) to proceed as planned and consulted on in a narrow section of the Management Unit.

Question:
Re: the following bullet, **what is MNR doing to potentially resolve this concern? Could MNR find a way to consider how to be responsive to the concern?**

a. Grassy Narrows First Nation indicated that it objected to the granting of concurrence for the individual EA request area as the community had not received any financial benefits associated with the tending and renewal activities which would occur if concurrence was granted. Grassy Narrows First Nation also suggested that the MOE consult with the First Nations who are located in the non-individual EA request area.

Proposed Response:

s.13

From: Dossett, Justin (ENE)
Sent: March 31, 2014 9:44 AM
To: IssuesManager_EAASIB_EAB (ENE)
Subject: RUSH: Proactive Update: Whiskey Jack Forest Management Plan - due ASAP
Importance: High

Hi Mark,

We had a couple follow up questions, need answers asap:

1. Would concurrence pose any risk to the Crown?
2. Re: the following bullet, what is MNR doing to potentially resolve this concern? Could MNR find a way to consider how to be responsive to the concern?
    a. Grassy Narrows First Nation indicated that it objected to the granting of concurrence for the individual EA request area as the community had not received any financial benefits associated with the tending and renewal activities which would occur if concurrence was granted. Grassy Narrows First Nation also suggested that the MOE consult with the First Nations who are located in the non-individual EA request area.

Please send me what answers you can get by 1030 AM this morning.

Justin

From: Dossett, Justin (ENE)
Sent: March 28, 2014 2:23 PM

To: @ENE-CB-ISS; Butchart, Jeff (ENE)
Cc: Harten, Jayne (ENE); Therrien, Dean (ENE); IssuesManager_EAASIB_EAB (ENE)
Subject: Proactive Update: Whiskey Jack Forest Management Plan

Please see updates regarding a request for concurrence for the Whiskey Jack Forest Management Plan. Updates include:

- A request for concurrence was received by the MOE on March 11, 2014. MNR is seeking approval from the Director of the Environmental Approvals Branch to commence with regular forest operations in areas of the forest management unit that are unaffected by the outstanding Part II Order request.

- In areas that are affected by the Part II Order Request, only maintenance of existing roads, renewal and tending operations (i.e. tree planting and thinning) would be permitted.

- On March 12, 2014, Earthroots wrote to the MOE identifying that it would not support granting concurrence if doing so would result in allowing mechanical tending and tree planting, and the use of herbicides, in the individual Environmental Assessment (EA) request area.

- On March 21, 2014 after verifying with MNR, the MOE wrote to both Earthroots and Grassy Narrows First Nation to confirm that only non-mechanical tending would be permitted in the Part II Order request area and that the application of herbicides would not be permitted.

- On March 27, 2014, the ministry met with Earthroots and Grassy Narrows First Nation. Grassy Narrows First Nation indicated that it objected to the granting of concurrence for the individual EA request area as the community had not received any financial benefits associated with the tending and renewal activities which would occur if concurrence was granted. Grassy Narrows First Nation also suggested that the MOE consult with the First Nations who are located in the non-individual EA request area.

- The Director is now considering whether to grant concurrence

- If concurrence is not granted, MNR notes that this may cause social and economic impact to those that rely on the Whiskey Jack Forest industry.

Thanks,
Justin

JUSTIN DOSSETT | senior divisional information coordinator
ministry of the environment | operations division
135 st clair ave w, 8th floor + toronto on M4V 1P5 | T: 416-212-5729 + BB: 647-624-3986

Wills, Devon (MOECC)

From: Wills, Devon (ENE)
Sent: April-01-14 10:40 AM
To: Glassford, Paul (MNR)
Cc: Weedon, Deb (MNR); Peterson, Neil (MNR); Pochailo, Kurt (MNR)
Subject: RE: Appendix 1 and 6

Paul,

As far as I understood it, the MOE was waiting for you to respond to my March 11, 2014 email containing the MOE finalized Appendix 1 and 6 documents. I believe that I worked on getting them finalized with John Sullivan who was your backup while you were on vacation. I will forward you that email.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: Glassford, Paul (MNR)
Sent: April-01-14 10:22 AM
To: Wills, Devon (ENE)
Cc: Weedon, Deb (MNR); Peterson, Neil (MNR); Pochailo, Kurt (MNR)
Subject: Appendix 1 and 6

Hey Devon:

When are we going to get the final Appendix 1 form and Appendix 6 letter? I had anticipated them weeks ago. Is there a problem or do you need more info?

Paul

Wills, Devon (MOECC)

From: Glassford, Paul (MNR)
Sent: April-01-14 10:55 AM
To: Wills, Devon (ENE)
Cc: Sullivan, John J. (MNR)
Subject: RE: Whiskey Jack Forest FMP

Devon:

I'm sorry Devon, as I was away at the time, I didn't realize there was still a question to MNR on this. I thought you would have given me a good kick by now for not answering this earlier...much earlier.

As the mercury issue was never raised in the planning process, IR never addressed it, so I don't believe there is any other documentation MNR could provide to support your review.

Paul

From: Wills, Devon (ENE)
Sent: April 1, 2014 10:41 AM
To: Glassford, Paul (MNR)
Cc: Weedon, Deb (MNR); Peterson, Neil (MNR); Pochailo, Kurt (MNR)
Subject: FW: Whiskey Jack Forest FMP

Forwarded email as discussed.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: Wills, Devon (ENE)
Sent: March-11-14 11:53 AM
To: Glassford, Paul (MNR)
Cc: Sullivan, John J. (MNR)
Subject: Whiskey Jack Forest FMP

Hello,

The Appendix 1 and 6 documents are attached to this email for your review. The documents have been reviewed by staff at the MOE and have been finalized. Is there any further information that MNR would feel beneficial to our review that could be included in Appendix 1- Issue 7 (e.g. issue resolution)? Please convey the additional information required by March 12, 2014, and I will update the document accordingly.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

Wills, Devon (MOECC)

From: Wills, Devon (MOECC)
Sent: April-01-14 11:22 AM
To: Lashbrook, Ross (MOECC)
Cc: Panko, Dan (MOECC)
Subject: FW: Whiskey Jack Forest FMP
Attachments: 2014 03 11 APPENDIX 1 MOE.docx; 2014 03 11 Appendix 6- Letter.docx

FYI

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: Wills, Devon (ENE)
Sent: April-01-14 10:41 AM
To: Glassford, Paul (MNR)
Cc: Weedon, Deb (MNR); Peterson, Neil (MNR); Pochailo, Kurt (MNR)
Subject: FW: Whiskey Jack Forest FMP

Forwarded email as discussed.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: Wills, Devon (ENE)
Sent: March-11-14 11:53 AM
To: Glassford, Paul (MNR)
Cc: Sullivan, John J. (MNR)
Subject: Whiskey Jack Forest FMP

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that could be included in Appendix 1- Issue 7 (e.g. issue resolution)? Please convey the additional information required by March 12, 2014, and I will update the document accordingly.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

Wills, Devon (MOECC)

From: Wills, Devon (MOECC)
Sent: April-01-14 11:23 AM
To: Lashbrook, Ross (MOECC)
Cc: Panko, Dan (MOECC)
Subject: FW: Whiskey Jack Forest FMP

FYI

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: Glassford, Paul (MNR)
Sent: April-01-14 10:55 AM
To: Wills, Devon (ENE)
Cc: Sullivan, John J. (MNR)
Subject: RE: Whiskey Jack Forest FMP

Devon:

I'm sorry Devon, as I was away at the time, I didn't realize there was still a question to MNR on this. I thought you would have given me a good kick by now for not answering this earlier...much earlier.

As the mercury issue was never raised in the planning process, IR never addressed it, so I don't believe there is any other documentation MNR could provide to support your review.

Paul

From: Wills, Devon (ENE)
Sent: April 1, 2014 10:41 AM
To: Glassford, Paul (MNR)
Cc: Weedon, Deb (MNR); Peterson, Neil (MNR); Pochailo, Kurt (MNR)
Subject: FW: Whiskey Jack Forest FMP

Forwarded email as discussed.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West

Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: Wills, Devon (ENE)
Sent: March-11-14 11:53 AM
To: Glassford, Paul (MNR)
Cc: Sullivan, John J. (MNR)
Subject: Whiskey Jack Forest FMP

Hello,

The Appendix 1 and 6 documents are attached to this email for your review. The documents have been reviewed by staff at the MOE and have been finalized. Is there any further information that MNR would feel beneficial to our review that could be included in Appendix 1- Issue 7 (e.g. issue resolution)? Please convey the additional information required by March 12, 2014, and I will update the document accordingly.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

Wills, Devon (MOECC)

From: Weedon, Deb (MNRF)
Sent: April-01-14 2:28 PM
To: Lashbrook, Ross (MOECC)
Subject: RE: Whiskey Jack info -

No problem Ross!

This is a long answer, and may be confusing - I will try to make clear. If it isn't, do feel free to give me a call and I can probably do a better job verbally!

Background: The FMP has high level objectives that need to be met. Part of these high level objectives mean you have to balance the economics, the social and ecological aspects. We do this by identifying various species and age of wood and running them thru models to make sure we are balanced as best we can (this is the planning phase). For example: if we were to harvest red pine, we would want to spread that harvest out over time and over an area. We would not want to focus on an area, deplete it and move on We want to balance out the different age classes of the species and ensure this species of tree is on the landscape. A good plan balances the economics, social and ecological concerns. Therefore areas are "planned" for all over the Whiskey Jack forest for sustainability.

When MNR did not do a FMP (due to trying to work things out with Grassy) – our only avenue was to do a 2 yr Contingency plan. Normally a contingency plan is done once, in this case we did 2 contingency plans, (for a total of 5 years of contingency plan). Again a second contingency plan was to once again to attempt to work with Grassy and get them) again we made every sincere effort to try to work with Grassy on their concerns (hence two mediations with Judge Iacobucci and the Process agreement).

The 2012-2014 contingency plan had harvest areas "planned" for - to meet the objectives of the FMP, the mediation/Process agreement; to provide opportunities for Grassy, should Grassy wish to harvest as well as follow Judge Iacobucci mediation agreements for Grassy to allow for some harvesting. There has been several attempts as I have mentioned in previously, where grassy members had wanted to do something, however did not move forward with these plans. There was also renewal work identified in this plan: surveys for free to grow and brushing were identified. There was no aerial herbicide identified in the contingency plan.

Please note:

- Within the 2012-2022 FMP, the average area planned for harvest is only 0.6% of the total forested lands in the Whiskey Jack Forest
- Within the proposed 2014/15Annual Work Schedule – only harvest identified is outside of the self-declared TLUA of Grassy - this represents a harvest area of 0.1% of total forested lands.
- The harvest level – since 2008 – has been outside of the self-declared TLUA of Grassy. This average harvest is 640ha, this is averaged over 10 years – a significant reduction on this forest!!

Call me if you need clarification.

deb

From: Lashbrook, Ross (ENE)
Sent: April-01-14 11:52 AM
To: Weedon, Deb (MNR)
Subject: RE: Whiskey Jack info -

Thanks Deb – much appreciated. This helps a lot!

One final question (I hope!). under the contingency plan which expired yesterday, what sort of forestry activities would have been permitted in the grassy narrows territory. I assume it was limited to tending, maintenance etc as I believe you had indicated no logging had occurred in the grassy narrows territory since 2008 if you could confirm that would be great.

Thanks

Ross Lashbrook | Manager (A) | Environmental Assessment Services | 416 314 7967 F: 416.314.8452 E: Ross.Lashbrook@Ontario.ca

From: Weedon, Deb (MNR)
Sent: April 1, 2014 12:29 PM
To: Lashbrook, Ross (ENE)
Subject: RE: Whiskey Jack info -

These particular projects dealt with fish freezers etc.

From: Lashbrook, Ross (ENE)
Sent: April-01-14 10:32 AM
To: Weedon, Deb (MNR)
Subject: RE: Whiskey Jack info -

What type of contracts? Forestry?

Ross Lashbrook | Manager (A) | Environmental Assessment Services | 416.314.7967 F: 416.314.8452 E: Ross.Lashbrook@Ontario.ca

From: Weedon, Deb (MNR)
Sent: April 1, 2014 11:29 AM
To: Lashbrook, Ross (ENE)
Subject: RE: Whiskey Jack info -

As another point – MNR worked with Grassy and had 2 contracts with Grassy this year in the amount of $103,000

deb

From: Lashbrook, Ross (ENE)
Sent: April-01-14 9:03 AM
To: Weedon, Deb (MNR)
Subject: RE: Whiskey Jack info -

Morning Deb,

I'm getting pressed on these questions – any feedback you can offer would be appreciated.

Thanks very much..

Ross Lashbrook | Manager (A) | Environmental Assessment Services | 416 314 7967 F: 416 314 8452 E: Ross.Lashbrook@Ontario.ca

From: Lashbrook, Ross (ENE)
Sent: March 31, 2014 3:39 PM
To: Weedon, Deb (MNR)
Subject: Whiskey Jack info -
Importance: High

Hi Deb,

Wondering if you could assist me with a few questions? Would appreciate any insights you can provide asap. Thanks very much!

1) When the previous contingency plans were approved, did this create a concern in the community?

2) Can you advise as to when MNR would next be speaking with Grassy Narrows with respect to future opportunities for tending/tree planting contracts, should the community wish to seek such contracts.

3) Does MNR publicly post concurrence? If so, how and when would that occur?

Wills, Devon (MOECC)

From: Wills, Devon (MOECC)
Sent: April-02-14 10:11 AM
To: Weedon, Deb (MNRF)
Cc: Willcocks, Allan (MNRF); Pochailo, Kurt (MNRF); Glassford, Paul (MNRF); Peterson, Neil (MNRF); Lashbrook, Ross (MOECC)
Subject: Whiskey Jack FMP- Appendix 1 and 6 Final
Attachments: 2014 04 1 Appendix 6- Letter.PDF; 2014 04 1 APPENDIX 1 MOE.pdf

Hello,

The Appendix 1 and 6 documents are attached to this email for your review. The documents have been reviewed by staff at the MOE and have been finalized. Please forward the appropriate information as specified in the attached letter for our review.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

Wills, Devon (MOECC)

From: Fletcher, Rachael (ENE)
Sent: April-16-14 1:48 PM
To: Wills, Devon (ENE)
Subject: Re: Science support for IEA response WJF

I'll see what I can do

From: Wills, Devon (ENE)
Sent: Wednesday, April 16, 2014 01:46 PM
To: Fletcher, Rachael (ENE)
Subject: RE: Science support for IEA response WJF s.21

Paul suggested tomorrow by the end of day. I told him that may not be possible since [redacted] I suggested that he submit the required information on Wednesday of next week to us as agreed too and submit the finalized "science" documentation at a later date. Hopefully, this works for you.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: Fletcher, Rachael (ENE)
Sent: April-16-14 1:43 PM
To: Wills, Devon (ENE)
Subject: Re: Science support for IEA response WJF

When do you need this for?

From: Wills, Devon (ENE)
Sent: Wednesday, April 16, 2014 01:40 PM
To: Fletcher, Rachael (ENE)
Subject: FW: Science support for IEA response WJF

Hello Rachael,

I have received these documents from the MNR outlining a response to the science related issues involving the Whiskey Jack FMP Part II Order request. Please review the documentation.

Thanks,

Devon Wills
Project Evaluator

Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: Glassford, Paul (MNR)
Sent: April-16-14 10:24 AM
To: Wills, Devon (ENE)
Subject: FW: Science support for IEA response WJF

Devon:

As discussed, attached is a draft science perspective on the issues raised in the IEA request on the WJF. I am providing this to you to seek an initial response from you as to whether you believe this additional response is helpful and whether you suggest any changes/additions/deletions.

Please respond by end of day tomorrow.

Paul

Wills, Devon (MOECC)

From: Wills, Devon (ENE)
Sent: April-17-14 3:01 PM
To: Glassford, Paul (MNR)
Subject: RE: Science support for IEA response WJF
Attachments: WhiskeyJackIEA MOE review1 1.docx

Hello Paul,

Rachael was able to review the draft science document that you have sent over earlier. I have attached it to this email for MNR's review. Please disregard my earlier voicemail.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: Glassford, Paul (MNR)
Sent: April-16-14 10:24 AM
To: Wills, Devon (ENE)
Subject: FW: Science support for IEA response WJF

Devon:

As discussed, attached is a draft science perspective on the issues raised in the IEA request on the WJF. I am providing this to you to seek an initial response from you as to whether you believe this additional response is helpful and whether you suggest any changes/additions/deletions.

Please respond by end of day tomorrow.

Paul

Wills, Devon (MOECC)

From: Van, Kieu (MOECC)
Sent: April-25-14 11:13 AM
To: Lashbrook, Ross (MOECC)
Subject: FW: 2012-2022 Whiskey Jack Forest IEA Request - MNR Response to MOE

Importance: High

As per Agatha's request, she has asked you to TAA for Whiskey Jack - actual IEA request (not a concurrence).

Thank you,
Kieu Van | Assistant to the Director | Environmental Approvals Branch | Ontario Ministry of the Environment | 2 St. Clair Avenue West, 12A Floor, Toronto, ON M4V 1L5 | : 416-314-7040 | : 416-314-7227 | :: kieu.van@ontario.ca

-----Original Message-----
From: Garcia-Wright, Agatha (ENE)
Sent: April 24, 2014 5:49 AM
To: Van, Kieu (ENE); Therrien, Dean (ENE)
Subject: FW: 2012-2022 Whiskey Jack Forest IEA Request - MNR Response to MOE

Q-pls go to link to print letter

Dean-haven't read yet but more on whiskey jack . Can u pls also advise nancy of status. I have been on hold since late march w/ no sense of what is going on and is an eab director decision on concurrence

Thx

From: kurt.pochailo@ontario.ca [kurt.pochailo@ontario.ca]
Sent: April 23, 2014 5:42 PM
To: Garcia-Wright, Agatha (ENE)
Cc: Weedon, Deb (MNR); Glassford, Paul (MNR); Wills, Devon (ENE); Peterson, Neil (MNR); simonfobister@gmail.com; abmer@earthroots.org
Subject: 2012-2022 Whiskey Jack Forest IEA Request - MNR Response to MOE

Agatha,

The attached documents are being forwarded on behalf of:

Deb Weedon
District Manager
Ministry of Natural Resources
808 Robertson Street
P.O. Box 5080
Kenora, ON P9N 3X9

PH: (807) 468-2528
FAX: (807) 468-2736

Email: deb.weedon@ontario.ca

File(s) will be available for download until 28 April 2014:

File:
Response_cover_letter.pdf<https://attachmail.ontario.ca/seos/1000/mpd/29042014b9da555e58b708f671bca2b4976aca42>, 33.26 KB [Fingerprint<https://attachmail.ontario.ca/courier/mail_user_fingerprint.html>:
4333d0e5953a7c6dd27f45d4c08925a8]
File:
Appendix_6_Response_April_23.pdf<https://attachmail.ontario.ca/seos/1000/mpd/290420142f8fcd874c7b7c8a82b86e8b76c43e5b>, 565.65 KB [Fingerprint<https://attachmail.ontario.ca/courier/mail_user_fingerprint.html>:
02e2c8dbda7f5eed3f00e55d8580d05d]
File:
Aboriginal_involvement_2012_2022_FMP.pdf<https://attachmail.ontario.ca/seos/1000/mpd/290420149a300d9fa91bf2cbb64945dba5716b5e>, 143.66 KB [Fingerprint<https://attachmail.ontario.ca/courier/mail_user_fingerprint.html>:
8b8ea400ca963cdaf6a0103ac4105193]
File: Appendix_A.zip<https://attachmail.ontario.ca/seos/1000/mpd/29042014ee4d1086ff80b992b44e044e392a0e5b>, 32,747.50 KB [Fingerprint<https://attachmail.ontario.ca/courier/mail_user_fingerprint.html>:
44afcb21b8b6ccdfdacb20f0662b8f4e]

You have received attachment link(s) within this e-mail message sent via Enterprise Attachment Transfer Service. To retrieve the attachment(s), please click on the link(s).
Accellion File Transfer<https://attachmail.ontario.ca>

Wills, Devon (MOECC)

From: Wills, Devon (MOECC)
Sent: April-29-14 1:18 PM
To: David Sone; Joseph Fobister
Cc: Lashbrook, Ross (MOECC); Panko, Dan (MOECC)
Subject: RE: Whiskey Jack IEA Request File

Hello David,

We have not received any other documentation from MNR in regards to providing a response to your IEA request. The documents that you have been copied on are the documents we have been provided for review.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: David Sone [mailto:david.sone@gmail.com]
Sent: April-28-14 11:00 AM
To: Wills, Devon (ENE); Joseph Fobister
Subject: Whiskey Jack IEA Request File

Hi Devon,

I hope that you are doing well.

I recently received a copy of the following documents from the MNR:

Response_cover_letter.pdf,
Appendix_6_Response_April_23.pdf,
Aboriginal_involvement_2012_2022_FMP.pdf,
File: Appendix_A.zip.

Earlier I received a copy of the MNR's request for concurrence.

Are there any other documents related to our IEA Request in the MOE file (or elsewhere)? For example, beyond responding to the MOE's questions about our request in the document above, has the MNR submitted any other response? Has the MNR submitted an opinion or recommendation for the MOE's future decision on our IEA request?

If so, please send me an electronic copy of those documents. If it is not possible to send them electronically, I would like to come in to make photocopies this week.

Take care,

Wills, Devon (MOECC)

From: David Sone <david.sone@gmail.com>
Sent: April-29-14 2:19 PM
To: Wills, Devon (MOECC)
Cc: Joseph Fobister; Lashbrook, Ross (MOECC); Panko, Dan (MOECC)
Subject: Re: Whiskey Jack IEA Request File

Hi Devon,

Thanks for your response.

Earthroots is preparing some comments on the MNR response to the Whiskey Jack IEA request. I hope to submit them to you within a week.

Take care,

David

On Tue, Apr 29, 2014 at 1:18 PM, Wills, Devon (ENE) <Devon.Wills@ontario.ca> wrote:

Hello David,

We have not received any other documentation from MNR in regards to providing a response to your IEA request. The documents that you have been copied on are the documents we have been provided for review.

Thanks,

Devon Wills

Project Evaluator

Ministry of the Environment

Environmental Assessment Services

---

2 St. Clair Avenue West

Toronto, Ontario, M4V 1L5

Phone: (416) 314-8259

Fax: (416) 314-3376

From: David Sone [mailto:david.sone@gmail.com]
Sent: April-28-14 11:00 AM
To: Wills, Devon (ENE); Joseph Fobister
Subject: Whiskey Jack IEA Request File

Hi Devon,

I hope that you are doing well.

I recently received a copy of the following documents from the MNR:

Response_cover_letter.pdf,
Appendix_6_Response_April_23.pdf,
Aboriginal_involvement_2012_2022_FMP.pdf,
File: Appendix_A.zip.

Earlier I received a copy of the MNR's request for concurrence.

Are there any other documents related to our IEA Request in the MOE file (or elsewhere)? For example, beyond responding to the MOE's questions about our request in the document above, has the MNR submitted any other response? Has the MNR submitted an opinion or recommendation for the MOE's future decision on our IEA request?

If so, please send me an electronic copy of those documents. If it is not possible to send them electronically, I would like to come in to make photocopies this week.

Take care,

David

Wills, Devon (MOECC)

From: Wills, Devon (MOECC)
Sent: May-14-14 2:43 PM
To: Lashbrook, Ross (MOECC); Allen, Dawnett (MOECC)
Cc: Panko, Dan (MOECC)
Subject: RE: Update on FMPs

Hello,

I am currently drafting the Decision Note for the Whiskey Jack FMP and hope to have the draft finished next week. I am also awaiting comments from Earthroots in response to MNR's response to the Whiskey Jack FMP IEA request.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario M4V 1L5
Phone: (416) 314-8239
Fax: (416) 314-2376

From: Lashbrook, Ross (ENE)
Sent: May-14-14 12:49 PM
To: Wills, Devon (ENE); Allen, Dawnett (ENE)
Cc: Panko, Dan (ENE)
Subject: Update on FMPs

Hi Devon and Dawnett,

Can you let me know where you're at on your FMPs, s.N/R [redacted] or the review of the requests for Whiskey Jack, along with timing (rough).

If you could send Dan and I a quick update by noon tomorrow that would be appreciated.

(my apologies if you've already been asked for an update from Dan – if that's the case let me know).

Thanks.

Ross Lashbrook | Manager (A) | Environmental Assessment Services | Environmental Approvals Branch | Ontario Ministry of the Environment | 2 St. Clair Ave. W. Floor 12A. Toronto ON M4V 1L5 | T: 416.314.7967 F: 416.314.8452 E: Ross.Lashbrook@Ontario.ca

Wills, Devon (MOECC)

From: Wills, Devon (ENE)
Sent: May-29-14 11:46 AM
To: Glassford, Paul (MNR); Fletcher, Rachael (ENE)
Subject: Grassy Narrows and Earthroots response to MNR response to the IEA request for the Whiskey Jack FMP
Attachments: GN and ER Comments on MNR Response to WJ IEA Request May 26 2014 FINAL.pdf; 2014 May 26 ER ANA Reply to MOE re MNR response to WJ IEA Request May 26 2014 Cover FINAL.pdf

Hello,

Attached please find Grassy Narrows and Earthroots' response the MNR response to the IEA request for the Whiskey Jack FMP 2012-2022 (cover letter and comments). Kindly review the provided information. I will be scheduling a meeting upon completion of the review so that an open discussion of relevant information may occur.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: Fiset, Wayne (MNR)
Sent: May-30-14 9:42 AM
To: Glassford, Paul (MNR); Wills, Devon (ENE)
Cc: Iwachewski, Ed (MNR); Puddister, Dan (MNR); Forestell, Eileen (MNR)
Subject: RE: voicemail

Thanks Paul – I spoke with Dan Puddister who will be taking over as Acting Manager of FRMS as of Monday. Ed: if you are willing, I think it best if you carry on as the lead for SRB on this file and keep Dan in the loop.

Paul: can you forward any materials you feel are pertinent to Dan as an FYI?

Good luck. s.N/R

Wayne

From: Glassford, Paul (MNR)
Sent: May 29, 2014 11:36 AM
To: Wills, Devon (ENE)
Cc: Iwachewski, Ed (MNR); Fiset, Wayne (MNR)
Subject: RE: voicemail

Great, thanks Devon.

Ed and Wayne please see below.

Paul

From: Wills, Devon (ENE)
Sent: May 29, 2014 11:35 AM
To: Glassford, Paul (MNR)
Subject: RE: voicemail

Hello Paul,

I will be forwarding the email to both you and Racheal for review, and can organize a meeting after both parties have finished analysis.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: Glassford, Paul (MNR)
Sent: May-29-14 11:31 AM
To: Wills, Devon (ENE)
Subject: voicemail

Got your voicemail on the Earthroots rebuttal of the science portion of our response and I have prepared staff to receive that...are you also forwarding to Racheal for her and her staff to respond to. I think that would be appropriate and that we may want a group meeting (MOE/MNR science staff) on the rebuttal.

Your thoughts?

Paul

From: Stevenson, Shawn (MNR)
Sent: May-30-14 10:57 AM
To: Wills, Devon (ENE)
Cc: Glassford, Paul (MNR); Peterson, Neil (MNR)
Subject: Supplemental MOE Questions regarding MNR Submission on the Whiskey Jack FMP IEA
Attachments: Aboriginal_involvement_additional_info(2)_2012.05.29.pdf; 2009_04_20gnfnadviseplantostart.pdf; 2010_02_03gnfninvtopart.pdf; 2010_03_17_GNFN_response_Invitation_participate.pdf; 2010_06_22_Minister_response_to GNFN_2010_03_17.pdf

Devon:

Thank you for the opportunity to clarify and, in some cases, correct typographical errors in our earlier submission. We have revised the "Summary of Aboriginal Involvement for the Whiskey Jack Forest 2012-2022 FMP" and provided accompanying documentation (i.e., letters) to respond to the questions you asked about our submission.

In addition, You have asked for additional clarification of MNR's response to the following issue identified in Appendix 1 – Issue 3:

Harvest – FMP contains no requirements for ongoing monitoring of mercury levels in the area affected by the IEA request to determine if in fact approved forest operations once implemented would (further) elevate mercury levels in catchment areas.

Forest management plans are implementation mechanisms that take direction from legislation, policy and guides and implement that direction. MNR's Forest EA Act approval and the Forest Management Planning Manual (FMPM) contain planning requirements for the monitoring of forest management activities in a forest management plan; however, do not include requirements to monitor specific effects of individual activities. The requirements include providing a description of:

- the monitoring of forest operations, with specific provisions for Areas of Concern to ensure operations are in compliance with the Forest Management Plan;
- the monitoring to be used to determine the effectiveness of any silvicultural treatments which are exceptions to the silvicultural guides;
- the monitoring to be used to determine the effectiveness of any operational prescriptions for Areas of Concern which are exceptions in the applicable forest management guides; and,
- the monitoring of regeneration success within a management unit.

The prevention, minimization and mitigation of the effects of forest management on the environment are addressed in forest management planning through the application of the appropriate guides required by Condition 38 of Declaration Order MNR-71. The development, review and revision of these guides is also mandated by this same condition of the Declaration Order, and directs MNR to assess the effectiveness of guides through appropriate scientific research projects and does not implicate ongoing monitoring in the context of individual forest management plans. Concerns such as those identified in this IEA request are addressed during the periodic review, and potential revision, of the guides and given the nature of this IEA request, MNR has already embarked on a process to

further consider this specific issue in the review of the relevant guide which is scheduled for review in the short term.

In addition, MOE has established in the Declaration Order a requirement for the formulation and implementation of a Provincial Forest Technical Committee, whose role will be to ensure that Guides are kept current with respect to scientific knowledge and management practices, by acting as a review board for proposed changes to existing guides and recommending priorities for new or existing guides. It would be most appropriate for this committee, primarily made up of non-MNR members chosen for their technical expertise, to direct and support guide related work.

Specifically:

Condition 38(f) requires each revised, amalgamated or new Guide to contain a description on an approach that shall be undertaken to monitor the effectiveness of the guide.

Condition 38(d) speaks to the requirement to review guides to ensure they reflect current scientific knowledge as it applies to Ontario. Factors that will be considered in the reviews include the results of applicable scientific research and the results of relevant and appropriate monitoring programs, along with other factors.

Condition 38(c) speaks to the role of the Provincial Forest Technical Committee in the review of existing Guides, and the setting of priorities for the revision, amalgamation or preparation of new Guides.

Further, Condition 31 requires that scientific studies be used to assess the effectiveness of guide direction.
I trust this response addresses your information requirements.

Thank you for the opportunity to clarify these points. If you have any further questions, please do not hesitate to contact Paul Glassford, Senior Advisor, Forest Environmental Assessment, Policy Division, Forests Branch.

Regards

Shawn Stevenson, M.Sc.
Resources Management Supervisor
Kenora District
Tel: (807)468-2579
shawn.stevenson@ontario.ca

Wills, Devon (MOECC)

From: Glassford, Paul (MNR)
Sent: June-03-14 1:07 PM
To: Wills, Devon (ENE)
Subject: mercury mentioned in 5 year ea report

Aquatic Effects Program

MNR's long-term aquatic effects program to assess the effectiveness of direction regarding aquatic ecosystems continued during the reporting period. The program includes both empirical measurement and modeling of the effects of harvest on aquatic ecosystems, and the evaluation of efforts to emulate natural disturbance patterns in watersheds and riparian zones in Northern Ontario. During the reporting period, the main initiative of the program was the development and implementation of an effectiveness monitoring program related to the Stand and Site Guide direction to maintain ecological functions of aquatic ecosystems. The purpose of the initiative was to ensure that application of the direction in the guide effectively minimizes physical disturbance within catchments (i.e., areas drained by rivers or bodies of water) so that hydrological, chemical and biological effects resulting from forest management activities do not exceed those observed in naturally disturbed catchments, and do not exceed acceptable levels for specific parameters such as methyl mercury. This project involves the development of modeling tools and survey methodology, and the validation of indicators of stream ecosystem structure and function (e.g., fish abundance, invertebrate community, temperature, water chemistry).

The program included a project which monitored small, forested watersheds for two years before and five years after harvest. Results indicate that forest harvesting causes increased water yield and an increased rate of movement of nutrients (e.g., nitrogen, potassium) and metals (e.g., mercury). However, subsequent research showed that mercury levels in fish and invertebrates in small, boreal streams were not related to the extent of forest harvesting. To help mitigate these impacts, program staff have developed a number of GIS-based tools to predict the location of small unmapped streams that may serve as fish habitat, and the hydrologic connection between aquatic and terrestrial areas. The tools, which are used to reduce site disturbance, were validated through field surveys and shared with MNR staff and the forest industry to help support forest management planning.

Wills, Devon (MOECC)

From: Glassford, Paul (MNR)
Sent: June-03-14 3:46 PM
To: Wills, Devon (ENE)
Cc: Sullivan, John J. (MNR); Churcher, Joe (MNR)
Subject: Stand and Site Review Questions

Hey Devon:

In response to your questions on the Stand and Site guide that you discussed with me today on the phone:

- The guide review will begin later this fall, with most of the work in the 2015 calendar year; completion date is Dec. 31, 2015
- Provincial Forest Technical Committee (requirement of EA approval) will be briefed on the review plan at their fall meeting; they know that the guide will be reviewed in 2015, but haven't been told of any details since we're still working on them
- Review will include anyone involved in the development of the original guide, plus anyone else who we think can add some value will be contacted during the review; this includes scientists (MNR, CFS, CWS, universities, etc.), practitioners (MNR and industry field staff), analysts, etc.; we will cast a wide net
- A draft terms of reference and timeline have been developed and they provide an idea of the scope of the review; it also shows that we've been thinking about this for some time, not just since the IEA request was made (i.e. it's part of normal business). I have not included but could forward if required.
- No changes to our current effectiveness monitoring approach are contemplated other than what we have already told you in our earlier response
- Revision would occur post completion of the review

Mercury is certainly one of the topics that we are planning on investigating during the review, as are a few other questions and 'known unknowns' (e.g. calcium, catchment scale effects, rutting standards).

In addition, I am preparing a briefing deck to enable the involvement of our affected Directors in the discussion with Agatha if you and Ross continue to think that is the next step. Finally, MNR is still reviewing the response by Earthroots and considering whether a response will be provided.

Paul

Wills, Devon (MOECC)

From: Reece, Cherie (MOECC)
Sent: June-10-14 11:05 AM
To: Lashbrook, Ross (MOECC)
Subject: Whiskey Jack Meeting

Myra is here for the 11:00 a.m. meeting re: Whiskey Jack.

Cherie Reece
Administrative Assistant
Environmental Assessment Services Section Environmental Approvals Branch Ministry of the Environment
2 St. Clair Avenue West, 12A Floor
Toronto ON M4V 1L5
416-314-7212

Wills, Devon (MOECC)

From: Weedon, Deb (MNR)
Sent: July-10-14 12:49 PM
To: Wills, Devon (ENE)
Cc: Glassford, Paul (MNR); Peterson, Neil (MNR); Pyke, Dan (MNR)
Subject: MNRF Clarification to MOE WJF IEA
Attachments: July IEA Clarification to MOE.PDF; Whiskey Jack IEA MNR science comment July 2014.pdf

Hi Devon,
Please find attached a letter and clarification piece to MNRF's response to the WJF IEA.

Thanks,
deb

Deb Weedon
District Manager, Kenora
Ministry of Natural Resources and Forestry

Phone: 807-468-2528
Cell: 807-466-2524
Deb.weedon@ontairo.ca

Wills, Devon (MOECC)

From: Wills, Devon (ENE)
Sent: July-15-14 3:09 PM
To: Schlag, Michelle (ENE)
Subject: FW: MNRF Clarification to MOE WJF IEA
Attachments: July IEA Clarification to MOE.PDF; Whiskey Jack IEA MNR science comment July 2014.pdf

Hi Michelle,

Just keeping you up to date with the science information we have received from MNR, in regards to the response from Earthroots.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment and Climate Change
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

Cameron, Anne (MOECC)

From: Garcia-Wright, Agatha (ENE)
Sent: July-17-14 9:58 AM
To: Van, Kieu (ENE)
Subject: FW: Mercury and Forestry...

Ask MNR if that proposed meeting is abt this request I made..dealing w/ options on mercury and foresty..not Whiskey Jack FMP itself...

Agatha Garcia-Wright
Director
Environmental Approvals Branch
Ministry of the Environment and Climate Change
2 St. Clair Avenue West, 12A Floor
Toronto, ON M4V 1L5
416-314-7288 (ph)
416-314-7227 (fax)

From: Walsh, Chris (MNR)
Sent: July 11, 2014 1:53 PM
To: Garcia-Wright, Agatha (ENE)
Cc: Lashbrook, Ross (ENE); Pyke, Dan (MNR); Glassford, Paul (MNR); Powley, Leigh (MNR); Walsh, Chris (MNR)
Subject: RE: Mercury and Forestry...

Hi Agatha,

MNR's process for administering IEA requests concentrates on our Regional Operations Division (Regional Director) with me on the periphery so I am only marginally aware of what is going on. I do know that Dan Pyke and his group are keying up a briefing for me sometime next week to catch me up.

Glad to share what I learn at that point. Will contact you next week.

Chris

From: Garcia-Wright, Agatha (ENE)
Sent: July 11, 2014 1:39 PM
To: Walsh, Chris (MNR)
Cc: Lashbrook, Ross (ENE)
Subject: Mercury and Forestry...

Hi Chris:

I understand that MNRF is looking at options dealing w/ forestry operations and mercury. Also, that there may be an opportunity for EAB to find out more on that work if I contacted you directly.

Any chance we can get an update on that work? Would be me and Ross...

thx

Agatha Garcia-Wright

Wills, Devon (MOECC)

From: Wills, Devon (ENE)
Sent: July-17-14 3:00 PM
To: Fletcher, Rachael (ENE)
Subject: RE: MNRF Clarification to MOE WJF IEA

Hello Rachael,

This response will be used for consideration by our Director when a final decision is made. Earthroots or any member of the public may go through the FOI process to gain access to this information. This was the case for MNR's first round of comments that Earthroots commented on.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment and Climate Change
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: Fletcher, Rachael (ENE)
Sent: July-15-14 3:52 PM
To: Wills, Devon (ENE)
Subject: RE: MNRF Clarification to MOE WJF IEA

Do you now take this response under consideration when making your final decision or does it go back to the community? Just curious as to how a final decision is made

Rachael Fletcher Ph.D.
Manager, Biomonitoring Section
Ministry of the Environment
125 Resources Road
Etobicoke, Ontario
M9P 3V6
Tel: (416) 327-2935
Cell: (416) 453-6591
Fax: (416) 327-6519

From: Wills, Devon (ENE)
Sent: July 15, 2014 2:40 PM
To: Fletcher, Rachael (ENE)
Subject: FW: MNRF Clarification to MOE WJF IEA

Hello Rachael,

Just keeping you up to date with the science information we have received from MNR, in regards to the response from Earthroots.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment and Climate Change
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

Wills, Devon (MOECC)

From: Wills, Devon (ENE)
Sent: July-25-14 3:44 PM
To: Panko, Dan (ENE)
Subject: Whiskey Jack

Hey Dan,

As discussed, the issue of methyl mercury in the Project is a difficult one to analyze. The requester (Eathroots/Grassy Narrows) raises issues by quoting from various accredited scientific studies and tries to relate this to the Whiskey Jack Forest, and states that MNR has not enough scientific evidence to discount the effects of methyl mercury. MNR has refuted the claims by stating that the cited scientific evidence presented by the requesters were taken out of context and are misleading. MNR reiterates the fact that the methyl mercury is still not well understood in science. MNR feels that there are no studies which identify or evaluate mitigation measures to minimize mercury mobilization following disturbance. Thus, their Stand and Site Guide does not specifically mention methyl mercury mitigation, but does provide direction to minimize site disturbance, sediment transport and hydrologic disruption all of which may be associated with increased mercury mobilization. MNR also feels that the Stand and Site Guide is based on the best science we have available today, but upon its revision at a later date, it can be modified to suite new methyl mercury information.

Devon Wills
Project Evaluator
Ministry of the Environment and Climate Change
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

Wills, Devon (MOECC)

From: Rudzki, Kristina (ENE)
Sent: August-28-14 11:25 AM
To: Cross, Annamaria (ENE)
Cc: Wills, Devon (ENE)
Subject: Whiskey Jack - IEA Request Status Update

Annamaria,
The email from Myra is below. Devon and I worked on the following info email bullets to provide status update. Please let me know if there are any questions.
Thanks,
Kristina

- On January 22, 2014 the Ministry of the Environment and Climate Change received one combined Part II Order request for the project from the Grassy Narrows First Nation (GNFN) and a non-profit environmental group, Earthroots. On May 2, 2014, the EAB Director granted concurrence to MNRF which permits forestry operators to continue with forestry operations in areas that are unaffected by the outstanding IEA request.

- The main issue raised in the Part II Order request by GNFN is that mercury contamination in local waterways will occur as a result of clear cutting and may ultimately affect human and ecosystem health. GNFN is concerned that this will adversely impact their Aboriginal and Treaty rights.

- MNRF is of the opinion that no further analysis on mercury is required at this time given that MNRF has followed appropriate mitigation measures per the current guide. MNRF has indicated that it will review how mercury may have an impact on forestry operations when they review/revise the Stand and Sight Guide in 2015.

- During the preliminary review of the individual environmental assessment requests, it was determined that MNRF's Aboriginal consultation was not adequately documented. MNRF provided revised documentation on Aboriginal consultation in June 2014.

s.19

Wills, Devon (MOECC)

From: Rudzki, Kristina (ENE)
Sent: September-04-14 4:10 PM
To: Wills, Devon (ENE)
Subject: FW: Whiskey Jack FMP

There we go.

From: Glassford, Paul (MNR)
Sent: September 4, 2014 4:09 PM
To: Rudzki, Kristina (ENE)
Subject: RE: Whiskey Jack FMP

Checking with the lawyer to see where he is at...back to you soon.

Paul

From: Rudzki, Kristina (ENE)
Sent: September 4, 2014 4:05 PM
To: Glassford, Paul (MNR)
Cc: Wills, Devon (ENE); Hewitt, Myra (ENE); Rose, Lorne M. (MNR)
Subject: Whiskey Jack FMP

Paul,

I understand that MNRF is preparing an analysis on duty to consult for the Whiskey Jack FMP and would be in a position to share/discuss this with MOECC this week. Do you have any updates as to the status of this analysis?

Please feel free to give me a call if you would like to discuss.

Thanks,
Kristina

Kristina Rudzki
Supervisor
Project Review Unit
Environmental Assessment Services Section
Environmental Approvals Branch
Ministry of the Environment and Climate Change
416-314-7237

Rudzki, Kristina (MOECC)

From: Cross, Annamaria (ENE)
Sent: October 22, 2014 9:42 AM
To: Rudzki, Kristina (ENE)
Cc: Reece, Cherie (ENE)
Subject: RE: Whiskey Jack

Sure let's meet at 1:30pm. Patrick isn't available until after 2pm, but we can re- loop him in after we have drafted some wording.

From: Rudzki, Kristina (ENE)
Sent: October 22, 2014 9:38 AM
To: Cross, Annamaria (ENE)
Cc: Reece, Cherie (ENE)
Subject: Whiskey Jack

Annamaria,
I've given the project file to Anne to start going over and I let her know that she would be taking this project over. I explained that we need to talk to MNRF asap re: conditions as well, so she will find the appropriate contacts. Do you have about a half hour before our weekly to meet with Anne and myself? I tried to give Anne some direction on developing conditions, but would really like to have a brief discussion on this as I wasn't in the meeting with Patrick. Please let me know if this will work.

Thanks,
Kristina

Cameron, Anne (MOECC)

From: Rudzki, Kristina (ENE)
Sent: October-22-14 4:31 PM
To: Cross, Annamaria (MOECC)
Cc: Cameron, Anne (MOECC)
Subject: Whiskey Jack

Annamaria,
FYI – We tried to invite the regional and district planners, as well as Paul Glassford but on Outlook, they are either out of office or no longer in the position. I tried to call John Sullivan (Paul's back-up) to see if we could possible still hold a call tomorrow and if so, with whom, but had to leave him a message.
Thanks,
Kristina

Rudzki, Kristina (MOECC)

From: Cross, Annamaria (ENE)
Sent: October 22, 2014 8:19 PM
To: Rudzki, Kristina (ENE)
Subject: Fw: whiskey jack

Importance: High

These are the MNRF Whiskey Jack people. We can try the district manager if you don't hear back.

From: Cross, Annamaria (ENE)
Sent: Friday, August 01, 2014 11:00 AM
To: Hewitt, Myra (ENE)
Cc: Wills, Devon (ENE); Rudzki, Kristina (ENE); Panko, Dan (ENE)
Subject: whiskey jack

Myra –

We are certain that the following individuals were on the call from MNRF:

- Jim Fry (District Manager)
- Eileen Forestell (Director – Science and Research) – did most of the talking
- Chris Walsh (Director – Forest Branch)

Others who confirmed attendance, but not sure if they participated because it was hard to hear who signed on:

- Deb Wheedon
- John Sills

Questions for MNR:

- Discussions of MNRF's proposed options with respect to how it plans to study / assess the impacts of mercury and forestry moving forward.
- Discussion of MNRF proposed options specifically with respect to Grassy Narrows.
- Updated on MNRF's duty to consult review as it pertains to the Whiskey Jack FMP.

Thanks,
Annamaria

Cameron, Anne (MOECC)

From: Ride, Kevin (MNR)
Sent: October-24-14 9:33 AM
To: Cameron, Anne (MOECC); Rudzki, Kristina (MOECC)
Cc: Pyke, Dan (MNRF); Stevenson, Shawn (MNRF); Sullivan, John J. (MNRF)
Subject: Feasibility of potential conditions on Whiskey Jack Forest IEA reqest

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Kristina and Anne,

Thanks for the call yesterday where you put forward a couple of prospective conditions relating to the Whiskey Jack request for an Individual Environmental Assessment.

In my words, these conditions were ...

1) That MNRF follow through with what the Forest Management Plan specifies with regard to monitoring soil disturbance

2) That if Ontario's Stand and Site Guide is revised during the life of the Forest Management Plan and if it prescribes different levels of protection for soil disturbance or alternate forms of monitoring that we incorporate these elements into our management of the Whiskey Jack.

Those of us in MNRF involved in the different planning, implementation and policy perspectives had a short discussion following this call and we all feel that these conditions would be feasible to implement. #2 would likely be handled through an amendment to the FMP should that be necessary.

I appreciate the opportunity to discuss this and we look forward to working with you on the actual wording when the appropriate time comes.

Thanks,
Kevin

Kevin Ride MSc-F RPF, *Regional Resources Planning Supervisor* | NW Regional Resources Unit | Ministry of Natural Resources and Forestry | Ontario Government Building, 435James Street South, Suite 221a, Thunder Bay ON P7E 6S8| ph: 807-475-1270 | fax: 807-473-3023 | mobile: 807-629-2731 |kevin.ride@ontario.ca|

Cameron, Anne (MOECC)

From: Wills, Devon (MOECC)
Sent: November-21-14 11:51 AM
To: 'David Sone'
Cc: Cameron, Anne (MOECC)
Subject: RE: Whiskey Jack GIS files

I followed up with MNRF and they were looking into it. We were never given the shapefiles for our review, but a static map which showed the IEA request area. I will check with MNRF to determine what the status is.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment and Climate Change
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: david.sone@gmail.com [mailto:david.sone@gmail.com] **On Behalf Of** David Sone
Sent: November-21-14 11:48 AM
To: Wills, Devon (MOECC)
Subject: Re: Whiskey Jack GIS files

Hi Devon,

I hope that you are doing well.

I would like to remind you of my data sharing request of November 10.

I have been able to acces the trapline boundaries using the LIO. But the other boundaries are not available there.

Take care,

David

On Mon, Nov 10, 2014 at 1:33 PM, David Sone <david@earthroots.org> wrote:
Hi Devon,

I hope that you are doing well.

Can you please send me GIS shapefile or TABfile boundaries for the areas in my earlier request to the MNRF? They told me to ask MOECC

If they are not too large, please send them by email. If not, please send them using a file transfer service.

Thanks very much.

Take care,

David

---------- Forwarded message ----------
From: **Stevenson, Shawn (MNR)** <shawn.stevenson@ontario.ca>
Date: Tue, Oct 14, 2014 at 11:43 AM
Subject: RE: Whiskey Jack GIS files
To: David Sone <david@earthroots.org>

Mr. Sone:

MOECC is currently reviewing all the information provided by MNRF, including the area affected, and the issues identified in the IEA request in order to make an informed decision. As you are aware, the IEA process is a separate process led by MOECC, as MNRF Regional Director has already approved the FMP. MNRF, at this point, simply provides supporting information to help the Director, MOECC make a decision on the IEA request. IEA request, the process for the review, and decision making are out of MNRF's hands and the responsibility of MOECC. If Earthroots is requesting information they should be requesting it from MOECC. If MOECC is unable to provide them the information, MOECC may seek our assistance if they so choose.

Regards

Shawn Stevenson, M.Sc.

Resources Management Supervisor

Kenora District

Tel: (807)468-2579

shawn.stevenson@ontario.ca

From: david.sone@gmail.com [mailto:david.sone@gmail.com] **On Behalf Of** David Sone
Sent: September 26, 2014 9:08 AM
To: Stevenson, Shawn (MNR); Joseph Fobister
Subject: Fwd: Whiskey Jack GIS files

Hi Shawn,

I got an auto-response from Kurt telling me to contact you. Please see the request below.

Take care,

David

---------- Forwarded message ----------
From: **David Sone** <david@earthroots.org>
Date: Fri, Sep 26, 2014 at 10:05 AM
Subject: Whiskey Jack GIS files
To: "Pochailo, Kurt (MNR)" <kurt.pochailo@ontario.ca>, Joseph Fobister <jbfobister@gmail.com>

Hi Kurt,

I hope that you are doing well.

Can you please send me GIS shapefiles for the following:

1. The Grassy Narrows IEA request area as shown on the map MNR prepared for MOE.

2. The areas used to create that map:

   i) Grassy Narrows MNR trapline areas (first attachmet);

   ii) MNR Grassy Narrows Study Area (second attachement);

   iii) The area avoided during the creation of the recent Whiskey Jack Contingency Plan (orange, pink, and green areas on the third attachment).

Thanks for your help.

Take care,

Cameron, Anne (MOECC)

From: Stevenson, Shawn (MNRF)
Sent: November-26-14 4:23 PM
To: Cameron, Anne (MOECC)
Cc: Pyke, Dan (MNRF); Ride, Kevin (MNRF); Sullivan, John J. (MNRF); Peterson, Neil (MNRF)
Subject: RE: Whiskey Jack FMP - questions
Attachments: MNR_Response_Earthroots.pdf; DM Letter_ GNFN Lucille McKenzie_2012.07.06.pdf; 2013_04_03cdsenttochief.pdf; 2013_10_28_ANA_letter_RD.pdf; PTs-31 _min_approved.doc; PTs-32_min_Final.doc; 2012_08_30mnrrestognfncomments.pdf

Anne:

Please find my response to your questions imbedded in your e-mail below.

I trust these my comments and responses in purple font will address the questions you raised appropriately. Where the response may require further elaboration or supporting documentation, I have included the same. Should you have any further questions, please let me know directly.

Regards

Shawn Stevenson, M.Sc.
Resources Management Supervisor
Kenora District
Tel: (807)468-2579
shawn.stevenson@ontario.ca

From: Cameron, Anne (MOECC)
Sent: November 25, 2014 2:16 PM
To: Stevenson, Shawn (MNRF)
Cc: Pyke, Dan (MNRF); Ride, Kevin (MNRF); Sullivan, John J. (MNRF); Peterson, Neil (MNRF)
Subject: Whiskey Jack FMP - questions

Hi Shawn,

I have a few questions regarding the consultation that was done for the Whiskey Jack FMP. Can you please provide me a response by the end of this week at the latest? If this is not possible please let me know.

1. It was stated in MNRF's Appendix 6: Additional Forestry Discussions with GNFN – that in 2013, MNRF began discussions with Grassy Narrows First Nation to explore a new forest tenure relationship and transition to an enhanced SFL for the Whiskey Jack Forest to give First Nations communities a greater say in the resource management.
   Are these discussions still on-going? Yes. Grassy Narrows continues to participate in discussions with MNRF regarding forestry tenure for the Whiskey Jack Forest. This stage of discussion is referred to as pre-engagement.

2. It was stated in MNRF's Appendix 6 response that Earthroots submitted correspondence to the MNRF (Oct 31, 2013) regarding mercury concerns.

Did MNRF provide a response to Earthroots' letter? If so when and can I have a copy of it? See attached letter "MNR Response Earthroots"

3. As per the attached consultation record – page 2 re: LTMD - Grassy Narrows First Nation submitted a letter to the MNRF on June 13, 2012 requesting information and providing an overview of their concerns. The attached document indicates that MNRF responded on July 6, 2012.
   Can I have a copy of the July 6, 2012 letter? If not can you please describe what the letter was about? See attached letter "DM Letter GNFN Lucille McKenzie 2012.07.06".

4. As per the attached consultation record – page 2 re: Stage 3 - On April 3, 2013 the MNRF sent a letter to Grassy Narrows First Nation asking if the community would like an information session to be held.
   Did Grassy Narrows First Nation respond? If so can I have a copy of the letter? Grassy Narrows did not respond directly to our letter (See attached letter "2013.04 03_cdsenttochief") though we did receive a letter addressed to the Regional Director "2013.10.28_ANA_Letter_RD" which outlines Grassy Narrows FN's position.

5. It was mentioned in MNRF's April 17, 2014 letter to Grassy Narrows that Grassy Narrows First Nation had a councillor, and additional representatives, attend some planning team meetings.
   When was this? The attached consultation record indicates that Grassy Narrows First Nation did not participate on the Planning Team. Grassy Narrows FN sent representatives to a couple planning team meetings (PTs-31 May 24, 2012 and PTs-32 June 14, 2012) but attended as "observers" only, and on a separate occasion met with MNRF staff seeking to better understand forest management planning. See attached Planning Team Minutes. Responses were sent Grassy Narrows FN regarding the concerns raised at the Planning Team; see attached letters "DM Letter GNFN Lucille McKenzie 2012.07.06" and " 2012.08.30mnrrestognfncomments".

Sincerely,

Anne Cameron
Project Evaluator I Project Review Unit I Environmental Approvals Branch I Ministry of the Environment and Climate Change
2 St. Clair Ave. West, Floor 12A, Toronto, ON M4V 1L5
T: 416-314-8229 I F: 416-314-8452 I E: anne.cameron@ontario.ca

Cameron, Anne (MOECC)

From: Cameron, Anne (MOECC)
Sent: November-27-14 11:18 AM
To: Stevenson, Shawn (MNRF)
Cc: Pyke, Dan (MNRF); Ride, Kevin (MNRF); Sullivan, John J. (MNRF); Peterson, Neil (MNRF)
Subject: RE: Whiskey Jack FMP - questions

Hi Shawn,

Thank you very much for your prompt reply and for the attached documents. I will let you know if any other questions come up.

Thanks again,

Anne Cameron
Project Evaluator I Project Review Unit I Environmental Approvals Branch I Ministry of the Environment and Climate Change
2 St. Clair Ave. West, Floor 12A, Toronto, ON M4V 1L5
T: 416-314-8229 I F: 416-314-8452 I E: anne.cameron@ontario.ca

From: Stevenson, Shawn (MNRF)
Sent: November-26-14 4:23 PM
To: Cameron, Anne (MOECC)
Cc: Pyke, Dan (MNRF); Ride, Kevin (MNRF); Sullivan, John J. (MNRF); Peterson, Neil (MNRF)
Subject: RE: Whiskey Jack FMP - questions

Anne:

Please find my response to your questions imbedded in your e-mail below.

I trust these my comments and responses in purple font will address the questions you raised appropriately. Where the response may require further elaboration or supporting documentation, I have included the same. Should you have any further questions, please let me know directly.

Regards

Shawn Stevenson, M.Sc.
Resources Management Supervisor
Kenora District
Tel: (807)468-2579
shawn.stevenson@ontario.ca

From: Cameron, Anne (MOECC)
Sent: November 25, 2014 2:16 PM
To: Stevenson, Shawn (MNRF)
Cc: Pyke, Dan (MNRF); Ride, Kevin (MNRF); Sullivan, John J. (MNRF); Peterson, Neil (MNRF)
Subject: Whiskey Jack FMP - questions

Hi Shawn,

I have a few questions regarding the consultation that was done for the Whiskey Jack FMP. Can you please provide me a response by the end of this week at the latest? If this is not possible please let me know.

1. It was stated in MNRF's Appendix 6: Additional Forestry Discussions with GNFN – that in 2013, MNRF began discussions with Grassy Narrows First Nation to explore a new forest tenure relationship and transition to an enhanced SFL for the Whiskey Jack Forest to give First Nations communities a greater say in the resource management.
   Are these discussions still on-going? Yes, Grassy Narrows continues to participate in discussions with MNRF regarding forestry tenure for the Whiskey Jack Forest. This stage of discussion is referred to as pre-engagement.

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   Did Grassy Narrows First Nation respond? If so can I have a copy of the letter? Grassy Narrows did not respond directly to our letter (See attached letter "2013.04.03_cdsenttochief") though we did receive a letter addressed to the Regional Director "2013.10.28_ANA_Letter_RD" which outlines Grassy Narrows FN's position.

5. It was mentioned in MNRF's April 17, 2014 letter to Grassy Narrows that Grassy Narrows First Nation had a councillor, and additional representatives, attend some planning team meetings.
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Sincerely,

Anne Cameron
Project Evaluator I Project Review Unit I Environmental Approvals Branch I Ministry of the Environment and Climate Change
2 St. Clair Ave. West, Floor 12A, Toronto, ON M4V 1L5
T: 416-314-8229 I F: 416-314-8452 I E: anne.cameron@ontario.ca

From: Rudzki, Kristina (MOECC)
Sent: December 3, 2014 4:39 PM
To: Garcia-Wright, Agatha (MOECC)
Cc: Cross, Annamaria (MOECC)
Subject: RE: Whiskey Jack Conditions

s.13

[redacted]

Thanks,
Kristina

From: Garcia-Wright, Agatha (MOECC)
Sent: December 3, 2014 4:33 PM
To: Rudzki, Kristina (MOECC)
Cc: Cross, Annamaria (MOECC)
Subject: RE: Whiskey Jack Conditions

s.13

Agatha Garcia-Wright
Director
Environmental Approvals Branch
Ministry of the Environment and Climate Change
2 St. Clair Avenue West, 12A Floor
Toronto, ON M4V 1L5
416-314-7288 (ph)
416-314-7227 (fax)

From: Rudzki, Kristina (MOECC)
Sent: December 3, 2014 4:10 PM
To: Garcia-Wright, Agatha (MOECC)
Cc: Cross, Annamaria (MOECC)
Subject: Whiskey Jack Conditions

Agatha,
Here are the DRAFT conditions s.19 for the Whiskey Jack FMP (we anticipate tweaking the wording a bit still):

s.13

With respect to MNRF contacts, these are the individuals that were directly involved or whom Anne has dealt with (not that BOTH Operations and Policy divisions were involved):

Shawn Stevenson, Resources Management Supervisor (Regional Ops Division)
Dan Pyke, Manager – forest management planning section (Policy Division)
Kevin Ride, Regional Resources Planning Supervisor (Ops div)
Neil Peterson, Regional FMP Specialist (Ops Div)
John Sullivan (Policy Division)
Paul Glassford (Policy Division)
Deb Weedon, District Manager (Ops)
Allan Willcocks, Regional Director (Ops)

I will send Jennie an email advising her to inform ADMO that Director is anticipating making a decision on Whiskey Jack FMP within the next week (+/- a few days) and let her know that we are working with Comms Branch (Michel Finn) to develop comms material. I will ask that she inform up for awareness and let us know what ADMO may need from us.

Thanks,
Kristina

Cameron, Anne (MOECC)

From: Cameron, Anne (MOECC)
Sent: December-04-14 10:09 AM
To: Finn, Michel (MOECC)
Cc: Rudzki, Kristina (MOECC)
Subject: RE: Whiskey Jack Forest Management Plan
Attachments: Whiskey Jack FMP IN 12 04.docx

Hi Michel,

As per our conversation yesterday, I have attached the most recent IN for the Whiskey Jack FMP.

Please let me know if you have any questions or require any additional information.

Thanks,

Anne Cameron
Project Evaluator I Project Review Unit I Environmental Approvals Branch I Ministry of the Environment and Climate Change
2 St. Clair Ave. West, Floor 12A, Toronto, ON M4V 1L5
T: 416-314-8229 I F: 416-314-8452 I E: anne.cameron@ontario.ca

---

From: Cameron, Anne (MOECC)
Sent: December-03-14 4:11 PM
To: Finn, Michel (MOECC)
Cc: Rudzki, Kristina (MOECC)
Subject: Whiskey Jack Forest Management Plan

Hi Michel,

I wanted to contact you regarding the preparation of a Q & A and a Communications Plan for the MNRF's Whiskey Jack Forest Management Plan (FMP). As you may know, the MOECC received a request that MNRF undertake an individual environmental assessment for the FMP. The project may be deemed contentious as Grassy Narrows First Nation is one of the requesters.

As the Director of EAB is going to be making a decision on the request shortly there is some urgency to this request and I am happy to provide you with any information you require.

Thanks,

Anne Cameron
Project Evaluator I Project Review Unit I Environmental Approvals Branch I Ministry of the Environment and Climate Change
2 St. Clair Ave. West, Floor 12A, Toronto, ON M4V 1L5
T: 416-314-8229 I F: 416-314-8452 I E: anne.cameron@ontario.ca

Cameron, Anne (MOECC)

From: Finn, Michel (MOECC)
Sent: December-23-14 11:50 AM
To: Cameron, Anne (MOECC)
Cc: Rudzki, Kristina (MOECC)
Subject: Whiskey Jack QA
Attachments: QA - Whiskey Jack - Dec 19(2).doc

Hi Anne,

Here's the QA approved by my branch and your ADMO.

Happy Holidays.
Michel

Questions and Answers
Whiskey Jack Forest: Request for Individual Environmental Assessment

KEY MESSAGES:

- After careful review, we are denying a request for an Individual Environmental Assessment for the Ministry of Natural Resources and Forestry's Whiskey Jack forest management plan.
- We are satisfied the project will be protective of the environment and human health and have imposed conditions to limit any mercury movements. The conditions include:
  - monitoring soil disturbances, and
  - reporting any changes to research methodology.
- The ministry is also satisfied that the forest will be regenerated through planting and seeding, thereby helping the absorption and conversion of greenhouse gases.
- Additionally, the plan includes measures to minimize soil disturbance such as harvesting only in the winter on shallow soil sites and reinforcing slopes and banks.
- Ontario's environmental assessment program promotes good environmental planning by requiring consultation and determining the potential effects of projects before decisions are made.

QUESTIONS AND ANSWERS:

Q1. What is the Whiskey Jack Forest Management Plan?

The forest management plan is in place to ensure the long-term health of forest ecosystems. The plan is usually in place for periods of ten years with the current plan valid from 2012 to 2022.

The Whiskey Jack Forest is approximately 450 kilometres west of Thunder Bay in northwest Ontario and contains over 1.1 million hectares of forested area. The Ministry of Natural Resources and Forestry, in consultation with the public, is responsible for the forest management plan for the area.

Q2. Why is the ministry denying the Individual Environmental Assessment request for the Whiskey Jack Forest Management Plan?

After careful review, the ministry has denied with conditions a request for an Individual Environmental Assessment for the Whiskey Jack Forest Management Plan including requirements for:

- monitoring soil disturbances, and

- reporting any changes to research methodology.

The Whiskey Jack forest management plan includes measures, such as harvesting only in the winter on shallow soil sites and reinforcing slopes and banks, which will be taken to minimize soil disturbance in order to minimize mercury movement.

Q3. How will the ministry ensure the local waterways are protected from mercury contamination?

The Whiskey Jack forest management plan includes measures, such as harvesting only in the winter on shallow soil sites and reinforcing slopes and banks, which will be taken to minimize soil disturbance in order to minimize mercury movement.

As a preventive measure, we are requiring the Ministry of Natural Resources and Forestry to:

- monitor soil disturbances, and
- report any changes to research methodology.

Q4. How can the ministry deny an Individual Environment Assessment given the mercury contamination?

As part of the assessment process for the Whiskey Jack Forest Management Plan, the Ministry of Natural Resources and Forestry conducted a very thorough review and assessment process as outlined in the Forest Management Planning Manual.

Conducting an Individual Environmental Assessment for forest management in the Whiskey Jack forest would not provide different responses to mercury concerns that were raised in the individual environmental assessment request. Rather, the ministry is imposing conditions to ensure that monitoring is undertaken and that the most current and updated guidance material is used for the Whiskey Jack forest management plan.

Q5. Why isn't the ministry concerned with the risks of mercury contamination?

The ministry is confident that the Whiskey Jack forest management plan has been developed with monitoring and mitigation measures that will ensure mercury mobilization is limited.

As well, the Ministry of Natural Resources and Forestry has the expertise to undertake monitoring and analysis of mercury and will incorporate its findings into the guidance material and forest management planning procedures.

Q6. How dangerous is mercury to human health and the environment?

Mercury is toxic, inherently persistent and bio-accumulative.

In water and sediments mercury can be converted into the highly toxic form known as methylmercury, which accumulates in the tissues of fish and other animal life.

Methylmercury is a potent neurotoxin that may impair brain function and adversely affect neurological development in wildlife and people (especially children).

Fish consumption is one of the main pathways for wildlife and human exposure to methylmercury, and is a major cause of restrictions on fish consumption guidelines, especially for inland lakes and rivers in Ontario.

Please visit Ontario.ca/fishguide for recommendations on the type and size of fish that is safe to eat.

Q7. Is there a provincial standard for mercury?

The provincial water quality objective for mercury is based on both mercury concentration in water and mercury concentration in fish tissue.

For water, the objective is 200 nanograms per litre. A nanogram is equal to one-billionth of a gram. To put this into perspective, 200 nanograms per litre is comparable with the passage of 200 seconds during a period of 32 years.

These standards are based on direct toxicity to fish and do not take into account effects on the food chain (i.e. bioaccumulation). It is possible that waters meet these standards for mercury, but effects in fish and wildlife may still occur due to bioaccumulation.

The provincial objective for fish tissue is that mercury should not exceed 0.5 micrograms per gram (wet weight) in whole fish for the protection of fish consuming birds and aquatic life.

Q8. Were Aboriginal communities consulted?

Six communities were consulted throughout the planning process:

1) Grassy Narrows First Nation
2) Wabaseemoong Independent Nations
3) Dalles First Nation
4) Wabauskang First Nation
5) Whitefish Bay First Nation, and
6) Kenora Metis Council.

Multiple Open Houses and meetings were held with communities who requested such. Notices of Public Information Centres and opportunities to review documents were sent to the communities. The Ministry of the Environment and Climate Change is satisfied that the Duty to Consult requirements were met.

Q9. Can this decision be appealed?

The Director's decision is final. The decision cannot be appealed to the Minister.

Q10. Both the Ministry of the Environment and Climate Change and the Ministry of Natural Resources and Forestry are ministries of the Ontario Government.

How can we be certain that the proper monitoring and abatement actions will take place?

The Ministry of Natural Resources and Forestry (MNRF) is required to undertake monitoring and abatement actions under the Crown Forest Sustainability Act.

They are required to maintain a program of scientific studies to assess the effectiveness of forest management guides.

The MNRF is currently supporting research projects and results will be used during the required periodic reviews of guidance material, such as the Stand and Site Guide which is used to develop forest management plans. The Stand and Site Guide provides direction to minimize site disturbance, sediment transport and hydrologic disruption in forest management plans.

As oversight, the Ministry of the Environment and Climate Change is imposing a condition requiring the MNRF to update the guidance material if new research comes to light. In addition, a condition is being imposed requiring the Ministry of Natural Resources and Forestry to report back to the Ministry of Environment and Climate Change if any updates are made.

Q11. Grassy Narrows First Nations has a history of mercury issues. How are they supposed to believe that mercury will not pose a risk to their health?

Mitigation measures, such as harvesting only in the winter on shallow soil sites and reinforcing slopes and banks, will be taken to minimize soil disturbance in order to minimize mercury movement. Minimizing mercury movement will decrease the likelihood of Grassy Narrows First Nations community members being affected by mercury.

In addition, the Ministry of the Environment and Climate Change is imposing conditions requiring the Ministry of Natural Resources and Forestry to follow the most current guidelines for monitoring.

Q12. What is an Individual Environment Assessment?

Individual Environmental Assessments are prepared for large-scale, complex projects with the potential for significant environmental effects. They require approval from the Ministry of the Environment and Climate Change.

Individual Environmental Assessments require more extensive review and public consultation and requires approval by the Minister of the Environment and Climate Change as well as Cabinet.

Cameron, Anne (MOECC)

From: Cameron, Anne (MOECC)
Sent: December-15-14 1:01 PM
To: Stevenson, Shawn (MNRF)
Subject: Whiskey Jack FMP

Hi Shawn,

Can you tell me, is mercury in the environment unique to the Whiskey Jack FMU or is it in all/most FMUs? Can you please let me know asap.

Thanks,

Anne Cameron
Project Evaluator I Project Review Unit I Environmental Approvals Branch I Ministry of the Environment and Climate Change
2 St. Clair Ave. West, Floor 12A, Toronto, ON M4V 1L5
T: 416-314-8229 I F: 416-314-8452 I E: anne.cameron@ontario.ca

From: Sullivan, John J. (MNRF)
Sent: December 15, 2014 4:20 PM
To: Rudzki, Kristina (MOECC)
Subject: FW: IEA Forecasting Update for 2015 FMPs
Attachments: 2014 12 12 IEA Request Tracking 2015.doc

Hi Kristina:

One other item that I forgot, was to ask if you could provide an update on the status of the Whiskey Jack FMP IEA request. It has been sometime since we had our teleconference on the approach MOECC was taking with making a decision on this request. There has been some recent correspondence between the District and Anne which has triggered my interest.

Thanks

John

From: Sullivan, John J. (MNRF)
Sent: December-12-14 2:10 PM
To: Rudzki, Kristina (MOECC)
Cc: Pyke, Dan (MNR); Glassford, Paul (MNR) (paul.glassford@ontario.ca)
Subject: IEA Forecasting Update for 2015 FMPs

Hi Kristina:

Attached is an updated IEA forecasting table to reflect the recent approvals of some 2015 Forest Management Plans – Phase II Operations.

s.N/R

If you have any questions or concerns let me know.

Thanks

John

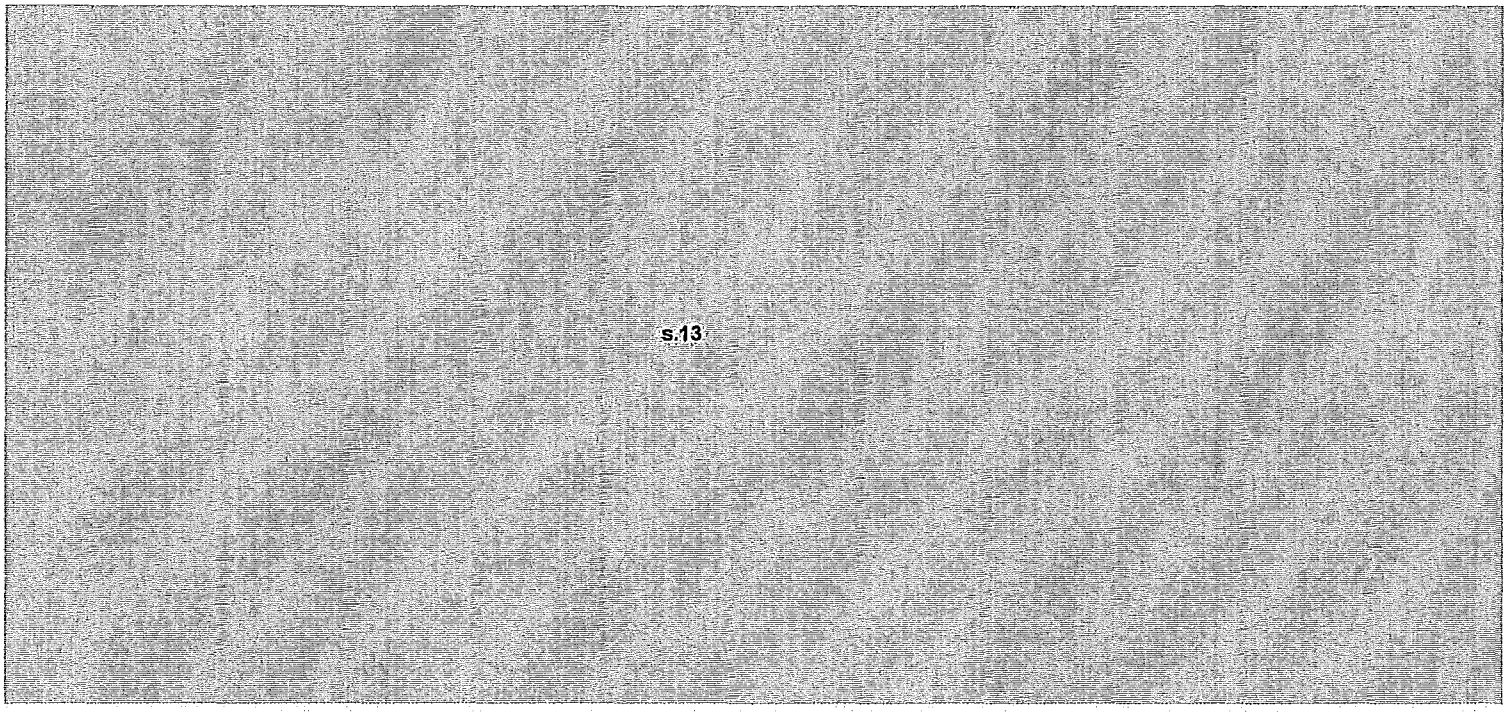
Cameron, Anne (MOECC)

From: Finn, Michel (MOECC)
Sent: December-18-14 2:11 PM
To: Cameron, Anne (MOECC)
Subject: RE: Whiskey Jack

Importance: High

Anne,

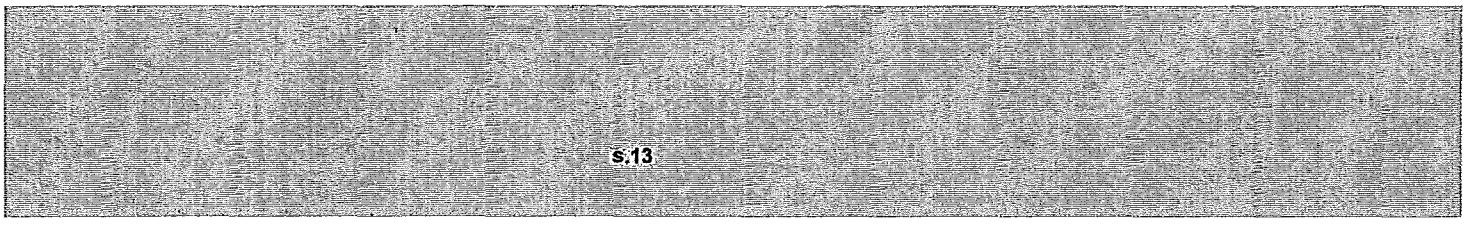
This is a start. If you guys think of other questions, please add them.



From: Cameron, Anne (MOECC)
Sent: December-18-14 1:26 PM
To: Finn, Michel (MOECC)
Subject: RE: Whiskey Jack

Hi Michel,

Thank you for your voicemail of earlier today. EAB has made some preliminary edits to the Q&A document (please see attached).



I started gathering some information from the Decision Note that may be helpful:

The MNRF advised MOECC that mercury is currently present in forests throughout Ontario, including the WJFMU. The MNRF has informed the MOECC that mobilization of mercury following forest disturbance may not be any different than that experienced during natural disturbances. Scientific studies conducted by a variety of research groups have found that if soil disturbance during forest operations is limited, the potential impact of mercury on fish and possible bioaccumulation is decreased. In the Whiskey Jack FMP there are measures, such as harvesting only in the winter on shallow soil sites and reinforcing slopes and banks, which will be taken to minimize soil disturbance in order to minimize mercury movement.

The MNRF is currently undertaking research to gain further understanding of the potential connection between forestry operations and mercury. This will help inform the development of guidance material used for forest management planning. As the MNRF has the expertise and is well positioned to undertake monitoring and analysis of mercury, the MOECC is imposing a condition requiring the MNRF to conduct monitoring, including monitoring of soil disturbance, in accordance with the Whiskey Jack FMP and the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (Stand and Site Guide). In addition, a condition requiring the MNRF to follow the most current version of the Stand and Site Guide will be imposed to ensure that the best available guidance is being used for the development of forest management planning.

I also changed some things to acronyms which I'm not sure if that allowed in terms of formatting (just let me know and I can delete them).

Thanks,

Anne Cameron
Project Evaluator I Project Review Unit I Environmental Approvals Branch I Ministry of the Environment and Climate Change
2 St. Clair Ave. West, Floor 12A, Toronto, ON M4V 1L5
T: 416-314-8229 I F: 416-314-8452 I E: anne.cameron@ontario.ca

From: Finn, Michel (MOECC)
Sent: December-16-14 9:22 AM
To: Cameron, Anne (MOECC)
Subject: Whiskey Jack

Good morning Anne,

I am currently working on developing the QA but I am struggling a bit with the conditions. How many conditions are being added to the decision? I saw one for monitoring for mercury.

With Agatha leaving, has your timeline moved at all?

Thanks.

Michel Finn
Senior Regional Communications Advisor/Conseiller principal en communications régionales
Ministry of the Environment and Climate Change/Ministère de l'Environnement et de l'Action en matière de changement climatique
613.521.3450 x262
Twitter: @EnvironmentOnt

From: Cross, Annamaria (MOECC)
Sent: December 29, 2014 2:42 PM
To: Rudzki, Kristina (MOECC)
Subject: RE: Whisky Jack Forest FMP Decision - Grassy Narrows FN Comment

I didn't catch the 2013, should be 2014.

From: Rudzki, Kristina (MOECC)
Sent: December 29, 2014 2:34 PM
To: Jordan, Kate (MOECC)
Cc: Berlin, Hayley (MOECC); Cross, Annamaria (MOECC)
Subject: RE: Whisky Jack Forest FMP Decision - Grassy Narrows FN Comment

Both. The decision was on the 22nd. That was when the letter was dated and mailed out.
Also – the bullets below are manager approved and modified from what we originally sent.
Thanks,
Kristina

- The IEA request for the Whiskey Jack FMP was received by the MOECC in January 2013.
- MOECC undertook a thorough review of the issues that were raised in the request. MOECC reviewed the IEA request to identify issues, ensure that the IEA requester has provided the necessary information and undertook preliminary discussions with MNRF on the issues.
- A request for concurrence was received by the MOECC on March 11, 2014. MNRF sought approval from the Director to commence with regular forest operations in areas of the forest management unit that are unaffected by the outstanding IEA request. On May 2, 2014, the EAB Director granted concurrence. This would allow MNRF to engage in access, harvest, renewal, site preparation, and tending operations.
- The length of the ministry review of an IEA request depends on a number of factors including the complexity of the issues raised. MOECC reviewed documentation to ensure it meet the requirements of the Declaration Order and consulted with MNRF on the issues raised by the requestors.

From: Jordan, Kate (MOECC)
Sent: December 29, 2014 2:32 PM
To: Rudzki, Kristina (MOECC)
Cc: Berlin, Hayley (MOECC); Cross, Annamaria (MOECC)
Subject: RE: Whisky Jack Forest FMP Decision - Grassy Narrows FN Comment

thanks. so the date of the decision was the 22nd? or the letter were date stamped the 22nd?

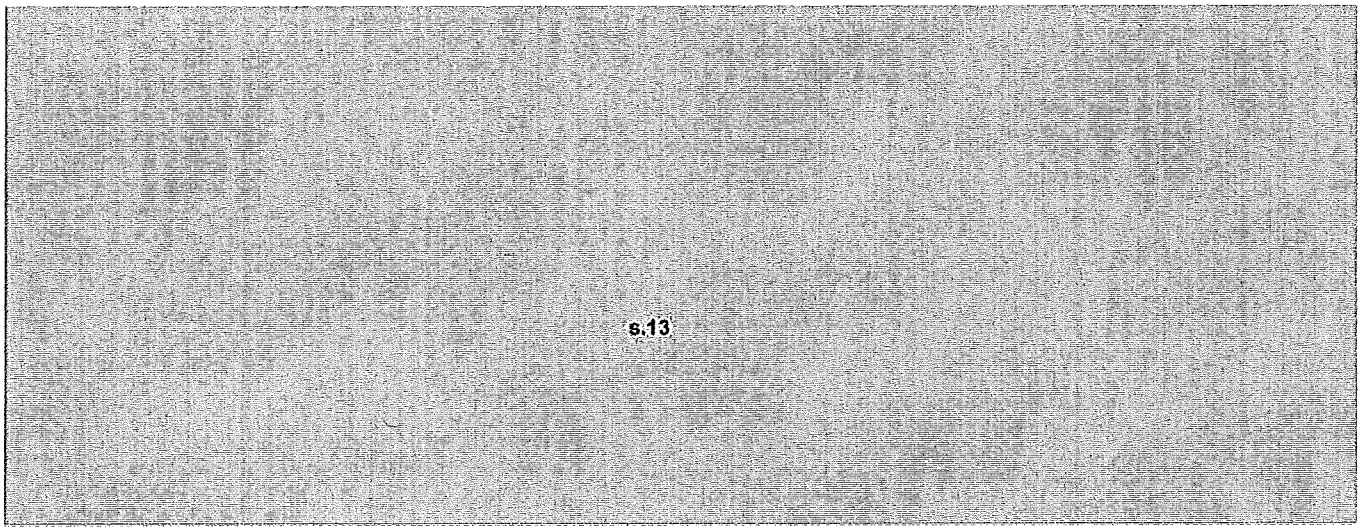
From: Rudzki, Kristina (MOECC)
Sent: December 29, 2014 2:30 PM
To: Jordan, Kate (MOECC)
Cc: Berlin, Hayley (MOECC); Cross, Annamaria (MOECC)
Subject: FW: Whisky Jack Forest FMP Decision - Grassy Narrows FN Comment

Kate,
Further to our discussion, letters were sent (mailed) to Grassy Narrows First Nation and to Earthroots on December 22, 2014. An email was not sent to either GNFN or to Earthroots. MNRF was informed of the decision by email. Also, please note some minor edits to the bullets below.

Thanks,
Kristina

From: Berlin, Hayley (MOECC)
Sent: December-29-14 2:14 PM
To: Jordan, Kate (MOECC)
Cc: Buchanan, Holly (MOECC)
Subject: FW: Whisky Jack Forest FMP Decision - Grassy Narrows FN Comment

Here are some bullets that may help about the bump up review process – this is not regulated but it is a process we have worked with MNRF on

- 

From: Buchanan, Holly (MOECC)
Sent: December-29-14 12:40 PM
To: Berlin, Hayley (MOECC)
Subject: FW: Whisky Jack Forest FMP Decision - Grassy Narrows FN Comment

Hayley,

The Grassy Narrows First Nation has released/circulated a statement regarding the MOECC's denial of its elevation request for the Whisky Jack Forest FMP. Kate has been fielding calls and has been using the messaging and information provided previously, but called to ask me to find out the timing of the decision (i.e. proximity to Christmas).

Is there anything we can say regarding the timing?

RELEASE Monday Dec. 29, 2014

ON says 'no' to environmental assessment of clearcut mercury impacts in Grassy Narrows

Science indicates that clearcuts will deepen the tragedy of mercury poisoning

*Grassy Narrows *– On the night before Christmas Grassy Narrows First Nation received notice that Ontario is rejecting the community's request for an Individual Environmental Assessment of the mercury impacts from the controversial final plan for clearcut logging on their homeland. Grassy Narrows is concerned that the planned clearcut logging will harm the health of their families by raising mercury poison levels in local fish – a traditional staple.

Ontario's logging plan makes no mention of mercury, and contains no special measures to account for the fact that Grassy Narrows' homeland is the site of Canada's most infamous case of mercury poisoning arising from 9,000 kg of mercury that was dumped into their river by a paper mill upstream in the 1960's. Scientific studies indicate that clearcut logging in the boreal forest can raise mercury in fish to unsafe levels.

"Ontario has ignored our voices and is planning to force more devastating clearcuts on our people without even applying their own Individual Environmental Assessment process," said Joseph Fobister, a Grassy Narrows land-user and businessman. "It makes me sad that our people will become even sicker if the government allows the logging industry to poison the fish that we eat."

"I am disheartened by this hurtful decision," said Chief Roger Fobister Sr. of Grassy Narrows. "It seems that our health and our culture do not matter to the government as they attempt to force their clearcut plans on us. The only honourable way forward here is to work together to gain our agreement before our land and water are used."

Grassy Narrows' request was an important test of Ontario's environmental laws. People with concerns can request an Individual Environmental Assessment (IEA) of a logging plan if they believe that environmental and human health are not being protected. However, such requests are rarely, if ever, granted since the current regulatory regime was established in 1994. The Timber Class Environmental Assessment for all logging which was approved in 1994 did not consider the mercury impacts from logging as they were not known until 1997.

"This is a glaring failure to use our environmental laws to ensure that the health of people and our environment are safe from the harmful impacts of industrial clearcut logging," explained Amber Ellis, Executive Director of Earthroots, which supported Grassy Narrows in their request. "It is hard to imagine a situation that requires an Individual Environmental Assessment more than the mercury issue in Grassy Narrows. What use is an Individual Environmental Assessment process when every request is rejected?"

The Ontario Ministry of Natural Resources and Forestry (MNRF) writes that "[t]he potential for forest management activities to result in mobilization of terrestrial mercury into aquatic systems is well documented and a serious concern." MNRF also admits that "[T]here are not mitigation measures specific to mercury in the [logging rules]," and "[t]here are no claims that the [logging rules] direction and application of the [logging rules] will mitigate or eliminate Hg mobilization."

And yet the Ontario Ministry of Environment and Climate Change has given the green light to the MNRF to authorize clearcut logging in one of the most mercury impacted parts of the planet, against the loud objections of Grassy Narrows where many families already suffer the debilitating symptoms of mercury poisoning.

Cameron, Anne (MOECC)

From: Fletcher, Rachael (MOECC)
Sent: January-08-15 3:50 PM
To: Cameron, Anne (MOECC)
Subject: Re: Grassy Narrows meeting

The working group was pulled together to work with the community to address their concerns resulting from the mercury spill in the 70/80s. The community has suffered the effects of mercury poisoning. In 2012 when the working group was set up as a result of a commitment made by them minister wynne. the primary objective was to address a set of 'demands' they had: mercury disability, environment, health and economic development. The 3 primary agencies involved are MAA (lead), MOHLTC, and MOECC. MNDM and MTC have also attended meetings. I was involved because of the work we do with mercury contaminants in fish as this was and still is to an extent their primary environmental concern. The commonity initially asked that MNRF not be included on the working group. The community have now requested MNRFs involvement and a new MOU has been developed to include them but has yet to be signed by the community. We are also working with HC to be involed with the group.

From: Cameron, Anne (MOECC)
Sent: Thursday, January 08, 2015 12:03 PM
To: Fletcher, Rachael (MOECC)
Subject: RE: Grassy Narrows meeting

Hi Rachael, I've been asked what the purpose of the working group (with all of the agencies) is? I apologise if you mentioned it on the phone but I can't seem to remember.

Thanks,

Anne Cameron
Project Evaluator I Project Review Unit I Environmental Approvals Branch I Ministry of the Environment and Climate Change
2 St. Clair Ave. West, Floor 12A, Toronto, ON M4V 1L5
T: 416-314-8229 I F: 416-314-8452 I E: anne.cameron@ontario.ca

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From: Fletcher, Rachael (MOECC)
Sent: January-08-15 11:36 AM
To: Wills, Devon (MOECC)
Subject: Grassy Narrows meeting

Hi Devon,

I am heading up to grassy narrows on the 19th Jan. In anticipation of questions I might receive pertaining to the Whiskey Jack decision, do you have any messaging I could use?

I'll give you call later today/tomorrow

Ministry of the Environment and Climate Change

Freedom of Information and Protection of Privacy Office

12th Floor
40 St. Clair Avenue West
Toronto ON M4V 1M2
Tel: (416) 314-4075
Fax: (416) 314-4285

Ministère de l'Environnement et de l'Action en matière de changement climatique

Bureau de l'accès à l'information et de la protection de la vie privée

12e étage
40, avenue St. Clair ouest
Toronto ON M4V 1M2
Tél. : (416) 314-4075
Téléc.: (416) 314-4285

Ontario

December 23, 2015

This is Exhibit B referred to in the affidavit of David Sone sworn before me, this 9th day of March 2016.

ERICA STAHL
A COMMISSIONER FOR TAKING AFFIDAVITS

David Sone
Earthroots
401 Richmond St W, #410
Toronto, ON M5V 3A8

Dear David Sone:

RE: *Freedom of Information and Protection of Privacy Act* Request
Our File # A-2015-00158

This letter is further to your request made pursuant to the *Freedom of Information and Protection of Privacy Act* relating to Records related to the Grassy Narrows and Earthroot's request for individual assessment of the Whiskey Jack 2012-2022, and any other matters related to this plan. As well, the release of mercury from clearcut logging and associated issues..

Attached is a copy of the records.

If you have any questions regarding this matter, please contact Oksana Budjko at oksana.budjko@ontario.ca.

Yours truly,

Heidi Ritscher
FOI Manager

Attachment

Alves, Tanya (MOECC)

From: Wills, Devon (ENE)
Sent: February 21, 2014 11:21 AM
To: Fletcher, Rachael (MOECC)
Subject: RE: Whiskey Jack FMP

Thanks Rachael, I got the invite from Paul and will be in attendance.

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

-----Original Message-----
From: Fletcher, Rachael (ENE)
Sent: February-21-14 10:55 AM
To: Wills, Devon (ENE)
Subject: Re: Whiskey Jack FMP

I've just sent you the meeting information.
The meeting is now set for monday at 10.30

----- Original Message -----
From: Wills, Devon (ENE)
Sent: Friday, February 21, 2014 10:18 AM
To: Fletcher, Rachael (ENE)
Subject: Whiskey Jack FMP

Hello Rachael,

Do you know if the MNR meeting that Paul was to schedule is on for today. I have not heard from him.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

Alves, Tanya (MOECC)

Subject: FW: Next MOE/MNR Manager's Meeting
Location: [redacted]

Start: Thu 03/20/2014 9:30 AM
End: Thu 03/20/2014 10:30 AM
Show Time As: Tentative s.N/R

Recurrence: (none)

Meeting Status: Not yet responded

Organizer: Glassford, Paul (MNR)

As per my call (Todd), here is the meeting details for tomorrows call to discuss Hg issues. While the discussion was triggered by logging issues, the thought was to discuss gaps in our knowledge and perhaps form a community of practice. I hope that you will be able to attend

-----Original Appointment-----
From: Glassford, Paul (MNR)
Sent: February 28, 2014 12:59 PM
To: Glassford, Paul (MNR); Iwachewski, Ed (MNR); Fiset, Wayne (MNR); Fletcher, Rachael (ENE)
Subject: Next MOE/MNR Manager's Meeting
When: March 20, 2014 9:30 AM-10:30 AM (UTC-05:00) Eastern Time (US & Canada).
Where: [redacted]

I looked at your calendars and you are all indicating free at this time.
I anticipate that the scientists would meet prior to this date and their outcomes/thoughts would be the basis for our meeting.

Alves, Tanya (MOECC)

From:	Kondrat, Todd (ENE)
Sent:	March 20, 2014 3:32 PM
To:	Fletcher, Rachael (MOECC)
Subject:	FW: Whisky Jack Forest Management Plan Bump up request
Attachments:	Request-IEA-Whiskey-Jack-FMP.pdf

letter already printed

Categories: Grassy Narrows

Hi Rachael,

Thanks for the invitation this morning. It was interesting to hear another perspective on Hg since we have been focusing so much on water. It will be interesting to see that balance between political sensitivity for a specific watershed/community and the implications for forestry management on a broader provincial scale. I liked the approach taken by Rob Makreth that looked a at hydrological consideration s on the watershed scale, to avoid areas that play a key role in methylation (i.e. wetlands) and possibly harvesting in the winter to minimize mercury transport.

Todd Kondrat
Surface Water Specialist – Group Leader
Northern Region
807-475-1752

From: Hamilton, Don (ENE)
Sent: March-20-14 2:30 PM
To: Kondrat, Todd (ENE); Hutchison, Carrie (ENE)
Subject: FW: Whisky Jack Forest Management Plan Bump up request

I thought you both might like to see this.

From: Tyance, Joseph (ENE)
Sent: March 20, 2014 12:05 PM
To: Hamilton, Don (ENE)
Subject: FW:

FYI – a bump request by Grassy Narrows First Nation on Whiskey Jack Forest Management Plan.

From: Schlag, Michelle (ENE)
Sent: March 19, 2014 9:50 AM
To: Tyance, Joseph (ENE)
Subject:

As per our conversation please see the attached.

Michelle Schlag, MNRM
Aboriginal Consultation Advisor
Environmental Approvals Access and Service Integration Branch
2 St. Clair Avenue West
Toronto, Ontario M4V 1L5
Phone: 416-326-9608/Toll free 1-800-461-6290
Fax: 416-246-7171 (Service Desk)

Alves, Tanya (MOECC)

From: Wills, Devon (ENE)
Sent: April 16, 2014 1:41 PM
To: Fletcher, Rachael (MOECC)
Subject: FW: Science support for IEA response WJF
Attachments: WhiskeyJackIEA review1.1.docx; SRB Hg research_2.docx

Hello Rachael,

I have received these documents from the MNR outlining a response to the science related issues involving the Whiskey Jack FMP Part II Order request. Please review the documentation.

Thanks,

Devon Wills
Project Evaluator
Ministry of the Environment
Environmental Assessment Services

2 St. Clair Avenue West
Toronto, Ontario, M4V 1L5
Phone: (416) 314-8259
Fax: (416) 314-2376

From: Glassford, Paul (MNR)
Sent: April-16-14 10:24 AM
To: Wills, Devon (ENE)
Subject: FW: Science support for IEA response WJF

Devon:

As discussed, attached is a draft science perspective on the issues raised in the IEA request on the WJF. I am providing this to you to seek an initial response from you as to whether you believe this additional response is helpful and whether you suggest any changes/additions/deletions.

Please respond by end of day tomorrow.

Paul

Page 539

is not relevant

est non pertinente

MNR Science review for the request for an Individual Environmental Assessment (IEA) of the Whiskey Jack forest management plan (EBR Registry No. 010-9240)

Introduction:

The IEA requestors contend that the Whiskey Jack forest management plan "fails to adequately deal with the impacts of logging on mercury levels in boreal water and fish" and that the plan will "harm water quality, fish habitat, wildlife and the health of people who eat the fish". To support their concern the requestors present as evidence a number of research studies that have shown that forest disturbance (both forest management and fire) result in changes to mercury dynamics within watersheds which may increase the movement of terrestrial bound mercury into aquatic systems and may be associated with higher levels of mercury in aquatic organisms.

The requestors also argue that the forest management guidelines, provided in the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales (the Stand and Site Guide or SSG), do not adequately address the issue of forest management impacts on mercury dynamics.

The IEA request is presented in 15 sections which address various related concerns. In the MNR science team's attempt to evaluate the scientific basis of the request and provide comments on current forest management policies and guidelines related to the issue, we have divided the sections into 4 general themes and we will address the scientific evidence and the interpretation of this evidence that is presented in themes A and B:

A) Concerns arising from research on mercury and forest management

1. Clearcutting Impacts Water Quality Through Mercury Contamination
2. Clearcutting Elevates Mercury Levels in Fish
3. Elevated Mercury Levels Impact Wildlife
11. Duration and Intensity of Impacts

B) Concerns associated with forest management policy (SSG)

7. Measures in the Logging Plan to Deal with the Mercury Problem
8. Stand and Site Guide Rationale on Mercury
9. Fundamental Problems with MNR Rationale
    - A. Natural Disturbance Emulation Not Appropriate for Mercury Safety
    - B. Mitigation Science is Not Sufficiently Developed
    - C. Log Now, Test Later Approach.
12. Changes to Guidelines Are Likely to Make Mercury Problem Worse
    - A. Logging to the Shoreline
    - B. Catchment Disturbance Thresholds Removed
13. Specific Deficiencies in MNR Mitigation Measures

C) Concerns arising from historical contamination

4. Fish in Grassy Narrows Have Critical Levels of Mercury
5. Mercury Impacts Human Health in Grassy Narrows

D) Concerns arising from the planning process (not directly linked to science/research)

6. Efforts to Raise the Mercury Issue
10. Delay and Hardship
14. Need for an Individual Environmental Assessment
15. Remedy Requested

A) Concerns arising from research on mercury and forest management

Mercury is a natural element that occurs in air, water, soil and biota in the boreal forest. Mercury, which exists in several inorganic, or elemental, forms (Hg) and as organic methylmercury (MeHg), alternates between forms and cycles among different components of the ecosystem as part of a complex biogeochemical process. Natural levels of mercury are spatially variable depending on geology, soil and forest characteristics; however, the global atmospheric pool of mercury has increased two to five fold over pre-industrial times (Linberg *et al.* 2007). There is clear evidence from a number of studies that forest management is one of a large number of factors that influence mercury dynamics within watersheds. In sections 1, 2, 3 and 11 the IEA requestors provide quotations from some of these studies to support their conclusions regarding the risk of mercury increases associated with forest management. The following is a review of these sections:

1. Clearcutting Impacts Water Quality Through Mercury Contamination

The requestors contend that forest management activities will result in an increase in Hg and MeHg in waterbodies in the area. As evidence to support this conclusion they present results from several studies conducted in Quebec, Sweden and Finland, much of which is summarized in a review paper by Bishop et al (2009).

MNR review:

- Increased mobilization of mercury within watersheds following forest disturbance has been documented in several studies done in Canada, Sweden and Finland.
- Disturbance impacts include increases in the concentration of Hg and MeHg in surface runoff (increased concentration) and increases in runoff, thereby increasing the movement of Hg even without concentration changes (transport or flux).
- Changes in Hg dynamics are highly variable among watersheds depending on a large number of factors, including watershed characteristics and the extent of disturbance. For example, Bishop et al (2009) show post-harvest Hg concentration response ranging from a 4 fold increase in a Finnish study to no increase found in a study done in Northwestern Ontario.
- Very little work is available which directly compares Hg mobilization between harvested and burned watersheds. Studies done in Quebec measured increases in dissolved organic carbon (DOC), to which Hg is bound in surface water runoff, following harvest under some conditions (large disturbance area within the watershed and a large watershed to lake area ratio) but not consistently (Carignan et al 2000).
- No research has been conducted to test the effectiveness of specific forest management planning or operational measures at mitigating increases in Hg mobilization. Bishop et al (2009) provide some recommended practices which are similar to direction provided in the SSG (see discussion in theme B below).

Conclusion: There is strong evidence, based on a number of studies, that the rate of movement of Hg and MeHg from terrestrial to aquatic areas will increase following forest disturbance. There is not sufficient evidence to conclude that the magnitude of Hg response to forest management disturbance differs significantly from natural disturbance events in all cases; however, the mechanism of response is likely different. There is also no research available which tests the effectiveness of guidelines to mitigate changes in watershed Hg dynamics arising from forest disturbance.

2. Clearcutting Elevates Mercury Levels in Fish

The IEA requestors state that forest management activities in the Whiskey Jack forest will increase Hg inputs into aquatic systems which will harmfully alter fish habitat and result in an increase in MeHg levels in fish and other aquatic organisms. As evidence they present a number of quotes from Bishop et al (2009) as well as from Garcia and Carignan (2005). It should be noted that the Bishop et al (2009) paper is a review of previous research and all information presented on fish Hg levels come from a study by Garcia and Carignan (2000, 2005) so the evidence comes from a single study.

MNR review

- The study by Garcia and Carignan (2000,2005) which included 38 lakes (9 cut, 9 burned and 20 reference) is likely the most comprehensive study on the association between watershed disturbance and fish mercury levels.
- Fish in disturbed watersheds (cut and burned) had higher mercury levels than fish in undisturbed reference lakes
- Fish mercury levels were highly variable and were strongly positively correlated with fish size (fig 1) and fish trophic position (fig 4) (Garcia and Carignan 2005)
- Based on fig 4 (Garcia and Carignan 2005) more than 3 times more variability in fish mercury is associated with trophic position than with watershed disturbance and there is very little difference between fish mercury levels in cut and burned lakes when trophic position is controlled for.
- 'The highest Hg concentrations were observed in fish from two partially burnt lakes' (pg 690, Garcia and Carignan 2005). It appears that fire intensity (proportion of the watershed burned and the amount of organic layer burned) has a substantial impact on mercury dynamics in the watershed and the potential response of aquatic organisms.
- Through elevating DOC export from soils, an enhanced vector of Hg export to aquatic ecosystems occurs.

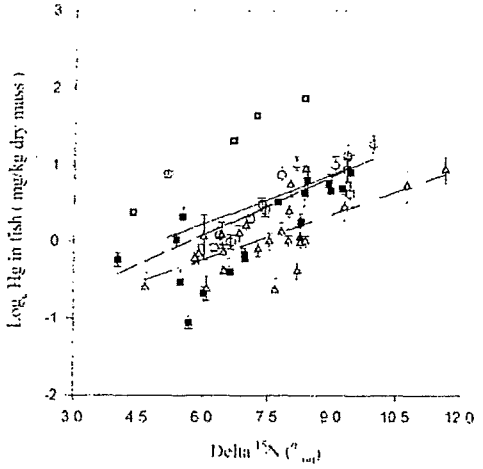

Fig. 4. Relationships between mercury (Hg) concentrations and fish $\delta^{15}N$ for reference lakes (triangles and dash-dot-dot line), and for lakes with cut (open circles and solid line) and burnt catchments (black and dotted squares for completely and partially burnt catchments, respectively, and dashed lines). Points represent fish of a standardized length from 62 populations. The $\delta^{15}N$ values are corrected for baseline variations. Error bars correspond to standard deviation.

From: Garcia and Carignan 2005

Conclusion: The comprehensive study of Quebec lakes provides evidence that fish in disturbed watersheds tend to have higher Hg concentrations than those in undisturbed watersheds. The study does not provide strong evidence that fish Hg concentrations consistently differ between burned and harvested watersheds. When trophic position is included in the analysis, fish Hg levels in harvested watersheds fall within the broader range of fish Hg levels in burned watersheds (fig 4, Garcia and Carignan 2005). This single study, despite being a very comprehensive, does not provide sufficient information to understand all the factors that influence fish Hg levels or how these factors may interact. Given the complexity of how disturbance impacts Hg dynamics and how aquatic systems may respond, it is unlikely that identical results would be seen in other regions of the boreal zone.

3. Elevated Mercury Levels Impact Wildlife

The IEA requestors express a concern that the mercury levels in a number of wildlife species, presumably those that consume fish, may increase if fish mercury levels increase. They provide evidence, primarily citing Environment Canada websites, which explains that mercury contamination can have negative impacts on the growth, development, behaviour and reproduction of wildlife species.

MNR review

- There is strong evidence that high body burdens of mercury may have toxic effects on certain wildlife species and lead to a number of health issues.
- Elemental mercury (Hg) in water and plants is not toxic to animals and is not stored in animal tissue; however, methylmercury (MeHg) is toxic and is stored and bioaccumulated in muscle and fat tissue. The main source of MeHg for terrestrial animals is the consumption of fish.
- We are unaware of any studies that directly examine the relationship between forest disturbance and wildlife Hg levels.

Conclusion: While it may be reasonable to assume that increases in fish Hg levels could lead to Hg increases in piscivorous wildlife species, the relationship between forest disturbance and fish Hg is not well understood (see section 2) and the further connection to wildlife is likely very complex and associated with a large number of interacting factors.

11. Duration and Intensity of Impacts

The requesters state on page 24 that "if further clearcutting is allowed without proven mitigation measures, and methyl mercury levels in local fish are elevated as a result, the impacts would likely be grave and long lasting." They further contend that "the impacts of releasing mercury into the environment in Grassy Narrows through clearcut logging are likely to last at least a decade in fish, and at least one human lifespan beyond that in people". They base their conclusions on data from studies conducted in (1) Ontario, Québec, Finland, and Sweden, much of which are summarized in studies by Bishop et al. (2009) and Garcia and Carignan (2005).

MNR review:

- The proponents state that "clearcutting has been found to increase MeHg bioaccumulation in boreal lakes by two to four fold, and sometimes as much as eight fold (Bishop et al., 2009)" (Page, 24). The further state that "As much as 37% of Hg in fish across a managed landscape would result from the increased Hg outputs associated with felling and thinning". Bishop et al. (2009) actually calculated that forest harvesting may contribute 9 to 23% of MeHg fluxes from the soil following harvesting. They also made

the point that many uncertainties existed in the calculations (e.g., small number of samples and a large range of impacts across studies).

- Few studies have been published regarding the effects of clearcut harvesting on fish MeHg concentrations. Those studies suggest that although MeHg concentrations in fish may increase following clearcut operations, it is generally limited to cases when soils are disturbed, and not to the harvesting of trees. This was alluded to by Bishop et al. (2009), as well as reported in findings and discussions of other studies (Povari et al., 2003, Sørensen et al., 2009, Eklöf et al., 2012, 2013). Soil disturbance contributes to elevated fish concentrations in upland catchments via particulate matter (organic and mineral) transport from forest soils to streams and lakes. Whereas, soil disturbance of lowland (e.g., wetlands and riparian zones) catchments increase MeHg runoff to streams and lakes via enhanced dissolved organic carbon (DOC) transport. Therefore, no evidence exists contrary to the protection of soils from disturbance as described in the Stand and Site Guide as a mitigation measure minimizing forest harvesting operation effects on fish MeHg concentrations.

- The requesters further contend on pages 24 – 25 that "impacts of clearcutting on mercury have been found to persist for at least five years, with no known endpoint" and "the increased in Hg loading effect has also been observed to persist up to at least 5 years, and there are no examples so far of the logging effect having dissipated (Bishop et al., 2009)". In fact, Skyllberg et al. (2009) assessed stream MeHg concentration in Sweden by comparing 47 clearcut stands dominated by Norway spruce to 10 mature Norway spruce-dominated stands. They showed stream MeHg concentrations were elevated in stands 0 to 4 years after harvested, but no differences occurred in MeHg concentration in streams 4 to 10 years after harvested. Skyllberg et al. (2009) suggested these results were attributed to increased organic matter added by logging residue stimulating Hg methylating bacteria in the soil, and by 4 to 10 years, this effect dissipated.

- The Hg in fish higher in the food chain continued to increase several years after harvest (Garcia and Carignan 2000, 2005, as cited in Bishop et al., 2009 (Page 24).
See response to section 2 for discussion of fish Hg response.

- The requesters contend on pages 25 – 26 that logging is likely to (1) further elevate mercury in fish in previously contaminated lakes due to increasing methylation rates of newly added mercury and stored mercury in lake sediments, (2) prolong the length of time for which fish in previously contaminated lakes remain unsafe to eat, (3) elevate mercury levels in fish in marginally safe lakes above safety limit, and (4) elevate mercury levels in fish in currently safe lakes above the safety limit.

  Skyllberg et al. (2009) reported that 17% of MeHg in streams came from methylation of stored mercury, while 73% arose from methylation of newly added mercury from logging debris and that TOC (total organic carbon in non-filtered water samples) and its structure did not differ between streams draining clearcut and mature forest catchments. Furthermore, Neff et al. (2012) conducted an intensive study of lake mercury levels in the English-Wabigoon River system. They examined long-term (1970 – 2010) monitoring data to assess temporal trends in mercury in walleye, northern pike, and lake-whitefish in 4 lakes along a chain of lakes occurring from closest to furthest locations from a paper mill source (approximately 10 tonnes Hg input between 1962 and 1970); Clay, Ball, Separation, and Tetu Lakes, respectively. Neff et al. (2012) found that for all lakes and fish species, mercury declined by 35 to 94% through time, although walleye and northern pike mercury concentrations were above (Clay Lake) or near (Ball and Separation Lakes) the human consumption guideline of 0.5 µg g-1 of fish tissue. Additionally, the authors summarized mercury concentrations of walleye (45 cm length) and northern pike (50 cm length) based on 143 and 123 locations in northwestern Ontario. Neff et al., (2012) reported median values near the 0.5 µg g-1 guideline for walleye (25th – 75th percentiles

= 0.38 and 0.75 µg g-1, respectively) and median of 0.38 (25th – 75th percentiles = 0.25 and 0.60 µg g-1, respectively) for northern pike.

Most rapid declines in fish mercury concentrations occurred between 1970 and 1985; however declines slowed from the late 1980s to 2010. Contributions to the slower declines are many and include (1) the lakes approaching baseline values prior to mercury contamination, (2) climate change enhancement of (a) area burned and severity of soil organic matter and mercury combustion or (b) extended drought followed by intense precipitation events, (3) catchment cover types and the wetland-to-lake ratio, and (4) connectivity of wetlands, streams, rivers, and lakes in a drainage basin.

- The proponents also suggest on pages 25 – 26 that "clearcutting leads to higher DOC compared to reference lakes and burned lakes (Garcia and Carignan, 2005), stimulating bacterial methylation, decreasing photo-oxidation of MeHg to Hg^{2+}, and possibly decreasing photo-reduction of Hg^{2+} to gaseous mercury. Those processes were suggested to elevate mercury levels in fish.

Research has shown in the temperate and boreal regions of North America (Couture et al., 2012) and Europe (Laudon et al., 2013) that climate change is the primary cause of elevated DOC concentrations in lakes. Moreover, although studies (e.g., Haines et al., 1994; Sellers et al., 1996) suggest elevated DOC concentrations may inhibit photo-oxidation of MeHg and reduction of Hg^{2+} to gaseous mercury these results are far from universal. For example, although DOC is an important transport vector for Hg^{2+} and MeHg, this DOC is highly recalcitrant (e.g., low bacterial degradability). Whereas bacterial methylation is dependent upon the presence of easily degradable DOC concentrations (as well as electron acceptors such as sulphate); thus increasing DOC-Hg transport from soil to lakes does not necessarily translate into greater rates of mercury-methylation.

Conclusion: For forest harvesting to further exacerbate walleye and northern pike mercury concentrations in lakes situated in the English-Wabigoon River System, any mercury input to upstream catchments will need to traverse a myriad of interconnected wetlands, streams, and lakes within the river system. However, we are aware of no published studies addressing potentially elevated long-range mercury transport in large drainage basins. In terms of MeHg (and assuming it is elevated in headwater catchments), some of it would be removed from the water column of lakes through (1) MeHg photo-oxidation to Hg^{2+} and its subsequent reduction to gaseous mercury and loss to the atmosphere or (2) settling of DOC- and particulate matter-bonded mercury from the water column to the sediments as water moves downstream. While much variation occurs in the photo-oxidation rates of MeHg to Hg^{2+} and its reduction to gaseous mercury, the current scientific evidence indicates that protecting soils from disturbance during harvesting operations as spelled out in the Stand and Site Guide will minimize total and methyl mercury loading from soils to streams and lakes in a catchment. Furthermore, it can be reasonably argued that any MeHg-containing water resulting from harvesting in headwater catchments will be diluted prior to reaching the English and Wabigoon Rivers and their connected lakes, thereby contributing little to mercury concentrations in the river system's lakes.

B) Concerns associated with forest management policy (SSG)

Direction in the SSG was based on a thorough review of existing literature, and discussions with and review by ecological researchers, practitioners, policy makers, stakeholders, and members of the public to ensure that direction would be effective in meeting ecological objectives, while also being feasible to implement and socially palatable. *'In all cases, the direction in the Stand and Site Guide represents a series of predictions or hypotheses. Those with a high degree of uncertainty have been identified as a high priority for testing through an effectiveness monitoring program (see Section 7). The results of this monitoring program, along with other sources of information, will be used during periodic reviews of the Stand and Site Guide to help determine*

when the guide needs to be revised' (SSG section 1.3.5, pg 5). The SSG therefore represents a summary of the best available direction to meet MNR's objectives and legislative requirements for sustainable forest management and incorporates an adaptive management approach to evaluate and improve direction in areas of uncertainty.

Section 1.3 of the SSG summarizes the guide's approach to conserving forest biodiversity using guidance characterized as coarse and fine filters. This direction is based on the principles of the *Crown Forest Sustainability Act, 1994* (CFSA) which a key piece of legislation regulating forest management. Specifically the CFSA states:

> *The long term health and vigor of Crown forests should be provided for by using forest practices that, within the limits of silvicultural requirements, emulate natural disturbances and landscape patterns* [coarse filter] *while minimizing adverse effects on plant life, animal life, water, soil, air and social and economic values, including recreational values and heritage values* [fine filters] (CFSA s. 2(3)2).

The coarse filter approach to the emulation of natural disturbance and landscape patterns is intended to maintain the natural diversity of forest condition and ecological processes in order to conserve forest biodiversity and is a legal requirement under the CFSA. The coarse filter is not intended as a specific mitigation measure but rather an approach to maintain the state of all elements of the forest ecosystem within a natural range. Fine filter direction is included when there is evidence that additional mitigation measures will improve the protection of specific values.

During the development of the SSG, MNR did an extensive review of the body of scientific literature examining the relationship between forest disturbance and mercury dynamics. A summary of this review and the resulting decision on guide direction are provided in the SSG Background and Rationale document (pg 23-25) which is included as an appendix in the IEA request. The key points from the review were:

- The potential for forest management activities to result in mobilization of terrestrial mercury into aquatic systems is well documented and a serious concern.
- The nature and magnitude of changes in mercury dynamics within a watershed following disturbance are complex and related to a number of interacting factors including area disturbed, changes to hydrology, the amount and type of wetland in the area and soil disturbance.
- There is limited information on the potential for fish Hg levels to be influenced by harvest disturbance but the best available evidence shows that fish in lakes with disturbed watersheds had higher mercury levels than those in undisturbed watersheds and that the range of Hg levels in fish in harvested watersheds was within the range of those in burned watersheds (Garcia and Carignan 2000, 2005).
- There is a high degree of uncertainty regarding Hg response to forest management and the issue should be a high priority area for guide effectiveness monitoring.

Because there are no studies which identify or evaluate mitigation measures to minimize mercury mobilization following disturbance there are no mitigation measures specific to mercury in the SSG. The guide does provide direction to minimize site disturbance, sediment transport and hydrologic disruption (listed on pg 24 of the SSG Background and Rationale) all of which may be associated with increased mercury mobilization. In a review paper published following the release of the SSG, Bishop et al (2009) conclude that "An understanding of the processes controlling the output of Hg from catchments to surface waters, and subsequent bioaccumulation, is not sufficiently developed to confidently recommend ameliorative measures for forestry" (pg 378). They do offer some suggested practices, which include minimizing site disturbance and hydrological disruption and protecting wetlands. Direction in the SSG is entirely consistent with the recommendations of Bishop et al (2009).

The IEA request raises a few specific concerns about the SSG which suggest that they have misinterpreted the direction in the guide:

- In section 8 the requestors interpret the SSG rationale on mercury as stating "1. Logging is essentially equivalent to fire so attempts to emulate fire will eliminate Hg impacts". The SSG does not suggest that emulation of natural disturbance patterns will eliminate Hg impacts. The emulation of natural disturbance patterns within watersheds is expected to result in watershed scale hydrologic changes that are within the range that would occur as a result of natural disturbance processes. The SSG provides additional direction to minimize site disturbance associated with harvest and road construction, particularly in areas that are expected to have higher soil moisture levels. The SSG acknowledges that Hg dynamics will likely change within the watershed as a result of any type of forest disturbance and that further research and monitoring is required to refine direction in the guide.

- In section 9 the requestors state that "logging and forest fire have nearly opposite impacts on mercury" (pg. 16). This statement is demonstrably false as all the literature they cite as evidence shows that Hg is mobilized and/or bioaccumulated following both fire and harvest disturbance. The mechanism and magnitude of Hg response almost certainly differs between burned and harvested watersheds but all of the studies cited found some level of Hg response following disturbance by fire. Fire intensity is likely an important factor that influences Hg response with high intensity fires volatilizing Hg bound in the organic soil layer and low intensity fires leaving this layer undisturbed and Hg subsequently being mobilized as water tables rise and surface runoff increases. In their study of fish Hg levels, Garcia and Carignan (2000, 2005) found the highest Hg levels in fish from watersheds impacted by low intensity fires and lower Hg levels in fish from watersheds with high intensity fires. Fish Hg levels in harvested watersheds fell within this range (Garcia and Carignan, 2000, 2005). (Note that the requestors appear to use fire size and fire intensity interchangeably when in fact these measure different things)

Conclusion: The Stand and Site Guide and accompanying Background and Rationale document clearly acknowledge the potential for forest management activities to mobilize mercury, provide a comprehensive summary of available scientific literature on the topic, provide a clear rationale for guide direction and acknowledge the uncertainty associated with this direction. There are no claims that SSG direction will mitigate or eliminate Hg mobilization.

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Page 549

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Summary of past, current and future research projects related to mercury in Ontario being conducted by the Ontario Ministry of Natural Resources, Science and Research Branch.

Mercury related research led by Dr. Jim McLaughlin, Forest Soils Research Scientist, Forest Research and Monitoring Section, Sault Ste. Marie

1) Climate change effects on total and methyl mercury runoff from peatlands.
    a) Intact peat cores collected in 2012 from peatland located near White River.
    b) Cores transported to BIOTON at the University of Western Ontario.
    c) Cores exposed to varying atmospheric CO_2 concentrations, air temperature, and soil moisture.
    d) Establishing a field-based experimental system for the evaluation of the effects of elevated temperature and elevated atmospheric carbon dioxide (CO2) on total and methyl mercury runoff peatlands.
2) Establishing baseline conditions for Far North peat total mercury storage.
    a) All collected peat samples are analyzed for total mercury concentration, bulk density, and peat depth to mineral sediment recorded.
    b) Mercury concentration, bulk density, and depth are used to calculate the amount of total mercury stored at each coring location, then scaled to total peatland area of the Far North.
3) Establishing baseline conditions for forest soil mercury storage.
    a) National Forest Inventory grid.
    b) Organic and mineral soil samples collected at selected locations and analyzed for total mercury and bulk density, and soil horizon thickness.
    c) Mercury concentration, bulk density, and soil horizon depth are used to calculate the amount of total mercury stored at each sampling location, then scaled to area of forest cover types in the Far North.
4) Baseline conditions for terrestrial ecosystem soil mercury storage.
    a) Calculated from numbers 2 and 3 above.
5) Synthesis of land use (e.g., mining, hydroelectric, forest harvesting and regeneration) effects on watershed total and methyl mercury cycling and export.

Mercury related research projects led by Dr. Tom Johnston, Research Scientist, Aquatic Research and Monitoring Section, Cooperative Freshwater Ecology Unit, Vale Living with Lakes Centre, Laurentian University, Sudbury.

1) Update fish mercury information to improve consumption guidelines and assist with community-based land-use planning. All fish mercury information we collect, whether near north or far north, fits this objective.

2) Determine temporal changes in fish mercury bioaccumulation, 1970s to present. Mostly sampling in the near north but some in the far north as well. This was the basis for Rex Tang's MSc thesis and has already been published (Tang et al. 2013. Sci. Tot. Environ.). But, we still sample a few lakes to try to fill in the geographic coverage of the analysis. I have also considered repeating the analysis over shorter (more recent) time windows, but have not pursued this yet.

3) Assess relative importance of food web position and growth rate in shaping interspecific variability in piscivore mercury concentrations (Johnston et al., ongoing). I usually call this the multi-predator project. We are targetting lakes that have co-habiting populations of lake trout, burbot, walleye, and northern pike. This will allow us to control (somewhat) for the lake effect when making interspecific comparisons.

4) Determine roles of physical-chemical limnology and food web structure in shaping fish mercury patterns in lakes across a climatic gradient (Sumner MSc project, started 2013). She will examine lakes across the near north and far north, comparing the role of climate (inferred from latitude or GDD) with the role of other factors. She may include some landscape factors (e.g., area or vegetation cover of drainage basin) in the analysis. This is probably the closest my research program comes to examining effects of forest harvesting on fish mercury.

5) Determine spatial variation in fish mercury concentrations from headwaters to James Bay in the Attawapiskat River drainage basin (Lescord PhD project, started 2013). This is restricted to the far north and looks at mercury dynamics following a river continuum framework. She will compare how mercury moves through the food web at various points along the continuum from the headwater lakes of the shield, to the main stem river of the lowlands.

Mercury related projects led by Dr. Rob Mackereth, Research Scientist, Centre for Northern Forest Ecosystem Research, Lakehead University, Thunder Bay.

1) Ongoing monitoring of mercury in small stream biota to evaluate the association between the rate of bioaccumulation and biomagnification of mercury and stream characteristics, including catchment disturbance. Sampling of periphyton, benthic invertebrates and fish have been conducted in watersheds having different forest management histories. Results to date show that mercury is present in all stream biota and tends to be higher in small streams compared to large. We have found no differences in fish mercury levels based on forest management activities in the watershed. Fish and invertebrate mercury concentrations tend to be associated with local conditions including pH, conductivity, stream gradient and temperature. Future work will focus on measuring fish and invertebrate mercury levels in streams within burned watersheds.

2) The Escape Lake experimental watershed study was initiated to evaluate the impacts of forest management activity on the hydrologic connectivity between terrestrial and aquatic habitats and to observe the catchment scale hydrologic (groundwater levels, surface water flow, water chemistry) and soil chemistry response. Beginning in March 2003, the watershed was surveyed (high resolution DEM, vegetation plots, soil pits) instrumented (wells and pizometers in wetland and along 3 experimental and 1 reference hillslope transect, resin bag transects) and monitored for 1.5 years. Experimental clearcut harvesting was carried out in June 2004, and included harvesting merchantable trees within the prescribed 30m buffer. Water quality constituents examined include major cations (Ca^{2+}, Mg^{2+}, K^{+}, Na^{+}) and anions (SO_4^{2-}, Cl^{-}), nutrients (NO^{3-}, NH^{4+}, TN, ortho-P, TP), TSS, turbidity, DOC, SRSI and metals (Al, Fe, Mn, Cu, Cd, Pb, Zn, Ni and MeHg and THg). Mercury concentration in ground and surface waters did not increase; however, following harvest, catchment water yield approximately doubled relative to pre-harvest resulting in an increase in Hg flux.

3) The associations between watershed and lake scale characteristics with THg in piscivorous fish were examined as part of an MSc research project (Victoria Danco). ArcGIS was used to delineate the waterbody catchment area and extract waterbody catchment characteristics for 243 of northern Ontario's lakes. Walleye (*Sander vitreus,* n= 121 lakes), lake trout (*Salvelinus namaycush,* n= 60 lakes), brook trout (*Salvelinus fontinalis*, n= 18 lakes), northern pike (*Esox lucius,* n =107 lakes), smallmouth bass (*Micropterus dolomieu*, n = 37 lakes), and burbot (*Lota lota,* n= 4 lakes) populations were standardized to the mean length of the populations by using power-series regressions. Multivariate analysis (non-metric multidimensional scaling) and univariate analysis were used to determine the associations between total mercury concentrations in fish and watershed scale and lake scale variables. Watershed and lake chemistry characteristics poorly described the variability in THg concentrations. Forest harvesting and natural disturbance were not associated with fish mercury concentrations.

Rang, Sarah (MOECC)

From:	Byrne, Darius (ENE)
Sent:	September-10-14 11:27 AM
To:	Rang, Sarah (ENE); Thiru, Kaj (ENE)
Cc:	Al-Dhaher, Ahmid (ENE); Davidson, Lindsay (ENE); Jordan, Kate (ENE); Lashbrook, Ross (ENE); McMahan, Peggy (ENE); Nguyen, Jan (ENE); Rabbior, Mark (ENE)
Subject:	Updated IN: Grassy Narrows
Attachments:	091014 IN Grassy Narrows Mercury Contamination.doc

FYI – updated to reflect a visit by Japanese scientists last week in the First Nations community, as well as recent meeting between their Minister and the community.

Darius Byrne
Supervisor, Issues and Media Relations
Ministry of the Environment and Climate Change

INFORMATION NOTE: Grassy Narrows First Nation Mercury Contamination
DATE: September 10, 2014

ISSUE

The Asubpeeschoseewagong Netum Anishinabek (ANA), formerly Grassy Narrows First Nations, has expressed concerns with the mercury levels from historical contamination in the fish from the English-Wabigoon River system. An inter-ministerial working group with the ANA continues to discuss this and other issues facing the community.

KEY FACTS

- During the 1960s and 1970s, mercury pollution occurred in the English-Wabigoon River system in northwestern Ontario from the operation of the chlor-alkali plant in Dryden (refer to Appendix 1).

- The ANA has expressed concerns with the mercury levels from historical contamination in the fish from the English-Wabigoon River system; their concerns primarily relate to:
    - Mercury Disability Board (MDB)- processes and procedures;
    - Environmental Issues - mercury in the environment;
    - Health - impacts of mercury on human health;
    - Economic Development – impact of mercury levels on commercial fishing.

- Testing has shown that mercury levels in sport fish in parts of the river system have declined as much as 87 percent since the 1970s, although consumption advisories remain in effect.

- The ministry tests the pulp and paper mill effluent at Dryden on an annual basis for mercury; mercury has not been detectable in the mill's effluent since at least 1989.

- In 2012, the Ministry of Aboriginal Affairs (MAA) established a working group with ANA in an effort to address community concerns. Member include the ANA, along with the ministries of Aboriginal Affairs, Environment and Climate Change, Health and Long-Term Care, and when required Northern Development and Mines and Training, Colleges and Universities.

    - MAA is drafting a Memorandum of Understanding with ANA to continue this working group which will also include the Ministry of Natural Resources and Forestry (MNRF) and the Federal government.

- A staff level working group (representatives from MOECC and MAA) meets quarterly to discuss environmental issues.

- The ministry is working with the community to address their environmental concerns. As part of this, the ministry is looking at their potential involvement in the Sport Fish Contaminant Monitoring Program and the Drinking Water Surveillance Program.

BACKGROUND

- Studies by the federal and provincial governments were conducted in the 1980s in the Wabigoon River to determine the location and the extent of contamination. In general, a clean up was not advisable due to the possible remobilization of mercury.

- Natural sedimentation within the system over the past 30+ years to provide for a cap was considered and is a viable remediation option for mercury contamination. Surveys suggest that mercury concentrations in the sediments have gone down and could be at levels comparable to other lakes in the area.

- The ANA relies on fish from the river system for food and obtains its drinking water from lakes within the river system and has expressed concerns with the mercury levels from historical contamination since the fish from this system are an important source of food for their community.

- Despite significant declines in mercury levels, restrictions on consumption of fish remain in place, yet the community continues to consume fish from their doorstep lakes/rivers. Under an arrangement with MNRF, MNRF provides the community with "clean" fish, but the community has not taken full advantage of the whitefish provided, as culturally they prefer walleye or pike.

- Under a 1985 Settlement Agreement, benefits continue to be paid to ANA and Wabaseemoong Independent Nations members who demonstrate symptoms consistent with mercury poisoning (through MDB). The MAA continues to financially support the MDB in administering the Mercury Disability Fund and making awards for eligible people.

- A main concern of the community is that the government has never formally recognised/acknowledged that community members are suffering from symptoms similar to that of people with Minamata disease (neurological disorder). The community is asking for:
    1. MDB be restructured to compensate fairly people with mercury poisoning and related illnesses;

    2. A specific tripartite protocol between ON/CAN/Grassy Narrows via the MDB to pay all medical and related expenses for hospitalization for those with chronic disabilities and illnesses; and,

3. A facility built on the reserve similar to the one in Japan (Minamata) where people with similar mercury-related medical conditions can be cared for together.

Recent Developments:

- On August 27, 2014 MAA met with a Japanese Research team in Kenora, Ontario, to hear the Japanese doctors' presentations and to observe their testing techniques on volunteer community members. MDB staff were also invited.
    - The MDB oversees testing and compensation for people with symptoms reasonably consistent with mercury poisoning, and will carefully review the information and research shared by the Japanese researchers.

- On August 20, 2014, the Minister of Aboriginal Affairs met with the Grassy Narrows First Nation community to discuss and better understand their concerns and to confirm the parties' commitment to work together.

- On August 1, 2014 the ANA Community sent a letter to the Minister of the Environment and Climate Change, requesting a meeting to discuss funding an environmental center.

- On July 31, 2014, members of the ANA and supporters marched on Queen's Park demanding the government address the impacts of mercury contamination in the Wabigoon River.

- Media reports indicate that a 2010 report, entitled "Literature Review: The Impact of Mercury Poisoning on Human Health," was commissioned by the MDB. The MDB contracted Drs. Chan and Mergler to review all literature worldwide to ensure up to date information on the impact of mercury on human health. The 2010 report by Drs. Chan and Mergler was made available to the Chiefs of ANA and Wabaseemoong and presented to a joint MDB/Search committee meeting.

Drinking Water Surveillance Program (DWSP)

- On June 10, 2014, at the request of the Band Council, MOECC staff visited the community to initiate monitoring for the community's drinking water under DWSP (a voluntary program that monitors trends and contaminant levels for a wide variety of parameters in drinking water).

- The ministry had concerns related to the treatment system; these were reported to Health Canada and documented in a letter to the Chief of the Band Council.

ANA - Ontario Working Group

- The Working Group was established in November 2012, to continue efforts to address concerns related to mercury, health and social issues in the ANA community that are within provincial jurisdiction. Members include the Chair of the MDB and representatives from ANA, MAA, MOECC, MOHLTC (Ministry of Northern Development and Mines (MNDM) and the Ministry of Training, Colleges and Universities (MTCU) are included when required).

- The Working Group has met between 4 to 6 times each year since its inception, most recently in June 2014. At the last meeting the Kenora/Dryden Public Health Unit was in attendance for discussions surrounding infant health care within the community.

- At the end of the June 2014 meeting, ANA members indicated they would only continue with Working Group meetings if a federal representative was present. MAA is drafting a Memorandum of Understanding with ANA to continue this working group.

- Through the working group, MOECC is providing leadership and support for the community on environmental issues/processes:
    - Working to set up a fish sampling project to collect and analyze fish form lakes where there is limited/outdated information to identify where the community can safely fish. Recovery of the fish from historical mercury contamination will also be monitored through this program. The high school has expressed interest in taking on this project and incorporating it into their curriculum;
    - In partnership with the MAA and MNRF, identifying river/lake systems where the community could re-establish its commercial fishery;
    - Participating in the ministry's DWSP through a special project to address the community's concerns about mercury in their drinking water; and,
    - Funded by MAA, initiated a study by Dr. Patricia Sellers (a researcher selected by the community) to conduct a literature review and gap analysis of existing knowledge on the current environmental condition of the English Wabigoon River system.

University of Ottawa-Health Canada Study on Food Nations Food Nutrition

- Dr. Chan, from the University of Ottawa, completed a study on First Nations food nutrition throughout Ontario; the study was funded by Health Canada and released to the community in June 2014. Although the ministry provided sport fish data to support the study, it was not provided with a copy of the report by either the researcher or community.

Meetings with ANA

- On July 31, 2012, then Minister of Aboriginal Affairs, Kathleen Wynne, accompanied by representatives from the MAA, the MOECC, and MOHLTC, visited the ANA to discuss concerns about mercury contamination in the community. The ANA raised five key issues: concerns with the MDB; community health issues; education; economic development; and environmental concerns.

- During the meeting, and in a CBC radio interview on August 3, 2012, the Minister of Aboriginal Affairs committed to:
  - re-engage the federal government about the community's concerns;
  - revitalize Ontario's Inter-ministerial Committee on Grassy Narrows (an internal advisory committee to the provincial government) to formalize next steps;
  - address specific issues raised by the community; and,
  - re-engage with the Chair of the MDB about the concerns raised about benefits.

Stakeholder Considerations

- In October 2013, the ANA issued a News Release rejecting the Whiskey Jack Forest Management Plan, due to concerns about the potential release of mercury resulting from logging activities.

- On August 28, 2013, protesters marched on Premier Wynne's home over mercury levels in the ANA community. The protest did not seem to be sanctioned by the ANA.

- In June 2012, the ANA held a series of events to raise awareness about the mercury poisoning (walk from north of Kenora to Toronto; Queens Park rally). The ANA has also called for a moratorium on industrial projects in their community.

- In August 2012, MNRF sent a letter to Kenora area businesses warning them not to purchase illegally caught walleye, pike, sauger and sturgeon from the English and Winnipeg River systems.

- In a May 30, 2012 a fish fry invitation was sent to the Premier and various MPPs, including the Minister of MAA. The ANA requested that the MOECC help their community establish a permanent ANA-run environmental monitoring station to inform and protect their people from damage from pollution and logging.

Appendix 1: Mercury pollution in the English-Wabigoon River system

GENERAL INFORMATION	
PREPARED BY: Dr. Rachael Fletcher Dr. Satyendra Bhavsar, EMRB	**TEL.:** 416-327-2935 416-327-5863
BRANCH APPROVAL: Ian Smith, Director, EMRB	**TEL.:** 416-235-6160
DIVISION APPROVAL: Anne Neary, ADM, ESSD	**TEL.:** 416-314-6310
DIVISION APPROVAL DATE:	10/September/2014
OTHER CONTACTS: Trina Rawn, NR, Operations Division	**TEL.:** 807-468-2734

Appendix 1: Mercury pollution in the English-Wabigoon River system

- From 1963 to 1970, approximately 10 metric tonnes of mercury from a chlor-alkali plant in Dryden, Ontario were released into the Wabigoon River. In 1970, this release was reduced by 99%, and by 1975 the chlor-alkali plant had converted to a process that did not use mercury.

- In 1970, commercial fishing was banned in the river system due to contamination of the fish stock; the pollution has impacted both the economies and health of the ANA and Wabaseemoong Independent Nations. As a precautionary measure, the ministry tests the pulp and paper mill effluent at Dryden annually for mercury. To date, it has not been detectable at 20 parts per trillion.

- The ministry is not aware of any current point sources of mercury into the natural environment in the English-Wabigoon River system.

- While various remediation techniques, such as dredging to remove the most contaminated sediment, have been suggested, there is no evidence that significant efforts at remediation were conducted. This is likely because they were not feasible.

- Currently, there are 12 locations on the Wabigoon River system under consideration for waterpower development. If lands are flooded during these projects, some increases in fish mercury concentrations may be expected for a number of years.

- There is no provincial program through which the mercury levels in land animals in Ontario are tested, nor has the province been provided with any such scientific data from a third party.

- MOECC and MNRF are discussing a potential study looking at the effects of logging and clear cutting on mercury levels in fish. ANA has expressed concerns that inappropriate logging on crown land impacts traditional practices. There is a general body of knowledge illustrating that logging practices promote mercury release to rivers; however, any impacts to the English-Wabigoon River system is unclear and could not be evaluated without analysis.

Alves, Tanya (MOECC)

From: Winter, Jennifer (MOECC)
Sent: June 16, 2015 11:44 AM
To: Alves, Tanya (MOECC)
Subject: FW: ADVICE NEEDED: #2878 - Grassy Narrows First Nation - due 11am Tuesday, Oct 16
Attachments: #2878 - Grassy Narrows First Nation_Advice Note Template.doc; 2878 - Grassy Narrows First Nation.pdf; 2878a - Grassy Narrows First Nation.pdf

From: Welch, Katherine (ENE)
Sent: October-12-12 2:46 PM
To: Fletcher, Rachael (ENE); Bhavsar, Satyendra (ENE)
Cc: Winter, Jennifer (ENE)
Subject: ADVICE NEEDED: #2878 - Grassy Narrows First Nation - due 11am Tuesday, Oct 16

Hi Satyendra and Rachael,

The Grassy Narrows First Nation requests a meeting with the Minister to discuss their opposition to the Contingency Plan for the Whiskey Jack Forest 2012-2014. The request has gone to OD, but we've been asked to provide a few bullets for the attached Meeting Note about our past interactions re. Sport Fish.

Our bullets are **due 11am on Tuesday, October 16.**

Perhaps the bullets below (from the Info Note) would work?

- MOE (in collaboration with MNR) conducted an internal study for MAA in January 2011 to assess long-term mercury trends as a result of historical contamination in the Wabigoon/English River system. The study was completed and shared with MAA in March 2011.
- The study showed that overall, mercury concentrations in fish from four representative lakes in affected areas of the English and Wabigoon Rivers, and surrounding lakes have declined since elevated mercury concentrations in fish were discovered in the 1970s (approximate 80% decline in sport fish), but are still above the sport fish consumption guidelines and background levels especially in the lakes close to the historical mercury discharge point.
- The ministry also authored a journal paper based on the findings of the internal study. On July 11, 2012, the paper titled "Long-term changes in fish mercury levels in historically impacted English-Wabigoon River system (Canada)" was published in the Journal of Environmental Monitoring.
- The Minister of MAA led a meeting with the Grassy Narrows Chief and Council on July 31, 2012. MOE also attended and presented information from the ministry's published paper on mercury levels in the English-Wabigoon river system.
- The presentation focussed on declines in mercury levels walleye over the last 40 years and how concentrations, while still severely elevated, are within the range of other northern Ontario lakes. Results were also provided for similar size whitefish, whose mercury levels are much lower, making them safer to eat.

Thank you,

Katherine Welch · Management Support Coordinator
Ministry of the Environment | Environmental Monitoring and Reporting Branch
Water Monitoring Section | Biomonitoring Section
125 Resources Road | Toronto, ON, M9P 3V6

Bhavsar, Satyendra (MOECC)

From: Welch, Katherine (ENE)
Sent: September-18-12 1:30 PM
To: Bhavsar, Satyendra (ENE); Fletcher, Rachael (ENE); Winter, Jennifer (ENE)
Cc: Cheung, Patrick (ENE); Grixti, Jennifer(ENE)
Subject: FW: ADM approved: Unsolicited updated IN: Grassy Narrows
Attachments: 091812 IN Grassy Narrows Mercury Contamination.doc

Good Afternoon,

Attached is the ADM approved updated Grassy Narrows IN.

Anne also had one follow-up comment, pertaining to the logging issue:

- Please ensure our folks are doing this in step with the Centre for Northern Forest Ecosystem Research (MNR) – Ed Iwachewski is the contact.

Thank you,

Kat

Katherine Welch | Management Support Coordinator
Ministry of the Environment | Environmental Monitoring and Reporting Branch
Water Monitoring Section | Biomonitoring Section
125 Resources Road | Toronto, ON, M9P 3V6
Katherine.Welch@ontario.ca
T (416) 235-5775 | **BB** (416) 985-5776 | **F** (416) 235-6064

From: Morton, Jennifer (ENE)
Sent: September 18, 2012 1:05 PM
To: Coordinator, EMRB (ENE)
Subject: FW: Unsolicited updated IN: Grassy Narrows

FYI – updated Grassy Narrows IN distributed

From: Morton, Jennifer (ENE)
Sent: September 18, 2012 1:05 PM
To: Nguyen, Jan (ENE); Byrne, Darius (ENE); Davidson, Lindsay (ENE); Jordan, Kate (ENE); McMahan, Peggy (ENE); Rabbior, Mark (ENE); Celsie, Paul (ENE); Al-Dhaher, Ahmid (ENE)
Cc: @ENE-ADMOStaff-ESSD
Subject: Unsolicited updated IN: Grassy Narrows

Afternoon all,

Please find attached unsolicited update Grassy Narrows IN.

Key updates are as follows:

- As a result of the discussion on the presentation, the following next steps are underway:

- A follow-up Grassy Narrows First Nation Inter-ministry Working Group teleconference was held on September 7, 2012 with the Chief and community. Another one will be scheduled later in September 2012 to discuss the next steps;
- MOE will contact Chief and Council after the next teleconference to discuss the possibility of working together to collect fish for continued monitoring on the recovery of the English-Wabigoon system from the historical mercury discharges, and to provide fish consumption advisories based on the latest measurements;
- MOE and MNR to discuss a potential study looking at the effects of logging and clear cutting on mercury levels in fish
    - Grassy Narrows First Nation has expressed concerns that inappropriate logging on crown land impacts traditional practices. There is a general body of knowledge illustrating that logging practices promote mercury release to rivers; however, any impacts to the English-Wabigoon system is unclear and could not be evaluated without further analysis.
- MOE will review the sediment study Grassy Narrows First Nation had commissioned; and,
- A multi-agency group meeting with Grassy Narrows First Nation fall 2012 (TBD).

Jen

Jennifer Morton
Executive Assistant | Environmental Sciences and Standards Division
Ontario Ministry of the Environment | 135 St. Clair Ave. W.
Tel: 416-314-6354
Fax: 416-314-6358

INFORMATION NOTE: Grassy Narrows First Nation Mercury Contamination
DATE: September 18, 2012

ISSUE

The Grassy Narrows First Nation has expressed concerns with the mercury levels from historical contamination as the fish from the Wabigoon River system are an important source of food for their community.

KEY MESSAGES

- **The Ministry of the Environment is committed to protecting Ontario's natural environment, our watersheds and our resources now and for future generations.**
- **The unfortunate mercury contamination that occurred in the Wabigoon river system in the 1960s and early 1970s predated the controls the Ministry of the Environment puts on industrial discharges today.**
- **We now have tough laws, standards and conditions in place to protect our environment from sources of contamination, including mercury.**
- **The Ministry of Aboriginal Affairs (MAA) has established a cross-ministry team made up of the Ministries of Health, Natural Resources and Environment to address issues such as health, mercury contamination and fish testing and economic development.**
- **Recently the Ministry of Environment presented our published findings to the First Nation on mercury contaminant levels in fish from the English Wabigoon river system and how they have changed over time. Minister Wynne also attended the meeting.**

IF ASKED ABOUT CLEAN UP

Has there been any clean up to date? Why not?

Extensive studies by the federal and provincial governments were conducted in the 1980s in the Wabigoon River to determine the location and the extent of contamination. It was determined that a clean up was not advisable due to the possible remobilization of mercury.

Natural sedimentation within the system over the past 30+ years has likely created a cap which is a viable remediation option for mercury contamination.

BACKGROUND

- During the 1960s and 1970s, mercury pollution occurred in the Wabigoon/English River system in northwestern Ontario from the operation of the chlor-alkali plant in Dryden.
- The Grassy Narrows First Nation relies on fish from the river system for food and obtains its drinking water from lakes within the river system.
- Grassy Narrows First Nation has expressed concerns with the mercury levels from historical contamination since the fish from this system are an important source of food for their community.

Grassy Narrows Sport Fish Study

- MOE (in collaboration with MNR) conducted an internal study for MAA in January 2011 to assess long-term mercury trends as a result of historical contamination in the Wabigoon/English River system. The study was completed and shared with MAA in March 2011.
- The study showed that overall, mercury concentrations in fish from four representative lakes in affected areas of the English and Wabigoon Rivers, and surrounding lakes have declined since elevated mercury concentrations in fish were discovered in the 1970s (approximate 80% decline in sport fish), but are still above the sport fish consumption guidelines and background levels especially in the lakes close to the historical mercury discharge point.
- The ministry also authored a journal paper based on the findings of the internal study. On July 11, 2012, the paper titled "Long-term changes in fish mercury levels in historically impacted English-Wabigoon River system (Canada)" was published in the Journal of Environmental Monitoring.

Meetings with Grassy Narrows First Nation

- In June 2011, MAA met with the chief his staff to discuss the community's concerns.
- The Minister of MAA led a meeting with the Grassy Narrows youth on July 30, 2012 and Chief and Council on July 31, 2012. MOE also attended and presented information from the ministry's published paper on mercury levels in the English-Wabigoon river system.
- The presentation focussed on declines in mercury levels in walleye over the last 40 years and how concentrations, while still severely elevated, are within the range of other northern Ontario lakes. Results were also provided for similar size whitefish, whose mercury levels are much lower, making them safer to eat.
- As a result of the discussion on the presentation, the following next steps are underway:
    - A follow-up Grassy Narrows First Nation Inter-ministry Working Group teleconference was held on September 7, 2012 with the Chief and community. Another one will be scheduled later in September 2012 to discuss the next steps;
    - MOE will contact Chief and Council after the next teleconference to discuss the possibility of working together to collect fish for continued monitoring on the

recovery of the English-Wabigoon system from the historical mercury discharges, and to provide fish consumption advisories based on the latest measurements;

- MOE and MNR to discuss a potential study looking at the effects of logging and clear cutting on mercury levels in fish
  - Grassy Narrows First Nation has expressed concerns that inappropriate logging on crown land impacts traditional practices. There is a general body of knowledge illustrating that logging practices promote mercury release to rivers; however, any impacts to the English-Wabigoon system is unclear and could not be evaluated without further analysis.
- MOE will review the sediment study Grassy Narrows First Nation had commissioned; and,
- A multi-agency group meeting with Grassy Narrows First Nation fall 2012 (TBD).

Stakeholder Considerations

- In a May 30, 2012 letter and fish fry invitation to the minister, the Grassy Narrows First Nation requested that the ministry help their community establish a permanent Grassy Narrows-run environmental monitoring station to inform and protect their people from damage from pollution and logging.

- From June 4 to 8, 2012, the Grassy Narrows First Nation held a series of events to raise awareness about mercury poisoning in their area. The events included a walk from north of Kenora to Toronto, and a rally on June 8, 2012 at Queens Park.

- Grassy Narrows First Nation has also called for a moratorium on industrial projects.

- Under a 1985 Settlement Agreement, benefits continue to be paid to Grassy Narrows and Wabaseemoong First Nation members who demonstrate symptoms consistent with mercury poisoning. This is done through the Mercury Disability Board. The MAA continues to financially support the Mercury Disability Board in its role of administering the Mercury Disability Fund and making awards for eligible people.

- In August 2012, MNR sent a letter to local businesses in the Kenora area warning them not to purchase illegally caught walleye, pike, sauger and sturgeon from the English and Winnipeg River systems.

GENERAL INFORMATION	
PREPARED BY: Dr. Rachael Fletcher Dr. Satyendra Bhavsar , EMRB	**TEL.:** 416-327-2935 416-327-5863
BRANCH APPROVAL: Ian Smith, Director, EMRB	**TEL.:** 416-235-6160
DIVISION APPROVAL: Anne Neary, ADM, ESSD	**TEL.:** 416-314-6310
DIVISION APPROVAL DATE:	
OTHER CONTACTS: Jim Fry, NR, Operations Division	**TEL.:** 807-475-1714

Appendix 1: Mercury pollution in the Wabigoon/English River system
Appendix 2: Results of the Sport Fish Report and Fish Consumption Advisories
Appendix 3: Dr. Masazumi Harada
Appendix 4: MOU to address communities' issues
Appendix 5: Xeneca Waterpower Projects FIT contracts

Appendix 1: Mercury pollution in the Wabigoon/English River system

- From 1963 to 1970, approximately 9-11 metric tonnes of mercury from a chlor-alkali plant in Dryden, Ontario were released into the Wabigoon River. In 1970, this release was reduced by 99%, and by 1975 the chlor-alkali plant had converted to a process that did not use mercury.

- In 1970, commercial fishing was banned in the river system due to contamination of the fish stock; the pollution has impacted both the economies and health of the Grassy Narrows and Wabaseemoong First Nations.

- As a precautionary measure, the ministry tests the pulp and paper mill effluent at Dryden on an annual basis for mercury. To date, it has not been detectable at 20 parts per trillion (ng/L).

- The ministry is not aware of any current point sources of mercury into the natural environment in the Wabigoon/English River system.

- While various remediation techniques, such as dredging to remove the most contaminated sediment, were suggested, there is no evidence that significant efforts at remediation were conducted likely because they were not feasible.

- Currently, there are 12 locations on the Wabigoon River system under consideration for waterpower development. If lands are flooded during these projects, some increases in fish mercury concentrations may be expected for a number of years.

- There is no provincial program through which the mercury levels in land animals in Ontario are tested, nor has the province been provided with any such scientific data from a third party.

- The study showed that overall, mercury concentrations in fish from four representative lakes in affected areas of the English and Wabigoon Rivers, and surrounding lakes have declined since elevated mercury concentrations in fish were discovered in the 1970s (approximate 80% decline in sport fish), but are still above the sport fish consumption guidelines and background levels especially in the lakes close to the historical mercury discharge point.

- The fish mercury levels in the Wabigoon and English Rivers continue to decrease; however, current fish mercury levels remain elevated. The rate of decrease is expected to be slow relative to the earlier, more rapid declines.

- Mercury concentrations in some fish in Tetu Lake, where the English River joins the Winnipeg River system, are similar to background concentrations.

- Based on fish mercury data collected by the MOE and MNR, restrictive fish consumption advisories are also in place for lakes surrounding Grassy Narrows community (namely Grassy Narrows Lake, Indian Lake, Garden Lake, Toothpick Lake, Delaney Lake, and Meandering Lake).

Sport fish Consumption Advisories

- Sport fish consumption advisories are provided through a biennial publication called the Guide to Eating Ontario Sport Fish (published since 1978).

- Ontario's sport fish consumption advisories are generally based on Health Canada's Tolerable Daily Intakes (the estimated quantity of a contaminant that can be ingested daily over a lifetime without posing a significant risk to health). Separate advisories are provided for the general population and the sensitive population (women of child-bearing age and children under 15).

- Sport fish consumption advice is based on a combination of fish size, species and location. The *Guide* lists the number of meals per month of the particular sizes and species of fish that can be safely consumed per month.

- There is currently one lodge on Clay Lake, which caters to anglers and hunters. Clay Lake also has a public access point. MNR indicated that they are not aware of lodges giving warnings regarding the consumption of fish from Clay Lake.

- The Guide advises that consumption of most sizes and species of fish from this lake is not recommended for sensitive populations (women of childbearing age and children under 15).

- The consumption advisories for fish become less stringent as you get closer to Grassy Narrows within the English/Wabigoon River system for the lakes within the Guide.

- It should also be noted that there are restrictive consumption advisories on almost every lake that is monitored across the province.

Appendix 3: Dr. Masazumi Harada

- In September 2002, Dr. Masazumi Harada, a Japanese researcher specializing in mercury poisoning, visited the Grassy Narrows First Nation at the request of the Chief. Dr. Harada found an increase in, and new cases of, mercury poisoning on the reserve.
- In August 2003, the ministry received a summary of Dr. Harada's report. The MOHLTC reviewed the summary; the ministry of the Environment did not participate in the review.
- Dr. Harada made a follow-up visit to Grassy Narrows in August 2004.

Dr. Harada's report: *Long-term study on the effects of mercury contamination on two indigenous communities in Canada (1975-2004).*

- Harada's research team first visited Grassy Narrows and Whitedog First Nation communities in 1975 and collected hair and blood samples for mercury analyses and assessed 89 residents for symptoms of Minamata Disease (neurological disorder). Some residents had mercury levels in hair above the "safety guideline of 50 ppm".
- In 1975 he concluded "mild Minamata Disease" was evident in residents based on hair and blood mercury levels plus assessment of neurological and sensory disturbances, but no "severe or typical " cases were observed.
- The Harada research team returned 27 years later in 2002 and 2004 and assessed 156 residents from the communities of Grassy Narrows and Whitedog FN (hair and blood analyses, physical and neurological testing), including 27 residents that were assessed in both 1975 and 2002/04.
- Even though mercury levels in hair and blood had fallen since 1975 Harada concluded that 79% of the residents assessed in 2002/04 had one or more physical or neurological symptoms characteristic of Minamata Disease, claiming "long-term low exposure in the past must have caused the symptoms".
- Harada's report acknowledges that the Ontario government issued warnings against taking fish for food in 1970. Since 1977 the ministry has been publishing the "*Guide to Eating Ontario Sport Fish*", broadening the scope of sport fish monitoring and reporting in Ontario.
- For the 27 residents examined in both 1975 and 2002/04, in all cases the disease symptoms had worsened. The report states that no new cases of Minamata Disease are expected considering the current low levels of mercury in the Indigenous residents from the Grassy Narrows and Whitedog First Nations.
- Harada also concluded it is possible to contract "chronic type" Minamata Disease even if hair levels are below the "safety guideline" (50 ppm earlier referenced). The research team also suggested the possibility of congenital Minamata Disease because of the presence of some disease symptoms in children born after the period of high environmental exposure.

Appendix 4: MOU to address communities' issues

- There have been two separate means for addressing the communities' issues - the 1978 Memorandum of Understanding (MOU) which focused on socio-economic issues, and the 1985 Settlement Agreement out of which the Mercury Disability Board was formed to compensate members of the two First Nations who demonstrate symptoms consistent with mercury poisoning. In Ontario, the ministry of Aboriginal Affairs is the lead on these activities.

- Under the 1978 MOU, the Grassy Narrows First Nation and Ontario pursued a further agreement on socio-economic issues. Despite considerable efforts, an agreement was not achieved.

- Ontario has met its obligations under the 1985 Settlement Agreement with the two First Nations relating to the discharge of mercury. The two First Nations received $2 million from Ontario, as well as additional funding from the federal government, into the Mercury Disability Fund, which was established as part of the Agreement signed by all parties.

- Ontario has a statutory obligation to maintain the Mercury Disability Fund above $100,000 as per the Ontario legislation Ontario English and Wabigoon River Systems Mercury Contamination Settlement Agreement Act, 1986, S.O. 1986, c.23, (the "Ontario Act").

Appendix 5: Xeneca Waterpower Projects Feed-in-Tariff (FIT) contracts with Ontario Power Authority

Xeneca Waterpower Projects has submitted three FIT applications to the Ontario Power Authority. Of these, two were rejected at the application stage, and only one application at Quibell is currently still active. The Quibell application is currently in the application queue and has not been processed.

Above Ball Lake (FIT-FD8YUER) REJECTED (in 2009)
notes: MNR site # 5QD17,5QD18
Wabigoon River
4.1MW

Wabigoon Falls REJECTED (in 2009)
FIT-FJ739ZC
MNR site # 5QD06
Wabigoon River
3.9MW

Quibell Application Complete (Nov. 2009) --> no contract.
FIT-FTWA92K
MNR site # 5QD04,5QD05
Wabigoon River
4.5 MW

Bhavsar, Satyendra (MOECC)

From: Fletcher, Rachael (ENE)
Sent: February-05-13 3:38 PM
To: Bhavsar, Satyendra (ENE)
Subject: Hg and clear cutting

What ever happened to the project you were trying to set up looking the effects of logging on Hg concentrations in fish.

Alves, Tanya (MOECC)

From: Smith, Ian (ENE)
Sent: August 7, 2013 1:33 PM
To: Fletcher, Rachael (MOECC)
Subject: RE: ELA and Grassy Narrows First Nation

See the name from frank....i'm not surprised it's slow – ongoing logging will increase Hg mobilization and nobody is tracking the downstream implications....

From: Fletcher, Rachael (ENE)
Sent: August 7, 2013 12:44 PM
To: Smith, Ian (ENE)
Subject: Re: ELA and Grassy Narrows First Nation

As a heads up - Satyendra has been working with MNR to try and set up a study using the SF data to see if we see any relationship between different logging practices and Hg in fish. This has been a slow process though and we haven't quite managed to get it up and running yet.

From: Smith, Ian (ENE)
Sent: Wednesday, August 07, 2013 12:40 PM
To: Kennedy, Frank (MNR); Neary, Anne (ENE)
Cc: Somers, Keith (ENE); Fletcher, Rachael (ENE)
Subject: ELA and Grassy Narrows First Nation

NO LOGGING, NO MERCURY: Noise Demo at Kathleen Wynne's home!

There will be a protest on the 24th led by the Grassy Narrows band as per the banner above.

MAA is leading preparation of the materials for the PO responding to the five (5) demands being made – one demand relates to controlling logging upstream of their water intake, GN contending logging is releasing mercury that they are drinking. Another demand is for $$ to support an "environmental health monitoring program" on GN. MAA is leading an inter-ministerial team on GN issues (year 2 now) with MOHLTC and MOE as key members – not sure Frank if MNR is a member, think not – interesting in light of the concerns about logging.

s.13

s.13

Ian

INFORMATION NOTE: Grassy Narrows First Nation Mercury Contamination
DATE: July 28, 2014

ISSUE

The Asubpeeschoseewagong Netum Anishinabek (formerly Grassy Narrows First Nations), has expressed concerns with the mercury levels from historical contamination in the fish from the English-Wabigoon River system. An inter-ministerial working group with the ANA continues to discuss this and other issues facing the community.

KEY MESSAGES

- The Ministry of the Environment and Climate Change is committed to protecting Ontario's natural environment, our watersheds and our resources now and for future generations.
- The unfortunate mercury contamination that occurred in the English-Wabigoon River system in the 1960s and early 1970s predated the controls the Ministry of the Environment and Climate Change puts on industrial discharges today.
- We now have tough laws, standards and conditions in place to protect our environment from sources of contamination, including mercury.
- Testing has shown that mercury levels in sport fish in parts of the river system have declined as much as 87 percent since the 1970s, although consumption advisories remain in effect.
- The ministry tests the pulp and paper mill effluent at Dryden on an annual basis for mercury. The results show that mercury has not been detectable in the mill's effluent since at least 1989.
- The Ministry of Aboriginal Affairs established a cross-ministry team made up of the Ministries of Health and Long-Term Care, Natural Resources and Forestry and Environment and Climate Change to address issues such as health, mercury contamination and fish testing, and economic development.
- A working group was developed with Asubpeeschoseewagong Netum Anishinabek to discuss the community's issues. The group consists of members from the First Nation along with the ministries of Aboriginal Affairs, Environment and Climate Change, Northern Development and Mines, Health and Long-Term Care, and Training, Colleges and Universities.

- The province is currently working with the community to develop a monitoring program and will consider the Grassy Narrows First Nation's request for an environmental monitoring station as part of this review.

- The ministry is working with the community to enhance their participation in monitoring activities, such as the Drinking Water Surveillance Program and the Sport Fish Contaminant Monitoring Program.

IF ASKED ABOUT CLEAN UP

Has there been any clean up to date? Why not?

Studies by the federal and provincial governments were conducted in the 1980s in the Wabigoon River to determine the location and the extent of contamination. In general, a clean up was not advisable due to the possible remobilization of mercury.

Natural sedimentation within the system over the past 30+ years to provide for a cap was considered and is a viable remediation option for mercury contamination. Surveys suggest that mercury concentrations in the sediments have gone down and could be at levels comparable to other lakes in the area.

BACKGROUND

- During the 1960s and 1970s, mercury pollution occurred in the English-Wabigoon River system in northwestern Ontario from the operation of the chlor-alkali plant in Dryden (refer to Appendix 1).

- The Asubpeeschoseewagong Netum Anishinabek (ANA) relies on fish from the river system for food and obtains its drinking water from lakes within the river system and has expressed concerns with the mercury levels from historical contamination since the fish from this system are an important source of food for their community.

Recent Developments:

- ANA recently announced their intent march to Queens Park (arriving on July 29, 2014) to protest against health related mercury issues and forestry activities.

- A main concern of the community is that the government has never formally recognised/acknowledged that community members are suffering from symptoms similar to that of people with Minamata disease (neurological disorder). The community is asking for:
    1. Mercury Disability Board (MDB) be restructured to compensate fairly people with mercury poisoning and related illnesses;

2. A specific tripartite protocol between ON/CAN/Grassy Narrows via the MDB to pay all medical and related expenses for hospitalization for those with chronic disabilities and illnesses; and,

3. A facility built on the reserve similar to the one in Japan (Minamata) where people with similar mercury-related medical conditions can be cared for together.

- Former Chief Steven Forbister met with the Minister of Aboriginal Affairs on July 27, 2014, and while he still intends on protesting mercury compensation, he will not be undertaking a hunger strike.

- Media reports indicate that a 2010 report, entitled "Literature Review: The Impact of Mercury Poisoning on Human Health," was commissioned by the Mercury Disability Board. The Mercury Disability Board contracted Drs. Chan and Mergler to review all literature worldwide to ensure up to date information on the impact of mercury on human health. The 2010 report by Drs. Chan and Mergler was made available to the Chiefs of ANA and Wabaseemoong and presented to a joint Mercury Disability Board/Search committee meeting.

Drinking Water Surveillance Program (DWSP)

- On June 10, 2014, at the request of the Band Council, MOECC staff visited the community to initiate monitoring for the community's drinking water under DWSP (a voluntary program that monitors trends and contaminant levels for a wide variety of parameters in drinking water). The MOECC collected information about the treatment processes and determined if and where water samples could be collected. Ministry concerns related to the treatment system were reported to Health Canada.

- On July 24, 2014, at the request of First Nations' counsel, a written summary of MOECC observations and concerns was sent to the Chief of the Band Council which included: non-functioning chemical dosing equipment; no online turbidity or chlorine monitors; lack of operator training; and, elevated treated water turbidity. Recommendations were made to follow up with the First Nations' Environmental Health Officer to fix the treatment equipment and online monitors, to have proper operator training, and to consider other upgrades to the treatment process.

ANA - Ontario Working Group

- The ANA-Ontario Working Group met on June 10 and 11, 2014. Issues of discussion included Drinking Water Surveillance and Fishing, Prenatal Health Care, Health/Environmental Literature Reviews, and Health Survey. The Kenora/Dryden Public Health Unit was in attendance for discussions surrounding infant health care within the community.

- At the end of the 2 day meeting, ANA members announced that they did not want to continue with Working Group meetings until a federal representative was present. MAA and MOHLTC are working with Health Canada on this request.

University of Ottawa-Health Canada Study on Food Nations Food Nutrition

- Dr. Chan, from the University of Ottawa, completed a study on First Nations food nutrition throughout Ontario; the study was funded by Health Canada and released to the community in June 2014. Although the ministry provided sportfish data to support the study, it was not provided with a copy of the report by either the researcher or community.

- The study is based on sampling conducted in 2011 on a random sample of 100 people from 100 different households in the community. Each person participated in a dietary survey and health questionnaire, and provided researchers with a sample of 30 types of traditional food they believed to be contaminated (including fish) for contaminant analysis. They were also asked to provide hair samples for contaminant analysis.

Grassy Narrows Sport Fish Study

- In January 2011, the ministry (in collaboration with the Ministry of Natural Resources [MNR]) conducted an internal study for MAA to assess mercury contaminants in fish as a result of historical contamination in the English-Wabigoon River system.

- Findings were published in the Journal of Environmental Monitoring (July 2012, (refer to Appendix 2), and showed that overall, mercury concentrations in fish from four representative lakes in affected areas of the English and Wabigoon Rivers, as well as surrounding lakes have declined since elevated mercury concentrations in fish were discovered in the 1970s (approximate 80% decline in sport fish). However, levels are still above the sport fish consumption guidelines and background levels, especially in the lakes close to the historical mercury discharge point (refer to Appendix 3).

Meetings with ANA

- On July 31, 2012, then Minister of Aboriginal Affairs, Kathleen Wynne, accompanied by representatives from the MAA, the MOECC, and MOHLTC, visited the ANA to discuss concerns about mercury contamination in the community. The ANA raised five key issues: concerns with the Mercury Disability Board (MDB); community health issues; education; economic development; and environmental concerns.

- During the meeting, and in a CBC radio interview on August 3, 2012, the Minister of Aboriginal Affairs committed to:
  - re-engage the federal government about the community's concerns;
  - revitalize Ontario's Inter-ministerial Committee on Grassy Narrows (an internal advisory committee to the provincial government) to formalize next steps;
  - address specific issues raised by the community; and,
  - re-engage with the Chair of the MDB about the concerns raised about benefits.

- Committee teleconferences were held in the fall of 2012 to discuss the next steps and review short and long-term strategies developed by MAA, and to plan for a follow-up meeting with the ANA.
  - Short-term Objectives:
    - Review list of key issues raised by the community;
    - Develop an approach for reporting back to the community;
    - Set out a collaborative engagement process between ANA and the province;
    - Initiate review of concerns related to MDB procedures and processes;
    - Involve Health Canada on community-based health education initiatives and identifying any gaps between provincial and federal programs.

  - Long-term Strategy:
    - Develop a proactive approach to re-establishing a meaningful relationship with ANA and to maintaining momentum from the July 31, 2012 meeting;
    - Work across Ontario ministries to develop responses and action items related to the key issues;
    - Consider the short and long-term role of the MDB; and,
    - Revisit mediation agreement issue.

ANA - Ontario Working Group

- Established in November 2012, the Working Group's function is to formalize the relationship between Ontario and ANA, and to continue efforts to address concerns related to mercury, health and social issues in the ANA community that are within provincial jurisdiction. Members include the Chair of the MDB and representatives from ANA, MAA, MOECC, MOHLTC, Ministry of Northern Development and Mines (MNDM), and the Ministry of Training, Colleges and Universities (MTCU).

- On February 6, 2013, the first face to face meeting of the working group was held. Discussions centered around the possibility of working together to collect fish for continued monitoring, the ANA's participating in the ministry's Drinking Water Surveillance Program (DWSP), and, working collaboratively to assess past work done in the area, review gaps in knowledge and assess current environmental conditions.

- During an April 25, 2013 teleconference, the ANA expressed interest learning more about DWSP, possible external funding opportunities for fish collections, and information on discharges from the Ear Falls station and the Dryden mill. They also asked the ministry to review a sediment study commissioned by the community.

- During the June 25, 2013, in person meeting, the ministry presented an overview of DWSP and discussed information on discharges from the Ear Falls station and the Dryden mill.

- On October 1, 2013, the Ontario-ANA Working Group met to identify key research questions on environmental concerns related to mercury, review maps of the area, and discussed how to conduct sampling.

- In mid-January 2014, the Working Group met to discuss health issues and the Mercury Disability Board, environmental issues and the river system, and planning site visits to areas of concern in May 2014.

Stakeholder Considerations

- On October 31, 2013, the ANA issued a News Release in relation to the Whiskey Jack Forest Management Plan (which they have rejected), and included an October 24, 2013 letter to the Premier.

- In a May 30, 2012 a fish fry invitation was sent to the Premier and various MPPs, including the Minister of MAA. The ANA requested that the MOE help their community establish a permanent ANA-run environmental monitoring station to inform and protect their people from damage from pollution and logging.

- From June 4 to 8, 2012, the ANA held a series of events to raise awareness about the mercury poisoning (walk from north of Kenora to Toronto; Queens Park rally). The ANA has also called for a moratorium on industrial projects in their community.

- Under a 1985 Settlement Agreement, benefits continue to be paid to ANA and Wabaseemoong Independent Nations members who demonstrate symptoms consistent with mercury poisoning (through MDB). The MAA continues to financially support the MDB in administering the Mercury Disability Fund and making awards for eligible people.

- In August 2012, MNR sent a letter to Kenora area businesses warning them not to purchase illegally caught walleye, pike, sauger and sturgeon from the English and Winnipeg River systems.

- On August 28, 2013, protesters marched on Premier Wynne's home over mercury levels in the ANA community. The protest did not seem to be sanctioned by the ANA.

GENERAL INFORMATION	
PREPARED BY: Dr. Rachael Fletcher Dr. Satyendra Bhavsar, EMRB	**TEL.:** 416-327-2935 416-327-5863
BRANCH APPROVAL: Ian Smith, Director, EMRB	**TEL.:** 416-235-6160
DIVISION APPROVAL: Anne Neary, ADM, ESSD	**TEL.:** 416-314-6310
DIVISION APPROVAL DATE:	28/July/2014
OTHER CONTACTS: Jim Fry, NR, Operations Division	**TEL.:** 807-475-1714

Appendix 1: Mercury pollution in the English-Wabigoon River system
Appendix 2: Sport Fish Report Results and Journal of Environmental Monitoring Article
Appendix 3: Fish Consumption Advisories
Appendix 4: Dr. Masazumi Harada
Appendix 5: MOU to address communities' issues
Appendix 6: Xeneca Waterpower Projects FIT contracts

Appendix 1: Mercury pollution in the English-Wabigoon River system

- From 1963 to 1970, approximately 10 metric tonnes of mercury from a chlor-alkali plant in Dryden, Ontario were released into the Wabigoon River. In 1970, this release was reduced by 99%, and by 1975 the chlor-alkali plant had converted to a process that did not use mercury.

- In 1970, commercial fishing was banned in the river system due to contamination of the fish stock; the pollution has impacted both the economies and health of the ANA and Wabaseemoong Independent Nations. As a precautionary measure, the ministry tests the pulp and paper mill effluent at Dryden annually for mercury. To date, it has not been detectable at 20 parts per trillion.

- The ministry is not aware of any current point sources of mercury into the natural environment in the English-Wabigoon River system.

- While various remediation techniques, such as dredging to remove the most contaminated sediment, have been suggested, there is no evidence that significant efforts at remediation were conducted. This is likely because they were not feasible.

- Currently, there are 12 locations on the Wabigoon River system under consideration for waterpower development. If lands are flooded during these projects, some increases in fish mercury concentrations may be expected for a number of years.

- There is no provincial program through which the mercury levels in land animals in Ontario are tested, nor has the province been provided with any such scientific data from a third party.

- At the request of ANA, MOECC reviewed the wild animal food contaminant study the community had had commissioned and provide comments:
  - The ministry agrees with the findings, that conclude the wild food in the territories have very low levels of the chemical contaminants considered in the study.
  - The ministry supports the advice that the consumption of certain organs of wild animals should be limited or avoided.
  - The suggestion of limiting consumption of pickerel and northern pike flesh is reflected in the fish consumption advisories issued by the ministry.
  - The report recommends future contaminant screening needs to consider dioxins and furans measurements in flesh of predatory fish. The ministry has collected measurements of dioxins and furans in whitefish; the measurements were low and do not pose any major health concerns.

- MOECC and MNRF are discussing a potential study looking at the effects of logging and clear cutting on mercury levels in fish. ANA has expressed concerns that inappropriate logging on crown land impacts traditional practices. There is a general body of knowledge illustrating that logging practices promote mercury release to

rivers; however, any impacts to the English-Wabigoon River system is unclear and could not be evaluated without analysis.

Appendix 2 – Results of the Sport Fish Report and Journal of Environmental Monitoring Article

- The study showed that overall, mercury concentrations in fish from four representative lakes in affected areas of the English and Wabigoon Rivers, and surrounding lakes have declined since elevated mercury concentrations in fish were discovered in the 1970s (approximate 80% decline in sport fish), but are still above the sport fish consumption guidelines and background levels especially in the lakes close to the historical mercury discharge point.

- The fish mercury levels in the Wabigoon and English Rivers continue to decrease; however, current fish mercury levels remain elevated. The rate of decrease is expected to be slow relative to the earlier, more rapid declines.

- Mercury concentrations in some fish in Tetu Lake, where the English River joins the Winnipeg River system, are similar to background concentrations.

- Based on fish mercury data collected by the MOECC and MNRF, restrictive fish consumption advisories are also in place for lakes surrounding ANA community (namely Grassy Narrows Lake, Indian Lake, Garden Lake, Toothpick Lake, Delaney Lake, and Meandering Lake).

Appendix 3 - Sport Fish Consumption Advisories

- Sport fish consumption advisories are provided through a biennial publication called the Guide to Eating Ontario Sport Fish (published since 1978).
- Ontario's sport fish consumption advisories are generally based on Health Canada's Tolerable Daily Intakes (the estimated quantity of a contaminant that can be ingested daily over a lifetime without posing a significant risk to health). Separate advisories are provided for the general population and the sensitive population (women of child-bearing age and children under 15).
- Sport fish consumption advice is based on a combination of fish size, species and location. The Guide lists the number of meals per month of the particular sizes and species of fish that can be safely consumed per month.
- There is currently one lodge on Clay Lake, which caters to anglers and hunters. Clay Lake also has a public access point. MNR indicated that they are not aware of lodges giving warnings regarding the consumption of fish from Clay Lake.
- The Guide advises that consumption of most sizes and species of fish from this lake is not recommended for sensitive populations (women of childbearing age and children under 15).
- The fish consumption advisories in the Guide, become less stringent the closer the fish are to Grassy Narrows within the English-Wabigoon River system for the lakes.
- It should also be noted that there are restrictive consumption advisories on almost every lake that is monitored across the province.

Appendix 4: Dr. Masazumi Harada

- In September 2002, Dr. Masazumi Harada, a Japanese researcher specializing in mercury poisoning, visited the Grassy Narrows First Nation at the request of the Chief. Dr. Harada found an increase in, and new cases of, mercury poisoning on the reserve.

- In August 2003, the ministry received a summary of Dr. Harada's report. The MOHLTC reviewed the summary; the MOE did not participate in the review.

- Dr. Harada made a follow-up visit to Grassy Narrows in August 2004.

Dr. Harada's report: *Long-term study on the effects of mercury contamination on two indigenous communities in Canada (1975-2004).*

- Harada's research team first visited ANA and Whitedog First Nations (a part of the Wabaseemoong Independent Nations) communities in 1975 and collected hair and blood samples for mercury analyses and assessed 89 residents for symptoms of Minamata Disease (neurological disorder). Some residents had mercury levels in hair above the "safety guideline of 50 ppm".

- In 1975 he concluded "mild Minamata Disease" was evident in residents based on hair and blood mercury levels plus assessment of neurological and sensory disturbances, but no "severe or typical" cases were observed.

- The Harada research team returned 27 years later in 2002 and 2004 and assessed 156 residents from the communities of Grassy Narrows and Whitedog First Nations (hair and blood analyses, physical and neurological testing), including 27 residents that were assessed in both 1975 and 2002/04.

- Even though mercury levels in hair and blood had fallen since 1975 Harada concluded that 79% of the residents assessed in 2002/04 had one or more physical or neurological symptoms characteristic of Minamata Disease, claiming "long-term low exposure in the past must have caused the symptoms".

- Harada's report acknowledges that the Ontario government issued warnings against taking fish for food in 1970. Since 1978, the ministry has been publishing the "Guide to Eating Ontario Sport Fish", broadening the scope of sport fish monitoring and reporting in Ontario.

- For the 27 residents examined in both 1975 and 2002/04, in all cases the disease symptoms had worsened. The report states that no new cases of Minamata Disease are expected considering the current low levels of mercury in the Indigenous residents from the ANA and Whitedog First Nations.

- Harada also concluded it is possible to contract "chronic type" Minamata Disease even if hair levels are below the "safety guideline" (50 ppm). The research team also suggested the possibility of congenital Minamata Disease because of the presence of some disease symptoms in children born after the period of high environmental exposure.

Appendix 5: MOU to address communities' issues

- There have been two separate means for addressing the communities' issues:
  - In 1978, representatives of the Government of Canada, the Province of Ontario and the two communities signed a Memorandum of Understanding (MOU), which focused on socio-economic issues
  - 1985 Settlement Agreement out of which the Mercury Disability Board was formed to compensate members of the two First Nations who demonstrated symptoms consistent with mercury poisoning.

  In Ontario, the Ministry of Aboriginal Affairs is the lead on these activities.

- Under the 1978 MOU, the ANA and Ontario pursued a further agreement on socio-economic issues. Despite considerable efforts, an agreement was not achieved.

- Ontario has met its obligations under the 1985 Settlement Agreement with the two First Nations relating to the discharge of mercury. The two First Nations received $2 million from Ontario, as well as additional funding from the federal government, into the Mercury Disability Fund, which was established as part of the Agreement signed by all parties.

- Ontario has a statutory obligation to maintain the Mercury Disability Fund above $100,000 as per the Ontario legislation Ontario English and Wabigoon River Systems Mercury Contamination Settlement Agreement Act, 1986, S.O. 1986, c.23, (the "Ontario Act").

Appendix 6: Xeneca Waterpower Projects Feed-in-Tariff (FIT) contracts with Ontario Power Authority

Xeneca Waterpower Projects has submitted three FIT applications to the Ontario Power Authority. Of these, two were rejected at the application stage, and only one application at Quibell is currently still active. The Quibell application is currently in the application queue and has not been processed.

Above Ball Lake (FIT-FD8YUER) REJECTED (in 2009)
notes: MNR site # 5QD17,5QD18
Wabigoon River
4.1MW

Wabigoon Falls REJECTED (in 2009)
FIT-FJ739ZC
MNR site # 5QD06
Wabigoon River
3.9MW

Quibell Application Complete (Nov. 2009) --> no contract.
FIT-FTWA92K
MNR site # 5QD04,5QD05
Wabigoon River
4.5 MW

Bhavsar, Satyendra (MOECC)

From: Fletcher, Rachael (ENE)
Sent: June-07-12 10:14 AM
To: Bhavsar, Satyendra (ENE); Smith, Ian (ENE)
Cc: Coordinator, EMRB (ENE)
Subject: RE: Hg declines in walleye from Clay Lake

When logging occurs, do they burn off the land before replanting? If this is the case can this also contribute to the overall load?

Rachael Fletcher Ph.D.

Manager, Biomonitoring Section
Ministry of the Environment
125 Resources Road
Etobicoke, Ontario
M9P 3V6

Tel: (416) 327-2935
Cell: (416) 453-6591
Fax: (416) 327-6519

From: Bhavsar, Satyendra (ENE)
Sent: June 7, 2012 9:20 AM
To: Smith, Ian (ENE); Fletcher, Rachael (ENE)
Cc: Coordinator, EMRB (ENE)
Subject: RE: Hg declines in walleye from Clay Lake

Although overall logic you presented seems a possibility, unfortunately it is a little more complicated -- which prevents us from making a confident statement. For example, it's not just possible increased mercury loading due to logging but also other factors such as possible increased loading of organic material may affect how and how much of increased/decreased mercury in the system gets bioaccumulated in fish. Even if overall mercury loading and water (and sediment) "total" mercury concentrations decline, you may see increased fish mercury levels due to increased methylation under changed conditions (e.g., water chemistry). It is as clear as mother's milk (this is a phrase a long time sport fish monitoring staff, Andre -- now retired, used to say)!!!

From: Smith, Ian (ENE)
Sent: June-07-12 8:12 AM
To: Bhavsar, Satyendra (ENE); Fletcher, Rachael (ENE)
Cc: Coordinator, EMRB (ENE)
Subject: RE: Hg declines in walleye from Clay Lake

So the Hg loading from soil erosion that accompanies logging (to clay lake) introduces a signal on-top of the signal from the Hg levels than the contaminated sediments? So during logging there might be a "top-up" of Hg – but once the logging ceases to load sediments to the water column those sediments will be cleaner that the historically contaminated sediments so overall there should be reduced hg cycling into the fish, because the sediments are cleaner near the top, yes?

From: Bhavsar, Satyendra (ENE)
Sent: June 7, 2012 12:27 AM
To: Smith, Ian (ENE); Fletcher, Rachael (ENE)
Cc: Coordinator, EMRB (ENE)
Subject: RE: Hg declines in walleye from Clay Lake

BEST AVAILABLE COPY

Yes, it comes from increased soil erosion from logging. [illegible] but research continues on this topic to improve knowledge.

From: Smith, Ian (ENE)
Sent: June-06-12 5:09 PM
To: Bhavsar, Satyendra (ENE); Fletcher, Rachael (ENE)
Cc: Coordinator, EMRB (ENE)
Subject: Re: Hg declines in walleye from Clay Lake

Where did the information come from on hg releases by logging? Ela?

I imagine its not the logging but the erosion of soils?

I other words is the hg released from the slash or from the soils?

Ian

Sent from my BlackBerry Wireless Handheld

From: Bhavsar, Satyendra (ENE)
To: Smith, Ian (ENE); Fletcher, Rachael (ENE)
Cc: Coordinator, EMRB (ENE)
Sent: Wed Jun 06 15:02:29 2012
Subject: RE: Hg declines in walleye from Clay Lake

Yes, logging introduces Hg! Do we have funding to conduct this study (I would love to explore) as this question itself is a research project on its own??!!!

From: Smith, Ian (ENE)
Sent: June-06-12 2:59 PM
To: Bhavsar, Satyendra (ENE); Fletcher, Rachael (ENE)
Cc: Coordinator, EMRB (ENE)
Subject: RE: Hg declines in walleye from Clay Lake

So logging introduces Hg? Could be?

It also introduces sediments – if they are cleaner than clay lake aren't we actually enhancing recovery of the system if we have logging?

Which trend overpowers the other – is logging more important to Hg trends than sedimentation?

From: Bhavsar, Satyendra (ENE)
Sent: June 6, 2012 1:36 PM
To: Smith, Ian (ENE); Fletcher, Rachael (ENE)
Cc: Coordinator, EMRB (ENE)
Subject: RE: Hg declines in walleye from Clay Lake

To my knowledge: One of the factors that might have slowed down the mercury declines in the last two decades could be logging activities in the area that began around the 1980s. Logging in the area has been mostly suspended since Abitibi Bowater surrendered their license in June 2008 under intense pressure from grassroots blockades, boycotts, and

legal action. In 2011, ON Court of Appeal ordered no logging without consent on Grassy Narrows Territory north of the English River, and Government of Ontario has agreed to it. However, the order may be appealed to the Supreme Court of Canada. So not sure what is going to happen in future.

In light of this new development (cessation of logging), we may see resumption of faster downward trend for mercury in fish (Note: I am not sure how imp logging activity is for fish mercury in the English-Wabigoon River). If we are going to track such changes, 10 year sampling frequency will not be powerful enough to detect them.

Satyendra

Satyendra Bhavsar, Ph.D., P.Eng.
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Please consider the environment before printing this email

-----Original Message-----
From: Smith, Ian (ENE)
Sent: June-06-12 1:26 PM
To: Fletcher, Rachael (ENE)
Cc: Bhavsar, Satyendra (ENE); Coordinator, EMRB (ENE)
Subject: Re: Hg declines in walleye from Clay Lake

So then we can stop monitoring lakes or draw back to every 10 years or something?

Sent from my BlackBerry Wireless Handheld

----- Original Message -----
From: Fletcher, Rachael (ENE)
To: Smith, Ian (ENE)
Cc: Bhavsar, Satyendra (ENE); Coordinator, EMRB (ENE)
Sent: Wed Jun 06 10:25:38 2012
Subject: Hg declines in walleye from Clay Lake

Ian, I'm not sure we are comfortable providing a strong statement as to when Hg levels will ever reach 0.5ug/g. Over the last 30 years levels have fluctuated within a very narrow range. The apparent downward trend is not statistically significant. We are seeing similar trends, and even apparent upward trends in the great Lakes (eg lake Erie) areas of the states and globally. There is debate in the scientific community as to whether Hg is actually increasing or not. It is just too soon to tell.

Alves, Tanya (MOECC)

From: Smith, Ian (ENE)
Sent: August 7, 2013 1:33 PM
To: Fletcher, Rachael (MOECC)
Subject: RE: ELA and Grassy Narrows First Nation

See the name from frank....i'm not surprised it's slow – ongoing logging will increase Hg mobilization and nobody is tracking the downstream implications....

From: Fletcher, Rachael (ENE)
Sent: August 7, 2013 12:44 PM
To: Smith, Ian (ENE)
Subject: Re: ELA and Grassy Narrows First Nation

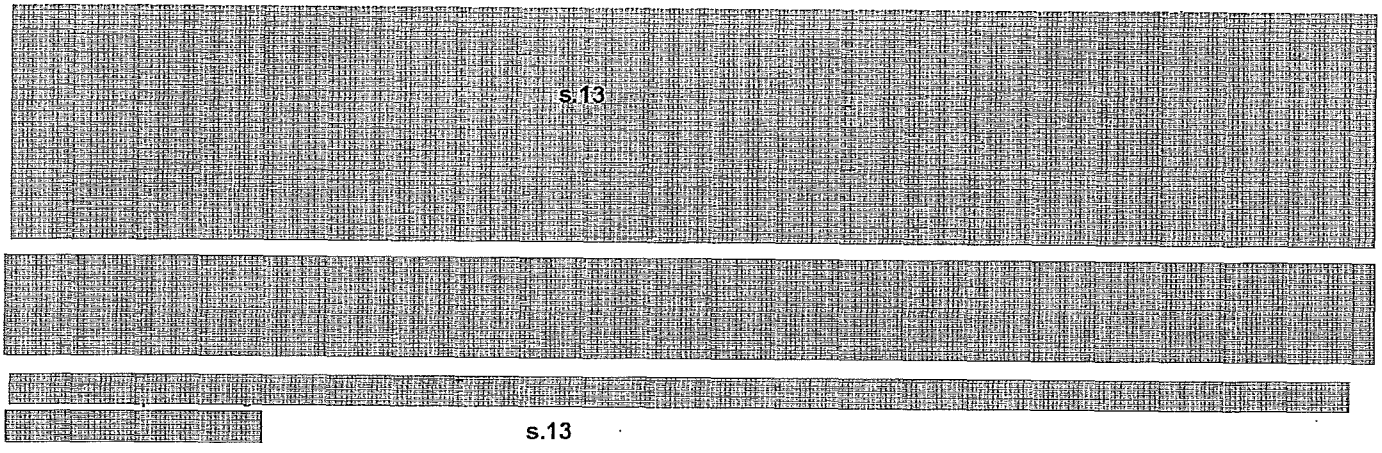
As a heads up - Satyendra has been working with MNR to try and set up a study using the SF data to see if we see any relationship between different logging practices and Hg in fish. This has been a slow process though and we haven't quite managed to get it up and running yet.

From: Smith, Ian (ENE)
Sent: Wednesday, August 07, 2013 12:40 PM
To: Kennedy, Frank (MNR); Neary, Anne (ENE)
Cc: Somers, Keith (ENE); Fletcher, Rachael (ENE)
Subject: ELA and Grassy Narrows First Nation

NO LOGGING, NO MERCURY: Noise Demo at Kathleen Wynne's home!

There will be a protest on the 24th led by the Grassy Narrows band as per the banner above.

MAA is leading preparation of the materials for the PO responding to the five (5) demands being made – one demand relates to controlling logging upstream of their water intake, GN contending logging is releasing mercury that they are drinking. Another demand is for $$ to support an "environmental health monitoring program" on GN. MAA is leading an inter-ministerial team on GN issues (year 2 now) with MOHLTC and MOE as key members – not sure Frank if MNR is a member, think not – interesting in light of the concerns about logging.



Ian

Alves, Tanya (MOECC)

From: Fletcher, Rachael (ENE)
Sent: January 10, 2014 6:32 PM
To: Schaus, Susan (MAA)
Cc: Walker, Elizabeth S. (MOHLTC)
Subject: Suggested wording

At the meeting, the community expressed their concerns over logging in the Grassy Narrows area. the community is already sensitive to the effects of Hg. This should be recognized when logging rights are being considered in this area, and it should be advised that a precautionary approach be considered. The community have peer reviewed studies showing that logging activities can result in the release of Hg into the natural environment. At the meeting concern was raised that all the work the inter agency working group has been doing to address the community's concerns could be negated if logging is allowed to continue in the area.

s.13

It should also be noted that the community expressed that they are considering a protest sometime around march to raise awareness of the logging issue as well as the Hg disability issue.

Alves, Tanya (MOECC)

From: Fletcher, Rachael (ENE)
Sent: March 21, 2014 9:29 AM
To: Wills, Devon (ENE)
Subject: Fw: Do you have any papers or links to Hg 101
Attachments: Garcia 2007 Hg Forest Harvesting Logging Fire Seasonal Inter-annual variation.pdf

Hope this helps

----- Original Message -----
From: Bhavsar, Satyendra (ENE)
Sent: Friday, March 21, 2014 05:18 AM
To: Fletcher, Rachael (ENE)
Subject: RE: Do you have any papers or links to Hg 101

Hi Rachael,

Sorry this got buried. Attached paper may be useful in this case. Let me know if you need anything else.

Cheers,
Satyendra

-----Original Message-----
From: Fletcher, Rachael (ENE)
Sent: March-14-14 9:55 AM
To: Bhavsar, Satyendra (ENE)
Subject: Do you have any papers or links to Hg 101

In particular how logging increases water flow and hence Hg release

To: Alves, Tanya (MOECC)
Subject: FW: FYI Daily Issues Alert - December 30, 2014
Attachments: QA - Whiskey Jack - Dec 19(2).doc; Whiskey Jack FMP IN 12 22.docx; [redacted]

2400 603

s.N

From: Smith, Ian (MOECC)
Sent: December-30-14 12:47 PM
To: Bhavsar, Satyendra (MOECC)
Cc: Winter, Jennifer (MOECC); Fletcher, Rachael (MOECC)
Subject: FW: FYI Daily Issues Alert - December 30, 2014

Note the "monitoring" is of soils and not the aquatic ecosystem.

Just curious – were we approached by EAAB for any input to the decision re: impacts on mercury in fish?

Ian

From: Sifo, Vittoria (MOECC)
Sent: December-30-14 7:42 AM
To: Shukla, Neera (MOECC); Dossett, Justin (MOECC); Todd, Aaron (MOECC); Celsie, Paul (MOECC); Klose, Steve (MOECC); Trevisan, Lisa (MOECC); DCO, Coordinator (MOECC); Hall, Yvonne (MOECC); Correia, Sergio (MOECC); Charron, Chris (MOECC); Odumeru, Joseph (MOECC); Duncan, Heather (MOECC); Capobianco, Shannon (MOECC); Radcliffe, Steve (MOECC); Smith, Ian (MOECC); Medeiros, Grace (MOECC); Jones, Karen (MOECC); Gray, Stefanie (MOECC); Conrod, Deborah (MOECC); Fletcher, Rachael (MOECC); Somers, Keith (MOECC); Wong, Mary-Ann (MOECC); Grgic, Dajana (MOECC); Carr, Cynthia (MOECC); Luniewski, Renee (MOECC); Cheung, Patrick (MOECC); Munoz, Tony (MOECC); Boyd, Darcy (MOECC); Boyd, Duncan (MOECC); Vansteenburgh, Ellen (MOECC); Welch, Katherine (MOECC); SDB, Coordinator (MOECC); Paulin, Christopher (MOECC); Yee, Kim (MOECC); Vasta, Shahsultan (MOECC); Mills, Janet (MOECC); Reiner, Eric (MOECC); Coordinator, EMRB (MOECC); Gillespie, Gerald (MOECC); ENE) (Sarah.Olinski@ontario.ca; ENE) (Adrienne.Bitner@ontario.ca; ENE) (Garth.Napier@ontario.ca; ENE) (Jason.Fani@ontario.ca
Subject: FYI Daily Issues Alert - December 30, 2014

There are no urgent items on the Alert this morning. Several stories of interest follow - note those one Grassy Narrows and neonics.

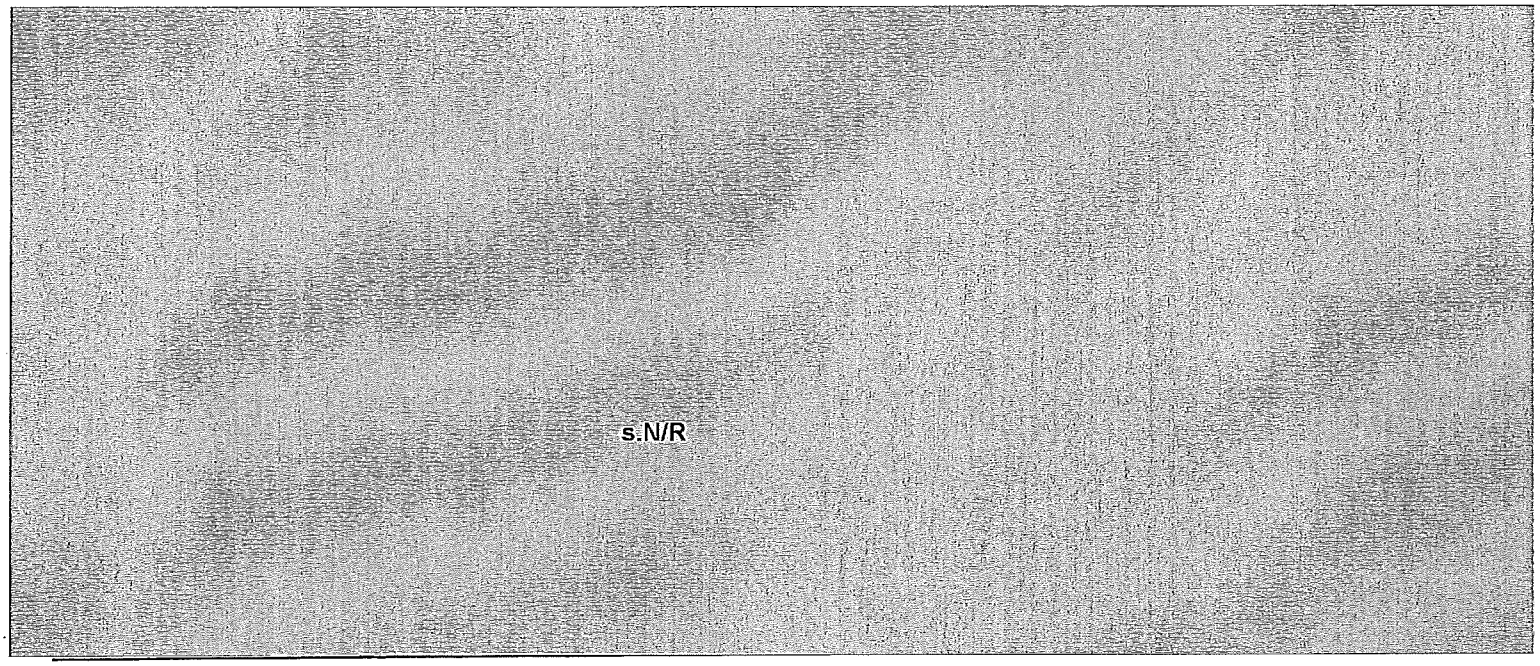
MOE DAILY ISSUES ALERT

Tuesday, December 30, 2014.

Action Items: No action items.

Top Stories:

- **Grassy Narrows denied assessment on clear-cutting; First Nation fears logging may raise mercury levels on site of 1960s poisoning** (Toronto Star) – see media response and attached Q&A and Information Note.



Page 19
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22

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de la Freedom of Information and Protection of Privacy Act

s.22

[redacted]

MOECC RESPONSE:

The ministry is confident that the Whiskey Jack forest management plan has been developed with monitoring and mitigation measures that will ensure any mercury migration is limited.

As a precaution, we have imposed conditions on the project to reduce any mercury movement. Conditions include, monitoring soil disturbances, and reporting any changes to research methodology. Additionally, measures to minimize soil disturbance such as harvesting only in the winter on shallow soil sites and reinforcing slopes and banks will be carried out.

It is worth pointing out that testing has shown that mercury levels in sport fish in parts of the river system have declined as much as 87 percent since the 1970s, although consumption advisories remain in effect. The ministry tests the pulp and paper mill effluent at Dryden on an annual basis for mercury. The results show that mercury has not been detectable in the mill's effluent since at least 1989.

In terms of timing, the decision was made on Dec 22nd and letters notifying the requesters of the decision were mailed that day.

Ontario

Kenora District
P.O. Box 5080
808 Robertson Street
Kenora, Ontario P9N 3X9

Ministry of
Natural Resources

Ministère des
Richesses naturelles

Tel: (807) 468-2501
Fax: (807) 468-2736

April 23, 2014

Agatha Garcia-Wright, Director
Environmental Assessment and Approvals Branch
Ministry of the Environment
2 St. Clair Avenue West
Toronto, ON M4V 1L5

RE: MNR RESPONSE TO MOE REQUEST FOR INFORMATION FOR THE 2012 TO 2022 FOREST MANAGEMENT PLAN FOR THE WHISKEY JACK FOREST

Dear Agatha:

The Ministry of Natural Resources (MNR) has received your request to provide information in relation to issues identified in the Individual Environmental Assessment (IEA) request on the 2012-2022 Forest Management Plan (FMP) for the Whiskey Jack Forest.

MNR has completed the response to the Ministry of the Environment (MOE) request and is pleased to provide it to you at this time. I have attached the response, containing the information requested.

If you have any questions regarding this response, please feel free to contact the MNR District Contact, Kurt Pochailo at (807) 468-2597 or kurt.pochailo@ontario.ca.

Sincerely,

Deb Weedon

Deb Weedon, District Manager
Kenora District
Ministry of Natural resources

Attachment

C: Devon Wills, MOE Project Evaluator
Neil Peterson, MNR Regional Contact
Paul Glassford, MNR Senior Advisor, Forest EA, FMPS
IEA Requesters

MNR Response to 2012-2022 Whiskey Jack FMP IEA Request

Introduction

The Director, Environmental Approvals Branch (EAB), Ministry of the Environment (MOE), has requested MNR provide specific documentation for consideration in its review of a joint request for an Individual Environmental Assessment on the 2012-2022 Whiskey Jack Forest Management Plan (FMP). This joint request was submitted by former Chief Simon Fobister, previous Chief of Grassy Narrows First Nation (GNFN), on behalf of Grassy Narrows First Nation, and Amber Ellis, Earthroots Executive Director, on behalf of Earthroots.

Documentation requested by MOE includes:

1. A detailed description of the involvement of the IEA requesters in the planning process;
2. A detailed description, with supporting documentation, of how the issues raised in the IEA requests;
    a. Were addressed in the planning process;
    b. Will be addressed in the implementation of forest operations and/or through additional commitments; and
3. A summary of Aboriginal involvement in the preparation of the FMP.

Potential mercury contamination appears to be the focus of the IEA requester's issues with the FMP. As this issue was raised late in the FMP process by the requesters, there is very little documentation of the issue in the FMP process as is explained in the following responses to MOE's questions. As a result, MNR has included an additional component in this response from MNR's forest science experts that should help MOE understand how MNR has been and will continue to investigate mercury issues through science and whether MNR is providing current science perspectives in the guides used to support the development of FMPs.

Further, MNR has a long standing relationship with Grassy Narrows First Nation and has been in ongoing discussions /negotiations on many topics, including forest management topics, for many years. MNR has included a brief summary of those topics and discussions to illustrate to MOE that MNR is making every attempt to address the first nation's interests and concerns.

Response to MOE's Questions

The MNR's response is structured to follow the information requested and is linked to the stages of consultation associated with the preparation of a FMP. For each stage of consultation, the response provides a brief overview of the requester's involvement in the planning process (Tables 1 and 2), and how the issues raised in the IEA request were addressed in the planning process

1. **A detailed description of the involvement of the IEA requestors in the planning process.**

Public consultation for the 2012-2022 Whiskey Jack FMP (Phase I) was developed in accordance with the requirements outlined in the 2009 Forest Management Planning Manual (FMPM).

The MNR's response is structured to follow the information requested and is linked to the following five stages of consultation for the development of the FMP; recognizing the preparation of the 2012-2022 Whiskey Jack FMP was interrupted by the preparation of a two year Contingency Plan (CP). The 2012-2014 CP was initiated during the planning process mainly to provide additional time to work with GNFN. The CP encompassed the first two years of operations developed for the 2012-2022 FMP. The endorsed CP Proposal can be found in Appendix A.

The resulting consultation stages for the 2012-2022 Whiskey Jack FMP are outlined as follows and include the stages of consultation for the preparation of the CP:

- Phase I: Stage One – Invitation to Participate
- Phase I: Stage Two – Review of Proposed Long-Term Management Direction

- Contingency Plan – Information Centre: Review of Proposed Operations
- Contingency Plan – Inspection of MNR-approved Contingency Plan

- Phase I: Stage Three – Information Centre: Review of Proposed Operations
- Phase I: Stage Four – Information Centre: Review of Draft Forest Management Plan
- Phase I: Stage Five – Inspection of MNR-approved Forest Management Plan

Prior to the commencement of the formal public consultation process for the preparation of the 2012-202 Whiskey Jack FMP, the Kenora District Manager, in accordance with

Part A, Section 4.4 of the FMPM, invited GNFN to discuss the development of a consultation approach for forest management planning with the community (i.e., customized consultation approach). GNFN indicated verbally to the Kenora District Manager that they did not want to discuss the preparation of the 2012-2022 Whiskey Jack FMP.

GNFN and Earthroots representatives received written notices for all stages of the consultation process in the preparation of the 2012-2014 CP and the 2012-2022 FMP, as required by the FMPM. In addition, at each stage of consultation, direct written notices were provided to some members of GNFN (e.g., trappers), public notices were placed in local newspapers, and an Information Notice was placed on the Environmental Registry website. Tables 1 and 2 provide a brief overview of the requester's involvement in the planning process for the 2012-2014 CP and the 2012-2022 FMP. The correspondence identified in Tables 1 and 2 can be found in Appendix A.

Table 1: Timeline and Correspondence Summary of Grassy Narrows First Nation in the FMP Process.

Date (dd/mm/yy)	Stage of Consultation and Contact
Stage One: Invitation to Participate	
20-Apr-09	Letter to Chief (6 months prior to Invitation to Participate) notifying of 2012-2022 FMP planning starting in November 2009.
3-Feb-10	Notification letter sent regarding the commencement of forest management planning process on the Whiskey Jack Forest (WJF)
2-Feb-10	Media Notice 2012-2022 FMP - Kenora Daily Miner
3-Feb-10	Media Notice 2012-2022 FMP - Red Lake Northern Sun News
6-Feb-10	Media Notice 2012-2022 FMP - Lake of the Woods Enterprise
10-Feb-10	Media Notice 2012-2022 FMP - Dryden Observer
18-Feb-10	Media Notice 2012-2022 FMP - Wawatay News
Stage Two: Long Term Management Direction	
14-Dec-11	Notification letter to review and comment on LTMD for the 2012-2022 FMP for the WJF
14-Dec-11	Media Notice 2012-2022 FMP - Kenora Daily Miner
17-Dec-11	Media Notice 2012-2022 FMP - Lake of the Woods Enterprise
19-Dec-11	Requested maps of LTMD were picked up by consultant and GNFN band member.
21-Dec-11	Media Notice 2012-2022 FMP - Dryden Observer
22-Dec-11	Media Notice 2012-2022 FMP - Wawatay News
2012-2014 Contingency Plan Development	

31-May-12	Registered letter sent to the Chief to bring GNFN up to date on the preparation of the 2012-2022 Whiskey Jack FMP. Notification of planning for Contingency Plan.
31-May-12	Media Notice 2012-2014 CP – Draft Plan Review – Kenora Lake of the Woods Enterprise
31-May-12	Media Notice 2012-2014 CP – Draft Plan Review – Wawatay News
1-Jun-12	Media Notice 2012-2014 CP – Draft Plan Review – Daily Miner
6-Jun-12	Media Notice 2012-2014 CP – Draft Plan Review – Northern Sun News
6-Jun-12	Media Notice 2012-2014 CP – Draft Plan Review – Dryden Observer
13-Jun-12	GNFN letter about the 2012-2022 FMP, presented at the CP planning team meeting on June 14th.
18-Jun-12	2012-2014 CP – Information Centre - Kenora
19-Jun-12	2012-2014 CP – Information Centre – Sioux Narrows
20-Jun-12	2012-2014 CP – Information Centre – Red Lake
21-Jun-12	2012-2014 CP – Information Centre – Ear Falls
30-Jul-12	Emails between District Manager and GNFN representative regarding planning of Aug 3rd meeting with GNFN.
3-Aug-12	Meeting with GNFN to discuss Whiskey Jack CP – GNFN would not discuss CP and left meeting – notes attached.
30-Aug-12	Letter to GNFN thanking them for their letter of June 13/2012 submitted to the planning team. This letter was in response to the 2012-2014 Draft CP.
18-Sep-12	Media Notice 2012-2014 CP – Notice of Approval – Daily Miner
19-Sep-12	Media Notice 2012-2014 CP – Notice of Approval – Northern Sun News
19-Sep-12	Media Notice 2012-2014 CP – Notice of Approval – Dryden Observer
20-Sep-12	Media Notice 2012-2014 CP – Notice of Approval – Kenora Lake of the Woods Enterprise
20-Sep-12	Media Notice 2012-2014 CP – Notice of Approval – Wawatay News
25-Sep-12	Letter to Chief – Invitation to inspect Approved CP
Stage Three: Review of Proposed Operations	
31-Jan-13	Registered letter to GNFN providing notification of upcoming Public Information Centres – offer in letter to have an information centre held at the community. No response received.
28-Jan-13	Media Notice 2012-2022 FMP Stage 3 - Lake of the Woods Enterprise
29-Jan-13	Media Notice 2012-2022 FMP Stage 3 - Kenora Daily Miner
2-Feb-13	Media Notice 2012-2022 FMP Stage 3 - Dryden Observer
2-Feb-13	Media Notice 2012-2022 FMP Stage 3 - Red Lake Northern Sun News
14-Feb-13	Media notice 2012-2022 FMP Stage 3 - Wawatay News
26-Feb-13	Letter sent to GNFN Chief reminding them of the upcoming Information Centres.
4-Mar-13	Information Centre 2012-2022 FMP Stage 3 - Kenora

5-Mar-13	Information Centre 2012-2022 FMP Stage 3 - Sioux Narrows
6-Mar-13	Information Centre 2012-2022 FMP Stage 3 - Red Lake
7-Mar-13	Information Centre 2012-2022 FMP Stage 3 - Ear Falls
3-Apr-13	Letter sent to GNFN Chief with CD containing maps and information on Stage 3 – Proposed Operations. Letter extended offer to hold an Information Centre in the community.
Stage Four: Review of Draft Plan	
30-Jul-13	Letter sent to GNFN inviting them to the upcoming Information Centres and provided a copy of GNFN Report on the Protection of Identified Aboriginal Values for review and comment. No comments were received from GNFN.
1-Aug-13	Media Notice 2012-2022 FMP Stage 4 - Lake of the Woods Enterprise
1-Aug-13	Media notice 2012-2022 FMP Stage 4 - Wawatay News
2-Aug-13	Media Notice 2012-2022 FMP Stage 4 - Kenora Daily Miner
7-Aug-13	Media Notice 2012-2022 FMP Stage 4 - Red Lake Northern Sun News
7-Aug-13	Media Notice 2012-2022 FMP Stage 4 - Dryden Observer
3-Sep-13	Information Centre 2012-2022 FMP Stage 4 - Sioux Narrows
4-Sep-13	Information Centre 2012-2022 FMP Stage 4 - Red Lake
5-Sep-13	Information Centre 2012-2022 FMP Stage 4 - Ear Falls
6-Sep-13	Information Centre 2012-2022 FMP Stage 4 - Kenora
24-Oct-13	Premier received letter regarding Draft Plan from GNFN
28-Oct-13	Received comments from GNFN on Draft Plan - Sent to Regional Director
Stage 5: Inspection of MNR Approved Plan	
19-Dec-13	Media notice 2012-2022 FMP Stage 5 - Wawatay News
23-Dec-13	Notification of MNR-approved FMP and 30 day Plan Inspection period
23-Dec-13	Media Notice 2012-2022 FMP Stage 5 - Kenora Daily Miner
24-Dec-13	Media Notice 2012-2022 FMP Stage 5 - Dryden Observer
25-Dec-13	Media Notice 2012-2022 FMP Stage 5 - Red Lake Northern Sun News
27-Dec-13	Media Notice 2012-2022 FMP Stage 5 - Lake of the Woods Enterprise

Table 2: Timeline and Correspondence Summary of Earthroots in the FMP Process.

Date	Stage of Consultation and Contact
Stage One: Invitation to Participate	
No correspondence received	
Stage Two: Long Term Management Direction	
22-Mar-12	Email from Earthroots requesting GIS files and past harvest information for the Whiskey Jack Forest
05-Apr-12	MNR responded to March 22, 2012 email requesting information – provided a list of requested materials and inquired if this would fulfill the requestors needs

05-Apr-12	Earthroots requested additional planning information in subsequent email
10-Apr-12	MNR response to April 5, 2012 email from Earthroots and directed them to the information requested.
2012-2014 Contingency Plan Development	
21-Jun-12	Received email from Earthroots requesting a specific individual is added to the Whiskey Jack Forest mailing list as well as a map and digital information of the plan.
Stage Three: Review of Proposed Operations	
No correspondence received	
Stage Four: Review of Draft Plan	
31-Oct-13	Received Earthroots comments on the 2012-2022 Whiskey Jack Draft FMP
1-Nov-13	Received email from Earthroots requesting data for the Draft Plan and the LTMD
05-Nov-13	Received email posing question regarding the Planned Wood Utilization by Mill (FMP-15) table from the Draft FMP
05-Nov-13	Email sent to Earthroots responding to request for large amounts of information on the 2012 Draft FMP
06-Nov-13	MNR responded to Earthroots November 5, 2013 request for digital information on the 2012-2022 FMP
26-Nov-13	Email from Earthroots regarding public input received during draft plan review and other questions related to planning
23-Dec-13	Responded to Earthroots email of November 26, 2013 providing all of the requested information.

2. **A detailed description, with supporting documentation, of how the issues raised in the IEA request:**
    a. **were addressed in the planning process; and**
    b. **will be addressed in the implementation of forest operations and/or through additional commitments.**

MOE determined that the following issues raised in the IEA request would be reviewed:

Issue 1 Harvest – Application of the clear cut silvicultural system on the area affected by the IEA request will disturb the soil causing naturally occurring mercury to become in flux and travel through the water system collecting in catchment areas already stressed with mercury, further exaggerating the existing mercury contamination issue in local waterways which may potentially affect human and ecosystem health and adversely impact Aboriginal and Treaty rights.

Issue 2 Harvest – MNR doesn't have the science and information base to support the development of prescriptions to mitigate the effect of mercury on terrestrial or aquatic ecosystems.

Issue 3 Harvest – FMP contains no requirements for ongoing monitoring of mercury levels in the area affected by the IEA request to determine if in fact approved forest operations once implemented would (further) elevate mercury levels in catchment areas.

Issue 4 Access – The construction of forest access roads on area affected by the IEA request will disturb the soil causing naturally occurring mercury to become in flux and travel through the water system collecting in downstream areas already stressed with mercury, further exaggerating the existing mercury contamination issue.

Issue 5 Consultation – MNR did not respond to comments submitted by the requestors on the mercury issue during the preparation of the FMP and the requestors have raised concerns about the failure to discharge the duty to consult in the development of this forest management plan.

Issues 1 to 4 deal with content of the FMP versus issue 5 which deals with the forest management planning process requirements. Therefore, issues 1 to 4 will be dealt with together and issue 5 will be dealt with separately.

Issues 1 to 4

During stages 1 through 3 of the planning process, issues 1 through 4 were not raised by the requesters. During Stage 4, the impact of clearcutting on mercury levels in piscivorous fish in local lakes and rivers was brought forward as one of a number of issues Earthroots had with the FMP. There was no corresponding mention of this issue in the response MNR received on the Draft FMP from GNFN. MNR responded to the issue brought forward by Earthroots indicating that MNR complied with the legislative, regulatory and policy requirements, including the approved forest management guides, which mitigate potential adverse effects on the environment. Through the implementation of the FMP, including the application of Area of Concern prescriptions, silvicultural ground rules, and best management practices for road construction activities, MNR will be further mitigating potential adverse effects on the environment. MNR has made no further commitments in the FMP to address the issues raised by the requesters.

Issue 5

In regards to the claim that MNR did not discharge its duty to consult during the development of the forest management plan, MNR followed the public and Aboriginal

consultation requirements outlined in the Forest EA approval and the FMPM as outlined below.

Aboriginal consultation for the 20012-2014 Whiskey Jack CP and the 2012-2022 Whiskey Jack FMP (Phase I) was undertaken in accordance with the requirements outlined in the 2009 Forest Management Planning Manual (FMPM):

1. Prior to the commencement of the formal public consultation process for the preparation of the 2012-202 Whiskey Jack FMP, the Kenora District Manager, in accordance with Part A, Section 4.4 of the FMPM, invited GNFN to discuss the development of a consultation approach for forest management planning with the community (i.e., customized consultation approach). GNFN declined the opportunity to develop a customized consultation approach.
2. The Kenora District Manager offered GNFN an opportunity to have a community representative sit on the FMP planning team and Local Citizens Committee (LCC). GNFN did not take the opportunity to become a member of the planning team or the LCC.
3. At each stage in the development of the CP and FMP notification letters were sent to GNFN to invite participation in the FMP process.
4. During the preparation of the 2012-2014 CP and the 2012-2022 FMP:
    a. the Kenora District Manager sought the involvement of GNFN to review and update the existing Aboriginal Background Information Report (ABIR), including the Aboriginal values maps; and
    b. The planning team produced a Report on Protection of Identified Aboriginal Values during the planning of operations as per the requirements of Part A, Section 4.6 of the FMPM

MNR responded to all comments submitted to the planning team during the preparation of the 2012-2014 CP and the 2012-2022 FMP in accordance with the requirements of the FMPM (Part A, Section 3.3.2.3). MNR did not receive any correspondence from GNFN, throughout the planning process, that there was a concern with the impact of clearcutting on mercury levels in piscivorous fish in local lakes and rivers. MNR did receive correspondence from Earthroots during Stage 4 of the planning process (i.e., Draft Plan Review) that they were concerned with, amongst many other concerns, with the impact of clearcutting on mercury levels in piscivorous fish in local lakes and rivers (Appendix A). MNR responded to these concern identified by Earthroots, indicating that MNR applied the direction in the approved forest management guides to mitigate potential adverse effects of forest management activities on the environment. (Appendix A).

In regards to the claim that MNR did not discharge its duty to consult during the development of these forest management plans, MNR followed the public and Aboriginal consultation requirements outlined in the Forest EA approval and the FMPM. Further, MNR has made substantial efforts to consult with GNFN on the specifics of the development of the 2012-2022 Whiskey Jack FMP and previous FMP plans (e.g., 2009 CP, 2012 CP). These efforts have been substantially rejected by GNFN. The duty to consult requirement is mandated under the Constitution Act, 1982 and as directed by case law, principally decisions rendered by the Supreme Court of Canada. It is also taken from this case law that First Nations cannot thwart the Crown's efforts to consult, such as refusing to participate in real and sincere efforts to consult. In regards to GNFN's assertion that "MNR did not discharge its duty to consult", with respect, the Ministry of the Environment has not been mandated to make a determination as to whether the MNR has met the burden of the Government's duty to consult.

In conclusion, the 2012-2014 CP and the 2012-2022 FMP for the Whiskey Jack Forest were prepared in accordance with the requirements of the FMPM.

3. Provide the web link to where a summary of Aboriginal involvement in the preparation of the FMP can be found.

The 2012-2022 Whiskey Jack FMP can be found on the Electronic FMP site at the following link:

http://www.efmp.lrc.gov.on.ca/eFMP/home.do

The summary of Aboriginal involvement has been retained at the Kenora District MNR office and its location is identified in Appendix C of the Supplementary Documentation. A copy of the summary can be found in the attachments to this letter.

Summary

The above documentation requested by MOE shows how MNR followed the *Forest Management Planning Manual - 2009* (FMPM) and engaged GNFN and Earthroots throughout the planning process. GNFN chose to remain on the periphery of forest management planning for the Whiskey Jack Forest by not participating on the planning team and rejecting offers to hold information centres at the community or engaging in face-to-face discussions. GNFN provided comments through the submission of letters at various stages throughout the planning process, and MNR responded to the concerns identified. The letters received from GNFN focused primarily on their rejection of the practice of "clearcutting" and their perception of elevated harvest levels. The application of the clearcut silvicultural system, as explained in MNRs responses to

GNFN, is the appropriate silvicultural system for the boreal forest, and ecosystem dominated by forest disturbance (eg. wildfire) and the planned harvest levels are in support of balanced objectives.

The issue of methylmercury was raised by GNFN for the first and only time, prior to the IEA request, in an October 24th, 2013 letter to the Premier, coincident with the Stage 4 – Review of Draft Plan. Earthroots also identified methylmercury as a potential issue for the first time in a letter dated October 31st, 2013 during Stage 4 – Review of Draft Plan.

The planning process contemplated the issue of methylmercury through the application of the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* 2010 (SSG). The accompanying Background and Rationale document for the SSG clearly acknowledges the potential for forest management activities to mobilize mercury, it provides a comprehensive summary of available scientific literature on the topic, provides a clear rationale for guide direction and acknowledges the uncertainty associated with this direction. There are no claims that SSG direction and application of the SSG will mitigate or eliminate Hg mobilization.

The summary of Aboriginal involvement identifies how MNR followed the requirements identified within the FMPM pertaining to Aboriginal consultation.

In addition to the information requested by MOE, MNR has provided some additional information with regard to the additional efforts to work with GNFN on many aspects of forestry and forest management planning on the Whiskey Jack Forest.

MNR Science Review

As part of MNR's review of the IEA request submitted by Grassy Narrows First Nation and Earthroots, MNR sought input from MNR forest scientists. They reviewed the submission, and in particular the many scientific references throughout, to ensure they were valid and pertinent to the discussion. Subsequently, MNR's forest scientists prepared the following response to the IEA requester's submission.

Introduction:

The IEA requestors contend that the Whiskey Jack forest management plan "fails to adequately deal with the impacts of logging on mercury levels in boreal water and fish" and that the plan will "harm water quality, fish habitat, wildlife and the health of people who eat the fish". To support their concern the requestors present as evidence a number of research studies that have shown that forest disturbance (both forest management and fire) result in changes to mercury dynamics within watersheds which may increase the movement of terrestrial bound mercury into aquatic systems and may be associated with higher levels of mercury in aquatic organisms.

The requestors also argue that the forest management guidelines, provided in the *Forest Management Guide for Conserving Biodiversity at the Stand and Site Scales* (the Stand and Site Guide or SSG), do not adequately address the issue of forest management impacts on mercury dynamics.

The IEA request is presented in 15 sections which address various related concerns. In the MNR science team's attempt to evaluate the scientific basis of the request and provide comments on current forest management policies and guidelines related to the issue, we have divided the sections into 4 general themes and we will address the scientific evidence and the interpretation of this evidence that is presented in themes A and B:

A) Concerns arising from research on mercury and forest management

1. Clearcutting Impacts Water Quality Through Mercury Contamination
2. Clearcutting Elevates Mercury Levels in Fish
3. Elevated Mercury Levels Impact Wildlife
11. Duration and Intensity of Impacts

B) Concerns associated with forest management policy (SSG)

7. Measures in the Logging Plan to Deal with the Mercury Problem
8. Stand and Site Guide Rationale on Mercury
9. Fundamental Problems with MNR Rationale
   - (i) Natural Disturbance Emulation Not Appropriate for Mercury Safety
   - (ii) Mitigation Science is Not Sufficiently Developed
   - (iii) Log Now, Test Later Approach.
12. Changes to Guidelines Are Likely to Make Mercury Problem Worse
   - (i) A. Logging to the Shoreline
   - (ii) Catchment Disturbance Thresholds Removed
13. Specific Deficiencies in MNR Mitigation Measures

C) Concerns arising from historical contamination

4. Fish in Grassy Narrows Have Critical Levels of Mercury
5. Mercury Impacts Human Health in Grassy Narrows

D) Concerns arising from the planning process (not directly linked to science/research)

6. Efforts to Raise the Mercury Issue
10. Delay and Hardship
14. Need for an Individual Environmental Assessment
15. Remedy Requested

A) Concerns arising from research on mercury and forest management

Mercury is a natural element that occurs in air, water, soil and biota in the boreal forest. Mercury, which exists in several inorganic, or elemental, forms (Hg) and as organic methylmercury (MeHg), alternates between forms and cycles among different components of the ecosystem as part of a complex biogeochemical process. Natural levels of mercury are spatially variable depending on geology, soil and forest characteristics; however, the global atmospheric pool of mercury has increased two to five fold over pre-industrial times (Linberg *et al.* 2007). There is clear evidence from a number of studies that forest management is one of a large number of factors that influence mercury dynamics within watersheds. In sections 1, 2, 3 and 11 the IEA requestors provide quotations from some of these studies to support their conclusions regarding the risk of mercury increases associated with forest management. The following is a review of these sections:

1. Clearcutting Impacts Water Quality Through Mercury Contamination

The requestors contend that forest management activities will result in an increase in Hg and MeHg in waterbodies in the area. As evidence to support this conclusion they present results from several studies conducted in Quebec, Sweden and Finland, much of which is summarized in a review paper by Bishop et al (2009).

MNR review:

- Increased mobilization of mercury within watersheds following forest disturbance has been documented in several studies done in Canada, Sweden and Finland.
- Disturbance impacts include increases in the concentration of Hg and MeHg in surface runoff (increased concentration) and increases in runoff, thereby increasing the movement of Hg even without concentration changes (transport or flux).
- Changes in Hg dynamics are highly variable among watersheds depending on a large number of factors, including watershed characteristics and the extent of disturbance. For example, Bishop et al (2009) show post-harvest Hg concentration response ranging from a 4 fold increase in a Finnish study to no increase found in a study done in Northwestern Ontario.
- Very little work is available which directly compares Hg mobilization between harvested and burned watersheds. Studies done in Quebec measured increases in dissolved organic carbon (DOC), to which Hg is bound in surface water runoff, following harvest under some conditions (large disturbance area within the watershed and a large watershed to lake area ratio) but not consistently (Carignan et al 2000).
- No research has been conducted to test the effectiveness of specific forest management planning or operational measures at mitigating increases in Hg

mobilization. Bishop et al (2009) provide some recommended practices which are similar to direction provided in the SSG (see discussion in theme B below).

Conclusion: There is strong evidence, based on a number of studies, that the rate of movement of Hg and MeHg from terrestrial to aquatic areas will increase following forest disturbance. There is not sufficient evidence to conclude that the magnitude of Hg response to forest management disturbance differs significantly from natural disturbance events in all cases; however, the mechanism of response is likely different. There is also no research available which tests the effectiveness of guidelines to mitigate changes in watershed Hg dynamics arising from forest disturbance.

2. Clearcutting Elevates Mercury Levels in Fish

The IEA requestors state that forest management activities in the Whiskey Jack forest will increase Hg inputs into aquatic systems which will harmfully alter fish habitat and result in an increase in MeHg levels in fish and other aquatic organisms. As evidence they present a number of quotes from Bishop et al (2009) as well as from Garcia and Carignan (2005). It should be noted that the Bishop et al (2009) paper is a review of previous research and all information presented on fish Hg levels come from a study by Garcia and Carignan (2000, 2005) so the evidence comes from a single study.

MNR review

- The study by Garcia and Carignan (2000,2005) which included 38 lakes (9 cut, 9 burned and 20 reference) is likely the most comprehensive study on the association between watershed disturbance and fish mercury levels.
- Fish in disturbed watersheds (cut and burned) had higher mercury levels than fish in undisturbed reference lakes
- Fish mercury levels were highly variable and were strongly positively correlated with fish size (fig 1) and fish trophic position (fig 4) (Garcia and Carignan 2005)
- Based on fig 4 (Garcia and Carignan 2005) more than 3 times more variability in fish mercury is associated with trophic position than with watershed disturbance and there is very little difference between fish mercury levels in cut and burned lakes when trophic position is controlled for.
- ‘The highest Hg concentrations were observed in fish from two partially burnt lakes’ (pg 690, Garcia and Carignan 2005). It appears that fire intensity (proportion of the watershed burned and the amount of organic layer burned) has a substantial impact on mercury dynamics in the watershed and the potential response of aquatic organisms.
- Through elevating DOC export from soils, an enhanced vector of Hg export to aquatic ecosystems occurs.

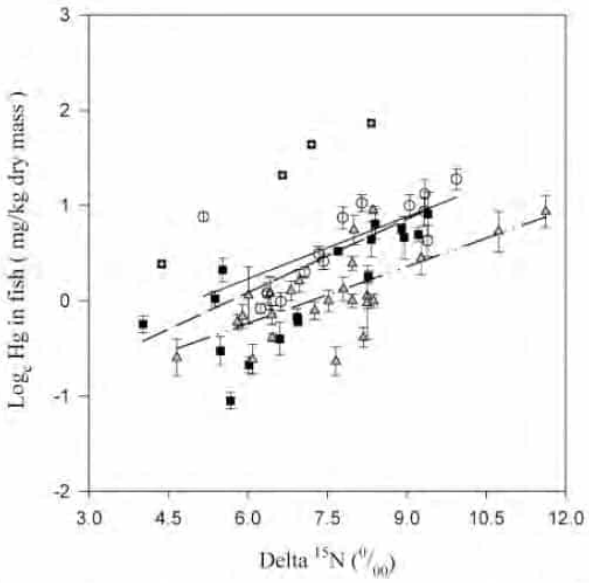

Fig. 4. Relationships between mercury (Hg) concentrations and fish $\delta^{15}N$ for reference lakes (triangles and dash-dot-dot line), and for lakes with cut (open circles and solid line) and burnt catchments (black and dotted squares for completely and partially burnt catchments, respectively, and dashed lines). Points represent fish of a standardized length from 62 populations. The $\delta^{15}N$ values are corrected for baseline variations. Error bars correspond to standard deviation.

From: Garcia and Carignan 2005

Conclusion: The comprehensive study of Quebec lakes provides evidence that fish in disturbed watersheds tend to have higher Hg concentrations than those in undisturbed watersheds. The study does not provide strong evidence that fish Hg concentrations consistently differ between burned and harvested watersheds. When trophic position is included in the analysis, fish Hg levels in harvested watersheds fall within the broader range of fish Hg levels in burned watersheds (fig 4, Garcia and Carignan 2005). This single study, despite being a very comprehensive, does not provide sufficient information to understand all the factors that influence fish Hg levels or how these factors may interact. Given the complexity of how disturbance impacts Hg dynamics and how aquatic systems may respond, it is unlikely that identical results would be seen in other regions of the boreal zone.

3. Elevated Mercury Levels Impact Wildlife

The IEA requestors express a concern that the mercury levels in a number of wildlife species, presumably those that consume fish, may increase if fish mercury levels increase. They provide evidence, primarily citing Environment Canada websites, which explains that mercury contamination can have negative impacts on the growth, development, behaviour and reproduction of wildlife species.

MNR review

- There is strong evidence that high body burdens of mercury may have toxic effects on certain wildlife species and lead to a number of health issues.
- Elemental mercury (Hg) in water and plants is not toxic to animals and is not stored in animal tissue; however, methylmercury (MeHg) is toxic and is stored and bioaccumulated in muscle and fat tissue. The main source of MeHg for terrestrial animals is the consumption of fish.
- We are unaware of any studies that directly examine the relationship between forest disturbance and wildlife Hg levels.

Conclusion: While it may be reasonable to assume that increases in fish Hg levels could lead to Hg increases in piscivorous wildlife species, the relationship between forest disturbance and fish Hg is not well understood (see section 2) and the further connection to wildlife is likely very complex and associated with a large number of interacting factors.

11. Duration and Intensity of Impacts

The requesters state on page 24 that “if further clearcutting is allowed without proven mitigation measures, and methyl mercury levels in local fish are elevated as a result, the impacts would likely be grave and long lasting.” They further contend that “the impacts of releasing mercury into the environment in Grassy Narrows through clearcut logging are likely to last at least a decade in fish, and at least one human lifespan beyond that in people”. They base their conclusions on data from studies conducted in (1) Ontario, Québec, Finland, and Sweden, much of which are summarized in studies by Bishop et al. (2009) and Garcia and Carignan (2005).

MNR review:

- The proponents state that “clearcutting has been found to increase MeHg bioaccumulation in boreal lakes by two to four fold, and sometimes as much as eight fold (Bishop et al., 2009)” (Page, 24). The further state that “As much as 37% of Hg in fish across a managed landscape would result from the increased Hg outputs associated with felling and thinning”. Bishop et al. (2009) actually calculated that forest harvesting may contribute 9 to 23% of MeHg fluxes from the soil following harvesting. They also made the point that many uncertainties existed in the calculations (e.g., small number of samples and a large range of impacts across studies).

- Few studies have been published regarding the effects of clearcut harvesting on fish MeHg concentrations. Those studies suggest that although MeHg concentrations in fish may increase following clearcut operations, it is generally limited to cases when soils are disturbed, and not to the harvesting of trees. This

was alluded to by Bishop et al. (2009), as well as reported in findings and discussions of other studies (Povari et al., 2003, Sørensen et al., 2009, Eklöf et al., 2012, 2013). Soil disturbance contributes to elevated fish concentrations in upland catchments via particulate matter (organic and mineral) transport from forest soils to streams and lakes. Whereas, soil disturbance of lowland (e.g., wetlands and riparian zones) catchments increase MeHg runoff to streams and lakes via enhanced dissolved organic carbon (DOC) transport. Therefore, no evidence exists contrary to the protection of soils from disturbance as described in the Stand and Site Guide as a mitigation measure minimizing forest harvesting operation effects on fish MeHg concentrations.

- The requesters further contend on pages 24 – 25 that "impacts of clearcutting on mercury have been found to persist for at least five years, with no known endpoint" and "the increased in Hg loading effect has also been observed to persist up to at least 5 years, and there are no examples so far of the logging effect having dissipated (Bishop et al., 2009)". In fact, Skyllberg et al. (2009) assessed stream MeHg concentration in Sweden by comparing 47 clearcut stands dominated by Norway spruce to 10 mature Norway spruce-dominated stands. They showed stream MeHg concentrations were elevated in stands 0 to 4 years after harvested, but no differences occurred in MeHg concentration in streams 4 to 10 years after harvested. Skyllberg et al. (2009) suggested these results were attributed to increased organic matter added by logging residue stimulating Hg methylating bacteria in the soil, and by 4 to 10 years, this effect dissipated.

- The Hg in fish higher in the food chain continued to increase several years after harvest (Garcia and Carignan 2000, 2005, as cited in Bishop et al., 2009 (Page 24).
  See response to section 2 for discussion of fish Hg response.

- The requesters contend on pages 25 – 26 that logging is likely to (1) further elevate mercury in fish in previously contaminated lakes due to increasing methylation rates of newly added mercury and stored mercury in lake sediments, (2) prolong the length of time for which fish in previously contaminated lakes remain unsafe to eat, (3) elevate mercury levels in fish in marginally safe lakes above safety limit, and (4) elevate mercury levels in fish in currently safe lakes above the safety limit.

  Skyllberg et al. (2009) reported that 17% of MeHg in streams came from methylation of stored mercury, while 73% arose from methylation of newly added mercury from logging debris and that TOC (total organic carbon in non-filtered water samples) and its structure did not differ between streams draining clearcut and mature forest catchments. Furthermore, Neff et al. (2012) conducted an intensive study of lake mercury levels in the English-Wabigoon River system. They examined long-term (1970 – 2010) monitoring data to assess temporal

trends in mercury in walleye, northern pike, and lake-whitefish in 4 lakes along a chain of lakes occurring from closest to furthest locations from a paper mill source (approximately 10 tonnes Hg input between 1962 and 1970); Clay, Ball, Separation, and Tetu Lakes, respectively. Neff et al. (2012) found that for all lakes and fish species, mercury declined by 35 to 94% through time, although walleye and northern pike mercury concentrations were above (Clay Lake) or near (Ball and Separation Lakes) the human consumption guideline of 0.5 µg g-1 of fish tissue. Additionally, the authors summarized mercury concentrations of walleye (45 cm length) and northern pike (50 cm length) based on 143 and 123 locations in northwestern Ontario. Neff et al., (2012) reported median values near the 0.5 µg g-1 guideline for walleye (25th – 75th percentiles = 0.38 and 0.75 µg g-1, respectively) and median of 0.38 (25th – 75th percentiles = 0.25 and 0.60 µg g-1, respectively) for northern pike.

Most rapid declines in fish mercury concentrations occurred between 1970 and 1985; however declines slowed from the late 1980s to 2010. Contributions to the slower declines are many and include (1) the lakes approaching baseline values prior to mercury contamination, (2) climate change enhancement of (a) area burned and severity of soil organic matter and mercury combustion or (b) extended drought followed by intense precipitation events, (3) catchment cover types and the wetland-to-lake ratio, and (4) connectivity of wetlands, streams, rivers, and lakes in a drainage basin.

- The proponents also suggest on pages 25 – 26 that “clearcutting leads to higher DOC compared to reference lakes and burned lakes (Garcia and Carignan, 2005), stimulating bacterial methylation, decreasing photo-oxidation of MeHg to Hg^{2+}, and possibly decreasing photo-reduction of Hg^{2+} to gaseous mercury. Those processes were suggested to elevate mercury levels in fish.

  Research has shown in the temperate and boreal regions of North America (Couture et al., 2012) and Europe (Laudon et al., 2013) that climate change is the primary cause of elevated DOC concentrations in lakes. Moreover, although studies (e.g., Haines et al., 1994; Sellers et al., 1996) suggest elevated DOC concentrations may inhibit photo-oxidation of MeHg and reduction of Hg^{2+} to gaseous mercury these results are far from universal. For example, although DOC is an important transport vector for Hg^{2+} and MeHg, this DOC is highly recalcitrant (e.g., low bacterial degradability). Whereas bacterial methylation is dependent upon the presence of easily degradable DOC concentrations (as well as electron acceptors such as sulphate); thus increasing DOC-Hg transport from soil to lakes does not necessarily translate into greater rates of mercury-methylation.

Conclusion: For forest harvesting to further exacerbate walleye and northern pike mercury concentrations in lakes situated in the English-Wabigoon River System, any mercury input to upstream catchments will need to traverse a myriad of interconnected

wetlands, streams, and lakes within the river system. However, we are aware of no published studies addressing potentially elevated long-range mercury transport in large drainage basins. In terms of MeHg (and assuming it is elevated in headwater catchments), some of it would be removed from the water column of lakes through (1) MeHg photo-oxidation to Hg^{2+} and its subsequent reduction to gaseous mercury and loss to the atmosphere or (2) settling of DOC- and particulate matter-bonded mercury from the water column to the sediments as water moves downstream. While much variation occurs in the photo-oxidation rates of MeHg to Hg^{2+} and its reduction to gaseous mercury, the current scientific evidence indicates that protecting soils from disturbance during harvesting operations as spelled out in the Stand and Site Guide will minimize total and methyl mercury loading from soils to streams and lakes in a catchment. Furthermore, it can be reasonably argued that any MeHg-containing water resulting from harvesting in headwater catchments will be diluted prior to reaching the English and Wabigoon Rivers and their connected lakes, thereby contributing little to mercury concentrations in the river system's lakes.

B) Concerns associated with forest management policy (SSG)

Direction in the SSG was based on a thorough review of existing literature, and discussions with and review by ecological researchers, practitioners, policy makers, stakeholders, and members of the public to ensure that direction would be effective in meeting ecological objectives, while also being feasible to implement and socially palatable. *'In all cases, the direction in the Stand and Site Guide represents a series of predictions or hypotheses. Those with a high degree of uncertainty have been identified as a high priority for testing through an effectiveness monitoring program (see Section 7). The results of this monitoring program, along with other sources of information, will be used during periodic reviews of the Stand and Site Guide to help determine when the guide needs to be revised'* (SSG section 1.3.5, pg 5). The SSG therefore represents a summary of the best available direction to meet MNR's objectives and legislative requirements for sustainable forest management and incorporates an adaptive management approach to evaluate and improve direction in areas of uncertainty.

Section 1.3 of the SSG summarizes the guide's approach to conserving forest biodiversity using guidance characterized as coarse and fine filters. This direction is based on the principles of the *Crown Forest Sustainability Act, 1994* (CFSA) which a key piece of legislation regulating forest management. Specifically the CFSA states:

> *The long term health and vigor of Crown forests should be provided for by using forest practices that, within the limits of silvicultural requirements, emulate natural disturbances and landscape patterns* [coarse filter] *while minimizing adverse effects on plant life, animal life, water, soil, air and social and economic values, including recreational values and heritage values* [fine filters] (CFSA s. 2(3)2).

The coarse filter approach to the emulation of natural disturbance and landscape patterns is intended to maintain the natural diversity of forest condition and ecological processes in order to conserve forest biodiversity and is a legal requirement under the CFSA. The coarse filter is not intended as a specific mitigation measure but rather an approach to maintain the state of all elements of the forest ecosystem within a natural range. Fine filter direction is included when there is evidence that additional mitigation measures will improve the protection of specific values.

During the development of the SSG, MNR did an extensive review of the body of scientific literature examining the relationship between forest disturbance and mercury dynamics. A summary of this review and the resulting decision on guide direction are provided in the SSG Background and Rationale document (pg 23-25) which is included as an appendix in the IEA request. The key points from the review were:

- The potential for forest management activities to result in mobilization of terrestrial mercury into aquatic systems is well documented and a serious concern.
- The nature and magnitude of changes in mercury dynamics within a watershed following disturbance are complex and related to a number of interacting factors including area disturbed, changes to hydrology, the amount and type of wetland in the area and soil disturbance.
- There is limited information on the potential for fish Hg levels to be influenced by harvest disturbance but the best available evidence shows that fish in lakes with disturbed watersheds had higher mercury levels than those in undisturbed watersheds and that the range of Hg levels in fish in harvested watersheds was within the range of those in burned watersheds (Garcia and Carignan 2000, 2005).
- There is a high degree of uncertainty regarding Hg response to forest management and the issue should be a high priority area for guide effectiveness monitoring.

Because there are no studies which identify or evaluate mitigation measures to minimize mercury mobilization following disturbance there are no mitigation measures specific to mercury in the SSG. The guide does provide direction to minimize site disturbance, sediment transport and hydrologic disruption (listed on pg 24 of the SSG Background and Rationale) all of which may be associated with increased mercury mobilization. In a review paper published following the release of the SSG, Bishop et al (2009) conclude that “An understanding of the processes controlling the output of Hg from catchments to surface waters, and subsequent bioaccumulation, is not sufficiently developed to confidently recommend ameliorative measures for forestry” (pg 378). They do offer some suggested practices, which include minimizing site disturbance and hydrological disruption and protecting wetlands. Direction in the SSG is entirely consistent with the recommendations of Bishop et al (2009).

The IEA request raises a few specific concerns about the SSG which suggest that they have misinterpreted the direction in the guide:

- In section 8 the requestors interpret the SSG rationale on mercury as stating “1. Logging is essentially equivalent to fire so attempts to emulate fire will eliminate Hg impacts”. The SSG does not suggest that emulation of natural disturbance patterns will eliminate Hg impacts. The emulation of natural disturbance patterns within watersheds is expected to result in watershed scale hydrologic changes that are within the range that would occur as a result of natural disturbance processes. The SSG provides additional direction to minimize site disturbance associated with harvest and road construction, particularly in areas that are expected to have higher soil moisture levels. The SSG acknowledges that Hg dynamics will likely change within the watershed as a result of any type of forest disturbance and that further research and monitoring is required to refine direction in the guide.

- In section 9 the requestors state that “logging and forest fire have nearly opposite impacts on mercury” (pg. 16). This statement is demonstrably false as all the literature they cite as evidence shows that Hg is mobilized and/or bioaccumulated following both fire and harvest disturbance. The mechanism and magnitude of Hg response almost certainly differs between burned and harvested watersheds but all of the studies cited found some level of Hg response following disturbance by fire. Fire intensity is likely an important factor that influences Hg response with high intensity fires volatilizing Hg bound in the organic soil layer and low intensity fires leaving this layer undisturbed and Hg subsequently being mobilized as water tables rise and surface runoff increases. In their study of fish Hg levels, Garcia and Carignan (2000, 2005) found the highest Hg levels in fish from watersheds impacted by low intensity fires and lower Hg levels in fish from watersheds with high intensity fires. Fish Hg levels in harvested watersheds fell within this range (Garcia and Carignan, 2000, 2005). (Note that the requestors appear to use fire size and fire intensity interchangeably when in fact these measure different things)

Conclusion: The Stand and Site Guide and accompanying Background and Rationale document clearly acknowledge the potential for forest management activities to mobilize mercury, provide a comprehensive summary of available scientific literature on the topic, provide a clear rationale for guide direction and acknowledge the uncertainty associated with this direction. There are no claims that SSG direction will mitigate or eliminate Hg mobilization.

Supplemental Information:

Outline of recently completed, ongoing, and proposed MNR research activities addressing identified science gaps with respect to total and methyl-mercury dynamics in forested watersheds.

As noted in section B (Concerns associated with forest management policy – SSG) of MNR's response to the current IEA request, and highlighted in the SSG Background and Rationale document there remains a high degree of uncertainty regarding Hg response to forest management activities. As such, MNR views this as a high priority area for guide effectiveness monitoring and research. It is anticipated that results from MNR's ongoing research efforts will be a valuable source of new scientific knowledge that will be used during the required periodic reviews of the SSG as part of the adaptive management approach to evaluate and improve direction in the guide with respect to minimizing the adverse effects of Hg mobilization and subsequent bioaccumulation.

As has been clearly highlighted in MNR's response to the IEA request of the Whiskey Jack FMP, total and methyl mercury export from terrestrial to aquatic ecosystems, and their accumulation through trophic levels in the latter are controlled by a myriad of interacting processes, including disturbance type and intensity, inherent site conditions, atmospheric mercury deposition, and climate change. These interacting factors contribute further to the high variability in mercury dynamics within forested watersheds. As such, MNR is supporting a number of research projects that are well-positioned to address critical science gaps associated with terrestrial and aquatic mercury dynamics, many of which have been part of multi-institutional (provincial ministries, federal , and academic) partnerships. The summary below provides brief overviews of research projects that are: (1) examining patterns in fish mercury bioaccumulation, (2) evaluating the levels of mercury runoff from forest and wetland soils to aquatic systems, (3) mercury research conducted by other provincial and federal agencies, some of which include MNR as partners, and (4) a proposed synthesis of land use effects (e.g., mining, hydroelectric, and forest management activites) on watershed Hg cycling and export..

1. **Fish mercury bioaccumulation**
   A. MNR research lead: Dr. Tom Johnston, Research Scientist, Aquatic Research and Monitoring Section
      1) Ongoing efforts to update fish mercury information, both in the near north and far north, to improve consumption guidelines and assist with community-based land-use planning.
      2) Determine temporal changes in fish mercury bioaccumulation, 1970s to present. These efforts are largely focused in the near north but does include some work in the far north as well. This project was the basis for Rex Tang's MSc thesis and has already been published (Tang et al. 2013. Sci. Tot. Environ.). Additional work is targeting additional lakes to provide

better geographic coverage for the analysis, and considering to repeat the analysis over shorter (more recent) timeframes.

3) Assess the relative importance of food web position and growth rate in shaping interspecific variability in piscivore mercury concentrations. This project is targeting lakes that have co-habiting populations of lake trout, burbot, walleye, and northern pike. This will allow us to control, to some extent, the between-lake variability when making interspecific comparisons.
4) Determine the spatial variation in fish mercury concentrations from headwaters to James Bay in the Attawapiskat River drainage basin (Lescord PhD project, started 2013). This project is restricted to the far north and looks at mercury dynamics following a river continuum framework. The PhD candiate will compare how mercury moves through the food web at various points along the continuum from the headwater lakes of the shield, to the main stem river of the lowlands.
5) Determine the roles of physical-chemical limnology and food web structure in shaping fish mercury patterns in lakes across a climatic gradient (Sumner MSc project, started 2013). The MSc student will examine lakes across the near north and far north, comparing the role of climate (inferred from latitude or GDD) with the role of other factors. She may include some landscape factors (e.g., area or vegetation cover of drainage basin) in the analysis.

B. MNR research lead: Dr. Rob Mackereth, Research Scientist, Centre for Northern Forest Ecosystem Research
    1) Ongoing monitoring of mercury in small stream biota to evaluate the association between the rate of bioaccumulation and biomagnification of mercury and stream characteristics, including catchment disturbance. Sampling of periphyton, benthic invertebrates and fish have been conducted in watersheds having different forest management histories. Results to date show that mercury is present in all stream biota and tends to be higher in small streams compared to large. We have found no differences in fish mercury levels based on forest management activities in the watershed. Fish and invertebrate mercury concentrations tend to be associated with local conditions including pH, conductivity, stream gradient and temperature. Future work will focus on measuring fish and invertebrate mercury levels in streams within burned watersheds.

2. Mercury runoff from forest and wetland soils to aquatic systems

A. MNR research lead: Dr. Rob Mackereth, Research Scientist, Centre for Northern Forest Ecosystem Research
    1) The Escape Lake experimental watershed study was initiated to evaluate the impacts of forest management activity on the hydrologic connectivity between terrestrial and aquatic habitats and to observe the catchment scale hydrologic (groundwater levels, surface water flow, water chemistry)

and soil chemistry response. Beginning in March 2003, the watershed was surveyed (high resolution DEM, vegetation plots, soil pits) instrumented (wells and pizometers in wetland and along 3 experimental and 1 reference hillslope transect, resin bag transects) and monitored for 1.5 years. Experimental clearcut harvesting was carried out in June 2004, and included harvesting merchantable trees within the prescribed 30m buffer. Water quality constituents examined include major cations (Ca^{2+}, Mg^{2+}, K^{+}, Na^{+}) and anions (SO_4^{2-}, Cl^{-}), nutrients (NO^{3-}, NH^{4+}, TN, ortho-P, TP), TSS, turbidity, DOC, SRSI and metals (Al, Fe, Mn, Cu, Cd, Pb, Zn, Ni and MeHg and THg). Mercury concentration in ground and surface waters did not increase; however, following harvest, catchment water yield approximately doubled relative to pre-harvest resulting in an increase in Hg flux.

2) The associations between watershed and lake scale characteristics with THg in piscivorous fish were examined as part of an MSc research project (Victoria Danco). ArcGIS was used to delineate the waterbody catchment area and extract waterbody catchment characteristics for 243 of northern Ontario's lakes. Walleye (*Sander vitreus,* n= 121 lakes), lake trout (*Salvelinus namaycush,* n= 60 lakes), brook trout (*Salvelinus fontinalis*, n= 18 lakes), northern pike (*Esox lucius,* n =107 lakes), smallmouth bass (*Micropterus dolomieu*, n = 37 lakes), and burbot (*Lota lota,* n= 4 lakes) populations were standardized to the mean length of the populations by using power-series regressions. Multivariate analysis (non-metric multidimensional scaling) and univariate analysis were used to determine the associations between total mercury concentrations in fish and watershed scale and lake scale variables. Watershed and lake chemistry characteristics poorly described the variability in THg concentrations. Forest harvesting and natural disturbance were not associated with fish mercury concentrations.

B. MNR research lead: Dr. Jim McLaughlin, Research Scientist, Forest Research and Monitoring Section

1) Climate change effects on total and methyl mercury runoff from peatlands. Intact peat monoliths were collected in 2012 from peatland located near White River and transported to the University of Western Ontario BIOTON, where we are exposing the cores to varying atmospheric-CO_2 concentrations, air temperature, and water table levels in a replicated experiment. Preliminary results point to low water table followed by rewetting of the peat through precipitation significantly elevated MeHg in runoff water compared to other treatments. Our PhD student (Catherine Dielman, started in 2013) is currently testing the relationships among climate change, plant vegetation, peat decomposition, Hg release, and its transport in conjunction with DOC flux.

2) On April 4 2014, the NSERC-Research Tools and Infrastructure funding program awarded us (University of Western Ontario, lead institute) a grant

to establish a field-based experimental system for the evaluation of the effects of elevated temperature and elevated atmospheric carbon dioxide (CO_2) on total and methyl mercury runoff peatlands.

3) Establishing baseline conditions for Far North peat total mercury storage. This project is ongoing, where peat samples are collected and analyzed for total mercury concentration, bulk density, and peat depth to mineral sediment recorded. The data will then be used to scale peat mercury levels to peatland area of the Far North.
4) Establishing baseline conditions for forest soil mercury storage. This project is also currently ongoing, where organic (e.g., forest floor) and mineral soil samples collected at selected locations are analyzed for total mercury and bulk density, and soil horizon thickness. These will then be used to scale total mercury levels by forest cover types in the Far North and Managed forest.

3. Other provincial and federal mercury research and monitoring studies

A. Ontario Ministry of the Environment
   1) Monitoring Results for Mercury in Ontario's Water in the Great Lakes, northern Ontario lakes, and the English-Wabigoon River System.
   2) Ontario Ministry of Environment commitment to fund the Experimental Lakes Area (ELA), which is one of the world's premier watershed-based studies on forest, wetland, and aquatic mercury cycling and transport research in the boreal forest. Past research has involved the Department of Fisheries and Oceans.

B. Canadian Network for Aquatic Ecosystem Services
   1) This national research network supported by NSERC's Strategic Network Grants program, which encourages large-scale, multidisciplinary, collaborative research projects that could improve Canada's economy, society and environment within the next decade. The network is a consortium of approximately 30 researchers from 11 universities, government, and industrial partners. The Attawapiskat River Basin is one of the intensive study locations.
   2) Provincial (MOE and MNR) and federal (Department of Fisheries and Oceans and Canadian Forest Service) are network partners, whose research and monitoring staff are working with Ontario universities (University of Western Ontario, University of Toronto, and Laurentian University), and those across Canada, to establish baseline conditions of aquatic mercury levels and understanding mercury transport (and methylation) mechanisms from terrestrial to aquatic ecosystems.

C. Environment Canada
   1) Canadian Environmental Sustainability Indicators tracks the emissions of mercury to the air. The data used to calculate these indicators are taken from the Air Pollutant Emission Summaries and Trends and the National

Pollutant Release Inventory (NPRI), Canada's legislated, publicly accessible inventory of pollutant releases. National and regional emissions of mercury are provided, with emissions broken down by source.

4. Synthesis of land use (e.g., mining, hydroelectric, forest harvesting and regeneration) effects on watershed total and methyl mercury cycling and export

A. Draft outline for synthesis
   1. Mercury atmospheric deposition amounts and trends.
   2. Forest and peatland mercury cycling and runoff to aquatic ecosystems.
   3. Mercury methylation and demethylation processes.
   4. Mercury turnover rates in litter and soil.
   5. Watershed hydrology and mercury fluxes.
   6. Aquatic mercury cycling and fluxes.
   7. Land use activities (e.g., forest harvesting, hydroelectric, mining activities) and their cumulative effects on aquatic mercury levels.

It is anticipated that this synthesis effort will be a key science product that will help guide the development of future research efforts to continue targeting important science/knowledge gaps with respect to Hg dynamics and response to land use activities.

Additional Forestry Discussions with Grassy Narrows First Nation

It is very important to note, that in addition to the consultation requirements addressed during the preparation of the 2012-2014 Whiskey Jack CP, and the 2012-2022 Whiskey Jack FMP, MNR has been actively involved in improving the relationship with GNFN for many years. Various representatives of MNR including the local District Manager, Regional Director and Assistant Deputy Minister's, have engaged in direct face-to-face efforts to hear and understand Grassy Narrows's community leadership and its members' views on forestry. Preparation of the 2009-2019 ten (10) year Forest Management Plan was delayed numerous times using interim FMPs called contingency plans (CP). These plans, the 2009-2012 CP and the 2012-2014 CP, were used to demonstrate MNR's commitment to the relationship by enabling ongoing discussions with GNFN. The result was that the development of a full and complete forest management plan, as per the Crown Forest Sustainability Act, was delayed for 5 years.

The following is a brief summary of the additional discussions undertaken by MNR with GNFN that are outside of the forest management planning process, that demonstrate MNR's ongoing commitment to build a sound relationship with GNFN:

- Grassy Narrows First Nation (GNFN), MNR, Abitibi and Indian and Northern Affairs Canada (INAC) have been in forestry discussions, individually or as a group, at various times, since at least 2004. In March 2004, focused discussions were initiated in response to road blockades organized by members of GNFN and their sympathizers. These discussions sought to understand and respond to GNFN grievances around forestry activities on the Whiskey Jack Forest.
- MNR, Abitibi and INAC indicated throughout the talks that they were prepared to discuss GNFN grievances on a practical basis, i.e., measures to address concerns

about how forestry was conducted, not rewriting the provincial forestry legislation or considering assertions for jurisdictional control of the GNFN traditional lands. The parties met on numerous occasions throughout 2004 and 2005 and exchanged a series of Interim Measures documents including a final joint offer that responded substantively to GNFN demands for enhanced consultation and involvement in forest management planning and increased economic benefits from forestry activities.

- The Interim Measures included annual funding for three years for capacity, infrastructure and community support as well as economic benefits in the form of preferential contracting and employment and annual wood allocation valued at approximately $2.5 million. Grassy Narrows First Nation has not responded or accepted these interim measures to date.
- Grassy Narrows has repeatedly rejected recent offers and has indicated that all future land use activities on their "homeland" will be directed by a culturally and ecosystem-based plan to be prepared independently by GNFN.
- GNFN has indicated that they will no longer react to "clearcut plans" of others nor are they able to remove existing blockades, release downed wood behind the blockades or enter into any agreement that would guarantee no further disruption of forestry operations.
- In 2008 Grassy Narrows First Nation and MNR signed a Memorandum of Understanding, which is referred to as the “Process Agreement”, to explore numerous aspects of forestry in the Whiskey Jack Forest as part of a multi-year process. The Honorable Justice Frank Iacobucci mediated the discussions between GNFN and MNR that led to the development and signing of the Process Agreement.
- During that time Grassy Narrows has received significant provincial funding and has worked with MNR on various working groups on matters related to forestry practices (i.e. new area of concern prescriptions, harvest block design, harvesting systems, etc.) and traditional values and use studies. These forestry practices were to be tested in the 115,000 hectare Pilot Project Area that was identified and agreed to by GNFN as part of the Process Agreement.Between 2009 and 2014 MNR deferred the completion of a new forest management plan to allow for Grassy Narrows to apply these practices; unfortunately little progress has been made during that time.
- This Process Agreement was twice mediated by the Honorable Justice Frank Iacobucci without resolving the lack of commitment by GNFN to achieving the practical measures identified in the agreement (e.g., traditional use study, forest management prescriptions to protect identified aboriginal values, etc.) or those identified in the mediated settlements (e.g., concurrent limited harvesting and concurrent forest management planning).
- The Process Agreement is still in effect though its focus has shifted from achieving the practical measures outlined in the document to discussing GNFN’s role in a new forest tenure relationship for the Whiskey Jack Forest. GNFN has expressed interest in being part of the new forest tenure on the Whiskey Jack Forest
- In 2012, MNR initiated detailed discussions with Grassy Narrows on the basis of their potential involvement in establishing a new forest tenure arrangement for the Whiskey Jack Forest.

- In 2013, MNR begun discussions with nine First Nation communities, including Grassy Narrows First Nation, to explore transition to an enhanced sustainable forest licence (ESFL) for the Whiskey Jack Forest and give First Nations communities a greater say in the resource management.
- Since 2004, Kenora District MNR staff have engaged the communities leadership, Chief and Council, on matters relating to economic development opportunities for the community and the opportunities to be afforded to the community by participating in the forest economy (e.g., tree planting, brush saw tending contracts, slash pile burning, etc.) and forest management planning.
- Since 2004 the issue of mercury or methyl mercury release through forest practises was not brought up as an issue critical to the community, until the IEA Request was filed by GNFN/ Earthroots.

Science References

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Summary of Aboriginal Involvement for the Whiskey Jack Forest 2012-22 FMP

Aboriginal Communities

- Asubpeeschoseewagong Netum Anishnabek First Nation (Grassy Narrows)
- Naotkamegwanning First Nation (Whitefish Bay)
- Wabaseemoong Independent Nations (Whitedog)
- Wabauskang First Nation
- Ochiichagwe'babigo'inning First Nation (Dalles)
- Kenora Metis Council

Planning Team Representatives

- Doug Riffel - Wabauskang First Nation
- Alex Tom - Naotkamegwanning First Nation (Whitefish Bay)
- Joel Henley – Kenora Metis Council
- TBA - Wabaseemoong Independent Nations (Whitedog)
- TBA - Ochiichagwe'babigo'inning First Nation (Dalles)

Communications

Invitation to Participate
Letters were sent on February 2, 2010 from the District Manager to the current Chief of each First Nations Community in both the Whiskey Jack and the Kenora Forest Management Units as an Invitation to Participate in the 2012-2022 Plans. The letter mentions the possibility of combining forest units as well as the need for an Aboriginal Task Team.

Only one response was received through the Minister's Office. A response from the Ministers Office was sent out June 22, 2010

LTMD
Registered Letter was sent to communities and Metis Council on December 14, 2011 inviting review and comment on the Long Term Management Direction for the Whiskey Jack Forest. One community requested an open house in early 2012.

(See Contingency Plan Consultation for communications during hiatus)

Stage 3
Letters were sent January 14, 2013 from the District Manager to the Chiefs of each First Nation Community identified above, to inform that Planning is starting for the WJ FMP 2012-2022. Please advise if Chief and Council would like a session brought to their community.

On January 31, 2013, a follow-up letter was sent from the District Manager to Chiefs within the WJF and the Metis Council announcing the MNR et al intentions to hold public information centres on the progress to date in the preparation of the FMP for the WJF.

Draft Plan
On July 30, 2013, a detailed information package and letter was sent to Chiefs within the WJF and to the Kenora Metis Council regarding the upcoming information centres for the Draft Plan. This letter invited the communities to Information Centres for the 2012-2022 Whiskey Jack Forest Draft Management Plan to be held September 3 to 6th in Kenora, Sioux Narrows, Red Lake and Ear Falls. The option to have an information centre at individual communities was presented.

Final Plan
On December 23, 2013 letters were sent from the District Manager to the Chiefs of each First Nation Community identified above, to invite them to inspect the Approved 2012-2022 Whiskey Jack FMP. The Final Plan was available for inspection between December 23rd, 2013 and January 22nd, 2014.

Newspaper Communications
Invitation to Participate
Newspapers advertisements were placed in the following editions with the dates provided:

Kenora Daily Miner and News	February 2, 2010
Sioux Lookout Wawatay News	February 18, 2010
Lake of the Woods Enterprise	February 6, 2010
Dryden Observer	February 10, 2010
Red Lake Northern Sun News	February 3, 2010

(See Contingency Plan Consultation for communications during hiatus between 2010-13)

LTMD
EBR Posting Approved November 22, 2011 (Withdrawn)
EBR Posting Approved December 24, 2011

Notices were published in local newspapers

Kenora Daily Miner and News	December 14, 2011
Lake of the Woods Enterprise	December 17, 2011
Dryden Observer	December 21, 2011
Sioux Lookout Wawatay News	December 22, 2011

Stage 3
Newspaper advertisements were placed in the following editions:

Kenora Daily Miner and News	January 29, 2013
Kenora Lake of the Woods Enterprise	January 28, 2013
Northern Sun News	February 2, 2013
Dryden Observer	February 2, 2013
Sioux Lookout Wawatay News	February 14, 2013

Stage 4 - Draft Plan

Newspaper Advertisements were placed in the following informing of dates of the Information Centres.

Kenora Daily Miner and News	August 2, 2013
Kenora Lake of the Woods Enterprise	August 1, 2013
Northern Sun News	August 7, 2013
Dryden Observer	August 7, 2013
Sioux Lookout Wawatay News	August 1, 2013

And follow-up advertisements sponsored by the Kenora Local Citizens Committee were placed in the Kenora Daily Miner and News, August 30, 2013 and in the Lake of the Woods Enterprise on August 29, 2013.

EBR posting was in place by July 30, 2013.

Information Centres were held as follows:

Sioux Narrows – September 4, 2013 – 0 members of public attended

Red Lake - September 4, 2013- 6 members of public attended
Ear Falls – September 5, 2013 – 10 members of public attended
Kenora – September 6, 2013 – 4 members of public attended.

Stage 5 – Final Plan

Newspaper Advertisements were placed in the following informing of dates of the Inspection of the Final Plan.

Kenora Daily Miner and News	December 23, 2013
Kenora Lake of the Woods Enterprise	December 27, 2013
Northern Sun News	December 25, 2013
Dryden Observer	December 24, 2013
Sioux Lookout Wawatay News	December 19, 2013

Canadian Environmental Law Association
EQUITY. JUSTICE. HEALTH.

DELIVERED BY COURIER

Registrar
Information and Privacy Commissioner/Ontario
1400-2 Bloor Street East
Toronto, Ontario
M4W 1A8

October 28, 2015

Re: Appeal of disclosure from the Ministry of the Environment and Climate Change
A-2015-00157

Please accept this letter of appeal of the Ministry of the Environment and Climate Change's ("MOECC") disclosure decision, file no. A-2015-00157. This letter provides details about the grounds for appeal and the possible resolution of this appeal. Full submissions will follow at a later date.

The Appeal Form dated October 28, 2015, the appellant's request letter dated January 7, 2015, the MOECC's decision letters dated September 8, 2015 and September 25, 2015, a copy of the envelope with the postmark date of the disclosure package of September 29, 2015, and a cheque for $25.00 are enclosed.

Request for Information under the *Freedom of Information and Protection of Privacy Act*

This appeal relates to the following request for disclosure from the MOECC, dated January 7, 2015:

1. All records contained in the confidential MOECC file for the Whiskey Jack 2012-2022 Forest Management Plan project. We do not require any documents that were submitted by Earthroots. Please list any documents in the file that have already been provided to Earthroots, but copies are not required.

2. Any other records which the MOECC relied on in making the decision on the request for individual environmental assessment of the Whiskey Jack 2012-2022 Forest Management Plan submitted by Grassy Narrows and Earthroots.

Background

This request for information relates to Earthroots and Grassy Narrows First Nation's ("GNFN") application to the MOECC for an Individual Environmental Assessment ("IEA") of the Whiskey Jack Forest Management Plan 2012-2022. The MOECC denied the request for an IEA. Earthroots and GNFN made the IEA request so that the MOECC could assess through the IEA whether clearcut logging authorized under the Forest Management Plan would release mercury into the watersheds of the English-Wabigoon river system, which is part of the traditional territory of GNFN. Earthroots and GNFN are concerned that this mercury will contaminate the fish in the river system, increasing the risk of serious harm to wildlife and humans consuming fish from that river system.

Request for Review

Reasonable Search – All documents responsive to the request must be disclosed

We request that the MOECC confirm that there are no other documents responsive to this disclosure request.

All notes from all meetings or phone calls relating to the IEA request, including meetings between MOECC and the appellant, and MOECC and the Ministry of Natural Resources and Forestry ("MNRF"), should be disclosed. For example, there was a meeting between the appellants and MOECC on March 27, 2014. No notes from that meeting have been disclosed. The appellants submitted documents at that time and there is no mention of those documents in the disclosure package.

Improper application of subsection 13(1) of the Freedom of Information and Protection of Privacy Act

The MOECC has improperly applied section 13 of the *Freedom of Information and Protection of Privacy Act,* RSO 1990, c F31 *("FIPPA")*. Disclosure of these documents serves the purposes of the *FIPPA* regime under section 1.

The following documents are properly classified under subsection 13(2) of *FIPPA* and should be disclosed. There is also a compelling public interest in their disclosure pursuant to sections 11(1) and 23 of *FIPPA* based on the very serious health and environmental issues arising from the MOECC's decision not to order an IEA. These documents would shed light on the operations of government and allow the public to understand the IEA decision-making process.

- 1- The following documents should be disclosed:

  (a) WhiskeyJackIEA review1 1.docx (attachment referred to on page 188)
  (b) WhiskeyJackIEA MOE review1 1.docx (attachment referred to on page 198)

(c) A MOECC document that examines the "potential methyl mercury impacts of forestry activities" (record referred to on page 238)
(d) July IEA Clarification to MOE.pdf (attachment referred to on pages 245,268)
(e) Whiskey Jack IEA MNR Science Comment July 2014 (attachment referred to on pages 245,268)

These documents should be disclosed in their entirety. Earthroots and GNFN put forward scientific evidence that clearcut logging will cause further mercury contamination of the English-Wabigoon water system, which will result in very serious health impacts for members of GNFN. These documents consist of background and factual information.

It is also in the public interest for the full extent of the MOECC's review of the IEA request to be made public. There has been a significant public interest in the MOECC's decision and there are very serious health and environmental issues at stake.

- 2- At page 236 of the disclosure package, Ms. Fletcher identified external experts on the issue of methyl mercury and forestry. This is factual information and should be disclosed. This information should also be disclosed pursuant to section 23 of *FIPPA,* because it is in the public interest to understand the full extent of the review performed by MOECC. This information would shed light on the government's decision-making process.

- 3-There are several documents, and redacted portions of documents, which relate to discussions between MOECC and MNRF during the decision-making process. GNFN and Earthroots were not previously aware of these discussions or of the extent of communication between the ministries. These documents are not properly classified under subsection 13(1) and should be disclosed to allow the public to assess the rigour and fairness of MOECC's IEA process. Disclosure of these documents would shed light on the government's decision-making process.

  This request relates to the following documents:

  - The two attachments, Appendix 1 and Appendix 6, referred to in the email at page 557 of the disclosure package, should be disclosed.

  - At page 576 of the disclosure package, an email between John Sullivan, MNRF, and Devon Wills, MOECC, refers to comments by Mr. Sullivan on Appendix 1 and Appendix 6. The two attachments should be disclosed.

  - Paul Glassford attached a document entitled 2014 02 24 Appendix 1 MNR Final.docx to an email dated February 25, 2014 between MNRF and Devon Wills at MOECC, at page 598 of the disclosure package. The attachment should be disclosed.

- At page 620, Paul Glassford, MNRF sent a document entitled Document 1.docx to Devon Wills. The email notes that the document relates to the "mercury issue". It is unclear whether this document has been disclosed. If it has, MOECC may refer us to the document in the disclosure package. If not, we ask that the document be disclosed.

- At page 1531, Harley Berlin, MOECC, noted that the review process for IEA requests is a "process we have worked with MNRF on". The redacted portion of this email should be disclosed.

- 4- Drafts of the decision and drafts of the conditions attached to the decision should be disclosed. These documents are not properly classified under subsection 13(1). Because of the significant health and environmental implications of the decision, there is a strong public interest in understanding the basis for the MOECC's decision. This disclosure will also shed light on the MOECC's decision-making process. This request relates to the following documents:

  (a) The drafts of Appendix 1 and Appendix 6, referred to at pages 1618 and 1659
  (b) The draft of the decision note referred to at page 1044 and redacted at page 1045 of the disclosure package, and
  (c) The draft conditions being considered at pages 1063 and 1549-1550 of the disclosure package.

- 5- The attached Whiskey_Jack_2014_AWS.pdf documents, at page 1899 of the disclosure package, relates to the Annual Work Schedule for the Whiskey Jack Forest. Section 13 does not apply to this document and it should be disclosed. If this document has already been disclosed, MOECC may refer us to the document.

The appeal related to these documents could be resolved if these documents, and any other related documents, were disclosed in their entirety pursuant to sections 1, 11(1), 13(1), 13(2) and 23 of *FIPPA*.

Documents that cannot be identified

It is not possible to definitively identify several documents which have been withheld pursuant to section 13 of *FIPPA*. We are therefore unable to assess whether section 13 was properly applied to these documents or whether they should be disclosed under subsection 13(2), or sections 11(1) and 23 of *FIPPA*. This appeal relates to the following documents:

- The document at pages 5-14 of the disclosure package

- The document at pages 16-19 of the disclosure package

- The document at pages 874-883 of the disclosure package
- The document at pages 1011-1014 of the disclosure package
- The document at pages 1069-1071 of the disclosure package
- The document at pages 1076-1078 of the disclosure package
- The document at pages 1554-1571 of the disclosure package
- The document at pages 1874-1879 of the disclosure package

There are other fully redacted documents within the disclosure package that can likely be identified from the surrounding documents, but we ask that they be reviewed and disclosed if appropriate.

The application of subsection 13(1) to these records may be resolved by the MOECC providing clear information that identifies the date, author, recipients, copied parties and subject of the documents and an explanation of its application of subsection 13(1) to the records.

It is our position that these records should be released under subsection 13(2), or sections 11(1) and 23 of *FIPPA*. If those sections are found not to apply, the MOECC should ensure that the documents are released to the extent possible under subsection 10(2) of *FIPPA*.

Redaction – "Consultation not Necessary"

We are unaware of any justification for the redaction at page 806, which is classified as "Consultation not Necessary". We ask that this segment of the email be disclosed.

Thank you for your consideration of this matter. Should you require any further information, please feel free to contact me. Please note that full submissions on these issues will follow at a later date.

Yours truly,

CANADIAN ENVIRONMENTAL LAW ASSOCIATION

Jacqueline Wilson
Counsel

encl.

Information and Privacy Commissioner/Ontario

Appeal Form

Appeal under the
Freedom of Information and Protection of Privacy Act (FIPPA)
or the
Municipal Freedom of Information and Protection of Privacy Act (MFIPPA)

Note: An appeal must be sent in writing **to the Registrar within 30 days** after the institution has given notice of its decision.

The government organization which dealt with your request is referred to as an "institution" under the *Acts*.

Your Information

☒ Mr. ☐ Mrs. ☐ Ms. ☐ Miss

Surname or Name of Company, Association or Organization: Earthroots

Given Name: _____ Initials: _____

Address: 401 Richmond Street West Unit: 410

City: Toronto Province: ON Postal Code: M5V 3A8

Telephone Daytime: 416-599-0152 Evening: _____

If this appeal is not being made in a personal capacity, please provide the following information:

Name of Contact: David Sone

Title: Director, Northern Ontario Campaigns Telephone: 416-599-0152 x.13

E-mail Address*: _____

☐ *I consent to being contacted at this e-mail address or through that of my representative on my behalf. I acknowledge that sending e-mail over the Internet is not secure, in that it can be intercepted and/or manipulated and retransmitted.

Please select *one* of the following:

☒ I made a request for access to a general record, and have enclosed the required $25.00 appeal fee.

☐ I made a request for access to my own personal information and have enclosed the required $10.00 appeal fee.

☐ I made a request to correct my own personal information and have enclosed the required $10.00 appeal fee.

☐ I received a notice that the institution intends to disclose a record/personal information that may relate to me. (No appeal fee required.)

Information and Privacy Commissioner/Ontario

Representative Information (Complete only if you will be represented.)

I authorize the following person to act on my behalf and to receive any personal information pertaining to me, as necessary for the purposes of this appeal.

REPRESENTATIVE IS A: ■ LAWYER ☐ AGENT ☐ MR. ☐ MRS. ☒ MS. ☐ MISS

SURNAME Wilson

GIVEN NAME Jacqueline INITIALS

NAME OF COMPANY, ASSOCIATION OR ORGANIZATION Canadian Environmental Law Association

ADDRESS 130 Spadina Avenue UNIT 301

CITY Toronto PROVINCE ON POSTAL CODE M5V 2L4

TELEPHONE DAYTIME 416-960-2284 ext. 213 EVENING

E-MAIL ADDRESS jacqueline@cela.ca

Institution Information (if available)

NAME OF INSTITUTION Minister of the Environment and Climate Change

INSTITUTION FILE NUMBER A-2015-00157

Consent to Provide a Copy of Documentation to the Institution

Please select *one* of the following:

■ I consent to a copy of this form and all attachments being provided to the institution.

☐ I do not consent to a copy of this form and all attachments being provided to the institution.

Attachments

The following documents have been attached (if available):

☒ Copy of the request.

■ Copy of the institution's decision letter.

■ Appeal fee made payable to the Minister of Finance (if required).

Information and Privacy
Commissioner/Ontario

Details of the Appeal

Please select the box(es) that explain why the appeal is being made.

☐ **Deemed Refusal** – It is more than 30 days since I made my request and I have not received a decision.

☐ **Failure to Disclose Records** – The institution decided to grant access to requested records but I have not received them.

☐ **Time Extension** – The institution decided to extend the time limit for responding to my request, and I disagree.

☐ **No Jurisdiction** – The institution indicated that the requested records are excluded from the *Act* and I disagree.

☒ **Reasonable Search** – The institution indicated that some or all of the requested records do not exist and I believe that more records do exist.

☐ **Frivolous or Vexatious** – The institution indicated my request is frivolous or vexatious and I disagree.

☒ **Exemptions** – The institution has exempted all or part of the requested records and I believe that more of them should be disclosed.

☐ **Interim Decision** – Because of the number of records at issue, the institution reviewed a sample of the records or consulted an experienced employee, advised me of the exemptions that might apply, and provided me with a fee estimate. I disagree with the amount of the fee estimate.

☐ **Fee/Fee Estimate** – The institution sent me an access decision that included a fee or fee estimate that I feel is excessive.

☐ **Fee Waiver** – The institution has refused to grant my request to waive the fees.

☐ **Refusal to Confirm or Deny** – The institution has refused to confirm or deny the existence of the requested records.

☐ **Correction** – The institution has refused to make corrections to my personal information.

☐ **Third Party** – The institution has indicated it will grant access to a record/personal information that may relate to me or the appellant, and I feel this information should not be disclosed.

☐ **Other** – please explain:

Information and Privacy Commissioner/Ontario

Resolution of Appeal

Please describe how you feel this appeal could be resolved.

Please see the attached letter dated October 28, 2015, which outlines the reasons for this appeal.

Previous Appeals

Please list any previous appeals with the Information and Privacy Commissioner/Ontario that may relate to this matter.

Information about the Appeal Process

For more information about the processes of the Information and Privacy Commissioner/Ontario and the Code of Procedure for appeals, please contact our office at 416-326-3333, toll-free at 1-800-387-0073, or visit our website at www.ipc.on.ca.

Where to Send this Form

This form, the applicable fee, and any additional documentation must be sent in writing to the Registrar within 30 days after the institution has given notice of its decision. The cheque should be payable to the Minister of Finance. **DO NOT SEND CASH.** Mail the above to:

Registrar
Information and Privacy Commissioner/Ontario
1400-2 Bloor Street East
Toronto, Ontario
M4W 1A8

Signature

YOUR SIGNATURE _____ DATE October 28, 2015

EARTHROOTS 401 Richmond St. W. #410 - Toronto, Ont. M5V 3A8 Phone: (416) 599-0152
Fax: (416) 340-2429 Email: info@earthroots.org Website: www.earthroots.org

David Sone
Earthroots
401 Richmond Street West,
Suite 410
Toronto, Ontario
M5V 3A8
Canada

January 07, 2015

Ms. Mary Ledwell
Team Lead, Freedom of Information and Privacy
Ministry of the Environment and Climate Change
Freedom of Information Unit
12th Floor, 40 St. Clair Ave. W.
Toronto, ON
M4V 1M2
mary.ledwell@ontario.ca

Via email

Dear Ms. Ledwell:

Re: Request for Information under the Freedom of Information and Protection of Privacy Act

Please consider the following as a request for information under the *Freedom of Information and Protection of Privacy Act* (*FIPPA*):

On Januay 30th, 2014 Anne Cameron of MECC wrote:

"The Ministry of the Environment and Climate Change maintains a public file and a confidential file for the Whiskey Jack 2012-2022 Forest Manage Plan project. You are welcome to view the public file at a time and date agreed upon by yourself and the ministry (myself). Alternatively, you are able to submit a Freedom of Information request in order to obtain the complete file. This can be done using the information found at https://www.ontario.ca/government/how-make-freedom-information-request ."

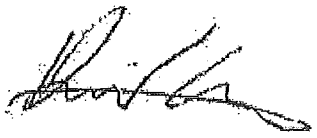
We request:

1. All records contained in the confidential MOECC file for the Whiskey Jack 2012-2022 Forest Management Plan project. We do not require any documents that were submitted by Earthroots. Please list any documents in the file that have already been provided to Earthroots, but copies are not required.
2. Any other records which the MOECC relied on in making the decision on the request for individual environmental assessment of the Whiskey Jack 2012-2022 Forest Management Plan submitted by Grassy Narrows and Earthroots.

A payment for the sum of $5.00 (five dollars) to the Minister of Finance will be made by credit card over the phone through the MOECC Freedom of Information Unit.

If you have any questions with respect to the above please do not hesitate to contact me via email at david@earthroots.org.

Sincerely,



David Sone
Earthroots

Ministry of the Environment and Climate Change

Freedom of Information and Protection of Privacy Office

12th Floor
40 St. Clair Avenue West
Toronto ON M4V 1M2
Tel: (416) 314-4075
Fax: (416) 314-4285

Ministère de l'Environnement et de l'Action en matière de changement climatique

Bureau de l'accès à l'information et de la protection de la vie privée

12e étage
40, avenue St. Clair ouest
Toronto ON M4V 1M2
Tél. : (416) 314-4075
Téléc.: (416) 314-4285

Ontario

September 8, 2015

David Sone
Earthroots
401 Richmond St W, #410
Toronto, ON M5V 3A8

Dear David Sone:

RE: *Freedom of Information and Protection of Privacy Act* Request
Our File #: A-2015-00157

This letter is in response to your request made pursuant to the *Freedom of Information and Protection of Privacy Act* relating to Records contained in the confidential MOECC file for the Whiskey Jack 2012-2022 Forest Management Plan project, and any other records related to the Ministry's decisions on the request for individual environmental assessment of the Plan.

After a review of the records received from the Ministry's Environmental Approvals Branch, the final decision has been made to provide partial access to the information as the identity of complainants has been removed to protect privacy (Section 21(1)(f) of the Act). In addition, advice and recommendations made by staff during the deliberative process have been withheld to encourage the free flow of advice in the government's decision-making process (Section 13(1)). Furthermore, communications and documentation exchanged between ministry staff and legal counsel as part of ongoing advice has been withheld to maintain solicitor-client privilege (Section 19(1)(a)(b)); publicly available information such as newspaper articles have been withheld (Section 22(a)); and records or information that is not relevant to the request have been removed and marked 'not responsive' or 'N/R'. Duplicate records have also been withheld.

Adjusted Fees:

In accordance with Section 57 of the *Freedom of Information and Protection of Privacy Act*, detailed below are our charges:

• Search Time 2 hours @ $30/hour	$60.00
• Copying 770 pages @ $0.20/page	$154.00
• Preparation Time 2 hours @ $30/hour	$60.00
• Delivery	$3.00
• **Total**	**$277.00**
• Deposit Received	$151.50
• **Balance Due**	**$125.50**

In order to receive a copy of the records please forward this amount to our office. You may pay by money order or cheque (made payable to the "Minister of Finance (FOI)") or by credit card. Credit card forms are available on the Ministry's website http://www.ontario.ca/environment-and-energy/freedom-information-request-form-credit-card-form. Please do not mail cash.

The Act provides that all or part of the fee can be waived if the fee will cause you financial hardship or if dissemination of the record will benefit public health or safety, in accordance with Section 57. You will be required to provide evidence to support any waiver claim in writing to the Ministry. It may be advantageous to access the Information and Privacy Commission's (IPC) website, www.ipc.on.ca to review successful fee waivers and get additional information on FOI legislation.

You may request a review of my decision by contacting the Information and Privacy Commissioner/Ontario, 2 Bloor Street East, Suite 1400, Toronto, ON M4W 1A8 (800-387-0073 or 416-326-3333). Please note that there is a $25.00 fee and you only have 30 days from receipt of this letter to request a review.

If you have any questions regarding this matter, please contact Oksana Budjko at oksana.budjko@ontario.ca.

Yours truly,

for Heidi Ritscher
FOI Manager

Ministry of the Environment and Climate Change

Freedom of Information and Protection of Privacy Office

12th Floor
40 St. Clair Avenue West
Toronto ON M4V 1M2
Tel: (416) 314-4075
Fax: (416) 314-4285

Ministère de l'Environnement et de l'Action en matière de changement climatique

Bureau de l'accès à l'information et de la protection de la vie privée

12e étage
40, avenue St. Clair ouest
Toronto ON M4V 1M2
Tél. : (416) 314-4075
Téléc.: (416) 314-4285

Ontario

September 25, 2015

David Sone
Earthroots
401 Richmond St W, #410
Toronto, ON M5V 3A8

Dear David Sone:

RE: *Freedom of Information and Protection of Privacy Act* Request
Our File # A-2015-00157

This letter is further to your request made pursuant to the *Freedom of Information and Protection of Privacy Act* relating to Records contained in the confidential MOECC file for the Whiskey Jack 2012-2022 Forest Management Plan project, and any other records related to the Ministry's decisions on the request for individual environmental assessment of the Plan.

Attached is a copy of the records.

If you have any questions regarding this matter, please contact Oksana Budjko oksana.budjko@ontario.ca.

Yours truly,

H. Ritscher

Heidi Ritscher
FOI Manager

Attachment

Ministry of
the Environment

Freedom of Information and
Protection of Privacy Office
2nd Floor
40 St. Clair Avenue West
Toronto ON M4V 1M2

Ministère de
l'Environnement

Bureau de l'accès à l'information
et de la protection de la vie privée
12e étage
40, avenue St. Clair ouest
Toronto ON M4V 1M2

150729 07:43 6133
CANADA POST
01.65

David Sone
Earthroots
401 Richmond St W, #410
Toronto, ON M5V 3A8

24552

Canadian Environmental Law Association
EQUITY. JUSTICE. HEALTH.

DELIVERED BY COURIER

Registrar
Information and Privacy Commissioner/Ontario
1400-2 Bloor Street East
Toronto, Ontario
M4W 1A8

January 22, 2016

Re: Appeal of disclosure from the Ministry of the Environment and Climate Change
A-2015-00158

Please accept this letter of appeal of the Ministry of the Environment and Climate Change's ("MOECC") disclosure decision, file no. A-2015-00158. This letter provides details about the grounds for appeal and the possible resolution of this matter.

Enclosed please find a copy of the Appeal Form dated January 22, 2016, the appellant's request for documents dated January 8, 2015, the MOECC's decision letter dated December 23, 2015 (received on January 6, 2016) and a cheque addressed to the Minister of Finance for $25.00.

Please note that a related appeal was filed with the Information and Privacy Commissioner (PA15-567) on October 28, 2015.

Request for Information under the *Freedom of Information and Protection of Privacy Act*, RSO 1990, c F31 *("FIPPA")*

This appeal relates to the following request for disclosure from the MOECC on January 8, 2015:

> We request all records as defined under FIPPA in possession, management or control of the MOECC that address, identify, discuss, refer, relate, or respond to:
>
> a) Grassy Narrows and Earthroots' request for individual environmental assessment of the Whiskey Jack Forest Management Plan 2012-2022.
> b) Any other matters related to the Whiskey Jack Forest Management Plan 2012-2022.
> c) The release of mercury from clearcut logging and associated issues.

Background

This request for information from the MOECC relates to the Ministry of Natural Resources and Forestry's ("MNRF") Whiskey Jack Forest Management Plan 2012-2022. Earthroots and Grassy

Narrows First Nation ("GNFN") requested that the MOECC order that MNRF conduct an Individual Environmental Assessment ("IEA") in respect of the potential release of mercury to the water system, methylmercury uptake in fish, and the resulting human health effects from eating the fish that would arise from clearcut logging authorized under the Plan. The MOECC refused the request for an IEA. The Whiskey Jack Forest Management Plan 2012-2022 is now in effect. Earthroots and GNFN are concerned about the mercury health effects of clearcut logging in the Whiskey Jack Forest which was authorized by the Plan.

Request for Review

A. Reasonable Search

(a) Attachments not included in release package

The following documents are attachments to emails disclosed in the release package. These attachments are also responsive to the request for information and should be disclosed. If any of these documents are included in the release package, we request that MOECC identify them.

1- Page 1 (PDF page 36) – Email dated June 16, 2015

Please disclose the following attachments: (1) "#2878 – Grassy Narrows First Nation_Advice Note Template.doc", (2) 2878 – Grassy Narrows First Nation.pdf, and (3) 2878a – Grassy Narrows First Nation.

2- Page 81 (PDF page 69) – Email dated May 29, 2014.

Please disclose the following attachments: (1) GN and ER comments on MNR Response to WJ IEA Request May 26, 2014 FINAL pdf, (2) 2014 May 26 ER ANA Reply to MOE re MNR response to WJ EA Request May 26, 2014, and (3) Cover FINAL.

3- Page 498 (PDF page 250) - Email dated July 15, 2014

Please disclose the following attachments: (1) July IEA Clarification to MOE. Pdf, and (2) Whiskey Jack IEA MNR science comment July 2014.

4- Page 538 (PDF page 287) – Email April 16, 2014

Please disclose the following attachments: (1) "WhiskeyJackIEA.review1.1", and (2) "SRB Hg research_2".

5- Page 634 (PDF page 318) – Email dated March 14, 2014

Please disclose the following attachment: "284.Redox Potential In Encyclopedia of Soils in the Environment.pdf".

6- Page 756 (PDF page 431): Email dated April 22, 2014

Please disclose the following attachment: (1) WhiskeyJackIEA review1_1.docx. The MOECC should confirm whether this document is an exact duplicate of the document referred to at page 538 (PDF page 287).

7- Page 830 (PDF page 490) – Email dated December 18, 2014

Please disclose the following attachment: (1) Whiskey Jack QA Dec 18.

8- Page 1111 (PDF page 681): Email dated August 26, 2014

Please disclose the following attachment: (1): "ANA Mercury Contamination.doc".

(b) The MOECC's search was not reasonable

We request that the MOECC confirm that there are no other documents responsive to this *FIPPA* request for records. Almost all of the records in the release package appear to be from computer files. We request in particular that the MOECC release all hard copy documents, written notes, voicemail message, texts, hard copy faxes, drafts and any other records that are responsive to the request.

There are several meetings referred to in the records that have been disclosed. All notes and records created for the meetings and at the meetings, and any records created as follow up to those meetings, are also responsive to the request and should be disclosed.

1- A meeting is referred to in an email dated March 28, 2014 at page 1021 (PDF page 623). The MOECC should disclose all records prepared for the meeting, created at the meeting, or after the meeting, and any documents created to follow up on issues raised at that meeting. (See also the reference to a meeting at page 1025 (PDF page 625).

2- Several records refer to meetings between MOECC and MNRF:

   a. The email dated February 18, 2014 at page 632 (PDF page 316)
   b. The email dated February 21, 2014 at page 742 (PDF page 417)
   c. The email dated February 28, 2014 at page 105 (PDF page 86)
   d. The email dated March 20, 2014 at page 516 (PDF page 268)
   e. The email dated March 20, 2014 at pages 552-553 (PDF pages 301-302)
   f. The email dated April 16, 2014 at page 538 (PDF page 287)
   g. The email dated May 29, 2014 at page 554 (PDF page 303)

   All records created relating to these meetings or any other meetings held between MOECC and MNRF related to the Whiskey Jack Forest Management Plan 2012-2022 or the IEA request are responsive to the *FIPPA* request but have not yet been disclosed. The

records should include documents prepared for the meetings, created at the meetings or after the meetings, and any records created to follow up on issues raised at the meetings.

The MOECC's decision not to grant Earthroots' and GNFN's request for an IEA was significant and took one year to finalize. There are very few documents relating to the substance of that decision in the release package. We request that the MOECC confirm that there are no other documents related to background research or drafts of the decision, or any other documents that relate to prong (a) of the information request, namely, "we request all records as defined under FIPPA in possession, management or control of the MOECC that address, identify, discuss, refer, relate, or respond to (a) Grassy Narrows and Earthroots' request for individual environmental assessment of the Whiskey Jack Forest Management Plan 2012-2022".

As well, we request the following documents:

1- The email dated July 30, 2013 at page 47 (PDF page 36) refers to a MNR[F]/MOE[CC] plan to conduct a study on the impacts of logging. MOECC should disclose all records related to the planning for this study. If the study was conducted, MOECC should disclose all records generated by the study including any findings from the study. We request any records created that follow up on the results of this study.

2- The email dated February 5, 2013 at page 63 (PDF page 51) refers to a project to look at the effects of logging on Hg concentrations in fish. MOECC should disclose all records related to the planning for this study. If the study was conducted, MOECC should disclose all records generated by the study including any findings from the study. We request any records created that follow up on the results of this study.

3- The email dated February 28, 2014 at page 105 (PDF page 86) refers to work Dr. Satyendra Bhavsar completed on "fish Hg/ logging". MOECC should disclose all records related to the planning for this study. If the study was conducted, MOECC should disclose all records generated by the study including any findings from the study. We request any records created that follow up on the results of this study.

4- The Information Note at pages 167 - 174 (PDF pages 126 – 133) refers to several studies. MOECC should disclose all documents related to the January 2011- March 2011 study referred to at page 168 (PDF page 127).

   The Information Note also refers to an MOEEC and MNRF discussion about a potential study to look at the effects of logging and clearcutting on mercury levels in fish at page 169 (PDF page 128). MOECC should disclose all records related to the planning for this study. If the study was conducted, MOECC should disclose all records generated by the study including any findings from the study. We request any records created that follow up on the results of this study.

   The email dated August 7, 2013 at page 656 (PDF page 335) refers to Dr. Satyendra Bhavsar working with MNR[F] to set up a study using "SF data" regarding the relationship between different logging practices and Hg in fish. MOECC should disclose

all records related to the planning for this study. If the study was conducted, MOECC should disclose all records generated by the study including any findings from the study. We request any records created that follow up on the results of this study.

5- The email dated April 16, 2014 at page 538 (PDF page 287) refers to a review by MOECC of science documentation provided by MNRF. MOECC should disclose all documents related to this review and any other science review conducted by MOECC during the IEA process.

6- The email dated April 22, 2014 at page 756 (PDF page 431) refers to Dr. Fletcher's comments on MNR[F]'s reply. MOECC should disclose all documents related to this review of MNRF's reply.

7- The email dated July 28, 2014 at page 1668 (PDF page 1044) refers to two reports. One is the report referenced by the media in relation to the Mercury Disability Board, and the other is a University of Ottawa report funded by Health Canada. MOECC should disclose these reports.

8- The email dated July 30, 2014 at page 740 (PDF page 415) refers to an "informal working group of scientists to better understand the impacts of logging and from a science view whether there are ways to mitigate the effects of Hg from logging". MOECC should disclose all records related to the working group.

9- We also request all drafts and all records created in relation to or as follow up after the Decision Note at pages 1326-1335 (PDF pages 885-894).

B. Documents that cannot be read or identified

Portions of the following documents are not readable and we ask that a new copy be disclosed. If a better copy is not available, we request that MOECC ask that the author of the document identify the document and record what it says: (1) email dated February 2, 2014 at page 53 (PDF page 41), (2) email dated June 7, 2012 at page 55-57 (PDF page 43-45), and (3) email dated May 29, 2014 at page 81 (PDF page 69).

There are also a significant number of documents that have been withheld in their entirety under section 13 or have been marked as "not relevant. There is no way to identify these documents or determine whether these characterizations should be upheld. We therefore request that the MOECC create an Index of Records which provides clear information that identifies the date, author, recipients, copied parties, subject of the documents, and an explanation of the application of subsection 13(1) or their characterization as "not relevant".

In particular, we ask that the MOECC identify each document redacted in its entirety under section 13 and explain why section 13 applies to the whole document.These documents include but are not limited to:

1- Pages 821-822 (PDF page 483)
2- Pages 825-826 (PDF page 486)
3- Pages 831-833 (PDF page 491)
4- Pages 836-838 (PDF page 494)
5- Pages 840-043 (PDF page 496).
6- Pages 850-854 (PDF page 503)
7- Pages 929-938 (PDF page 567)
8- Pages 939-943 (PDF page 568)
9- Pages 944-945 (PDF page 569)

It is CELA's position that section 13 has been improperly applied to these documents and we ask that the documents be disclosed. They are not properly classified under subsection 13(1), are properly classified under subsection 13(2), and should be disclosed pursuant to section 23. Disclosure of these documents would serve the purposes of the *FIPPA* regime under section 1. In the alternative, the MOECC should ensure that the documents are released to the extent possible under subsection 10(2) of *FIPPA*.

There are also a significant number of documents in the release package which have been withheld in their entirety and marked as "not relevant". There is no way to identify these documents or to determine whether these documents have been appropriately classified as not relevant. We ask that the MOECC identify these documents and explain their characterization as not relevant. We ask that all of the documents marked as not relevant be disclosed.

C. Section 13 has been improperly applied

Section 13 has been improperly applied throughout the release package and we ask that these documents be disclosed because they are not properly classified under subsection 13(1), are properly classified under subsection 13(2), and should be disclosed pursuant to section 23. Disclosure of these documents would serve the purposes of the *FIPPA* regime under section 1.

Many of the documents are background information or scientific reviews. There is a compelling public interest in their disclosure. They relate to very serious health and environmental issues arising from the Whiskey Jack Forest Management Plan 2012-2022 and the MOECC's decision not to order an IEA.

There is a strong public interest in understanding the basis for the MOECC's decision. These documents would shed light on the operations of government and allow the public to assess the rigour and fairness of the IEA decision-making process in this case.

In particular, section 13 has been improperly applied in the following documents and the information withheld under section 13 should be disclosed:

1- The email chain dated August 7, 2014 at pages 656-657 (PDF pages 335-336).

2- The email chain dated July 31, 2014 at pages 740-741 (PDF pages 415-416).

3- The email dated January 10, 2014 at page 760 (PDF page 435).

4- The email dated March 31, 2014 at page 814 (PDF page 476).

5- The email dated April 1, 2014 at page 815 (PDF page 477).

6- The email chain dated December 18, 2014 at pages 827-829 (PDF pages 487-489).

7- The email chain dated April 1, 2014 at pages 1238- 1243 (PDF pages 797-802).

8- Decision Note at pages 1326-1335 (PDF pages 885 – 894).

D. Redaction to document at page 39 (PDF page 32)

Please disclose the full document at page 39 (PDF page 32). The reason for the redactions has not been disclosed.

Thank you for your consideration of this matter. Please note that I will be out of the office from January 22, 2016- February 8, 2016 without access to email. During that time, if you require immediate assistance, please contact my colleague Joseph Castrilli at 416-960-2284 ext. 218 or castrillij@sympatico.ca.

Yours truly,

CANADIAN ENVIRONMENTAL LAW ASSOCIATION

Jacqueline Wilson
Counsel

encl.

cc. Ministry of the Environment and Climate Change

Information and Privacy Commissioner/Ontario

Appeal Form

Appeal under the
Freedom of Information and Protection of Privacy Act (FIPPA)
or the
Municipal Freedom of Information and Protection of Privacy Act (MFIPPA)

Note: An appeal must be sent in writing **to the Registrar within 30 days** after the institution has given notice of its decision.

The government organization which dealt with your request is referred to as an "institution" under the *Acts*.

Your Information

☒ Mr. ☐ Mrs. ☐ Ms. ☐ Miss

Surname or Name of Company, Association or Organization: Earthroots

Given Name: _____ Initials: _____

Address: 401 Richmond Street West Unit: 410

City: Toronto Province: ON Postal Code: M5V 3A8

Telephone Daytime: 416-599-0152 Evening: _____

If this appeal is not being made in a personal capacity, please provide the following information:

Name of Contact: David Sone

Title: Director, Northern Ontario Campaigns Telephone: 416-599-0152 x13

E-mail Address*: _____

☐ *I consent to being contacted at this e-mail address or through that of my representative on my behalf. I acknowledge that sending e-mail over the Internet is not secure, in that it can be intercepted and/or manipulated and retransmitted.

Please select *one* of the following:

☒ I made a request for access to a general record, and have enclosed the required $25.00 appeal fee.

☐ I made a request for access to my own personal information and have enclosed the required $10.00 appeal fee.

☐ I made a request to correct my own personal information and have enclosed the required $10.00 appeal fee.

☐ I received a notice that the institution intends to disclose a record/personal information that may relate to me. (No appeal fee required.)

Information and Privacy Commissioner/Ontario

Representative Information (Complete only if you will be represented.)

I authorize the following person to act on my behalf and to receive any personal information pertaining to me, as necessary for the purposes of this appeal.

REPRESENTATIVE IS A: ■ LAWYER ☐ AGENT ☐ MR. ☐ MRS. ☒ MS. ☐ MISS

SURNAME Wilson

GIVEN NAME Jacqueline INITIALS

NAME OF COMPANY, ASSOCIATION OR ORGANIZATION Canadian Environmental Law Association

ADDRESS 130 Spadina Avenue UNIT 301

CITY Toronto PROVINCE ON POSTAL CODE M5V 2L4

TELEPHONE DAYTIME 416-960-2284 ex 213 EVENING

E-MAIL ADDRESS jacqueline@cela.ca

Institution Information (if available)

NAME OF INSTITUTION Minister of the Environment and Climate Change

INSTITUTION FILE NUMBER A-2015-00158

Consent to Provide a Copy of Documentation to the Institution

Please select *one* of the following:

■ I consent to a copy of this form and all attachments being provided to the institution.

☐ I do not consent to a copy of this form and all attachments being provided to the institution.

Attachments

The following documents have been attached (if available):

☒ Copy of the request.

■ Copy of the institution's decision letter.

■ Appeal fee made payable to the Minister of Finance (if required).

Information and Privacy Commissioner/Ontario

Details of the Appeal

Please select the box(es) that explain why the appeal is being made.

☐ **Deemed Refusal** – It is more than 30 days since I made my request and I have not received a decision.

☐ **Failure to Disclose Records** – The institution decided to grant access to requested records but I have not received them.

☐ **Time Extension** – The institution decided to extend the time limit for responding to my request, and I disagree.

☐ **No Jurisdiction** – The institution indicated that the requested records are excluded from the *Act* and I disagree.

☒ **Reasonable Search** – The institution indicated that some or all of the requested records do not exist and I believe that more records do exist.

☐ **Frivolous or Vexatious** – The institution indicated my request is frivolous or vexatious and I disagree.

☒ **Exemptions** – The institution has exempted all or part of the requested records and I believe that more of them should be disclosed.

☐ **Interim Decision** – Because of the number of records at issue, the institution reviewed a sample of the records or consulted an experienced employee, advised me of the exemptions that might apply, and provided me with a fee estimate. I disagree with the amount of the fee estimate.

☐ **Fee/Fee Estimate** – The institution sent me an access decision that included a fee or fee estimate that I feel is excessive.

☐ **Fee Waiver** – The institution has refused to grant my request to waive the fees.

☐ **Refusal to Confirm or Deny** – The institution has refused to confirm or deny the existence of the requested records.

☐ **Correction** – The institution has refused to make corrections to my personal information.

☐ **Third Party** – The institution has indicated it will grant access to a record/personal information that may relate to me or the appellant, and I feel this information should not be disclosed.

☐ **Other** – please explain:

Information and Privacy Commissioner/Ontario

Resolution of Appeal

Please describe how you feel this appeal could be resolved.

Please see the attached letter dated January 22, 2016, which outlines the reasons for this appeal.

Previous Appeals

Please list any previous appeals with the Information and Privacy Commissioner/Ontario that may relate to this matter.

This appeal relates to appeal PA15-567 (Ministry of the Environment and Climate Change - A-2015-00157).

Information about the Appeal Process

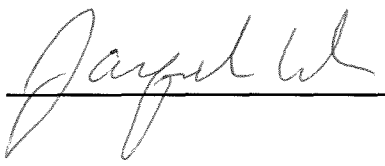
For more information about the processes of the Information and Privacy Commissioner/Ontario and the Code of Procedure for appeals, please contact our office at 416-326-3333, toll-free at 1-800-387-0073, or visit our website at www.ipc.on.ca.

Where to Send this Form

This form, the applicable fee, and any additional documentation must be sent in writing to the Registrar within 30 days after the institution has given notice of its decision. The cheque should be payable to the Minister of Finance. **DO NOT SEND CASH.** Mail the above to:

Registrar
Information and Privacy Commissioner/Ontario
1400-2 Bloor Street East
Toronto, Ontario
M4W 1A8

Signature

YOUR SIGNATURE  DATE January 22, 2016

David Sone
Earthroots
401 Richmond Street West,
Suite 410
Toronto, Ontario
M5V 3A8
Canada

January 08, 2015

Ms. Mary Ledwell
Team Lead, Freedom of Information and Privacy
Ministry of the Environment and Climate Change
Freedom of Information Unit
12th Floor, 40 St. Clair Ave. W.
Toronto, ON
M4V 1M2
mary.ledwell@ontario.ca

Via email

Dear Ms. Ledwell:

Re: Request for Information under the Freedom of Information and Protection of Privacy Act

Please consider the following as a request for information under the *Freedom of Information and Protection of Privacy Act* (*FIPPA*):

We request all records as defined under FIPPA in possession, management or control of the MOECC that address, identify, discuss, refer, relate, or respond to:

a) Grassy Narrows and Earthroots' request for individual environmental assessment of the Whiskey Jack Forest Management Plan 2012-2022.
b) Any other matters related to the Whiskey Jack Forest Management Plan 2012-2022.
c) The release of mercury from clearcut logging and associated issues.

Any records previously provided to Earthroots need not be provided.

A payment for the sum of $5.00 (five dollars) to the Minister of Finance will be made by credit card over the phone through the MOECC Freedom of Information Unit.

If you have any questions with respect to the above please do not hesitate to contact me at via email at david@earthroots.org.

Sincerely,

David Sone

Ministry of the Environment and Climate Change

Freedom of Information and Protection of Privacy Office

12th Floor
40 St. Clair Avenue West
Toronto ON M4V 1M2
Tel: (416) 314-4075
Fax: (416) 314-4285

Ministère de l'Environnement et de l'Action en matière de changement climatique

Bureau de l'accès à l'information et de la protection de la vie privée

12e étage
40, avenue St. Clair ouest
Toronto ON M4V 1M2
Tél. : (416) 314-4075
Téléc.: (416) 314-4285

Ontario

December 23, 2015

David Sone
Earthroots
401 Richmond St W, #410
Toronto, ON M5V 3A8

Dear David Sone:

RE: *Freedom of Information and Protection of Privacy Act* Request
Our File # A-2015-00158

This letter is further to your request made pursuant to the *Freedom of Information and Protection of Privacy Act* relating to Records related to the Grassy Narrows and Earthroot's request for individual assessment of the Whiskey Jack 2012-2022, and any other matters related to this plan. As well, the release of mercury from clearcut logging and associated issues..

Attached is a copy of the records.

If you have any questions regarding this matter, please contact Oksana Budjko at oksana.budjko@ontario.ca.

Yours truly,

H. Ritscher

Heidi Ritscher
FOI Manager

Attachment

Court File No. 446/15

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

SUPPLEMENTARY AFFIDAVIT OF DAVID SONE

CANADIAN ENVIRONMENTAL LAW ASSOCIATION
130 SPADINA AVE., SUITE 301
TORONTO, ONTARIO M5V 2L4

Telephone: (416) 960-2284
Facsimile: (416) 960-9392

Joseph F. Castrilli (LSUC No. 26123A)
Richard D. Lindgren (LSUC No. 28529E)
Jacqueline Wilson (LSUC No. 60330R)

Solicitors for the Applicants

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other
members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

SUPPLEMENTARY AFFIDAVIT OF JOSEPH FOBISTER

I, JOSEPH FOBISTER, of Grassy Narrows, in the District of Kenora, AFFIRM AND SAY AS FOLLOWS:

1. I am a Band member of the Grassy Narrows First Nation ("Grassy Narrows"), and I have acted as advisor to former Chief Simon Fobister on logging issues, and negotiator for Grassy Narrows on logging issues between 2007 and 2014. I have continued to work with

current Chief Roger Fobister, Senior on the bump-up request referred to below and matters arising from that issue. As such I have knowledge of the matters hereinafter deposed to.

FIPPA REQUEST TO MOECC

2. I have read the supplementary affidavit of David Sone, sworn March 9, 2016, and the exhibits contained therein. The efforts of Mr. Sone to obtain information under the *Freedom of Information and Protection of Privacy Act* ("*FIPPA*") from the Ministry of the Environment and Climate Change ("MOECC") about its consideration of the issue of mercury during the bump-up request process described in detail in Mr. Sone's supplementary affidavit, were in furtherance of the joint efforts of Grassy Narrows and Earthroots Coalition ("Earthroots") discussed in my earlier affidavit, affirmed August 26, 2015, to obtain information about the extent to which the release of mercury to area waterbodies from clearcut logging was addressed by the Ministry of Natural Resources and Forestry ("MNRF") prior to its decision to approve the 2012-2022 Whiskey Jack Forest Management Plan ("Plan").

3. I also agree with paragraphs 5-9 and 17 of Mr. Sone's supplementary affidavit. Grassy Narrows was not privy to the communications or discussions or aware of the existence of on-going contact and collaboration that was taking place between MOECC and MNRF during the bump-up request process that is revealed in Mr. Sone's supplementary affidavit and exhibits.

4. I affirm this supplementary affidavit in support of the within application for judicial review, and for no other or improper purpose.

AFFIRMED before me in the District of Kenora, in the Province of Ontario, this ___ day of _____, 2016.

A Commissioner, etc.

_____
Joseph Fobister

Court File No. 446/15

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

SUPPLEMENTARY AFFIDAVIT OF JOSEPH FOBISTER

CANADIAN ENVIRONMENTAL LAW ASSOCIATION
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Joseph F. Castrilli (LSUC No. 26123A)
Richard D. Lindgren (LSUC No. 28529E)
Jacqueline Wilson (LSUC No. 60330R)

Solicitors for the Applicants

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

SUPPLEMENTARY AFFIDAVIT OF ROGER FOBISTER, SENIOR

I, ROGER FOBISTER, SENIOR, of Grassy Narrows, in the District of Kenora, AFFIRM AND SAY AS FOLLOWS:

1. I am one of the applicants in the within application for judicial review, and as such have knowledge of the matters hereinafter deposed to.

2. I am a member of the Grassy Narrows First Nation (hereinafter "Grassy Narrows"). I have been its elected Chief since April 2014.

3. I have read the supplementary affidavit of David Sone, sworn March 9, 2016. I agree with paragraphs 5-9 and 17 of Mr. Sone's supplementary affidavit. Neither Grassy Narrows nor I were privy to the communications or aware of the existence of on-going contact and collaboration between the Ministry of the Environment and Climate Change ("MOECC") and the Ministry of Natural Resources and Forestry ("MNRF") during the period of my tenure as Chief and our request was before MOECC (April to December 2014) for an individual environmental assessment ("IEA") of the potential mercury impacts of clearcut logging arising from the MNRF decision to approve the 2012-2022 Whiskey Jack Forest Management Plan.

4. I only learned of the fact, nature, frequency, and extent of the MOECC/MNRF contact and collaboration on our IEA request upon reading Mr. Sone's supplementary affidavit.

5. I affirm this supplementary affidavit in support of the within application for judicial review, and for no other or improper purpose.

AFFIRMED before me in the City of Toronto, in the Province of Ontario, this ___ day of _____, 2016.

A Commissioner, etc.

_____
Roger Fobister, Senior

Court File No. 446/15

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

SUPPLEMENTARY AFFIDAVIT OF ROGER FOBISTER, SENIOR

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Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
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CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

SUPPLEMENTARY AFFIDAVIT OF SIMON FOBISTER

I, SIMON FOBISTER, of Grassy Narrows, in the District of Kenora, AFFIRM AND SAY AS FOLLOWS:

1. I am one of the applicants in the within application for judicial review, and as such have knowledge of the matters hereinafter deposed to.

2. I am a member of the Grassy Narrows First Nation (hereinafter "Grassy Narrows"). I was its elected Chief from 1976-1980, and again from 2002 until April 2014.

3. I have read the supplementary affidavit of David Sone, sworn March 9, 2016, and the attached exhibits. I agree with paragraphs 5-9 and 17 of Mr. Sone's supplementary affidavit. Neither Grassy Narrows nor I were privy to the communications or aware of the existence of on-going contact and collaboration between the Ministry of the Environment and Climate Change ("MOECC") and the Ministry of Natural Resources and Forestry ("MNRF") during the period of my tenure as Chief and our request was before MOECC (January to April 2014) for an individual environmental assessment ("IEA") of the potential mercury impacts of clearcut logging arising from the MNRF decision to approve the 2012-2022 Whiskey Jack Forest Management Plan.

4. I only learned of the fact, nature, frequency, and extent of the MOECC/MNRF contact and collaboration on our IEA request upon reading Mr. Sone's supplementary affidavit and exhibits.

5. I affirm this supplementary affidavit in support of the within application for judicial review, and for no other or improper purpose.

AFFIRMED before me in the District of Kenora, in the Province of Ontario, this ___ day of _____, 2016.

A Commissioner, etc.

_____
Simon Fobister

Court File No. 446/15

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

SUPPLEMENTARY AFFIDAVIT OF SIMON FOBISTER

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Solicitors for the Applicants

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

SUPPLEMENTARY AFFIDAVIT OF WILLIAM FOBISTER, SENIOR

I, WILLIAM FOBISTER, SENIOR, of Grassy Narrows, in the District of Kenora, AFFIRM AND SAY AS FOLLOWS:

1. I am one of the applicants in the within application for judicial review, and as such have knowledge of the matters hereinafter deposed to.

2. I am a member of the Grassy Narrows First Nation (hereinafter "Grassy Narrows"), a Band Council member (1980-1992, 2003 to date), and former elected Chief (1992-2002).

3. I have read the supplementary affidavit of David Sone, sworn March 9, 2016. I agree with paragraphs 5-9 and 17 of Mr. Sone's supplementary affidavit. Neither Grassy Narrows nor I were privy to the communications or aware of the existence of on-going contact and collaboration between the Ministry of the Environment and Climate Change ("MOECC") and the Ministry of Natural Resources and Forestry ("MNRF") during the period of my tenure as Band Council member and our request was before MOECC (January to December 2014) for an individual environmental assessment ("IEA") of the potential mercury impacts of clearcut logging arising from the MNRF decision to approve the 2012-2022 Whiskey Jack Forest Management Plan.

4. I only learned of the fact, nature, frequency, and extent of the MOECC/MNRF contact and collaboration on our IEA request upon reading Mr. Sone's supplementary affidavit.

5. I affirm this supplementary affidavit in support of the within application for judicial review, and for no other or improper purpose.

AFFIRMED before me in the City of Toronto, in the Province of Ontario, this ___ day of _____, 2016.

A Commissioner, etc.

_____
William Fobister, Senior

Court File No. 446/15

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

SUPPLEMENTARY AFFIDAVIT OF WILLIAM FOBISTER, SENIOR

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Jacqueline Wilson (LSUC No. 60330R)

Solicitors for the Applicants

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

SUPPLEMENTARY AFFIDAVIT OF SHERRY FOBISTER

I, SHERRY FOBISTER, of Grassy Narrows, in the District of Kenora, AFFIRM AND SAY AS FOLLOWS:

1. I am one of the applicants in the within application for judicial review, and as such have knowledge of the matters hereinafter deposed to.

2. I am a member of the Grassy Narrows First Nation (hereinafter “Grassy Narrows”), and I live on Grassy Narrows Reserve.

3. I have read the supplementary affidavit of David Sone, sworn March 9, 2016, and the attached exhibits. I agree with paragraphs 5-9 and 17 of Mr. Sone’s supplementary affidavit. I was not privy to the communications or aware of the existence of on-going contact and collaboration between the Ministry of the Environment and Climate Change (“MOECC”) and the Ministry of Natural Resources and Forestry (“MNRF”) during the period January to December 2014 when Grassy Narrows was requesting an individual environmental assessment (“IEA”) of the potential mercury impacts of clearcut logging arising from the MNRF decision to approve the 2012-2022 Whiskey Jack Forest Management Plan.

4. I only learned of the fact, nature, frequency, and extent of the MOECC/MNRF contact and collaboration on the IEA request upon reading Mr. Sone’s supplementary affidavit and exhibits.

5. I affirm this supplementary affidavit in support of the within application for judicial review, and for no other or improper purpose.

AFFIRMED before me in the District of Kenora, in the Province of Ontario, this ___ day of _____, 2016.

A Commissioner, etc.

_____
Sherry Fobister

Court File No. 446/15

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

SUPPLEMENTARY AFFIDAVIT OF SHERRY FOBISTER

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Jacqueline Wilson (LSUC No. 60330R)

Solicitors for the Applicants

Court File No. 446/15

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

SUPPLEMENTARY APPLICATION RECORD

CANADIAN ENVIRONMENTAL LAW ASSOCIATION
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Telephone: (416) 960-2284
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Jacqueline Wilson (LSUC No. 60330R)

Lawyers for the Applicants

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DECEMBER 10, 2021

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Tab 9

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, CHIEF SIMON FOBISTER
and
former CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO),
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

APPLICATION UNDER Section 2(1)
of the *Judicial Review Procedure Act*
R.S.O. 1990, c. J.1

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Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
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Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

AFFIDAVIT OF SHIGERU TAKAOKA

I, SHIGERU TAKAOKA, of the City of Minamata, in the Prefecture of Kumamoto, Japan MAKE OATH AND SAY AS FOLLOWS:

1. I am a medical doctor and director of the Kyoritsu Neurology and Rehabilitation Clinic, in the City of Minamata, in the Prefecture of Kumamoto, where I specialize in the areas of neurological, rehabilitative, and general internal medicine. I have participated in clinical examinations of patients suspected of having been exposed to mercury in

Minamata, Japan and Grassy Narrows, Ontario, Canada, the latter experience as part of a team of researchers lead by the late Dr. Masazumi Harada. In addition to my clinical work, I am also the co-author of several articles on the subject of exposure to mercury that have been published in a number of peer-reviewed medical and scientific journals. A copy of my curriculum vitae is attached to Exhibit "A", below.

2. In December 2015 I, along with my colleagues Drs. Tadashi Fujino and Akitomo Shimoji were asked by counsel for Grassy Narrows First Nation to answer certain questions on medical-psychological/psychiatric issues pertaining to mercury exposure at Grassy Narrows. The questions and our answers to them appear as part of our May 2016 expert report attached as Exhibit "A" to my Affidavit.

3. A copy of my Acknowledgement of Expert's Duty form is attached as Exhibit "B" to my Affidavit.

SWORN BEFORE ME in the City of Minamata, in the Prefecture of Kumamoto, Japan, this ___ day of _____, 2016.

A Commissioner, etc.

_____
Shigeru Takaoka

DR. TAKAOKA'S AFFIDAVIT IN JAPANESE AND COMMISSIONED

裁判所ファイル番号 446/15

オンタリオ州高等裁判所
（ディビジョナル裁判所）

当事者名：

グラッシー・ナローズ・ファースト・ネーション、
シェリー・フォビスター
ウィリアム・フォビスター、長老サイモン・フォビスター、
そして族長ロジャー・フォビスター、シニアの代表
グラッシー・ナローズ・ファースト・ネーション全員の代表

原告

及び

オンタリオ州天然資源省森林局、オンタリオ州環境省、
そしてオンタリオ州法務長官省

被告

高岡滋の宣誓供述書

私、日本国熊本県水俣市在住の高岡滋は下記のことを宣誓供述致します。

1. 私は医師で熊本県水俣市の神経内科リハビリテーション協立クリニック院長であります。私の専門は神経内科とリハビリテーション、そして一般内科です。私は日本の水俣市とカナダ国オンタリオ州グラッシーナローズにて水銀汚染されたと疑われる患者の住民健診に参加しました。グラッシー・ナローズにおいては原田正純医師率いる調査チームに参加しました。臨床経験に加え、私は水銀汚染に関する論文をいくつか共同で執筆し、それらは論文審査のある医学科学専門誌で発表されました。以下の証拠品 A に私の履歴書が添付されています。

2. 2015 年 12 月に私と同僚の藤野糺医師、下地明友医師に対してグラッシー・ナローズ・ファースト・ネーションの弁護士からグラッシー・ナローズにおける水銀汚染に係る医学的、心理学的、そして精神的影響に関するいくつかの質問に回答するように依頼されました。質問と回答は私の供述宣誓書に証拠品 A として添付されている 2016 年 5 月専門家報告書に記載されています。

3. 私の専門家全責任承認フォーム 1 部が証拠品 B として私の供述宣誓書に添付されています。

2016年　月　日　　)
日本国熊本県水俣市にて　　)
面前認証　　)
　　)
　　)
　　)
署長、等
　　)

_____
高岡滋

This is Exhibit.....referred to in t
affidavit of.....
sworn before me, this.....
day of.....20.....
2494
011
.....
A COMMISSIONER FOR TAKING AFFIDAV

EXPERT REPORT

Grassy Narrows First Nation and Sherry Fobister, William Fobister, Senior, Simon Fobister and Chief Roger Fobister, Senior on their own behalf and on behalf of all other members of Grassy Narrows First Nation v. Minister of Natural Resources and Forestry (Ontario) and Minister of the Environment and Climate Change (Ontario), and the Attorney General of Ontario

Ontario Superior Court of Justice
(Divisional Court)

Prepared for
Joseph F. Castrilli and Richard D. Lindgren
Counsel, Canadian Environmental Law Association
55 University Avenue, Suite 1500
Toronto, Ontario
M5J 2H7

RESPONSE TO QUESTIONS ON MEDICAL-PSYCHOLOGICAL/PSYCHIATRIC ISSUES PERTAINING TO MERCURY EXPOSURE AT GRASSY NARROWS

Prepared by

Dr. Shigeru Takaoka, MD, Dr. Tadashi Fujino, MD, Dr. Akitomo Shimoji, MD

Date: May ___, 2016 _____

Dr. Shigeru Takaoka, MD

Date: May ___, 2016 _____

Dr. Tadashi Fujino, MD

Date: May ___, 2016 _____

Dr. Akitomo Shimoji, MD

Introduction: Expertise and Qualifications

We are three doctors who practice in Kumamoto Prefecture on the island of Kyushu in Japan. The following is a brief summary of our experience and expertise:

Dr. Shigeru Takaoka: I am a medical doctor and director of the Kyoritsu Neurology and Rehabilitation Clinic, Minamata, Kumamoto, Japan where I specialize in a number of areas, including neurological, rehabilitative, and general internal medicine. I have participated in clinical examinations of patients suspected of having been exposed to mercury in Minamata, Japan and Grassy Narrows, Ontario, Canada, the latter experience as part of a team of researchers lead by the late Dr. Masazumi Harada. In addition to my clinical work, I am also the co-author of several articles on the subject of exposure to mercury that have been published in a number of peer-reviewed medical and scientific journals.

Dr. Tadashi Fujino: I am a medical doctor specializing in psychiatry and neurology at Kumamoto Hospital. I have considerable clinical experience examining patients exposed to mercury in Minamata, Japan. At various times, over several decades, I also undertook, with a team of researchers lead by the late Dr. Masazumi Harada, many clinical examinations of men, women, and children suspected of being exposed to mercury in Grassy Narrows, Ontario, Canada. I have written extensively about my clinical investigations in both countries in numerous medical and scientific peer-reviewed journals.

Dr. Akitomo Shimoji: I am a medical doctor, neuro-psychiatrist, and professor at Kumamoto Gakuen University. Along with a team of researchers lead by the late Dr. Masazumi Harada, I participated in clinical examinations of patients exposed or suspected of having been exposed to mercury in Grassy Narrows, Ontario, Canada. Based on my clinical experience in Japan, I also have authored or co-authored several articles that have been published in peer-reviewed medical and scientific journals on the subject of exposure to mercury.

Our curriculum vitae appear in Appendix B of our Expert Report.

Instructions and Nature of Professional Opinion Sought

We have been asked by Joseph F. Castrilli and Richard D. Lindgren of the Canadian Environmental Law Association on behalf of Grassy Narrows First Nation to prepare an expert report that responds to four questions that are reproduced below. We are solely responsible for the answers to the questions contained in this report. Page references contained in the questions set out below are from the Applicants' Application Record in *Grassy Narrows First Nation, et al v. Minister of Natural Resources and Forestry (Ontario), et al.*

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List of Questions Asked

Questions for Dr. Shigeru Takaoka et al.		
English	Japanese	Reference Page
Question 1: Based on the clinical medical examinations that Dr. Harada's team performed on people at Grassy Narrows over the years, please comment on the statements, which appear below respecting pages 001251 to 001252 of the January 2014 request by Grassy Narrows (GN) to the Government of Ontario, and whether they are accurate in their summary of the findings of Dr. Harada's team based on the two Harada referenced reports of 2005 and 2011 that appear at page 001284 of the January 2014 request?		
Excerpt from: Bump-up Request for an Individual Environmental Assessment (IEA) submitted to the Ontario Ministry of the Environment regarding the Forest Management Plan for the Whiskey Jack Forest for the 10-year period April 1, 2012 to March 31, 2022 - Final Plan Inspection Approved by the Ministry of Natural Resources, December 23, 2013 - EBR Registry No. 010-9240 Submitted by: Grassy Narrows First Nation and Earthroots January 22, 2014 5. Mercury Impacts Human Health in Grassy Narrows SUMMARY 35 Years of study by renowned mercury expert Dr. Harada and his team have confirmed that people in Grassy Narrows are suffering from Minamata Disease as a result of methyl mercury ingested by eating local fish. EVIDENCE Doctor Harada's teams of researchers have studied mercury health impacts in Grassy Narrows for over 35 years starting in 1975. "[I]t is an undoubtable fact that Minamata Disease occurred in [Grassy Narrows and White Dog], based on our long-term investigation result." (Harada et al., 2011) Grassy Narrows people "were poisoned by eating fish contaminated with mercury." (Harada et al., 2011) Findings by Harada et al., 2011 • 59% of the 160 people tested in GN and White Dog were affected by mercury. • 34% were diagnosed with Minamata Disease (MD)		1251-1252

using current Japanese diagnostic criteria (41% in GN --> 30 cases) • 25% were diagnosed with suspected Minamata Disease (SMD) • 44% of people aged 21-40 had MD or SMD. All these people were born after the mercury dumping was curtailed in 1971. "[T]he possibility of congenital Minamata Disease occurrence is very high in these two communities. We examined 7 cases of cerebral palsy and 7 cases of mental deficiency.... Further epidemiological research on stillbirths and miscarriages needs to be done." (Harada et al., 2005) All of Dr. Harada's patients who indicated mercury levels higher than the safetyguideline of 50 ppm in 1975 were deceased by 2004. (Harada et al., 2005)		
References Cited Section of Previous Excerpted Document: Harada, Masazumi, Masanori Hanada, Masami Tajiri, Yukari Inoue, Nobuyuki Hotta, Tadashi Fujino, Shigeru Takaoka, and Keishi Ueda. 2011. "Mercury Poisoning in First Nations Groups in Ontario, Canada 35 Years of Minamata Disease in Canada." Journal of Minamata Studies 3: 3–30. Harada, Masazumi, Masanori Hanada, Takashi Miyakita, Tadashi Fujino, Kazuhito Tsuruta, Akira Fukuhara, Tadashi Orui, Shigeharu Nakachi, Chihito Araki, and Masami Tajiri. 2005. "Long-Term Study on the Effects of Mercury Contamination on Two Indigenous Communities in Canada (1975-2004)." Research on Environmental Disruption 34 (4).		1284
Question 2: Based on the clinical medical examinations that Dr. Harada's team performed on people at Grassy Narrows over the years, please comment on the statements, which appear below respecting pages 001445, 001479 to 001483 of the September 2014 supplementary GN submissions to the Government of Ontario, and whether they are accurate in their summary of the findings of Dr. Harada's team referred to in those pages?		

The following 5 Excerpts are from: Literature Review regarding the Impact of Mercury on Human Health Summary of a text produced by Drs. Laurie Chan and Donna Mergler for the Mercury Disability Board presented by Donna Mergler PhD, Professor Emerita, University of Quebec at Montreal: Dr. Harada's studies • Dr. Harada did pioneering work in Japan, demonstrating neurologic damage of Minamata Disease • In a recent report, he stated: "During the early stages of the MD crisis in Minamata, patients, who were diagnosed with MD, seemed to be typical and severe cases of the Hunter-Russell syndrome, including sensory disturbance, concentric constriction of the visual field, ataxia, speech impairment and impaired hearing. However, through more study, it became clear that such severe cases were rather exceptional and many more mild cases were progressing to chronic Minamata Disease. I observed that the symptoms of Minamata Disease became more chronic and atypical in the 1970s. Also I have been proving that sensory disturbances, specifically stronger loss of sensation in the extremities, were seen among patients of methylmercury poisoning at a very high rate, through clinical examinations on family members of patients with sever(sic) and typical symptoms or mothers of congenital Minamata Disease patients"		1479
Dr. Harada's studies • In the '70s, he showed that persons in Grassy Narrows and White Dog manifested similar signs and symptoms to MD and there appeared to be a dose-relation with mercury exposure • In 2002 and 2004, he and his team went back. In total they examined 156 people from Grassy Narrows and White Dog. • Age ranged from 1-90 years • No information was provided on how persons were recruited		1480
Dr. Harada's studies • Diagnostic criteria: • MD: more than one symptom of: sensory disturbances, ataxia, disturbed ocular movement, imbalance, concentric constr[i]ction of the visual field and speech impairment. • In cases where examinees were showing only sensory disturbances, we acknowledged MD as long as there was no other disease causing the symptom. • If an examinee had another disease and still showed symptoms of MD that were not explained by that other disease, we defined the case as MD with complications.		1481

Dr. Harada's studies • Findings: • 60 cases of MD (34.2% of total examinees, excluding people 10 years old and younger); • 54 cases (30.8%) of MD with complications; • 25 cases (14.2%) of possible MD for a total of 139 cases (79.4%). • They conclude : • It is very high rate of neurological symptoms for a sample of a population, even though examinees came because of other health issues. It is as high as contaminated areas in Minamata. We cannot help but recognize the effects of methylmercury from the symptoms we have seen.		1482
Our conclusions [of Drs. Chan and Mergler] • Dr Harada and his group did not evaluate the prevalence of MD in this population, but reported on the percentage of MD signs and symptoms within the group that they examined. • We consider that Dr. Harada's follow-up clinical evaluation should be seen as a preliminary study showing the need for a comprehensive epidemiologic study that would include all of the known outcomes of mercury exposure and could take into account co-morbidity from other diseases, such as diabetes and /or alcohol and test for possible interactions. Such a study should also take into account the presence of other contaminants. For this study it would be most useful to have all of the results of hair and blood sampling by Health Canada, Dr. Chan and Dr. Harada, as well as the results of the neurological examinations that were done by Dr. Harada.		1483
Question 3: Based on the clinical psychological/psychiatric examinations that Dr. Harada's team performed on people at Grassy Narrows over the years, please comment on whether you agree with the statements of Donnan, 1986, regarding the psychological health impacts of mercury/methylmercury, which statements appear below respecting pages 001492 to 001493 of the November 2014 supplementary GN submissions to the Government of Ontario? In your professional opinion, has exposure to mercury had psychological/psychiatric impacts on the people of Grassy Narrows and, if so, what have been those impacts?		

Excerpts from: Grassy Narrows and Earthroots Fourth Supplementary Submission to Devon Wills, Ministry of the Environment on 2012-2022 Whiskey Jack Forest Management Plan IEA Request, dated November 14, 2014 2. PSYCHOLOGICAL HEALTH IMPACTS OF MERCURY "High blood mercury levels contribute to anxiety..." (Donnan, MOE 1986, p.28) "...mental health effects such as anxiety due to mercury contamination in the Wabigoon- English River System have been borne almost entirely by the Native people of the Grassy Narrows and Whitedog Bands." (Donnan, MOE 1986, p.28) The fear and anxiety from knowing they were contaminated was debilitating to many. The threat of mercury poisoning clearly affected the mental health of these people...." (Donnan, MOE 1986, p.31) "[A] reduction in fish mercury levels could help to reduce anxiety and mental trauma experienced by these people." (Donnan, MOE 1986, p.44)		1492-1493
Question 4: Do you continue to adopt the findings and conclusions contained in the article by Shigeru Takaoka, et al, entitled "Signs and symptoms of methylmercury contamination in a First Nations community in Northwestern Ontario, Canada" reported in Science of the Total Environment 468-469 (2014) 950-957? If not, what has caused you to change your opinion since publication of the article?		

Answers to Questions

Question No. 1

They are accurate.

Question No. 2

They are accurate.

Question No. 3

In our professional opinion, yes, there were negative psychiatric effects.

Question No. 4

We continue to support them.

References Cited

Harada, Masazumi, Masanori Hanada, Takashi Miyakita, Tadashi Fujino, Kazuhito Tsuruta, Akira Fukuhara, Tadashi Orui, Shigeharu Nakachi, Chihito Araki, and Masami Tajiri. 2005. "Long-Term Study on the Effects of Mercury Contamination on Two Indigenous Communities in Canada (1975-2004)." Research on Environmental Disruption 34 (4).

Harada, Masazumi, Masanori Hanada, Masami Tajiri, Yukari Inoue, Nobuyuki Hotta, Tadashi Fujino, Shigeru Takaoka, and Keishi Ueda. 2011. "Mercury Poisoning in First Nations Groups in Ontario, Canada 35 Years of Minamata Disease in Canada." Journal of Minamata Studies 3: 3–30.

Takaoka, Shigeru, Tadashi Fujino, Nobuyuki Hotta, Keishi Ueda, Masanobu Hanada, Masami Tajiri, Yukari Inoue. 2014. Signs and symptoms of methylmercury contamination in a First Nations community in Northwestern Ontario, Canada." Science of the Total Environment 468-469: 950-957.

Appendix A:
2014 Article – Signs and Symptoms of Methylmercury Contamination in a First Nations Community in Northwestern Ontario, Canada

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Signs and symptoms of methylmercury contamination in a First Nations community in Northwestern Ontario, Canada

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HIGHLIGHTS

- Similarities between the prevalence of complaints in Minamata and Grassy Narrows
- Similarities in neurological findings were also found.
- Quantitative sensory measurements gave similar results for impairments.
- Younger Canadians were less severely affected than older ones.
- Results suggest that subjects from Grassy Narrows had methylmercury poisoning.

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ABSTRACT

In 1970, fish caught in the English–Wabigoon River system in northwestern Ontario, Canada, were found to be contaminated with mercury coming from a chlor-alkali plant in the province. In the 1970s, patients exhibiting some of the symptoms of the Hunter–Russell syndrome (e.g. paresthesias, visual field constriction, ataxia, impaired hearing, and speech impairment) were reported by some researchers. However attempts to diagnose the patients as suffering from methylmercury poisoning proved to be controversial. In order to research the presence of methylmercury contamination, and show that the patients, through eating contaminated fish, were suffering from methylmercury poisoning, we studied the results of subjective complaints, neurological findings, and quantitative somatosensory measurements gathered in Grassy Narrows Indian Reservation, Ontario, in March, 2010. At that time, the population of the Grassy Narrows settlement was around 900. Ninety-one residents volunteered to be examined. From them, we selected 80 people who were older than 15 years old, and divided them into two groups. Canadian Younger (CY): 36 residents who were from 16 to 45 years old. Canadian Older (CO): 44 residents who were from 46 to 76 years old. We compared them to Japanese Exposed (JE): 88 methylmercury exposed residents from the Minamata district in Japan, and Japanese Control (JC): 164 control residents from non-polluted areas in Japan. Complaints and abnormal neurological findings were more prevalent and quantitative sensory measurements were worse in the two Canadian groups and the Japanese Exposed group than in the Japanese Control group. Complaints, neurological findings and quantitative sensory measurements were similar in Canadian Older and Japanese Exposed. The results for Canadian Younger fell between those of Canadian Older and Japanese Control. These findings indicate that the clinical signs and symptoms of the residents of Grassy Narrows are almost the same as those recorded for Minamata disease in Japan.

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1. Introduction

Since the 1960s, a chlor-alkali plant had been releasing waste products contaminated with mercury into the waters of the English–Wabigoon River system in northwestern Ontario, Canada. In the first examples of fish, from the river system, that were contaminated with methylmercury (Bligh, 1970) levels of up to 16 μg/g were reported. Fimreite and Reynolds (1973) found highly contaminated fish with a maximum

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methylmercury concentration of 27.8 μg/g in 1970. The contamination in fish there was almost equal to that measured in fish from Minamata Bay, Japan, where a barracuda was recorded as having 23 μg/g in May 1961 (Fujiki and Irukayama, 1979). The average mercury concentrations, measured in 1971, in walleye and northern pike from Ball Lake, English–Wabigoon River, were 1.99 μg/g and 5.05 μg/g respectively (Armstrong and Scott, 1979).

In 2003, results of similar measurements were 0.40 μg/g in walleye and 0.85 μg/g in northern pike (Kinghorn et al., 2007). The concentrations of mercury in fish are declining, but they are still higher than those found in fish in Minamata Bay, Japan, where the average concentration of mercury in fish has been from 0.17 to 0.42 μg/g during the period of 1998-2004. (Kindaichi and Matsuyama, 2005). Residents living in that area of Japan, still continue to be exposed to low levels of mercury from the eating of locally caught fish.

The two First Nations' communities living in Grassy Narrows and Whitedog Indian Reservations became victims of methylmercury poisoning through the consumption of locally caught fish. Patients with some of the Hunter–Russell syndrome symptoms have been reported in these reserves (Harada et al., 1976). Canadian researchers also examined the indigenous residents of the areas. Wheatley et al. (1979) reported that effects associated with methylmercury poisoning were observed, but they concluded that direct impacts on human health were difficult to prove.

Pathological studies of a cat from Whitedog, which exhibited acute neurological symptoms, revealed high mercury levels in the brain similar to those of Minamata disease in Japan (Takeuchi et al., 1977). Another cat from neighboring Grassy Narrows showed no symptoms, but on closer examination it was shown to have high mercury levels in the brain and latent defects caused by methylmercury poisoning (Takeuchi et al., 1977).

Since 2004, more than 60,000 people from the Minamata district have been diagnosed with abnormal neurological symptoms. In many cases, the abnormalities were being reported for the first time since the release of methylmercury contaminated wastewater was stopped in 1968 (Takaoka et al., 2009). In chronic methylmercury poisoning the somatosensory disturbance from cortical damage is specific and sensory disturbance is present either in all four limbs or throughout the body, sometimes with the exception of the face and head. To detect such abnormalities, quantitative sensory measurements are useful (Takaoka et al., 2008). So we carried out a health survey that included the examination of subjective complaints, neurological symptoms, and quantitative sensory measurements in Grassy Narrows, Ontario, Canada, in 2010 and tried to reassess the effect of methylmercury in this area.

2. Materials and methods

2.1. Subjects

The study was carried out in March 2010 in Grassy Narrows, Ontario, Canada. We contacted a Grassy Narrows support group and asked for their help. They informed the indigenous population of our coming survey to detect any health effects from methylmercury poisoning and asked for volunteers to take part in the study. The Chief of Grassy Narrows First Nation went on the local radio to ask for volunteers for our research. Posters, informing of our coming research project and our wish for volunteers, were displayed in the band office and a local store. Of the approximately 900 residents, 91 volunteered to be examined. We selected 80 residents, who were older than 15, for the study. Subjects were informed verbally and in writing about the examination method, how the data would be used and that their confidentiality would be protected. Each participant gave their written consent.

We divided them into two groups. (1) Group Canadian Younger (CY): consisted of 36 residents who were from 16 to 45 years old (M/F = 18/18, 34.4 ± 9.5 years old). (2) Group Canadian Older (CO): consisted of 44 residents who were from 46 to 76 years old (M/F = 19/25, 57.5 ± 8.1 years old).

We studied subjective symptoms, neurological findings and carried out four quantitative sensory measurements (including minimal tactile sensation, vibration, position sense, and two-point discrimination) among the 80 residents. In order to assess the state of health of the residents of Grassy Narrows, we compared them to a group of Japanese residents who had also been exposed to methylmercury as well as a group of Japanese control residents. These residents were the same people we had used as subjects in our previous study (Takaoka et al., 2008).

(3) Group Japanese Exposed (JE): was comprised of 88 randomly selected Japanese subjects. They were chosen from residents of the Minamata area who had been exposed to methylmercury and who had been included in our former study at the Minamata Kyoritsu Hospital and the Kyoritsu Neurology and Rehabilitation Clinic between November 2004 and April 2005. Their ages matched those of the corresponding Canadian group but the genders could not be matched exactly (M/F = 38/50, 59.0 ± 7.5). They answered a detailed questionnaire and were given a neurological examination including the same four quantitative sensory measurements as we performed in Canada. All of them were born before 1969. In our former study, we separated the subjects into those with and without neurological or neurologically related diseases, but we found that there was little difference between those two groups. So in this study, Group JE included subjects both with and without such related diseases.

(4) Group Japanese Control (JC): consisted of 164 residents who lived in other districts, e.g. around Fukuoka City, Kumamoto City, and Kagoshima City, aged between 40 and 79. In the control group, people who had lived around Minamata City or who suffered from a neurological disease or a neurologically related illness were excluded. The control subjects were examined between February and May 2006 (M/F = 67/97, 58.4 ± 11.6).

2.2. Epidemiological conditions and questionnaire on complications

The questionnaire, both in Canada and Japan, included questions to determine the subject's exposure to methylmercury and asked for information regarding place of residence, dietary habits, occupational history, medical complications and the health and medical histories of family members.

The questionnaire on complaints for the Canadian groups (CO and CY) consisted of 47 questions related to sensory impairment (7 items), somatic pain (4), visual impairment (3), hearing impairment (3), tasting and smelling problems (3), in-coordination of the extremities (4), other movement impairment (11), vertigo and dizziness (4), general complaints (2), and mental and intellectual problems (6).

The questionnaire on complaints for the Japanese groups (JE and JC) consisted of about 50 questions. We selected 35 relevant questions from the Japanese questionnaire and used them in the Canadian one. They were as follows: sensory impairment (4 items), somatic pain (3), visual impairment (3), hearing impairment (3), tasting and smelling problems (3), in-coordination of the extremities (5), other movement impairment (4), vertigo and dizziness (4), general complaints (2), and mental and intellectual problems (4).

In answer to questions on health complaints, subjects were asked to select one of 4 possible choices. 1) Yes, always, 2) Yes, sometimes, 3) Yes, in the past but not at present, and 4) No, never. The prevalence of each complaint was calculated for each group and then compared between the four groups. All subjects completed the questionnaire before their medical examination. Subjects who could not complete the questionnaire by themselves were asked the questions verbally. All questionnaires were reviewed prior to the examinations.

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2.3. Standard neurological examination

A standard neurological examination was carried out on 32 of the 36 subjects in Group CY and on all 44 subjects in Group CO. Dysarthria, auditory disturbance, visual constriction, finger–nose test with the eyes open and closed, diadochokinesis, heel–shin test, gait disturbances, tandem gait test, Mann's test, balancing on one foot with eyes open and closed, and superficial sensory disturbance (touch and pain) were used and tested for. The examination methods and criteria were almost the same as the former study (Takaoka et al., 2008).

Dysarthria, auditory disturbance, visual constriction, postural hand tremors, gait disturbances and Romberg's sign were judged to be either present or absent. Dysarthria, auditory disturbance, and visual field constriction were judged by the examining physician without using special instruments. Tunnel vision was considered to be present when the confrontation test showed a lateral field of vision of 80° or less.

Limb and truncal ataxia were judged as being either absent, mildly abnormal or moderately to severely abnormal. The results of the finger–nose test and the heel–shin test were judged to be positive not only when there was constant dysmetria or decomposition but also when there was uncertain dysmetria, decomposition, or very slow movement involved. Dysdiadochokinesis was judged to be present from when there was a constant abnormality to when there was an uncertain abnormality or slow movement. Tandem gait disturbance was judged as present not only when the subject could not walk more than five steps but also when they could walk five steps but were unstable. In the balancing on one foot test, disequilibrium was judged as present when it was impossible to balance more than 3 s or when the subject was unstable, but could keep their balance for more than 3 s.

The examinations were carried out in Canada by one neurologist and four psychiatrists. The neurologist and two of the psychiatrists had previous experience in carrying out these tests from earlier examinations of Minamata disease patients. The other two psychiatrists had been briefed and trained to carry out the tests. In Japan, Group JE was examined by six physicians and one neurologist and Group JC was examined by forty-five physicians, several of whom were neurologists.

Because there was not enough data collected from Group JE for the finger–nose test with eyes closed, Mann's test, Romberg's sign or balancing on one foot with eyes closed test, we excluded that information from our calculations.

2.4. Quantitative sensory measurements

Four categories of tests were used in the quantitative measurement of the somatosensory system. All four categories were the same as in the former study (Takaoka et al., 2008).

2.4.1. Assessment of minimal tactile sense

The minimal tactile sense was measured by the Semmes–Weinstein monofilament test. Twenty kinds of filaments from 0.008 to 300 g were used. Subjects were tested with eyes closed after receiving clear instructions on which locations would be tested. Each filament was pushed until it bent about 90° for about a second. The threshold was the smallest size filament which a subject could feel as touch. The trial was performed starting from a smaller size filament and then gradually increasing the size.

Each filament was tested only once except when the subject was unsure. In that case the examiner, using the same filament, repeated the test an odd number of times and selected the dominant response. If a subject could not detect the maximum filament (300 g), we defined the threshold as 400 g for calculation. Testing was carried out on the lower lip, upper chest and ventral sides of both index fingers and big toes.

2.4.2. Vibration sense

Vibration sense was measured by using a 128 Hz tuning fork. The vibration test was carried out on the middle or upper sternum, the radial side of both wrists and the fibular side of both ankles. Subjects were told to indicate when they no longer could feel the vibrations. The examiner simultaneously struck a tuning fork and started a stopwatch, then placed the base of the fork against the area to be tested. The time interval until the subject reacted was recorded.

2.4.3. Position sense

The testing of position sense was carried out on subjects with their eyes closed. A ruler with a millimeter scale was used. Tests were carried out on the subject's index fingers and big toes. A ruler was placed vertically alongside the digit. With the digit held horizontally, the zero point was the position of the digit's nail on the ruler's scale. The examiner held the digit by its sides and moved it either up or down, holding the position for about 1 s. The subject was asked to indicate whether they felt the movement and if it was up or down. The upward or downward movement started from 5 mm from the zero point and was considered to be the minimum value. The movement was increased in 5 mm increments and the subject's threshold distance was recorded.

Each trial was carried out once for each distance except when the subject was uncertain. In that case the examiner would repeat the test again for an odd number of times and choose the dominant response. If the subject could not feel the maximum movement, the threshold was defined as the maximum distance plus 5 mm.

2.4.4. Two-point discrimination

The two-point discrimination test was carried out on subjects while their eyes were closed. A drafting divider, with the legs set at different distances, was pressed against the subject's skin at an angle of 30 to 45° to a depth of between 1 and 2 mm for about 1 s. The distances between the points used in the test were 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20, 25, 30 and 36 mm. The threshold recorded was the shortest distance at which a subject answered correctly. This method was performed on the lower lip and the ventral side of each index finger. If the subject was unable to detect the maximum distance of 36 mm, the threshold was defined as 40 mm for calculation purposes.

In testing Groups CO and CY, the "Yes/No" method was used. However, when a subject felt that 1-point stimulation was actually 2-point stimulation, they were re-tested using the "2-alternative, forced-choice method". In Groups JE and JC the "2-alternative, forced-choice method" was used exclusively.

2.5. Statistical methods

All the calculations were performed using MS Excel and SPSS. Chi square analysis was used in MS Excel when the prevalence was compared, and t-test was used in MS Excel when the average was compared. The correlations were calculated by SPSS.

When we calculated the minimal tactile sense, we converted the grams to the evaluator size using the equation: Evaluator size = log([gram]) + 4.

3. Results

3.1. The subjects' backgrounds

The age and sex of the subjects are shown in Table 1. The age and sex in Groups CO, JC and JE were not statistically different. The age of Group CY was less than the other groups.

From Table 2, we can see that 86% of Group CO and 83% of Group CY answered the question on how they obtained fish and over 60% of Groups CO and CY answered that they are catching fish by themselves. Also from Table 2, we can see that 41% of Group JE and 1% of Group JC

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Table 1
Age and sex of each group.

	Age	n (M/F)
Group CO	57.5 ± 8.1	44 (19/25)
Group CY	34.4 ± 9.5	36 (18/18)
Group JE	59.0 ± 7.5	88 (38/50)
Group JC	58.4 ± 11.6	164 (67/97)

belonged to a fisher family. Ninety-three percent of Group JE and 25% of Group JC ate fish every day.

Table 3 shows the relevant medical history of Group CO and Group CY. The information was collected through interviews. On the question of hypertension, although some subjects had no recorded history of hypertension, high blood pressure was detected during the tests. If we detected a systolic pressure of 170 or more or and diastolic pressure of 110 or more in a subject, we recorded that hypertension was present. Some neurological or neurologically related diseases were found in 47 subjects (53%) of Group JE. No neurological or neurologically related diseases were found in Group JC.

3.2. Questionnaire on medical complaints

Medical complaints reported from each group are shown in Table 4, and the p-values by chi square among the four groups are shown in Table 5. In general, the prevalence in both "Yes, always" and "Yes, always" + "Yes, sometimes" in Groups JE, CO, and CY was statistically higher than Group JC. In general, the prevalence in Group JE and Group CO was similar. For most of the complaints Group CY showed a lower prevalence than Group CO.

The questionnaire consisted of questions related to specific and non-specific symptoms in the methylmercury polluted area. Specific symptoms included numbness, difficulty in speaking, fine-finger tasks, buttoning, losing slippers while walking, difficulty in differentiating tastes, detecting smells etc. Non-specific symptoms included headaches, forgetfulness, general fatigue, and so on. In specific symptoms, the prevalence of the answer "Yes, always" + "Yes, sometimes" was lower in Table 4. A tendency to a similar prevalence was observed both in specific and non-specific symptoms.

The correlation efficient among four groups was shown in Table 7. In "Yes, always" answers, the correlation between Groups JE and CO was highest, and was followed by the one between Groups CO and CY. In "Yes, always" + "Yes, sometimes" answers the correlation between Groups CO and CY was highest, and was followed by the one between Groups JE and CO and between Groups JE and CY.

Table 2
Fish sources and frequency of ingestion.

In Canada	Group CO	Group CY
Self-caught fish	28/44 (64%)	24/36 (67%)
Fish caught by relatives and friends, purchased etc.	30/44 (68%)	22/36 (61%)
A combination of both the above	38/44 (86%)	30/36 (83%)
In Japan	**Group JE**	**Group JC**
Fishermen	10/88 (11%)	0/164 (0%)
Fishermen's families	36/88 (41%)	1/164 (1%)
Sport fishing/recreational fishing	62/88 (70%)	17/161 (11%)[b]
Daily ingestion	81/87 (93%)[a]	40/157 (25%)[c]
Ingestion more than once a week	85/87 (98%)[a]	119/157 (76%)[c]

[a] Datum for 1 person was missing.
[b] Data for 3 persons were missing.
[c] Data for 7 persons were missing.

Table 3
Complications in Canadian subjects.

	Group CO	Group CY
Hypertension	15 (34%)	16 (44%)
Diabetes mellitus	8 (18%)	3 (8%)
Stroke	3 (7%)	1 (3%)
Lung diseases	0 (0%)	1 (3%)
Stomach diseases	6 (14%)	1 (3%)
Heart diseases	1 (2%)	0 (0%)
Orthopedic diseases	7 (16%)	4 (11%)
Psychiatric diseases	3 (7%)	1 (3%)

3.3. Neurological examination

The neurological findings for each group and p-values by chi-square among the four groups are shown in Table 6. The prevalence was generally highest in Group JE, and the prevalence of all the findings of Groups JE and CO was statistically higher than Group JC. All the findings of Group CY were less prevalent than Group CO, and seven of twelve findings of Group CO showed statistically higher prevalence than Group CY.

The most prevalent findings in Groups CO are tandem gait abnormality and somatosensory disturbances of pain and touch, followed by hearing impairment, truncal ataxia other than tandem gait abnormality, upper extremity ataxia (finger–nose test and diadochokinesis), and lower extremity ataxia (heel–shin test). The prevalence of visual constriction or dysarthria was lower. Although the orders of prevalence for the positive findings were different, the tendencies of the abnormalities were similar between Groups CO and JE.

Correlation among four groups was shown in Table 7. Correlations between Groups JE and CY, Groups CO and CY, and Groups JE and CO were higher than those between Group JC and other three groups, and p-values were lower.

3.4. Quantitative sensory measurements

3.4.1. Minimal tactile sensitivity using the Semmes–Weinstein monofilament test

Thirty-three subjects (75%) of Group CO and 24 subjects (67%) of Group CY were examined. One set of data for the lower lip in Group CO and one set of data for the left and right big toes in Group CY were absent. 84 of 88 subjects (95%) in Group JE (in which three sets of data were missing for the lower lip) and all 164 subjects of Group JC were examined and calculated.

Fig. 1 shows the results of the minimal tactile sensitivity using the Semmes–Weinstein monofilament test. The results were worst in Group CO, and there were distinct statistical differences between Groups CO, CY, and JC. Group JE was, in general, positioned between Groups CO and CY.

3.4.2. Vibration sense

Thirty-five subjects from Group CO and 25 subjects from Group CY were examined. Two subjects from Group CO and one subject from Group CY were unable to carry out the test correctly and were excluded from the results. Consequently, the results of 33 subjects (75%) from Group CO and 24 subjects (67%) from Group CY were used in the calculation. Three sets of data for the right ankle and 4 sets of data for the left ankle were absent for Group CO. All 88 subjects of Group JE and all 164 subjects of Group JC (in which one set of data for the chest and one set of data for the left and right ankles were absent) were examined and calculated.

Fig. 2 shows that the vibration sense was worst in Group JE, followed by Group CO, Group CY and Group JC. Most of them had statistical differences between each other.

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Table 4
Percentage of complaints.

		Yes, always				Yes, always + Yes, sometimes			
		Group CO	Group CY	Group JE	Group JC	Group CO	Group CY	Group JE	Group JC
1	Numbness in hands	40%	11%	49%	2%	86%	75%	92%	6%
2	Numbness in legs	39%	8%	42%	1%	91%	61%	86%	6%
3	Cannot judge bath water temperature	26%	8%	15%	0%	47%	31%	35%	0%
4	No pain when burned or wounded	23%	17%	16%	0%	65%	49%	44%	0%
5	Hand weakness	34%	22%	56%	3%	78%	69%	81%	5%
6	Leg weakness	35%	11%	49%	2%	79%	54%	77%	4%
7	Tremor in hand	23%	19%	24%	2%	74%	67%	68%	4%
8	Difficulty in speaking	2%	6%	8%	0%	51%	53%	62%	2%
9	Difficulty in fine finger tasks	47%	14%	57%	0%	77%	72%	86%	7%
10	Dropping things	9%	8%	16%	0%	77%	47%	73%	6%
11	Difficulty in buttoning clothes	21%	6%	25%	0%	49%	28%	57%	0%
12	Stumbling	29%	17%	5%	0%	79%	58%	65%	1%
13	Losing slippers while walking	8%	0%	23%	0%	50%	27%	70%	1%
14	Disturbed vision	33%	19%	49%	3%	93%	75%	87%	15%
15	Difficulty in finding things in shops	13%	9%	29%	0%	63%	46%	72%	6%
16	Limited peripheral vision	32%	14%	25%	1%	59%	31%	64%	4%
17	Difficulty in hearing	42%	25%	35%	7%	72%	61%	71%	15%
18	Tinnitus	30%	19%	34%	6%	86%	81%	80%	17%
19	Can hear, but cannot understand	5%	3%	7%	1%	65%	64%	45%	6%
20	Difficulty in differentiating tastes	28%	6%	18%	0%	53%	28%	46%	1%
21	Difficulty in sampling food while cooking	26%	0%	15%	1%	48%	23%	47%	1%
22	Difficulty in detecting smells	28%	11%	22%	0%	49%	28%	48%	4%
23	Muscle cramps	33%	17%	31%	3%	98%	91%	91%	29%
24	Headaches	37%	25%	37%	1%	88%	81%	86%	30%
25	Shoulder stiffness	24%	6%	64%	10%	95%	53%	95%	51%
26	Forgetfulness	21%	17%	34%	1%	81%	72%	97%	52%
27	Inability to hold concentration at work	26%	3%	28%	0%	74%	58%	67%	11%
28	Lack of motivation to do things	16%	0%	26%	1%	58%	56%	86%	21%
29	Irritation	21%	22%	31%	0%	72%	78%	85%	33%
30	Difficulty in sleeping	37%	39%	39%	3%	74%	69%	84%	19%
31	Dizziness when standing up	23%	14%	15%	0%	86%	83%	85%	17%
32	Feeling of head spinning	0%	3%	3%	1%	49%	58%	63%	5%
33	Swaying dizziness	5%	3%	5%	1%	72%	72%	57%	6%
34	Dizziness, bordering on fainting	7%	0%	5%	1%	47%	22%	46%	2%
35	General fatigue	40%	31%	45%	2%	95%	78%	87%	25%

3.4.3. Position sense

Twenty-eight subjects from Group CO and 24 subjects from Group CY were examined. One subject from Group CO and one subject from Group CY were unable to carry out the test correctly and were excluded from the results. Consequently, the results of 27 subjects (61%) from Group CO and 23 subjects (64%) from Group CY were used in the calculation. One set of data for the left and the right big toe, both upward and downward movements, was absent for Group CO. Eighty-seven subjects from Group JE (in which one set of data for both big toes in both directions was absent) and all 164 subjects of Group JC were examined and calculated.

Fig. 3 shows that the position sense was worst in Group JE, followed by Group CO, Group CY, and Group JC. Although there were some exceptions, most of the groups had statistical differences.

3.4.4. Two-point discrimination

Thirty-four subjects from Group CO and 25 subjects from Group CY were examined. Two subjects from Group CO and one subject from Group CY were unable to carry out the test correctly and were excluded from the results. Consequently, the results of 32 subjects (73%) from Group CO and 24 subjects (67%) from Group CY were used in the calculation. 87 of 88 subjects (99%) from Group JE and all 164 subjects of Group JC (in which one set of data for the right index finger was absent) were examined and calculated.

Fig. 4 shows that the position sense was worst in Group JE or Group CO, followed by Group CY and finally Group JC. Most of them had statistical differences, except for the results for index fingers when comparing Group JE with Group CO.

Table 5
p-Value for complaints – comparing groups.

		$p < 0.01$	$p < 0.05$	n.s.
"Yes, always"	CO, JC	All others	Nos. 25, 34	Nos. 8, 19, 32, 33
	CY, JC	All others	Nos. 1, 2, 6, 8, 11, 18, 20	Nos. 13, 19, 21, 25, 27, 28, 32, 33, 34
	JE, JC	All others	Nos. 12, 19	Nos. 32, 33, 34
	CO, CY	Nos. 1, 2, 9, 21	Nos. 6, 20, 27, 28	All others
	JE, CO	Nos. 12, 25	No. 5	All others
	JE, CY	Nos. 1, 2, 5, 6, 9, 13, 14, 25, 27, 28	Nos. 11, 15, 21	All others
"Yes, always" + "Yes, sometimes"	CO, JC	All	–	–
	CY, JC	All others	No. 26	No.25
	JE, JC	All	–	–
	CO, CY	Nos. 2, 25	Nos. 6, 10, 16, 20, 21, 34, 35	All others
	JE, CO	No. 28	Nos. 4, 19, 26	All others
	JE, CY	Nos. 2, 11, 13, 16, 25, 26, 28	Nos. 1, 6, 10, 15, 21, 34	All others

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Table 6
Neurological findings and group comparisons.

Examination	Prevalence of abnormality				p-Value					
	Group CO	Group CY	Group JE	Group JC	CO, JC	CY, JC	JE, JC	CO, CY	JE, CO	JE, CY
Hearing impairment	49%	17%	32%	6%	<0.01	n.s.	<0.01	<0.05	n.s.	n.s.
Visual constriction	14%	0%	28%	0%	<0.01	n.s.	<0.01	n.s.	n.s.	<0.01
Dysarthria	17%	3%	18%	1%	<0.01	n.s.	<0.01	n.s.	n.s.	n.s.
Postural tremor	20%	19%	28%	3%	<0.01	<0.01	<0.01	n.s.	n.s.	n.s.
Normal gait—unstable	28%	6%	30%	5%	<0.01	n.s.	<0.01	<0.05	n.s.	<0.05
Tandem gait—unstable	87%	34%	68%	7%	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01
Finger–nose test (eyes open)	21%	0%	47%	0%	<0.01	n.s.	<0.01	<0.05	<0.01	<0.01
Adiadokokinesis	23%	3%	43%	1%	<0.01	n.s.	<0.01	<0.05	n.s.	<0.01
Balancing on one foot (eyes open)	53%	22%	63%	8%	<0.01	<0.05	<0.01	<0.05	n.s.	<0.01
Heel–knee test	24%	0%	50%	1%	<0.01	n.s.	<0.01	<0.05	<0.05	<0.01
Touch disturbance (four limbs)	50%	44%	83%	1%	<0.01	<0.01	<0.01	n.s.	<0.01	<0.01
Pain disturbance (four limbs)	59%	50%	97%	1%	<0.01	<0.01	<0.01	n.s.	<0.01	<0.01

4. Discussion

Our results show that subjective complaints were most prevalent in Group JE, followed by Groups CO, CY and JC. Similar and high prevalence of more specific complaints from methylmercury poisoning between Groups JE and CO suggest that these similarities are mainly related to methylmercury poisoning. The increase of non-specific complaints, which was found in Group JE, was also observed in Group CO.

The high prevalence of somatosensory disturbance and following ataxic movement in Groups JE and CO suggests that those two groups are similarly affected by methylmercury and Group CY is affected to a smaller extent by methylmercury. Harada et al. (1976) conducted health surveys on 89 indigenous inhabitants of Grassy Narrows and Whitedog and found sensory disturbance (47.6%), abnormality in visual field (18.0%), impaired hearing (44.9%), ataxia (9.0%), and dysarthria (5.6%). These findings together with the Hunter–Russell syndrome suggest methylmercury pollution in these communities.

Except for the high prevalence of tandem gait abnormality and hearing loss, the pattern of prevalence is almost the same as our study from the Minamata area in the 1970s (Fujino, 1994). Harada and his colleague visited Grassy Narrows in 2002 (Harada et al., 2005a) and Grassy Narrows and Whitedog in 2004 (Harada et al., 2005b). In 2002, glove and stocking type of sensory disturbance (54.4%), tunnel vision (10.5%), ataxia (12.3%) and impaired speech (12.3%) were observed in 57 subjects (Harada et al., 2005a). Combining the results of both studies, 2002 and 2004, glove and stocking type sensory disturbance was found in 65.1% of the cases, tunnel vision in 10.8%, ataxia in 25.1% and impaired speech in 6.9% of the 175 subjects (Harada et al., 2005b). As the criteria used for determining ataxia was not described in those papers, it is possible that the actual percentage could be greater than the papers suggested. We show the raw data for ataxic movement in this study.

Our present study differs from the former studies of 1975, 2002 and 2004, in that quantitative measurements of somatosensory disturbance were added to the study. The results of two-point discrimination sensitivity of the lower lip, vibration sense and position sense in big toes were also worse in Group JE, followed by Groups CO, CY and JC. Somatosensory acuity was most impaired in Group JE. Whereas minimal tactile sensitivity of the lower lip and left big toe were worst in Group CO, followed by Groups JE, CY and JC. The reason for these differences is, as yet, unascertained. As to two-point discrimination, the "Yes/No" method was used in testing Groups CO and CY, and the "2-alternative, forced-choice method" was used in testing of Groups JE and JC. But, in our experience, there were no great differences between results of these two methods.

Quantitative measurements showed that somatosensory disturbance, showing a similar pattern, was present in all tested body areas. These patterns are assumed to be the characteristics of somatosensory disturbance due to a uniformly injured central nervous system, especially the sensory cortex.

The similarity in the symptoms of abnormalities, neurological findings and quantitative measurements in Groups JE and CO were assumed to be produced by methylmercury poisoning. The intermediate abnormalities in Group CY suggest a milder and continuing effect of methylmercury poisoning in the younger generations of this area.

There are some limitations in this study. The first one is that the subjects in the study consisted of applicants who volunteered for the examination. The subjects in Groups JE, CO and CY ate a lot of fish, but the subjects in Group JC ate less fish. Also the lifestyle and occupations of the Japanese and the Canadian subjects are likely to be quite different. Also, the lifestyle and occupations were not the same in the two Japanese groups JE and JC.

Secondly we had no control area in Canada. Instead, we compared the Canadian results with the results from a control area in Japan, as well as from an exposed area in Japan.

Thirdly, there can be other factors involved which can affect the findings. In Groups CO and CY, some neurological diseases were found which confused the analysis of the test results. In order to overcome this limitation, we tried to compare a wide range of symptoms and complaints, neurological findings and quantitative measurements.

In the earlier study in Japan, we found that some complaints, symptoms, neurological findings, and quantitative measurements recorded could be affected by the presence of certain other neurological diseases. However, the similar patterns of symptoms, neurological findings, and quantitative sensory measurements cannot be explained without taking

Table 7
Correlation of prevalence of complaints and neurological examinations — group comparisons.

		CO, JC	CY, JC	JE, JC	CO, CY	JE, CO	JE, CY
"Yes, always"	Correlation coefficient	0.315	0.301	0.549	0.630	0.712	0.450
	p-Value	n.s.	n.s.	<0.01	<0.01	<0.01	<0.01
"Yes, always" + "Yes, sometimes"	Correlation coefficient	0.578	0.521	0.693	0.813	0.787	0.712
	p-Value	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Neurological examination	Correlation coefficient	0.628	0.242	0.048	0.784	0.708	0.825
	p-Value	<0.05	n.s.	n.s.	<0.01	<0.01	<0.01

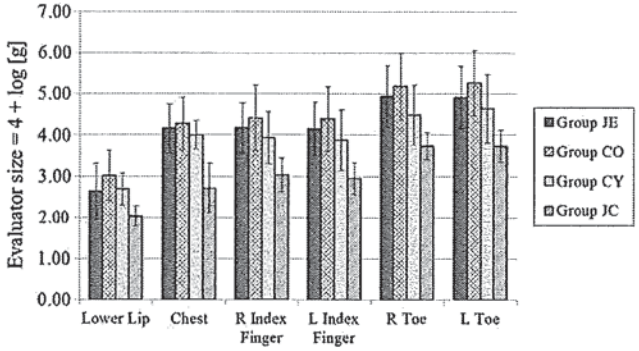

Fig. 1. Threshold for minimal tactile sense — group comparisons. JC, JE: $p < 0.01$ (all locations), JC, CO: $p < 0.01$ (all locations), JC, CY: $p < 0.01$ (all locations), JE, CO: $p < 0.01$ (lower lip), $p < 0.05$ (L toe), n.s. (other locations), JE, CY: $p < 0.01$ (R toe), $p < 0.05$ (chest and R index finger), n.s. (other locations), and CO, CY: $p < 0.05$ (chest), $p < 0.01$ (other locations).

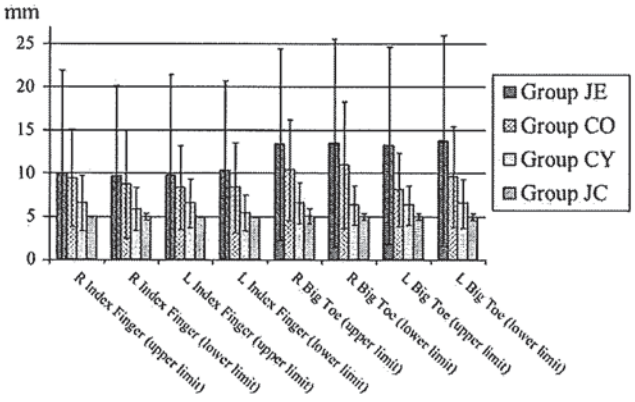

Fig. 3. Threshold for position sense — group comparisons. JC, JE: $p < 0.01$ (all locations), JC, CO: $p < 0.01$ (all locations), JC, CY: $p < 0.05$ (R index finger—lower), n.s. (L index finger—lower), $p < 0.01$ (all other locations), JE, CO: $p < 0.01$ (L big toe—upper & lower), $p < 0.05$ (R big toe—upper), n.s. (all other locations), JE, CY: $p < 0.05$ (L index finger—upper), $p < 0.01$ (all other locations), and CO, CY: $p < 0.05$ (R index finger—lower, L index finger—upper, L big toe—upper), $p < 0.01$ (all other locations).

into account the possibility of the presence of methylmercury poisoning (Takaoka et al., 2008).

After Harada's paper in 1976, the health effects of methylmercury on indigenous Canadians (First Nations) were reported by Canadian researchers. Barbeau et al. (1976) reported that he discovered symptoms like Minamata disease patients in Quebec, but he soon modified and toned down his conclusions. Shephard (1979) admitted the higher exposure in Canadian Indians and insisted that there was no agreement on the clinical diagnosis of mercury poisoning. But no conclusive human health-related data of Canadian Indians were presented by them. Wheatley et al. (1979) reported that they failed to prove abnormalities attributable to methylmercury. But his study in 1979 was based on clinical and pathological test results taken from only one male Cree Indian.

In north-western Quebec, McKeown-Eyssen and Ruedy (1983) studied individuals from the Cree First Nation and reported incoordination (15.4% in males/6.5% in females in Mistassini, 44.2% in males/26.5% in females in Great Whale), abnormal perception of sensations (5.7% in males/4.3% in females in Mistassini, 9.3% in males/2.1% in females in Great Whale). The results for subjects who had visual field scores of over 55° were 16.0% in males and 19.4% in females in Mistassini, and 0.7% in males and 15.5% in females in Great Whale. Although the patterns of abnormalities are very different from our results, the presence of these abnormalities could suggest milder methylmercury poisoning. The Canadian researchers did not, however, come to this conclusion. It would appear that they did not follow up and observe the individuals for a longer period of time, which is unfortunate. In our new Minamata disease cases, observed from November 2004 to April 2005, about half of them were considered to have had their first abnormalities after 1968, the year when the Chisso Company ceased to release methylmercury contaminated industrial wastewater (Takaoka et al., 2009).

Spitzer et al. (1988) found no abnormalities in north-western Quebec when they compared people from the Cree First Nation with a control group. In this study, the exposed group (SDD: The Self Designated Disease Group) and other three control groups were compared. Visual constriction was observed in 4.9% of SDD and in 0.0–1.7% of other groups. Peripheral sensory disturbance (written as "peripheral neuropathy" in the paper) was observed in 9.9% of SDD and in 1.5–3.1% of other groups. There was a higher tendency in the prevalence in SDD, but there was no statistical difference between SDD and other groups.

In examining the Cree people, McKeown-Eyssen et al. (1990) emphasized inter-observer variation. It is more important, however, to do the same examination in the control area and to set criteria for judging the results of the examination, rather than to repeat an examination in the same group. Even though there were some variations and differences between the results obtained by the screener and the results of the neurological examination by the neurologist, e.g. prevalence of tremor (screener 40.2%, neurologist 29.9%) and incoordination (screener 22.8%, neurologist 15.4%) in men in Mistassini, they were still high. They also had differences in criteria when identifying neurological abnormalities, but it should be possible to set standard criteria for the assessment of the neurological findings similar to our methods.

Changeability of neurological functions is quite common in cases of Minamata disease. In Minamata disease the range of four limb

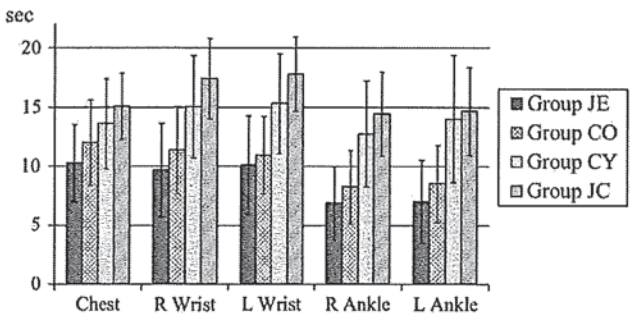

Fig. 2. Threshold for vibration sense — group comparisons. JC, JE: $p < 0.01$ (all locations), JC, CO: $p < 0.01$ (all locations), JC, CY: $p < 0.01$ (bilateral wrist), $p < 0.05$ (chest and R. ankle), n.s. (L. ankle), JE, CO: $p < 0.01$ (chest), n.s. (L wrist), $p < 0.05$ (other locations), JE, CY: $p < 0.01$ (all locations), and CO, CY: n.s. (chest), $p < 0.01$ (all other locations).

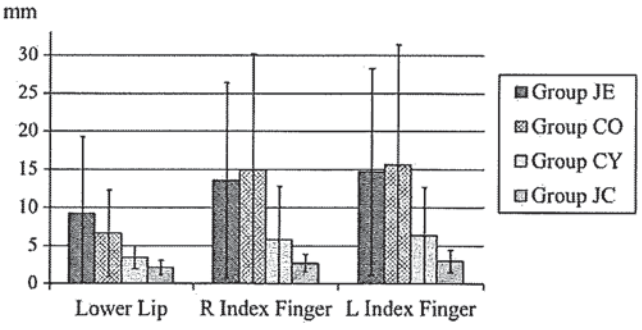

Fig. 4. Threshold for two-point discrimination — group comparisons. JC, JE: $p < 0.01$ (all locations), JC, CO: $p < 0.01$ (all locations), JC, CY: $p < 0.05$ (R index finger), $p < 0.01$ (other locations), JE, CO: $p < 0.05$ (lower lip), n.s. (other locations), JE, CY: $p < 0.01$ (all locations), and CO, CY: $p < 0.01$ (all locations).

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somatosensory disturbance is changeable. Uchino and Araki (1984) reported on 100 cases of Minamata disease. In 77 of the 100 cases the examination for superficial sensory disturbance was carried out from 2 to 5 times, and 63 of the 77 cases (82%) were recorded as "unstable type" in which the area of the body showing somatosensory disturbance changed. The most important factor in showing the effect of environmental pollution on the inhabitants of an area is the ability to gather data and information from both the people exposed to the pollution and from a control group which has not been exposed.

There are some other Canadian studies about the exposure to methylmercury (Wheatley and Paradis, 1996; Wheatley et al., 1997; Wheatley and Paradis, 1998), but there are few that take into account epidemiological human health data. Wheatley (1996) stressed that the people of the First Nations understanding of mercury contamination is influenced by their holistic concepts of health and environment. But there was too little physical data available to corroborate this concept. Without the presence of human physical data, we cannot evaluate psychological, social and spiritual values of health.

5. Conclusions

The data collected from methylmercury-exposed indigenous residents of Grassy Narrows suggest that they were poisoned by methylmercury. The health abnormalities also appear to exist in a milder form in the younger generations from Grassy Narrows.

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Conflict of interest

There is no conflict of interest in this study.

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Appendix B:
Curriculum Vitae of Authors

Annex B: Authors' biographies

Shigeru Takaoka

March	1985	Graduated from Yamaguchi University Medical School
May	1985	Yoshikazu Medical Institution, Kuwamizu Hospital
May	1986	Yoshikazu Medical Institution, Minamata Kyoritsu Hospital
May	1987	Okinawa Medical Co-operative Kyodo Kumiai, Okinawa Kyodo Hospital
May	1988	Yoshikazu Medical Institution, Kuwamizu Hospital
May	1989	Yoshikazu Medical Institution, Minamata Kyoritsu Hospital
May	1991	Post-graduate student majoring in Cranial Nerve Treatment, Juntendo University (Neurology)
May	1993	Assistant Director at Minamata Kyoritsu Hospital
April	1993	Post-graduate research student in Third Department of Internal Medicine, Kagoshima University
July	1993	Director, Minamata Kyoritsu Hospital
April	2002	Director, Minamata Kyoritsu Neurology and Rehabilitation Clinic

Clinical research experience in Canada

March 2010	Participation in Grassy Narrows and White Dog medical screening, with Dr. Masazumi Harada

Professional Associations

Japanese Society of Internal Medicine, Japanese Society of Neurology, Japanese Association of Rehabilitation Medicine, Japanese Society of Psychiatry and Neurology

Credentials

Jun	1985	Medical license (License No. 294252)
Jul	1991	Medical Specialist, Japanese Society of Neurology (No. 1570)
May	2001	Occupational Health Doctor, accredited by Japan Medical Association (No. 13043)
Apr	2005	Accredited physician, Japanese Society of Internal Medicine (No. 81805)
Apr	2006	Medical Specialist, Japanese Association of Rehabilitation Medicine (No. 1349)
Dec	2015	Medical Specialist in General Internal Medicine, Japanese Society of Internal Medicine (No. 21072)

Major Articles

1. S. Takaoka, T. Fujino, T. Sekikawa, T. Miyaoka: Psychophysical sensory examination of individuals with a history of methylmercury exposure. Environmental Research, Vol. 95, p126-132, 2004.

2. S. Takaoka, Y. Kawakami, T. Fujino, F. Ohishi, F. Motokura, Y. Kumagai, T. Miyaoka: Somatosensory disturbance due to methylmercury exposure. Environmental Research, Vol. 107, p6-19, 2008.
3. S. Takaoka, T. Fujino, N. Hotta, K. Ueda, M. Hanada, M. Tajiri, Y. Inoue: Signs and symptoms of methylmercury contamination in a First Nations community in Northwestern Ontario, Canada. Science of the Total Environment, Vol. 468-469, p950-957, 2014.

Tadashi Fujino

Education・Work Experience

March	1968	Graduated from Kumamoto University Medical School
April	1969	Entered Department of Neuropsychiatry, Faculty of Life Sciences, Kumamoto University
April	1972	Minamata Sanatorium Post-graduate student, Department of Neuropsychiatry, Faculty of Life Sciences, Kumamoto University
January	1974	Director, Yoshikazu Medical Institution, Minamata Clinic
April	1976	Post-graduate student, Institute of Constitutional Medicine, Kumamoto University
March	1978	Director, Yoshikazu Medical Institution, Minamata Kyoritsu Hospital
February	1981	Received Medical Degree (Kumamoto University, Doctor No. 399)
March	1982	Completed post-graduate programs at Kumamoto University Medical School and the Institute of Constitutional Medicine
April	1989	Contract Psychiatrist, Minamata Public Health Center, Kumamoto Prefecture, up to March 2002
April	1990	General Director, Yoshikazukai Medical Institution, Minamata Kyoritsu Hospital Director, Minamata Kyoritsu Neurology and Rehabilitation Clinic
July	2002	Tomiokai Medical Institution, Sakuragaoka Hospital
January	2005	Forensic Psychiatrist, Kumamoto District Court, up to December 2008
April	2006	Visiting Researcher, Open Research Center for Minamata Studies, Kumamoto Gakuen University
July	2008	Yoshikazukai Medical Institution, Kikuyo Hospital
April	2009	Yoshikazukai Medical Institution, Minamata Kyoritsu Hospital
April	2012	Anninkai General Foundation, Kumamoto Seimyo Hospital

Clinical research experience in Canada

August	1975	Participation in G.N. and W.D. medical screening, with Dr. Masazumi Harada
August	2002	Participation in G.N. medical screening, with Dr. Masazumi Harada
August	2004	Participation in G.N. and W.D. medical screening, with Dr. Masazumi Harada
March	2010	Participation in G.N. and W.D. medical screening, with Dr. Masazumi Harada

Major Professional Associations

Japanese Society of Psychiatry and Neurology
Japan Environmental Council

Credentials

September	1968	Medical license (License No. 198507)
September	1972	Psychiatrist (No. 3438 under former professional name), up to September 1991
July	1981	Designated Doctor under Physical Disability Welfare Act (Neurology)
October	1991	Psychiatrist (No. 3438 under current professional name)
May	2005	Occupational Health Doctor, accredited by Japan Medical Association (No. 0500949)
January	2006	Contract Advisory Doctor, Japanese Society of Psychiatry and Neurology (Membership Number 05982)
April	2007	Medical Specialist, accredited by Japanese Society of Psychiatry and Neurology (No. 15059826)

Major Articles

1. Masazumi Harada, Taketoshi Akagi, Tadashi Fujino
   Kanada ni okeru suiginosen mondai, Nihon no Kagakusha 10, 511-514, 1975
   (Mercury pollution issues in Canada)

2. Masazumi Harada, Taketoshi Akagi, Tadashi Fujino
   Tokushu: Kanada Indian suiginchudoku jiken – ekigakuteki・rinshoteki chosa, Kogaikenkyu 5, (3), 5-18, 1976
   (Cases of mercury poisoning in Canadian Indians: epidemiological and clinical study)

3. Masazumi Harada, Tadashi Fujino, Taketoshi Akagi and Susumu Nishizaki : Epidemiological and clinical study and histological background of mercury pollution on Indian reservations in Northwestern Ontario, Canada, Bull. Inst. Constit. Med, 26, 169-185, 1976

4. Tadashi Fujino, Shiro Sumiyoshi, Ryuichi Minami, Teruo Hirahara, Hideyo Hattori, Masazumi Harada, Nobuyuki Hotta : *Seishinchitai no rinshoekigakuteki kennkyu – yuukisuiginosen no eikyo, Kumaikaishi 50, 282-295, 1976*
   (Clinical epidemiology study into mental retardation: impact of organic mercury pollution)

5. Masazumi Harada, Tadashi Fujino, Keikichi Kagashima:
Minamata ni okeru hozon saitai no mechirusuigin ni kansuru kenkyu, no to hattatsu, 9, 79-84, 1977
(Study of umbilical cord methylmercury concentration in Minamata)

6. Tadashi Fujino: *Aru shima ni okeru jumin no yuukisuiginosen no eikyou ni kansuru rinshoeki gakuteki kenkyu (Daiippou Osenchiku Jumin no Isseikenshin), Kumaikaishi 51, 22-62, 1977*
(Clinical epidemiology study of impact of organic mercury pollution on island populations)

7. Tadashi Fujino: *Aru shima ni okeru jumin no yuukisuiginosen no eikyou ni kansuru rinshoeki gakuteki kenkyu (Dainihou Hiosenchiku Jumin no isseikenshin) Kumaikaishi 51,91-147, 1977*
(Clinical epidemiology study of impact of organic mercury pollution on island populations)

8. Masazumi Harada, Tadashi Fujino: *Mansei Minamatabyo no chiryo, Nihonijishinpo —α- mercaptopropionyl glycine ni tsuite, Nihonijishinpo 2769,18-22, 1977*
(Treatment of chronic Minamata disease - α- Mercaptopropionyl Glycine)

9. Keikichi Kagashima, Ryuichi Minami, Tadashi Fujino, Masazumi Harada: *Mansei Minamatabyo ni okeru hossaseishojo to nouha shoken, Rinshonoha, 19, 733, 736, 1977*
(Conclusions on paroxysmal symptoms and brainwaves with regard to chronic Minamata disease)

10. Masazumi Harada,Tadashi Fujino,Taketoshi Akagi and Susumu Nishigaki: Mercury contamination in human hair on Indian reservations in Canada, Kumamoto Med. J. 30, 57-64, 1977

11. Masazumi Harada, Tadashi Fujino, Yaeko Itai: *Mansei Minamatabyo no chiryo – Sodium Valproate ni tsuite, Nihonijishinpo, 2848,29-34, 1978*
(Treatment of chronic Minamata disease - Sodium Valproate)

12. Masazumi Harada, Tadashi Fujino, Hitoshi Takahashi : Effects of Tiopronin and Spironolactone in the treatment of chronic methylmercury poisoning, Bull. Inst. Constit. Med. (Kumamoto), 29, 1-20, 1978

13. Tadashi Fujino, Yaeko Itai, Masazumi Harada: *Sentenijo to kankyo osen niyoru yukisuigin no eikyo no kento — Laurence-Moon-Biedl shokogun wo megutte, Taishitsugakushi 44, 103-115, 1980*
(Congenital abnormality and environmental pollution: impact of organic mercury in relation to Laurence-Moon-Biedl syndrome)

14. Tadashi Fujino, Yaeko Itai, Masayoshi Kage: *Minamatabyo tahatsuchiku ni umare senteiseikikei wo tomonatta Laurence-Moon-Biedl shokogun no ichirei, Igakuhyoron No. 66, 57 – 63, 1980*
(Repeated occurrence of Minamata disease: an example of Laurence-Moon-Biedl syndrome accompanying congenital disorders)

15. Tadashi Fujino: *Aru shima ni okeru jumin no yukisuiginosen no eikyo ni kansuru rinshoekigakuteki kenkyu (daisanpo Ⅰ Osenchiku ni okeru jakunensha no isseikenshin, Ⅱ Minamatabyo shindan ni taisuru aratana shokensano kokoromi), Kumaikaishi 54, 149-193, 1980*
(Clinical epidemiology study of impact of organic mercury pollution on island populations; new studies on medical examinations of Minamata disease)

16. Tadashi Fujino, Yaeko Itai: *Kumamoto-ken Goshoura-machi jumin no jikakushojo, shinkeishojo no suii — Mechirusuigin no mansei biryoosen no eikyo ni kansuru kenkyu, Igakuhyoron 75, 51-57, 1983*
(Goshora, Kumamoto prefecture: development of subjective and nervous symptoms in the population – study into the effect of persistent minute amounts of methylmercury)

17. Tadashi Fujino, Yaeko Itai, Masazumi Harada: *Yukisuiginosen chikujumin no rinshoshojo no seni, — Hikakuteki shoryo no osen no eikyo ni kansuru rinshotekikenkyu —, Taishitsuikenho 34, 541-558, 1984*
(Development of clinical symptoms from organic mercury: clinical study into impact of comparatively low levels of pollution)

18. Komyo Eto, Masazumi Harada, Isao Mishima, Tadashi Fujino, Yaeko Itai, Tadao Takeuchi: *Minamatabyo no rinsho to byori no hikakukento – 25 nen no keika wo totta seishinshojo wo tomonau minamatabyo no ichi boken rei - Neuropathol. 5. 29-40, 1984*
(Clinical pathology comparative study – 25 years of mental symptoms accompanying Minamata disease: autopsy example)

19. Tadashi Fujino, Yaeko Itai, Shuichi Kamijukkoku, Masazumi Harada: *Yukisuigin ni yoru kankyoosen ga jumin no kenko ni oyobosu eikyo — aru gyosonchiku no baai,*

ankeetochosa to kenshinkekka yori, Nihontaishitsugakuzasshi dai 49 kan, dai 1・2 go, 139-152, 1985
(Impact of organic mercury pollution on population health in a fishing village: results of a survey and medical examinations)

20. Tadashi Fujino, Yaeko Itai, Itaru Nagayama, and others: *Mechirusuigin no manseibiryoosen no eikyo ni kansuru kenkyu dai 2 ho: Doitsukensasha ni yoru Shiranuikai engan jumin 510mei no jikakushojo・shinkeishojo no suii, Igakuhyoron No.82,34-41, 1987*
(Second study into impact of minute levels of methylmercury: 510 people from the same sample group of the Shiranui seashore population)

21. Tadashi Fujino, Yaeko Itai, Yasuko Motomatsu, and others: *Mechirusuigin no manseibiryoosen no eikyo ni kansuru kenkyu dai 3 po: Osengen haishutsu teishigo no tennyusha no rinshoshojo ni tsuite, Igakuhyoron No.83,52-60, 1987*
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22. Tadashi Fujino, Yaeko Itai, Yasuko Motomatsu: *Mechirusuigin no manseibiryoosen no eikyo ni kansuru kenkyu dai 4 ho: Osenchi kara tenshutsushita junin ni mirareta kenkohigai, iwayuru "Chihatsusei" no mondai, Igagkuhyoron No.84,46-54, 1988*
(Fourth study into impact of minute levels of methylmercury: health difficulties of the population after moving out and late onset problems)

23. Tadashi Fujino, Muneo Hirata, Shiro Kozuma: *Tokuyamawan engan jumin kenkochosa hokoku —Mechirusuigin no biryoosen no eikyo, Igakuhyoron No.90,43-53, 1991*
(Health report on population of Tokuyama Bay seashore: impact of minute levels of methylmercury)

24. Tadashi Fujino: Clinical and Epidemiological studies on chronic disease in Minamata Part 1: Study on Katurajima Island, Kumamoto M.J.Vol. 44 (4), 139-155, 1994

25. Yaeko Itai, Tadashi Fujino, Keiko Ueno and Yasuko Motomatsu : An Epidemiological study of the incidence of abnormal pregnancy in areas heavily contaminated with methylmercury, Environmental Sciences, 11, 2 (2004) 083-097

26. Shigeru Takaoka, Tadashi Fujino, Tomoko Sekikawa, Tetsu Miyaoka : Psychophysical sensory examination in individuals with a history of methylmercury exposure, Environmental Research 95 (2004) 126-132

27. M. Hanada, T. Fujino, T. Oorui, S. Nakachi, T. Nou, T. Kizaki, Y. Hitomi, N. Nakano, H. Ohno: Follow-up study of mercury pollution in indigenous tribe reservations in Ontario, Canada, 1975-2002 Bull. Environ. Contam. Toxicol. (2005) 74: 689-697

28. Masazumi Harada, Masanobu Hanada, Takashi Miyakita, Tadashi Fujino, Kazuhito Tsuruta, Akira Fukuhara, Tadashi Orui, Shigeharu Nakachi, Chihito Araki, Masami Tajiri, Itsuka Nagano: *Choki keikago no kanada senjuminchiku niokeru suiginosen no eikyochosa (1975-2004), Kankyo to kogai 34, 2-8, 2005*
(Study into long-term after effects of mercury pollution on Canadian First Nation population areas)

29. Masazumi Harada, Sadako Urasaki, Nobue Kamachi, Chihito Araki, Sayuri Uemura, Tadashi Fujino, Akira Shimotsuura, Toshihide Tsuda : *Kamineyushojiken no genjo to jinken, Shakaikankeikenkyu dai 11 kan,, dai 1 ・2 go, 1-47, 2006. 2*
(Yusho disease: current conditions and rights)

30. Shigeru Takaoka, Yoshinobu Kawakami, Tadashi Fujino, Fumihiro Oh-ishi, Fukuo Motokura, Yoshio Kumagai, Tetsu Miyaoka : Somatosensory disturbance due to methylmercury exposure, Environmental Research 107 (2008) 6-19

31. Masazumi Harada, Akitomo Shimoji, Masami Tajiri, Yukari Inoue, Tadashi Fujino, Yoshinobu Kawakami, Shigeru Takaoka, Tatsumi Ikeda, Yaeko Itai, Kanji Iwata, Fumihiro Oishi, Yuusuke Kado, Keikichi Kagashima, Yasunori Sakai, Tetsuo Shiokawa, Tateyo Suzuki, Shigeo Araki, Hisashi Tanaka, Naomi Tokura, Tetsuya Miyake, Fukuo Motokura: *Shiranuikai engan jumin no yukisuigin no eikyo ni kansuru kenkyu — Shiranuikai engan jumin kenkochosa hokoku, Minamatagakukenkyu, 2, 61—86、2010. 3*
(Shiranui seashore population: study into the impact of organic mercury – health report)

32. Masazuzmi Harada, Sadako Urasaki, Nobue Kamachi, Masami Tajiri, Yukari Inoue, Nobuyuki Hotta, Tadashi Fujino, Kazuhito Tsuruta, Takashi Yorifuji, Toshikazu Fujiwara: *Kanemiyusho higaisha no genjo—40 nen me no kenkochosa, Shakaikankeikenkyu dai 16 kan, dai 1 go, 1-53, 2011. 2 1-53, 2011. 2*
(Victims of Yusho disease: fortieth year health study)

33. Masazumi Harada, Masanobu Hanada, Masami Tajiri, Yukari Inoue, Nobuyuki Hotta, Tadashi Fujino, Shigeru Takaoka, Keishi Ueda: *Kanada Ontario-shu senjuminchiku ni okeru suiginosen — Kanada minamatabyo no 35 nenkan, Minamatagakukenkyu, 3, 3-30, 2011. 3*
(Mercury pollution in First Nation population areas in Ontario, Canada: 35 years of Minamata disease in Canada)

34. Tadashi Fujino, Shigeru Takaoka: *Mansei minamatabyo no rinshoekigakutekikenkyu—Chisso・Asetoarudehido kojo sogyoteishigo ni shussei shita jumin no shinkeishoko, Minamatagakukenkyu, 3, 31-56, 2011. 3*
(Clinical epidemiology study into chronic Minamata disease: nervous symptoms in population born after suspension of Chisso Acetaldehyde factory production)

35. Shigeru Takaoka, Tadashi Fujino, Nobuyuki Hotta, Keishi Ueda, Masanobu Hanada, Masami Tajiri, Yukari Inoue : Signs and symptoms of methylmercury contamination in a First Nations community in Northwestern Ontario, Canada, Science of the Total Environment, 468-469 (2014) 950-957

Akitomo Shimoji

Education

1973 Graduated Faculty of Medicine, Kumamoto University

1973 Started work at Department of Neuropsychiatry, Faculty of Life Sciences, Kumamoto University

1975 Tomiai Prefectural Hospital Kumamoto (currently called Kokoro Medical Center)

1977 Research Associate, Poisoning Research Center, Neurotoxin Sector, Kumamoto University

1981 Research Associate, Department of Psychiatry, Kumamoto University

1987 Chief Psychiatrist, Okinawa Miyako Hospital

1989 Lecturer, Department of Neuropsychiatry, Kumamoto University

1997 Associate Professor, Department of Neuropsychiatry (Clinical Psychology), Kumamoto University

2004 Associate Professor, Department of Psychiatry and Neuropathology, Graduate School of Medicine and Faculty of Medicine of Kumamoto University (Chief Psychiatrist, Department of Neuropsychiatry)

2005 Professor, Graduate School and Faculty of Social Welfare of Kumamoto Gakuen University (Welfare Environmental Studies)

Clinical research experience in in Canada

August 2014 Participated in clinical research in Grassy Narrows and Whitedog

Major Professional Associations

Japanese Society of Psychiatry and Neurology
Japanese Society of Transcultural Psychiatry
Japanese Society of Psychopathology
Japanese Society of Pathography

Credentials

Psychiatrist

Major Articles

1. Akitomo Shimoji: *"Minamatabyo" kenkyu no hohoron saiko—I gakutekishiko no aratana paradaimu tenkan—, Minamatagakukenkyu, 2, 23-30, 2010*
   (A reappraisal of the methodology of Minamata disease research: new paradigm change in medical opinion)

2. Masazumi Harada, Akitomo Shimoji, Masami Tajiri, Yukari Inoue, Tadashi Fujino, Yoshinobu Kawakami, Shigeru Takaoka, Tatsumi Ikeda, Yaeko Itai, Kanji Iwata, Fumihiro Oishi, Yuusuke Kado, Keikichi Kagashima, Yasuyuki Sakai, Tetsuo Shiokawa, Tateyo Suzuki, Shigeo Araki, Hisahi Tanaka, Naomi Tokura, Tetsuya Miyake, Fukuo Motokura: *Shiranukai engan jumin no yukisuigin no eikyo ni kansuru kenkyu—Shiranukai engan jumin kenkochosahokoku, Minamatagakukenkyu, 2, 61-86, 2010*
   (Shiranui seashore population: study into the impact of organic mercury – health report)

3. Taihei Miyakawa, Isao Shikai, Akitomo Shimoji: *Jikkenteki yukisuiginchudoku—Chikakuseni no shogai ni kanshite, Monbushotokutekikenkyu "Nanbyo"han gyosekishu, 1361 —362、1977*
   (Experimental organic mercury poisoning – difficulties related to developmental awareness)

4. Taihei Miyakara, Eiichi Murakami, Isao Shikai, Akitomo Shimoji, Kenichi Nagatoshi: *Minamatabyo no utagaiga motareta kanja no hifukushinkei seiken* shoken, Minamatabyo ni kansuru sogotekikenkyu, Nihonkoshueiseikyokai 68-72, *1978*
   (Patient with suspected Minamata disease: findings from biopsy of sural nerve)

5. Taihei Miyakawa, Motonori Deshimaru, Akitomo Shimoji and Kenjiro Watanabe: The study of muscle spindles in experimental organic mercury Poisoning, Kumamoto Medical Journal, 38(1):27-36, 1985

EXPERT REPORT IN JAPANESE AND COMMISSIONED

専門家による報告書

グラッシー・ナローズ・ファーストネーションとシェリー・フォビスター、ウィリアム・フォビスター、長老サイモン・フォビスター、族長ロジャー・フォビスター、シニアの代表、そしてその他のグラッシー・ナローズ・ファーストネーション全員の代表
対　オンタリオ州天然資源省森林局、オンタリオ州環境省、そしてオンタリオ州法務長官省

オンタリオ州高等裁判所
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弁護士ジョゼフ・F.・カストリリ氏とリチャード・D.・リンドグレン氏のために作成されました。

グラッシー・ナローズにおける水銀汚染に関連する医学心理学的・精神的問題に関する質問に対する回答

作成者

高岡滋医師、藤野糺医師、
下地明友医師

これは証拠品.....であり、.....の宣誓供述書の中で参照されているものです。
20.....、
目前認証されました。

.....
認証者

日付：2016 年 5 月　日　_____
医師
高岡滋

日付：2016 年 5 月　日　_____
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前書き：専門分野と資格

私たちは日本の九州に位置する熊本県の 3 人の医師です。下記の内容は私たちの経験と専門分野の簡潔な要約です。

高岡滋医師：私は医師で日本国熊本県水俣市にある神経内科リハビリテーション協立クリニックの院長です。私の専門は幅広く、神経内科とリハビリテーションそして一般内科です。私は日本の水俣市とカナダ国オンタリオ州グラッシーナローズにて水銀汚染されたと疑われる患者の住民健診に参加しました。グラッシー・ナローズにおいては原田正純医師率いる調査チームに参加しました。臨床経験に加え、私は水銀汚染に関する論文をいくつか共同で執筆し、それらは論文審査のある医学科学専門誌で発表されました。

藤野糺医師：私は熊本病院で精神科と神経内科を専門としている医師です。私は日本の水俣において水銀汚染された患者の住民健診の経験が豊富であります。数十年に渡り、何度も原田正純医師率いる調査チームと共にカナダ国オンタリオ州グラッシー・ナローズで水銀汚染されたと疑われる男性女性児童の住民検診を多く手がけました。両国において臨床研究について広範囲にわたり論文を執筆し、それらは論文審査のある多くの医学科学専門誌で発表されました。

下地明友医師：私は神経精神科医であり、熊本大学の教授でもあります。故原田正純医師率いる調査チームと共にカナダ国オンタリオ州グラッシー・ナローズにおいて水銀汚染された又は水銀汚染が疑われた患者の臨床評価に参加しました。日本における臨床経験に基づき、私は水銀汚染に関する論文を執筆・共同執筆し、それらは論文審査のある医学科学専門誌で発表されました。

私たちの履歴書は専門家報告書の付録 B に記載されています。

専門的意見を依頼された経緯と背景

私たちはグラッシー・ナローズ・ファースト・ネーションを代理であるカナダ環境法協会のジョゼフ・F・カストリリ氏とリチャード・D・リンドグレン氏より下記の 4 つの質問に回答として専門家報告書の作成を依頼されました。質問の中に出てくる参照ページは原告の申請記録「グラッシー・ナローズ・ファースト・ネーション及びその他、対オンタリオ州天然資源省森林局及びその他」から引用しています。

質問の一覧

Questions for Dr. Shigeru Takaoka et al.	高岡滋医師とそのチームにへの質問	
English	**日本語**	**関連ページ**
Question 1: Based on the clinical medical examinations that Dr. Harada's team performed on people at Grassy Narrows over the years, please comment on the statements, which appear below respecting pages 001251 to 001252 of the January 2014 request by Grassy Narrows (GN) to the Government of Ontario, and whether they are accurate in their summary of the findings of Dr. Harada's team based on the two Harada referenced reports of 2005 and 2011 that appear at page 001284 of the January 2014 request?	**質問１：原田医師とそのチームがグラッシー・ナローズで長年に渡って行った臨床医療調査をもとに、下記のステートメントにコメントしてください。2014 年 1 月にオンタリオ州政府へグラッシー・ナローズから提出されたリクエストの 001251 ページから 001252 ページに関連しています。それらは 2014 年 1 月のリクエストの 001284 ページに記載されている、原田医師が書いた 2005 年と 2011 年の報告書に基づいて原田医師のチームが出した調査結果はその要旨において正確でしょうか。**	
Excerpt from: Bump-up Request for an Individual Environmental Assessment (IEA) submitted to the Ontario Ministry of the Environment regarding the Forest Management Plan for the Whiskey Jack Forest for the 10-year period April 1, 2012 to March 31, 2022 - Final Plan Inspection Approved by the Ministry of Natural Resources, December 23, 2013 - EBR Registry No. 010-9240 Submitted by: Grassy Narrows First Nation and Earthroots January 22, 2014 5. Mercury Impacts Human Health in Grassy Narrows SUMMARY 35 Years of study by renowned mercury expert Dr. Harada and his team have confirmed that people in Grassy Narrows are suffering from Minamata Disease as a result of methyl mercury ingested by eating local fish. EVIDENCE Doctor Harada's teams of researchers have studied mercury health impacts in Grassy Narrows for over 35 years starting in 1975. "[I]t is an undoubtable fact that Minamata Disease occurred in [Grassy Narrows and White Dog], based on our long-term investigation result." (Harada et al., 2011) Grassy Narrows people "were poisoned by eating fish contaminated with mercury." (Harada et al., 2011) Findings by Harada et al., 2011	次より抜粋：2012 年 4 月 1 日から 2022 年 3 月 31 日までの 10 年間に及ぶウィスキー・ジャック・フォレストの森林管理計画に関してオンタリオ州環境省に提出された個別環境調査(IEA)への再リクエスト– オンタリオ州天然資源省より 2013 年 12 月 23 日に承認された最終計画監査。EBR Registry No. 010-9240 2014 年 1 月 22 日にグラッシー・ナローズ ファーストネーションとアースルートにより提出。 ５．グラッシー・ナローズにおいての水銀の人間の健康への影響 要旨 水銀の専門家として有名な原田医師とそのチームによって行われた 35 年に及ぶ調査により、グラッシー・ナローズ住民は地元で採れた魚を食することによって摂取したメチル水銀が原因で水俣病に苦しんでいることが確認された。 証拠 原田医師の研究者チームは 1975 年以来 35 年に渡りグラッシー・ナローズにおいて水銀の健康に対する影響を調査した。 「長期間に及ぶ調査の結果、（グラッシー・ナローズとホワイト・ドッグでは）水俣病が発生したことは疑う余地のない事実である。」（原田医師とそのチーム、2011 年） グラッシー・ナローズの人々は「水銀に汚染された魚を摂取することにより汚染された。」（原田医師とそのチーム、2011 年） 原田医師とそのチームによって発見された事実	1251-1252

• 59% of the 160 people tested in GN and White Dog were affected by mercury. • 34% were diagnosed with Minamata Disease (MD) using current Japanese diagnostic criteria (41% in GN --> 30 cases) • 25% were diagnosed with suspected Minamata Disease (SMD) • 44% of people aged 21-40 had MD or SMD. All these people were born after the mercury dumping was curtailed in 1971. "[T]he possibility of congenital Minamata Disease occurrence is very high in these two communities. We examined 7 cases of cerebral palsy and 7 cases of mental deficiency…. Further epidemiological research on stillbirths and miscarriages needs to be done." (Harada et al., 2005) All of Dr. Harada's patients who indicated mercury levels higher than the safetyguideline of 50 ppm in 1975 were deceased by 2004. (Harada et al., 2005)	(2011 年) • グラッシー・ナローズとホワイト・ドッグで検査を受けた 160 名の 59%が水銀に汚染されていた。 • 現在の日本の診断基準に基づき、34%が水俣病（MD）と診断された。（グラッシー・ナローズでは 41%、30 件以上） • 25%は水俣病の疑いあり（SMD）と診断された。 • 21 歳か 40 歳の 44%が MD 又は SMD と診断された。全員が 1971 年に水銀放出が削減された以降に生まれている。 「これらの２つのコミュニティーにおいて先天的水俣病発生率は極めて高い。脳性まひ 7 症例と知的障害 7 症例を調査した。死産と流産に関しては、より詳しい疫学的調査を実施する必要がある。」（原田医師とそのチーム、2005 年） 原田医師の患者全員で、1975 年には水銀レベルが 50 ppm の安全指針よりも高かったが、2004 年までには下がった。（原田医師とそのチーム、2005 年）	
References Cited Section of Previous Excerpted Document: Harada, Masazumi, Masanori Hanada, Masami Tajiri, Yukari Inoue, Nobuyuki Hotta, Tadashi Fujino, Shigeru Takaoka, and Keishi Ueda. 2011. "Mercury Poisoning in First Nations Groups in Ontario, Canada 35 Years of Minamata Disease in Canada." Journal of Minamata Studies 3: 3–30. Harada, Masazumi, Masanori Hanada, Takashi Miyakita, Tadashi Fujino, Kazuhito Tsuruta, Akira Fukuhara, Tadashi Orui, Shigeharu Nakachi, Chihito Araki, and Masami Tajiri. 2005. "Long-Term Study on the Effects of Mercury Contamination on Two Indigenous Communities in Canada (1975-2004)." Research on Environmental Disruption 34 (4).	以前に抜粋された資料から引用されたセクションの参考文献目録 ハラダ、マサズミ、ハラダマサノリ、タジリマサミ、イノウエユカリ、ホッタノブユキ、フジノタダシ、タカオカシゲル、ウエダケイシ 2011 年 「カナダ国オンタリオ州ファーストネーショングループにおける水銀汚染。カナダの水俣病の 35 年」水俣研究ジャーナル 3:3-30 ハラダ、マサズミ、ハラダマサノリ、ミヤキタタカシ、フジノタダシ、ツルタカズヒト、フクハラアキラ、オルイタダシ、ナカチシゲハル、アラキチヒト、タジリマサミ、2005 年 「カナダの２つの先住民コミュニティーにおける水銀汚染の影響に関する長期調査（1975-2004）」環境崩壊に関する調査 34(4)	1284
Question 2: Based on the clinical medical examinations that Dr. Harada's team performed on people at Grassy Narrows over the years, please comment on the statements, which appear below respecting pages 001445, 001479 to 001483 of the September 2014 supplementary GN submissions to the Government of Ontario, and whether they are accurate in their summary of the findings of Dr. Harada's team referred to in those pages?	**質問２：原田医師とそのチームがグラッシー・ナローズで長年に渡って行った臨床医療調査をもとに、下記のステートメントにコメントしてください。2014 年 9 月にグラッシー・ナローズがオンタリオ州政府に提出した補足提出の 001445 ページ、 001479 ページと 001483 ページに関連しています。それらは原田医師のチームがこれらのページおいて言及している調査結果はその要旨において正確でしょうか？**	

The following 5 Excerpts are from: Literature Review regarding the Impact of Mercury on Human Health Summary of a text produced by Drs. Laurie Chan and Donna Mergler for the Mercury Disability Board presented by Donna Mergler PhD, Professor Emerita, University of Quebec at Montreal: Dr. Harada's studies • Dr. Harada did pioneering work in Japan, demonstrating neurologic damage of Minamata Disease • In a recent report, he stated: "During the early stages of the MD crisis in Minamata, patients, who were diagnosed with MD, seemed to be typical and severe cases of the Hunter-Russell syndrome, including sensory disturbance, concentric constriction of the visual field, ataxia, speech impairment and impaired hearing. However, through more study, it became clear that such severe cases were rather exceptional and many more mild cases were progressing to chronic Minamata Disease. I observed that the symptoms of Minamata Disease became more chronic and atypical in the 1970s. Also I have been proving that sensory disturbances, specifically stronger loss of sensation in the extremities, were seen among patients of methylmercury poisoning at a very high rate, through clinical examinations on family members of patients with sever(sic) and typical symptoms or mothers of congenital Minamata Disease patients"	下記の 5 つは次からの抜粋です。人間の健康に及ぼす水銀の影響に関する文献の考察 ローリー・チャン博士とドナ・マーグラー博士により水銀障害委員会のために作成された文章の要旨 モントリオール、ケベック大学名誉教授ドナ・マーグラー博士によって公開されました。 原田医師の調査 • 原田医師は日本で草分け的な調査を行い、水俣病の神経系の障害を証明した。 • 最近の報告書にて、彼は「水俣市における水俣病騒動の初期において、水俣病患者は知覚障害、視野の求心性収縮、運動失調、発語障害と聴覚障害などの、ハンター＝ラッセル症候群患者に典型的でかつ重度な症状が見受けられた。しかしながら、より多くの調査を通じて、そのような重度な症例はどちらかというと例外的で、多くの軽症例が慢性的水俣病へ移行していくことが明確になった。水俣病の症状は 1970 年代に、より慢性で変則的なものとなったことが認められ。また私は、先天性水俣病患者の家族または母親の臨床検査を通じて、知覚障害、厳密に言えば、四肢におけるより強度な知覚喪失がメタル水銀中毒患者に非常に高い率で診られることを証明した。」と述べている。	1479
Dr. Harada's studies • In the '70s, he showed that persons in Grassy Narrows and White Dog manifested similar signs and symptoms to MD and there appeared to be a dose-relation with mercury exposure • In 2002 and 2004, he and his team went back. In total they examined 156 people from Grassy Narrows and White Dog. • Age ranged from 1-90 years • No information was provided on how persons were recruited	原田医師の調査 • 70 年代に、彼はグラッシー・ナローズとホワイト・ドッグの住人に水俣病に似た兆候と症状が現われ、水銀の摂取量と関係があることを明らかにした。 • 2002 年と 2004 年に彼と彼のチームは現地へ戻り、グラッシー・ナローズとホワイト・ドッグで合計 156 名を調査した。 ・年齢は 1 歳から 90 歳 ・調査対象の選出法については一切公表されていない	1480

Dr. Harada's studies • Diagnostic criteria: • MD: more than one symptom of: sensory disturbances, ataxia, disturbed ocular movement, imbalance, concentric constr[i]ction of the visual field and speech impairment. • In cases where examinees were showing only sensory disturbances, we acknowledged MD as long as there was no other disease causing the symptom. • If an examinee had another disease and still showed symptoms of MD that were not explained by that other disease, we defined the case as MD with complications.	原田医師の調査 ・診断基準 • 水俣病：知覚障害、運動失調、眼球運動障害、平衡失調、視野の求心性収縮、発語障害の症状のいずれかが一つ以上認められる。 • 調査対象で知覚障害のみが認められた場合、その症状を引き起こす他の疾患が認められない場合は水俣病と認識した。 • 調査対象が他の疾患を持ちながら水俣病症状を表し、その症状が他の疾患によるものではない場合、そのケースは合併症を伴う水俣病とした。	1481
Dr. Harada's studies • Findings: • 60 cases of MD (34.2% of total examinees, excluding people 10 years old and younger); • 54 cases (30.8%) of MD with complications; • 25 cases (14.2%) of possible MD for a total of 139 cases (79.4%). • They conclude : • It is very high rate of neurological symptoms for a sample of a population, even though examinees came because of other health issues. It is as high as contaminated areas in Minamata. We cannot help but recognize the effects of methylmercury from the symptoms we have seen.	原田医師の調査 ・調査結果 ・60 の症例が水俣病（調査対象全員の 34.2%、10 歳以下を除く） ・54 の症例（30.8%）が合併症を伴う水俣病 ・合計 139 の症例（79.4%）のうち 25 の症例（14.2%）が水俣病の疑いがある ・結論 ・調査対象が他の健康問題で来たにもかかわらず、住民の実例としては神経症状はかなり高い率で見られた。それは水俣の汚染地域と同じくらい高かった。我々が見た症状からするとメチル水銀の影響と認識せざるを得ない。	1482
Our conclusions [of Drs. Chan and Megler] • Dr Harada and his group did not evaluate the prevalence of MD in this population, but reported on the percentage of MD signs and symptoms within the group that they examined. • We consider that Dr. Harada's follow-up clinical evaluation should be seen as a preliminary study showing the need for a comprehensive epidemiologic study that would include all of the known outcomes of mercury exposure and could take into account co-morbidity from other diseases, such as diabetes and /or alcohol and test for possible interactions. Such a study should also take into account the presence of other contaminants. For this study it would be most useful to have all of the results of hair and blood sampling by Health Canada, Dr. Chan and Dr. Harada, as well as the results of the neurological examinations that were done by Dr. Harada.	我々の結論（チャン博士とメグラー博士による） • 原田医師と彼のチームはこの住人における水俣病の患者数は見積もらなかったが、水俣病の兆候と症状を示した調査対象人数の参加人数に対するパーセンテージを報告した。 • 原田医師のフォローアップ臨床評価は、既に知られていた水銀汚染の全ての結果を含む、包括的な疫学調査の必要性を示す予備調査として見られるべきであり、糖尿病やアルコールとの相互作用の可能性のテスト等、他の疾患との合計疾患率を考慮せねばならない。このような調査は他の汚染物質の存在をも考慮せねばならない。この調査のためにはヘルス・カナダやチャン博士と原田医師による髪の毛や血液のサンプル摂取の結果の全てと原田医師によって実施された神経学に関する調査の結果があれば最も価値あるものとなるであろう。	1483

Question 3: Based on the clinical psychological/psychiatric examinations that Dr. Harada's team performed on people at Grassy Narrows over the years, please comment on whether you agree with the statements of Donnan, 1986, regarding the psychological health impacts of mercury/methylmercury, which statements appear below respecting pages 001492 to 001493 of the November 2014 supplementary GN submissions to the Government of Ontario? In your professional opinion, has exposure to mercury had psychological/psychiatric impacts on the people of Grassy Narrows and, if so, what have been those impacts?	**質問３：原田医師とそのチームがグラッシー・ナローズで長年に渡って行った臨床心理学的・精神学的調査をもとに、1986 年にドナンが述べた、水銀・メチル水銀の心理学的健康の影響について下記のステートメントに貴殿が同意するか否かをコメントしてください。2014 年 11 月にグラッシー・ナローズがオンタリオ州政府に提出した補足提出の 001492 ページと 001493 ページ関連しています。専門家として貴殿は、グラッシー・ナローズの住人は水銀汚染されたことによって心理的・精神的影響を受けたでしょうか。受けたとお考えであれば、どのような影響を受けたのでしょうか。**	
Excerpts from: Grassy Narrows and Earthroots Fourth Supplementary Submission to Devon Wills, Ministry of the Environment on 2012-2022 Whiskey Jack Forest Management Plan IEA Request, dated November 14, 2014 2. PSYCHOLOGICAL HEALTH IMPACTS OF MERCURY "High blood mercury levels contribute to anxiety..." (Donnan, MOE 1986, p.28) "…mental health effects such as anxiety due to mercury contamination in the Wabigoon-English River System have been borne almost entirely by the Native people of the Grassy Narrows and Whitedog Bands." (Donnan, MOE 1986, p.28) The fear and anxiety from knowing they were contaminated was debilitating to many. The threat of mercury poisoning clearly affected the mental health of these people…." (Donnan, MOE 1986, p.31) "[A] reduction in fish mercury levels could help to reduce anxiety and mental trauma experienced by these people." (Donnan, MOE 1986, p.44)	次から抜粋：グラッシー・ナローズとアースルーツの 2012-2022 年ウィスキージャック森林管理計画 IEA リクエストに関する、デボンウィルス、環境省に提出した第４補足提案、2014 年 11 月 14 日付 ２．水銀の心理学的健康への影響 「高い血中の水銀値は不安を抱かせる」（ドナン、MOE 1986 年、28 ページ） 「グラッシー・ナローズとホワイトドッグ・バンドの原住民によってほぼ全域が所有されているワビゴーン-イングリッシュ川沿岸が水銀に汚染されていることによって引き起こされる不安などのメンタルヘルスの影響」（ドナン、MOE 1986 年、28 ページ） 「彼らが汚染されていると知っていることによる恐れと不安は、多くの人々を衰弱させる。水銀汚染の脅威は明らかにこれらの人々のメンタルヘルスに影響を及ぼしている。」（ドナン、MOE 1986 年、31 ページ） 「魚の水銀汚染レベルを下げることは人々の不安と彼らが経験した精神的なトラウマを少なくさせることに役立つ。」（ドナン、MOE 1986 年、44 ページ）	1492-1493
Question 4: Do you continue to adopt the findings and conclusions contained in the article by Shigeru Takaoka, et al, entitled "Signs and symptoms of methylmercury contamination in a First Nations community in Northwestern Ontario, Canada" reported in Science of the Total Environment 468-469 (2014) 950-957? If not, what has caused you to change your opinion since publication of the article?	**質問４：高岡滋医師と彼のチームによって書かれ、Science of Total Environment 486-469 (2014) 950-957 に報告された「カナダ・オンタリオ州北西部にあるファーストネーション・コミュニティーにおけるメタル水銀汚染の兆候と症状」という題名の記事に記載されている調査結果と結論を引き続き支持されますか。支持ないのであれば、この記事が発表となって以来どのような理由で貴殿のご意見が変わったのでしょうか？**	

質問への回答

質問１

正確です。

質問２

正確です。

質問３

我々専門家の意見では、精神的悪影響を受けました。

質問４

我々は引き続き支持します。

引用

原田正純、花田昌宜、宮北隆志、藤野糺、鶴田和仁、福原明、大類義、中地重晴、荒木千史、田尻雅美、2005 年　「カナダの２つの先住民コミュニティーにおける水銀汚染の影響に関する長期調査（1975-2004）」環境崩壊に関する調査 34(4)

原田正純、花田昌宜、田尻雅美、井上ゆかり、堀田宜之、藤野糺、高岡滋、上田啓司、2011 年　「カナダ・オンタリオ州ファースト・ネーショングループにおける水銀汚染。カナダの水俣病の 35 年」水俣研究ジャーナル 3:3-30

高岡滋、藤野糺、堀田宜之、上田啓司、花田昌宜、井上ゆかり 2014 年「カナダ・オンタリオ州北西部にあるファースト・ネーションコミュニティーにおけるメチル水銀汚染の兆候と症状」総合環境サイエンス 468-469:950-957

付録 A: 2014 年に書かれた記事 - カナダ・オンタリオ州北西部に位置する北米先住民族コミュニティーにおけるメチル水銀汚染の兆候と症状

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Signs and symptoms of methylmercury contamination in a First Nations community in Northwestern Ontario, Canada

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HIGHLIGHTS

- Similarities between the prevalence of complaints in Minamata and Grassy Narrows
- Similarities in neurological findings were also found.
- Quantitative sensory measurements gave similar results for impairments.
- Younger Canadians were less severely affected than older ones.
- Results suggest that subjects from Grassy Narrows had methylmercury poisoning.

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ABSTRACT

In 1970, fish caught in the English–Wabigoon River system in northwestern Ontario, Canada, were found to be contaminated with mercury coming from a chlor-alkali plant in the province. In the 1970s, patients exhibiting some of the symptoms of the Hunter–Russell syndrome (e.g. paresthesias, visual field constriction, ataxia, impaired hearing, and speech impairment) were reported by some researchers. However attempts to diagnose the patients as suffering from methylmercury poisoning proved to be controversial. In order to research the presence of methylmercury contamination, and show that the patients, through eating contaminated fish, were suffering from methylmercury poisoning, we studied the results of subjective complaints, neurological findings, and quantitative somatosensory measurements gathered in Grassy Narrows Indian Reservation, Ontario, in March, 2010. At that time, the population of the Grassy Narrows settlement was around 900. Ninety-one residents volunteered to be examined. From them, we selected 80 people who were older than 15 years old, and divided them into two groups. Canadian Younger (CY): 36 residents who were from 16 to 45 years old. Canadian Older (CO): 44 residents who were from 46 to 76 years old. We compared them to Japanese Exposed (JE): 88 methylmercury exposed residents from the Minamata district in Japan, and Japanese Control (JC): 164 control residents from non-polluted areas in Japan. Complaints and abnormal neurological findings were more prevalent and quantitative sensory measurements were worse in the two Canadian groups and the Japanese Exposed group than in the Japanese Control group. Complaints, neurological findings and quantitative sensory measurements were similar in Canadian Older and Japanese Exposed. The results for Canadian Younger fell between those of Canadian Older and Japanese Control. These findings indicate that the clinical signs and symptoms of the residents of Grassy Narrows are almost the same as those recorded for Minamata disease in Japan.

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1. Introduction

Since the 1960s, a chlor-alkali plant had been releasing waste products contaminated with mercury into the waters of the English–Wabigoon River system in northwestern Ontario, Canada. In the first examples of fish, from the river system, that were contaminated with methylmercury (Bligh, 1970) levels of up to 16 μg/g were reported. Fimreite and Reynolds (1973) found highly contaminated fish with a maximum

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methylmercury concentration of 27.8 μg/g in 1970. The contamination in fish there was almost equal to that measured in fish from Minamata Bay, Japan, where a barracuda was recorded as having 23 μg/g in May 1961 (Fujiki and Irukayama, 1979). The average mercury concentrations, measured in 1971, in walleye and northern pike from Ball Lake, English–Wabigoon River, were 1.99 μg/g and 5.05 μg/g respectively (Armstrong and Scott, 1979).

In 2003, results of similar measurements were 0.40 μg/g in walleye and 0.85 μg/g in northern pike (Kinghorn et al., 2007). The concentrations of mercury in fish are declining, but they are still higher than those found in fish in Minamata Bay, Japan, where the average concentration of mercury in fish has been from 0.17 to 0.42 μg/g during the period of 1998-2004. (Kindaichi and Matsuyama, 2005). Residents living in that area of Japan, still continue to be exposed to low levels of mercury from the eating of locally caught fish.

The two First Nations' communities living in Grassy Narrows and Whitedog Indian Reservations became victims of methylmercury poisoning through the consumption of locally caught fish. Patients with some of the Hunter–Russell syndrome symptoms have been reported in these reserves (Harada et al., 1976). Canadian researchers also examined the indigenous residents of the areas. Wheatley et al. (1979) reported that effects associated with methylmercury poisoning were observed, but they concluded that direct impacts on human health were difficult to prove.

Pathological studies of a cat from Whitedog, which exhibited acute neurological symptoms, revealed high mercury levels in the brain similar to those of Minamata disease in Japan (Takeuchi et al., 1977). Another cat from neighboring Grassy Narrows showed no symptoms, but on closer examination it was shown to have high mercury levels in the brain and latent defects caused by methylmercury poisoning (Takeuchi et al., 1977).

Since 2004, more than 60,000 people from the Minamata district have been diagnosed with abnormal neurological symptoms. In many cases, the abnormalities were being reported for the first time since the release of methylmercury contaminated wastewater was stopped in 1968 (Takaoka et al., 2009). In chronic methylmercury poisoning the somatosensory disturbance from cortical damage is specific and sensory disturbance is present either in all four limbs or throughout the body, sometimes with the exception of the face and head. To detect such abnormalities, quantitative sensory measurements are useful (Takaoka et al., 2008). So we carried out a health survey that included the examination of subjective complaints, neurological symptoms, and quantitative sensory measurements in Grassy Narrows, Ontario, Canada, in 2010 and tried to reassess the effect of methylmercury in this area.

2. Materials and methods

2.1. Subjects

The study was carried out in March 2010 in Grassy Narrows, Ontario, Canada. We contacted a Grassy Narrows support group and asked for their help. They informed the indigenous population of our coming survey to detect any health effects from methylmercury poisoning and asked for volunteers to take part in the study. The Chief of Grassy Narrows First Nation went on the local radio to ask for volunteers for our research. Posters, informing of our coming research project and our wish for volunteers, were displayed in the band office and a local store. Of the approximately 900 residents, 91 volunteered to be examined. We selected 80 residents, who were older than 15, for the study. Subjects were informed verbally and in writing about the examination method, how the data would be used and that their confidentiality would be protected. Each participant gave their written consent.

We divided them into two groups. (1) Group Canadian Younger (CY): consisted of 36 residents who were from 16 to 45 years old (M/F = 18/18, 34.4 ± 9.5 years old). (2) Group Canadian Older (CO): consisted of 44 residents who were from 46 to 76 years old (M/F = 19/25, 57.5 ± 8.1 years old).

We studied subjective symptoms, neurological findings and carried out four quantitative sensory measurements (including minimal tactile sensation, vibration, position sense, and two-point discrimination) among the 80 residents. In order to assess the state of health of the residents of Grassy Narrows, we compared them to a group of Japanese residents who had also been exposed to methylmercury as well as a group of Japanese control residents. These residents were the same people we had used as subjects in our previous study (Takaoka et al., 2008).

(3) Group Japanese Exposed (JE): was comprised of 88 randomly selected Japanese subjects. They were chosen from residents of the Minamata area who had been exposed to methylmercury and who had been included in our former study at the Minamata Kyoritsu Hospital and the Kyoritsu Neurology and Rehabilitation Clinic between November 2004 and April 2005. Their ages matched those of the corresponding Canadian group but the genders could not be matched exactly (M/F = 38/50, 59.0 ± 7.5). They answered a detailed questionnaire and were given a neurological examination including the same four quantitative sensory measurements as we performed in Canada. All of them were born before 1969. In our former study, we separated the subjects into those with and without neurological or neurologically related diseases, but we found that there was little difference between those two groups. So in this study, Group JE included subjects both with and without such related diseases.

(4) Group Japanese Control (JC): consisted of 164 residents who lived in other districts, e.g. around Fukuoka City, Kumamoto City, and Kagoshima City, aged between 40 and 79. In the control group, people who had lived around Minamata City or who suffered from a neurological disease or a neurologically related illness were excluded. The control subjects were examined between February and May 2006 (M/F = 67/97, 58.4 ± 11.6).

2.2. Epidemiological conditions and questionnaire on complications

The questionnaire, both in Canada and Japan, included questions to determine the subject's exposure to methylmercury and asked for information regarding place of residence, dietary habits, occupational history, medical complications and the health and medical histories of family members.

The questionnaire on complaints for the Canadian groups (CO and CY) consisted of 47 questions related to sensory impairment (7 items), somatic pain (4), visual impairment (3), hearing impairment (3), tasting and smelling problems (3), in-coordination of the extremities (4), other movement impairment (11), vertigo and dizziness (4), general complaints (2), and mental and intellectual problems (6).

The questionnaire on complaints for the Japanese groups (JE and JC) consisted of about 50 questions. We selected 35 relevant questions from the Japanese questionnaire and used them in the Canadian one. They were as follows: sensory impairment (4 items), somatic pain (3), visual impairment (3), hearing impairment (3), tasting and smelling problems (3), in-coordination of the extremities (5), other movement impairment (4), vertigo and dizziness (4), general complaints (2), and mental and intellectual problems (4).

In answer to questions on health complaints, subjects were asked to select one of 4 possible choices. 1) Yes, always, 2) Yes, sometimes, 3) Yes, in the past but not at present, and 4) No, never. The prevalence of each complaint was calculated for each group and then compared between the four groups. All subjects completed the questionnaire before their medical examination. Subjects who could not complete the questionnaire by themselves were asked the questions verbally. All questionnaires were reviewed prior to the examinations.

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2.3. Standard neurological examination

A standard neurological examination was carried out on 32 of the 36 subjects in Group CY and on all 44 subjects in Group CO. Dysarthria, auditory disturbance, visual constriction, finger–nose test with the eyes open and closed, diadochokinesis, heel–shin test, gait disturbances, tandem gait test, Mann's test, balancing on one foot with eyes open and closed, and superficial sensory disturbance (touch and pain) were used and tested for. The examination methods and criteria were almost the same as the former study (Takaoka et al., 2008).

Dysarthria, auditory disturbance, visual constriction, postural hand tremors, gait disturbances and Romberg's sign were judged to be either present or absent. Dysarthria, auditory disturbance, and visual field constriction were judged by the examining physician without using special instruments. Tunnel vision was considered to be present when the confrontation test showed a lateral field of vision of 80° or less.

Limb and truncal ataxia were judged as being either absent, mildly abnormal or moderately to severely abnormal. The results of the finger–nose test and the heel–shin test were judged to be positive not only when there was constant dysmetria or decomposition but also when there was uncertain dysmetria, decomposition, or very slow movement involved. Dysdiadochokinesis was judged to be present from when there was a constant abnormality to when there was an uncertain abnormality or slow movement. Tandem gait disturbance was judged as present not only when the subject could not walk more than five steps but also when they could walk five steps but were unstable. In the balancing on one foot test, disequilibrium was judged as present when it was impossible to balance more than 3 s or when the subject was unstable, but could keep their balance for more than 3 s.

The examinations were carried out in Canada by one neurologist and four psychiatrists. The neurologist and two of the psychiatrists had previous experience in carrying out these tests from earlier examinations of Minamata disease patients. The other two psychiatrists had been briefed and trained to carry out the tests. In Japan, Group JE was examined by six physicians and one neurologist and Group JC was examined by forty-five physicians, several of whom were neurologists.

Because there was not enough data collected from Group JE for the finger–nose test with eyes closed, Mann's test, Romberg's sign or balancing on one foot with eyes closed test, we excluded that information from our calculations.

2.4. Quantitative sensory measurements

Four categories of tests were used in the quantitative measurement of the somatosensory system. All four categories were the same as in the former study (Takaoka et al., 2008).

2.4.1. Assessment of minimal tactile sense

The minimal tactile sense was measured by the Semmes–Weinstein monofilament test. Twenty kinds of filaments from 0.008 to 300 g were used. Subjects were tested with eyes closed after receiving clear instructions on which locations would be tested. Each filament was pushed until it bent about 90° for about a second. The threshold was the smallest size filament which a subject could feel as touch. The trial was performed starting from a smaller size filament and then gradually increasing the size.

Each filament was tested only once except when the subject was unsure. In that case the examiner, using the same filament, repeated the test an odd number of times and selected the dominant response. If a subject could not detect the maximum filament (300 g), we defined the threshold as 400 g for calculation. Testing was carried out on the lower lip, upper chest and ventral sides of both index fingers and big toes.

2.4.2. Vibration sense

Vibration sense was measured by using a 128 Hz tuning fork. The vibration test was carried out on the middle or upper sternum, the radial side of both wrists and the fibular side of both ankles. Subjects were told to indicate when they no longer could feel the vibrations. The examiner simultaneously struck a tuning fork and started a stopwatch, then placed the base of the fork against the area to be tested. The time interval until the subject reacted was recorded.

2.4.3. Position sense

The testing of position sense was carried out on subjects with their eyes closed. A ruler with a millimeter scale was used. Tests were carried out on the subject's index fingers and big toes. A ruler was placed vertically alongside the digit. With the digit held horizontally, the zero point was the position of the digit's nail on the ruler's scale. The examiner held the digit by its sides and moved it either up or down, holding the position for about 1 s. The subject was asked to indicate whether they felt the movement and if it was up or down. The upward or downward movement started from 5 mm from the zero point and was considered to be the minimum value. The movement was increased in 5 mm increments and the subject's threshold distance was recorded.

Each trial was carried out once for each distance except when the subject was uncertain. In that case the examiner would repeat the test again for an odd number of times and choose the dominant response. If the subject could not feel the maximum movement, the threshold was defined as the maximum distance plus 5 mm.

2.4.4. Two-point discrimination

The two-point discrimination test was carried out on subjects while their eyes were closed. A drafting divider, with the legs set at different distances, was pressed against the subject's skin at an angle of 30 to 45° to a depth of between 1 and 2 mm for about 1 s. The distances between the points used in the test were 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20, 25, 30 and 36 mm. The threshold recorded was the shortest distance at which a subject answered correctly. This method was performed on the lower lip and the ventral side of each index finger. If the subject was unable to detect the maximum distance of 36 mm, the threshold was defined as 40 mm for calculation purposes.

In testing Groups CO and CY, the “Yes/No” method was used. However, when a subject felt that 1-point stimulation was actually 2-point stimulation, they were re-tested using the “2-alternative, forced-choice method”. In Groups JE and JC the “2-alternative, forced-choice method” was used exclusively.

2.5. Statistical methods

All the calculations were performed using MS Excel and SPSS. Chi square analysis was used in MS Excel when the prevalence was compared, and t-test was used in MS Excel when the average was compared. The correlations were calculated by SPSS.

When we calculated the minimal tactile sense, we converted the grams to the evaluator size using the equation: Evaluator size $=$ $\log([\text{gram}]) + 4$.

3. Results

3.1. The subjects' backgrounds

The age and sex of the subjects are shown in Table 1. The age and sex in Groups CO, JC and JE were not statistically different. The age of Group CY was less than the other groups.

From Table 2, we can see that 86% of Group CO and 83% of Group CY answered the question on how they obtained fish and over 60% of Groups CO and CY answered that they are catching fish by themselves. Also from Table 2, we can see that 41% of Group JE and 1% of Group JC

Table 1
Age and sex of each group.

	Age	n (M/F)
Group CO	57.5 ± 8.1	44 (19/25)
Group CY	34.4 ± 9.5	36 (18/18)
Group JE	59.0 ± 7.5	88 (38/50)
Group JC	58.4 ± 11.6	164 (67/97)

belonged to a fisher family. Ninety-three percent of Group JE and 25% of Group JC ate fish every day.

Table 3 shows the relevant medical history of Group CO and Group CY. The information was collected through interviews. On the question of hypertension, although some subjects had no recorded history of hypertension, high blood pressure was detected during the tests. If we detected a systolic pressure of 170 or more or and diastolic pressure of 110 or more in a subject, we recorded that hypertension was present. Some neurological or neurologically related diseases were found in 47 subjects (53%) of Group JE. No neurological or neurologically related diseases were found in Group JC.

3.2. Questionnaire on medical complaints

Medical complaints reported from each group are shown in Table 4, and the p-values by chi square among the four groups are shown in Table 5. In general, the prevalence in both "Yes, always" and "Yes, always" + "Yes, sometimes" in Groups JE, CO, and CY was statistically higher than Group JC. In general, the prevalence in Group JE and Group CO was similar. For most of the complaints Group CY showed a lower prevalence than Group CO.

The questionnaire consisted of questions related to specific and non-specific symptoms in the methylmercury polluted area. Specific symptoms included numbness, difficulty in speaking, fine-finger tasks, buttoning, losing slippers while walking, difficulty in differentiating tastes, detecting smells etc. Non-specific symptoms included headaches, forgetfulness, general fatigue, and so on. In specific symptoms, the prevalence of the answer "Yes, always" + "Yes, sometimes" was lower in Table 4. A tendency to a similar prevalence was observed both in specific and non-specific symptoms.

The correlation efficient among four groups was shown in Table 7. In "Yes, always" answers, the correlation between Groups JE and CO was highest, and was followed by the one between Groups CO and CY. In "Yes, always" + "Yes, sometimes" answers the correlation between Groups CO and CY was highest, and was followed by the one between Groups JE and CO and between Groups JE and CY.

Table 2
Fish sources and frequency of ingestion.

In Canada	Group CO	Group CY
Self-caught fish	28/44 (64%)	24/36 (67%)
Fish caught by relatives and friends, purchased etc.	30/44 (68%)	22/36 (61%)
A combination of both the above	38/44 (86%)	30/36 (83%)
In Japan	**Group JE**	**Group JC**
Fishermen	10/88 (11%)	0/164 (0%)
Fishermen's families	36/88 (41%)	1/164 (1%)
Sport fishing/recreational fishing	62/88 (70%)	17/161 (11%)[b]
Daily ingestion	81/87 (93%)[a]	40/157 (25%)[c]
Ingestion more than once a week	85/87 (98%)[a]	119/157 (76%)[c]

[a] Datum for 1 person was missing.
[b] Data for 3 persons were missing.
[c] Data for 7 persons were missing.

Table 3
Complications in Canadian subjects.

	Group CO	Group CY
Hypertension	15 (34%)	16 (44%)
Diabetes mellitus	8 (18%)	3 (8%)
Stroke	3 (7%)	1 (3%)
Lung diseases	0 (0%)	1 (3%)
Stomach diseases	6 (14%)	1 (3%)
Heart diseases	1 (2%)	0 (0%)
Orthopedic diseases	7 (16%)	4 (11%)
Psychiatric diseases	3 (7%)	1 (3%)

3.3. Neurological examination

The neurological findings for each group and p-values by chi-square among the four groups are shown in Table 6. The prevalence was generally highest in Group JE, and the prevalence of all the findings of Groups JE and CO was statistically higher than Group JC. All the findings of Group CY were less prevalent than Group CO, and seven of twelve findings of Group CO showed statistically higher prevalence than Group CY.

The most prevalent findings in Groups CO are tandem gait abnormality and somatosensory disturbances of pain and touch, followed by hearing impairment, truncal ataxia other than tandem gait abnormality, upper extremity ataxia (finger–nose test and diadochokinesis), and lower extremity ataxia (heel–shin test). The prevalence of visual constriction or dysarthria was lower. Although the orders of prevalence for the positive findings were different, the tendencies of the abnormalities were similar between Groups CO and JE.

Correlation among four groups was shown in Table 7. Correlations between Groups JE and CY, Groups CO and CY, and Groups JE and CO were higher than those between Group JC and other three groups, and p-values were lower.

3.4. Quantitative sensory measurements

3.4.1. Minimal tactile sensitivity using the Semmes–Weinstein monofilament test

Thirty-three subjects (75%) of Group CO and 24 subjects (67%) of Group CY were examined. One set of data for the lower lip in Group CO and one set of data for the left and right big toes in Group CY were absent. 84 of 88 subjects (95%) in Group JE (in which three sets of data were missing for the lower lip) and all 164 subjects of Group JC were examined and calculated.

Fig. 1 shows the results of the minimal tactile sensitivity using the Semmes–Weinstein monofilament test. The results were worst in Group CO, and there were distinct statistical differences between Groups CO, CY, and JC. Group JE was, in general, positioned between Groups CO and CY.

3.4.2. Vibration sense

Thirty-five subjects from Group CO and 25 subjects from Group CY were examined. Two subjects from Group CO and one subject from Group CY were unable to carry out the test correctly and were excluded from the results. Consequently, the results of 33 subjects (75%) from Group CO and 24 subjects (67%) from Group CY were used in the calculation. Three sets of data for the right ankle and 4 sets of data for the left ankle were absent for Group CO. All 88 subjects of Group JE and all 164 subjects of Group JC (in which one set of data for the chest and one set of data for the left and right ankles were absent) were examined and calculated.

Fig. 2 shows that the vibration sense was worst in Group JE, followed by Group CO, Group CY and Group JC. Most of them had statistical differences between each other.

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Table 4
Percentage of complaints.

		Yes, always				Yes, always + Yes, sometimes			
		Group CO	Group CY	Group JE	Group JC	Group CO	Group CY	Group JE	Group JC
1	Numbness in hands	40%	11%	49%	2%	86%	75%	92%	6%
2	Numbness in legs	39%	8%	42%	1%	91%	61%	86%	6%
3	Cannot judge bath water temperature	26%	8%	15%	0%	47%	31%	35%	0%
4	No pain when burned or wounded	23%	17%	16%	0%	65%	49%	44%	0%
5	Hand weakness	34%	22%	56%	3%	78%	69%	81%	5%
6	Leg weakness	35%	11%	49%	2%	79%	54%	77%	4%
7	Tremor in hand	23%	19%	24%	2%	74%	67%	68%	4%
8	Difficulty in speaking	2%	6%	8%	0%	51%	53%	62%	2%
9	Difficulty in fine finger tasks	47%	14%	57%	0%	77%	72%	86%	7%
10	Dropping things	9%	8%	16%	0%	77%	47%	73%	6%
11	Difficulty in buttoning clothes	21%	6%	25%	0%	49%	28%	57%	0%
12	Stumbling	29%	17%	5%	0%	79%	58%	65%	1%
13	Losing slippers while walking	8%	0%	23%	0%	50%	27%	70%	1%
14	Disturbed vision	33%	19%	49%	3%	93%	75%	87%	15%
15	Difficulty in finding things in shops	13%	9%	29%	0%	63%	46%	72%	6%
16	Limited peripheral vision	32%	14%	25%	1%	59%	31%	64%	4%
17	Difficulty in hearing	42%	25%	35%	7%	72%	61%	71%	15%
18	Tinnitus	30%	19%	34%	6%	86%	81%	80%	17%
19	Can hear, but cannot understand	5%	3%	7%	1%	65%	64%	45%	6%
20	Difficulty in differentiating tastes	28%	6%	18%	0%	53%	28%	46%	1%
21	Difficulty in sampling food while cooking	26%	0%	15%	1%	48%	23%	47%	1%
22	Difficulty in detecting smells	28%	11%	22%	0%	49%	28%	48%	4%
23	Muscle cramps	33%	17%	31%	3%	98%	91%	91%	29%
24	Headaches	37%	25%	37%	1%	88%	81%	86%	30%
25	Shoulder stiffness	24%	6%	64%	10%	95%	53%	95%	51%
26	Forgetfulness	21%	17%	34%	1%	81%	72%	97%	52%
27	Inability to hold concentration at work	26%	3%	28%	0%	74%	58%	67%	11%
28	Lack of motivation to do things	16%	0%	26%	1%	58%	56%	86%	21%
29	Irritation	21%	22%	31%	0%	72%	78%	85%	33%
30	Difficulty in sleeping	37%	39%	39%	3%	74%	69%	84%	19%
31	Dizziness when standing up	23%	14%	15%	0%	86%	83%	85%	17%
32	Feeling of head spinning	0%	3%	3%	1%	49%	58%	63%	5%
33	Swaying dizziness	5%	3%	5%	1%	72%	72%	57%	6%
34	Dizziness, bordering on fainting	7%	0%	5%	1%	47%	22%	46%	2%
35	General fatigue	40%	31%	45%	2%	95%	78%	87%	25%

3.4.3. Position sense

Twenty-eight subjects from Group CO and 24 subjects from Group CY were examined. One subject from Group CO and one subject from Group CY were unable to carry out the test correctly and were excluded from the results. Consequently, the results of 27 subjects (61%) from Group CO and 23 subjects (64%) from Group CY were used in the calculation. One set of data for the left and the right big toe, both upward and downward movements, was absent for Group CO. Eighty-seven subjects from Group JE (in which one set of data for both big toes in both directions was absent) and all 164 subjects of Group JC were examined and calculated.

Fig. 3 shows that the position sense was worst in Group JE, followed by Group CO, Group CY, and Group JC. Although there were some exceptions, most of the groups had statistical differences.

3.4.4. Two-point discrimination

Thirty-four subjects from Group CO and 25 subjects from Group CY were examined. Two subjects from Group CO and one subject from Group CY were unable to carry out the test correctly and were excluded from the results. Consequently, the results of 32 subjects (73%) from Group CO and 24 subjects (67%) from Group CY were used in the calculation. 87 of 88 subjects (99%) from Group JE and all 164 subjects of Group JC (in which one set of data for the right index finger was absent) were examined and calculated.

Fig. 4 shows that the position sense was worst in Group JE or Group CO, followed by Group CY and finally Group JC. Most of them had statistical differences, except for the results for index fingers when comparing Group JE with Group CO.

Table 5
p-Value for complaints — comparing groups.

		$p < 0.01$	$p < 0.05$	n.s.
"Yes, always"	CO, JC	All others	Nos. 25, 34	Nos. 8, 19, 32, 33
	CY, JC	All others	Nos. 1, 2, 6, 8, 11, 18, 20	Nos. 13, 19, 21, 25, 27, 28, 32, 33, 34
	JE, JC	All others	Nos. 12, 19	Nos. 32, 33, 34
	CO, CY	Nos. 1, 2, 9, 21	Nos. 6, 20, 27, 28	All others
	JE, CO	Nos. 12, 25	No. 5	All others
	JE, CY	Nos. 1, 2, 5, 6, 9, 13, 14, 25, 27, 28	Nos. 11, 15, 21	All others
"Yes, always" + "Yes, sometimes"	CO, JC	All	–	–
	CY, JC	All others	No. 26	No.25
	JE, JC	All	–	–
	CO, CY	Nos. 2, 25	Nos. 6, 10, 16, 20, 21, 34, 35	All others
	JE, CO	No. 28	Nos. 4, 19, 26	All others
	JE, CY	Nos. 2, 11, 13, 16, 25, 26, 28	Nos. 1, 6, 10, 15, 21, 34	All others

Table 6
Neurological findings and group comparisons.

Examination	Prevalence of abnormality				p-Value					
	Group CO	Group CY	Group JE	Group JC	CO, JC	CY, JC	JE, JC	CO, CY	JE, CO	JE, CY
Hearing impairment	49%	17%	32%	6%	<0.01	n.s.	<0.01	<0.05	n.s.	n.s.
Visual constriction	14%	0%	28%	0%	<0.01	n.s.	<0.01	n.s.	n.s.	<0.01
Dysarthria	17%	3%	18%	1%	<0.01	n.s.	<0.01	n.s.	n.s.	n.s.
Postural tremor	20%	19%	28%	3%	<0.01	<0.01	<0.01	n.s.	n.s.	n.s.
Normal gait—unstable	28%	6%	30%	5%	<0.01	n.s.	<0.01	<0.05	n.s.	<0.05
Tandem gait—unstable	87%	34%	68%	7%	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01
Finger–nose test (eyes open)	21%	0%	47%	0%	<0.01	n.s.	<0.01	<0.05	<0.01	<0.01
Adiadokokinesis	23%	3%	43%	1%	<0.01	n.s.	<0.01	<0.05	n.s.	<0.01
Balancing on one foot (eyes open)	53%	22%	63%	8%	<0.01	<0.05	<0.01	<0.05	n.s.	<0.01
Heel–knee test	24%	0%	50%	1%	<0.01	n.s.	<0.01	<0.05	<0.05	<0.01
Touch disturbance (four limbs)	50%	44%	83%	1%	<0.01	<0.01	<0.01	n.s.	<0.01	<0.01
Pain disturbance (four limbs)	59%	50%	97%	1%	<0.01	<0.01	<0.01	n.s.	<0.01	<0.01

4. Discussion

Our results show that subjective complaints were most prevalent in Group JE, followed by Groups CO, CY and JC. Similar and high prevalence of more specific complaints from methylmercury poisoning between Groups JE and CO suggest that these similarities are mainly related to methylmercury poisoning. The increase of non-specific complaints, which was found in Group JE, was also observed in Group CO.

The high prevalence of somatosensory disturbance and following ataxic movement in Groups JE and CO suggests that those two groups are similarly affected by methylmercury and Group CY is affected to a smaller extent by methylmercury. Harada et al. (1976) conducted health surveys on 89 indigenous inhabitants of Grassy Narrows and Whitedog and found sensory disturbance (47.6%), abnormality in visual field (18.0%), impaired hearing (44.9%), ataxia (9.0%), and dysarthria (5.6%). These findings together with the Hunter–Russell syndrome suggest methylmercury pollution in these communities.

Except for the high prevalence of tandem gait abnormality and hearing loss, the pattern of prevalence is almost the same as our study from the Minamata area in the 1970s (Fujino, 1994). Harada and his colleague visited Grassy Narrows in 2002 (Harada et al., 2005a) and Grassy Narrows and Whitedog in 2004 (Harada et al., 2005b). In 2002, glove and stocking type of sensory disturbance (54.4%), tunnel vision (10.5%), ataxia (12.3%) and impaired speech (12.3%) were observed in 57 subjects (Harada et al., 2005a). Combining the results of both studies, 2002 and 2004, glove and stocking type sensory disturbance was found in 65.1% of the cases, tunnel vision in 10.8%, ataxia in 25.1% and impaired speech in 6.9% of the 175 subjects (Harada et al., 2005b). As the criteria used for determining ataxia was not described in those papers, it is possible that the actual percentage could be greater than the papers suggested. We show the raw data for ataxic movement in this study.

Our present study differs from the former studies of 1975, 2002 and 2004, in that quantitative measurements of somatosensory disturbance were added to the study. The results of two-point discrimination sensitivity of the lower lip, vibration sense and position sense in big toes were also worse in Group JE, followed by Groups CO, CY and JC. Somatosensory acuity was most impaired in Group JE. Whereas minimal tactile sensitivity of the lower lip and left big toe were worst in Group CO, followed by Groups JE, CY and JC. The reason for these differences is, as yet, unascertained. As to two-point discrimination, the "Yes/No" method was used in testing Groups CO and CY, and the "2-alternative, forced-choice method" was used in testing of Groups JE and JC. But, in our experience, there were no great differences between results of these two methods.

Quantitative measurements showed that somatosensory disturbance, showing a similar pattern, was present in all tested body areas. These patterns are assumed to be the characteristics of somatosensory disturbance due to a uniformly injured central nervous system, especially the sensory cortex.

The similarity in the symptoms of abnormalities, neurological findings and quantitative measurements in Groups JE and CO were assumed to be produced by methylmercury poisoning. The intermediate abnormalities in Group CY suggest a milder and continuing effect of methylmercury poisoning in the younger generations of this area.

There are some limitations in this study. The first one is that the subjects in the study consisted of applicants who volunteered for the examination. The subjects in Groups JE, CO and CY ate a lot of fish, but the subjects in Group JC ate less fish. Also the lifestyle and occupations of the Japanese and the Canadian subjects are likely to be quite different. Also, the lifestyle and occupations were not the same in the two Japanese groups JE and JC.

Secondly we had no control area in Canada. Instead, we compared the Canadian results with the results from a control area in Japan, as well as from an exposed area in Japan.

Thirdly, there can be other factors involved which can affect the findings. In Groups CO and CY, some neurological diseases were found which confused the analysis of the test results. In order to overcome this limitation, we tried to compare a wide range of symptoms and complaints, neurological findings and quantitative measurements.

In the earlier study in Japan, we found that some complaints, symptoms, neurological findings, and quantitative measurements recorded could be affected by the presence of certain other neurological diseases. However, the similar patterns of symptoms, neurological findings, and quantitative sensory measurements cannot be explained without taking

Table 7
Correlation of prevalence of complaints and neurological examinations — group comparisons.

		CO, JC	CY, JC	JE, JC	CO, CY	JE, CO	JE, CY
"Yes, always"	Correlation coefficient	0.315	0.301	0.549	0.630	0.712	0.450
	p-Value	n.s.	n.s.	<0.01	<0.01	<0.01	<0.01
"Yes, always" + "Yes, sometimes"	Correlation coefficient	0.578	0.521	0.693	0.813	0.787	0.712
	p-Value	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Neurological examination	Correlation coefficient	0.628	0.242	0.048	0.784	0.708	0.825
	p-Value	<0.05	n.s.	n.s.	<0.01	<0.01	<0.01

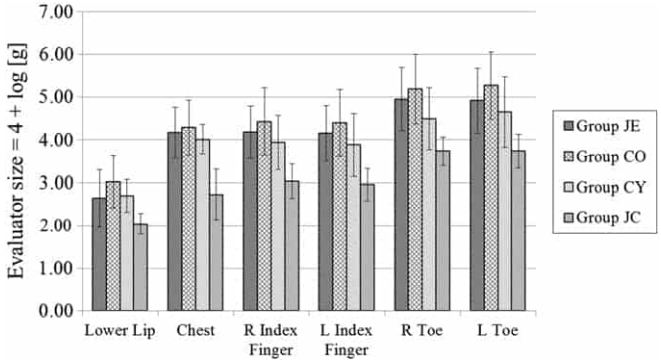

Fig. 1. Threshold for minimal tactile sense — group comparisons. JC, JE: $p < 0.01$ (all locations), JC, CO: $p < 0.01$ (all locations), JC, CY: $p < 0.01$ (all locations), JE, CO: $p < 0.01$ (lower lip), $p < 0.05$ (L toe), n.s. (other locations), JE, CY: $p < 0.01$ (R toe), $p < 0.05$ (chest and R index finger), n.s. (other locations), and CO, CY: $p < 0.05$ (chest), $p < 0.01$ (other locations).

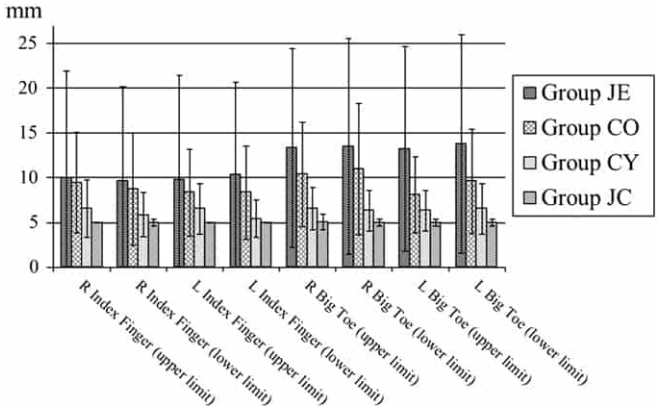

Fig. 3. Threshold for position sense — group comparisons. JC, JE: $p < 0.01$ (all locations), JC, CO: $p < 0.01$ (all locations), JC, CY: $p < 0.05$ (R index finger—lower), n.s. (L index finger—lower), $p < 0.01$ (all other locations), JE, CO: $p < 0.01$ (L big toe—upper & lower), $p < 0.05$ (R big toe—upper), n.s. (all other locations), JE, CY: $p < 0.05$ (L index finger—upper), $p < 0.01$ (all other locations), and CO, CY: $p < 0.05$ (R index finger—lower, L index finger—upper, L big toe—upper), $p < 0.01$ (all other locations).

into account the possibility of the presence of methylmercury poisoning (Takaoka et al., 2008).

After Harada's paper in 1976, the health effects of methylmercury on indigenous Canadians (First Nations) were reported by Canadian researchers. Barbeau et al. (1976) reported that he discovered symptoms like Minamata disease patients in Quebec, but he soon modified and toned down his conclusions. Shephard (1979) admitted the higher exposure in Canadian Indians and insisted that there was no agreement on the clinical diagnosis of mercury poisoning. But no conclusive human health-related data of Canadian Indians were presented by them. Wheatley et al. (1979) reported that they failed to prove abnormalities attributable to methylmercury. But his study in 1979 was based on clinical and pathological test results taken from only one male Cree Indian.

In north-western Quebec, McKeown-Eyssen and Ruedy (1983) studied individuals from the Cree First Nation and reported incoordination (15.4% in males/6.5% in females in Mistassini, 44.2% in males/26.5% in females in Great Whale), abnormal perception of sensations (5.7% in males/4.3% in females in Mistassini, 9.3% in males/2.1% in females in Great Whale). The results for subjects who had visual field scores of over 55° were 16.0% in males and 19.4% in females in Mistassini, and 0.7% in males and 15.5% in females in Great Whale. Although the patterns of abnormalities are very different from our results, the presence of these abnormalities could suggest milder methylmercury poisoning. The Canadian researchers did not, however, come to this conclusion. It would appear that they did not follow up and observe the individuals for a longer period of time, which is unfortunate. In our new Minamata disease cases, observed from November 2004 to April 2005, about half of them were considered to have had their first abnormalities after 1968, the year when the Chisso Company ceased to release methylmercury contaminated industrial wastewater (Takaoka et al., 2009).

Spitzer et al. (1988) found no abnormalities in north-western Quebec when they compared people from the Cree First Nation with a control group. In this study, the exposed group (SDD: The Self Designated Disease Group) and other three control groups were compared. Visual constriction was observed in 4.9% of SDD and in 0.0–1.7% of other groups. Peripheral sensory disturbance (written as "peripheral neuropathy" in the paper) was observed in 9.9% of SDD and in 1.5–3.1% of other groups. There was a higher tendency in the prevalence in SDD, but there was no statistical difference between SDD and other groups.

In examining the Cree people, McKeown-Eyssen et al. (1990) emphasized inter-observer variation. It is more important, however, to do the same examination in the control area and to set criteria for judging the results of the examination, rather than to repeat an examination in the same group. Even though there were some variations and differences between the results obtained by the screener and the results of the neurological examination by the neurologist, e.g. prevalence of tremor (screener 40.2%, neurologist 29.9%) and incoordination (screener 22.8%, neurologist 15.4%) in men in Mistassini, they were still high. They also had differences in criteria when identifying neurological abnormalities, but it should be possible to set standard criteria for the assessment of the neurological findings similar to our methods.

Changeability of neurological functions is quite common in cases of Minamata disease. In Minamata disease the range of four limb

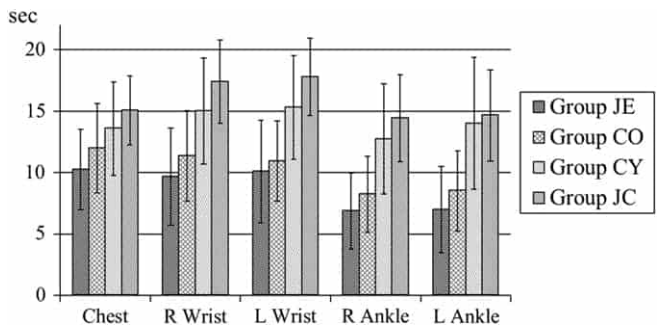

Fig. 2. Threshold for vibration sense — group comparisons. JC, JE: $p < 0.01$ (all locations), JC, CO: $p < 0.01$ (all locations), JC, CY: $p < 0.01$ (bilateral wrist), $p < 0.05$ (chest and R. ankle), n.s. (L. ankle), JE, CO: $p < 0.01$ (chest), n.s. (L wrist), $p < 0.05$ (other locations), JE, CY: $p < 0.01$ (all locations), and CO, CY: n.s. (chest), $p < 0.01$ (all other locations).

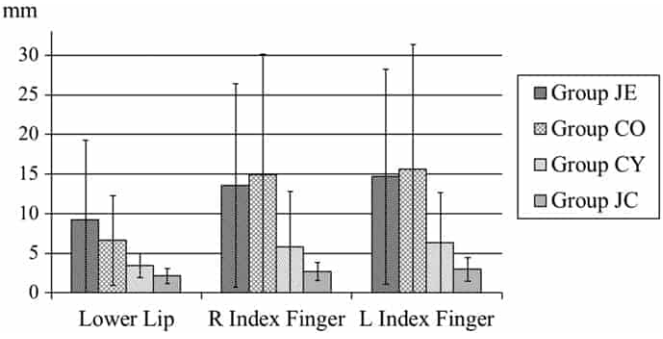

Fig. 4. Threshold for two-point discrimination — group comparisons. JC, JE: $p < 0.01$ (all locations), JC, CO: $p < 0.01$ (all locations), JC, CY: $p < 0.05$ (R index finger), $p < 0.01$ (other locations), JE, CO: $p < 0.05$ (lower lip), n.s. (other locations), JE, CY: $p < 0.01$ (all locations), and CO, CY: $p < 0.01$ (all locations).

somatosensory disturbance is changeable. Uchino and Araki (1984) reported on 100 cases of Minamata disease. In 77 of the 100 cases the examination for superficial sensory disturbance was carried out from 2 to 5 times, and 63 of the 77 cases (82%) were recorded as "unstable type" in which the area of the body showing somatosensory disturbance changed. The most important factor in showing the effect of environmental pollution on the inhabitants of an area is the ability to gather data and information from both the people exposed to the pollution and from a control group which has not been exposed.

There are some other Canadian studies about the exposure to methylmercury (Wheatley and Paradis, 1996; Wheatley et al., 1997; Wheatley and Paradis, 1998), but there are few that take into account epidemiological human health data. Wheatley (1996) stressed that the people of the First Nations understanding of mercury contamination is influenced by their holistic concepts of health and environment. But there was too little physical data available to corroborate this concept. Without the presence of human physical data, we cannot evaluate psychological, social and spiritual values of health.

5. Conclusions

The data collected from methylmercury-exposed indigenous residents of Grassy Narrows suggest that they were poisoned by methylmercury. The health abnormalities also appear to exist in a milder form in the younger generations from Grassy Narrows.

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Conflict of interest

There is no conflict of interest in this study.

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下地 明友

＜学歴＞
1973 年　熊本大学医学部の卒業年度
1973 年　熊本大学神経科・精神科入局
1975 年　熊本県立・富合病院（現・こころの医療センター）
1977 年　熊本大学・助手・中毒研究施設・神経中毒学部門
1981 年　熊本大学精神科助手
1987 年　沖縄県立宮古病院精神科医長
1989 年　熊本大学神経精神科講師
1997 年　熊本大学神経精神科（臨床行動学）助教授
2004 年　熊本大学大学院医学薬学研究部脳機能病態学分野助教授
　　（神経精神科・科長）
2005 年　熊本学園大学大学院社会福祉学研究科福祉環境学専攻教授

＜カナダ検診に関する経歴＞
2014 年 8 月　Grassy Narrows, Whitedog の住民健診

＜主な所属学会＞
日本精神神経学会
日本多文化間精神医学会
日本精神病理学会
日本病跡学会

＜資格・専門医等＞
精神保健指定医

＜主な論文＞

1.下地明友：「水俣病」研究の方法論再考―医学的思考の新たなパラダイム転換―、水俣学研究、2, 23-30, 2010
2. 原田正純，下地明友，田尻雅美，井上ゆかり、藤野糺，川上義信、高岡滋、池田龍己、板井八重子、岩田勘司、大石史弘、門祐輔、樺島啓吉、酒井保之、塩川哲男、鈴木健世、荒木重夫、田中久、戸倉直美、三宅徹也、元倉福雄：不知火海沿岸住民の有機水銀の影響に関する研究―不知火海沿岸住民健康調査報告、水俣学研究、2，61-86, 2010
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Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO),
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

ACKNOWLEDGEMENT OF EXPERT'S DUTY

1. My name is Shigeru Takaoka. I live in the City of Minamata in the Prefecture of Kumamoto.

2. I have been engaged by or on behalf of Grassy Narrows First Nation to provide evidence in relation to the above-noted court proceeding.

3. I acknowledge that it is my duty to provide evidence in relation to this proceeding as follows:

   (a) to provide opinion evidence that is fair, objective and non-partisan;

   (b) to provide opinion evidence that is related only to matters that are within my area of expertise; and

   (c) to provide such additional assistance as the court may reasonably require, to determine a matter in issue.

4. I acknowledge that the duty referred to above prevails over any obligation which I may owe to any party by whom or on whose behalf I am engaged.

Date: _____ _____

Shigeru Takaoka

DR. TAKAOKA'S ACKNOWLEDGEMENT OF EXPERT'S DUTY IN JAPANESE AND COMMISSIONED

これは証拠品.....であり、.....の宣誓供述書の中で参照されているものです。
20.....、
目前認証されました。

.....
認証者

裁判所ファイル番号 446/15

オンタリオ州高等裁判所
(ディビジョナル裁判所)

当事者名

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シェリー・フォビスター
ウィリアム・フォビスター、長老サイモン・フォビスター
族長ロジャー・フォビスター、シニアの代表
そしてグラッシー・ナローズ・ファースト・ネーション全員の代表

原告

及び

オンタリオ州天然資源省森林局、オンタリオ州環境省、
そしてオンタリオ州法務長官省

被告

専門家全責務の承認

1. 私は高岡滋と申します。熊本県水俣市在住です。

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日付: _____ _____

高岡滋

Court File No. 446/15

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

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Jacqueline Wilson (LSUC No. 60330R)

Lawyers for the Applicants

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
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B E T W E E N:

GRASSY NARROWS FIRST NATION
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and THE ATTORNEY GENERAL OF ONTARIO

Respondents

AFFIDAVIT OF TADASHI FUJINO

I, TADASHI FUJINO, of the City of Kumamoto, in the Prefecture of Kumamoto, Japan MAKE OATH AND SAY AS FOLLOWS:

1. I am a medical doctor specializing in psychiatry and neurology at Kumamoto Hospital, in the City of Kumamoto, in the Prefecture of Kumamoto. I have considerable clinical experience examining patients exposed to mercury in Minamata, Japan. At various times, over several decades, I also undertook, with a team of researchers lead by the late Dr.

Masazumi Harada, many clinical examinations of men, women, and children suspected of being exposed to mercury in Grassy Narrows, Ontario, Canada. I have written extensively about my clinical investigations in both countries in a number of medical and scientific peer-reviewed journals. A copy of my curriculum vitae is attached to Exhibit "A" of the affidavit of Shigeru Takaoka for this proceeding.

2. In December 2015 I, along with my colleagues Drs. Shigeru Takaoka and Akitomo Shimoji were asked by counsel for Grassy Narrows First Nation to answer certain questions on medical-psychological/psychiatric issues pertaining to mercury exposure at Grassy Narrows. The questions and our answers to them appear as part of our May 2016 expert report attached as Exhibit "A" to the affidavit of Shigeru Takaoka.

3. A copy of my Acknowledgement of Expert's Duty form is attached as Exhibit "A" to my Affidavit.

SWORN BEFORE ME in the)
City of Kumamoto, in the Prefecture)
of Kumamoto, Japan, this ___ day)
of _____, 2016.)
)
)
A Commissioner, etc.)

_____
Tadashi Fujino

DR. FUJINO'S AFFIDAVIT IN JAPANESE AND COMMISSIONED

裁判所ファイル番号 446/15

オンタリオ州高等裁判所
(ディビジョナル裁判所)

当事者名：

グラッシー・ナローズ・ファースト・ネーション、
シェリー・フォビスター
ウィリアム・フォビスター、長老サイモン・フォビスター、
そして族長ロジャー・フォビスター、シニアの代表
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原告

及び

オンタリオ州天然資源省森林局、オンタリオ州環境省、
そしてオンタリオ州法務長官省

被告

藤野糺の宣誓供述書

私、日本国熊本県熊本市在住の藤野糺は下記のことを宣誓供述致します。

1. 私は熊本県熊本市にある熊本病院で精神科と神経内科を専門としている医師です。私は日本の水俣において水銀汚染された患者の住民健診の経験が豊富であります。数十年に渡り、何度も原田正純医師率いる調査チームと共にカナダ・オンタリオ州グラッシー・ナローズで水銀汚染されたと疑われる男性女性児童の住民検診を多く手がけました。両国において臨床研究について広範囲にわたり論文を執筆し、それらは論文審査のある多くの医学科学専門誌で発表されました。私の履歴書はこの訴訟のために、高岡滋氏の宣誓供述書の証拠品 A に添付されています。
2. 2015 年 12 月、私と同僚の高岡滋医師、下地明友医師はグラッシー・ナローズ・ファースト・ネーションの弁護士からグラッシー・ナローズにおける水銀汚染に係る医学的、心理学的、そして精神的影響に関するいくつかの質問に回答するように依頼されました。質問と回答は高岡滋氏の供述宣誓書に証拠品 A として添付されている 2016 年 5 月専門家報告書の一部として記載されています。
3. 私の専門家全責任承認フォーム 1 部が証拠品 A として私の供述宣誓書に添付されています。

2016年　月　日　　)
日本国熊本県水俣市にて　　)
面前認証　　)
　　)
　　)
　　)
署長、等　　)

_____
藤野糺

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

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and
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-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO),
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

ACKNOWLEDGEMENT OF EXPERT'S DUTY

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Date: _____ _____

Tadashi Fujino

DR. FUJINO'S ACKNOWLEDGEMENT OF EXPERT'S DUTY IN JAPANESE AND COMMISSIONED

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原告

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専門家全責務の承認

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藤野糺

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ONTARIO
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Lawyers for the Applicants

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Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

AFFIDAVIT OF AKITOMO SHIMOJI

I, AKITOMO SHIMOJI, of the City of Kumamoto, in the Prefecture of Kumamoto, Japan MAKE OATH AND SAY AS FOLLOWS:

1. I am a medical doctor, neuro-psychiatrist, and professor at Kumamoto University, in the City of Kumamoto, in the Prefecture of Kumamoto. Along with a team of researchers lead by the late Dr. Masazumi Harada, I participated in clinical evaluations of patients exposed or suspected of having been exposed to mercury in Grassy Narrows, Ontario,

Canada. Based on my clinical experience in Japan, I also have authored or co-authored several articles that have been published in peer-reviewed medical and scientific journals on the subject of exposure to mercury. A copy of my curriculum vitae is attached to Exhibit "A" of the affidavit of Shigeru Takaoka for this proceeding.

2. In December 2015 I, along with my colleagues Drs. Shigeru Takaoka and Tadashi Fujino were asked by counsel for Grassy Narrows First Nation to answer certain questions on medical-psychological/psychiatric issues pertaining to mercury exposure at Grassy Narrows. The questions and our answers to them appear as part of our May 2016 expert report attached as Exhibit "A" to the affidavit of Shigeru Takaoka.

3. A copy of my Acknowledgement of Expert's Duty form is attached as Exhibit "A" to my Affidavit.

SWORN BEFORE ME in the City of Kumamoto, in the Prefecture of Kumamoto, Japan, this ___ day of _____, 2016.

A Commissioner, etc.

_____
Akitomo Shimoji

DR. SHIMOJI'S AFFIDAVIT IN JAPANESE AND COMMISSIONED

裁判所ファイル番号 446/15

オンタリオ州高等裁判所
(ディビジョナル裁判所)

当事者名：

グラッシー・ナローズ・ファースト・ネーション、
シェリー・フォビスター
ウィリアム・フォビスター、長老サイモン・フォビスター、
そして族長ロジャー・フォビスター、シニアの代表
グラッシー・ナローズ・ファースト・ネーション全員の代表

原告

及び

オンタリオ州天然資源省森林局、オンタリオ州環境省、
そしてオンタリオ州法務長官省

被告

下地明友の宣誓供述書

私、日本国熊本県熊本市在住の下地明友は下記のことを宣誓供述致します。

1. 私は神経精神科医であり、熊本県熊本市にある熊本大学の教授でもあります。故原田正純医師率いる調査チームと共にカナダ・オンタリオ州グラッシー・ナローズにおいて水銀汚染された又は水銀汚染が疑われた患者の臨床評価に参加しました。日本における臨床経験に基づき、私は水銀汚染に関する論文を執筆・共同執筆し、それらは論文審査のある医学科学専門誌で発表されました。私の履歴書はこの訴訟のために、高岡滋氏の宣誓供述書の証拠品 A に添付されています。
2. 2015 年 12 月に私と同僚の高岡滋医師、藤野糺医師はグラッシー・ナローズ・ファースト・ネーションの弁護士からグラッシー・ナローズにおける水銀汚染に係る医学的、心理学的、そして精神的影響に関するいくつかの質問に回答するように依頼されました。質問と回答は高岡滋氏の供述宣誓書に証拠品 A として添付されている 2016 年 5 月専門家報告書の一部として記載されています。
3. 私の専門家全責任承認フォーム 1 部が証拠品 A として私の供述宣誓書に添付されています。

2016年　月　日　　)
日本国熊本県水俣市にて　　)
面前認証　　)
　　)
　　)
　　)
署長、等　　)

_____
下地明友

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO),
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

ACKNOWLEDGEMENT OF EXPERT'S DUTY

1. My name is Akitomo Shimoji. I live in the City of Kumamoto in the Prefecture of Kumamoto.

2. I have been engaged by or on behalf of Grassy Narrows First Nation to provide evidence in relation to the above-noted court proceeding.

3. I acknowledge that it is my duty to provide evidence in relation to this proceeding as follows:

   (a) to provide opinion evidence that is fair, objective and non-partisan;

   (b) to provide opinion evidence that is related only to matters that are within my area of expertise; and

   (c) to provide such additional assistance as the court may reasonably require, to determine a matter in issue.

4. I acknowledge that the duty referred to above prevails over any obligation which I may owe to any party by whom or on whose behalf I am engaged.

Date: _____ _____

Akitomo Shimoji

DR. SHIMOJI'S ACKNOWLEDGEMENT OF EXPERT'S DUTY IN JAPANESE AND COMMISSIONED

これは証拠品.....であり、.....の宣誓供述書の中で参照されているものです。
20.....、
目前認証されました。

.....
認証者

裁判所ファイル番号 446/15

オンタリオ州高等裁判所
(ディビジョナル裁判所)

当事者名

グラッシー・ナローズ・ファースト・ネーション、
シェリー・フォビスター
ウィリアム・フォビスター、長老サイモン・フォビスター
族長ロジャー・フォビスター、シニアの代表
そしてグラッシー・ナローズ・ファースト・ネーション全員の代表

原告

及び

オンタリオ州天然資源省森林局、オンタリオ州環境省、
そしてオンタリオ州法務長官省

被告

専門家全責務の承認

1. 私は下地明友と申します。熊本県熊本市在住です。

2. 私はグラッシー・ナローズ・ファースト・ネーションのために雇われ上記に記載された訴訟に係る証拠を提供しました。

3. 下記の通り、私の全責任を持って、この訴訟に係る証拠を提供することを承認しています。

   (a) 公平で客観的で政治的偏向のない意見証拠を提出する事

   (b) 私の専門分野のみに関連することに係る意見証拠を提出する事

   (a) 争点事項を決定するにあたり、裁判所の妥当な要求に対する追加的な力添えをする事

4. 上記に関わる責務は私を雇った人物・団体に対する責務より優先することであることを私は承認しています。

日付: _____ _____

下地明友

Court File No. 446/15

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

AFFIDAVIT OF AKITOMO SHIMOJI

CANADIAN ENVIRONMENTAL LAW ASSOCIATION
55 UNIVERSITY AVENUE, SUITE 1500
TORONTO, ONTARIO M5J 2H7

Telephone: (416) 960-2284
Facsimile: (416) 960-9392

Joseph F. Castrilli (LSUC No. 26123A)
Richard D. Lindgren (LSUC No. 28529E)
Jacqueline Wilson (LSUC No. 60330R)

Lawyers for the Applicants

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

AFFIDAVIT OF MINAKO MIYATA

I, MINAKO MIYATA, of the City of Markham, in the Province of Ontario, MAKE OATH AND SAY AS FOLLOWS:

1. I am a contractor with Multilingual Community Interpreter Services ("MCIS") in Toronto, Ontario where I provide Japanese-English interpretation and translation services in a wide variety of contexts.

2. I am fully qualified to translate Japanese and English. My professional qualifications, work experience, education, and membership affiliations are included in my curriculum vitae, attached as Exhibit “A” to my Affidavit.

3. In July 2016, I was asked by MCIS to verify that the Japanese and English versions of the material that appears in Exhibit “B” to my Affidavit are identical. I am very familiar with this material due to my having previously translated it, except for what is identified in paragraph 5, below, from English to Japanese or Japanese to English, as the circumstances required, in the period December 2015 to April 2016.

4. I have carefully reviewed the Japanese and English versions of the documents produced to me by MCIS identified below that appear in Exhibit “B” to my Affidavit, including:

   (a) Affidavit of Shigeru Takaoka;

   (b) Expert Report of Drs. Shigeru Takaoka, Tadashi Fujino, and Akitomo Shimoji entitled “Response to Questions on Medical-Psychological/Psychiatric Issues Pertaining to Mercury Exposure at Grassy Narrows”;

   (c) Acknowledgement of Expert’s Duty by Shigeru Takaoka;

   (d) Affidavit of Tadashi Fujino;

   (e) Acknowledgement of Expert’s Duty by Tadashi Fujino;

   (f) Affidavit of Akitomo Shimoji; and

   (g) Acknowledgement of Expert’s Duty by Akitomo Shimoji.

5. The Japanese and English versions of the above documents are in all material respects identical to each other except that the Japanese versions of the documents: (1) have been

signed by Shigeru Takaoka, Tadashi Fujino, or Akitomo Shimoji, as appropriate; (2) contain various dates in May 2016 (May 27 or May 28, 2016) in the jurat; and (3) contain the signature of John Donald Davis, and the jurat in the Japanese documents states that he is a commissioner for taking oaths.

6. A copy of my Acknowledgement of Expert's Duty form is attached as Exhibit "C" to my Affidavit.

SWORN BEFORE ME in the City of Toronto, in the Province of Ontario, this ___ day of July, 2016.

A Commissioner, etc.

_____
Minako Miyata

This is Exhibit.....referred to in the affidavit of.....
sworn before me, this.....
day of.....20.....

.....
A COMMISSIONER FOR TAKING AFFIDAVITS

Minako Miyata

Professional Qualification:

- **Court Interpreter (Japanese/English),** fully accredited by Ontario Ministry of the Attorney General
- **Immigration Interpreter (Japanese/English),** accredited by Immigration Refugee Board of Canada
- **Community Interpreter (Japanese/English),** certified by Ontario Ministry of Citizenship and Immigration
- **Candidate for Certificate in Translation, ATIO** (Association of Translators and Interpreters of Ontario), **English-to-Japanese**

Professional Organizations:

IMINTERA (Immigration Interpreters Association)
ATIO (Association of Translators and Interpreters of Ontario)

Professional Interpreting/Translating Experience:

- Trained and qualified interpreter with experience in sight translation, simultaneous / consecutive interpretation, conference call, home visit, group and message relay in the following settings.
  - Criminal / Family / Federal / Provincial Offence Courts
  - Mediation / Examination of Discovery
  - Tribunal
  - Immigration / Boarder Service
  - Videotaped Statement / Photo Line Up
  - Landlord – Tenant Disputes
  - Estates
  - Victim Service / Women's Support
  - Partner Assault Response (PAR) Program / Women' PAR
  - Child Protection
  - Family Services (Individual, Marital / Couple Counselings)
  - Parent-Teacher Meeting / Assessment Before Starting School
  - Speech and Language assessment / PECS Parent Training / Infant Hearing Loss Workshop
  - Immigration Service / Settlement Services
  - Prenatal Health Care / Breastfeeding Clinic / Parenting
  - Care Plan Meeting / Long-Term Care Home Placement Process Meeting
  - Psychological Assessment / Medical Assessment
  - Discharge meeting / Dialysis Treatment
  - Internal Training / New Product Presentation

- Qualified translator with localization experience (English-to-Japanese, Japanese-to-English)
    - Legal documents
    - Medical documents
    - Research documents
    - Marketing
    - Education
    - Personal documents
    - Customer Service
    - Tourism
    - Localization and translation
    - Business letters

Other Professional Experience:

Customer Support Representative	Office Team	2011
Customer Support Representative (Contract)	Scholastic Canada	2011
In-House Japanese Translator	Ganz	2008 – 2011
Interactive Consumer Support Representative	Ganz	2008
Back-up Senior/Executive Bilingual Secretary	Temp Staff	1997 – 1998

Education:

Bachelor Degree Program, Education	University of Paris V	1990
BA, French Literature	Meiji Gakuin University	1989

Professional Trainings:

Anti-Oppression Training	MCIS	2016
Advanced Medical Interpreting Workshop	MCIS	2014
Human Trafficking / Sexual Assault Workshop	MCIS	2013
Court Interpreter Test Preparation Course	MCIS	2012
Interpreting Training Course	MCIS	2012
Translation Course	Babel Institute of Translation	1993

References: Available upon request.

This is Exhibit.....referred to in the
affidavit of.....
sworn before me, this.....
day of.....20.....

.....
A COMMISSIONER FOR TAKING AFFIDAVITS

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

AFFIDAVIT OF SHIGERU TAKAOKA

I, SHIGERU TAKAOKA, of the City of Minamata, in the Prefecture of Kumamoto, Japan MAKE OATH AND SAY AS FOLLOWS:

1. I am a medical doctor and director of the Kyoritsu Neurology and Rehabilitation Clinic, in the City of Minamata, in the Prefecture of Kumamoto, where I specialize in the areas of neurological, rehabilitative, and general internal medicine. I have participated in clinical examinations of patients suspected of having been exposed to mercury in

Minamata, Japan and Grassy Narrows, Ontario, Canada, the latter experience as part of a team of researchers lead by the late Dr. Masazumi Harada. In addition to my clinical work, I am also the co-author of several articles on the subject of exposure to mercury that have been published in a number of peer-reviewed medical and scientific journals. A copy of my curriculum vitae is attached to Exhibit "A", below.

2. In December 2015 I, along with my colleagues Drs. Tadashi Fujino and Akitomo Shimoji were asked by counsel for Grassy Narrows First Nation to answer certain questions on medical-psychological/psychiatric issues pertaining to mercury exposure at Grassy Narrows. The questions and our answers to them appear as part of our May 2016 expert report attached as Exhibit "A" to my Affidavit.

3. A copy of my Acknowledgement of Expert's Duty form is attached as Exhibit "B" to my Affidavit.

SWORN BEFORE ME in the City of Minamata, in the Prefecture of Kumamoto, Japan, this ___ day of _____, 2016.

A Commissioner, etc.

_____
Shigeru Takaoka

DR. TAKAOKA'S AFFIDAVIT IN JAPANESE AND COMMISSIONED

裁判所ファイル番号 446/15

オンタリオ州高等裁判所
(ディビジョナル裁判所)

当事者名：

グラッシー・ナローズ・ファースト・ネーション、
シェリー・フォビスター
ウィリアム・フォビスター、長老サイモン・フォビスター、
そして族長ロジャー・フォビスター、シニアの代表
グラッシー・ナローズ・ファースト・ネーション全員の代表

原告

及び

オンタリオ州天然資源省森林局、オンタリオ州環境省、
そしてオンタリオ州法務長官省

被告

高岡滋の宣誓供述書

私、日本国熊本県水俣市在住の高岡滋は下記のことを宣誓供述致します。

1. 私は医師で熊本県水俣市の神経内科リハビリテーション協立クリニック院長であります。私の専門は神経内科とリハビリテーション、そして一般内科です。私は日本の水俣市とカナダ国オンタリオ州グラッシーナローズにて水銀汚染されたと疑われる患者の住民健診に参加しました。グラッシー・ナローズにおいては原田正純医師率いる調査チームに参加しました。臨床経験に加え、私は水銀汚染に関する論文をいくつか共同で執筆し、それらは論文審査のある医学科学専門誌で発表されました。以下の証拠品Aに私の履歴書が添付されています。

2. 2015年12月に私と同僚の藤野糺医師、下地明友医師に対してグラッシー・ナローズ・ファースト・ネーションの弁護士からグラッシー・ナローズにおける水銀汚染に係る医学的、心理学的、そして精神的影響に関するいくつかの質問に回答するように依頼されました。質問と回答は私の供述宣誓書に証拠品Aとして添付されている2016年5月専門家報告書に記載されています。

3. 私の専門家全責任承認フォーム1部が証拠品Bとして私の供述宣誓書に添付されています。

2016年5月28日)
日本国熊本県水俣市にて)
面前認証)
)
)
)
署長、等 JOHN DONALD DAVIS)

高岡 滋

高岡滋

This is Exhibit 2594 referred to in the affidavit of 111
sworn before me, this
day of 20
A COMMISSIONER FOR TAKING AFFIDAVITS

EXPERT REPORT

Grassy Narrows First Nation and Sherry Fobister, William Fobister, Senior, Simon Fobister and Chief Roger Fobister, Senior on their own behalf and on behalf of all other members of Grassy Narrows First Nation v. Minister of Natural Resources and Forestry (Ontario) and Minister of the Environment and Climate Change (Ontario), and the Attorney General of Ontario

Ontario Superior Court of Justice
(Divisional Court)

Prepared for
Joseph F. Castrilli and Richard D. Lindgren
Counsel, Canadian Environmental Law Association
55 University Avenue, Suite 1500
Toronto, Ontario
M5J 2H7

RESPONSE TO QUESTIONS ON MEDICAL-PSYCHOLOGICAL/PSYCHIATRIC ISSUES PERTAINING TO MERCURY EXPOSURE AT GRASSY NARROWS

Prepared by

Dr. Shigeru Takaoka, MD, Dr. Tadashi Fujino, MD, Dr. Akitomo Shimoji, MD

Date: May ___, 2016 _____

Dr. Shigeru Takaoka, MD

Date: May ___, 2016 _____

Dr. Tadashi Fujino, MD

Date: May ___, 2016 _____

Dr. Akitomo Shimoji, MD

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Introduction: Expertise and Qualifications

We are three doctors who practice in Kumamoto Prefecture on the island of Kyushu in Japan. The following is a brief summary of our experience and expertise:

Dr. Shigeru Takaoka: I am a medical doctor and director of the Kyoritsu Neurology and Rehabilitation Clinic, Minamata, Kumamoto, Japan where I specialize in a number of areas, including neurological, rehabilitative, and general internal medicine. I have participated in clinical examinations of patients suspected of having been exposed to mercury in Minamata, Japan and Grassy Narrows, Ontario, Canada, the latter experience as part of a team of researchers lead by the late Dr. Masazumi Harada. In addition to my clinical work, I am also the co-author of several articles on the subject of exposure to mercury that have been published in a number of peer-reviewed medical and scientific journals.

Dr. Tadashi Fujino: I am a medical doctor specializing in psychiatry and neurology at Kumamoto Hospital. I have considerable clinical experience examining patients exposed to mercury in Minamata, Japan. At various times, over several decades, I also undertook, with a team of researchers lead by the late Dr. Masazumi Harada, many clinical examinations of men, women, and children suspected of being exposed to mercury in Grassy Narrows, Ontario, Canada. I have written extensively about my clinical investigations in both countries in numerous medical and scientific peer-reviewed journals.

Dr. Akitomo Shimoji: I am a medical doctor, neuro-psychiatrist, and professor at Kumamoto Gakuen University. Along with a team of researchers lead by the late Dr. Masazumi Harada, I participated in clinical examinations of patients exposed or suspected of having been exposed to mercury in Grassy Narrows, Ontario, Canada. Based on my clinical experience in Japan, I also have authored or co-authored several articles that have been published in peer-reviewed medical and scientific journals on the subject of exposure to mercury.

Our curriculum vitae appear in Appendix B of our Expert Report.

Instructions and Nature of Professional Opinion Sought

We have been asked by Joseph F. Castrilli and Richard D. Lindgren of the Canadian Environmental Law Association on behalf of Grassy Narrows First Nation to prepare an expert report that responds to four questions that are reproduced below. We are solely responsible for the answers to the questions contained in this report. Page references contained in the questions set out below are from the Applicants' Application Record in *Grassy Narrows First Nation, et al v. Minister of Natural Resources and Forestry (Ontario), et al.*

List of Questions Asked

Questions for Dr. Shigeru Takaoka et al.		
English	**Japanese**	**Reference Page**
Question 1: Based on the clinical medical examinations that Dr. Harada's team performed on people at Grassy Narrows over the years, please comment on the statements, which appear below respecting pages 001251 to 001252 of the January 2014 request by Grassy Narrows (GN) to the Government of Ontario, and whether they are accurate in their summary of the findings of Dr. Harada's team based on the two Harada referenced reports of 2005 and 2011 that appear at page 001284 of the January 2014 request?		
Excerpt from: Bump-up Request for an Individual Environmental Assessment (IEA) submitted to the Ontario Ministry of the Environment regarding the Forest Management Plan for the Whiskey Jack Forest for the 10-year period April 1, 2012 to March 31, 2022 - Final Plan Inspection Approved by the Ministry of Natural Resources, December 23, 2013 - EBR Registry No. 010-9240 Submitted by: Grassy Narrows First Nation and Earthroots January 22, 2014 5. Mercury Impacts Human Health in Grassy Narrows SUMMARY 35 Years of study by renowned mercury expert Dr. Harada and his team have confirmed that people in Grassy Narrows are suffering from Minamata Disease as a result of methyl mercury ingested by eating local fish. EVIDENCE Doctor Harada's teams of researchers have studied mercury health impacts in Grassy Narrows for over 35 years starting in 1975. "[I]t is an undoubtable fact that Minamata Disease occurred in [Grassy Narrows and White Dog], based on our long-term investigation result." (Harada et al., 2011) Grassy Narrows people "were poisoned by eating fish contaminated with mercury." (Harada et al., 2011) Findings by Harada et al., 2011 • 59% of the 160 people tested in GN and White Dog were affected by mercury. • 34% were diagnosed with Minamata Disease (MD)		1251-1252

using current Japanese diagnostic criteria (41% in GN --> 30 cases) • 25% were diagnosed with suspected Minamata Disease (SMD) • 44% of people aged 21-40 had MD or SMD. All these people were born after the mercury dumping was curtailed in 1971. "[T]he possibility of congenital Minamata Disease occurrence is very high in these two communities. We examined 7 cases of cerebral palsy and 7 cases of mental deficiency.... Further epidemiological research on stillbirths and miscarriages needs to be done." (Harada et al., 2005) All of Dr. Harada's patients who indicated mercury levels higher than the safetyguideline of 50 ppm in 1975 were deceased by 2004. (Harada et al., 2005)		
References Cited Section of Previous Excerpted Document: Harada, Masazumi, Masanori Hanada, Masami Tajiri, Yukari Inoue, Nobuyuki Hotta, Tadashi Fujino, Shigeru Takaoka, and Keishi Ueda. 2011. "Mercury Poisoning in First Nations Groups in Ontario, Canada 35 Years of Minamata Disease in Canada." Journal of Minamata Studies 3: 3–30. Harada, Masazumi, Masanori Hanada, Takashi Miyakita, Tadashi Fujino, Kazuhito Tsuruta, Akira Fukuhara, Tadashi Orui, Shigeharu Nakachi, Chihito Araki, and Masami Tajiri. 2005. "Long-Term Study on the Effects of Mercury Contamination on Two Indigenous Communities in Canada (1975-2004)." Research on Environmental Disruption 34 (4).		1284
Question 2: Based on the clinical medical examinations that Dr. Harada's team performed on people at Grassy Narrows over the years, please comment on the statements, which appear below respecting pages 001445, 001479 to 001483 of the September 2014 supplementary GN submissions to the Government of Ontario, and whether they are accurate in their summary of the findings of Dr. Harada's team referred to in those pages?		

The following 5 Excerpts are from: Literature Review regarding the Impact of Mercury on Human Health Summary of a text produced by Drs. Laurie Chan and Donna Mergler for the Mercury Disability Board presented by Donna Mergler PhD, Professor Emerita, University of Quebec at Montreal: Dr. Harada's studies • Dr. Harada did pioneering work in Japan, demonstrating neurologic damage of Minamata Disease • In a recent report, he stated: "During the early stages of the MD crisis in Minamata, patients, who were diagnosed with MD, seemed to be typical and severe cases of the Hunter-Russell syndrome, including sensory disturbance, concentric constriction of the visual field, ataxia, speech impairment and impaired hearing. However, through more study, it became clear that such severe cases were rather exceptional and many more mild cases were progressing to chronic Minamata Disease. I observed that the symptoms of Minamata Disease became more chronic and atypical in the 1970s. Also I have been proving that sensory disturbances, specifically stronger loss of sensation in the extremities, were seen among patients of methylmercury poisoning at a very high rate, through clinical examinations on family members of patients with sever(sic) and typical symptoms or mothers of congenital Minamata Disease patients"		1479
Dr. Harada's studies • In the '70s, he showed that persons in Grassy Narrows and White Dog manifested similar signs and symptoms to MD and there appeared to be a dose-relation with mercury exposure • In 2002 and 2004, he and his team went back. In total they examined 156 people from Grassy Narrows and White Dog. • Age ranged from 1-90 years • No information was provided on how persons were recruited		1480
Dr. Harada's studies • Diagnostic criteria: • MD: more than one symptom of: sensory disturbances, ataxia, disturbed ocular movement, imbalance, concentric constr[i]ction of the visual field and speech impairment. • In cases where examinees were showing only sensory disturbances, we acknowledged MD as long as there was no other disease causing the symptom. • If an examinee had another disease and still showed symptoms of MD that were not explained by that other disease, we defined the case as MD with complications.		1481

Dr. Harada's studies • Findings: • 60 cases of MD (34.2% of total examinees, excluding people 10 years old and younger); • 54 cases (30.8%) of MD with complications; • 25 cases (14.2%) of possible MD for a total of 139 cases (79.4%). • They conclude : • It is very high rate of neurological symptoms for a sample of a population, even though examinees came because of other health issues. It is as high as contaminated areas in Minamata. We cannot help but recognize the effects of methylmercury from the symptoms we have seen.		1482
Our conclusions [of Drs. Chan and Mergler] • Dr Harada and his group did not evaluate the prevalence of MD in this population, but reported on the percentage of MD signs and symptoms within the group that they examined. • We consider that Dr. Harada's follow-up clinical evaluation should be seen as a preliminary study showing the need for a comprehensive epidemiologic study that would include all of the known outcomes of mercury exposure and could take into account co-morbidity from other diseases, such as diabetes and /or alcohol and test for possible interactions. Such a study should also take into account the presence of other contaminants. For this study it would be most useful to have all of the results of hair and blood sampling by Health Canada, Dr. Chan and Dr. Harada, as well as the results of the neurological examinations that were done by Dr. Harada.		1483
Question 3: Based on the clinical psychological/psychiatric examinations that Dr. Harada's team performed on people at Grassy Narrows over the years, please comment on whether you agree with the statements of Donnan, 1986, regarding the psychological health impacts of mercury/methylmercury, which statements appear below respecting pages 001492 to 001493 of the November 2014 supplementary GN submissions to the Government of Ontario? In your professional opinion, has exposure to mercury had psychological/psychiatric impacts on the people of Grassy Narrows and, if so, what have been those impacts?		

Excerpts from: Grassy Narrows and Earthroots Fourth Supplementary Submission to Devon Wills, Ministry of the Environment on 2012-2022 Whiskey Jack Forest Management Plan IEA Request, dated November 14, 2014 2. PSYCHOLOGICAL HEALTH IMPACTS OF MERCURY "High blood mercury levels contribute to anxiety..." (Donnan, MOE 1986, p.28) "...mental health effects such as anxiety due to mercury contamination in the Wabigoon- English River System have been borne almost entirely by the Native people of the Grassy Narrows and Whitedog Bands." (Donnan, MOE 1986, p.28) The fear and anxiety from knowing they were contaminated was debilitating to many. The threat of mercury poisoning clearly affected the mental health of these people...." (Donnan, MOE 1986, p.31) "[A] reduction in fish mercury levels could help to reduce anxiety and mental trauma experienced by these people." (Donnan, MOE 1986, p.44)		1492-1493
Question 4: Do you continue to adopt the findings and conclusions contained in the article by Shigeru Takaoka, et al, entitled "Signs and symptoms of methylmercury contamination in a First Nations community in Northwestern Ontario, Canada" reported in Science of the Total Environment 468-469 (2014) 950-957? If not, what has caused you to change your opinion since publication of the article?		

Answers to Questions

Question No. 1

They are accurate.

Question No. 2

They are accurate.

Question No. 3

In our professional opinion, yes, there were negative psychiatric effects.

Question No. 4

We continue to support them.

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Harada, Masazumi, Masanori Hanada, Masami Tajiri, Yukari Inoue, Nobuyuki Hotta, Tadashi Fujino, Shigeru Takaoka, and Keishi Ueda. 2011. "Mercury Poisoning in First Nations Groups in Ontario, Canada 35 Years of Minamata Disease in Canada." Journal of Minamata Studies 3: 3–30.

Takaoka, Shigeru, Tadashi Fujino, Nobuyuki Hotta, Keishi Ueda, Masanobu Hanada, Masami Tajiri, Yukari Inoue. 2014. Signs and symptoms of methylmercury contamination in a First Nations community in Northwestern Ontario, Canada." Science of the Total Environment 468-469: 950-957.

Appendix A:
2014 Article – Signs and Symptoms of Methylmercury Contamination in a First Nations Community in Northwestern Ontario, Canada

Science of the Total Environment 468–469 (2014) 950–957

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Signs and symptoms of methylmercury contamination in a First Nations community in Northwestern Ontario, Canada

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HIGHLIGHTS

- Similarities between the prevalence of complaints in Minamata and Grassy Narrows
- Similarities in neurological findings were also found.
- Quantitative sensory measurements gave similar results for impairments.
- Younger Canadians were less severely affected than older ones.
- Results suggest that subjects from Grassy Narrows had methylmercury poisoning.

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ABSTRACT

In 1970, fish caught in the English–Wabigoon River system in northwestern Ontario, Canada, were found to be contaminated with mercury coming from a chlor-alkali plant in the province. In the 1970s, patients exhibiting some of the symptoms of the Hunter–Russell syndrome (e.g. paresthesias, visual field constriction, ataxia, impaired hearing, and speech impairment) were reported by some researchers. However attempts to diagnose the patients as suffering from methylmercury poisoning proved to be controversial. In order to research the presence of methylmercury contamination, and show that the patients, through eating contaminated fish, were suffering from methylmercury poisoning, we studied the results of subjective complaints, neurological findings, and quantitative somatosensory measurements gathered in Grassy Narrows Indian Reservation, Ontario, in March, 2010. At that time, the population of the Grassy Narrows settlement was around 900. Ninety-one residents volunteered to be examined. From them, we selected 80 people who were older than 15 years old, and divided them into two groups. Canadian Younger (CY): 36 residents who were from 16 to 45 years old. Canadian Older (CO): 44 residents who were from 46 to 76 years old. We compared them to Japanese Exposed (JE): 88 methylmercury exposed residents from the Minamata district in Japan, and Japanese Control (JC): 164 control residents from non-polluted areas in Japan. Complaints and abnormal neurological findings were more prevalent and quantitative sensory measurements were worse in the two Canadian groups and the Japanese Exposed group than in the Japanese Control group. Complaints, neurological findings and quantitative sensory measurements were similar in Canadian Older and Japanese Exposed. The results for Canadian Younger fell between those of Canadian Older and Japanese Control. These findings indicate that the clinical signs and symptoms of the residents of Grassy Narrows are almost the same as those recorded for Minamata disease in Japan.

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1. Introduction

Since the 1960s, a chlor-alkali plant had been releasing waste products contaminated with mercury into the waters of the English–Wabigoon River system in northwestern Ontario, Canada. In the first examples of fish, from the river system, that were contaminated with methylmercury (Bligh, 1970) levels of up to 16 μg/g were reported. Fimreite and Reynolds (1973) found highly contaminated fish with a maximum

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methylmercury concentration of 27.8 μg/g in 1970. The contamination in fish there was almost equal to that measured in fish from Minamata Bay, Japan, where a barracuda was recorded as having 23 μg/g in May 1961 (Fujiki and Irukayama, 1979). The average mercury concentrations, measured in 1971, in walleye and northern pike from Ball Lake, English–Wabigoon River, were 1.99 μg/g and 5.05 μg/g respectively (Armstrong and Scott, 1979).

In 2003, results of similar measurements were 0.40 μg/g in walleye and 0.85 μg/g in northern pike (Kinghorn et al., 2007). The concentrations of mercury in fish are declining, but they are still higher than those found in fish in Minamata Bay, Japan, where the average concentration of mercury in fish has been from 0.17 to 0.42 μg/g during the period of 1998-2004. (Kindaichi and Matsuyama, 2005). Residents living in that area of Japan, still continue to be exposed to low levels of mercury from the eating of locally caught fish.

The two First Nations' communities living in Grassy Narrows and Whitedog Indian Reservations became victims of methylmercury poisoning through the consumption of locally caught fish. Patients with some of the Hunter–Russell syndrome symptoms have been reported in these reserves (Harada et al., 1976). Canadian researchers also examined the indigenous residents of the areas. Wheatley et al. (1979) reported that effects associated with methylmercury poisoning were observed, but they concluded that direct impacts on human health were difficult to prove.

Pathological studies of a cat from Whitedog, which exhibited acute neurological symptoms, revealed high mercury levels in the brain similar to those of Minamata disease in Japan (Takeuchi et al., 1977). Another cat from neighboring Grassy Narrows showed no symptoms, but on closer examination it was shown to have high mercury levels in the brain and latent defects caused by methylmercury poisoning (Takeuchi et al., 1977).

Since 2004, more than 60,000 people from the Minamata district have been diagnosed with abnormal neurological symptoms. In many cases, the abnormalities were being reported for the first time since the release of methylmercury contaminated wastewater was stopped in 1968 (Takaoka et al., 2009). In chronic methylmercury poisoning the somatosensory disturbance from cortical damage is specific and sensory disturbance is present either in all four limbs or throughout the body, sometimes with the exception of the face and head. To detect such abnormalities, quantitative sensory measurements are useful (Takaoka et al., 2008). So we carried out a health survey that included the examination of subjective complaints, neurological symptoms, and quantitative sensory measurements in Grassy Narrows, Ontario, Canada, in 2010 and tried to reassess the effect of methylmercury in this area.

2. Materials and methods

2.1. Subjects

The study was carried out in March 2010 in Grassy Narrows, Ontario, Canada. We contacted a Grassy Narrows support group and asked for their help. They informed the indigenous population of our coming survey to detect any health effects from methylmercury poisoning and asked for volunteers to take part in the study. The Chief of Grassy Narrows First Nation went on the local radio to ask for volunteers for our research. Posters, informing of our coming research project and our wish for volunteers, were displayed in the band office and a local store. Of the approximately 900 residents, 91 volunteered to be examined. We selected 80 residents, who were older than 15, for the study. Subjects were informed verbally and in writing about the examination method, how the data would be used and that their confidentiality would be protected. Each participant gave their written consent.

We divided them into two groups. (1) Group Canadian Younger (CY): consisted of 36 residents who were from 16 to 45 years old (M/F = 18/18, 34.4 ± 9.5 years old). (2) Group Canadian Older (CO): consisted of 44 residents who were from 46 to 76 years old (M/F = 19/25, 57.5 ± 8.1 years old).

We studied subjective symptoms, neurological findings and carried out four quantitative sensory measurements (including minimal tactile sensation, vibration, position sense, and two-point discrimination) among the 80 residents. In order to assess the state of health of the residents of Grassy Narrows, we compared them to a group of Japanese residents who had also been exposed to methylmercury as well as a group of Japanese control residents. These residents were the same people we had used as subjects in our previous study (Takaoka et al., 2008).

(3) Group Japanese Exposed (JE): was comprised of 88 randomly selected Japanese subjects. They were chosen from residents of the Minamata area who had been exposed to methylmercury and who had been included in our former study at the Minamata Kyoritsu Hospital and the Kyoritsu Neurology and Rehabilitation Clinic between November 2004 and April 2005. Their ages matched those of the corresponding Canadian group but the genders could not be matched exactly (M/F = 38/50, 59.0 ± 7.5). They answered a detailed questionnaire and were given a neurological examination including the same four quantitative sensory measurements as we performed in Canada. All of them were born before 1969. In our former study, we separated the subjects into those with and without neurological or neurologically related diseases, but we found that there was little difference between those two groups. So in this study, Group JE included subjects both with and without such related diseases.

(4) Group Japanese Control (JC): consisted of 164 residents who lived in other districts, e.g. around Fukuoka City, Kumamoto City, and Kagoshima City, aged between 40 and 79. In the control group, people who had lived around Minamata City or who suffered from a neurological disease or a neurologically related illness were excluded. The control subjects were examined between February and May 2006 (M/F = 67/97, 58.4 ± 11.6).

2.2. Epidemiological conditions and questionnaire on complications

The questionnaire, both in Canada and Japan, included questions to determine the subject's exposure to methylmercury and asked for information regarding place of residence, dietary habits, occupational history, medical complications and the health and medical histories of family members.

The questionnaire on complaints for the Canadian groups (CO and CY) consisted of 47 questions related to sensory impairment (7 items), somatic pain (4), visual impairment (3), hearing impairment (3), tasting and smelling problems (3), in-coordination of the extremities (4), other movement impairment (11), vertigo and dizziness (4), general complaints (2), and mental and intellectual problems (6).

The questionnaire on complaints for the Japanese groups (JE and JC) consisted of about 50 questions. We selected 35 relevant questions from the Japanese questionnaire and used them in the Canadian one. They were as follows: sensory impairment (4 items), somatic pain (3), visual impairment (3), hearing impairment (3), tasting and smelling problems (3), in-coordination of the extremities (5), other movement impairment (4), vertigo and dizziness (4), general complaints (2), and mental and intellectual problems (4).

In answer to questions on health complaints, subjects were asked to select one of 4 possible choices. 1) Yes, always, 2) Yes, sometimes, 3) Yes, in the past but not at present, and 4) No, never. The prevalence of each complaint was calculated for each group and then compared between the four groups. All subjects completed the questionnaire before their medical examination. Subjects who could not complete the questionnaire by themselves were asked the questions verbally. All questionnaires were reviewed prior to the examinations.

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2.3. Standard neurological examination

A standard neurological examination was carried out on 32 of the 36 subjects in Group CY and on all 44 subjects in Group CO. Dysarthria, auditory disturbance, visual constriction, finger–nose test with the eyes open and closed, diadochokinesis, heel–shin test, gait disturbances, tandem gait test, Mann's test, balancing on one foot with eyes open and closed, and superficial sensory disturbance (touch and pain) were used and tested for. The examination methods and criteria were almost the same as the former study (Takaoka et al., 2008).

Dysarthria, auditory disturbance, visual constriction, postural hand tremors, gait disturbances and Romberg's sign were judged to be either present or absent. Dysarthria, auditory disturbance, and visual field constriction were judged by the examining physician without using special instruments. Tunnel vision was considered to be present when the confrontation test showed a lateral field of vision of 80° or less.

Limb and truncal ataxia were judged as being either absent, mildly abnormal or moderately to severely abnormal. The results of the finger–nose test and the heel–shin test were judged to be positive not only when there was constant dysmetria or decomposition but also when there was uncertain dysmetria, decomposition, or very slow movement involved. Dysdiadochokinesis was judged to be present from when there was a constant abnormality to when there was an uncertain abnormality or slow movement. Tandem gait disturbance was judged as present not only when the subject could not walk more than five steps but also when they could walk five steps but were unstable. In the balancing on one foot test, disequilibrium was judged as present when it was impossible to balance more than 3 s or when the subject was unstable, but could keep their balance for more than 3 s.

The examinations were carried out in Canada by one neurologist and four psychiatrists. The neurologist and two of the psychiatrists had previous experience in carrying out these tests from earlier examinations of Minamata disease patients. The other two psychiatrists had been briefed and trained to carry out the tests. In Japan, Group JE was examined by six physicians and one neurologist and Group JC was examined by forty-five physicians, several of whom were neurologists.

Because there was not enough data collected from Group JE for the finger–nose test with eyes closed, Mann's test, Romberg's sign or balancing on one foot with eyes closed test, we excluded that information from our calculations.

2.4. Quantitative sensory measurements

Four categories of tests were used in the quantitative measurement of the somatosensory system. All four categories were the same as in the former study (Takaoka et al., 2008).

2.4.1. Assessment of minimal tactile sense

The minimal tactile sense was measured by the Semmes–Weinstein monofilament test. Twenty kinds of filaments from 0.008 to 300 g were used. Subjects were tested with eyes closed after receiving clear instructions on which locations would be tested. Each filament was pushed until it bent about 90° for about a second. The threshold was the smallest size filament which a subject could feel as touch. The trial was performed starting from a smaller size filament and then gradually increasing the size.

Each filament was tested only once except when the subject was unsure. In that case the examiner, using the same filament, repeated the test an odd number of times and selected the dominant response. If a subject could not detect the maximum filament (300 g), we defined the threshold as 400 g for calculation. Testing was carried out on the lower lip, upper chest and ventral sides of both index fingers and big toes.

2.4.2. Vibration sense

Vibration sense was measured by using a 128 Hz tuning fork. The vibration test was carried out on the middle or upper sternum, the radial side of both wrists and the fibular side of both ankles. Subjects were told to indicate when they no longer could feel the vibrations. The examiner simultaneously struck a tuning fork and started a stopwatch, then placed the base of the fork against the area to be tested. The time interval until the subject reacted was recorded.

2.4.3. Position sense

The testing of position sense was carried out on subjects with their eyes closed. A ruler with a millimeter scale was used. Tests were carried out on the subject's index fingers and big toes. A ruler was placed vertically alongside the digit. With the digit held horizontally, the zero point was the position of the digit's nail on the ruler's scale. The examiner held the digit by its sides and moved it either up or down, holding the position for about 1 s. The subject was asked to indicate whether they felt the movement and if it was up or down. The upward or downward movement started from 5 mm from the zero point and was considered to be the minimum value. The movement was increased in 5 mm increments and the subject's threshold distance was recorded.

Each trial was carried out once for each distance except when the subject was uncertain. In that case the examiner would repeat the test again for an odd number of times and choose the dominant response. If the subject could not feel the maximum movement, the threshold was defined as the maximum distance plus 5 mm.

2.4.4. Two-point discrimination

The two-point discrimination test was carried out on subjects while their eyes were closed. A drafting divider, with the legs set at different distances, was pressed against the subject's skin at an angle of 30 to 45° to a depth of between 1 and 2 mm for about 1 s. The distances between the points used in the test were 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20, 25, 30 and 36 mm. The threshold recorded was the shortest distance at which a subject answered correctly. This method was performed on the lower lip and the ventral side of each index finger. If the subject was unable to detect the maximum distance of 36 mm, the threshold was defined as 40 mm for calculation purposes.

In testing Groups CO and CY, the "Yes/No" method was used, However, when a subject felt that 1-point stimulation was actually 2-point stimulation, they were re-tested using the "2-alternative, forced-choice method". In Groups JE and JC the "2-alternative, forced-choice method" was used exclusively.

2.5. Statistical methods

All the calculations were performed using MS Excel and SPSS. Chi square analysis was used in MS Excel when the prevalence was compared, and t-test was used in MS Excel when the average was compared. The correlations were calculated by SPSS.

When we calculated the minimal tactile sense, we converted the grams to the evaluator size using the equation: Evaluator size = log([gram]) + 4.

3. Results

3.1. The subjects' backgrounds

The age and sex of the subjects are shown in Table 1. The age and sex in Groups CO, JC and JE were not statistically different. The age of Group CY was less than the other groups.

From Table 2, we can see that 86% of Group CO and 83% of Group CY answered the question on how they obtained fish and over 60% of Groups CO and CY answered that they are catching fish by themselves. Also from Table 2, we can see that 41% of Group JE and 1% of Group JC

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Table 1
Age and sex of each group.

	Age	n (M/F)
Group CO	57.5 ± 8.1	44 (19/25)
Group CY	34.4 ± 9.5	36 (18/18)
Group JE	59.0 ± 7.5	88 (38/50)
Group JC	58.4 ± 11.6	164 (67/97)

belonged to a fisher family. Ninety-three percent of Group JE and 25% of Group JC ate fish every day.

Table 3 shows the relevant medical history of Group CO and Group CY. The information was collected through interviews. On the question of hypertension, although some subjects had no recorded history of hypertension, high blood pressure was detected during the tests. If we detected a systolic pressure of 170 or more or and diastolic pressure of 110 or more in a subject, we recorded that hypertension was present. Some neurological or neurologically related diseases were found in 47 subjects (53%) of Group JE. No neurological or neurologically related diseases were found in Group JC.

3.2. Questionnaire on medical complaints

Medical complaints reported from each group are shown in Table 4, and the p-values by chi square among the four groups are shown in Table 5. In general, the prevalence in both "Yes, always" and "Yes, always" + "Yes, sometimes" in Groups JE, CO, and CY was statistically higher than Group JC. In general, the prevalence in Group JE and Group CO was similar. For most of the complaints Group CY showed a lower prevalence than Group CO.

The questionnaire consisted of questions related to specific and non-specific symptoms in the methylmercury polluted area. Specific symptoms included numbness, difficulty in speaking, fine-finger tasks, buttoning, losing slippers while walking, difficulty in differentiating tastes, detecting smells etc. Non-specific symptoms included headaches, forgetfulness, general fatigue, and so on. In specific symptoms, the prevalence of the answer "Yes, always" + "Yes, sometimes" was lower in Table 4. A tendency to a similar prevalence was observed both in specific and non-specific symptoms.

The correlation efficient among four groups was shown in Table 7. In "Yes, always" answers, the correlation between Groups JE and CO was highest, and was followed by the one between Groups CO and CY. In "Yes, always" + "Yes, sometimes" answers the correlation between Groups CO and CY was highest, and was followed by the one between Groups JE and CO and between Groups JE and CY.

Table 2
Fish sources and frequency of ingestion.

In Canada	Group CO	Group CY
Self-caught fish	28/44 (64%)	24/36 (67%)
Fish caught by relatives and friends, purchased etc.	30/44 (68%)	22/36 (61%)
A combination of both the above	38/44 (86%)	30/36 (83%)
In Japan	**Group JE**	**Group JC**
Fishermen	10/88 (11%)	0/164 (0%)
Fishermen's families	36/88 (41%)	1/164 (1%)
Sport fishing/recreational fishing	62/88 (70%)	17/161 (11%)[b]
Daily ingestion	81/87 (93%)[a]	40/157 (25%)[c]
Ingestion more than once a week	85/87 (98%)[a]	119/157 (76%)[c]

[a] Datum for 1 person was missing.
[b] Data for 3 persons were missing.
[c] Data for 7 persons were missing.

Table 3
Complications in Canadian subjects.

	Group CO	Group CY
Hypertension	15 (34%)	16 (44%)
Diabetes mellitus	8 (18%)	3 (8%)
Stroke	3 (7%)	1 (3%)
Lung diseases	0 (0%)	1 (3%)
Stomach diseases	6 (14%)	1 (3%)
Heart diseases	1 (2%)	0 (0%)
Orthopedic diseases	7 (16%)	4 (11%)
Psychiatric diseases	3 (7%)	1 (3%)

3.3. Neurological examination

The neurological findings for each group and p-values by chi-square among the four groups are shown in Table 6. The prevalence was generally highest in Group JE, and the prevalence of all the findings of Groups JE and CO was statistically higher than Group JC. All the findings of Group CY were less prevalent than Group CO, and seven of twelve findings of Group CO showed statistically higher prevalence than Group CY.

The most prevalent findings in Groups CO are tandem gait abnormality and somatosensory disturbances of pain and touch, followed by hearing impairment, truncal ataxia other than tandem gait abnormality, upper extremity ataxia (finger–nose test and diadochokinesis), and lower extremity ataxia (heel–shin test). The prevalence of visual constriction or dysarthria was lower. Although the orders of prevalence for the positive findings were different, the tendencies of the abnormalities were similar between Groups CO and JE.

Correlation among four groups was shown in Table 7. Correlations between Groups JE and CY, Groups CO and CY, and Groups JE and CO were higher than those between Group JC and other three groups, and p-values were lower.

3.4. Quantitative sensory measurements

3.4.1. Minimal tactile sensitivity using the Semmes–Weinstein monofilament test

Thirty-three subjects (75%) of Group CO and 24 subjects (67%) of Group CY were examined. One set of data for the lower lip in Group CO and one set of data for the left and right big toes in Group CY were absent. 84 of 88 subjects (95%) in Group JE (in which three sets of data were missing for the lower lip) and all 164 subjects of Group JC were examined and calculated.

Fig. 1 shows the results of the minimal tactile sensitivity using the Semmes–Weinstein monofilament test. The results were worst in Group CO, and there were distinct statistical differences between Groups CO, CY, and JC. Group JE was, in general, positioned between Groups CO and CY.

3.4.2. Vibration sense

Thirty-five subjects from Group CO and 25 subjects from Group CY were examined. Two subjects from Group CO and one subject from Group CY were unable to carry out the test correctly and were excluded from the results. Consequently, the results of 33 subjects (75%) from Group CO and 24 subjects (67%) from Group CY were used in the calculation. Three sets of data for the right ankle and 4 sets of data for the left ankle were absent for Group CO. All 88 subjects of Group JE and all 164 subjects of Group JC (in which one set of data for the chest and one set of data for the left and right ankles were absent) were examined and calculated.

Fig. 2 shows that the vibration sense was worst in Group JE, followed by Group CO, Group CY and Group JC. Most of them had statistical differences between each other.

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Table 4
Percentage of complaints.

		Yes, always				Yes, always + Yes, sometimes			
		Group CO	Group CY	Group JE	Group JC	Group CO	Group CY	Group JE	Group JC
1	Numbness in hands	40%	11%	49%	2%	86%	75%	92%	6%
2	Numbness in legs	39%	8%	42%	1%	91%	61%	86%	6%
3	Cannot judge bath water temperature	26%	8%	15%	0%	47%	31%	35%	0%
4	No pain when burned or wounded	23%	17%	16%	0%	65%	49%	44%	0%
5	Hand weakness	34%	22%	56%	3%	78%	69%	81%	5%
6	Leg weakness	35%	11%	49%	2%	79%	54%	77%	4%
7	Tremor in hand	23%	19%	24%	2%	74%	67%	68%	4%
8	Difficulty in speaking	2%	6%	8%	0%	51%	53%	62%	2%
9	Difficulty in fine finger tasks	47%	14%	57%	0%	77%	72%	86%	7%
10	Dropping things	9%	8%	16%	0%	77%	47%	73%	6%
11	Difficulty in buttoning clothes	21%	6%	25%	0%	49%	28%	57%	0%
12	Stumbling	29%	17%	5%	0%	79%	58%	65%	1%
13	Losing slippers while walking	8%	0%	23%	0%	50%	27%	70%	1%
14	Disturbed vision	33%	19%	49%	3%	93%	75%	87%	15%
15	Difficulty in finding things in shops	13%	9%	29%	0%	63%	46%	72%	6%
16	Limited peripheral vision	32%	14%	25%	1%	59%	31%	64%	4%
17	Difficulty in hearing	42%	25%	35%	7%	72%	61%	71%	15%
18	Tinnitus	30%	19%	34%	6%	86%	81%	80%	17%
19	Can hear, but cannot understand	5%	3%	7%	1%	65%	64%	45%	6%
20	Difficulty in differentiating tastes	28%	6%	18%	0%	53%	28%	46%	1%
21	Difficulty in sampling food while cooking	26%	0%	15%	1%	48%	23%	47%	1%
22	Difficulty in detecting smells	28%	11%	22%	0%	49%	28%	48%	4%
23	Muscle cramps	33%	17%	31%	3%	98%	91%	91%	29%
24	Headaches	37%	25%	37%	1%	88%	81%	86%	30%
25	Shoulder stiffness	24%	6%	64%	10%	95%	53%	95%	51%
26	Forgetfulness	21%	17%	34%	1%	81%	72%	97%	52%
27	Inability to hold concentration at work	26%	3%	28%	0%	74%	58%	67%	11%
28	Lack of motivation to do things	16%	0%	26%	1%	58%	56%	86%	21%
29	Irritation	21%	22%	31%	0%	72%	78%	85%	33%
30	Difficulty in sleeping	37%	39%	39%	3%	74%	69%	84%	19%
31	Dizziness when standing up	23%	14%	15%	0%	86%	83%	85%	17%
32	Feeling of head spinning	0%	3%	3%	1%	49%	58%	63%	5%
33	Swaying dizziness	5%	3%	5%	1%	72%	72%	57%	6%
34	Dizziness, bordering on fainting	7%	0%	5%	1%	47%	22%	46%	2%
35	General fatigue	40%	31%	45%	2%	95%	78%	87%	25%

3.4.3. Position sense

Twenty-eight subjects from Group CO and 24 subjects from Group CY were examined. One subject from Group CO and one subject from Group CY were unable to carry out the test correctly and were excluded from the results. Consequently, the results of 27 subjects (61%) from Group CO and 23 subjects (64%) from Group CY were used in the calculation. One set of data for the left and the right big toe, both upward and downward movements, was absent for Group CO. Eighty-seven subjects from Group JE (in which one set of data for both big toes in both directions was absent) and all 164 subjects of Group JC were examined and calculated.

Fig. 3 shows that the position sense was worst in Group JE, followed by Group CO, Group CY, and Group JC. Although there were some exceptions, most of the groups had statistical differences.

3.4.4. Two-point discrimination

Thirty-four subjects from Group CO and 25 subjects from Group CY were examined. Two subjects from Group CO and one subject from Group CY were unable to carry out the test correctly and were excluded from the results. Consequently, the results of 32 subjects (73%) from Group CO and 24 subjects (67%) from Group CY were used in the calculation. 87 of 88 subjects (99%) from Group JE and all 164 subjects of Group JC (in which one set of data for the right index finger was absent) were examined and calculated.

Fig. 4 shows that the position sense was worst in Group JE or Group CO, followed by Group CY and finally Group JC. Most of them had statistical differences, except for the results for index fingers when comparing Group JE with Group CO.

Table 5
p-Value for complaints – comparing groups.

		$p < 0.01$	$p < 0.05$	n.s.
"Yes, always"	CO, JC	All others	Nos. 25, 34	Nos. 8, 19, 32, 33
	CY, JC	All others	Nos. 1, 2, 6, 8, 11, 18, 20	Nos. 13, 19, 21, 25, 27, 28, 32, 33, 34
	JE, JC	All others	Nos. 12, 19	Nos. 32, 33, 34
	CO, CY	Nos. 1, 2, 9, 21	Nos. 6, 20, 27, 28	All others
	JE, CO	Nos. 12, 25	No. 5	All others
	JE, CY	Nos. 1, 2, 5, 6, 9, 13, 14, 25, 27, 28	Nos. 11, 15, 21	All others
"Yes, always" + "Yes, sometimes"	CO, JC	All	–	–
	CY, JC	All others	No. 26	No.25
	JE, JC	All	–	–
	CO, CY	Nos. 2, 25	Nos. 6, 10, 16, 20, 21, 34, 35	All others
	JE, CO	No. 28	Nos. 4, 19, 26	All others
	JE, CY	Nos. 2, 11, 13, 16, 25, 26, 28	Nos. 1, 6, 10, 15, 21, 34	All others

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Table 6
Neurological findings and group comparisons.

Examination	Prevalence of abnormality				p-Value					
	Group CO	Group CY	Group JE	Group JC	CO, JC	CY, JC	JE, JC	CO, CY	JE, CO	JE, CY
Hearing impairment	49%	17%	32%	6%	<0.01	n.s.	<0.01	<0.05	n.s.	n.s.
Visual constriction	14%	0%	28%	0%	<0.01	n.s.	<0.01	n.s.	n.s.	<0.01
Dysarthria	17%	3%	18%	1%	<0.01	n.s.	<0.01	n.s.	n.s.	n.s.
Postural tremor	20%	19%	28%	3%	<0.01	<0.01	<0.01	n.s.	n.s.	n.s.
Normal gait–unstable	28%	6%	30%	5%	<0.01	n.s.	<0.01	<0.05	n.s.	<0.05
Tandem gait–unstable	87%	34%	68%	7%	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01
Finger–nose test (eyes open)	21%	0%	47%	0%	<0.01	n.s.	<0.01	<0.05	<0.01	<0.01
Adiadokokinesis	23%	3%	43%	1%	<0.01	n.s.	<0.01	<0.05	n.s.	<0.01
Balancing on one foot (eyes open)	53%	22%	63%	8%	<0.01	<0.05	<0.01	<0.05	n.s.	<0.01
Heel–knee test	24%	0%	50%	1%	<0.01	n.s.	<0.01	<0.05	<0.05	<0.01
Touch disturbance (four limbs)	50%	44%	83%	1%	<0.01	<0.01	<0.01	n.s.	<0.01	<0.01
Pain disturbance (four limbs)	59%	50%	97%	1%	<0.01	<0.01	<0.01	n.s.	<0.01	<0.01

4. Discussion

Our results show that subjective complaints were most prevalent in Group JE, followed by Groups CO, CY and JC. Similar and high prevalence of more specific complaints from methylmercury poisoning between Groups JE and CO suggest that these similarities are mainly related to methylmercury poisoning. The increase of non-specific complaints, which was found in Group JE, was also observed in Group CO.

The high prevalence of somatosensory disturbance and following ataxic movement in Groups JE and CO suggests that those two groups are similarly affected by methylmercury and Group CY is affected to a smaller extent by methylmercury. Harada et al. (1976) conducted health surveys on 89 indigenous inhabitants of Grassy Narrows and Whitedog and found sensory disturbance (47.6%), abnormality in visual field (18.0%), impaired hearing (44.9%), ataxia (9.0%), and dysarthria (5.6%). These findings together with the Hunter–Russell syndrome suggest methylmercury pollution in these communities.

Except for the high prevalence of tandem gait abnormality and hearing loss, the pattern of prevalence is almost the same as our study from the Minamata area in the 1970s (Fujino, 1994). Harada and his colleague visited Grassy Narrows in 2002 (Harada et al., 2005a) and Grassy Narrows and Whitedog in 2004 (Harada et al., 2005b). In 2002, glove and stocking type of sensory disturbance (54.4%), tunnel vision (10.5%), ataxia (12.3%) and impaired speech (12.3%) were observed in 57 subjects (Harada et al., 2005a). Combining the results of both studies, 2002 and 2004, glove and stocking type sensory disturbance was found in 65.1% of the cases, tunnel vision in 10.8%, ataxia in 25.1% and impaired speech in 6.9% of the 175 subjects (Harada et al., 2005b). As the criteria used for determining ataxia was not described in those papers, it is possible that the actual percentage could be greater than the papers suggested. We show the raw data for ataxic movement in this study.

Our present study differs from the former studies of 1975, 2002 and 2004, in that quantitative measurements of somatosensory disturbance were added to the study. The results of two-point discrimination sensitivity of the lower lip, vibration sense and position sense in big toes were also worse in Group JE, followed by Groups CO, CY and JC. Somatosensory acuity was most impaired in Group JE. Whereas minimal tactile sensitivity of the lower lip and left big toe were worst in Group CO, followed by Groups JE, CY and JC. The reason for these differences is, as yet, unascertained. As to two-point discrimination, the "Yes/No" method was used in testing Groups CO and CY, and the "2-alternative, forced-choice method" was used in testing of Groups JE and JC. But, in our experience, there were no great differences between results of these two methods.

Quantitative measurements showed that somatosensory disturbance, showing a similar pattern, was present in all tested body areas. These patterns are assumed to be the characteristics of somatosensory disturbance due to a uniformly injured central nervous system, especially the sensory cortex.

The similarity in the symptoms of abnormalities, neurological findings and quantitative measurements in Groups JE and CO were assumed to be produced by methylmercury poisoning. The intermediate abnormalities in Group CY suggest a milder and continuing effect of methylmercury poisoning in the younger generations of this area.

There are some limitations in this study. The first one is that the subjects in the study consisted of applicants who volunteered for the examination. The subjects in Groups JE, CO and CY ate a lot of fish, but the subjects in Group JC ate less fish. Also the lifestyle and occupations of the Japanese and the Canadian subjects are likely to be quite different. Also, the lifestyle and occupations were not the same in the two Japanese groups JE and JC.

Secondly we had no control area in Canada. Instead, we compared the Canadian results with the results from a control area in Japan, as well as from an exposed area in Japan.

Thirdly, there can be other factors involved which can affect the findings. In Groups CO and CY, some neurological diseases were found which confused the analysis of the test results. In order to overcome this limitation, we tried to compare a wide range of symptoms and complaints, neurological findings and quantitative measurements.

In the earlier study in Japan, we found that some complaints, symptoms, neurological findings, and quantitative measurements recorded could be affected by the presence of certain other neurological diseases. However, the similar patterns of symptoms, neurological findings, and quantitative sensory measurements cannot be explained without taking

Table 7
Correlation of prevalence of complaints and neurological examinations – group comparisons.

		CO, JC	CY, JC	JE, JC	CO, CY	JE, CO	JE, CY
"Yes, always"	Correlation coefficient	0.315	0.301	0.549	0.630	0.712	0.450
	p-Value	n.s.	n.s.	<0.01	<0.01	<0.01	<0.01
"Yes, always" + "Yes, sometimes"	Correlation coefficient	0.578	0.521	0.693	0.813	0.787	0.712
	p-Value	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Neurological examination	Correlation coefficient	0.628	0.242	0.048	0.784	0.708	0.825
	p-Value	<0.05	n.s.	n.s.	<0.01	<0.01	<0.01

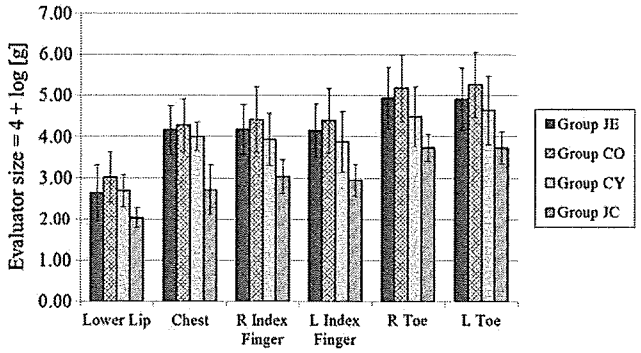

Fig. 1. Threshold for minimal tactile sense — group comparisons. JC, JE: $p < 0.01$ (all locations), JC, CO: $p < 0.01$ (all locations), JC, CY: $p < 0.01$ (all locations), JE, CO: $p < 0.01$ (lower lip), $p < 0.05$ (L toe), n.s. (other locations), JE, CY: $p < 0.01$ (R toe), $p < 0.05$ (chest and R index finger), n.s. (other locations), and CO, CY: $p < 0.05$ (chest), $p < 0.01$ (other locations).

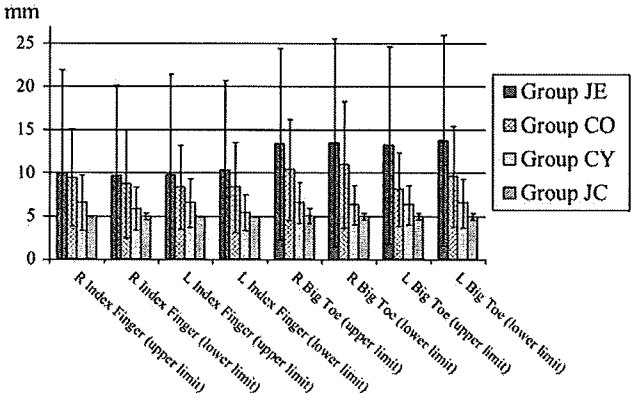

Fig. 3. Threshold for position sense — group comparisons. JC, JE: $p < 0.01$ (all locations), JC, CO: $p < 0.01$ (all locations), JC, CY: $p < 0.05$ (R index finger—lower), n.s. (L index finger—lower), $p < 0.01$ (all other locations), JE, CO: $p < 0.01$ (L big toe—upper & lower), $p < 0.05$ (R big toe—upper), n.s. (all other locations), JE, CY: $p < 0.05$ (L index finger—upper), $p < 0.01$ (all other locations), and CO, CY: $p < 0.05$ (R index finger—lower, L index finger—upper, L big toe—upper), $p < 0.01$ (all other locations).

into account the possibility of the presence of methylmercury poisoning (Takaoka et al., 2008).

After Harada's paper in 1976, the health effects of methylmercury on indigenous Canadians (First Nations) were reported by Canadian researchers. Barbeau et al. (1976) reported that he discovered symptoms like Minamata disease patients in Quebec, but he soon modified and toned down his conclusions. Shephard (1979) admitted the higher exposure in Canadian Indians and insisted that there was no agreement on the clinical diagnosis of mercury poisoning. But no conclusive human health-related data of Canadian Indians were presented by them. Wheatley et al. (1979) reported that they failed to prove abnormalities attributable to methylmercury. But his study in 1979 was based on clinical and pathological test results taken from only one male Cree Indian.

In north-western Quebec, McKeown-Eyssen and Ruedy (1983) studied individuals from the Cree First Nation and reported incoordination (15.4% in males/6.5% in females in Mistassini, 44.2% in males/26.5% in females in Great Whale), abnormal perception of sensations (5.7% in males/4.3% in females in Mistassini, 9.3% in males/2.1% in females in Great Whale). The results for subjects who had visual field scores of over 55° were 16.0% in males and 19.4% in females in Mistassini, and 0.7% in males and 15.5% in females in Great Whale. Although the patterns of abnormalities are very different from our results, the presence of these abnormalities could suggest milder methylmercury poisoning. The Canadian researchers did not, however, come to this conclusion. It would appear that they did not follow up and observe the individuals for a longer period of time, which is unfortunate. In our new Minamata disease cases, observed from November 2004 to April 2005, about half of them were considered to have had their first abnormalities after 1968, the year when the Chisso Company ceased to release methylmercury contaminated industrial wastewater (Takaoka et al., 2009).

Spitzer et al. (1988) found no abnormalities in north-western Quebec when they compared people from the Cree First Nation with a control group. In this study, the exposed group (SDD: The Self Designated Disease Group) and other three control groups were compared. Visual constriction was observed in 4.9% of SDD and in 0.0–1.7% of other groups. Peripheral sensory disturbance (written as "peripheral neuropathy" in the paper) was observed in 9.9% of SDD and in 1.5–3.1% of other groups. There was a higher tendency in the prevalence in SDD, but there was no statistical difference between SDD and other groups.

In examining the Cree people, McKeown-Eyssen et al. (1990) emphasized inter-observer variation. It is more important, however, to do the same examination in the control area and to set criteria for judging the results of the examination, rather than to repeat an examination in the same group. Even though there were some variations and differences between the results obtained by the screener and the results of the neurological examination by the neurologist, e.g. prevalence of tremor (screener 40.2%, neurologist 29.9%) and incoordination (screener 22.8%, neurologist 15.4%) in men in Mistassini, they were still high. They also had differences in criteria when identifying neurological abnormalities, but it should be possible to set standard criteria for the assessment of the neurological findings similar to our methods.

Changeability of neurological functions is quite common in cases of Minamata disease. In Minamata disease the range of four limb

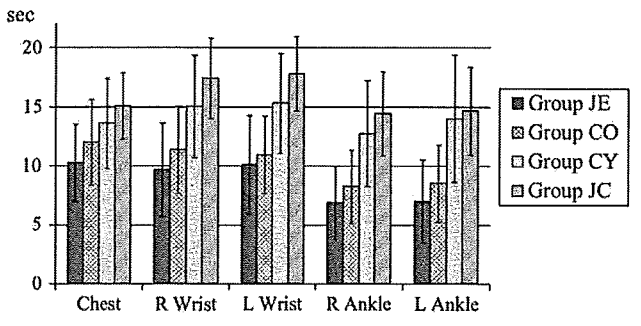

Fig. 2. Threshold for vibration sense — group comparisons. JC, JE: $p < 0.01$ (all locations), JC, CO: $p < 0.01$ (all locations), JC, CY: $p < 0.01$ (bilateral wrist), $p < 0.05$ (chest and R. ankle), n.s. (L. ankle), JE, CO: $p < 0.01$ (chest), n.s. (L wrist), $p < 0.05$ (other locations), JE, CY: $p < 0.01$ (all locations), and CO, CY: n.s. (chest), $p < 0.01$ (all other locations).

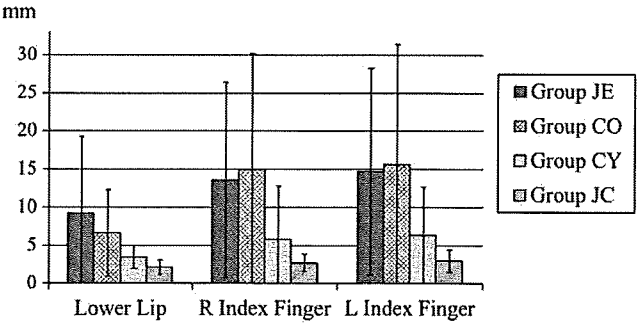

Fig. 4. Threshold for two-point discrimination — group comparisons. JC, JE: $p < 0.01$ (all locations), JC, CO: $p < 0.01$ (all locations), JC, CY: $p < 0.05$ (R index finger), $p < 0.01$ (other locations), JE, CO: $p < 0.05$ (lower lip), n.s. (other locations), JE, CY: $p < 0.01$ (all locations), and CO, CY: $p < 0.01$ (all locations).

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somatosensory disturbance is changeable. Uchino and Araki (1984) reported on 100 cases of Minamata disease. In 77 of the 100 cases the examination for superficial sensory disturbance was carried out from 2 to 5 times, and 63 of the 77 cases (82%) were recorded as "unstable type" in which the area of the body showing somatosensory disturbance changed. The most important factor in showing the effect of environmental pollution on the inhabitants of an area is the ability to gather data and information from both the people exposed to the pollution and from a control group which has not been exposed.

There are some other Canadian studies about the exposure to methylmercury (Wheatley and Paradis, 1996; Wheatley et al., 1997; Wheatley and Paradis, 1998), but there are few that take into account epidemiological human health data. Wheatley (1996) stressed that the people of the First Nations understanding of mercury contamination is influenced by their holistic concepts of health and environment. But there was too little physical data available to corroborate this concept. Without the presence of human physical data, we cannot evaluate psychological, social and spiritual values of health.

5. Conclusions

The data collected from methylmercury-exposed indigenous residents of Grassy Narrows suggest that they were poisoned by methylmercury. The health abnormalities also appear to exist in a milder form in the younger generations from Grassy Narrows.

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Conflict of interest

There is no conflict of interest in this study.

Acknowledgment

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Appendix B:
Curriculum Vitae of Authors

Annex B: Authors' biographies

Shigeru Takaoka

March	1985	Graduated from Yamaguchi University Medical School
May	1985	Yoshikazu Medical Institution, Kuwamizu Hospital
May	1986	Yoshikazu Medical Institution, Minamata Kyoritsu Hospital
May	1987	Okinawa Medical Co-operative Kyodo Kumiai, Okinawa Kyodo Hospital
May	1988	Yoshikazu Medical Institution, Kuwamizu Hospital
May	1989	Yoshikazu Medical Institution, Minamata Kyoritsu Hospital
May	1991	Post-graduate student majoring in Cranial Nerve Treatment, Juntendo University (Neurology)
May	1993	Assistant Director at Minamata Kyoritsu Hospital
April	1993	Post-graduate research student in Third Department of Internal Medicine, Kagoshima University
July	1993	Director, Minamata Kyoritsu Hospital
April	2002	Director, Minamata Kyoritsu Neurology and Rehabilitation Clinic

Clinical research experience in Canada

March 2010	Participation in Grassy Narrows and White Dog medical screening, with Dr. Masazumi Harada

Professional Associations

Japanese Society of Internal Medicine, Japanese Society of Neurology, Japanese Association of Rehabilitation Medicine, Japanese Society of Psychiatry and Neurology

Credentials

Jun	1985	Medical license (License No. 294252)
Jul	1991	Medical Specialist, Japanese Society of Neurology (No. 1570)
May	2001	Occupational Health Doctor, accredited by Japan Medical Association (No. 13043)
Apr	2005	Accredited physician, Japanese Society of Internal Medicine (No. 81805)
Apr	2006	Medical Specialist, Japanese Association of Rehabilitation Medicine (No. 1349)
Dec	2015	Medical Specialist in General Internal Medicine, Japanese Society of Internal Medicine (No. 21072)

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1. S. Takaoka, T. Fujino, T. Sekikawa, T. Miyaoka: Psychophysical sensory examination of individuals with a history of methylmercury exposure. Environmental Research, Vol. 95, p126-132, 2004.

2. S. Takaoka, Y. Kawakami, T. Fujino, F. Ohishi, F. Motokura, Y. Kumagai, T. Miyaoka: Somatosensory disturbance due to methylmercury exposure. Environmental Research, Vol. 107, p6-19, 2008.
3. S. Takaoka, T. Fujino, N. Hotta, K. Ueda, M. Hanada, M. Tajiri, Y. Inoue: Signs and symptoms of methylmercury contamination in a First Nations community in Northwestern Ontario, Canada. Science of the Total Environment, Vol. 468-469, p950-957, 2014.

Tadashi Fujino

Education • Work Experience

March	1968	Graduated from Kumamoto University Medical School
April	1969	Entered Department of Neuropsychiatry, Faculty of Life Sciences, Kumamoto University
April	1972	Minamata Sanatorium Post-graduate student, Department of Neuropsychiatry, Faculty of Life Sciences, Kumamoto University
January	1974	Director, Yoshikazu Medical Institution, Minamata Clinic
April	1976	Post-graduate student, Institute of Constitutional Medicine, Kumamoto University
March	1978	Director, Yoshikazu Medical Institution, Minamata Kyoritsu Hospital
February	1981	Received Medical Degree (Kumamoto University, Doctor No. 399)
March	1982	Completed post-graduate programs at Kumamoto University Medical School and the Institute of Constitutional Medicine
April	1989	Contract Psychiatrist, Minamata Public Health Center, Kumamoto Prefecture, up to March 2002
April	1990	General Director, Yoshikazukai Medical Institution, Minamata Kyoritsu Hospital Director, Minamata Kyoritsu Neurology and Rehabilitation Clinic
July	2002	Tomiokai Medical Institution, Sakuragaoka Hospital
January	2005	Forensic Psychiatrist, Kumamoto District Court, up to December 2008
April	2006	Visiting Researcher, Open Research Center for Minamata Studies, Kumamoto Gakuen University
July	2008	Yoshikazukai Medical Institution, Kikuyo Hospital
April	2009	Yoshikazukai Medical Institution, Minamata Kyoritsu Hospital
April	2012	Anninkai General Foundation, Kumamoto Seimyo Hospital

Clinical research experience in Canada

August	1975	Participation in G.N. and W.D. medical screening, with Dr. Masazumi Harada
August	2002	Participation in G.N. medical screening, with Dr. Masazumi Harada
August	2004	Participation in G.N. and W.D. medical screening, with Dr. Masazumi Harada
March	2010	Participation in G.N. and W.D. medical screening, with Dr. Masazumi Harada

Major Professional Associations

Japanese Society of Psychiatry and Neurology
Japan Environmental Council

Credentials

September	1968	Medical license (License No. 198507)
September	1972	Psychiatrist (No. 3438 under former professional name), up to September 1991
July	1981	Designated Doctor under Physical Disability Welfare Act (Neurology)
October	1991	Psychiatrist (No. 3438 under current professional name)
May	2005	Occupational Health Doctor, accredited by Japan Medical Association (No. 0500949)
January	2006	Contract Advisory Doctor, Japanese Society of Psychiatry and Neurology (Membership Number 05982)
April	2007	Medical Specialist, accredited by Japanese Society of Psychiatry and Neurology (No. 15059826)

Major Articles

1. Masazumi Harada, Taketoshi Akagi, Tadashi Fujino
   Kanada ni okeru suiginosen mondai, Nihon no Kagakusha 10, 511-514, 1975
   (Mercury pollution issues in Canada)

2. Masazumi Harada, Taketoshi Akagi, Tadashi Fujino
   Tokushu: Kanada Indian suiginchudoku jiken – ekigakuteki・rinshoteki chosa, Kogaikenkyu 5, (3), 5-18, 1976
   (Cases of mercury poisoning in Canadian Indians: epidemiological and clinical study)

3. Masazumi Harada, Tadashi Fujino, Taketoshi Akagi and Susumu Nishizaki : Epidemiological and clinical study and histological background of mercury pollution on Indian reservations in Northwestern Ontario, Canada, Bull. Inst. Constit. Med, 26, 169-185, 1976

4. Tadashi Fujino, Shiro Sumiyoshi, Ryuichi Minami, Teruo Hirahara, Hideyo Hattori, Masazumi Harada, Nobuyuki Hotta : *Seishinchitai no rinshoekigakuteki kennkyu – yuukisuiginosen no eikyo, Kumaikaishi 50, 282-295, 1976*
   (Clinical epidemiology study into mental retardation: impact of organic mercury pollution)

5. Masazumi Harada, Tadashi Fujino, Keikichi Kagashima:
Minamata ni okeru hozon saitai no mechirusuigin ni kansuru kenkyu, no to hattatsu, 9, 79-84, 1977
(Study of umbilical cord methylmercury concentration in Minamata)

6. Tadashi Fujino: *Aru shima ni okeru jumin no yuukisuiginosen no eikyou ni kansuru rinshoeki gakuteki kenkyu (Daiippou Osenchiku Jumin no Isseikenshin), Kumaikaishi 51, 22-62, 1977*
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7. Tadashi Fujino: *Aru shima ni okeru jumin no yuukisuiginosen no eikyou ni kansuru rinshoeki gakuteki kenkyu (Dainihou Hiosenchiku Jumin no isseikenshin) Kumaikaishi 51,91-147, 1977*
(Clinical epidemiology study of impact of organic mercury pollution on island populations)

8. Masazumi Harada, Tadashi Fujino: *Mansei Minamatabyo no chiryo, Nihonijishinpo —α- mercaptopropionyl glycine ni tsuite, Nihonijishinpo 2769,18-22, 1977*
(Treatment of chronic Minamata disease - α- Mercaptopropionyl Glycine)

9. Keikichi Kagashima, Ryuichi Minami, Tadashi Fujino, Masazumi Harada: *Mansei Minamatabyo ni okeru hossaseishojo to nouha shoken, Rinshonoha, 19, 733, 736, 1977*
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10. Masazumi Harada,Tadashi Fujino,Taketoshi Akagi and Susumu Nishigaki: Mercury contamination in human hair on Indian reservations in Canada, Kumamoto Med. J. 30, 57-64, 1977

11. Masazumi Harada, Tadashi Fujino, Yaeko Itai: *Mansei Minamatabyo no chiryo – Sodium Valproate ni tsuite, Nihonijishinpo, 2848,29-34, 1978*
(Treatment of chronic Minamata disease - Sodium Valproate)

12. Masazumi Harada, Tadashi Fujino, Hitoshi Takahashi : Effects of Tiopronin and Spironolactone in the treatment of chronic methylmercury poisoning, Bull. Inst. Constit. Med. (Kumamoto), 29, 1-20, 1978

13. Tadashi Fujino, Yaeko Itai, Masazumi Harada: *Sentenijo to kankyo osen niyoru yukisuigin no eikyo no kento — Laurence-Moon-Biedl shokogun wo megutte, Taishitsugakushi 44, 103-115, 1980*
(Congenital abnormality and environmental pollution: impact of organic mercury in relation to Laurence-Moon-Biedl syndrome)

14. Tadashi Fujino, Yaeko Itai, Masayoshi Kage: *Minamatabyo tahatsuchiku ni umare senteiseikikei wo tomonatta Laurence-Moon-Biedl shokogun no ichirei, Igakuhyoron No. 66, 57 – 63, 1980*
(Repeated occurrence of Minamata disease: an example of Laurence-Moon-Biedl syndrome accompanying congenital disorders)

15. Tadashi Fujino: *Aru shima ni okeru jumin no yukisuiginosen no eikyo ni kansuru rinshoekigakuteki kenkyu (daisanpo Ⅰ Osenchiku ni okeru jakunensha no isseikenshin, Ⅱ Minamatabyo shindan ni taisuru aratana shokensano kokoromi), Kumaikaishi 54, 149-193, 1980*
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16. Tadashi Fujino, Yaeko Itai: *Kumamoto-ken Goshoura-machi jumin no jikakushojo, shinkeishojo no suii — Mechirusuigin no mansei biryoosen no eikyo ni kansuru kenkyu, Igakuhyoron 75, 51-57, 1983*
(Goshora, Kumamoto prefecture: development of subjective and nervous symptoms in the population – study into the effect of persistent minute amounts of methylmercury)

17. Tadashi Fujino, Yaeko Itai, Masazumi Harada: *Yukisuiginosen chikujumin no rinshoshojo no seni, — Hikakuteki shoryo no osen no eikyo ni kansuru rinshotekikenkyu —, Taishitsuikenho 34, 541-558, 1984*
(Development of clinical symptoms from organic mercury: clinical study into impact of comparatively low levels of pollution)

18. Komyo Eto, Masazumi Harada, Isao Mishima, Tadashi Fujino, Yaeko Itai, Tadao Takeuchi: *Minamatabyo no rinsho to byori no hikakukento – 25 nen no keika wo totta seishinshojo wo tomonau minamatabyo no ichi boken rei - Neuropathol. 5. 29-40, 1984*
(Clinical pathology comparative study – 25 years of mental symptoms accompanying Minamata disease: autopsy example)

19. Tadashi Fujino, Yaeko Itai, Shuichi Kamijukkoku, Masazumi Harada: *Yukisuigin ni yoru kankyoosen ga jumin no kenko ni oyobosu eikyo — aru gyosonchiku no baai,*

ankeetochosa to kenshinkekka yori, Nihontaishitsugakuzasshi dai 49 kan, dai 1・2 go, 139-152, 1985
(Impact of organic mercury pollution on population health in a fishing village: results of a survey and medical examinations)

20. Tadashi Fujino, Yaeko Itai, Itaru Nagayama, and others: *Mechirusuigin no manseibiryoosen no eikyo ni kansuru kenkyu dai 2 ho: Doitsukensasha ni yoru Shiranuikai engan jumin 510mei no jikakushojo・shinkeishojo no suii, Igakuhyoron No.82,34-41, 1987*
(Second study into impact of minute levels of methylmercury: 510 people from the same sample group of the Shiranui seashore population)

21. Tadashi Fujino, Yaeko Itai, Yasuko Motomatsu, and others: *Mechirusuigin no manseibiryoosen no eikyo ni kansuru kenkyu dai 3 po: Osengen haishutsu teishigo no tennyusha no rinshoshojo ni tsuite, Igakuhyoron No.83,52-60, 1987*
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22. Tadashi Fujino, Yaeko Itai, Yasuko Motomatsu: *Mechirusuigin no manseibiryoosen no eikyo ni kansuru kenkyu dai 4 ho: Osenchi kara tenshutsushita junin ni mirareta kenkohigai, iwayuru "Chihatsusei" no mondai, Igagkuhyoron No.84,46-54, 1988*
(Fourth study into impact of minute levels of methylmercury: health difficulties of the population after moving out and late onset problems)

23. Tadashi Fujino, Muneo Hirata, Shiro Kozuma: *Tokuyamawan engan jumin kenkochosa hokoku —Mechirusuigin no biryoosen no eikyo, Igakuhyoron No.90,43-53, 1991*
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28. Masazumi Harada, Masanobu Hanada, Takashi Miyakita, Tadashi Fujino, Kazuhito Tsuruta, Akira Fukuhara, Tadashi Orui, Shigeharu Nakachi, Chihito Araki, Masami Tajiri, Itsuka Nagano: *Choki keikago no kanada senjuminchiku niokeru suiginosen no eikyochosa (1975-2004), Kankyo to kogai 34, 2-8, 2005*
(Study into long-term after effects of mercury pollution on Canadian First Nation population areas)

29. Masazumi Harada, Sadako Urasaki, Nobue Kamachi, Chihito Araki, Sayuri Uemura, Tadashi Fujino, Akira Shimotsuura, Toshihide Tsuda : *Kamineyushojiken no genjo to jinken, Shakaikankeikenkyu dai 11 kan,, dai 1 ・2 go, 1-47, 2006. 2*
(Yusho disease: current conditions and rights)

30. Shigeru Takaoka, Yoshinobu Kawakami, Tadashi Fujino, Fumihiro Oh-ishi, Fukuo Motokura, Yoshio Kumagai, Tetsu Miyaoka : Somatosensory disturbance due to methylmercury exposure, Environmental Research 107 (2008) 6-19

31. Masazumi Harada, Akitomo Shimoji, Masami Tajiri, Yukari Inoue, Tadashi Fujino, Yoshinobu Kawakami, Shigeru Takaoka, Tatsumi Ikeda, Yaeko Itai, Kanji Iwata, Fumihiro Oishi, Yuusuke Kado, Keikichi Kagashima, Yasunori Sakai, Tetsuo Shiokawa, Tateyo Suzuki, Shigeo Araki, Hisashi Tanaka, Naomi Tokura, Tetsuya Miyake, Fukuo Motokura: *Shiranuikai engan jumin no yukisuigin no eikyo ni kansuru kenkyu — Shiranuikai engan jumin kenkochosa hokoku, Minamatagakukenkyu, 2, 61—86、2010. 3*
(Shiranui seashore population: study into the impact of organic mercury – health report)

32. Masazuzmi Harada, Sadako Urasaki, Nobue Kamachi, Masami Tajiri, Yukari Inoue, Nobuyuki Hotta, Tadashi Fujino, Kazuhito Tsuruta, Takashi Yorifuji, Toshikazu Fujiwara: *Kanemiyusho higaisha no genjo—40 nen me no kenkochosa, Shakaikankeikenkyu dai 16 kan, dai 1 go, 1-53, 2011. 2 1-53, 2011. 2*
(Victims of Yusho disease: fortieth year health study)

33. Masazumi Harada, Masanobu Hanada, Masami Tajiri, Yukari Inoue, Nobuyuki Hotta, Tadashi Fujino, Shigeru Takaoka, Keishi Ueda: *Kanada Ontario-shu senjuminchiku ni okeru suiginosen — Kanada minamatabyo no 35 nenkan, Minamatagakukenkyu, 3, 3-30, 2011. 3*
(Mercury pollution in First Nation population areas in Ontario, Canada: 35 years of Minamata disease in Canada)

34. Tadashi Fujino, Shigeru Takaoka: *Mansei minamatabyo no rinshoekigakutekikenkyu—Chisso・Asetoarudehido kojo sogyoteishigo ni shussei shita jumin no shinkeishoko, Minamatagakukenkyu, 3, 31-56, 2011. 3*
(Clinical epidemiology study into chronic Minamata disease: nervous symptoms in population born after suspension of Chisso Acetaldehyde factory production)

35. Shigeru Takaoka, Tadashi Fujino, Nobuyuki Hotta, Keishi Ueda, Masanobu Hanada, Masami Tajiri, Yukari Inoue : Signs and symptoms of methylmercury contamination in a First Nations community in Northwestern Ontario, Canada, Science of the Total Environment, 468-469 (2014) 950-957

Akitomo Shimoji

Education

1973 Graduated Faculty of Medicine, Kumamoto University

1973 Started work at Department of Neuropsychiatry, Faculty of Life Sciences, Kumamoto University

1975 Tomiai Prefectural Hospital Kumamoto (currently called Kokoro Medical Center)

1977 Research Associate, Poisoning Research Center, Neurotoxin Sector, Kumamoto University

1981 Research Associate, Department of Psychiatry, Kumamoto University

1987 Chief Psychiatrist, Okinawa Miyako Hospital

1989 Lecturer, Department of Neuropsychiatry, Kumamoto University

1997 Associate Professor, Department of Neuropsychiatry (Clinical Psychology), Kumamoto University

2004 Associate Professor, Department of Psychiatry and Neuropathology, Graduate School of Medicine and Faculty of Medicine of Kumamoto University (Chief Psychiatrist, Department of Neuropsychiatry)

2005 Professor, Graduate School and Faculty of Social Welfare of Kumamoto Gakuen University (Welfare Environmental Studies)

Clinical research experience in in Canada

August 2014 Participated in clinical research in Grassy Narrows and Whitedog

Major Professional Associations

Japanese Society of Psychiatry and Neurology
Japanese Society of Transcultural Psychiatry
Japanese Society of Psychopathology
Japanese Society of Pathography

Credentials

Psychiatrist

Major Articles

1. Akitomo Shimoji: *"Minamatabyo" kenkyu no hohoron saiko—I gakutekishiko no aratana paradaimu tenkan—, Minamatagakukenkyu, 2, 23-30, 2010*
   (A reappraisal of the methodology of Minamata disease research: new paradigm change in medical opinion)

2. Masazumi Harada, Akitomo Shimoji, Masami Tajiri, Yukari Inoue, Tadashi Fujino, Yoshinobu Kawakami, Shigeru Takaoka, Tatsumi Ikeda, Yaeko Itai, Kanji Iwata, Fumihiro Oishi, Yuusuke Kado, Keikichi Kagashima, Yasuyuki Sakai, Tetsuo Shiokawa, Tateyo Suzuki, Shigeo Araki, Hisahi Tanaka, Naomi Tokura, Tetsuya Miyake, Fukuo Motokura: *Shiranukai engan jumin no yukisuigin no eikyo ni kansuru kenkyu—Shiranukai engan jumin kenkochosahokoku, Minamatagakukenkyu, 2, 61-86, 2010*
   (Shiranui seashore population: study into the impact of organic mercury – health report)

3. Taihei Miyakawa, Isao Shikai, Akitomo Shimoji: *Jikkenteki yukisuiginchudoku—Chikakuseni no shogai ni kanshite, Monbushotokutekikenkyu "Nanbyo"han gyosekishu, 1361 —362、1977*
   (Experimental organic mercury poisoning – difficulties related to developmental awareness)

4. Taihei Miyakara, Eiichi Murakami, Isao Shikai, Akitomo Shimoji, Kenichi Nagatoshi: *Minamatabyo no utagaiga motareta kanja no hifukushinkei seiken* shoken, Minamatabyo ni kansuru sogotekikenkyu, Nihonkoshueiseikyokai 68-72, *1978*
   (Patient with suspected Minamata disease: findings from biopsy of sural nerve)

5. Taihei Miyakawa, Motonori Deshimaru, Akitomo Shimoji and Kenjiro Watanabe: The study of muscle spindles in experimental organic mercury Poisoning, Kumamoto Medical Journal, 38(1):27-36, 1985

EXPERT REPORT IN JAPANESE AND COMMISSIONED

専門家による報告書

グラッシー・ナローズ・ファーストネーションとシェリー・フォビスター、ウィリアム・フォビスター、長老サイモン・フォビスター、族長ロジャー・フォビスター、シニアの代表、そしてその他のグラッシー・ナローズ・ファーストネーション全員の代表
対　オンタリオ州天然資源省森林局、オンタリオ州環境省、そしてオンタリオ州法務長官省

オンタリオ州高等裁判所
(ディビジョナル裁判所)

カナダ環境法協会
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弁護士ジョゼフ・F.・カストリリ氏とリチャード・D.・リンドグレン氏のために作成されました。

グラッシー・ナローズにおける水銀汚染に関連する医学心理学的・精神的問題に関する質問に対する回答

作成者

高岡滋医師、藤野糺医師、下地明友医師

これは証拠品 A であり、高岡滋 (Takaoka, Shigeru) の宣誓供述書の中で参照されているものです。
2016 May 28
目前認証されました。
JOHN DONALD DAVIS認証者

corrected by J.D.D.

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前書き：専門分野と資格

私たちは日本の九州に位置する熊本県の３人の医師です。下記の内容は私たちの経験と専門分野の簡潔な要約です。

高岡滋医師：私は医師で日本国熊本県水俣市にある神経内科リハビリテーション協立クリニックの院長です。私の専門は幅広く、神経内科とリハビリテーションそして一般内科です。私は日本の水俣市とカナダ国オンタリオ州グラッシーナローズにて水銀汚染されたと疑われる患者の住民健診に参加しました。グラッシー・ナローズにおいては原田正純医師率いる調査チームに参加しました。臨床経験に加え、私は水銀汚染に関する論文をいくつか共同で執筆し、それらは論文審査のある医学科学専門誌で発表されました。

藤野糺医師：私は熊本病院で精神科と神経内科を専門としている医師です。私は日本の水俣において水銀汚染された患者の住民健診の経験が豊富であります。数十年に渡り、何度も原田正純医師率いる調査チームと共にカナダ国オンタリオ州グラッシー・ナローズで水銀汚染されたと疑われる男性女性児童の住民検診を多く手がけました。両国において臨床研究について広範囲にわたり論文を執筆し、それらは論文審査のある多くの医学科学専門誌で発表されました。

下地明友医師：私は神経精神科医であり、熊本大学の教授でもあります。故原田正純医師率いる調査チームと共にカナダ国オンタリオ州グラッシー・ナローズにおいて水銀汚染された又は水銀汚染が疑われた患者の臨床評価に参加しました。日本における臨床経験に基づき、私は水銀汚染に関する論文を執筆・共同執筆し、それらは論文審査のある医学科学専門誌で発表されました。

私たちの履歴書は専門家報告書の付録Ｂに記載されています。

専門的意見を依頼された経緯と背景

私たちはグラッシー・ナローズ・ファースト・ネーションを代理であるカナダ環境法協会のジョゼフ・Ｆ・カストリリ氏とリチャード・Ｄ・リンドグレン氏より下記の４つの質問に回答として専門家報告書の作成を依頼されました。質問の中に出てくる参照ページは原告の申請記録「グラッシー・ナローズ・ファースト・ネーション及びその他、対オンタリオ州天然資源省森林局及びその他」から引用しています。

質問の一覧

Questions for Dr. Shigeru Takaoka et al.	高岡滋医師とそのチームにへの質問	
English	日本語	関連ページ
Question 1: Based on the clinical medical examinations that Dr. Harada's team performed on people at Grassy Narrows over the years, please comment on the statements, which appear below respecting pages 001251 to 001252 of the January 2014 request by Grassy Narrows (GN) to the Government of Ontario, and whether they are accurate in their summary of the findings of Dr. Harada's team based on the two Harada referenced reports of 2005 and 2011 that appear at page 001284 of the January 2014 request?	**質問１：原田医師とそのチームがグラッシー・ナローズで長年に渡って行った臨床医療調査をもとに、下記のステートメントにコメントしてください。2014 年 1 月にオンタリオ州政府へグラッシー・ナローズから提出されたリクエストの 001251 ページから 001252 ページに関連しています。それらは 2014 年 1 月のリクエストの 001284 ページに記載されている、原田医師が書いた 2005 年と 2011 年の報告書に基づいて原田医師のチームが出した調査結果はその要旨において正確でしょうか。**	
Excerpt from: Bump-up Request for an Individual Environmental Assessment (IEA) submitted to the Ontario Ministry of the Environment regarding the Forest Management Plan for the Whiskey Jack Forest for the 10-year period April 1, 2012 to March 31, 2022 - Final Plan Inspection Approved by the Ministry of Natural Resources, December 23, 2013 - EBR Registry No. 010-9240 Submitted by: Grassy Narrows First Nation and Earthroots January 22, 2014 5. Mercury Impacts Human Health in Grassy Narrows SUMMARY 35 Years of study by renowned mercury expert Dr. Harada and his team have confirmed that people in Grassy Narrows are suffering from Minamata Disease as a result of methyl mercury ingested by eating local fish. EVIDENCE Doctor Harada's teams of researchers have studied mercury health impacts in Grassy Narrows for over 35 years starting in 1975. "[I]t is an undoubtable fact that Minamata Disease occurred in [Grassy Narrows and White Dog], based on our long-term investigation result." (Harada et al., 2011) Grassy Narrows people "were poisoned by eating fish contaminated with mercury." (Harada et al., 2011) Findings by Harada et al., 2011	次より抜粋：2012 年 4 月 1 日から 2022 年 3 月 31 日までの 10 年間に及ぶウィスキー・ジャック・フォレストの森林管理計画に関してオンタリオ州環境省に提出された個別環境調査(IEA)への再リクエスト- オンタリオ州天然資源省より 2013 年 12 月 23 日に承認された最終計画監査。EBR Registry No. 010-9240 2014 年 1 月 22 日にグラッシー・ナローズ ファーストネーションとアースルートにより提出。 ５．グラッシー・ナローズにおいての水銀の人間の健康への影響 要旨 水銀の専門家として有名な原田医師とそのチームによって行われた 35 年に及ぶ調査により、グラッシー・ナローズ住民は地元で採れた魚を食することによって摂取したメチル水銀が原因で水俣病に苦しんでいることが確認された。 証拠 原田医師の研究者チームは 1975 年以来 35 年に渡りグラッシー・ナローズにおいて水銀の健康に対する影響を調査した。 「長期間に及ぶ調査の結果、（グラッシー・ナローズとホワイト・ドッグでは）水俣病が発生したことは疑う余地のない事実である。」（原田医師とそのチーム、2011 年） グラッシー・ナローズの人々は「水銀に汚染された魚を摂取することにより汚染された。」（原田医師とそのチーム、2011 年） 原田医師とそのチームによって発見された事実	1251-1252

• 59% of the 160 people tested in GN and White Dog were affected by mercury. • 34% were diagnosed with Minamata Disease (MD) using current Japanese diagnostic criteria (41% in GN --> 30 cases) • 25% were diagnosed with suspected Minamata Disease (SMD) • 44% of people aged 21-40 had MD or SMD. All these people were born after the mercury dumping was curtailed in 1971. "[T]he possibility of congenital Minamata Disease occurrence is very high in these two communities. We examined 7 cases of cerebral palsy and 7 cases of mental deficiency.... Further epidemiological research on stillbirths and miscarriages needs to be done." (Harada et al., 2005) All of Dr. Harada's patients who indicated mercury levels higher than the safetyguideline of 50 ppm in 1975 were deceased by 2004. (Harada et al., 2005)	(2011 年) • グラッシー・ナローズとホワイト・ドッグで検査を受けた 160 名の 59%が水銀に汚染されていた。 • 現在の日本の診断基準に基づき、34%が水俣病（MD）と診断された。（グラッシー・ナローズでは 41%、30 件以上） • 25%は水俣病の疑いあり（SMD）と診断された。 • 21 歳か 40 歳の 44%が MD 又は SMD と診断された。全員が 1971 年に水銀放出が削減された以降に生まれている。 「これらの２つのコミュニティーにおいて先天的水俣病発生率は極めて高い。脳性まひ 7 症例と知的障害 7 症例を調査した。死産と流産に関しては、より詳しい疫学的調査を実施する必要がある。」（原田医師とそのチーム、2005 年） 原田医師の患者全員で、1975 年には水銀レベルが 50 ppm の安全指針よりも高かったが、2004 年までには下がった。（原田医師とそのチーム、2005 年）	
References Cited Section of Previous Excerpted Document: Harada, Masazumi, Masanori Hanada, Masami Tajiri, Yukari Inoue, Nobuyuki Hotta, Tadashi Fujino, Shigeru Takaoka, and Keishi Ueda. 2011. "Mercury Poisoning in First Nations Groups in Ontario, Canada 35 Years of Minamata Disease in Canada." Journal of Minamata Studies 3: 3–30. Harada, Masazumi, Masanori Hanada, Takashi Miyakita, Tadashi Fujino, Kazuhito Tsuruta, Akira Fukuhara, Tadashi Orui, Shigeharu Nakachi, Chihito Araki, and Masami Tajiri. 2005. "Long-Term Study on the Effects of Mercury Contamination on Two Indigenous Communities in Canada (1975-2004)." Research on Environmental Disruption 34 (4).	以前に抜粋された資料から引用されたセクションの参考文献目録 ハラダ、マサズミ、ハラダマサノリ、タジリマサミ、イノウエユカリ、ホッタノブユキ、フジノタダシ、タカオカシゲル、ウエダケイシ 2011 年「カナダ国オンタリオ州ファーストネーショングループにおける水銀汚染。カナダの水俣病の 35 年」水俣研究ジャーナル 3:3-30 ハラダ、マサズミ、ハラダマサノリ、ミヤキタタカシ、フジノタダシ、ツルタカズヒト、フクハラアキラ、オルイタダシ、ナカチシゲハル、アラキチヒト、タジリマサミ、2005 年 「カナダの２つの先住民コミュニティーにおける水銀汚染の影響に関する長期調査（1975-2004）」環境崩壊に関する調査 34(4)	1284
Question 2: Based on the clinical medical examinations that Dr. Harada's team performed on people at Grassy Narrows over the years, please comment on the statements, which appear below respecting pages 001445, 001479 to 001483 of the September 2014 supplementary GN submissions to the Government of Ontario, and whether they are accurate in their summary of the findings of Dr. Harada's team referred to in those pages?	**質問２：原田医師とそのチームがグラッシー・ナローズで長年に渡って行った臨床医療調査をもとに、下記のステートメントにコメントしてください。2014 年 9 月にグラッシー・ナローズがオンタリオ州政府に提出した補足提出の 001445 ページ、 001479 ページと 001483 ページに関連しています。それらは原田医師のチームがこれらのページおいて言及している調査結果はその要旨において正確でしょうか？**	

The following 5 Excerpts are from: Literature Review regarding the Impact of Mercury on Human Health Summary of a text produced by Drs. Laurie Chan and Donna Mergler for the Mercury Disability Board presented by Donna Mergler PhD, Professor Emerita, University of Quebec at Montreal: Dr. Harada's studies • Dr. Harada did pioneering work in Japan, demonstrating neurologic damage of Minamata Disease • In a recent report, he stated: "During the early stages of the MD crisis in Minamata, patients, who were diagnosed with MD, seemed to be typical and severe cases of the Hunter-Russell syndrome, including sensory disturbance, concentric constriction of the visual field, ataxia, speech impairment and impaired hearing. However, through more study, it became clear that such severe cases were rather exceptional and many more mild cases were progressing to chronic Minamata Disease. I observed that the symptoms of Minamata Disease became more chronic and atypical in the 1970s. Also I have been proving that sensory disturbances, specifically stronger loss of sensation in the extremities, were seen among patients of methylmercury poisoning at a very high rate, through clinical examinations on family members of patients with sever(sic) and typical symptoms or mothers of congenital Minamata Disease patients"	下記の 5 つは次からの抜粋です。人間の健康に及ぼす水銀の影響に関する文献の考察 ローリー・チャン博士とドナ・マーグラー博士により水銀障害委員会のために作成された文章の要旨 モントリオール、ケベック大学名誉教授ドナ・マーグラー博士によって公開されました。 原田医師の調査 • 原田医師は日本で草分け的な調査を行い、水俣病の神経系の障害を証明した。 • 最近の報告書にて、彼は「水俣市における水俣病騒動の初期において、水俣病患者は知覚障害、視野の求心性収縮、運動失調、発語障害と聴覚障害などの、ハンター＝ラッセル症候群患者に典型的でかつ重度な症状が見受けられた。しかしながら、より多くの調査を通じて、そのような重度な症例はどちらかというと例外的で、多くの軽症例が慢性的水俣病へ移行していくことが明確になった。水俣病の症状は 1970 年代に、より慢性で変則的なものとなったことが認められ。また私は、先天性水俣病患者の家族または母親の臨床検査を通じて、知覚障害、厳密に言えば、四肢におけるより強度な知覚喪失がメタル水銀中毒患者に非常に高い率で診られることを証明した。」と述べている。	1479
Dr. Harada's studies • In the '70s, he showed that persons in Grassy Narrows and White Dog manifested similar signs and symptoms to MD and there appeared to be a dose-relation with mercury exposure • In 2002 and 2004, he and his team went back. In total they examined 156 people from Grassy Narrows and White Dog. • Age ranged from 1-90 years • No information was provided on how persons were recruited	原田医師の調査 • 70 年代に、彼はグラッシー・ナローズとホワイト・ドッグの住人に水俣病に似た兆候と症状が現われ、水銀の摂取量と関係があることを明らかにした。 • 2002 年と 2004 年に彼と彼のチームは現地へ戻り、グラッシー・ナローズとホワイト・ドッグで合計 156 名を調査した。 ・年齢は 1 歳から 90 歳 ・調査対象の選出法については一切公表されていない	1480

Dr. Harada's studies • Diagnostic criteria: • MD: more than one symptom of: sensory disturbances, ataxia, disturbed ocular movement, imbalance, concentric constr[i]ction of the visual field and speech impairment. • In cases where examinees were showing only sensory disturbances, we acknowledged MD as long as there was no other disease causing the symptom. • If an examinee had another disease and still showed symptoms of MD that were not explained by that other disease, we defined the case as MD with complications.	原田医師の調査 ・診断基準 • 水俣病：知覚障害、運動失調、眼球運動障害、平衡失調、視野の求心性収縮、発語障害の症状のいずれかが一つ以上認められる。 • 調査対象で知覚障害のみが認められた場合、その症状を引き起こす他の疾患が認められない場合は水俣病と認識した。 • 調査対象が他の疾患を持ちながら水俣病症状を表し、その症状が他の疾患によるものではない場合、そのケースは合併症を伴う水俣病とした。	1481
Dr. Harada's studies • Findings: • 60 cases of MD (34.2% of total examinees, excluding people 10 years old and younger); • 54 cases (30.8%) of MD with complications; • 25 cases (14.2%) of possible MD for a total of 139 cases (79.4%). • They conclude : • It is very high rate of neurological symptoms for a sample of a population, even though examinees came because of other health issues. It is as high as contaminated areas in Minamata. We cannot help but recognize the effects of methylmercury from the symptoms we have seen.	原田医師の調査 ・調査結果 ・60 の症例が水俣病（調査対象全員の 34.2%、10 歳以下を除く） ・54 の症例（30.8%）が合併症を伴う水俣病 ・合計 139 の症例（79.4%）のうち 25 の症例（14.2%）が水俣病の疑いがある ・結論 ・調査対象が他の健康問題で来たにもかかわらず、住民の実例としては神経症状はかなり高い率で見られた。それは水俣の汚染地域と同じくらい高かった。我々が見た症状からするとメチル水銀の影響と認識せざるを得ない。	1482
Our conclusions [of Drs. Chan and Megler] • Dr Harada and his group did not evaluate the prevalence of MD in this population, but reported on the percentage of MD signs and symptoms within the group that they examined. • We consider that Dr. Harada's follow-up clinical evaluation should be seen as a preliminary study showing the need for a comprehensive epidemiologic study that would include all of the known outcomes of mercury exposure and could take into account co-morbidity from other diseases, such as diabetes and /or alcohol and test for possible interactions. Such a study should also take into account the presence of other contaminants. For this study it would be most useful to have all of the results of hair and blood sampling by Health Canada, Dr. Chan and Dr. Harada, as well as the results of the neurological examinations that were done by Dr. Harada.	我々の結論（チャン博士とメグラー博士による） • 原田医師と彼のチームはこの住人における水俣病の患者数は見積もらなかったが、水俣病の兆候と症状を示した調査対象人数の参加人数に対するパーセンテージを報告した。 • 原田医師のフォローアップ臨床評価は、既に知られていた水銀汚染の全ての結果を含む、包括的な疫学調査の必要性を示す予備調査として見られるべきであり、糖尿病やアルコールとの相互作用の可能性のテスト等、他の疾患との合計疾患率を考慮せねばならない。このような調査は他の汚染物質の存在をも考慮せねばならない。この調査のためにはヘルス・カナダやチャン博士と原田医師による髪の毛や血液のサンプル摂取の結果の全てと原田医師によって実施された神経学に関する調査の結果があれば最も価値あるものとなるであろう。	1483

Question 3: Based on the clinical psychological/psychiatric examinations that Dr. Harada's team performed on people at Grassy Narrows over the years, please comment on whether you agree with the statements of Donnan, 1986, regarding the psychological health impacts of mercury/methylmercury, which statements appear below respecting pages 001492 to 001493 of the November 2014 supplementary GN submissions to the Government of Ontario? In your professional opinion, has exposure to mercury had psychological/psychiatric impacts on the people of Grassy Narrows and, if so, what have been those impacts?	**質問３：原田医師とそのチームがグラッシー・ナローズで長年に渡って行った臨床心理学的・精神学的調査をもとに、1986 年にドナンが述べた、水銀・メチル水銀の心理学的健康の影響について下記のステートメントに貴殿が同意するか否かをコメントしてください。2014 年 11 月にグラッシー・ナローズがオンタリオ州政府に提出した補足提出の 001492 ページと 001493 ページ関連しています。専門家として貴殿は、グラッシー・ナローズの住人は水銀汚染されたことによって心理的・精神的影響を受けたでしょうか。受けたとお考えであれば、どのような影響を受けたのでしょうか。**	
Excerpts from: Grassy Narrows and Earthroots Fourth Supplementary Submission to Devon Wills, Ministry of the Environment on 2012-2022 Whiskey Jack Forest Management Plan IEA Request, dated November 14, 2014 2. PSYCHOLOGICAL HEALTH IMPACTS OF MERCURY "High blood mercury levels contribute to anxiety..." (Donnan, MOE 1986, p.28) "...mental health effects such as anxiety due to mercury contamination in the Wabigoon-English River System have been borne almost entirely by the Native people of the Grassy Narrows and Whitedog Bands." (Donnan, MOE 1986, p.28) The fear and anxiety from knowing they were contaminated was debilitating to many. The threat of mercury poisoning clearly affected the mental health of these people...." (Donnan, MOE 1986, p.31) "[A] reduction in fish mercury levels could help to reduce anxiety and mental trauma experienced by these people." (Donnan, MOE 1986, p.44)	次から抜粋：グラッシー・ナローズとアースルーツの 2012-2022 年ウィスキージャック森林管理計画 IEA リクエストに関する、デボンウィルス、環境省に提出した第４補足提案、2014 年 11 月 14 日付 ２．水銀の心理学的健康への影響 「高い血中の水銀値は不安を抱かせる」（ドナン、MOE 1986 年、28 ページ） 「グラッシー・ナローズとホワイトドッグ・バンドの原住民によってほぼ全域が所有されているワビゴーン-イングリッシュ川沿岸が水銀に汚染されていることによって引き起こされる不安などのメンタルヘルスの影響」（ドナン、MOE 1986 年、28 ページ） 「彼らが汚染されていると知っていることによる恐れと不安は、多くの人々を衰弱させる。水銀汚染の脅威は明らかにこれらの人々のメンタルヘルスに影響を及ぼしている。」（ドナン、MOE 1986 年、31 ページ） 「魚の水銀汚染レベルを下げることは人々の不安と彼らが経験した精神的なトラウマを少なくさせることに役立つ。」（ドナン、MOE 1986 年、44 ページ）	1492-1493
Question 4: Do you continue to adopt the findings and conclusions contained in the article by Shigeru Takaoka, et al, entitled "Signs and symptoms of methylmercury contamination in a First Nations community in Northwestern Ontario, Canada" reported in Science of the Total Environment 468-469 (2014) 950-957? If not, what has caused you to change your opinion since publication of the article?	**質問４：高岡滋医師と彼のチームによって書かれ、Science of Total Environment 486-469 (2014) 950-957 に報告された「カナダ・オンタリオ州北西部にあるファーストネーション・コミュニティーにおけるメタル水銀汚染の兆候と症状」という題名の記事に記載されている調査結果と結論を引き続き支持されますか。支持ないのであれば、この記事が発表となって以来どのような理由で貴殿のご意見が変わったのでしょうか？**	

質問への回答

質問１

正確です。

質問２

正確です。

質問３

我々専門家の意見では、精神的悪影響を受けました。

質問４

我々は引き続き支持します。

引用

原田正純、花田昌宜、宮北隆志、藤野糺、鶴田和仁、福原明、大類義、中地重晴、荒木千史、田尻雅美、2005 年　「カナダの２つの先住民コミュニティーにおける水銀汚染の影響に関する長期調査（1975-2004）」環境崩壊に関する調査 34(4)

原田正純、花田昌宜、田尻雅美、井上ゆかり、堀田宜之、藤野糺、高岡滋、上田啓司、2011 年　「カナダ・オンタリオ州ファースト・ネーショングループにおける水銀汚染。カナダの水俣病の 35 年」水俣研究ジャーナル 3:3-30

高岡滋、藤野糺、堀田宜之、上田啓司、花田昌宜、井上ゆかり 2014 年「カナダ・オンタリオ州北西部にあるファースト・ネーションコミュニティーにおけるメチル水銀汚染の兆候と症状」総合環境サイエンス 468-469:950-957

付録 A: 2014 年に書かれた記事 - カナダ・オンタリオ州北西部に位置する北米先住民族コミュニティーにおけるメチル水銀汚染の兆候と症状

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Signs and symptoms of methylmercury contamination in a First Nations community in Northwestern Ontario, Canada

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HIGHLIGHTS

- Similarities between the prevalence of complaints in Minamata and Grassy Narrows
- Similarities in neurological findings were also found.
- Quantitative sensory measurements gave similar results for impairments.
- Younger Canadians were less severely affected than older ones.
- Results suggest that subjects from Grassy Narrows had methylmercury poisoning.

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ABSTRACT

In 1970, fish caught in the English–Wabigoon River system in northwestern Ontario, Canada, were found to be contaminated with mercury coming from a chlor-alkali plant in the province. In the 1970s, patients exhibiting some of the symptoms of the Hunter–Russell syndrome (e.g. paresthesias, visual field constriction, ataxia, impaired hearing, and speech impairment) were reported by some researchers. However attempts to diagnose the patients as suffering from methylmercury poisoning proved to be controversial. In order to research the presence of methylmercury contamination, and show that the patients, through eating contaminated fish, were suffering from methylmercury poisoning, we studied the results of subjective complaints, neurological findings, and quantitative somatosensory measurements gathered in Grassy Narrows Indian Reservation, Ontario, in March, 2010. At that time, the population of the Grassy Narrows settlement was around 900. Ninety-one residents volunteered to be examined. From them, we selected 80 people who were older than 15 years old, and divided them into two groups. Canadian Younger (CY): 36 residents who were from 16 to 45 years old. Canadian Older (CO): 44 residents who were from 46 to 76 years old. We compared them to Japanese Exposed (JE): 88 methylmercury exposed residents from the Minamata district in Japan, and Japanese Control (JC): 164 control residents from non-polluted areas in Japan. Complaints and abnormal neurological findings were more prevalent and quantitative sensory measurements were worse in the two Canadian groups and the Japanese Exposed group than in the Japanese Control group. Complaints, neurological findings and quantitative sensory measurements were similar in Canadian Older and Japanese Exposed. The results for Canadian Younger fell between those of Canadian Older and Japanese Control. These findings indicate that the clinical signs and symptoms of the residents of Grassy Narrows are almost the same as those recorded for Minamata disease in Japan.

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1. Introduction

Since the 1960s, a chlor-alkali plant had been releasing waste products contaminated with mercury into the waters of the English–Wabigoon River system in northwestern Ontario, Canada. In the first examples of fish, from the river system, that were contaminated with methylmercury (Bligh, 1970) levels of up to 16 μg/g were reported. Fimreite and Reynolds (1973) found highly contaminated fish with a maximum

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methylmercury concentration of 27.8 μg/g in 1970. The contamination in fish there was almost equal to that measured in fish from Minamata Bay, Japan, where a barracuda was recorded as having 23 μg/g in May 1961 (Fujiki and Irukayama, 1979). The average mercury concentrations, measured in 1971, in walleye and northern pike from Ball Lake, English–Wabigoon River, were 1.99 μg/g and 5.05 μg/g respectively (Armstrong and Scott, 1979).

In 2003, results of similar measurements were 0.40 μg/g in walleye and 0.85 μg/g in northern pike (Kinghorn et al., 2007). The concentrations of mercury in fish are declining, but they are still higher than those found in fish in Minamata Bay, Japan, where the average concentration of mercury in fish has been from 0.17 to 0.42 μg/g during the period of 1998-2004. (Kindaichi and Matsuyama, 2005). Residents living in that area of Japan, still continue to be exposed to low levels of mercury from the eating of locally caught fish.

The two First Nations' communities living in Grassy Narrows and Whitedog Indian Reservations became victims of methylmercury poisoning through the consumption of locally caught fish. Patients with some of the Hunter–Russell syndrome symptoms have been reported in these reserves (Harada et al., 1976). Canadian researchers also examined the indigenous residents of the areas. Wheatley et al. (1979) reported that effects associated with methylmercury poisoning were observed, but they concluded that direct impacts on human health were difficult to prove.

Pathological studies of a cat from Whitedog, which exhibited acute neurological symptoms, revealed high mercury levels in the brain similar to those of Minamata disease in Japan (Takeuchi et al., 1977). Another cat from neighboring Grassy Narrows showed no symptoms, but on closer examination it was shown to have high mercury levels in the brain and latent defects caused by methylmercury poisoning (Takeuchi et al., 1977).

Since 2004, more than 60,000 people from the Minamata district have been diagnosed with abnormal neurological symptoms. In many cases, the abnormalities were being reported for the first time since the release of methylmercury contaminated wastewater was stopped in 1968 (Takaoka et al., 2009). In chronic methylmercury poisoning the somatosensory disturbance from cortical damage is specific and sensory disturbance is present either in all four limbs or throughout the body, sometimes with the exception of the face and head. To detect such abnormalities, quantitative sensory measurements are useful (Takaoka et al., 2008). So we carried out a health survey that included the examination of subjective complaints, neurological symptoms, and quantitative sensory measurements in Grassy Narrows, Ontario, Canada, in 2010 and tried to reassess the effect of methylmercury in this area.

2. Materials and methods

2.1. Subjects

The study was carried out in March 2010 in Grassy Narrows, Ontario, Canada. We contacted a Grassy Narrows support group and asked for their help. They informed the indigenous population of our coming survey to detect any health effects from methylmercury poisoning and asked for volunteers to take part in the study. The Chief of Grassy Narrows First Nation went on the local radio to ask for volunteers for our research. Posters, informing of our coming research project and our wish for volunteers, were displayed in the band office and a local store. Of the approximately 900 residents, 91 volunteered to be examined. We selected 80 residents, who were older than 15, for the study. Subjects were informed verbally and in writing about the examination method, how the data would be used and that their confidentiality would be protected. Each participant gave their written consent.

We divided them into two groups. (1) Group Canadian Younger (CY): consisted of 36 residents who were from 16 to 45 years old (M/F = 18/18, 34.4 ± 9.5 years old). (2) Group Canadian Older (CO): consisted of 44 residents who were from 46 to 76 years old (M/F = 19/25, 57.5 ± 8.1 years old).

We studied subjective symptoms, neurological findings and carried out four quantitative sensory measurements (including minimal tactile sensation, vibration, position sense, and two-point discrimination) among the 80 residents. In order to assess the state of health of the residents of Grassy Narrows, we compared them to a group of Japanese residents who had also been exposed to methylmercury as well as a group of Japanese control residents. These residents were the same people we had used as subjects in our previous study (Takaoka et al., 2008).

(3) Group Japanese Exposed (JE): was comprised of 88 randomly selected Japanese subjects. They were chosen from residents of the Minamata area who had been exposed to methylmercury and who had been included in our former study at the Minamata Kyoritsu Hospital and the Kyoritsu Neurology and Rehabilitation Clinic between November 2004 and April 2005. Their ages matched those of the corresponding Canadian group but the genders could not be matched exactly (M/F = 38/50, 59.0 ± 7.5). They answered a detailed questionnaire and were given a neurological examination including the same four quantitative sensory measurements as we performed in Canada. All of them were born before 1969. In our former study, we separated the subjects into those with and without neurological or neurologically related diseases, but we found that there was little difference between those two groups. So in this study, Group JE included subjects both with and without such related diseases.

(4) Group Japanese Control (JC): consisted of 164 residents who lived in other districts, e.g. around Fukuoka City, Kumamoto City, and Kagoshima City, aged between 40 and 79. In the control group, people who had lived around Minamata City or who suffered from a neurological disease or a neurologically related illness were excluded. The control subjects were examined between February and May 2006 (M/F = 67/97, 58.4 ± 11.6).

2.2. Epidemiological conditions and questionnaire on complications

The questionnaire, both in Canada and Japan, included questions to determine the subject's exposure to methylmercury and asked for information regarding place of residence, dietary habits, occupational history, medical complications and the health and medical histories of family members.

The questionnaire on complaints for the Canadian groups (CO and CY) consisted of 47 questions related to sensory impairment (7 items), somatic pain (4), visual impairment (3), hearing impairment (3), tasting and smelling problems (3), in-coordination of the extremities (4), other movement impairment (11), vertigo and dizziness (4), general complaints (2), and mental and intellectual problems (6).

The questionnaire on complaints for the Japanese groups (JE and JC) consisted of about 50 questions. We selected 35 relevant questions from the Japanese questionnaire and used them in the Canadian one. They were as follows: sensory impairment (4 items), somatic pain (3), visual impairment (3), hearing impairment (3), tasting and smelling problems (3), in-coordination of the extremities (5), other movement impairment (4), vertigo and dizziness (4), general complaints (2), and mental and intellectual problems (4).

In answer to questions on health complaints, subjects were asked to select one of 4 possible choices. 1) Yes, always, 2) Yes, sometimes, 3) Yes, in the past but not at present, and 4) No, never. The prevalence of each complaint was calculated for each group and then compared between the four groups. All subjects completed the questionnaire before their medical examination. Subjects who could not complete the questionnaire by themselves were asked the questions verbally. All questionnaires were reviewed prior to the examinations.

2.3. Standard neurological examination

A standard neurological examination was carried out on 32 of the 36 subjects in Group CY and on all 44 subjects in Group CO. Dysarthria, auditory disturbance, visual constriction, finger–nose test with the eyes open and closed, diadochokinesis, heel–shin test, gait disturbances, tandem gait test, Mann's test, balancing on one foot with eyes open and closed, and superficial sensory disturbance (touch and pain) were used and tested for. The examination methods and criteria were almost the same as the former study (Takaoka et al., 2008).

Dysarthria, auditory disturbance, visual constriction, postural hand tremors, gait disturbances and Romberg's sign were judged to be either present or absent. Dysarthria, auditory disturbance, and visual field constriction were judged by the examining physician without using special instruments. Tunnel vision was considered to be present when the confrontation test showed a lateral field of vision of 80° or less.

Limb and truncal ataxia were judged as being either absent, mildly abnormal or moderately to severely abnormal. The results of the finger–nose test and the heel–shin test were judged to be positive not only when there was constant dysmetria or decomposition but also when there was uncertain dysmetria, decomposition, or very slow movement involved. Dysdiadochokinesis was judged to be present from when there was a constant abnormality to when there was an uncertain abnormality or slow movement. Tandem gait disturbance was judged as present not only when the subject could not walk more than five steps but also when they could walk five steps but were unstable. In the balancing on one foot test, disequilibrium was judged as present when it was impossible to balance more than 3 s or when the subject was unstable, but could keep their balance for more than 3 s.

The examinations were carried out in Canada by one neurologist and four psychiatrists. The neurologist and two of the psychiatrists had previous experience in carrying out these tests from earlier examinations of Minamata disease patients. The other two psychiatrists had been briefed and trained to carry out the tests. In Japan, Group JE was examined by six physicians and one neurologist and Group JC was examined by forty-five physicians, several of whom were neurologists.

Because there was not enough data collected from Group JE for the finger–nose test with eyes closed, Mann's test, Romberg's sign or balancing on one foot with eyes closed test, we excluded that information from our calculations.

2.4. Quantitative sensory measurements

Four categories of tests were used in the quantitative measurement of the somatosensory system. All four categories were the same as in the former study (Takaoka et al., 2008).

2.4.1. Assessment of minimal tactile sense

The minimal tactile sense was measured by the Semmes–Weinstein monofilament test. Twenty kinds of filaments from 0.008 to 300 g were used. Subjects were tested with eyes closed after receiving clear instructions on which locations would be tested. Each filament was pushed until it bent about 90° for about a second. The threshold was the smallest size filament which a subject could feel as touch. The trial was performed starting from a smaller size filament and then gradually increasing the size.

Each filament was tested only once except when the subject was unsure. In that case the examiner, using the same filament, repeated the test an odd number of times and selected the dominant response. If a subject could not detect the maximum filament (300 g), we defined the threshold as 400 g for calculation. Testing was carried out on the lower lip, upper chest and ventral sides of both index fingers and big toes.

2.4.2. Vibration sense

Vibration sense was measured by using a 128 Hz tuning fork. The vibration test was carried out on the middle or upper sternum, the radial side of both wrists and the fibular side of both ankles. Subjects were told to indicate when they no longer could feel the vibrations. The examiner simultaneously struck a tuning fork and started a stopwatch, then placed the base of the fork against the area to be tested. The time interval until the subject reacted was recorded.

2.4.3. Position sense

The testing of position sense was carried out on subjects with their eyes closed. A ruler with a millimeter scale was used. Tests were carried out on the subject's index fingers and big toes. A ruler was placed vertically alongside the digit. With the digit held horizontally, the zero point was the position of the digit's nail on the ruler's scale. The examiner held the digit by its sides and moved it either up or down, holding the position for about 1 s. The subject was asked to indicate whether they felt the movement and if it was up or down. The upward or downward movement started from 5 mm from the zero point and was considered to be the minimum value. The movement was increased in 5 mm increments and the subject's threshold distance was recorded.

Each trial was carried out once for each distance except when the subject was uncertain. In that case the examiner would repeat the test again for an odd number of times and choose the dominant response. If the subject could not feel the maximum movement, the threshold was defined as the maximum distance plus 5 mm.

2.4.4. Two-point discrimination

The two-point discrimination test was carried out on subjects while their eyes were closed. A drafting divider, with the legs set at different distances, was pressed against the subject's skin at an angle of 30 to 45° to a depth of between 1 and 2 mm for about 1 s. The distances between the points used in the test were 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20, 25, 30 and 36 mm. The threshold recorded was the shortest distance at which a subject answered correctly. This method was performed on the lower lip and the ventral side of each index finger. If the subject was unable to detect the maximum distance of 36 mm, the threshold was defined as 40 mm for calculation purposes.

In testing Groups CO and CY, the "Yes/No" method was used. However, when a subject felt that 1-point stimulation was actually 2-point stimulation, they were re-tested using the "2-alternative, forced-choice method". In Groups JE and JC the "2-alternative, forced-choice method" was used exclusively.

2.5. Statistical methods

All the calculations were performed using MS Excel and SPSS. Chi square analysis was used in MS Excel when the prevalence was compared, and t-test was used in MS Excel when the average was compared. The correlations were calculated by SPSS.

When we calculated the minimal tactile sense, we converted the grams to the evaluator size using the equation: Evaluator size = log([gram]) + 4.

3. Results

3.1. The subjects' backgrounds

The age and sex of the subjects are shown in Table 1. The age and sex in Groups CO, JC and JE were not statistically different. The age of Group CY was less than the other groups.

From Table 2, we can see that 86% of Group CO and 83% of Group CY answered the question on how they obtained fish and over 60% of Groups CO and CY answered that they are catching fish by themselves. Also from Table 2, we can see that 41% of Group JE and 1% of Group JC

Table 1
Age and sex of each group.

	Age	n (M/F)
Group CO	57.5 ± 8.1	44 (19/25)
Group CY	34.4 ± 9.5	36 (18/18)
Group JE	59.0 ± 7.5	88 (38/50)
Group JC	58.4 ± 11.6	164 (67/97)

belonged to a fisher family. Ninety-three percent of Group JE and 25% of Group JC ate fish every day.

Table 3 shows the relevant medical history of Group CO and Group CY. The information was collected through interviews. On the question of hypertension, although some subjects had no recorded history of hypertension, high blood pressure was detected during the tests. If we detected a systolic pressure of 170 or more or and diastolic pressure of 110 or more in a subject, we recorded that hypertension was present. Some neurological or neurologically related diseases were found in 47 subjects (53%) of Group JE. No neurological or neurologically related diseases were found in Group JC.

3.2. Questionnaire on medical complaints

Medical complaints reported from each group are shown in Table 4, and the p-values by chi square among the four groups are shown in Table 5. In general, the prevalence in both "Yes, always" and "Yes, always" + "Yes, sometimes" in Groups JE, CO, and CY was statistically higher than Group JC. In general, the prevalence in Group JE and Group CO was similar. For most of the complaints Group CY showed a lower prevalence than Group CO.

The questionnaire consisted of questions related to specific and non-specific symptoms in the methylmercury polluted area. Specific symptoms included numbness, difficulty in speaking, fine-finger tasks, buttoning, losing slippers while walking, difficulty in differentiating tastes, detecting smells etc. Non-specific symptoms included headaches, forgetfulness, general fatigue, and so on. In specific symptoms, the prevalence of the answer "Yes, always" + "Yes, sometimes" was lower in Table 4. A tendency to a similar prevalence was observed both in specific and non-specific symptoms.

The correlation efficient among four groups was shown in Table 7. In "Yes, always" answers, the correlation between Groups JE and CO was highest, and was followed by the one between Groups CO and CY. In "Yes, always" + "Yes, sometimes" answers the correlation between Groups CO and CY was highest, and was followed by the one between Groups JE and CO and between Groups JE and CY.

Table 2
Fish sources and frequency of ingestion.

In Canada	Group CO	Group CY
Self-caught fish	28/44 (64%)	24/36 (67%)
Fish caught by relatives and friends, purchased etc.	30/44 (68%)	22/36 (61%)
A combination of both the above	38/44 (86%)	30/36 (83%)
In Japan	**Group JE**	**Group JC**
Fishermen	10/88 (11%)	0/164 (0%)
Fishermen's families	36/88 (41%)	1/164 (1%)
Sport fishing/recreational fishing	62/88 (70%)	17/161 (11%)[b]
Daily ingestion	81/87 (93%)[a]	40/157 (25%)[c]
Ingestion more than once a week	85/87 (98%)[a]	119/157 (76%)[c]

[a] Datum for 1 person was missing.
[b] Data for 3 persons were missing.
[c] Data for 7 persons were missing.

Table 3
Complications in Canadian subjects.

	Group CO	Group CY
Hypertension	15 (34%)	16 (44%)
Diabetes mellitus	8 (18%)	3 (8%)
Stroke	3 (7%)	1 (3%)
Lung diseases	0 (0%)	1 (3%)
Stomach diseases	6 (14%)	1 (3%)
Heart diseases	1 (2%)	0 (0%)
Orthopedic diseases	7 (16%)	4 (11%)
Psychiatric diseases	3 (7%)	1 (3%)

3.3. Neurological examination

The neurological findings for each group and p-values by chi-square among the four groups are shown in Table 6. The prevalence was generally highest in Group JE, and the prevalence of all the findings of Groups JE and CO was statistically higher than Group JC. All the findings of Group CY were less prevalent than Group CO, and seven of twelve findings of Group CO showed statistically higher prevalence than Group CY.

The most prevalent findings in Groups CO are tandem gait abnormality and somatosensory disturbances of pain and touch, followed by hearing impairment, truncal ataxia other than tandem gait abnormality, upper extremity ataxia (finger–nose test and diadochokinesis), and lower extremity ataxia (heel–shin test). The prevalence of visual constriction or dysarthria was lower. Although the orders of prevalence for the positive findings were different, the tendencies of the abnormalities were similar between Groups CO and JE.

Correlation among four groups was shown in Table 7. Correlations between Groups JE and CY, Groups CO and CY, and Groups JE and CO were higher than those between Group JC and other three groups, and p-values were lower.

3.4. Quantitative sensory measurements

3.4.1. Minimal tactile sensitivity using the Semmes–Weinstein monofilament test

Thirty-three subjects (75%) of Group CO and 24 subjects (67%) of Group CY were examined. One set of data for the lower lip in Group CO and one set of data for the left and right big toes in Group CY were absent. 84 of 88 subjects (95%) in Group JE (in which three sets of data were missing for the lower lip) and all 164 subjects of Group JC were examined and calculated.

Fig. 1 shows the results of the minimal tactile sensitivity using the Semmes–Weinstein monofilament test. The results were worst in Group CO, and there were distinct statistical differences between Groups CO, CY, and JC. Group JE was, in general, positioned between Groups CO and CY.

3.4.2. Vibration sense

Thirty-five subjects from Group CO and 25 subjects from Group CY were examined. Two subjects from Group CO and one subject from Group CY were unable to carry out the test correctly and were excluded from the results. Consequently, the results of 33 subjects (75%) from Group CO and 24 subjects (67%) from Group CY were used in the calculation. Three sets of data for the right ankle and 4 sets of data for the left ankle were absent for Group CO. All 88 subjects of Group JE and all 164 subjects of Group JC (in which one set of data for the chest and one set of data for the left and right ankles were absent) were examined and calculated.

Fig. 2 shows that the vibration sense was worst in Group JE, followed by Group CO, Group CY and Group JC. Most of them had statistical differences between each other.

Table 4
Percentage of complaints.

		Yes, always				Yes, always + Yes, sometimes			
		Group CO	Group CY	Group JE	Group JC	Group CO	Group CY	Group JE	Group JC
1	Numbness in hands	40%	11%	49%	2%	86%	75%	92%	6%
2	Numbness in legs	39%	8%	42%	1%	91%	61%	86%	6%
3	Cannot judge bath water temperature	26%	8%	15%	0%	47%	31%	35%	0%
4	No pain when burned or wounded	23%	17%	16%	0%	65%	49%	44%	0%
5	Hand weakness	34%	22%	56%	3%	78%	69%	81%	5%
6	Leg weakness	35%	11%	49%	2%	79%	54%	77%	4%
7	Tremor in hand	23%	19%	24%	2%	74%	67%	68%	4%
8	Difficulty in speaking	2%	6%	8%	0%	51%	53%	62%	2%
9	Difficulty in fine finger tasks	47%	14%	57%	0%	77%	72%	86%	7%
10	Dropping things	9%	8%	16%	0%	77%	47%	73%	6%
11	Difficulty in buttoning clothes	21%	6%	25%	0%	49%	28%	57%	0%
12	Stumbling	29%	17%	5%	0%	79%	58%	65%	1%
13	Losing slippers while walking	8%	0%	23%	0%	50%	27%	70%	1%
14	Disturbed vision	33%	19%	49%	3%	93%	75%	87%	15%
15	Difficulty in finding things in shops	13%	9%	29%	0%	63%	46%	72%	6%
16	Limited peripheral vision	32%	14%	25%	1%	59%	31%	64%	4%
17	Difficulty in hearing	42%	25%	35%	7%	72%	61%	71%	15%
18	Tinnitus	30%	19%	34%	6%	86%	81%	80%	17%
19	Can hear, but cannot understand	5%	3%	7%	1%	65%	64%	45%	6%
20	Difficulty in differentiating tastes	28%	6%	18%	0%	53%	28%	46%	1%
21	Difficulty in sampling food while cooking	26%	0%	15%	1%	48%	23%	47%	1%
22	Difficulty in detecting smells	28%	11%	22%	0%	49%	28%	48%	4%
23	Muscle cramps	33%	17%	31%	3%	98%	91%	91%	29%
24	Headaches	37%	25%	37%	1%	88%	81%	86%	30%
25	Shoulder stiffness	24%	6%	64%	10%	95%	53%	95%	51%
26	Forgetfulness	21%	17%	34%	1%	81%	72%	97%	52%
27	Inability to hold concentration at work	26%	3%	28%	0%	74%	58%	67%	11%
28	Lack of motivation to do things	16%	0%	26%	1%	58%	56%	86%	21%
29	Irritation	21%	22%	31%	0%	72%	78%	85%	33%
30	Difficulty in sleeping	37%	39%	39%	3%	74%	69%	84%	19%
31	Dizziness when standing up	23%	14%	15%	0%	86%	83%	85%	17%
32	Feeling of head spinning	0%	3%	3%	1%	49%	58%	63%	5%
33	Swaying dizziness	5%	3%	5%	1%	72%	72%	57%	6%
34	Dizziness, bordering on fainting	7%	0%	5%	1%	47%	22%	46%	2%
35	General fatigue	40%	31%	45%	2%	95%	78%	87%	25%

3.4.3. Position sense

Twenty-eight subjects from Group CO and 24 subjects from Group CY were examined. One subject from Group CO and one subject from Group CY were unable to carry out the test correctly and were excluded from the results. Consequently, the results of 27 subjects (61%) from Group CO and 23 subjects (64%) from Group CY were used in the calculation. One set of data for the left and the right big toe, both upward and downward movements, was absent for Group CO. Eighty-seven subjects from Group JE (in which one set of data for both big toes in both directions was absent) and all 164 subjects of Group JC were examined and calculated.

Fig. 3 shows that the position sense was worst in Group JE, followed by Group CO, Group CY, and Group JC. Although there were some exceptions, most of the groups had statistical differences.

3.4.4. Two-point discrimination

Thirty-four subjects from Group CO and 25 subjects from Group CY were examined. Two subjects from Group CO and one subject from Group CY were unable to carry out the test correctly and were excluded from the results. Consequently, the results of 32 subjects (73%) from Group CO and 24 subjects (67%) from Group CY were used in the calculation. 87 of 88 subjects (99%) from Group JE and all 164 subjects of Group JC (in which one set of data for the right index finger was absent) were examined and calculated.

Fig. 4 shows that the position sense was worst in Group JE or Group CO, followed by Group CY and finally Group JC. Most of them had statistical differences, except for the results for index fingers when comparing Group JE with Group CO.

Table 5
p-Value for complaints — comparing groups.

		$p < 0.01$	$p < 0.05$	n.s.
"Yes, always"	CO, JC	All others	Nos. 25, 34	Nos. 8, 19, 32, 33
	CY, JC	All others	Nos. 1, 2, 6, 8, 11, 18, 20	Nos. 13, 19, 21, 25, 27, 28, 32, 33, 34
	JE, JC	All others	Nos. 12, 19	Nos. 32, 33, 34
	CO, CY	Nos. 1, 2, 9, 21	Nos. 6, 20, 27, 28	All others
	JE, CO	Nos. 12, 25	No. 5	All others
	JE, CY	Nos. 1, 2, 5, 6, 9, 13, 14, 25, 27, 28	Nos. 11, 15, 21	All others
"Yes, always" + "Yes, sometimes"	CO, JC	All	–	–
	CY, JC	All others	No. 26	No.25
	JE, JC	All	–	–
	CO, CY	Nos. 2, 25	Nos. 6, 10, 16, 20, 21, 34, 35	All others
	JE, CO	No. 28	Nos. 4, 19, 26	All others
	JE, CY	Nos. 2, 11, 13, 16, 25, 26, 28	Nos. 1, 6, 10, 15, 21, 34	All others

Table 6
Neurological findings and group comparisons.

Examination	Prevalence of abnormality				p-Value					
	Group CO	Group CY	Group JE	Group JC	CO, JC	CY, JC	JE, JC	CO, CY	JE, CO	JE, CY
Hearing impairment	49%	17%	32%	6%	<0.01	n.s.	<0.01	<0.05	n.s.	n.s.
Visual constriction	14%	0%	28%	0%	<0.01	n.s.	<0.01	n.s.	n.s.	<0.01
Dysarthria	17%	3%	18%	1%	<0.01	n.s.	<0.01	n.s.	n.s.	n.s.
Postural tremor	20%	19%	28%	3%	<0.01	<0.01	<0.01	n.s.	n.s.	n.s.
Normal gait–unstable	28%	6%	30%	5%	<0.01	n.s.	<0.01	<0.05	n.s.	<0.05
Tandem gait–unstable	87%	34%	68%	7%	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01
Finger–nose test (eyes open)	21%	0%	47%	0%	<0.01	n.s.	<0.01	<0.05	<0.01	<0.01
Adiadokokinesis	23%	3%	43%	1%	<0.01	n.s.	<0.01	<0.05	n.s.	<0.01
Balancing on one foot (eyes open)	53%	22%	63%	8%	<0.01	<0.05	<0.01	<0.05	n.s.	<0.01
Heel–knee test	24%	0%	50%	1%	<0.01	n.s.	<0.01	<0.05	<0.05	<0.01
Touch disturbance (four limbs)	50%	44%	83%	1%	<0.01	<0.01	<0.01	n.s.	<0.01	<0.01
Pain disturbance (four limbs)	59%	50%	97%	1%	<0.01	<0.01	<0.01	n.s.	<0.01	<0.01

4. Discussion

Our results show that subjective complaints were most prevalent in Group JE, followed by Groups CO, CY and JC. Similar and high prevalence of more specific complaints from methylmercury poisoning between Groups JE and CO suggest that these similarities are mainly related to methylmercury poisoning. The increase of non-specific complaints, which was found in Group JE, was also observed in Group CO.

The high prevalence of somatosensory disturbance and following ataxic movement in Groups JE and CO suggests that those two groups are similarly affected by methylmercury and Group CY is affected to a smaller extent by methylmercury. Harada et al. (1976) conducted health surveys on 89 indigenous inhabitants of Grassy Narrows and Whitedog and found sensory disturbance (47.6%), abnormality in visual field (18.0%), impaired hearing (44.9%), ataxia (9.0%), and dysarthria (5.6%). These findings together with the Hunter–Russell syndrome suggest methylmercury pollution in these communities.

Except for the high prevalence of tandem gait abnormality and hearing loss, the pattern of prevalence is almost the same as our study from the Minamata area in the 1970s (Fujino, 1994). Harada and his colleague visited Grassy Narrows in 2002 (Harada et al., 2005a) and Grassy Narrows and Whitedog in 2004 (Harada et al., 2005b). In 2002, glove and stocking type of sensory disturbance (54.4%), tunnel vision (10.5%), ataxia (12.3%) and impaired speech (12.3%) were observed in 57 subjects (Harada et al., 2005a). Combining the results of both studies, 2002 and 2004, glove and stocking type sensory disturbance was found in 65.1% of the cases, tunnel vision in 10.8%, ataxia in 25.1% and impaired speech in 6.9% of the 175 subjects (Harada et al., 2005b). As the criteria used for determining ataxia was not described in those papers, it is possible that the actual percentage could be greater than the papers suggested. We show the raw data for ataxic movement in this study.

Our present study differs from the former studies of 1975, 2002 and 2004, in that quantitative measurements of somatosensory disturbance were added to the study. The results of two-point discrimination sensitivity of the lower lip, vibration sense and position sense in big toes were also worse in Group JE, followed by Groups CO, CY and JC. Somatosensory acuity was most impaired in Group JE. Whereas minimal tactile sensitivity of the lower lip and left big toe were worst in Group CO, followed by Groups JE, CY and JC. The reason for these differences is, as yet, unascertained. As to two-point discrimination, the "Yes/No" method was used in testing Groups CO and CY, and the "2-alternative, forced-choice method" was used in testing of Groups JE and JC. But, in our experience, there were no great differences between results of these two methods.

Quantitative measurements showed that somatosensory disturbance, showing a similar pattern, was present in all tested body areas. These patterns are assumed to be the characteristics of somatosensory disturbance due to a uniformly injured central nervous system, especially the sensory cortex.

The similarity in the symptoms of abnormalities, neurological findings and quantitative measurements in Groups JE and CO were assumed to be produced by methylmercury poisoning. The intermediate abnormalities in Group CY suggest a milder and continuing effect of methylmercury poisoning in the younger generations of this area.

There are some limitations in this study. The first one is that the subjects in the study consisted of applicants who volunteered for the examination. The subjects in Groups JE, CO and CY ate a lot of fish, but the subjects in Group JC ate less fish. Also the lifestyle and occupations of the Japanese and the Canadian subjects are likely to be quite different. Also, the lifestyle and occupations were not the same in the two Japanese groups JE and JC.

Secondly we had no control area in Canada. Instead, we compared the Canadian results with the results from a control area in Japan, as well as from an exposed area in Japan.

Thirdly, there can be other factors involved which can affect the findings. In Groups CO and CY, some neurological diseases were found which confused the analysis of the test results. In order to overcome this limitation, we tried to compare a wide range of symptoms and complaints, neurological findings and quantitative measurements.

In the earlier study in Japan, we found that some complaints, symptoms, neurological findings, and quantitative measurements recorded could be affected by the presence of certain other neurological diseases. However, the similar patterns of symptoms, neurological findings, and quantitative sensory measurements cannot be explained without taking

Table 7
Correlation of prevalence of complaints and neurological examinations – group comparisons.

		CO, JC	CY, JC	JE, JC	CO, CY	JE, CO	JE, CY
"Yes, always"	Correlation coefficient	0.315	0.301	0.549	0.630	0.712	0.450
	p-Value	n.s.	n.s.	<0.01	<0.01	<0.01	<0.01
"Yes, always" + "Yes, sometimes"	Correlation coefficient	0.578	0.521	0.693	0.813	0.787	0.712
	p-Value	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Neurological examination	Correlation coefficient	0.628	0.242	0.048	0.784	0.708	0.825
	p-Value	<0.05	n.s.	n.s.	<0.01	<0.01	<0.01

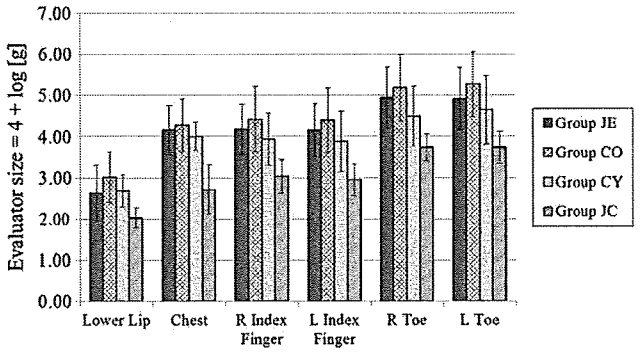

Fig. 1. Threshold for minimal tactile sense — group comparisons. JC, JE: $p < 0.01$ (all locations), JC, CO: $p < 0.01$ (all locations), JC, CY: $p < 0.01$ (all locations), JE, CO: $p < 0.01$ (lower lip), $p < 0.05$ (L toe), n.s. (other locations), JE, CY: $p < 0.01$ (R toe), $p < 0.05$ (chest and R index finger), n.s. (other locations), and CO, CY: $p < 0.05$ (chest), $p < 0.01$ (other locations).

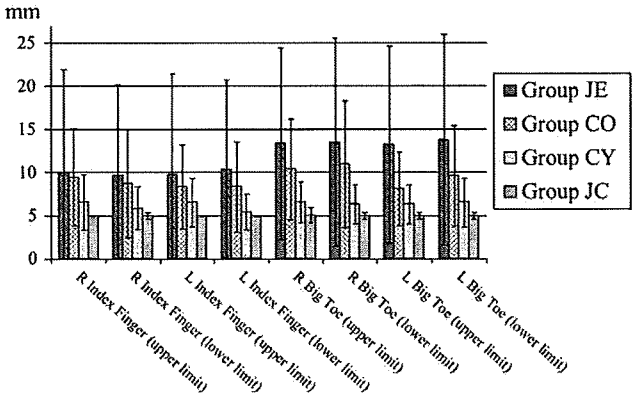

Fig. 3. Threshold for position sense — group comparisons. JC, JE: $p < 0.01$ (all locations), JC, CO: $p < 0.01$ (all locations), JC, CY: $p < 0.05$ (R index finger—lower), n.s. (L index finger—lower), $p < 0.01$ (all other locations), JE, CO: $p < 0.01$ (L big toe—upper & lower), $p < 0.05$ (R big toe—upper), n.s. (all other locations), JE, CY: $p < 0.05$ (L index finger—upper), $p < 0.01$ (all other locations), and CO, CY: $p < 0.05$ (R index finger—lower, L index finger—upper, L big toe—upper), $p < 0.01$ (all other locations).

into account the possibility of the presence of methylmercury poisoning (Takaoka et al., 2008).

After Harada's paper in 1976, the health effects of methylmercury on indigenous Canadians (First Nations) were reported by Canadian researchers. Barbeau et al. (1976) reported that he discovered symptoms like Minamata disease patients in Quebec, but he soon modified and toned down his conclusions. Shephard (1979) admitted the higher exposure in Canadian Indians and insisted that there was no agreement on the clinical diagnosis of mercury poisoning. But no conclusive human health-related data of Canadian Indians were presented by them. Wheatley et al. (1979) reported that they failed to prove abnormalities attributable to methylmercury. But his study in 1979 was based on clinical and pathological test results taken from only one male Cree Indian.

In north-western Quebec, McKeown-Eyssen and Ruedy (1983) studied individuals from the Cree First Nation and reported incoordination (15.4% in males/6.5% in females in Mistassini, 44.2% in males/26.5% in females in Great Whale), abnormal perception of sensations (5.7% in males/4.3% in females in Mistassini, 9.3% in males/2.1% in females in Great Whale). The results for subjects who had visual field scores of over 55° were 16.0% in males and 19.4% in females in Mistassini, and 0.7% in males and 15.5% in females in Great Whale. Although the patterns of abnormalities are very different from our results, the presence of these abnormalities could suggest milder methylmercury poisoning. The Canadian researchers did not, however, come to this conclusion. It would appear that they did not follow up and observe the individuals for a longer period of time, which is unfortunate. In our new Minamata disease cases, observed from November 2004 to April 2005, about half of them were considered to have had their first abnormalities after 1968, the year when the Chisso Company ceased to release methylmercury contaminated industrial wastewater (Takaoka et al., 2009).

Spitzer et al. (1988) found no abnormalities in north-western Quebec when they compared people from the Cree First Nation with a control group. In this study, the exposed group (SDD: The Self Designated Disease Group) and other three control groups were compared. Visual constriction was observed in 4.9% of SDD and in 0.0–1.7% of other groups. Peripheral sensory disturbance (written as "peripheral neuropathy" in the paper) was observed in 9.9% of SDD and in 1.5–3.1% of other groups. There was a higher tendency in the prevalence in SDD, but there was no statistical difference between SDD and other groups.

In examining the Cree people, McKeown-Eyssen et al. (1990) emphasized inter-observer variation. It is more important, however, to do the same examination in the control area and to set criteria for judging the results of the examination, rather than to repeat an examination in the same group. Even though there were some variations and differences between the results obtained by the screener and the results of the neurological examination by the neurologist, e.g. prevalence of tremor (screener 40.2%, neurologist 29.9%) and incoordination (screener 22.8%, neurologist 15.4%) in men in Mistassini, they were still high. They also had differences in criteria when identifying neurological abnormalities, but it should be possible to set standard criteria for the assessment of the neurological findings similar to our methods.

Changeability of neurological functions is quite common in cases of Minamata disease. In Minamata disease the range of four limb

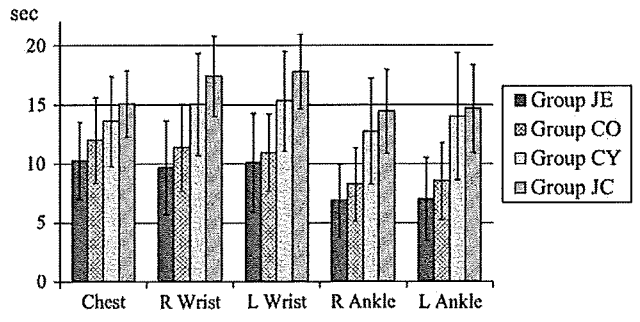

Fig. 2. Threshold for vibration sense — group comparisons. JC, JE: $p < 0.01$ (all locations), JC, CO: $p < 0.01$ (all locations), JC, CY: $p < 0.01$ (bilateral wrist), $p < 0.05$ (chest and R. ankle), n.s. (L. ankle), JE, CO: $p < 0.01$ (chest), n.s. (L wrist), $p < 0.05$ (other locations), JE, CY: $p < 0.01$ (all locations), and CO, CY: n.s. (chest), $p < 0.01$ (all other locations).

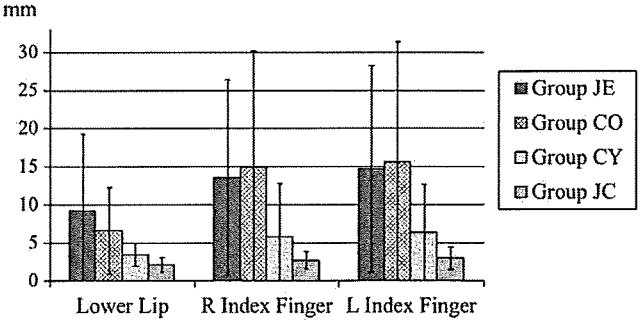

Fig. 4. Threshold for two-point discrimination — group comparisons. JC, JE: $p < 0.01$ (all locations), JC, CO: $p < 0.01$ (all locations), JC, CY: $p < 0.05$ (R index finger), $p < 0.01$ (other locations), JE, CO: $p < 0.05$ (lower lip), n.s. (other locations), JE, CY: $p < 0.01$ (all locations), and CO, CY: $p < 0.01$ (all locations).

somatosensory disturbance is changeable. Uchino and Araki (1984) reported on 100 cases of Minamata disease. In 77 of the 100 cases the examination for superficial sensory disturbance was carried out from 2 to 5 times, and 63 of the 77 cases (82%) were recorded as "unstable type" in which the area of the body showing somatosensory disturbance changed. The most important factor in showing the effect of environmental pollution on the inhabitants of an area is the ability to gather data and information from both the people exposed to the pollution and from a control group which has not been exposed.

There are some other Canadian studies about the exposure to methylmercury (Wheatley and Paradis, 1996; Wheatley et al., 1997; Wheatley and Paradis, 1998), but there are few that take into account epidemiological human health data. Wheatley (1996) stressed that the people of the First Nations understanding of mercury contamination is influenced by their holistic concepts of health and environment. But there was too little physical data available to corroborate this concept. Without the presence of human physical data, we cannot evaluate psychological, social and spiritual values of health.

5. Conclusions

The data collected from methylmercury-exposed indigenous residents of Grassy Narrows suggest that they were poisoned by methylmercury. The health abnormalities also appear to exist in a milder form in the younger generations from Grassy Narrows.

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Conflict of interest

There is no conflict of interest in this study.

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海沿岸住民の有機水銀の影響に関する研究―不知火海沿岸住民健康調査報告、水俣学研究、2，61－86、2010．3
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下地 明友

＜学歴＞
1973 年　熊本大学医学部の卒業年度
1973 年　熊本大学神経科・精神科入局
1975 年　熊本県立・富合病院（現・こころの医療センター）
1977 年　熊本大学・助手・中毒研究施設・神経中毒学部門
1981 年　熊本大学精神科助手
1987 年　沖縄県立宮古病院精神科医長
1989 年　熊本大学神経精神科講師
1997 年　熊本大学神経精神科（臨床行動学）助教授
2004 年　熊本大学大学院医学薬学研究部脳機能病態学分野助教授
　　（神経精神科・科長）
2005 年　熊本学園大学大学院社会福祉学研究科福祉環境学専攻教授

＜カナダ検診に関する経歴＞
2014 年 8 月　Grassy Narrows, Whitedog の住民健診

＜主な所属学会＞
日本精神神経学会
日本多文化間精神医学会
日本精神病理学会
日本病跡学会

＜資格・専門医等＞
精神保健指定医

＜主な論文＞

1.下地明友：「水俣病」研究の方法論再考―医学的思考の新たなパラダイム転換―、水俣学研究、2, 23-30, 2010
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4. 宮川太平、村山英一、鹿井功、下地明友、永利憲一：水俣病の疑いがもたれた患者の腓腹神経生検所見、水俣病に関する総合的研究、日本公衆衛生協会、68-72,1978
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Watanabe: The Study of Muscle Spindle in Experimental Organic Mercury Poisoning, Kumamoto Medical Journal, 38(1):27-36, 1985

This is Exhibit.....referred to in the
affidavit of.....
sworn before me, this.....
day of.....20.....

.....
A COMMISSIONER FOR TAKING AFFIDAVITS

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO),
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

ACKNOWLEDGEMENT OF EXPERT'S DUTY

1. My name is Shigeru Takaoka. I live in the City of Minamata in the Prefecture of Kumamoto.

2. I have been engaged by or on behalf of Grassy Narrows First Nation to provide evidence in relation to the above-noted court proceeding.

3. I acknowledge that it is my duty to provide evidence in relation to this proceeding as follows:

   (a) to provide opinion evidence that is fair, objective and non-partisan;

   (b) to provide opinion evidence that is related only to matters that are within my area of expertise; and

   (c) to provide such additional assistance as the court may reasonably require, to determine a matter in issue.

4. I acknowledge that the duty referred to above prevails over any obligation which I may owe to any party by whom or on whose behalf I am engaged.

Date: _____

_____
Shigeru Takaoka

DR. TAKAOKA'S ACKNOWLEDGEMENT OF EXPERT'S DUTY IN JAPANESE AND COMMISSIONED

これは証拠品 B であり、高岡滋(Takaoka Shigeru)の宣誓供述書の中で参照されているものです。
2016 May 28、
目前認証されました。

JOHN DONALD DAVIS 認証者

裁判所ファイル番号 446/15

オンタリオ州高等裁判所
(ディビジョナル裁判所)

当事者名

グラッシー・ナローズ・ファースト・ネーション、
シェリー・フォビスター
ウィリアム・フォビスター、長老サイモン・フォビスター
族長ロジャー・フォビスター、シニアの代表
そしてグラッシー・ナローズ・ファースト・ネーション全員の代表

原告

及び

オンタリオ州天然資源省森林局、オンタリオ州環境省、
そしてオンタリオ州法務長官省

被告

専門家全責務の承認

1. 私は高岡滋と申します。熊本県水俣市在住です。

2. 私はグラッシー・ナローズ・ファースト・ネーションのために雇われ上記に記載された訴訟に係る証拠を提供しました。

3. 下記の通り、私の全責任を持って、この訴訟に係る証拠を提供することを承認しています。

   (a) 公平で客観的で政治的偏向のない意見証拠を提出する事

   (b) 私の専門分野のみに関連することに係る意見証拠を提出する事

   (c) 争点事項を決定するにあたり、裁判所の妥当な要求に対する追加的な力添えをする事

4. 上記に関わる責務は私を雇った人物・団体に対する責務より優先することであることを私は承認しています。

日付: 2016.5.28

高岡 滋

高岡滋

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

AFFIDAVIT OF TADASHI FUJINO

I, TADASHI FUJINO, of the City of Kumamoto, in the Prefecture of Kumamoto, Japan MAKE OATH AND SAY AS FOLLOWS:

1. I am a medical doctor specializing in psychiatry and neurology at Kumamoto Hospital, in the City of Kumamoto, in the Prefecture of Kumamoto. I have considerable clinical experience examining patients exposed to mercury in Minamata, Japan. At various times, over several decades, I also undertook, with a team of researchers lead by the late Dr.

Masazumi Harada, many clinical examinations of men, women, and children suspected of being exposed to mercury in Grassy Narrows, Ontario, Canada. I have written extensively about my clinical investigations in both countries in a number of medical and scientific peer-reviewed journals. A copy of my curriculum vitae is attached to Exhibit "A" of the affidavit of Shigeru Takaoka for this proceeding.

2. In December 2015 I, along with my colleagues Drs. Shigeru Takaoka and Akitomo Shimoji were asked by counsel for Grassy Narrows First Nation to answer certain questions on medical-psychological/psychiatric issues pertaining to mercury exposure at Grassy Narrows. The questions and our answers to them appear as part of our May 2016 expert report attached as Exhibit "A" to the affidavit of Shigeru Takaoka.

3. A copy of my Acknowledgement of Expert's Duty form is attached as Exhibit "A" to my Affidavit.

SWORN BEFORE ME in the City of Fukuoka, in the Prefecture of Fukuoka, Japan, this ___ day of _____, 2016.

A Commissioner, etc.

_____
Tadashi Fujino

DR. FUJINO'S AFFIDAVIT IN JAPANESE AND COMMISSIONED

裁判所ファイル番号 446/15

オンタリオ州高等裁判所
(ディビジョナル裁判所)

当事者名：

グラッシー・ナローズ・ファースト・ネーション、
シェリー・フォビスター
ウィリアム・フォビスター、長老サイモン・フォビスター、
そして族長ロジャー・フォビスター、シニアの代表
グラッシー・ナローズ・ファースト・ネーション全員の代表

原告

及び

オンタリオ州天然資源省森林局、オンタリオ州環境省、
そしてオンタリオ州法務長官省

被告

藤野糺の宣誓供述書

私、日本国熊本県熊本市在住の藤野糺は下記のことを宣誓供述致します。

1. 私は熊本県熊本市にある熊本病院で精神科と神経内科を専門としている医師です。私は日本の水俣において水銀汚染された患者の住民健診の経験が豊富であります。数十年に渡り、何度も原田正純医師率いる調査チームと共にカナダ・オンタリオ州グラッシー・ナローズで水銀汚染されたと疑われる男性女性児童の住民検診を多く手がけました。両国において臨床研究について広範囲にわたり論文を執筆し、それらは論文審査のある多くの医学科学専門誌で発表されました。私の履歴書はこの訴訟のために、高岡滋氏の宣誓供述書の証拠品Aに添付されています。
2. 2015年12月、私と同僚の高岡滋医師、下地明友医師はグラッシー・ナローズ・ファースト・ネーションの弁護士からグラッシー・ナローズにおける水銀汚染に係る医学的、心理学的、そして精神的影響に関するいくつかの質問に回答するように依頼されました。質問と回答は高岡滋氏の供述宣誓書に証拠品Aとして添付されている2016年5月専門家報告書の一部として記載されています。
3. 私の専門家全責任承認フォーム1部が証拠品Aとして私の供述宣誓書に添付されています。

2016年5月27日 福岡 JDD.)
日本国~~熊本~~県~~水俣~~市にて)
面前認証)
)
)
)
署長、等 JOHN DONALD DAVIS)

藤野糺

藤野糺

This is Exhibit.....referred to in the
affidavit of.....
sworn before me, this.....
day of.....20.....

.....
A COMMISSIONER FOR TAKING AFFIDAVITS

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO),
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

ACKNOWLEDGEMENT OF EXPERT'S DUTY

1. My name is Tadashi Fujino. I live in the City of Kumamoto in the Prefecture of Kumamoto.

2. I have been engaged by or on behalf of Grassy Narrows First Nation to provide evidence in relation to the above-noted court proceeding.

3. I acknowledge that it is my duty to provide evidence in relation to this proceeding as follows:

   (a) to provide opinion evidence that is fair, objective and non-partisan;

   (b) to provide opinion evidence that is related only to matters that are within my area of expertise; and

   (c) to provide such additional assistance as the court may reasonably require, to determine a matter in issue.

4. I acknowledge that the duty referred to above prevails over any obligation which I may owe to any party by whom or on whose behalf I am engaged.

Date: _____ _____

Tadashi Fujino

DR. FUJINO'S ACKNOWLEDGEMENT OF EXPERT'S DUTY IN JAPANESE AND COMMISSIONED

これは証拠品.....A.....であり、藤野紀(Fujino, Toshi)の宣誓供述書の中で参照されているものです。
20.16 May 27、
目前認証されました。

JOHN DONALD DAVIS 認証者

裁判所ファイル番号 446/

オンタリオ州高等裁判所
(ディビジョナル裁判所)

当事者名

グラッシー・ナローズ・ファースト・ネーション、
シェリー・フォビスター
ウィリアム・フォビスター、長老サイモン・フォビスター
族長ロジャー・フォビスター、シニアの代表
そしてグラッシー・ナローズ・ファースト・ネーション全員の代表

原告

及び

オンタリオ:然資源省森林局、オンタリオ州環境省、
してオンタリオ州法務長官省

被告

専門家全責務の承認

1. 私は藤野糺と申します。熊本県熊本市在住です。

2. 私はグラッシー・ナローズ・ファースト・ネーションのために雇われ上記に記載された訴訟に係る証拠を提供しました。

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   (b) 私の専門分野のみに関連することに係る意見証拠を提出する事

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4. 上記に関わる責務は私を雇った人物・団体に対する責務より優先することであることを私は承認しています。

日付: 2016年5月27日　　藤野 糺

藤野糺

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
(Divisional Court)

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO)
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

AFFIDAVIT OF AKITOMO SHIMOJI

I, AKITOMO SHIMOJI, of the City of Kumamoto, in the Prefecture of Kumamoto, Japan MAKE OATH AND SAY AS FOLLOWS:

1. I am a medical doctor, neuro-psychiatrist, and professor at Kumamoto Gakuen University, in the City of Kumamoto, in the Prefecture of Kumamoto. Along with a team of researchers lead by the late Dr. Masazumi Harada, I participated in clinical evaluations of patients exposed or suspected of having been exposed to mercury in Grassy Narrows,

Ontario, Canada. Based on my clinical experience in Japan, I also have authored or co-authored several articles that have been published in peer-reviewed medical and scientific journals on the subject of exposure to mercury. A copy of my curriculum vitae is attached to Exhibit "A" of the affidavit of Shigeru Takaoka for this proceeding.

2. In December 2015 I, along with my colleagues Drs. Shigeru Takaoka and Tadashi Fujino were asked by counsel for Grassy Narrows First Nation to answer certain questions on medical-psychological/psychiatric issues pertaining to mercury exposure at Grassy Narrows. The questions and our answers to them appear as part of our May 2016 expert report attached as Exhibit "A" to the affidavit of Shigeru Takaoka.

3. A copy of my Acknowledgement of Expert's Duty form is attached as Exhibit "A" to my Affidavit.

SWORN BEFORE ME in the City of Kumamoto, in the Prefecture of Kumamoto, Japan, this ___ day of _____, 2016.

A Commissioner, etc.

_____
Akitomo Shimoji

DR. SHIMOJI'S AFFIDAVIT IN JAPANESE AND COMMISSIONED

裁判所ファイル番号 446/15

オンタリオ州高等裁判所
(ディビジョナル裁判所)

当事者名：

グラッシー・ナローズ・ファースト・ネーション、
シェリー・フォビスター
ウィリアム・フォビスター、長老サイモン・フォビスター、
そして族長ロジャー・フォビスター、シニアの代表
グラッシー・ナローズ・ファースト・ネーション全員の代表

原告

及び

オンタリオ州天然資源省森林局、オンタリオ州環境省、
そしてオンタリオ州法務長官省

被告

下地明友の宣誓供述書

私、日本国熊本県熊本市在住の下地明友は下記のことを宣誓供述致します。

(AS)
JOH
2016-5-2

1. 私は神経精神科医であり、熊本県熊本市にある熊本大学(学園)の教授でもあります。故原田正純医師率いる調査チームと共にカナダ・オンタリオ州グラッシー・ナローズにおいて水銀汚染された又は水銀汚染が疑われた患者の臨床評価に参加しました。日本における臨床経験に基づき、私は水銀汚染に関する論文を執筆・共同執筆し、それらは論文審査のある医学科学専門誌で発表されました。私の履歴書はこの訴訟のために、高岡滋氏の宣誓供述書の証拠品 A に添付されています。

2. 2015 年 12 月に私と同僚の高岡滋医師、藤野糺医師はグラッシー・ナローズ・ファースト・ネーションの弁護士からグラッシー・ナローズにおける水銀汚染に係る医学的、心理学的、そして精神的影響に関するいくつかの質問に回答するように依頼されました。質問と回答は高岡滋氏の供述宣誓書に証拠品 A として添付されている 2016 年 5 月専門家報告書の一部として記載されています。

3. 私の専門家全責任承認フォーム 1 部が証拠品 A として私の供述宣誓書に添付されています。

2016年5月28日)
日本国熊本県水俣市にて)
面前認証)
)
)
)
署長、等 JOHN DONALD DAVIS)

下地明友

下地明友

This is Exhibit.....referred to in the
affidavit of.....
sworn before me, this.....
day of.....20.....

.....
A COMMISSIONER FOR TAKING AFFIDAVITS

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO),
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

ACKNOWLEDGEMENT OF EXPERT'S DUTY

1. My name is Akitomo Shimoji. I live in the City of Kumamoto in the Prefecture of Kumamoto.

2. I have been engaged by or on behalf of Grassy Narrows First Nation to provide evidence in relation to the above-noted court proceeding.

3. I acknowledge that it is my duty to provide evidence in relation to this proceeding as follows:

   (a) to provide opinion evidence that is fair, objective and non-partisan;

   (b) to provide opinion evidence that is related only to matters that are within my area of expertise; and

   (c) to provide such additional assistance as the court may reasonably require, to determine a matter in issue.

4. I acknowledge that the duty referred to above prevails over any obligation which I may owe to any party by whom or on whose behalf I am engaged.

Date: _____

_____
Akitomo Shimoji

DR. SHIMOJI'S ACKNOWLEDGEMENT OF EXPERT'S DUTY IN JAPANESE AND COMMISSIONED

これは証拠品 A であり、下地明友(Shimoji, Akitomo)の宣誓供述書の中で参照されているものです。
2016 May 28、
目前認証されました。
JOHN DONALD DAVIS 認証者

裁判所ファイル番号 446/15

オンタリオ州高等裁判所
(ディビジョナル裁判所)

当事者名

グラッシー・ナローズ・ファースト・ネーション、
シェリー・フォビスター
ウィリアム・フォビスター、長老サイモン・フォビスター
族長ロジャー・フォビスター、シニアの代表
そしてグラッシー・ナローズ・ファースト・ネーション全員の代表

原告

及び

オンタリオ州天然資源省森林局、オンタリオ州環境省、
そしてオンタリオ州法務長官省

被告

専門家全責務の承認

1. 私は下地明友と申します。熊本県熊本市在住です。

2. 私はグラッシー・ナローズ・ファースト・ネーションのために雇われ上記に記載された訴訟に係る証拠を提供しました。

3. 下記の通り、私の全責任を持って、この訴訟に係る証拠を提供することを承認しています。

   (a) 公平で客観的で政治的偏向のない意見証拠を提出する事

   (b) 私の専門分野のみに関連することに係る意見証拠を提出する事

   (a) 争点事項を決定するにあたり、裁判所の妥当な要求に対する追加的な力添えをする事

4. 上記に関わる責務は私を雇った人物・団体に対する責務より優先することであることを私は承認しています。

日付: 2016.5.28

下地明友

下地明友

This is Exhibit.....referred to in the
affidavit of.....
sworn before me, this.....
day of.....20.....

.....
A COMMISSIONER FOR TAKING AFFIDAVITS

Court File No. 446/15

ONTARIO
SUPERIOR COURT OF JUSTICE
DIVISIONAL COURT

B E T W E E N:

GRASSY NARROWS FIRST NATION
and
SHERRY FOBISTER,
WILLIAM FOBISTER, SENIOR, SIMON FOBISTER
and
CHIEF ROGER FOBISTER, SENIOR
on their own behalf and on behalf of all other members of
GRASSY NARROWS FIRST NATION

Applicants

-and-

MINISTER OF NATURAL RESOURCES AND FORESTRY (ONTARIO),
and MINISTER OF THE ENVIRONMENT AND CLIMATE CHANGE (ONTARIO),
and THE ATTORNEY GENERAL OF ONTARIO

Respondents

ACKNOWLEDGEMENT OF EXPERT'S DUTY

1. My name is Minako Miyata. I live in the City of Markham in the Province of Ontario.

2. I have been engaged by, or on behalf of, Grassy Narrows First Nation to provide evidence in relation to the above-noted court proceeding.

3. I acknowledge that it is my duty to provide evidence in relation to this proceeding as follows:

   (a) to provide opinion evidence that is fair, objective and non-partisan;

   (b) to provide opinion evidence that is related only to matters that are within my area of expertise; and

   (c) to provide such additional assistance as the court may reasonably require, to determine a matter in issue.

4. I acknowledge that the duty referred to above prevails over any obligation which I may owe to any party by whom or on whose behalf I am engaged.

Date: _____

_____
Minako Miyata

Court File No. 446/15

GRASSY NARROWS FIRST NATION, *et al.* v. **MINISTER OF NATURAL RESOURCES AND FORESTRY, *et al.***

Applicants | Respondents

ONTARIO
SUPERIOR COURT OF JUSTICE

(Divisional Court)

PROCEEDING COMMENCED AT TORONTO

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TORONTO, ONTARIO M5J 2H7

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Lawyers for the Applicants

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DECEMBER 10, 2021

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TAB 10

Justin Podur, York University

Logging and Forest Fire Risk in Boreal Forests: A Letter

Justin Podur
November 5, 2021

[I am an Associate Professor at the Faculty of Environmental and Urban Change at York University in Toronto. In recent years I have taught courses with titles like: Geographic Information Systems, Environmental Analytics, and Sustainable Environmental Management. My M.Sc. F (2001) and PhD (2006) were in Forestry at the University of Toronto. From 1999, when I started my graduate studies, until 2011, I published in the scientific literature on forest fires (for the past decade I have focused on publishing academic work in other areas). This letter is informed by my own first-hand research in this area as well as my reading of the more recent scientific literature in the field.]

This letter answers three questions.

1. Are fires more likely to start in mature or logged boreal forests?

2. Do logged areas provide effective fire breaks to prevent the spread of boreal forest fires?

3. Does the suspension of logging create increased forest fire risk in boreal forests?

All three of these questions pertain to the idea of a natural or historical fire regime for the boreal forest and the effect of logging in that regime.

1. Are fires more likely to start in mature or logged boreal forests?

No.

The Canadian Forest Fire Behavior Prediction System (FBP System - https://cwfis.cfs.nrcan.gc.ca/background/summary/fbp) "provides quantitative estimates of potential head fire spread rate, fuel consumption, and fire intensity, as well as fire descriptions. With the aid of an elliptical fire growth model, the FBP system gives estimates of fire area, perimeter, perimeter growth rate, and fire behavior at the head, flanks, and back of a fire." These estimates are used by modelers and fire managers in the field in their decision-making about fire management. The FBP Fuel Types are described here – https://cwfis.cfs.nrcan.gc.ca/background/fueltypes/c1. Recently harvested areas would be classified as S1 – Jack or Lodgepole Pine Slash, S2 – White Spruce – Balsam Slash; mature areas would be classified as, for example, C2 – Boreal Spruce, C3 – Mature Jack or Lodgepole Pine.

The conditions for a fire to start or spread in different fuel types can be understood by observations of fire behavior in different boreal fuel types. J. J. Podur & Martell, 2009 studied the fraction of area burned in different FBP System fuel types in 594 large fires in the boreal forest between 1996-2006 and found that "the composition of fuels burned is essentially the same as the composition of fuels available for burning."

In other words, if the weather conditions are conducive to fire spread, fires will start in mature or logged boreal forests without preference.

2. Do logged areas provide effective fire breaks to prevent the spread of boreal forest fires?

No.

In fire management in Ontario, fires are usually fought using water – firelines are constructed around a perimeter using water pumped from a nearby body of water. In rare cases and other jurisdictions, firebreaks can be made using back fires or bulldozer lines.

These firebreaks are different from harvested areas, which become the slash fuel type. As discussed in question number 1, in areas with the slash fuel type, and in young forest areas, fires start and spread at the same rate as in mature forests. Logged and young boreal forests provide no fire protection compared to mature boreal forests.

3. Does the suspension of logging create increased forest fire risk in boreal forests?

No.

It is possible to mitigate fire risk using a series of measures grouped under the label “fire-smart forest management” (Hirsch et al., 2001). Such measures are based on a recognition that fire plays an important ecological role in boreal forests and include allowing fire on the landscape where other values (especially public safety) are not at risk (Shinneman et al., 2012).

But harvesting is not a way to mitigate fire risk.

Additional Discussion

Several studies discuss the relative importance of fuels and weather in fire behavior (e.g. (Bessie & Johnson, 1995), (Hély et al., 2001), (Parisien et al., 2011), (Lydersen et al., 2017)). While several of these, including fire-smart management, emphasize the ecological value of increasing fire on the landscape (e.g. (Parks et al., 2015), (Hirsch et al., 2001)), other authors worry that climate change will overwhelm fire management capacity ((Dieleman et al., 2020), (Whitman et al., 2019), (J. Podur & Wotton, 2010).

While fire weather is known to be the overwhelming factor, it has been pointed out that a complete change of species composition from conifer to deciduous could reduce fire risk, or at least mitigate the increase in fire risk due to climate change. Krawchuk & Cumming, 2011 conducted a simulation study and did find that “forest harvesting resulted in decreased regional fire activity when compared to unharvested conditions”. They note however that in their simulation, “forest composition and age structure was shifted substantially, illustrating a trade-off between management goals to minimize fire and conservation goals.” Terrier et al., 2013 also conducted a simulation study and found that the wholesale conversion of boreal conifer forest to deciduous forest could reduce fire risk, though it would do so at the price of completely changing the ecosystem. In most of Eastern Canada’s boreal forest,

logging has so dramatically altered the ecosystem that restoration efforts would be required to attain the pre-industrial age structure, species mix, and altitudinal gradients ((Boucher et al., 2009). This would seem to make the preservation of existing old-growth forests a priority, at least from an ecological conservation perspective.

Sincerely,

Justin Podur, Associate Professor, York University

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Tab 11

Whiskey Jack Forest Independent Forest Audit 2004-2009

Final Report

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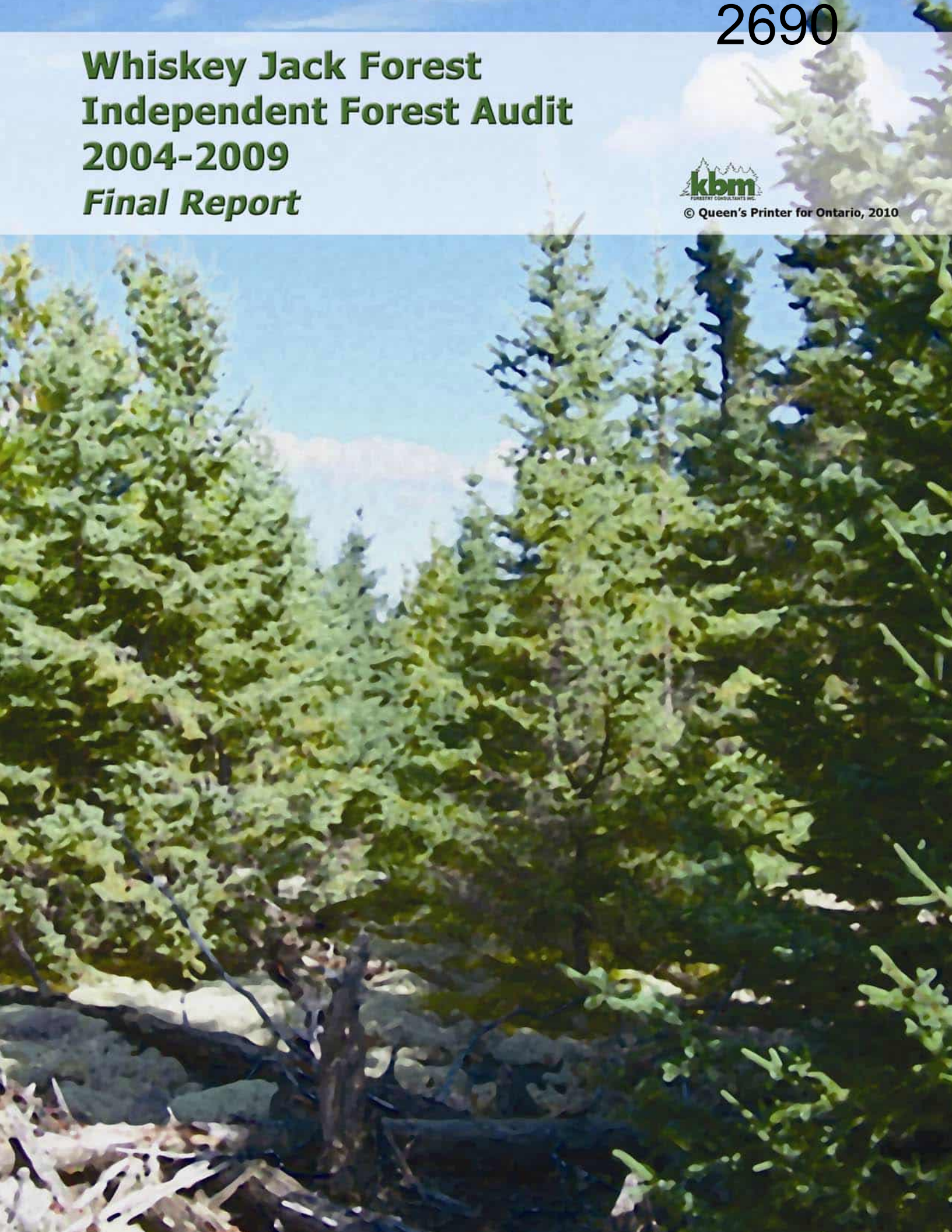

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1.0 EXECUTIVE SUMMARY

This report, for the Whiskey Jack Forest (the Forest), documents the results of an Independent Forest Audit conducted by KBM Forestry Consultants Inc. All Crown forests in Ontario are required to be audited at least every five years; the requirement for independent audits arising from MNR's Class Environmental Assessment Approval for Forest Management on Crown Lands in Ontario (2003). Regulation 160/04 of the Crown Forest Sustainability Act (S.O. 1994, c. 25) (CFSA) sets out the specific requirements for conducting the audits.

KBM Forestry Consultants Inc. conducted an independent forest audit on the Whiskey Jack Forest for the five-year period April 1, 2004 to March 31, 2009. The audit assessed implementation of the 2004-2024 Forest Management Plan (FMP) and the planning process and approval of the 2009-2012 Contingency Plan. Selected portions of the planning process for the 2004-2024 FMP, the first year of which was a contingency plan, were also audited. The on-site component of the audit occurred from September 14 to 21, 2009. Document review and interviews occurred throughout the audit process. The principal auditees were both Abitibi-Consolidated Company of Canada (ACCC), a subsidiary of Abitibi-Bowater, and the Kenora District and Red Lake District of the Ontario Ministry of Natural Resources (MNR).

During the audit term, the Sustainable Forest Licence (SFL) for the Whiskey Jack Forest was held by ACCC. Circumstances related to closure of the company's newsprint mill in Kenora, Ontario and a protracted dispute between the Crown and Grassy Narrows First Nation over forest management practices on the Whiskey Jack Forest, led the company to make a request to surrender the SFL to the Crown. The Crown accepted the company's completion of its pre-surrender obligations in a letter dated September 29, 2009, at which time the company was given six months to complete all post-surrender conditions. As holder of the SFL during the audit term, ACCC was responsible for virtually all aspects of forest management planning, harvesting, reforestation, and monitoring.

Based on the audit, 21 recommendations were made. Recommendations arise from audit team observations of material non-conformances, or may be developed to address situations in which the audit team identifies a significant lack of effectiveness in forest management activities. All audit recommendations are either directed at MNR or the Forest Manager or both. The Forest Manager represents the equivalent of the SFL holder in terms of contractual obligations. Because the SFL was surrendered by ACCC, MNR is presently the defacto forest manager on the Whiskey Jack Forest. As such, MNR is responsible to address all the audit recommendations directed at the Forest Manager until a new Forest Manager is identified.

The audit team found significant issues with management of the Whiskey Jack Forest, both in planning and in on-the-ground implementation of the plan. The future forest modeled during planning, and the one associated with the selected management alternative, is inconsistent with the natural forest as described in the forest management plan. The differences are magnified by the silviculture program being implemented in that the program is inconsistent with the forest projected by the selected management alternative and is leading the forest even further away from the natural forest condition.

The regeneration methods being practised do not support the plan goal of maintaining current levels of spruce forest and will result in a further departure from what is believed to be the historic forest condition of a spruce dominated forest described in the 2009-2012 Contingency Plan. The resulting forest stands will have a greater hardwood component and lower conifer stocking than projected. This has implications for the achievement of wildlife habitat management objectives for species that rely on the development of conifer dominated cover types.

The increase in hardwood at the expense of conifer is the direct result of the absence of a tending program, beyond a small scale spacing program. This in turn is tied to the protracted dispute with Grassy Narrows First Nation over forest management practices on the Whiskey Jack Forest, including

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herbicide spraying, and decision not to spray herbicide during the dispute. A lack of tending was identified as a serious issue in the previous Independent Forest Audit. Significant effort and expense will be required to retreat or otherwise manage sites artificially regenerated during the audit term to align them with outcomes projected in the 2004-2024 Forest Management Plan. The audit team also found that Free-to-Grow survey records did not accurately reflect stand attributes; both for the regular survey program and the survey of backlog areas, and therefore needs review.

The audit team found that a pesticide program intended to control an outbreak of jack pine budworm lacked an adequate analysis of alternatives from a cost/benefit standpoint. The audit team recommended that MNR be better prepared to conduct such analyses for future outbreaks.

Improvements were noted in water crossings installations (non-winter) and drainage practices on roads.

The audit team concluded that, with the following critical exception noted below, management of the Whiskey Jack Forest was generally in compliance with the legislation, regulations and policies that were in effect during the term covered by the audit, and MNR met its legal obligations. Forest sustainability, as assessed through the Independent Forest Audit Process and Protocol, will not be achieved unless corrective measures are immediately taken to address the following issues:

Silviculture practices, including a lack of tending of artificially regenerated areas, are leading to reduced stocking of conifer and an increased component of hardwood on the Forest. This trend does not support the management intention of maintaining a conifer dominated forest, as set out in the 2004-2024 Whiskey Jack Forest FMP.

Recommendation 3 of this audit must be satisfied to bring the Whiskey Jack Forest into general compliance.

ACCC has surrendered the SFL for the Whiskey Jack Forest to the Crown; therefore the audit team makes no recommendation on licence extension.

Rod Seabrook, CEA(SFM) EMS(LA)
Lead Auditor, on behalf of the audit team

2.0 TABLE OF RECOMMENDATIONS

Recommendation on Licence Extension
Management of the Whiskey Jack Forest was generally in compliance with the legislation, regulations and policies that were in effect during the term covered by the audit, and MNR met its legal obligations. No recommendation is made as Abitibi Consolidated Company of Canada has surrendered SFL Licence No. 542253 for the Whiskey Jack Forest to the Crown.

Recommendations Directed to Forest Manager / MNR District
Recommendation 1: MNR Kenora District and MNR Red Lake District must ensure that the LCC Terms of Reference for the Kenora and Red Lake LCCs meet the content requirements of the FMPM regarding a protocol for the functioning of multiple LCCs.
Recommendation 2: The Forest Manager must ensure that available survey information (regeneration surveys, Free-to-Grow, silviculture effectiveness monitoring, etc.) is used in the development of the silviculture program in the next FMP.
Recommendation 3: The Forest Manager must ensure that: a) the Silviculture Ground Rules, silviculture exceptions, planned renewal program and actual silvicultural intentions of the next forest management plan support the long term management direction and related silvicultural strategies, b) the connection between strategic and operational silviculture is clearly discussed in the text of the next plan, and c) the operational renewal program aligns with the planned renewal program and supports the long term management direction.
Recommendation 5: The Forest Manager must ensure that, if required, the Natural Benchmark (or equivalent) developed for the next FMP better reflects actual conditions and that, if required, targets/desired levels (or equivalent) for appropriate objectives in the next FMP include consideration for the Natural Benchmark trend line.
Recommendation 6: The Forest Manager must ensure that moose shelter patches are retained as specified in the FMP.
Recommendation 7: The Forest Manager must ensure that operators refine their work methods on fine textured soils to avoid operating during wet or non-frozen periods.
Recommendation 8: The Forest Manager must ensure that the inventory is reviewed and verified for accuracy with respect to Free to Grow records updated during the audit term.
Recommendation 9: The Forest Manager must ensure that site preparation results in the production of planting spots of the quality and quantity appropriate to meet plan objectives.
Recommendation 10: The Forest Manager must ensure that planting of red and white pine occurs on appropriate sites.
Recommendation 11: MNR Kenora District must ensure that all blocks harvested during the audit term are reviewed for slash management and, where established regeneration will not be affected a) slash be piled and burned or otherwise removed to allow regeneration of productive land, or b) if natural regeneration of these areas is not expected, then treat the area to ensure regeneration.
Recommendation 12: MNR Kenora District must ensure that: a) a review is conducted of all areas planted and seeded during the audit term and that fill planting or re-seeding occurs as necessary to support the achievement of FMP objectives, b) a review of all sites harvested during the audit term that are forecast to become conifer-leading forest units is conducted, and that tending occurs where necessary so that plan objectives can be met.
Recommendation 13: The Forest Manager must ensure that seed collection and storage meet the needs of the renewal program.
Recommendation 14: MNR Kenora District must review the Forest Renewal Trust Fund rates particularly for spruce/pine/fir and assign rates appropriate for meeting plan objectives.
Recommendation 15: The Forest Manager must develop a road rehabilitation strategy for the next FMP to ensure that unwarranted roads are rehabilitated and returned to the productive forest landbase.
Recommendation 16: The Forest Manager must develop a monitoring program to ensure that all water crossings installed during the winter are inspected immediately following the first spring thaw after their installation, and incorporate the monitoring strategy into the FMP.
Recommendation 17: The Forest Manager must ensure that the interests of public safety are paramount for establishing pit rehabilitation requirements for all pits at all times.

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Recommendation 18: MNR Kenora District must ensure that a review of the original field data of the barren and scattered survey occurs and that the inventory is appropriately updated with this information.
Recommendation 19: The Forest Manager must ensure that: a) all information in the Annual Report is confirmed for accuracy prior to finalization, b) future Annual Reports contain all required discussions including progress towards achievement of plan objectives, potential implications of operations on future operations and effectiveness of road use management strategies.
Recommendation 20: MNR Kenora District must ensure that the 2008-09 Year 10 AR is revised to include the following: a) analysis/discussion of changes that may affect future levels, effectiveness and expenditures of renewal and tending operations, b) analysis/discussion of effectiveness of silvicultural treatment packages that are exceptions to the forest management guides, c) review/discussion of needed modifications or refinements to modeling assumptions, d) a summary of progress on implementation of the 1999-2004 IFA Action Plan, e) an update of the inventory and running of SFMM at plan end (2009) to determine objective achievement, f) an update of the 2004-2024 FMP social and economic description, and g) based on the determination of sustainability and the social and economic review, develop recommendations for the next FMP.
Recommendation 21: The MNR Kenora District Manager and the Forest Manager must ensure that the audit action plan and status report comply with all IFAPP submission requirements.

Recommendations Directed to Corporate or Regional MNR
Recommendation 4: MNR Region must develop the capacity to conduct risk based cost benefit analyses of proposed pest management programs in advance of future outbreaks.

3.0 INTRODUCTION

3.1 Audit Process

Independent Forest Audits (IFAs) are a requirement of the Crown Forest Sustainability Act (S.O. 1994, c. 25) (CFSA) and the Forest Management Class Environmental Assessment on Crown Lands in Ontario. Every forest management unit in Ontario must be audited by an independent party at least once every five years. The Independent Forest Audit Process and Protocol (IFAPP) was developed by MNR to provide a comprehensive and consistent method of evaluating forest management activities on Crown land. It serves as a framework that provides a structured approach to evaluating whether or not forest management activities meet the requirements governing forestry practices on Crown land in Ontario.

Within the report the audit team has made recommendations to address instances of non-conformance to a law and/or policy, or an identified lack of effectiveness in forest management activities. Recommendations are listed in the table in the previous section and presented within the main body of the report together with a brief description of the issue leading to the recommendation. A full discussion of the issue, including the link to the IFAPP principle, criteria and audit procedure, associated background information, summary of evidence and conclusion leading to the recommendation is contained in Appendix 1.

All audit recommendations are either directed at MNR or the Forest Manager or both. The Forest Manager represents the equivalent of the SFL holder in terms of contractual obligations. Because the SFL was surrendered by ACCC, MNR is presently the defacto forest manager on the Whiskey Jack Forest. As such, MNR is responsible to address all the audit recommendations directed at the Forest Manager until a new Forest Manager is identified. More detailed information on the audit process and sampling is provided in Appendix 4 of this report.

KBM Forestry Consultants Inc. conducted the IFA on the Whiskey Jack Forest for the five-year period April 1, 2004 to March 31, 2009. Audit team members and their qualifications are presented in Appendix

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6. The audit assessed implementation and selected portions of planning of the 2004-2024 Forest Management Plan (FMP), the first year of which was a contingency plan, and the planning process and approval of the 2009-2012 Contingency Plan. The 2004-2005 Contingency Plan was prepared due to a delay in preparation of the 2004-2024 FMP. The Contingency Plan operating areas were derived from non-contentious areas identified from the FMP. As such, preparation of the Contingency Plans was directly tied to preparation of the FMP.

According to the Contingency Plan proposal for the 2009-2012 Contingency Plan, the Plan was required to synchronize the planning schedules for the Whiskey Jack Forest and the adjoining Kenora Forest to enable the amalgamation of the two forests.

3.2 Management Unit Description

The Whiskey Jack Forest is located in Northwestern Ontario within MNR's Northwest Region. The Forest is administered by MNR Kenora District, with Red Lake District having compliance monitoring and enforcement responsibilities for portions of the Forest north of the English River. During the audit term, the majority of wood harvested from the Forest was processed by facilities in Kenora and Fort Frances with the balance sent to facilities in Ear Falls, Chapple, Dryden, Hudson, Thunder Bay, Longlac and Nipigon. Other communities within and surrounding the Whiskey Jack Forest include Sioux Narrows, Keewatin, and the First Nations of Grassy Narrows, Whitefish Bay, Wabauskang, and Wabaseemoong.

Figure 1 depicts the Forest in relation to Northwestern Ontario and surrounding Forest Management Units and communities.

The Whiskey Jack Forest is approximately 964,000 ha in size. It occurs fully within the Boreal Forest Region of Ontario and forest cover is predominantly jack pine, black spruce, poplar and birch. Red pine and white pine also occur in southern portions of the unit in proximity to Lake of the Woods. Figure 2 illustrates the proportion of production forest by working group, exclusive of barren and scattered areas, and the age class distribution on the Forest at the start of the 2004-2024 FMP.

Soils are mostly sandy to coarse loamy in texture. Fine textured silt and clay soils are associated with approximately 15% of the Forest's area. These types of soils are highly productive but are also susceptible to compaction if care is not taken during forestry operations. Another important feature is the large number and extent of lakes and rivers on the Forest. Production forest accounts for approximately 84% of the total forested land and about 68% of the total forest area.

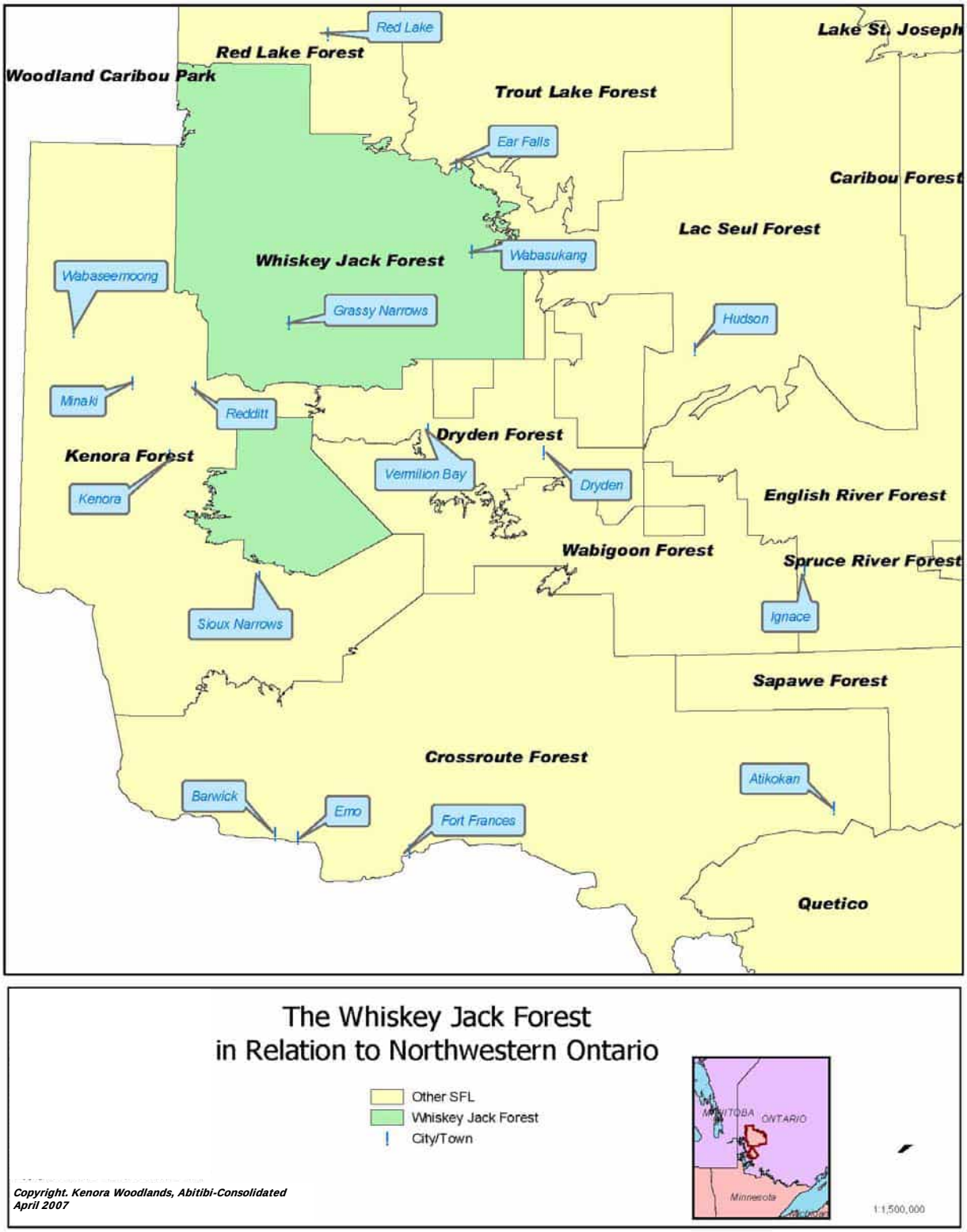

Figure 1. Location of the Whiskey Jack Forest in Northwestern Ontario. (Source: Ontario Ministry of Natural Resources)

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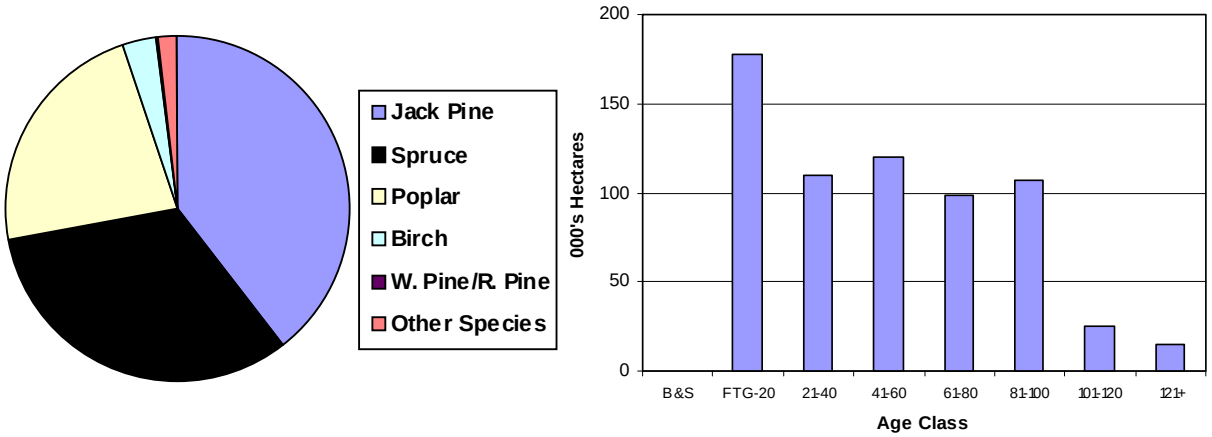

Figure 2. ***(Left)*** **Proportion of forest cover by working group. (Source: Table 1, 2004-2024 Whiskey Jack Forest FMP).** ***(Right)*** **Age class distribution. (Source: Table 5, Comparison and Trend Analysis Report).**

3.3 Current Issues

Key current issues are summarized below:

1. Industrial wood consumption has declined dramatically. The permanent closure of the ACCC paper mill in Kenora, idling of the Kenora Forest Products sawmill, the decision by Boise Cascade to not take products originating from wood from the Whiskey Jack Forest, together with the severe economic downturn in the forest products industry have combined to significantly reduce actual harvest levels compared to planned levels.

2. There is an ongoing dispute between Grassy Narrows First Nation (GNFN) and MNR over concerns the First Nation has with management of the Whiskey Jack Forest, in particular on areas the First Nation community has declared as traditional territory. During the dispute there has been a virtual halt to logging within the traditional territory and suspension of herbicide spraying under the regeneration program across the Forest.

   A Process Agreement was entered into by GNFN and the Province in 2008 committing the two parties to creating a positive, long-term relationship by reaching agreements that address GNFN's concerns; however, during a meeting between the lead auditor and GNFN representatives of the Forest Management Working Group (FMWG), established under the Process Agreement, the representatives stated that the agreement was not progressing as well as expected. The representatives felt that there is a set agenda and that MNR wants things to fit within established practices, and that nothing new has been forthcoming from the exercise. The representatives also stated that real change needs to occur and emphasized that past audits of the Whiskey Jack Forest did not provide substantial change for the process of forest management. Documentation submitted by GNFN in response to the proposed 2009-2012 Contingency Plan illustrates the depths of the divide between the community and MNR over management of the Whiskey Jack Forest, and the extent to which the community demands direct involvement in decision-making on its traditional territory on the Forest. For example, GNFN believes that setting buffer widths based on slope is simply following the rules and does not make sense ecologically. It is also felt that 30 m wide buffers do nothing for wildlife habitat.

   Forest management planning on the Whiskey Jack Forest is now complicated by the Process Agreement between the two parties that operates according to a separate timetable and has a

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separate set of expectations, objectives and activities that GNFN requires are resolved before they give consent to further forestry activities within their traditional territory.

3. There was a notable lack of adequate vegetation control that was observed in previous IFAs and has carried into the current audit term. It has led to an increase in the presence of aspen and other forms of vegetation that are competing with conifer regeneration and to a forest composition inconsistent with the long term management direction set for the Forest. This situation is a result of Issue 2, described above, and is accentuated by ACCC's move to the use of lower cost renewal treatments.

4. The wood supply commitment for Weyerhaeuser Trus Joist cannot be met because the reduction in softwood harvest has resulted in a reduction in the harvest of incidental hardwood.

5. Piling and burning of roadside logging slash was not done on many of the blocks logged in 2007 and later. This will result in areas of productive land being unavailable for regeneration if left in their current state.

6. Mechanical site preparation did not provide good block coverage, conifer planting densities were lower than desired and areas seeded to jack pine were generally not successful. As a consequence, many sites will require fill planting to meet FMP objectives.

3.4 Summary of Consultation and Input to Audit

Opportunities were provided throughout the audit process for consultation with and input from auditees and other interested parties. The audit team spoke with staff from MNR, AbitibiBowater, Local Citizen Committee (LCC) members, a wood supply commitment holder, and members of two First Nation communities. In addition, comments were received in response to a questionnaire made available to the public. A summary of the methods and input is provided in Appendix 4.

4.0 AUDIT FINDINGS

4.1 Commitment

The commitment principle is deemed to be met for both the company and MNR, according to the IFAPP, since the Whiskey Jack Forest was certified under the CAN/CSA Z809-02 certification standard for most of the audit term. The company had a written environmental and sustainable forest management policy that was communicated within the organization and available externally. The company's compliance record was considered acceptable. However, recent decisions with respect to the renewal program are leading to changes in forest cover that are not fully consistent with the direction set in the FMP. The FMP, in turn, is not completely aligned with the plan's intention of producing a spruce dominated forest condition similar to that which existed historically. Adjustments in management practices and/or management direction will need to be made to address this issue.

4.2 Public Consultation and Aboriginal Involvement

Notifications to the public met FMP requirements for the 2004-2024 FMP with minor exceptions. MNR maintained a summary of public input in table form; however the record of responses to issues or questions requiring follow-up was incomplete. This was improved for the 2009-2012 Contingency Plan. Overall, records of notices and public input were well organized and maintained. Public consultation for the 2009-2012 Contingency Plan followed the process described in the associated plan proposal and represented an abbreviated version of consultation under a regular forest management plan, with mailouts, published notices to the public, and opportunities for public input on the Draft Contingency Plan at public information sessions being provided.

There were five concerns raised during preparation of the 2004-2024 FMP that had the potential to enter into the issue resolution process. Four of the five were either not pursued or were resolved without

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pursuing issue resolution. The fifth, initiated by three GNFN trappers, resulted in a request to the Ministry of the Environment (MOE) for an Individual Environmental Assessment (IEA). Extensive documentation exists regarding this issue. The IEA was eventually denied by MOE; however one of the trappers has since launched a law suit, currently before the courts, challenging MNR's authority to manage portions of the Whiskey Jack Forest. There were no requests for issue resolution during preparation of the Contingency Plan.

Requirements for establishment and operation of an LCC were met for both the Kenora LCC and the Red Lake LCC. Regular meetings were held (Red Lake does not meet during the summer) and attendance was generally acceptable. Some interest groups remain unrepresented (e.g. Aboriginal communities); however, efforts are on-going to recruit representatives. Both are longstanding committees with a number of members with extensive experience serving on the committee. Both LCCs had representatives who regularly attended planning team meetings for the 2004-2024 FMP and 2009-2012 Contingency Plan. Terms of Reference were updated as of 2006 for both LCCs; however a protocol was not prepared to address the functioning of multiple LCCs on the Whiskey Jack Forest, as required by the Forest Management Planning Manual (FMPM).

Recommendation 1: MNR Kenora District and MNR Red Lake District must ensure that the LCC Terms of Reference for the Kenora and Red Lake LCCs meet the content requirements of the FMPM regarding a protocol for the functioning of multiple LCCs.

MNR maintains an extensive list of Aboriginal communities and organizations with a potential interest on the Whiskey Jack Forest. Four First Nation communities (Grassy Narrows, Whitefish Bay, Wabauskang, and Wabaseemoong) are either within or adjacent to the Whiskey Jack Forest and as such received separate invitations to participate on the 2009-2012 Contingency Plan Planning Team, with three communities accepting the invitation. The Kenora Métis Council also provided a representative to the planning team.

GNFN has continued to decline to participate in the formal forest management planning process although meetings were held between MNR and GNFN at which components of the Contingency Plan were discussed. A separate process is underway with MNR in an attempt to resolve GNFN community's concerns about forest management and other issues on the Whiskey Jack Forest. Both GNFN and Whitefish Bay First Nation stated in separate letters to MNR their concerns with the 2009-2012 Contingency Plan and dissatisfaction with the forest management planning process. This position was restated during a meeting between Grassy Narrows First Nation representatives on the Forest Management Working Group and the lead auditor. The Working Group was formed as part of the Process Agreement between GNFN and MNR.

There are fundamental differences in the viewpoints between GNFN and MNR regarding forest management principles and practices. It is the audit team's opinion that these differences cannot be resolved without the Province setting aside many of the requirements to manage the Whiskey Jack Forest under the CFSA and the FMPM, and relinquishing significant authority to the First Nation to manage portions of the Whiskey Jack Forest according to the desires of the GNFN community. The audit team further believes that the forest management planning process did not anticipate, nor was it designed to resolve the type of dispute currently being experienced on the Whiskey Jack Forest.

Background information reports were produced for each community; however there has been little to no direct participation by First Nation communities in preparation of the reports. This is related to some extent to differing expectations over the level of funding and effort required to develop the information necessary for forest management planning purposes and differences in viewpoints as to the extent of values protection required.

Wabeseemoong First Nation's principal interests are associated with the Kenora Forest but the community has recently become more involved in forest management planning on the Whiskey Jack

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Forest. The community is interested in participating in a new cooperative SFL that may involve the eventual merger of the Kenora Forest and Whiskey Jack Forest; two meetings with MNR having been held to date. The community is working on a Traditional Ecological Knowledge project and has been interviewing community members and identifying values such as grave sites and trap lines. Wabaseemoong has its own geographic information system (GIS) that it is using to map these values and also values contained in MNR's database. The community has been involved in tree planting and a few community members also operate logging equipment. The community has received a 9,000 m^3 commitment for pole sized material from the Whiskey Jack Forest and the same amount from the Kenora Forest, and has partnered with a local company to build modular homes designed for northern conditions. Community members have expressed concern over herbicide spraying especially by Hydro on the power line right of way, and there are mixed feelings in the community about logging.

4.3 Forest Management Planning

During development of the 2009-2019 FMP, factors such as the collapse of world financial markets, the closure of the Kenora saw mill and the development of a Memorandum of Understanding between MNR and Grassy Narrows First Nation had significant impact on forest management planning. Through interviews and document review it was determined that there were considerable delays developing the 2009-2019 FMP. In particular there were delays achieving the planning inventory checkpoint and there was division in the planning team regarding the Long Term Management Direction (LTMD) that stalled plan development. These factors were considered in the decision by the MNR District Manager in June 2008 to halt development of the 2009-2019 FMP prior to Regional review/approval of the LTMD. Soon after, it was decided by MNR that a three year Contingency Plan was needed to allow amalgamation of the Whiskey Jack and Kenora Forests (scheduled for 2012) and to deal with the many factors impacting upon forest management planning.

Both the Contingency Plan proposal and the Contingency Plan met the requirements of the FMPM. The Contingency Plan Proposal cites only amalgamation as rationale for the need of a Contingency Plan and despite almost two full years of planning for the 2009-2019 FMP, section 3.4 of the 2009-2012 Contingency Plan notes that "there have been no new planning initiatives on the Forest". Considering the substantial planning that had occurred, the audit team suggests there should have been some mention in the Contingency Plan Proposal and the 2009-2012 Contingency Plan regarding the development of the 2009-2019 FMP, particularly the main issues encountered, and reasons for the plan delays and other factors that led to the decision for a three year Contingency Plan. This information is important to future planners and would provide clarity to the public.

Weyerhaeuser representatives may have a legitimate concern that the delay to develop a new FMP (i.e. abandoning the 2009-2019 FMP for the 2009-2012 Contingency Plan) will further compromise the ability to realize their wood commitments from the Forest. MNR is planning to amend the Contingency Plan if the current allocation is inadequate to meet wood supply commitments.

Area of Concern (AOC) planning for the 2009-2012 Contingency Plan was performed in accordance with the FMPM requirements. Supplemental Documentation 6.6.14 provided detailed discussion for a range of values and included separating similar values because of specific environmental or geographic circumstances to which the values was tied. For example, osprey nests were separated into three AOCs for the development of prescriptions that were distinctly related to environmental and geographic conditions: NE2 – Primary Osprey Nest established prior to operations; NE3 - Primary Osprey Nest in areas previously harvested; and NE4 - Alternate Osprey Nest.

Resource Stewardship Agreements (RSAs) were included in AOC prescriptions developed for tourism operations. Seventeen AOC prescriptions for tourism were included in Sup Doc 6.6.14, the majority of which followed RSA direction negotiated in the 2004-2024 FMP. The 2009-2012 CP explained that RSAs negotiated with ACCC would become obsolete although prescriptions developed therein have been carried forward.

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There were 45 Silvicultural Ground Rules (SGRs) developed for the 2004-2024 FMP, which followed the requirements of the 1996 FMPM. The same SGRs were used in the 2009-2012 Contingency Plan as stipulated by the approved Contingency Plan Proposal. While the SGRs are a relatively good representation of what is on the Forest, significant issues were found regarding specific components of some SGRs related to over-estimation of expected future conifer and under-estimation of hardwood. Better use of field survey information would assist in addressing this issue.

Recommendation 2: The Forest Manager must ensure that available survey information (regeneration surveys, Free-to-Grow, silviculture effectiveness monitoring, etc.) is used in the development of the silviculture program in the next FMP.

Other, less significant issues found with the SGRs are also summarized in the audit report to aid in the development of the next SGRs.

During the previous IFA the audit team recommended that future forest management plans include thorough silvicultural strategies that support silviculture intentions and are linked to the selected management alternative. However, the 1999-2004 IFA recommendations were not available for the development of the 2004-2024 FMP and the Contingency Plan subsequently developed for the 2009-2012 term is required to use the strategic direction from the 2004-2024 FMP, therefore actions on this recommendation have not yet occurred. Similar, if not greater, discrepancies with regards to the modeled and planned silviculture program were found in the 2004-2024 FMP and the 2009-2012 Contingency Plan. The audit team recommended improvements be made to address these various issues during planning of the next FMP.

Recommendation 3: The Forest Manager must ensure that:

a) the Silviculture Ground Rules, silviculture exceptions, planned renewal program and actual silvicultural intentions of the next forest management plan support the long term management direction and related silvicultural strategies,

b) the connection between strategic and operational silviculture is clearly discussed in the text of the next plan, and

c) the operational renewal program aligns with the planned renewal program and supports the long term management direction.

The audit team inspected approximately 3,000 ha of forest treated over two years by aerial application of a biological pesticide (Btk) to control an outbreak of jack pine budworm. The treated area viewed by the audit team encompassed a marten core that is deferred from harvest to maintain marten habitat and large areas of "interior" old forest. The value of trying to "preserve" the jack pine in marten core areas is questionable. MNR representatives suggest that the main reason this strategy was pursued was to reduce the risk of catastrophic fire and this may indeed have a favourable benefit-cost ratio but the supporting analysis is limited. The evaluation of options lacked rigour and was supported by a minimal level of quantitative analysis. There were also issues in assembling the data at the regional scale to complete a detailed analysis of options. Future outbreaks will surely occur and MNR should prepare for this event by, at the very least, preparing input files for regional level analyses.

Recommendation 4: MNR Region must develop the capacity to conduct risk based cost benefit analyses of proposed pest management programs in advance of future outbreaks.

The 2004-2024 FMP described the selection criteria for harvest, renewal and tending which were consistent with the eligibility criteria. These criteria were thorough, clearly written and ranked in order of importance. Selection criteria in the 2009-2012 Contingency Plan were somewhat consistent with those used in the 2004-2024 FMP but focus was given to operational interests over de-fragmentation and other objectives. Also, some FMPM requirements were not met – documentation regarding how the criteria

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reflect or are consistent with the SMA and discussion of relative importance of criterion were absent. This documentation should be included in the next FMP.

It was noted that the harvest selection criteria from the Contingency Plan Proposal, which included ensuring that planned and contingency areas from the 2004-2024 FMP were to be first priority for selection and that selections would include only non-contentious areas, were not brought into the text of the 2009-2012 CP. This would have provided better context to the selection of operations in the CP. According to MNR, 97% of the 2009-2012 contingency planned allocation (one year regular harvest area and six months of contingency area) was formerly either planned harvest or contingency harvest from the 2004-2024 FMP. The remaining 3% came from non-contentious areas deemed as optional for harvest in the 2004-2024 FMP.

According to the Contingency Plan Proposal, the AHA for the 2009-2012 term was not to exceed three-fifths of the 2004-2024 FMP AHA by forest unit (16,924 ha) and allocations were to reflect the age classes from the 2004-2024 FMP. In the 2009-2012 CP total allocation does not surpass AHA by forest unit and planned harvest generally coincides to the AHA by age class although some substitution for younger wood occurred "in order to form operational blocks". The age class substitution was considered "minor in magnitude and short-term (one year's harvest)" and therefore would "not impact long-term forest sustainability". The auditors agree with this assessment and expect that this will be taken into consideration when the remaining harvest areas are selected.

Approximately one year of allocation was planned in the 2009-2012 CP – 5,367 ha (31.6% of the three year AHA). The remaining two years of allocations were expected to be amended to the plan as needed. It was noted that the one year of planned harvest favoured the younger age classes forecast for harvest. MNR noted that there was no intent to target younger wood.

The Contingency Plan Proposal indicated that up to six months of contingency harvest area was to be identified to be utilized should unforeseen circumstances cause some of the planned harvest area to be unavailable for harvest during the 2009-2012 period. The contingency area was to be selected based on the selection criteria listed in the Contingency Plan Proposal. The 2009-2012 CP correctly noted use of contingency area, confirmed the Contingency Plan Proposal direction and noted that 2,889 ha were selected as contingency area (almost exactly six months worth of allocation). Some required documentation is missing regarding accessibility and road planning for contingency areas. This text should be included in the next FMP.

The 2009-2012 CP notes that "disturbance frequency distribution by size class was a component of the strategic planning carried forward to this contingency plan, therefore maps and associated analyses were not redone for this plan". Also, "the analysis of the effects on landscape pattern will occur as part of the development of the 2012-2022 FMP". Table FMP-16 indicates the total number and size of planned clearcuts for the one year of planned operations as well as the ratio of <= 260 ha to >260 ha clearcuts. The ratio is expected to be about 80/20 for the Boreal Forest but only 46/54 is attained "in order to create large, even-aged patches of forest for future caribou and marten core habitat areas and to move towards the natural disturbance frequency by size class template for the Forest". It is also expected by the planning team that this ratio will improve when the remaining two years of allocations are selected.

Residual stand components were considered in the 2009-2012 CP through planning for leaving uncut insular and peninsular areas in planned clear cut areas, standing individual live and snag trees and downed woody material. This planning met requirements.

According to the 2009-2012 CP there had not been any significant changes to the land base since the 2004-2024 FMP was developed. However, as early as 2006 forest managers knew that 87,000 ha (12.5% of the Whiskey Jack Productive Forest) was infested with jack pine budworm. Insect Pest Management Plans covering several forests in the area were developed and implemented in 2006 and 2007 to battle the jack pine budworm (discussed further in the Contractual Obligations section).

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Approximately 30,000 ha of the Whiskey Jack Forest was sprayed over those two years. Although there were allowances in the Insect Pest Management Plans to re-direct planned harvest in the outbreak area, MNR noted that this was not considered for the Whiskey Jack Forest. The auditors believe that, at the least, the fact that an outbreak had/was occurring on the Forest and that plans had been developed and implemented in 2006 and 2007 should have been discussed in the CP rather than classifying this event as non-significant.

The 2009-2012 CP outlined a thorough program to monitor compliance, exceptions, silviculture and roads. Planned levels of monitoring were appropriate. MNR prepared the Strategic Compliance Plan for the contingency plan and committed to implementing the compliance program due to the company surrendering the SFL. No level of inspections was included in the compliance plan (this is done in the annual compliance schedule) but compliance history, issues and focus was detailed as well as compliance objectives for the term. Compliance and monitoring are discussed further in the Monitoring section of this audit report.

There were two plans within the audit term that were available for review of amendments – the 2004-2005 Contingency Plan and the 2004-2024 FMP. There were no amendments to the 2009-2012 Contingency Plan within the audit term. The 2004-2005 CP had 17 administrative amendments and the 2004-2024 FMP had 16 amendments, all were administrative except for one minor amendment to modify an osprey AOC. Amendments were normally a result of updating the plan based on actual field conditions or for providing operational flexibility in a challenging market place. The amendment classifications were appropriate, the number of amendments was not large, and the issues for amendments were common ones.

The 2004-05 Annual Work Schedule (AWS) was also the 2004-2005 Contingency Plan for the Whiskey Jack Forest until the 2004-2024 FMP was approved and implemented in February 2005. According to the 2004-2005 AWS/Contingency Plan text "the Contingency Plan is in effect until the 2004-2024 FMP is approved and implemented. Upon implementation of the FMP, the Contingency Plan will expire. Following that the 2004-2005 Annual Work Schedule will come into effect until March 31, 2005". It is not clear from this text what effect moving from the 2004-2005 Contingency Plan to the 2004-05 AWS will have on forest operations included in the text/tables. This should be clear for public review.

The audit team found a lack of agreement between text and tables during its review of the AWSs. For example, the 2004-2005 Contingency Plan/AWS text noted 5,971 ha planned for harvest while tables indicated 6,866 ha. This may be due to revisions/amendments made to the document during the year but there are no version numbers or other identifier to indicate possible differences. There were also discrepancies and issues with other AWSs – the 2005-06 'current' version had highlighted changes throughout. The 2006-07 and 2007-08 AWS table and text values were not always in alignment. These variances may have been due to different document versions (i.e. the AWS text was usually in Microsoft Word or Adobe Acrobat format and the tables in Microsoft Excel) or are simply errors. Although there were fewer issues with the 2008-09 AWS it is suggested that a document control protocol be developed and implemented to improve the quality of hard copy and electronic versions of AWSs and other documents. These public documents should be accurate and complete.

AWSs during the term indicated more than one year's worth of allocations to "allow flexibility". The flexibility provided was very large in a few AWSs. For example; the 2005-06 AWS included 64% of the 2004-2009 allocation, which is over triple the average annual allotment. Reasonable rationale was provided for the large yearly allocations. Overall, there was good correlation between the AWSs and the 2004-2024 FMP. All components were completed and included required information.

Forest Operation Prescriptions (FOPs) for harvest, renewal, and maintenance (tending and protection) operations were consistent with the SGRs in the applicable FMPs and were prepared according to requirements in the FMPM and FIM, with one exception – the FOP revision process was not followed. Instead of verifying prescriptions in advance of operations, changes to prescriptions were made and

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submitted annually to MNR. However, according to the 2009 FMPM, changes to silviculture prescriptions now need only to be maintained by the SFL holder, so no recommendation is made in the audit.

4.4 Plan Assessment and Implementation

Plan Assessment

The Forest was generally well described in the 2004-2024 FMP and reflected the geology, soils, and sites as well as depletions, accruals and FEC types viewed during the audit; however little analysis and discussion regarding the historic forest condition and related management implications was presented in the FMP and the available information was not incorporated into the selected management alternative.

While the forest description text in the 2009-2012 Contingency Plan was a marked improvement when compared to the predecessor, the strategic direction from the 2004-2024 FMP was brought forward to the 2009-2012 Contingency Plan, and therefore the Natural Benchmark (NB) was again not a reflection of the natural forest as described in the Contingency Plan. The recommendation for this finding is included in Recommendation 5 below.

A number of objectives in the 2004-2024 FMP and 2009-2012 Contingency Plan had targets based on the 'natural bounds of variation'. The 'bounds' were derived from +/- 20% of the highest and lowest points of the Natural Benchmark. The issue is that the benchmark starts at a current condition that had over-representation of mixed wood and jack pine stands and under-representation of spruce. In addition, the objective targets were not linked to the trend line of the NB. As a result, the target of staying within the natural bounds could be met even while the management strategy moves away from the Natural Benchmark. For example, the NB indicates a slow steady rise of jack pine into the future but the selected management strategy decreases slightly through time.

Recommendation 5: The Forest Manager must ensure that, if required, the Natural Benchmark (or equivalent) developed for the next FMP better reflects actual conditions and that, if required, targets/desired levels (or equivalent) for appropriate objectives in the next FMP include consideration for the Natural Benchmark trend line.

Areas of Concern

The field portion of the audit included field examination of a number of harvest blocks in which AOCs were established to protect known values. Included in the field sample were AOCs protecting lakes and streams as well as nesting sites of eagles, ospreys and herons, and moose aquatic feeding areas. A number of tourism AOCs were also viewed.

Examination of AOCs from the air and on the ground, as well as on supplemental aerial photography showed that AOC boundaries were maintained. AOC prescriptions afforded appropriate protection to the values and followed FMP and AWS direction.

Harvest

A sample of harvesting operations was audited in the field by truck and helicopter in September 2009. The sample included harvest operations for each of the contractors that worked on the Forest during the audit term, across all seasons and included full tree to roadside and some cut-to-length operations. Roadside operations included round wood processing and chipping. Salvage of blown down timber was also viewed.

Block boundaries followed FMP/AWS mapping and good cut block boundary control was viewed during the audit. According to compliance records, there were a few trespasses during the term but they were not large. Continued training and use of GPS devices is reducing this issue on the Forest.

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Harvesting operations audited showed a high level of compliance, particularly in light of the poor market conditions during most of the audit term that resulted in downsizing and layoffs across the sector. There was one notable exception on Puzzle Lake Road where there was some site damage and utilization issues. These problems will likely be overcome through further training and monitoring. Given the fact that this was an isolated case, no recommendations for corrective action are required.

A number of harvest blocks were visited that were to include moose shelter. In several cases, moose shelter patches had been harvested and had not been left as required.

Recommendation 6: The Forest Manager must ensure that moose shelter patches are retained as specified in the FMP.

Site disturbance from rutting was identified as an issue in the previous IFA. This problem has been virtually eliminated on all sites examined during this audit. Fine textured soils are common on portions of the Forest. These soils are vulnerable to compaction and many sites showed evidence consistent with this type of damage (i.e. reduced regeneration of trees along machine routes). These sites cannot be operated upon during wet conditions or a non-frozen condition. In addition, approximately half of the harvest blocks observed by the audit team had operations that extended beyond one season. Many of these blocks were re-opened on several occasions. This practice can exacerbate site damage from compaction and creates compliance monitoring issues.

Recommendation 7: The Forest Manager must ensure that operators refine their work methods on fine textured soils to avoid operating during wet or non-frozen periods.

Silviculture

For the five-year term being audited, the audit team viewed a representative sample of each type of regeneration and site preparation operation conducted annually to assess the effectiveness of the silviculture prescriptions. Aerial photographs, maps, Annual Work Schedules, Annual Reports and Forest Operations Information Program (FOIP) information was used to aid in the audit of the renewal activities.

Operations viewed by the audit team included site preparation, seeding jack pine following site preparation, planting (with and without site preparation) and natural regeneration mainly on hardwood-leading/mixed wood and lowland sites. Slash management and the silviculture exception of full tree harvesting on very shallow soiled sites were also audited. It was evident at several sites that conifer establishment is being hampered by competition. Tending is discussed later in this section.

Renewal operations were consistent with locations in the FMP/AWS in most cases and silviculture mapping was generally well done. This included those areas reviewed in concert with the Specified Procedures Report.

Free-to-Grow (FTG) record updating completed during the audit term was not always accurate. This finding is based on some obvious issues noted during the FTG program review. For example, some areas dominated by jack pine with a small spruce component were recorded in the inventory as spruce stands with a small component of pine; the opposite was also found. Based on the sample audited, the quantity and significance of discrepancies found indicated a systematic data entry issue that needs to be corrected. The monitoring section contains a full account of the silviculture monitoring program including FTG assessments conducted during the audit term.

Recommendation 8: The Forest Manager must ensure that the inventory is reviewed and verified for accuracy with respect to Free to Grow records updated during the audit term.

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Site preparation (trencher) was under-achieved during the audit term - about 7,800 ha of 15,922 ha planned was completed (~50%). The work was often too light and spacing was too wide between passes leading to reduced planting spots on many sites.

Recommendation 9: The Forest Manager must ensure that site preparation results in the production of planting spots of the quality and quantity appropriate to meet plan objectives.

The planting program during the audit term exceeded the planned program - 11,850 ha versus 6,278 ha (190%) but due to the under-achievement of site preparation, a large component (~50%) was direct plant (i.e. planted without site preparation).

A review of planting density from the Annual Reports indicates a pronounced reduction of seedlings per hectare during the audit term (average 2,000 seedlings/ha in 2004-05 decreasing to 1,334 seedlings/ha by 2008-09). Ingress was sparse on many of the sites viewed and was generally limited to jack pine on shallow soiled/rocky upland areas and black spruce on some lowland sites. Consequently, there will be a need for fill planting on many sites to meet plan objectives.

In spite of vegetative competition on many sites (discussed later), most black spruce stock that has thus far survived had excellent growth; however, it was noted that the stock selected for some very shallow or wet sites did not perform well. Alternative stock may be preferable on these sites. It was also observed that few white spruce, red pine or white pine were planted during the term. The plan target to enhance red and white pine on the Forest will not be met unless treatments include these species on appropriate sites.

Recommendation 10: The Forest Manager must ensure that planting of red and white pine occurs on appropriate sites.

It was noted that there was no plan objective/target to maintain on the Forest (other than red and white pine) the presence of less common tree species such as white spruce or black ash. This should be considered for the next FMP.

Many areas that were seeded were not well stocked and will require fill plant/re-seeding to meet plan objectives. Under-stocking of seeded areas is mainly a result of low germination due to light and wide site preparation.

Slash management during the audit term was variable. At the beginning of the audit term effort was made to pile and burn slash; however, the company did not conduct a slash management program from 2007 to 2009. If left untreated, this will effectively remove large areas of productive land from the land base, likely for decades.

Recommendation 11: MNR Kenora District must ensure that all blocks harvested during the audit term are reviewed for slash management and, where established regeneration will not be affected
a) slash be piled and burned or otherwise removed to allow regeneration of productive land, or
b) if natural regeneration of these areas is not expected, then treat the area to ensure regeneration.

Possible compaction of fine-textured soils, as previously discussed, may be the cause of large grassy or open patches observed on many of these sites. Poplar shoot blight is also an issue on a majority of the Forest; regenerating poplar trees are being delayed and damaged by this disease. As a result, the required 70% stocking may be difficult to achieve on some of these sites. Related model inputs may need to be revised in the next FMP to ensure consistency with field conditions.

Tending was an issue on the previous two audits and is considered the most important issue on the Forest in this audit. Little tending was completed during the audit term. Chemical tending was planned in the 2004-05 AWS and 2005-06 AWS however no program was carried out. The reason stated in the

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associated ARs for cancellation of the planned spray program was "concerns about the use of herbicides from stakeholders on the forest". In subsequent AWSs no specific area for spraying was identified, although it remained an option, subject to discussions with First Nations and stakeholders, however, no spraying was conducted in the remaining years of the audit term.

Tending completed consisted solely of pre-commercial thinning of 1,370 ha of 2,900 ha planned (~47%), which was well done. No chemical, mechanical or manual plantation cleaning occurred even though 8,737 ha were planned. The lack of cleaning, particularly on areas planted and seeded, is considered by the audit team to be a crucial finding. Many sites viewed require some form of competition control to meet plan objectives. In the absence of a competition control program, the Desired Future Forest Condition described in the 2004-2024 FMP and the 2009-2012 CP will not be achieved. Site preparing, planting and seeding of areas without effective competition control is also viewed as a loss of value.

ACCC chose to suspend the vegetation control program in the final year of implementation of the 1999-2019 FMP while discussions were taking place with Grassy Narrows First Nation; a community that is generally against the use of herbicides. Because several artificial renewal sites on the Whiskey Jack Forest were in need of tending at the time to meet plan objectives, the audit team for the 1999-2004 IFA recommended that ACCC implement an approved vegetation control program; however, no vegetation control program occurred during the 2004-09 term. Document review suggests that the company considered replacing aerial spray with ground spray for several candidate vegetation management sites but no ground spray was conducted. Documents also showed that the company chose not to spray during implementation of the 2004-2024 FMP in order to avoid the anticipated political backlash from Grassy Narrows First Nation.

Some older FTG areas viewed during the audit were vigorous and composed of almost pure conifer. These areas demonstrate the capacity of the Forest under an effective competition control regime and are the model for the Desired Future Forest Condition as described in the FMPs. According to silviculture monitoring completed during the audit term, about 22,000 ha of older disturbed area requires competition control in order to meet regeneration standards. The combined effort of tending requisite areas renewed during the audit term and these older stands will be considerable.

Recommendation 12: MNR Kenora District must ensure that:
a) a review is conducted of all areas planted and seeded during the audit term and that fill planting or re-seeding occurs as necessary to support the achievement of FMP objectives,
b) a review of all sites harvested during the audit term that are forecast to become conifer-leading forest units is conducted, and that tending occurs where necessary so that plan objectives can be met.

Even though there were numerous sites that required fill planting or other re-treatments to ensure plan objectives could be met, few remedial treatments occurred during the audit term (51 ha of re-planting). The recommendations associated with this section should lead to the re-treatment of a significant number of blocks.

No tree improvement activities were conducted during the audit term. However, managers of the Whiskey Jack Forest were an active participating member of the Superior Woods Tree Improvement Association. Any activities carried out on the Association's orchards are the result of decisions made by the Association.

At the time of the audit two of three jack pine seed lots stored will not meet the annual seed supply requirements noted in the 2009-2012 Contingency Plan. There should be at least a few years worth of seed stored for each species/seed zone combination on the Forest.

Recommendation 13: The Forest Manager must ensure that seed collection and storage meet the needs of the renewal program.

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Underachievement of many planned renewal activities during the term was partially due to the reduced harvest level during the term but was largely due to selecting new less intensive treatments for many stands (for example, many areas planned for 'Intensive' treatments – site preparation, planting and tending – were simply direct planted – a 'Basic' treatment). Based on poor field results (as discussed previously in this audit report), it appears that reducing silviculture costs, rather than adjusting operations according to actual field conditions, was the main reason for changing from preferred to alternate prescriptions in many cases. The cycle of silviculture cost reduction started with selecting less intensive/costly options to implement in the field, building a surplus in the Forest Renewal Trust Fund (FRTF) and then using the surplus as evidence in the request to reduce contribution rates during the term.

During the audit term the company requested contribution rate decreases for spruce, pine and fir. In spite of MNR's own information that indicated problems with the renewal program, MNR approved on two occasions during the audit term the company's request for reductions in the FRT fund contribution rate for spruce, pine and fir. FRTF funding is also discussed in the Contractual Obligations section of this report.

Plan objectives and the desired future forest condition on many sites will not be achieved with the renewal options chosen, particularly in light of the operational issues noted. Adequate renewal funding is needed to ensure that appropriate silviculture is completed and plan objectives can be met. Additional funding will also be needed to fulfill actions for several recommendations in this audit report.

Recommendation 14: MNR Kenora District must review the Forest Renewal Trust Fund rates particularly for spruce/pine/fir and assign rates appropriate for meeting plan objectives.

It is obvious from the findings above that there was considerable erosion of the silviculture program on the Whiskey Jack Forest over the past several years, particularly later in the 2004-2009 term:

- vegetation control was not conducted,
- site preparation program was reduced and not closely monitored for effectiveness,
- the planting program focused on direct planting with little control of density,
- planting density decreased significantly,
- seeding was not always effective,
- adequate seed was not maintained for some seed zones, and
- slash management decreased significantly.

Appropriate actions to address the recommendations provided are needed to ensure plan objectives are met and to work towards a desirable future forest condition. This work should not be delayed and will come at significant effort and cost. Otherwise, a steady erosion of a conifer-dominated forest condition to one with significantly more mixed woods at reduced stocking can be expected with the continuance of this silviculture program.

Access

During the field portion of the audit, several harvest blocks were viewed where road rehabilitation should have occurred. Road rehabilitation can provide a means to effectively return land to the productive land base as well as eliminate unnecessary and disproportionate loss of productive land where excessive road building has occurred. A road rehabilitation strategy would assist in conducting the work efficiently.

Recommendation 15: The Forest Manager must develop a road rehabilitation strategy for the next FMP to ensure that unwarranted roads are rehabilitated and returned to the productive forest landbase.

Numerous water crossings and drainages were examined during the audit with marked improvements compared to that described in the past IFA. Water crossing installations that were performed in winter

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were found to be inadequate or failing. Erosion of winter road surfaces and unstable slopes were found at several water crossings. Monitoring is required to properly address the potential failure of water crossings that are installed during the winter. A monitoring program should be developed and incorporated into the FMP that includes monitoring crossings the spring following installation.

Recommendation 16: The Forest Manager must develop a monitoring program to ensure that all water crossings installed during the winter are inspected immediately following the first spring thaw after their installation, and incorporate the monitoring strategy into the FMP.

Aggregate pits were generally found to be in good condition, the result of the cooperative effort between ACCC and MNR to monitor and rehabilitate pits where necessary. One aggregate pit was found to have been operated since the rehabilitation effort was completed, without proper rehabilitation afterwards as required by the Aggregate Resources Provincial Standards. This condition may present a public safety hazard if left unaddressed.

Recommendation 17: The Forest Manager must ensure that the interests of public safety are paramount for establishing pit rehabilitation requirements for all pits at all times.

4.5 System Support

The Human Resources component of IFAPP Principle 5 is deemed to be met for both the company and MNR, according to the IFAPP, since the Whiskey Jack Forest was certified under the CAN/CSA Z809-02 certification standard for most of the audit term.

Information necessary for planning, implementation and reporting on forest management was generally thorough and well maintained. Much documentation is managed electronically, including maps and the associated attribute information. Paper records at MNR's Kenora District office were well maintained, typically in binder form and information was readily retrievable. Virtually all of the information associated with managing the Whiskey Jack Forest had been transferred from ACCC to MNR at the time of the audit, as part of the SFL surrender process.

4.6 Monitoring

Silviculture

The silviculture monitoring program was assessed through interviewing company and MNR staff, examining actual field data, reviewing all Annual Reports, and through viewing a sample of sites deemed FTG during the audit term. MNR records of silviculture effectiveness monitoring were also reviewed.

The company invested significant resources in completing a very large silviculture monitoring program during the audit term. The regular FTG program (18,000 ha) was completed by company staff mainly by helicopter where appropriate but also through ground plots when more intensive assessment was required. The barren and scattered/backlog update project (93,000 ha) was completed by a contracted firm.

The audit included a ten percent sample, mainly by helicopter, of the regular and backlog update assessment areas. It was found in many of the backlog update areas deemed FTG that the hardwood composition was under-represented and that age and height was under-estimated in the inventory. The extent of the discrepancies between the original survey data and the status of the surveyed areas as observed by the audit tam could only be attributed to inaccurate calls during the original survey. Other than age, similar issues were found with the regular FTG program while stocking was also sometimes over-estimated and broad stratification was also noted.

It is estimated that the barren and scattered survey cost over one-half million dollars to complete (~$6/ha) but timing of the assessment and the methodology required for updating the inventory reduced the accuracy of the product. It is important that future surveys are completed in a manner that allows for accurate hardwood estimation and that the inventory updating process maintains the accuracy of field information.

In the Plan Assessment and Implementation section of the audit report a recommendation is made to review FTG records updated during the audit term and ensure the data is accurate. The following recommendation builds on that by ensuring that the original field data is fully incorporated.

Recommendation 18: MNR Kenora District must ensure that a review of the original field data of the barren and scattered survey occurs and that the inventory is appropriately updated with this information.

The level of silviculture assessment completed by the company during the audit term was appropriate and consistent with past operations and natural disturbances and was sufficient for reporting on the effectiveness of forest operations in meeting plan objectives. However, as discussed, apparent data entry errors were found and there were notable issues with some calls. The audit team believes that, following the update and verification, as recommended by this audit, the inventory of the barren and scattered areas will suffice for strategic-level planning until the next full inventory is completed, the tentative delivery schedule for the next forest inventory being 2015.

Since 2006, MNR has conducted an annual Silviculture Effectiveness Monitoring (SEM) Program. The program has focused on verifying FTG calls and checking effectiveness of silviculture treatments such as planting and site preparation. Through the SEM program it was determined that SGR standards were rarely met on FTG areas mainly due to under-stocking, particularly of desired conifer species, versus the regeneration standards. It was also found that direct planting did not result in adequate stocking and site preparation was too wide to allow full stocking of sites. SEM results confirm audit findings related to under-estimation of hardwood and over-estimation of stocking in FTG areas and concerns with light and wide spacing of site prepared areas and wide spacing/missed areas in direct planted areas.

Recommendations provided in the Plan Assessment and Implementation section were made to improve the site preparation, planting, seeding and tending programs. The audit team expects that actions taken for these recommendations will include a thorough review of silviculture operations that occurred during the audit term and significant effort in re-treating and/or tending of several blocks. Completion of this work will be vital, particularly to the future SFL holder. As a result, extra care should be taken to fully and accurately monitor and record these efforts.

Compliance

MNR developed annual compliance operating plans (ACOPs) during the audit term that described actual compliance targets by forest operation. Planned compliance monitoring rates in the ACOPs varied during the term. The 2006-07 ACOP notes that the harvest target monitoring rate of 25% has never been achieved so the target was dropped to 10% and modest renewal targets were reinstated. Similar rates were maintained for the remaining two years of the audit term. MNR staff noted that the changes to targets during the audit term were a result of achieving a balance between targets suggested by the Forestry Forum and resources to complete the actual tasks. Based on audit results and other MNR initiatives during the audit term such as silviculture effectiveness monitoring, the targets set in the more recent ACOPs are appropriate and adjustments can be made as necessary.

Viewing supplemental aerial photography (SAP) is an efficient way to augment the compliance monitoring program. Road layout, boundary control, residual standing individual and patches of trees and slash/chipper debris management are some of the operations that can be readily observed on SAPs. MNR staff noted that SAPs were requested from the company during the term but that the company was

unwilling to provide them. Source data, including SAPs, is required to be provided by SFL holders to MNR (FIM 2007); this is normally not an issue.

According to the 2008-09 Annual Report MNR certified inspectors completed 109 inspections during the audit term. Although the ACOP targets were not met in some years during the audit, this is an appropriate amount of inspections by MNR, particularly in light of the reduced operations later in the term. Reports reviewed were detailed and many included useful digital images.

The Strategic Compliance Plan for the 2004-2024 FMP was completed by the company and met requirements. Due to the imminent surrender of the SFL by ACCC, MNR authored the Strategic Compliance Plan for the 2009-2012 Contingency Plan. This document was also well written and met requirements and indicated that MNR will assume responsibility for compliance monitoring in the absence of a new forest management group. Each of the Annual Work Schedule submissions during the audit term included an Annual Compliance Schedule. The Annual Compliance Schedules described the planned compliance monitoring program for the year, culminating in a table that summarized all planned operations by expected start season.

During the audit term ACCC maintained its compliance oversight role by developing the required compliance documents, inspecting operations and providing education/training to staff and contractors/overlapping licence holders. According to the Strategic Compliance Plan in the 2004-2024 FMP, overlapping licensees were responsible for construction and maintenance of all roads on their operations and the identification of all AOCs and harvest block boundaries. Therefore Overlapping Licensees were only required to be compliant, not complete inspections, etc. MNR confirmed that this arrangement occurred during the audit term.

MNR had little involvement with the company's internal Environmental Management System, training and education program but believe that a good program was in place, based on the relatively good compliance record of the company; the auditors concur. MNR did assist the company with Forest Operations Inspection Program training during the audit term.

According to the Year 10 Annual Report, the company completed 413 inspections during the audit term. This level was appropriate for the reduced operations that occurred during the term. Company reports reviewed were generally good and, according to MNR and audit review, content improvements were made during the term. MNR noted that compliance report submissions by MNR and ACCC often did not meet the required timelines earlier in the audit term but that both parties had improved in this respect.

Water crossing installations, roads issues, small trespasses and operating near unmapped streams were the common non-compliances found during the audit term. Overall, the company found 14 non-compliances during the term (a 96.6% compliance rate based on 413 inspections) and MNR found 20 (an 81.7% compliance rate based on 109 inspections). It is common for discrepancies in reported compliance rates between forest management firms and MNR but the 15% difference on the Whiskey Jack Forest during the audit term suggests inconsistent compliance interpretation. In addition, differing opinion regarding compliance was highlighted in two annual reports during the term - "The company does not agree with all of the MNR's findings…It was requested these reports be re-opened and their compliance status be changed to in compliance". MNR noted that the compliance status of these issues was reviewed and found to be correct so no changes were made to compliance reports as a result of the company's request.

As discussed, ACCC has now surrendered the SFL to MNR and a new entity will one day manage the Forest. Forging a cooperative relationship should be a priority of MNR and the new managers.

Annual Reports

Annual reporting during the audit term was fairly well done. The ARs were generally well written, numbers in text and tables were typically in agreement and 'to date' summaries were usually correct; however there were some concerns noted regarding the accuracy of some information. Based on the field audit, the activities conducted during the term, including monitoring and assessment, were summarized in the ARs.

In addition to the numeric errors, potential implications of deviations from plan values were rarely discussed or were discussed with little detail. For example, deviations between planned and actual levels were provided for all activities and reasoning was often provided for achievement rates but discussion of how this affected or will affect plan objectives did not occur. Also absent in the ARs was discussion regarding the implications of silviculture success (a very important measure of the ability to successfully apply renewal prescriptions) on the achievement of plan objectives.

As discussed previously, the lack of tending during this audit term raises significant concerns regarding objective achievement and future forest condition. However, there is limited discussion in the ARs regarding the possible affects due to lack of a tending program. One AR statement - "Prompt renewal activities with the use of superior growing stock are assisting to offset the absence of chemical tending" - actually raises more questions than are answered.

ARs are required to discuss monitoring of exceptions to forest management guides, reasons for non-compliances, and the effectiveness of road use management strategies, among other things; however, discussion on these required topics was limited in the ARs.

ARs should be a clear and accurate account of annual forest operations but are often inadequately completed. ARs normally meet the basic accounting/summary of operations but miss the deeper discussions required of the FMPM. Moving forward, this should be considered during development of ARs.

Recommendation 19: The Forest Manager must ensure that:
a) all information in the Annual Report is confirmed for accuracy prior to finalization,
b) future Annual Reports contain all required discussions including progress towards achievement of plan objectives, potential implications of operations on future operations and effectiveness of road use management strategies.

4.7 Achievement of Management Objectives and Sustainability

Year 10 Annual Report

The Year 10 AR (2008-09 AR) was a fairly accurate and complete compilation of activities that occurred during the 2004-09 term but some errors were noted when comparing the Year 10 AR values to a summary of the ARs. Besides relatively minor accuracy issues, the Year 10 AR, as was the case for the regular ARs, lacked most of the deeper analyses and discussions that are required. Bearing in mind the numerous and considerable issues noted in the ARs and witnessed during the audit, the Year 10 AR should have been a substantial document that 'set the stage' for the next FMP. Rather, the tendency in the Year 10 AR was to provide cursory explanations for many important trends, delay required analyses and make poor excuses, such as the 2009-2012 Contingency Plan's utilization of the 2004-2024 FMP strategic direction, for not completing required work. In summary, the level of analysis and discussion in the Year 10 AR is deemed to be sub-par and inadequate. This must be rectified so that gains in knowledge made over the audit term are available for use during the development of the next full FMP for the Whiskey Jack or amalgamated Forest, which was already in progress in the fall of 2009 during the audit.

Recommendation 20: MNR Kenora District must ensure that the 2008-09 Year 10 AR is revised to include the following:

a) analysis/discussion of changes that may affect future levels, effectiveness and expenditures of renewal and tending operations,
b) analysis/discussion of effectiveness of silvicultural treatment packages that are exceptions to the forest management guides,
c) review/discussion of needed modifications or refinements to modeling assumptions,
d) a summary of progress on implementation of the 1999-2004 IFA Action Plan,
e) an update of the inventory and running of SFMM at plan end (2009) to determine objective achievement,
f) an update of the 2004-2024 FMP social and economic description, and
g) based on the determination of sustainability and the social and economic review, develop recommendations for the next FMP.

Achievement of Management Objectives

Ten of the 16 objectives set in the 2004-2024 FMP were achieved. The silviculture objective was not met since the program being applied does not support the forecast in the Selected Management Alternative. In addition, the audit team does not believe that the objectives for forest structure or for maintenance of habitat for selected wildlife species or marten will be met in practice due to the disconnect between the future forest condition as represented in modelling compared to the actual forest resulting from the silviculture program being applied on the ground. The silviculture program will lead to a forest with more hardwood and less conifer.

Harvest was well below target levels due to the permanent closure of the Kenora paper mill and the protracted idling of Kenora Forest Products. This shortfall was also related to AbitibiBowater no longer sourcing wood from the Whiskey Jack Forest for its mill in Fort Frances. Objectives for sustained wood supply and forest resource use commercial (i.e. Weyerhaeuser) will not be met.

A significant shortfall in harvest area was experienced over all three terms reported in the Trend Analysis, with a cumulative total shortfall of 45,000 ha by 2009. This was offset to some extent by natural depletions due to blowdown and jack pine budworm, although the nature of the forest resulting from these events is different than the forest that results from clearcut harvesting and associated silviculture.

While total renewal area significantly exceeded harvest area over the past three terms, more recent forest composition, pattern and structure targets may not be met due to low harvest exacerbated principally by a lack of tending. This is illustrated in the Trend Analysis data which shows a 30% increase in poplar working group and a 46% decline in spruce working group over the last 15 years. There is also concern with meeting the soil quality objective on fine textured sites due to multiple entries, although rutting and other forms of site damage were observed to be minimal. Discussion on the achievement of the full set of management objectives is contained in Appendix 2. The objectives for the 2004-2024 FMP were carried forward into the Contingency Plan; therefore certain objectives will similarly not be met if current trends continue.

Trend Analysis Report

ACCC prepared a draft Comparison and Trend Analysis Report (TAR) covering fifteen years of operations (1994-2009) on the Whiskey Jack Forest. The audit team reviewed the draft according to the procedure in the IFAPP and identified the need for changes, following which a final TAR was resubmitted by ACCC. The TAR included as Appendix 7 to the audit report is the correct and complete report. The period covered by the analysis encompasses four separate FMPs: one each for the Pakwash Forest and Patricia Forest and two for the amalgamated Pakwash and Patricia Forests (i.e. the Whiskey Jack Forest). During this time frame there was an 8% reduction in the production forest landbase due principally to withdrawals for parks and protected areas. There was a notable shift in the composition of the tree cover with a large increase in jack pine and poplar working groups and correspondingly large decrease in

spruce working group. Harvest area averaged 53% of planned resulting in a cumulative total of approximately 45,000 ha of available harvest area remaining uncut by the end of the fifteen years. Utilization of the available poplar fibre resource increased significantly with the opening of the Weyerhaeuser strand lumber mill in Kenora whereas the available jack pine and spruce were significantly underutilized during the last five years due to recent mill closures and changes in fibre sourcing policies, as previously mentioned.

Large natural disturbance events (principally jack pine budworm infestation) resulted in a reported depletion of some 218,000 ha or 27% of the forested landbase, approximately 90% having occurred in the 2004-2009 FMP period. Total renewal area significantly exceeded total harvest area due to the overall shortfall in actual versus planned harvest area. There was a recent shift to a greater reliance on natural regeneration and a very steep decline in chemical tending, with resulting issues as previously discussed. Some 87% of the area harvested during the five years from 1994-1999 were declared FTG with most of the balance expected to meet the minimum regeneration standards in the near future. The reader should understand that areas meeting the minimum regeneration standards are not necessarily regenerating to the planned forest unit. For example, the Year 10 AR for the 2004-2009 period reports approximately 76% of the area declared FTG was regenerating to the planned forest unit.

Forest Sustainability

Forest sustainability (i.e. achieving plan objectives and the long term management direction set for the forest in the FMP) was not well-supported by the silviculture program. Corrective measures will need to be taken at both the plan level and at the operations level to reset the course towards what is thought to be the historic condition of a spruce dominated forest condition if that is the intent, or the plan adjusted to reflect the fact that a higher component of hardwood can be expected with continuation of the current silviculture program.

To a great extent, management of the Forest was significantly complicated by external social and economic factors. The protest by GNFN over forestry practices, including herbicide spraying, was a key factor influencing decisions not to spray herbicide on the Forest. Some 25,000 m^3 of wood was already stranded on the Forest as a result of an ongoing road blockade by GNFN. As the downturn in the forest industry took hold, harvesting on the Forest also began to decline. As a consequence, the balance in the Forest Renewal Trust fund account declined and forest managers began to rely more heavily on lower cost renewal treatment approaches.

Specific planning and operational issues associated with the silviculture program that underlie the problem are summarized below.

- The natural benchmark does not reflect plan intentions to develop a natural forest composition
- The selected management alternative moves the forest further from the natural benchmark
- The planned silviculture program does not meet the selected management alternative with respect to treatment intensities
- Silviculture inputs exceed the silvicultural ground rule standards in some cases
- Actual silviculture implemented is not meeting silvicultural ground rules
  - Stocking below target
  - Conifer composition below target
  - Loss of infrequent species (i.e. white spruce, red pine, white pine)
- Under-estimates of hardwood composition during free-to-grow surveys delays full detection of forest change until the next forest resource inventory is completed

Combined, these factors have led to a steady erosion of a conifer-dominated forest condition to one with significantly more mixed woods at reduced stocking. Forest sustainability, as assessed through the Independent Forest Audit Process and Protocol will not be achieved unless corrective measures are immediately taken.

4.8 Contractual Obligations

Appendix 3 summarizes the individual conditions arising from the SFL and provides the audit team's assessment of the extent to which each licence condition was met. Most conditions were met or partially met. Conditions not met were associated with maintenance of the Forestry Futures Trust minimum balance, the achievement of silviculture standards, and the timely completion and submission of IFA action plans and status reports.

Recommendation 21: The MNR Kenora District Manager and the Forest Manager must ensure that the audit action plan and status report comply with all IFAPP submission requirements.

As part of the review of contractual obligations, the audit team is required to assess the effectiveness of actions developed by the auditees to address the recommendations arising from the previous IFA. It was apparent from documentation, interviews and field observations that work had been undertaken on the 2004 IFA action plan and, according to the latest draft of the action plan available during the audit, virtually all of the audit recommendations were actioned. The audit team reviewed these actions and concluded that most audit recommendations were appropriately dealt with. However, the audit team disagreed with the status of "complete" for Recommendation 8 (silviculture strategies), Recommendation 10 (site disturbance), and Recommendation 11 (vegetation control program), as reported in the draft action plan, because the actions or their implementation have not adequately addressed the original issue. The audit team's concerns are captured in the associated discussion and recommendations contained in this audit report.

A final audit action plan, dated March 2010, was provided to the audit team. The deadline date for completion of actions associated with Recommendation 11 is now "ongoing". This change does not alter the audit team's view that the original concern identified in the 2004 IFA has not been adequately addressed.

Errors in text and tables and a lack of adequate discussion of issues and trends were found in the Annual Reports. The audit team does not believe the low cost approach to the silviculture program was always a wise or effective use of money from the Renewal Trust Fund, as evidenced by the often poor regeneration results on the ground compared to the expectations set out in the FMP.

The SFL holder worked for more than a year to secure a surrender agreement. Some of the delays were related to assessing liability for silviculture. The surrender agreement was signed outside of the audit period. However, the process behind securing the surrender agreement is material to the audit under the principle of contractual obligations.

The audit team believes that the process took longer than it should have. The issue of silviculture liability should not have been a stumbling block. The records should be up to date and MNR should move quickly to ensure the harvest and renewal programs proceed under a direct delivery model, a forest management contract or a new licence. Funds to complete forest renewal should be sufficient if the minimum balance has been maintained. Since more SFLs may be surrendered in the future, corporate MNR should undertake measures to allow for expedient surrenders of licences and interim measures to deliver the forest management program until such time as a new SFL is issued.

4.9 Conclusions and Licence Extension Recommendation

The audit team concluded that, with the following critical exception noted below, management of the Whiskey Jack Forest was generally in compliance with the legislation, regulations and policies that were in effect during the term covered by the audit, and MNR met its legal obligations. Forest sustainability, as assessed through the Independent Forest Audit Process and Protocol, will not be achieved unless corrective measures are immediately taken to address the issues that silviculture practices, including a lack of tending of artificially regenerated areas, are leading to reduced stocking of conifer and an

increased component of hardwood on the Forest. This trend does not support the management intention of maintaining a conifer dominated forest, as set out in the 2004-2024 Whiskey Jack Forest FMP.

- Recommendation 3 of this audit must be satisfied to bring the Whiskey Jack Forest into general compliance.

ACCC has surrendered the SFL for the Whiskey Jack Forest to the Crown; therefore the audit team makes no recommendation on licence extension.

Appendix 1 - Recommendations

Independent Forest Audit – Record of Finding **Recommendation 1**
Principle: 2. Public Consultation and Aboriginal Involvement **Criterion:** 2.1 Local Citizens Committee establishment and Terms of Reference **Procedure:** 2.1.1.1 Review the terms of reference and LCC minutes, compared to the applicable FMPM requirements.
Background Information and Summary of Evidence: The current Terms of Reference for the Kenora LCC and the Red Lake LCC do not contain a protocol describing the presence of or functioning of the two LCCs on the Whiskey Jack Forest.
Discussion: The 2004 FMPM Sections 3.2.3 and 3.2.4 requires that the LCC terms of reference contain a protocol which describes how multiple committees on a forest will function. There are two LCCs with responsibilities on the Whiskey Jack Forest (Kenora LCC and Red Lake LCC).
Conclusion: The Terms of Reference for both the Kenora LCC and Red Lake LCC do not meet the requirement of the FMPM with respect to a protocol for multiple committees.
Recommendation 1: MNR Kenora District and MNR Red Lake District must ensure that the LCC Terms of Reference for the Kenora and Red Lake LCCs meet the content requirements of the FMPM regarding a protocol for the functioning of multiple LCCs.

Independent Forest Audit – Record of Finding
Recommendation 2

Principle: 3. Forest Management Planning

Criterion: 3.5.4 FMP silviculture ground rules

Procedure: 3.5.4.1 Assess whether treatments for harvest, renewal and tending activities and regeneration standards appropriately reflect the selected management alternative/management strategy.

Background Information and Summary of Evidence: There were 45 Silviculture Ground Rules (SGRs) developed for the 2004-2024 FMP, which followed the requirements of the 1996 FMPM. These exact SGRs were used in the 2009-2012 Contingency Plan as stipulated by the approved Contingency Plan proposal. The SGRs are a relatively good representation of what is on the Forest but significant issues were found regarding specific components of some SGRs:

- Over-estimation of expected amounts of future conifer in some extensive SGRs, e.g. Mixed-E = 50%, PRW-E = 80%, SPDom-E = 80%.
- Acceptable species lists sometimes exclude important species such as red and white pine and white spruce.
- Some acceptable species lists include values that do not meet the intended future forest condition, e.g. PjDom-E has Pj>=50% when PjDom forest unit requires Pj>=60%.
- Unrealistic future forest condition in some cases, e.g. PjDom-SpDom with future forest condition that contains only 10% Pj.
- No allowance for cleaning treatments in PjDom-B or SPDom-B. If these SGRS are to have no more than 10% hardwood species at maturity some form of cleaning would be required on most sites.

Other, less significant issues found with the SGRs are also summarizedt to aid in the development of the next SGRs:

- Use of shelter cones is described for jack pine and black spruce seeding in some SGRs. This technique has not been used on the Forest in several years.
- Regeneration standards should be reviewed. SpLow-E has 60 cm height for black spruce at 15 years – this is extremely slow growth. Minimum average height is given for all species in some SGRs. This should be identified by species or, at the least, by conifer and hardwood.
- A few SGRs had both scarification and mechanical site preparation – this should not occur.

Discussion: Over-estimation of expected future conifer and under-estimate hardwood in affected SGRs can negatively impact future forest condition if not corrected. Predicting unrealistic future forest conditions and limiting treatment options could also have long term implications.

Regeneration and silviculture survey information available for the Forest corroborates most of the silviculture planning and implementation findings presented in this audit report. To date, the survey information has not been fully utilized when developing forest management plans.

Conclusion: Silviculture survey information must be analyzed and used by the planning team when developing the silviculture program for the next FMP. This will ensure the development of a management alternative that can meet plan objectives and develop a desirable future forest condition.

The recommendation below has been purposely expanded beyond the SGRs to include the entire silviculture program because it was found that several components of silviculture planning are in need of revision based on available information. Other silviculture planning issues are discussed elsewhere in this report.

Recommendation 2: The Forest Manager must ensure that available survey information (regeneration surveys, Free-to-Grow, silviculture effectiveness monitoring, etc.) is used in the development of the silviculture program in the next FMP.

Independent Forest Audit – Record of Finding
Recommendation 3

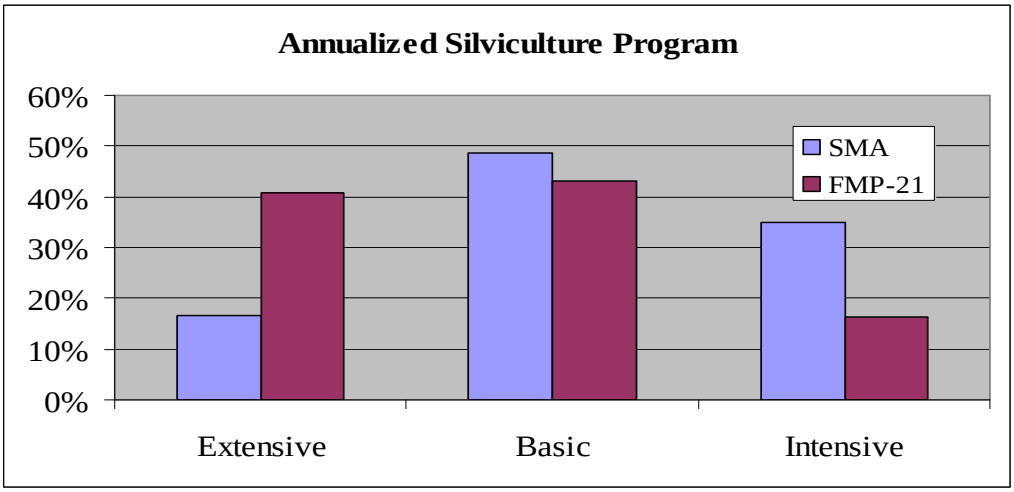
Principle: 3. Forest Management Planning

Criterion: 3.5.7 FMP renewal, tending, protection and renewal support

Procedure: 3.5.7.1 Assess planned implementation of the selected management alternative/management strategy.

Background Information and Summary of Evidence: The work to associate strategic to operational silviculture and the required discussion was deficient in the 1999-2004 Whiskey Jack Forest FMP and a recommendation was provided in the 1999-2004 IFA to remedy this (#8). Unfortunately, the 1999-2004 IFA recommendations were not available for the development of the 2004-2024 FMP and the Contingency Plan subsequently developed for the 2009-2012 term used the strategic direction from the 2004-2024 FMP, so actions on this recommendation have not yet occurred. This is evident because similar, if not greater, discrepancies with regards to the modeled and planned silviculture program are found in the 2004-2024 FMP and the 2009-2012 Contingency Plan; these are summarized below.

The figure below indicates considerable differences between the annualized modeled silviculture program by intensity (selected management alternative = SMA) and the planned program (FMP-21 from the 2009-2012 Contingency Plan).



Comparison of Modeled and Planned Silviculture Program by Intensity.

Table FMP-16 summarizes forest unit transitions expected to occur on the planned harvest area when the modeled silviculture program is followed. This table is limited to activities or changes predicted for the plan term (five years) but trends can be compared to the SMA to ensure consistency. Table FMP-16 in the 2004-2024 FMP (and the 2009-2012 Contingency Plan, which uses the strategic direction from the 2004-2024 FMP), indicates an increase in Mixed, PRW and PoDom forest units and a decrease of all the other forest units. These trends are similar to the SMA in the plans, but the magnitude of change is significantly different. In the five years of transition shown in Table FMP-16, the Mixed forest unit is to increase by 23.5% and SpDom is to decrease by 6%.

Another discrepancy found with regards to silviculture was between stocking rates in yield curves and stocking rates in Silviculture Ground Rules (SGRs). Stocking in yield curves was found to exceed target stocking in all SGRs. For example, PjDom-I yield curve has 100% stocking whereas the PjDom-I SGR only requires >=90%.

Planning for tending (release from vegetative competition) was also an issue in the 2004-2024 FMP and 2009-2012 Contingency Plan. Although there is no specific model input for tending, yield curves (predicted species composition, stocking and volumes), forest unit transitions and silviculture costing are developed based on the assumption of removing competing vegetation on most areas treated by planting or seeding (e.g. Intensive and Basic treatments). Therefore, it is usual to plan for competition control on all areas planned for Intensive

treatments and a large portion of those planned as Basic.

In the 2004-2024 FMP about 63% of silviculture treatment area was planned for planting and seeding (generally correlates to Intensive and Basic treatment intensities respectively). Of this area, less than half (~47%) was planned for tending. In the 2009-2012 Contingency Plan the proportion of artificial treatments planned decreased to ~59% of which just over one-quarter (~27%) was planned to be tended.

Discussion: Silviculture in a forest management plan may be broadly separated into the modeled and planned programs.

- The modeled or 'strategic' silviculture program links expected silviculture treatments and associated average yield curves by intensity. The strategic silviculture program is developed to meet related plan objectives and ultimately derive preferred future forest conditions – it is usually desired to move towards a historic/natural forest condition, normally defined in northern Ontario as one dominated by pure or mixed conifer stands.
- The planned or 'operational' silviculture program focuses on actual silviculture treatments by area based on those areas not yet treated or requiring re-treatment from the current/previous plan(s) and those planned for treatment in the upcoming plan term.

Although the modeled and planned silviculture programs are somewhat different, the two should be solidly linked to allow fulfillment of associated plan objectives through plan implementation. Furthermore, the connection between strategic and operational should be clearly discussed in forest management plans to provide confirmation that what is planned in the FMP can meet plan objectives and, in time, the preferred future forest condition.

To meet plan objectives, the SMA calls for a significantly larger proportion of intensive and basic treatments when compared to the planned program (Figure above). Exact correlation between these values is not expected but solid association is. No discussion is provided in the FMP for this discrepancy. Also, the very large percent changes by forest unit over short periods shown in Table FMP-16 are not consistent with the SMA and this is not discussed in the text of the FMP.

Over a large area, the reduction of volume based on 10% less stocking in SGRs versus the yield curves would be considerable. Furthermore, survey results indicate that only a small portion of Intensive treatments actually meet the 90% stocking requirement; the need for better inclusion of survey data is included with the SGR discussion with the previous recommendation.

The decreasing reliance on artificial treatments and tending is not in alignment with the selected management alternative, is not supported by results of actual treatments on the Forest and will not lead to objective achievement or producing the desired future forest condition. The need for tending is discussed in several other sections in this audit.

Conclusion: As noted earlier, the 1999-2004 IFA included a recommendation focused on improving silviculture planning but actions for this recommendation have not yet occurred due to timing of FMP development/need for a Contingency Plan. Several issues were also found regarding silviculture planning in the 2004-2024 and 2009-2012 FMPs. To ensure this important work occurs in the next FMP, a recommendation similar to the one in the 1999-2004 IFA is included in this audit.

The next FMP will be a significant improvement over its predecessors with the proper incorporation of field survey data (based on the previous recommendation) and through developing and detailing clear connections between strategic and operational silviculture (as a result of the recommendation below).

Recommendation 3: The Forest Manager must ensure that:

a) the Silviculture Ground Rules, silviculture exceptions, planned renewal program and actual silvicultural intentions of the next forest management plan support the long term management direction and related silvicultural strategies,
b) the connection between strategic and operational silviculture is clearly discussed in the text of the next plan, and
c) the operational renewal program aligns with the planned renewal program and supports the long term management direction.

Independent Forest Audit – Record of Finding
Recommendation 4

Principle: 3. Forest Management Planning; 4. Plan Implementation; 7. Achievement of Management Objectives; 8. Contractual Obligations

Criterion: 3.7. Contingency Plan; 4.1 Plan Assessment; 7.2 Assessment of Objective Achievement; 8.1.2 Wood Supply Commitments

Procedures: 3.7.2 Assess whether the planning procedures used for the contingency plan followed the requirement
3.7.3 Assess whether the rationale for the contingency plan was appropriate in the circumstances
4.1.1 Modeling assumptions
7.2.2 Assessment of the progress towards achieving each objective
8.1.2.1 Determine whether wood supply commitments and any special conditions have been complied with

Background Information and Summary of Evidence: The audit team inspected approximately 3,000 ha of area treated in June 2007 by aerial application of a biological pesticide (Btk) to control an outbreak of jack pine budworm. The 2008-09 Annual Report notes that the spray was successful so no further work was required. There was no visible distinction between treated and untreated forest observed by the audit team by air but such an assessment may be premature at this time.

The pest management proposals for 2006 and 2007 were reviewed and found to have met the FMPM requirements in terms of content. The documents were complete and well written; however, the evaluation of options lacked rigour and meaningful quantitative analysis.

Discussion: The treated area viewed by the audit team encompassed a marten core that is deferred from harvest to maintain marten habitat and large areas of "interior" old forest. Older boreal forest cover types, especially jack pine, serve ecological functions through the mortality of the pine overstory. As the dominant trees die they provide habitat structure for marten and other species. The value of trying to "preserve" the jack pine in marten core areas is questionable. MNR representatives suggest that the main reason this strategy was pursued was to reduce the risk of catastrophic fire and this may indeed have a favourable benefit-cost ratio but the supporting analysis is limited.

Conclusion: The pest management proposals for 2006 and 2007 were reviewed and found to have met FMPM requirements in terms of content. The documents were complete and well written. The required management options such as no treatment, modified harvest strategies and insecticide applications were evaluated by the program planning team. However; the evaluation of options lacked rigour and was supported by a minimal level of quantitative analysis. It appears that the decision to spray the biological pesticide Btk was made and the pest management proposal was then drafted to meet the FMPM requirements rather than giving serious consideration to other management options. Several planning team members confirmed that, in hindsight, this was indeed the case but it was necessary to quickly respond to the outbreak. There were also issues in assembling the data at the regional scale to complete a detailed analysis of options. If the program is to continue, a more rigorous cost-benefit analysis should be completed. Future outbreaks will surely occur and MNR should prepare for this event by, at the very least, preparing input files for regional level analyses.

Recommendation 4: MNR Region must develop the capacity to conduct risk based cost benefit analyses of proposed pest management programs in advance of future outbreaks.

Independent Forest Audit – Record of Finding **Recommendation 5**
Principle: 4. Plan Assessment and Implementation **Criterion:** 4.1 Plan assessment **Procedure:** 4.1.1 Assess whether the FMP was appropriate in the circumstance
Background Information and Summary of Evidence: A number of objectives in the 2004-2024 FMP and 2009-2012 Contingency Plan had targets based on the 'natural bounds of variation'. The natural bounds of variation were derived from +/-20% of the highest and lowest points of the Natural Benchmark (NB). The issue with this is that the benchmark starts at the current condition that had over-representation of mixed wood and jack pine stands and under-representation of spruce. In addition, the objective targets were not linked to the trend line of the NB. The Natural Benchmark developed for the plan deviated in several ways from the stated natural condition and one of the FMP targets (pg. 81) "…move toward area by forest unit as represented by previous forest inventories…"
Discussion: The bounds of natural variation were exaggerated, i.e. the lower bound for spruce was likely lower than natural while the upper bounds for jack pine and mixed wood were higher than normal. Thus, the target of staying within the natural bounds could be met while the management strategy moves away from the NB. For example, the NB indicates a slow steady rise of jack pine into the future but the selected management strategy decreases slightly through time. Instead of reducing the current over-representation of mixed wood and jack pine stands, the NB maintains/increases these types and spruce decreases. It is mentioned in the FMP that the relatively short fire cycle determined for the Whiskey Jack Forest favoured jack pine over black spruce. The fire cycle should have been altered to allow development of an appropriate NB.
Conclusion: The bounds of variation used were exaggerated for select forest units and were not appropriate for use in objective target setting. The natural benchmark developed for the 2004-2024 FMP and 2009-2012 Contingency Plan does not reflect the development of a natural forest.
Recommendation 5: The Forest Manager must ensure that, if required, the Natural Benchmark (or equivalent) developed for the next FMP better reflects actual conditions and that, if required, targets/desired levels (or equivalent) for appropriate objectives in the next FMP include consideration for the Natural Benchmark trend line.

Independent Forest Audit – Record of Finding **Recommendation 6**
Principle: 4. Plan Assessment and Implementation **Criterion:** 4.3 Harvest **Procedure:** 4.3.1 Assess in the field the implementation of approved harvest operations
Background Information and Summary of Evidence: The 2004-2009 FMP included moose as one of the featured species on the Whiskey Jack Forest. The plan further outlines how moose habitat would be considered in the layout of cutblocks including "… irregularly, shaped and sized cuts with scattered shelter patches…" Wildlife habitat objectives include an objective for moose habitat which identifies a shelter patch strategy: "Where harvest blocks exceed 100 ha and the 'edge of cover' to 'edge of cover' distance potentially exceeds 400 m, suitable shelter patches will be retained within the harvest block." During the field audit, a number of harvest blocks were visited that were to include moose shelter. In four cases, moose shelter patches had been harvested and had not been left as required.
Discussion: The discussion provided in the FMP clearly explains the reason for including moose shelter patches. Maps included in the auditor field binders illustrated the desired location of the shelter patches but harvest operations did not abide by the plan.
Recommendation 6: The Forest Manager must ensure that moose shelter patches are retained as specified in the FMP.

Independent Forest Audit – Record of Finding **Recommendation 7**
Principle: 4. Plan Assessment and Implementation **Criterion:** 4.3 Harvest **Procedure:** 4.3.1 Assess in the field the implementation of approved harvest operations
Background Information and Summary of Evidence: Site disturbance in the form of rutting was identified as an issue in the 1999-2004 IFA. This problem has been completely eliminated on all sites examined during this audit. However, a number of sites viewed showed signs of compaction of fine textured soils (e.g. reduced regeneration of trees along machine routes) that is contributing to decreased stocking.
Discussion: The fine textured soils common to portions of the Forest are vulnerable to compaction and many sites showed evidence of this type of damage. Based on records and interviews many of these sites were supposedly harvested during the winter period to reduce site disturbance but there are very obvious areas where trees are not regenerating naturally, due to compaction of soils by equipment.
Conclusion: These sites cannot be operated upon during wet or non-frozen periods.
Recommendation 7: The Forest Manager must ensure that operators refine their work methods on fine textured soils to avoid operating during wet or non-frozen periods.

Independent Forest Audit – Record of Finding **Recommendation 8**
Principle: 4. Plan Assessment and Implementation **Criterion:** 4.1 Plan assessment **Procedure:** 4.1.1 Assess whether the FMP was appropriate in the circumstances.
Background Information and Summary of Evidence: The inventory update for the 2009-2012 Contingency Plan was relatively good but FTG record updating completed during the audit term was not always accurate. FTG information in the inventory was compared to actual field visits during the audit. Some large discrepancies were noted. For example, some areas dominated by jack pine with a small spruce component were recorded in the inventory as spruce stands with a small component of pine; the opposite was also found.
Discussion: Small and infrequent discrepancies are common when reviewing Forest Resource Inventory (FRI) attributes, but absolute disagreement of working group should rarely occur. In the 10% sample taken by the audit team, there were several instances of absolute disagreement of working group. Therefore, the quantity and significance of discrepancies noted by the audit team in the sample reviewed suggests a systematic issue with data input and is not categorized as an occasional typographical error. The monitoring section contains a full account of the silviculture monitoring program including FTG assessed during the term.
Conclusion: In preparation for the next FMP, FTG records must be accurately brought into the inventory.
Recommendation 8: The Forest Manager must ensure that the inventory is reviewed and verified for accuracy with respect to Free to Grow records updated during the audit term.

Independent Forest Audit – Record of Finding Recommendation 9
Principle: 4. Plan Assessment and Implementation **Criterion:** 4.4 Renewal **Procedure:** 4.4.1 Effectiveness of renewal prescriptions
Background Information and Summary of Evidence: Site preparation was under-achieved during the audit term - about 7,800 ha of 15,922 ha planned was completed (~50%). All site preparation during the term was completed by a single contractor using a trencher. Site preparation viewed at almost every site visited was often too light and spacing was too wide between passes. MNR SEM assessments mirror the audit findings.
Discussion: Light, wide site preparation led to reduced planting spots on most sites. Fill planting will be required to ensure stocking/density levels can be met on many of these sites.
Conclusion: Site preparation must be monitored to ensure an adequate number of quality planting spots are created.
Recommendation 9: The Forest Manager must ensure that site preparation results in the production of planting spots of the quality and quantity appropriate to meet plan objectives.

Independent Forest Audit – Record of Finding Recommendation 10
Principle: 4 Plan Assessment and Implementation **Criterion:** 4.4 Renewal **Procedure:** 4.4.1 Effectiveness of renewal prescriptions
Background Information and Summary of Evidence: It was noted from Annual Reports that few white spruce, red pine or white pine were planted during the term (11,900, 5,500 and zero, respectively).
Discussion: Several sites audited had a significant pre-harvest white spruce component and at least one site had red pine but these species were not included in the renewal of these areas. Based on the number of seedlings of these species (see above), approximately 15 to 20 ha would have been planted during the audit term (assumes a 20-30% mix of these species rather than pure planting) – this area(s) was not included in the audit sample. According to the 2008-09 AR (final AR for the 2004-2024 FMP), during the audit term 1,324 m^3 of Pr and 110 m^3 of Pw was harvested as well as an undisclosed amount of Sw (planned Sw was 8% of all spruce volume but actual spruce volume harvested was supposedly only ~ 527 ha of Sb although there was evidence of Sw harvest at several audit sites). Based on a conservative value of 5% of the spruce harvested during the term being Sw, plus the Pr and Pw harvest values above, approximately 220-500 ha should have been planted with a mix of Pr, Pw or Sw during the 2004-09 period just to maintain these species on the landscape.
Conclusion: The plan target to enhance red and white pine on the Forest will not be met unless treatments include these species on appropriate sites.
Recommendation 10: The Forest Manager must ensure that planting of red and white pine occurs on appropriate sites.

Independent Forest Audit – Record of Finding **Recommendation 11**
Principle: 4. Plan Assessment and Implementation **Criterion:** 4.4 Renewal **Procedure:** 4.4.1 effectiveness of renewal prescriptions
Background Information and Summary of Evidence: Slash management during the audit term was variable. At the beginning of the audit term effort was made to pile and burn slash. Despite annual reporting that suggests an effective burning program during these years, slash piles were often left unburned or partially burned. The company ceased the slash management program from 2007 to 2009 - slash was left unpiled and unburned along roadsides.
Discussion: Recommendations have been provided in at least the two previous audits to improve slash management. Slash management has been, and continues to be, an issue on the Forest.
Conclusion: If left untreated, piled or unpiled slash will effectively remove large areas of productive land from the land base, likely for decades.
Recommendation 11: MNR Kenora District must ensure that all blocks harvested during the audit term are reviewed for slash management and, where established regeneration will not be affected **a) slash be piled and burned or otherwise removed to allow regeneration of productive land, or** **b) if natural regeneration of these areas is not expected, then treat the area to ensure regeneration.**

Independent Forest Audit – Record of Finding
Recommendation 12

Principle: 4. Plan Assessment and Implementation

Criterion: 4.4 Renewal; 4.5 Tending and Protection

Procedure: 4.4.1 effectiveness of renewal prescriptions
4.5.1 gaps between the planned and actual levels of each type of tending

Background Information and Summary of Evidence: Due to the under-achievement of site preparation, a large component of the planting program was direct plant (i.e. planted without site preparation). As noted, site preparation was often too light and widely spaced to provide the requisite number of planting spots but planting viewed on prepared areas was generally well done with good choice of micro-site. However, wide spacing and missed areas was common on most areas that were direct planted.

A review of planting density from the ARs indicates a pronounced reduction of seedlings per hectare during the audit term – average densities started at just over 2,000 seedlings/ha in 2004-05 and decreased to 1,334 seedlings/ha by 2008-09.

Seeding occurred on 2,100 ha of 7,780 ha planned (~27%). Many of the sites scheduled for seeding were planted instead. This was noted as appropriate during the field review since many of these sites were too competitive for seeding. However, other areas currently scheduled for planting could be effectively site prepared and seeded. Many areas that were seeded were not well stocked and may not meet targeted stocking rates.

No chemical, mechanical or manual plantation cleaning occurred during the audit term even though 8,737 ha were planned. This was confirmed by the field audit that included many sites that had heavy shrub or hardwood tree competition of planted and natural conifer trees. Some older areas deemed FTG also had hardwood competition.

According to silviculture monitoring completed during the audit term, about 22,000 ha of older disturbed area requires competition control in order to meet regeneration standards.

Discussion: Direct planting is a viable option on many sites but must be closely monitored to ensure plan objectives can be met.

Seedling densities were apparently reduced to account for natural ingress; however, the reliability of ingress was not demonstrated in silviculture monitoring results and was not witnessed during the audit. Ingress was sparse on many of the sites viewed and was generally limited to jack pine on shallow soiled/rocky upland patches and black spruce on some lowland sites. Otherwise, shrubs, hardwood species and occasional balsam fir occupied large portions of many sites.

The audit team believes that under-stocking of seeded areas is mainly a result of low germination due to light and wide site preparation. Seed germination potential, timing, and rate of application of seed were not deemed to be cause for the low germination.

The lack of cleaning, particularly on areas planted and seeded, is considered by the audit team to be a crucial finding. Many sites viewed require some form of competition control to meet plan objectives.

The company confirmed the extent of the issue in the 2007-08 AR:

> *The limited tending on the forest may impede achievement of the forecasted forest condition described in the FMP. The inability to economically provide opportunity for optimum tree growth, could over time change the species composition of the Forest by faster growing (poplar, white birch) becoming more frequent and slower growing, shade intolerant species (jack pine, spruce) becoming less frequent on the Forest. This change will impact the local forest users dramatically. Similarly, recent renewal efforts may not result in expected results due to lack of tending operations, generating an increase in areas declared not sufficiently reforested.*

Inadequate tending was an issue raised during the previous two audits and is considered the most significant issue on the Forest in this audit. Interestingly, the tending issue on the Forest has changed from one of a perceived or real over-application of herbicide in the past to the outright abandonment of the program. In the 1994-99 IFA, issues were raised prior to and during the audit concerning the pre-disposition to conifer renewal by the company in situations where pre-harvest hardwood was a large component of the sites. A concern was the significant reduction in the poplar component where block application of aerial herbicide could not easily avoid poplar concentrations. The 1994-99 IFA audit team expressed concern whether some spraying was in fact necessary and whether each candidate spray block received sufficient inspection one year in advance of planned treatment. The auditors recommended that a thorough field assessment of candidate spray blocks occur to ensure prudent use of herbicide.

Spray assessment records and correspondence between Abitibi and MNR reviewed for the 1999-2004 IFA indicated that there were still significant problems with the spray program at the time, particularly early in the 1999-2004 term. Problems included variability in determination of areas requiring tending, areas where the treatment failed and areas being sprayed or re-sprayed that were already free-growing. These problems appear to have caused a lack of confidence by MNR that Abitibi was applying herbicide judiciously. As a result, proposed tending treatments were suspended while MNR and Abitibi representatives jointly enhanced the survey methodology.

Even though the new survey methodology was amended to the 1999-2004 Whiskey Jack Forest FMP in early 2001, the planned tending program was suspended fully by MNR for two years and partially in one year of the five-year term. In addition, Abitibi chose to suspend the vegetation control program in the final year of that audit term while discussions were taking place with Grassy Narrows First Nation, a community that is generally against the use of herbicides.

Because several artificial renewal sites on the Whiskey Jack Forest were in need of tending at the time to meet plan objectives, the audit team for the 1999-2004 IFA recommended that Abitibi implement an approved vegetation control program. As noted, no vegetation control program occurred during the 2004-09 term. Document review suggests that the company considered replacing aerial spray with ground spray for several candidate vegetation management sites; however, ground spray was subsequently also abandoned. Documents also reveal that the company has chosen not to spray in order to avoid the anticipated political backlash from Grassy Narrows First Nation.

Some older FTG areas viewed during the audit were vigorous and composed of almost pure conifer. These areas demonstrate the capacity of the Forest under an effective competition control regime and are the model for the Desired Future Forest Condition as described in the FMPs.

Conclusion: There will be a need for fill planting on most sites planted during the audit term to meet plan objectives. Many areas seeded during the audit term will require fill plant/re-seeding to meet plan objectives. In the absence of a competition control program, the Desired Future Forest Condition described in the 2004-2024 FMP and the 2009-2012 Contingency Plan will not be achieved. Site preparing, planting and seeding of areas without effective competition control is also viewed as a loss of value. The combined effort of tending requisite areas renewed during the audit term and older stands to achieve FTG status will be considerable.

Recommendation 12: MNR Kenora District must ensure that:

a) a review is conducted of all areas planted and seeded during the audit term and that fill planting or re-seeding occurs as necessary to support the achievement of FMP objectives,

b) a review of all sites harvested during the audit term that are forecast to become conifer-leading forest units is conducted, and that tending occurs where necessary so that plan objectives can be met.

Independent Forest Audit – Record of Finding
Recommendation 13

Principle: 4. Plan Assessment and Implementation

Criterion: 4.6 Renewal support

Procedure: 4.6.2 Assess whether actual tree seed collection and nursery stock production is appropriate for the site conditions encountered on the management unit.

Background Information and Summary of Evidence: Seed storage was reviewed during the audit. At the time of the audit two of three jack pine seed lots stored will not meet the annual requirements noted in the 2009-2012 Contingency Plan – there is actually no jack pine seed for seed zone 11. The following table indicates amount of jack pine (Pj) seed stored (X 000,000) versus the need according to the Contingency Plan. Orange indicates less than one year of seed available and yellow indicates less than two years.

seedzone	Pj stored	Pj need CFMP	Years seed CFMP
9	50	50	1
10	11.4	14	0.8
11	0	7	0

If average usage from the 2004-09 term is used as a gauge of future need, only one seed lot of each species is deficient for annual requirements (Pj seed zone 11).

Discussion: Recent diminished harvest levels will reduce the need for seed but renewal support needs to be planned and available for full utilization. In addition, remedial work needed as a result of this audit will increase the demand for seed.

Conclusion: There should be at least a few years worth of seed stored for each species/seed zone combination on the Forest.

Recommendation 13: The Forest Manager must ensure that seed collection and storage meet the needs of the renewal program.

Independent Forest Audit – Record of Finding **Recommendation 14**
Principle: 4. Plan Assessment and Implementation **Criterion:** 4.4 Renewal **Procedure:** 4.4.1 Consider whether there are any gaps between the planned and actual levels of each type of renewal activity seen in the field.
Background Information and Summary of Evidence: New FOPs were selected for many stands during the audit term. For example, direct planting and no tending options were often chosen over more intensive prescriptions. It appears that reducing silviculture cost, rather than modifying operations according to actual field conditions, was the main reason for changing from preferred to alternate prescriptions in many cases. The cycle of silviculture cost reduction started with selecting less intensive/costly options to implement in the field, building a surplus in the Forest Renewal Trust Fund (FRTF) and then using the surplus as evidence in the request to reduce contribution rates. Through requests by the company, the FRTF contribution rate for spruce, pine and fir was reduced from $6.00 per cubic meter in 2005-06 to $5.00 in 2006-07 and to $3.00 in 2008-09.
Discussion: In spite of MNR Area Forester analyses and silviculture effectiveness monitoring that indicated significant issues with the silviculture program, as well as FTG results that showed that regeneration standards were often not being met; MNR granted the renewal rate reductions. In addition, declining contributions (mainly through reduced harvest levels) led to the FRTF minimum balance not being maintained, as required.
Conclusion: Plan objectives and the desired future forest condition on many sites will not be achieved with the options chosen, particularly in light of the operational issues and reduced funding noted. Adequate renewal funding is needed to ensure plan objectives can be met. Additional funding will also be needed to fulfill actions for several recommendations in this audit report.
Recommendation 14: MNR Kenora District must review the Forest Renewal Trust Fund rates particularly for spruce / pine / fir and assign rates appropriate for meeting plan objectives.

Independent Forest Audit – Record of Finding
Recommendation 15

Principle: 4. Plan Assessment and Implementation

Criterion: 4.7 Access

Procedure: 4.7.1 Assess whether roads have been constructed, maintained, and decommissioned to minimize environmental impacts and provide for public and operator safety.

Background Information and Summary of Evidence: During the field portion of the audit, several harvest blocks were viewed where road rehabilitation should have occurred. For example, Block 4.721 and Block 4.760 had roads that would serve no further purpose and rehabilitation would reduce loss of productive area. Although Block 4.760 also had excessive road building, this was the only instance of this found on the audit.

Example of an excessively roaded area that should have been rehabilitated.

Discussion: Road rehabilitation can provide a means to effectively return land to the productive land base as well as eliminate unnecessary and disproportionate loss of productive land where excessive road building has occurred. Where roads will serve no further purpose, be it for forest management or other uses, strategies to rehabilitate roads can result in returning roaded areas to the productive landbase.

Conclusion: Where excessive road building has occurred, efforts need to be made to rehabilitate roads.

Recommendation 15: The Forest Manager must develop a road rehabilitation strategy for the next FMP to ensure that unwarranted roads are rehabilitated and returned to the productive forest landbase.

Independent Forest Audit – Record of Finding
Recommendation 16

Principle: 4. Plan Assessment and Implementation

Criterion: 4.1 Access

Procedure: 4.7.1 Assess in the field the implementation of approved access activities

Background Information and Summary of Evidence: During the field portion of the audit, numerous water crossings and drainages were examined. Marked improvements were noted in water crossing installations from that described in the past IFA. Cross drainage installations were also noted to have improved.

Although improvements were noted, water crossing installations that were performed in winter were found to be inadequate or failing. Erosion of surfaces of winter roads and unstable slopes of water crossings was found at several crossings that had been installed during the winter.

Examples of failing water crossing sites where work had been performed during the winter (aerial view on left).

Discussion: Water crossings are particularly challenging to install during winter months. Even with adequate care a winter installation can fail as snow pack melts and frozen soil thaws. Often harvest operations are completed before spring thaw and failing water crossings can go unnoticed. Even properly installed crossings can fail during and after spring thaw.

Conclusion: Monitoring is required to properly address the potential failure of water crossings that are installed during the winter. A monitoring program should ensure that all water crossings that are installed during the winter are inspected after the spring thaw following their installation.

Recommendation 16: The Forest Manager must develop a monitoring program to ensure that all water crossings installed during the winter are inspected immediately following the first spring thaw after their installation, and incorporate the monitoring strategy into the FMP.

Independent Forest Audit – Record of Finding
Recommendation 17

Principle: 4. Plan Assessment and Implementation

Criterion: 4.1 Access

Procedure: 4.7.1 Assess whether roads have been constructed, maintained, and decommissioned to minimize environmental impacts and provide for public and operator safety.

Background Information and Summary of Evidence: A number of aggregate pits were viewed during the field audit. All of the pits except one were found to be in good condition, the result of the cooperative effort between Abitibi and MNR to monitor and rehabilitate pits where necessary. An example of a typical rehabilitation is shown in the following figure.

One aggregate pit was found to have been operated since the rehabilitation effort had been completed without proper rehabilitation in the interest of public safety. Progressive rehabilitation needs to consider public safety at all times during the life of a pit. Although this was the only instance of a pit that needed work, the audit team gives a recommendation to ensure remediation of the concern. The following photograph illustrates the condition of this pit at the time of the site visit.

Discussion: This is a Category 9 pit with no specific requirement for rehabilitation until final rehabilitation. However, progressive rehabilitation, as outlined in the Aggregate Resources Act, R.S.O 1990, c. A.8 should be given full consideration, particularly in the interest of public safety.

Recommendation 17: The Forest Manager must ensure that the interests of public safety are paramount for establishing pit rehabilitation requirements for all pits at all times.

Independent Forest Audit – Record of Finding
Recommendation 18

Principle: 6. Monitoring

Criterion: 6.3 Silviculture Standards and Assessment Program

Procedure: 6.3.2 Assess whether the SFL/management unit assessment program is sufficient and is being used to provide the required silviculture effectiveness monitoring

Background Information and Summary of Evidence: The company invested significant resources in completing a very large silviculture monitoring program during the audit term. The regular FTG program was completed by company staff mainly by helicopter where appropriate but also through ground plots when more intensive assessment was required (using the Well Spaced Free Growing Assessment method). The FTG program totalled 18,140 ha of 28,243 ha planned for the 2004-09 term (~64%). The under-achievement was partially due to reduced activities during the audit term but was also due to undertaking the assessment of a very large area categorized in the inventory at the time as barren and scattered (i.e. backlog). The backlog area was mainly composed of older blow down areas, areas naturally regenerating following fires and areas regenerating following harvest.

The barren and scattered/backlog update project was completed by a contracted firm during leaf-off periods in the fall of 2004 and spring of 2005. The methodology was low-level helicopter fly-through with at least two calibration landings per day. MNR was involved with some of the early meetings between the company and contractor and also participated in the helicopter during the pilot project (a few base maps were completed in the fall of 2004 in advance of starting the entire project). Of the ~72,000 ha reports as surveyed, ~53,000 ha was declared FTG (~74%) - results were included in the 2007-08 Annual Report.

The audit included a ten percent sample, mainly by helicopter, of the regular and backlog update assessment areas. It was found in many of the backlog update areas deemed FTG that the hardwood composition was under-represented and that age and height was under-estimated in the inventory. The extent of the discrepancies between the original survey data and the status of the surveyed areas as observed by the audit tam could only be attributed to inaccurate calls during the original survey.

Completing assessment work during the leaf-off period is the likely source of the under-estimation of hardwood composition noted. Under-estimation of hardwood composition during surveys is a concern because full detection of forest change will be delayed until the next FRI is completed. Age/height issues are discussed in the next paragraph. Other than age, similar issues were found with the regular FTG program while stocking was also sometimes over-estimated and broad stratification was also noted.

From an examination of the backlog update project specifications and through interviews with company, MNR and contractor staff, it was determined that age was based on the year of disturbance i.e. the 1991 Pakwash blow down area was aged as ~14 years old in 2005. While this methodology is appropriate for disturbances where full kill or removal of the entire stand occurs (such as wildfire or clearcut harvest), it is not always appropriate for disturbances such as blow down that may leave considerable standing trees and/or advanced growth. For example, what was found during the audit of the Pakwash blow down area was that most of the regenerating trees were under-story advanced growth from the previous stand that are now approximately 40 years old. These trees are also much taller than what is in the inventory (~10 to 12 m on average versus 3 to 7 m).

Discussion: It is estimated that the barren and scattered survey cost over one-half million dollars to complete (~$6/ha) but timing of the assessment and the methodology required for updating the inventory reduced the accuracy of the product. It is important that future surveys are completed in a manner that allows for accurate hardwood estimation and that the inventory updating process maintains the accuracy of field information.

Conclusion: FTG records updated during the audit term need to be reviewed to ensure the data is accurate. The following recommendation builds on that recommendation by ensuring that the original field data is fully incorporated. The audit team believes that, following the update and verification that will occur as a result of the recommendation provided below, the inventory of barren and scattered areas will suffice for strategic-level planning until the next full inventory is completed.

Recommendation 18: MNR Kenora District must ensure that a review of the original field data of the barren and scattered survey occurs and that the inventory is appropriately updated with this information.

Independent Forest Audit – Record of Finding
Recommendation 19

Principle: 6. Monitoring

Criterion: 6.5 Annual Reports

Procedure: 6.5.1 Assess whether the text, tables and maps including digital information is accurate, complete and in accordance with the applicable; requirements
6.5.2 Assesses progress towards the objectives and targets identified in the FMP
6.5.3 Assess whether the observations and implications accurately reflect the levels of forest operations that have been implemented to date, any implications on achievement of objectives/targets of the FMP and future levels of forest operations

Background Information and Summary of Evidence:

1. Annual reporting during the audit term was fairly well done. Numbers in text and tables were often in agreement and 'to date' summaries were usually correct. However there were some concerns noted regarding the accuracy of some information. For example, the amount of assessment in the 2007-08 and 2008-09 ARs was incorrect and there were discrepancies in values within ARs. For example the 2007-08 AR suggests on one page that 7,199 ha was sprayed for jack pine budworm while on another page over 28,400 ha was sprayed. The latter was found to be correct.

2. Non-compliance (NC) was reported and discussed in the ARs but text regarding the reason for non-compliance and actions taken was cursory. It is unclear from the limited discussion provided how further EMS training is actually addressing recurring NC issues, such as trespass. The ARs also discuss specific road and crossing repairs and maintenance completed each year as required but there is nothing mentioned relative to effectiveness of road use management strategies. This may be due to having only completed decommissioning work in the last year of the plan term and thus having little effectiveness.

3. A large amount of area was assessed for renewal during the audit term. For areas that had been managed, silviculture success (i.e. following the path chosen) and regeneration success (i.e. not following intended path but adequate amounts of acceptable tree species present) was calculated and summarized in the ARs. However, important required information on how silviculture success is affecting plan objectives and other potential implications was not included in the ARs.

   In one AR the following is provided:
   Silvicultural success to the projected forest unit on normal harvest areas and natural disturbed areas was 53% of the area successfully regenerated. The ingress of jack pine and eventual dominance on 1,317 ha of area projected as SPDOM treated with a black spruce planting was the main contributing factor to decreasing the silvicultural success rate. Other contributing factors were the establishment of 437 ha of MIXED and 119 ha of PODOM forest units on projected SPDOM areas.

4. Under-achievement of tending was found to be a considerable issue in the 1999-2004 IFA for the Whiskey Jack Forest. The lack of tending during this audit term raises significant concerns regarding objective achievement and future forest condition.

   The ARs however include little discussion regarding the affect of the lack of tending (e.g.):
   The absence of a chemical tending program is a concern to the success of certain plantations.

   The limited tending on the forest may impede achievement of the forecasted forest condition, as described in the FMP. The inability to economically provided opportunity for optimum tree growth, could over time change the species composition of the forest by faster growing (poplar, white birch) becoming more frequent and slower growing, shade intolerant species (jack pine, spruce) becoming less frequent on the forest. This change will impact the local forest users dramatically. Similarly, recent renewal efforts may not result in expected results due to lack of tending operations, generating an increase in areas declared not sufficiently reforested.

More recent ARs also include the following regarding the lack of tending:
Prompt renewal activities with the use of superior growing stock are assisting to offset the absence of chemical tending.

5. Under-achievement of harvest area, volume targets and most renewal activities is documented in all ARs but there is little discussion regarding how this affects or will affect the achievement of plan objectives.

6. One objective in the 2004-2024 FMP was to move towards the template disturbance frequency through reducing fragmentation on the Forest. The ARs contain minimal information regarding this:
This being the third Annual Report of the 2004 FMP, there is not sufficient data available to mark the progress of meeting the frequency/size distribution objective. Reports for years 4 and 5 would provide a better indication of progress.

Unfortunately there is little provided in the year 4 and 5 reports – from the 2008-09 AR:
Harvesting on 5.3 ha occurred in location ID 561 in 2008-09. The remaining area harvested this year was within contingency blocks amended to the FMP thus were not part of the planned clear cut analysis conducted in the 2004 FMP.

Other notable discussions/assessments missing from some or all ARs:
- the need to increase, maintain or decrease renewal rates
- the reason for non-compliances and kinds of actions taken to mitigate non-conformances
- implications on achievement of long-term management direction not included with the assessment of regeneration success
- effectiveness of use management strategies for roads

Discussion: The ARs generally cover required topics but in depth analysis and discussion is lacking. For example, deviations between planned and actual activity amounts were provided and reasoning was often provided for achievement rates but discussion of how this affected or will affect plan objectives did not occur. Potential implications were sometimes discussed but with little detail. For example, the average silviculture success rate over the term was 71% but the implications of this were not discussed. Some discussion of possible affects of no tending was provided but some text actually raised questions rather than answered questions – e.g. what studies were done to determine how superior growing stock is offsetting the lack of tending? Regarding analysis of planned clear cuts, Table AR-3 in the later ARs indicates a number of planned clearcuts are completed, certainly enough to start discussing movement towards meeting this objective.

Conclusion: ARs should be a clear and accurate presentation of annual forest operations but are often inadequately and/or hastily prepared. ARs normally meet the basic accounting/summary of operations FMPM requirements but miss the deeper discussions required of the FMPM. Moving forward, this should be considered during development of ARs.

Recommendation 19: The Forest Manager must ensure that:
a) all information in the Annual Report is confirmed for accuracy prior to finalization,
b) future Annual Reports contain all required discussions including progress towards achievement of plan objectives, potential implications of operations on future operations and effectiveness of road use management strategies.

Independent Forest Audit – Record of Finding
Recommendation 20

Principle: 7. Achievement of Management Objectives and Forest Sustainability

Criterion: 7.1 Year Ten Annual Report

Procedures: 7.1.1 to 7.1.7

Background Information and Summary of Evidence:

1. As per the regular ARs audited, there were inconsistencies noted in the Year 10 AR. For example, there were discrepancies between the individual AR harvest areas and associated harvest volumes versus the total in the Year 10 AR; however, all renewal and compliance values were found to be correct. There was also a difference in area assessed – individual ARs total 19,162 ha vs the Year 10 AR total of 17,235 ha. The 2007-08 and 2008-09 ARs had errors that led to this difference.

2. The Year 10 AR included a review of renewal and tending operations during the term as well as expenditures, silvicultural effectiveness and harvest/renewal trends. Section 4.2 also included a discussion of renewal trends, etc. but, according to the author, "the change in forest units in the 2004-2024 FMP makes it difficult to compare between terms". Lack of aerial spray and likely changes to forest composition and the inability to provide the preferred future forest condition was also noted as was the increased use of planting without site preparation. Although "this practice has been limited to the least competitive sites, until herbicides can be used", direct planting viewed during the audit occurred on a variety of sites, including some very competitive sites.

   There was no discussion in the Year 10 AR regarding changes that may affect future silviculture effectiveness or expenditures and although there were three changes to renewal rates during the audit term, there was no rationale for this in any of the ARs including the Year 10 AR.

   There was no discussion regarding the effectiveness of silvicultural treatment packages that are exceptions to the forest management guides in the text.

3. The Year 10 AR includes the following:
   Many of the model assumptions are difficult to assess for two reasons. The 2009-2012 Contingency Plan carried forward the objectives, strategies, modeling, and targets from the 2004-2024 FMP. The assessment of forest conditions, habitat levels, yield curve adjustments, age class distribution, forest unit classification, etc. were not conducted for the 2009 plan, thus not available for comparison to 2004 targets. Secondly, with only 57% of the forecast harvest area being achieved, targets related to yield, disturbance patterns, silviculture, budgets, etc. may be skewed due to selection and location of harvest allocations.

   This discussion does not meet the FMPM requirements.

4. The Year 10 AR includes a section regarding the 1999-2004 IFA action plan but it is merely a summary of the recommendations and suggestions from the audit and a cursory note that "All recommendations have been addressed in the draft action plan currently in the final stages of approval by the MNR. The status of these action items is completed with the exception of two recommendations".

5. According to Table AR-20 in the Year 10 AR, many of the objectives cannot be assessed because the 2009-2012 Contingency Plan did not run SFMM and the FRI for the 2009-2019 FMP, which was never developed, had some new forest units.

6. Section 4.6.1 of the Year 10 AR includes a Social and Economic Review that focuses on mill closures and the working group developed between MNR and Grassy Narrows First Nation as well as the intended surrender of the SFL by ACCC. This does not meet the FMPM requirements (Part E 4.6.1) that an updated social and economic description be prepared.

7. The FMPM Part E 4.6.2 requires that recommendations be developed as a result of the determination of sustainability and social and economic review. The recommendations are to focus on considerations for the

next FMP including changes to the LTMD and forest operations. Considering the issues noted in ARs and witnessed during the audit, this section should be substantial and should 'set the stage' for the next FMP. Unfortunately, only the following was provided:

Due to the current conditions of the forest industry, many objectives or targets were not achieved during this term. Similarly, the development of the 2009-2012 Contingency Plan by carrying forward objectives and targets from the 2004-2024 FMP did not allow for a complete assessment. The 2011 and 2012 Annual Reports should provide an assessment of achievements for the eight year term (2004-2012).

Discussion:

1. The Year 10 AR was a fairly accurate compilation of activities that occurred during the 2004-09 term but errors still occurred when compared to a summary of the ARs.

2. Some attempt should have been made to analyze the main forest units (pj dom, sb dom, pt dom, mixed wood) to determine renewal trends. Also, it was noted that the analyses contained in the Year 10 AR were not carried forward into the 2009-2012 Contingency Plan since the strategic direction from the 2004-2024 FMP had to be used. It is expected that gains in knowledge made over the audit term and beyond will need to be incorporated in the planning for the next full FMP for the Whiskey Jack Forest. Thus, this work needs to be completed.

3. The requirement is that, based on new information, operations, etc., the 2004-2024 FMP assumptions are reviewed so that modifications/revisions can occur in the next FMP. Although the next plan turned out to be a three year Contingency Plan for 2009-2012 that used the strategic direction from the 2004-2024 FMP, this review still needs to be done for future use (i.e. the development of the 2012-2022 FMP) which was already under way during the conduct of the audit.

4. The text provided in the Year 10 AR does not fulfill the FMPM requirement that the text summarize the IFA action plan, including a discussion of the progress on implementation and any implications.

5. SFMM could have been re-run at the end of the term with the actual harvest areas to determine the trends. Likewise, the inventory for the 2004-2024 FMP could have been updated with accruals and depletions to 2009 without changing the forest units.

6. The Social and Economic Review does not meet the FMPM requirements (Part E 4.6.1) that an updated social and economic description be prepared.

7. The proposed delay of required work to another AR does not meet FMPM requirements.

Conclusion: Overall, the tendency in the ARs reviewed, including the Year 10 AR, was to provide cursory explanations for many important trends, delay required analyses and give poor explanations for not completing required work. The level of analysis and discussion in the Year 10 AR is deemed to be sub-par and inadequate and a recommendation is made to revise the AR to meet requirements.

Recommendation 20: MNR Kenora District must ensure that the 2008-09 Year 10 AR is revised to include the following:

a) analysis/discussion of changes that may affect future levels, effectiveness and expenditures of renewal and tending operations,
b) analysis/discussion of effectiveness of silvicultural treatment packages that are exceptions to the forest management guides,
c) review/discussion of needed modifications or refinements to modeling assumptions,
d) a summary of progress on implementation of the 1999-2004 IFA Action Plan,
e) an update of the inventory and running of SFMM at plan end (2009) to determine objective achievement,
f) an update of the 2004-2024 FMP social and economic description, and
g) based on the determination of sustainability and the social and economic review, develop recommendations for the next FMP.

Independent Forest Audit – Record of Finding
Recommendation 21

Principle: 8. Contractual Obligations

Criterion: 8.1.9 Audit action plan and status report

Procedure: 8.1.9 Assess whether the action plan was prepared in accordance with requirements.
8.1.9.2 Assess whether status report was prepared in accordance with requirements.

Background Information and Summary of Evidence: During the 2004 IFA one of the key recommendations was that the Action Plan Status Report for the 1999 IFA be submitted, to allow MNR to act on the recommendation by the 1999 IFA audit team that the licence be extended. The Minister typically requires demonstrated progress on the actions associated with recommendations arising from an IFA before the licence is extended; the audit action plan status report documents that progress and provides supporting information necessary to make such a decision. As of the start of the 2009 IFA the 1999 IFA action plan status report was not finalized; however the licence was extended in 2006.

The 2004 IFA action plan had not been finalized; and therefore neither had the status report been prepared at the time of the 2009 IFA. The 2004 IFAPP required the action plan be prepared subject to written MNR approval within two months of receipt of the final audit report, unless otherwise directed by the Minister. The audit report was submitted in April 2005. There was no evidence that an extension to the submission time for the audit action plan was granted. The audit team reviewed email records mostly from April 2008 to June 2009 between the MNR Northwest Region and SFL representatives and/or MNR staff regarding preparation of the audit action plan and status report, including the 1999 IFA status report. There was only a single record of correspondence on the subject between August 2005 and April 2008. The audit team also spoke with MNR Kenora District staff, the Northwest Region representative and an SFL representative on this subject.

Conclusion: It appears that the strained working relationship between the District and ACCC and priority given to what were deemed other more pressing tasks were at the root of the failure to meet IFAPP action plan and status report submission requirements. The lack of regular communication between all parties with responsibility to prepare the action plans and status reports also appears to be a contributing factor in the protracted delays in submission. Despite this, the delays in submission of these documents did not significantly impact implementation of actions to address the recommendations arising from the 2004 IFA.

Recommendation 21: The MNR Kenora District Manager and the Forest Manager must ensure that the audit action plan and status report comply with all IFAPP submission requirements.

Appendix 2 – Management Objectives Tables

2004-2024 Forest Management Plan - Whiskey Jack Forest

Objective		Assessment - Auditor Comments
Forest Diversity Objectives		
Forest Structure	Maintain or move toward a natural age class structure that is within the estimated bounds of natural variation for the Whiskey Jack Forest through management planning and silviculture.	Not Met - due to declining harvest rates related to economic factors outside the control of forest managers.
Forest Composition	Maintain or move toward a range of forest units and age classes within the bounds of natural variation as developed for the Whiskey Jack Forest.	Not Met - due to lack of tending.
Natural Disturbance Emulation	Emulate natural disturbance patterns, characteristic of the Whiskey Jack Forest.	Met - NDPE guidelines applied appropriately.
Social and Economic Matters Objectives		
Sustained Wood Supply	Provide a predictable and continuous supply of wood to the forest products industry from the Whiskey Jack Forest.	Not Met - due to ongoing dispute with Grassy Narrows First Nation and market collapse, which are factors outside the control of forest managers.
Working with Aboriginal Peoples	Work with local Aboriginal peoples, whose communities are situated in or adjacent to the Whiskey Jack Forest, to identify and implement forest operations (harvest, access, renewal, maintenance and protection) that will maintain or enhance social and economic benefits to Aboriginal peoples. Targets (non-quantifiable): • Provide opportunity to harvest, through overlapping license, 10,000 m^3 on an annual basis to members of the Grassy Narrows First Nation. • Provide opportunity to harvest, through overlapping license, 10,000 m^3 on an annual basis to members of the Wabauskang First Nation.	Met - 52,868 m^3 allocated for harvest by OFRL holders in Table FMP-23. No volumes reported as harvested by Grassy Narrows FN. Wabauskang FN community member harvest averaged 26,000 m^3 per year. Tree planting and tree thinning work conducted by Aboriginal contractor.
Forest Resources for Personal and Commercial Use	Make available incidental volumes of timber for other uses such as fuelwood, building logs, furniture and other materials. (These incidental volumes will come from areas allocated within this FMP).	Met - ARs note personal use of fuel wood during term. MNR confirmed availability.

Objective		Assessment - Auditor Comments
Tourism, Commercial and Non-commercial Users	Select and prescribe forest operations (harvest, renewal, maintenance, protection and access) that consider the requirements of other forest users, allowing continued use of the forest while minimizing conflict between forest operations and other forest users.	Met Road systems were generally open for public use and roads were maintained while company was operating. 43 tourism operators responded and 33 accepted invitation to participate in RSA process – the group was further refined as individuals inspected the proposed area of operations maps. 13 RSAs were negotiated and drafted for signature. These RSAs provided the basis for tourism AOC prescriptions for the Plan. Public consultation process was followed; AOC planning provided opportunities for discussion and protection of known values.
Other Land Uses	Conduct forest management activities in a manner that considers private land, parks and other land designations or values.	Met - AOC prescriptions were followed for all AOCs examined in the field portion of the audit.
Cultural Heritage Values	Protect identified, registered, or high potential archaeological and cultural heritage sites from conditions that could potentially damage or cause an increase in rates of deterioration.	Met - High Potential Cultural Heritage AOCs applied and implemented; AOC prescription permits timber harvest only when ground conditions prevent surface soil damage – no SIP – winter roads permitted when ground frozen and <1% of AOC is disturbed – no ditching.
Provision of Forest Cover Objectives		
Selected Wildlife Species	Provide suitable/preferred habitat within the bounds of natural variability for the selected wildlife species within the Whiskey Jack Forest.	Met in planning phase. Only Great Grey Owl falls below the null and only by 1.65% for one term. Silviculture direction of the FMP was not implemented thereby compromising the ability to meet this objective in the long term. See Recommendation 3.
Woodland Caribou	Maintain or improve contribution of the Whiskey Jack Forest to continued range occupancy and healthy populations of woodland caribou in Northwestern Ontario.	Met - The Northwest portion of the Whiskey Jack Forest is managed under Woodland Caribou guidelines. No forestry activities had occurred in this area during the audit term.

Objective		Assessment - Auditor Comments
Marten	Maintain or move toward having 10-20% of capable marten habitat area in suitable conditions arranged in core areas of 3,000 to 5,000 hectares.	Not Met FMP only provides for 3.7% in 36 cores - deferral of these 36 cores for the next 60 years, providing there is no natural disturbance, will provide for an increase of suitable marten habitat to 70,603 ha (10.4% capable) by 2064. Silviculture direction of the FMP was not implemented thereby compromising the ability to meet this objective in the long term. Without implementing planned silviculture direction future marten habitat is unlikely to improve significantly. See Recommendation 3.
Moose	Retain a year round supply of suitable habitat (including foraging and winter habitat) for moose on the Whiskey Jack Forest.	Partially Met - See Appendix 8D, pg. 18 of the 2004-2024 Whiskey Jack Forest FMP. Shelter patches not all refined as planned. See Recommendation 6.
Stick Nests	Provide for the protection of nest sites and associated habitat of bald eagle, osprey, great blue heron and other locally significant forest dwelling raptors.	Met - Accomplished through application of various AOCs associated with each of these species.
Soil	Minimize any possible adverse effects of forest practices on soil quality.	Partially Met - Rutting no longer an issue on forest but compaction of fine textured soils appears to be an issue on some sites viewed. See Recommendation 7.
Fisheries and Water Quality Function	Maintain riparian habitat, water quality and to prevent the harmful alteration, disruption or destruction of fisheries habitat where forest management activities occur.	Partially Met - Riparian AOCs implemented. Water crossings that are installed during the winter need monitoring to address erosion concerns. See Recommendation 16.
Silvicultural Objective		
Silviculture	Apply the most appropriate level of silviculture that will ensure the long-term forest sustainability while consistent with all other objectives of this plan.	Not Met - Planting objective over-achieved but most trees were direct planted. Therefore SIP and seeding under-achieved. SIP too wide and too light, direct plant is resulting in low stocking. Tending almost non-existent. Target stocking and species composition objectives will not be met. See Recommendation 9, Recommendation 10, Recommendation 11, Recommendation 12.

Appendix 3 – Compliance with Contractual Obligations

The following table provides the conditions of SFL No. 542253 for the Whiskey Jack Forest. Each condition is provided on a separate row with comments by the audit team to report on the degree of attainment of the condition.

Licence Condition	Licence Holder Performance
Payment of Forestry Futures and Ontario Crown charges	Met – according to information provided to the audit team by MNR.
Wood supply commitments, MOAs, sharing arrangements, special conditions	According to annual reporting most of the wood supply commitments could have been met during the term. Poor markets were the over-riding issue that led to less than 50% of the planned volume being harvested during the term. The 2009-2012 Contingency Plan intends to meet all wood supply demands. Hardwood veneer (poplar) to Columbia Forest Products: No response from Columbia FP to audit team request for input. Non-veneer aspen and birch to Weyerhaeuser Company Limited: Not Met in 2008 due to Grassy Narrows FN actions. Jack pine, spruce and balsam to Kenora Forest Products Ltd.: Met; mill closed in 2008.
Preparation of FMP, AWS and reports; abiding by the FMP, and all other requirements of the FMPM and CFSA	Partially Met - FMPs and AWSs were generally prepared as required. However errors were noted in text and tables of ARs, in depth analysis was lacking in ARs including the Year 10 AR, and the process for revising forest operations prescriptions was not followed in the AWSs. See Recommendation 19 and Recommendation 20. Partially met with respect to following the planned silviculture plan during the term. Recommendation 9 through Recommendation 13 and related text cover on-the-ground silviculture issues discovered during the audit.
Conduct inventories, surveys, tests and studies; provision and collection of information in accordance with FIM	Met with respect to collection of survey information; however, the information is not being effectively used during planning. See Recommendation 2.
Wasteful practices not to be committed	Met – Utilization was observed to be acceptable, with minor exceptions.
Natural disturbance and salvage SFL conditions must be followed	Met – Salvage of some blown-down timber occurred during the audit term. Planning for this work met requirements.
Protection of the licence area from pest damage, participation in pest control programs	Met – Insect Pest Management Plans covering several forests including the Whiskey Jack Forest were developed and implemented in 2006 and 2007. The company had representation on the planning teams for these plans and worked with MNR to help identify and map affected areas but no plans were made to salvage these areas mainly due to inaccessibility.
Withdrawals from licence area	N/A
Audit action plan and status report	Not Met – Prolonged delays in the preparation, submission and approval of audit action plans and status reports by both the company and MNR Kenora District.

Licence Condition	Licence Holder Performance
	Neither the 1999 IFA Status Report nor the 2004 IFA audit action plan and status report were finalized by the time of the 2009 IFA. See Recommendation 21.
Payment of forest renewal charges to Forest Renewal Trust (FRT)	Partially Met – Regular contributions were made for most of the audit term.
Forest Renewal Trust eligible silviculture work	Met –Verification of maps, records, and fieldwork associated with Forest Renewal Trust Account expenditures for 2006-2007 were found to be accurate.
Forest Renewal Trust forest renewal charge analysis	Analysis conducted, however audit team recommended further review – see Recommendation 14.
Forest Renewal Trust account minimum balance	Partially Met – Minimum balance requirement met in three of five years
Silviculture standards and assessment program	Not Met - Section 16 of the SFL document outlines the silviculture standards requirement: *The Company will implement the necessary silvicultural prescriptions on lands described in paragraph 16.2 herein* (i.e. Category 2 Lands, which are essentially all areas harvested since 1994) *so as to meet the silvicultural standards described in the approved Forest Management Plan for the Whiskey Jack Forest when the silvicultural prescriptions were made, or in accordance with any amendment of that standard.* Considering the field audit findings and the silviculture monitoring results for the audit term, it is clear that the company did not fully meet its obligation with regards to silviculture standards during the audit term. Now that the licence has been officially surrendered, MNR is responsible for this obligation until a new forest management company has taken over. It is expected that completing the actions necessary to meet several recommendations in this audit may lead to fulfilling this requirement. This should be a consideration of prospective forest managers.
Aboriginal Opportunities	Met – Opportunities included wood harvesting, tree planting, slash pile burning, thinning, nuisance beaver control; opportunities provided to participate on the LCC and during forest management planning, including learning opportunities.
Preparation of compliance plan	Met - Company prepared the compliance plan and annual compliance schedule and carried out regular inspections of operations. Inspection reports were prepared and submitted as required. Overall compliance levels were considered acceptable. ACCC developed the Strategic Compliance Plan for the 2004-2024 FMP and Annual Compliance Schedules for each year during the audit term. Due to pending surrender of the SFL, MNR developed the Strategic Compliance Plan for the 2009-2012 Contingency Plan. These documents all met content requirements. ACCC also had an internal prevention/education program during the audit term, which MNR felt met the requirements and needs of forest management on the unit. As noted in the monitoring section of this audit report, there was a significant discrepancy between MNR and

Licence Condition	Licence Holder Performance
	company compliance findings during the audit term and annual reports noted the company's disagreement with some of the ministry's compliance findings. It is hoped that the new management entity for the Forest maintains a cooperative relationship with MNR so that, amongst other things, differences in compliance interpretation can be minimized. Overall, considering the significant sector downturn, contractors going out of business and mill closures, the compliance program delivered during the audit term was acceptable but compliance rates indicate that improvements can be made.
Internal compliance prevention/education program	Met – Implemented through company EMS training programs.
Compliance inspections and reporting; compliance with compliance plan	Met – Compliance plan implemented; inspections conducted and compliance reports submitted.
SFL forestry operations on mining claims	Met – No infractions reported.
SFL or Agreement extension recommendation	None made due to surrender of SFL to the Crown in August, 2009.

Appendix 4 – Audit Process

The Independent Forest Audit Process and Protocol (IFAPP) was developed by MNR to provide a comprehensive and consistent method of evaluating forest management activities on Crown land. The IFAPP (2009) states that the purpose of an Independent Forest Audit is to:

a) assess to what extent forest management planning activities comply with the Forest Management Planning Manual (FMPM) and the Crown Forest Sustainability Act (S.O. 1994, c. 25) (CFSA);
b) assess to what extent forest management activities comply with the CFSA and with the forest management plans, the manuals approved under the CFSA and the applicable guides;
c) assess the effectiveness of forest management activities in meeting the forest management objectives set out in the forest management plan, as measured in relation to the criteria established for the audit;
d) compare the forest management activities carried out with those that were planned;
e) assess the effectiveness of any action plans implemented to remedy shortcomings revealed by a previous IFA;
f) review and assess a licensee's compliance with the terms and conditions of the forest resource licence.

The IFAPP is based on eight guiding principles and contains 158 procedures, 135 of which are applicable to the Whiskey Jack Forest. Of that number a further 15 procedures were not audited due to sampling or by exemption under the IFAPP. The audit procedure serves as a framework to provide a structured approach to evaluating whether or not forest management activities meet the requirements governing forestry practices on Crown land in Ontario. The guiding principles are:

1. Commitment
2. Public consultation and Aboriginal involvement
3. Forest management planning
4. Plan assessment and implementation
5. System support
6. Monitoring
7. Achievement of management objectives and forest sustainability
8. Contractual obligations

MNR categorized the various IFA procedures based on complexity and their potential impact on forest sustainability. The IFAPP directs the audit team to assess through sampling, per audit principle and associated criteria, the three categories of procedures as follows:

- Administrative procedures – low (L) risk: 20-30% of L procedures to be assessed
- Administrative but also having a bearing on sustainable forest management – medium (M) risk: 50-75% of M procedures to be assessed
- Procedures directly related to sustainable forest management – high (H) risk: 100% of H procedures to be assessed

The lower range of the sample scale may be considered for forests certified in accordance with a sustainable forest management standard accepted by Ontario. The following table summarizes the number of procedures selected by the audit team for audit based on the direction provided by the IFAPP.

Table: Summary of the number of procedures selected by the audit team for audit based on direction provided in the IFAPP.

Principle	Procedures Audited by Risk Category							Comments
	Low Risk			Medium Risk			High Risk	
	Applicable (#)	Selected (#)	% Audited	Applicable (#)	Selected (#)	% Audited	Audited (#) (100% of applicable audited)	
1. Commitment	0	-	0	2	0	0	0	The Whiskey Jack Forest was certified to CSA Z809-02 for the majority of the audit term and therefore Principle 1 was considered met.
2. Public Consultation and Aboriginal Involvement	0	-	0	6	5	83	2	Procedure *not* audited: 2.6.1
3. Forest Management Planning	6	3	50	12	8	67	36	Procedures *not* audited: 3.2.1.1, 3.2.1.2, 3.2.2.1, 3.3.2.3, 3.6.2.1, 3.9.2.1, 3.9.3.2
4. Plan Assessment & Implementation	1	1	100	1	1	100	9	
5. System Support	0	-	0	1	1	100	1	Procedure 5.1.1 *not* audited because the Whiskey Jack Forest was certified to CSA Z809-02 for the majority of the audit term.
6. Monitoring	0	-	0	7	5	71	11	Procedures *not* audited: 6.1.2; 6.4.3
7. Achievement of Management Objectives and Forest Sustainability	0	-	0	2	1	50	13	Procedure *not* audited: 7.1.8
8. Contractual Obligations	0	-	0	4	3	75	8	Procedure *not* audited: 8.1.8.1
Totals	7	4	57	35	24	69	80	

The audit process for the Forest consisted of seven components:

1. Audit Plan: KBM prepared an audit plan that described the schedule of audit activities, audit team members and their qualifications, audit participants, and auditing methods. The audit plan was submitted to MNR, ACCC, the Forestry Futures Trust Committee, and the Chairs of the Kenora LCC and the Red Lake District Resource Management Advisory Committee.

2. Public Consultation: Several means of engaging consultation for the audit were used. Utilizing the MNR Kenora District mailing list, KBM mailed letters to numerous parties advising of the audit and inviting their input. Mail-outs included a one-page survey to solicit public input to the audit process. The survey was also available to the general public on the KBM website (www.kbm.on.ca). Newspaper ads were published in four area newspapers prior to the pre-audit meeting advising the public of the upcoming audit, identifying the purpose of the audit and inviting the public to submit comments to the LCC Chair or directly to KBM.

3. Aboriginal Engagement: KBM sent a letter to four Aboriginal communities and the Kenora Metis Association, each with either a direct relationship or involvement in forest management

planning on the Whiskey Jack Forest, inviting their participation in the IFA for the Whiskey Jack Forest. The letter requested their input and encouraged them to contact KBM if they wished to participate in the audit or if they required more information before making a decision. Follow-up phone calls were made during the site visit to encourage a response. In addition, standard public notification letters were sent to other Aboriginal communities and organizations not directly located on the Forest or involved in planning for the Forest.

4. Field Site Selection: The audit team conducted a preliminary site selection prior to meeting with ACCC and MNR staff. Annual Work Schedules and Annual Reports were used to determine the amount and type of forest operations carried out on the Forest during the audit period. A stratified random sample of sites was then selected to ensure that selected sites were representative of a cross section of all activities conducted on the Forest during the audit period. A pre-audit meeting was held in Kenora on August 5, 2009. Part of the pre-audit site visit was spent discussing the preliminary site selection and preparation of field packages with ACCC and MNR.

5. Pre-audit Document Review: Prior to the September site visit, the audit team reviewed documents provided by ACCC and MNR, including the:
    a) Whiskey Jack Forest 2004-2024 FMP and 2009-2012 Contingency Plan
    b) Annual Work Schedules and Annual Reports associated with the 2004-2024 FMP
    c) Comparison and Trend Analysis of Planned versus Actual Forest Operations Report (TAR)
    d) Whiskey Jack Forest Independent Forest Audit 1999-2004 report
    e) Whiskey Jack Forest 1999-2004 draft Independent Forest Audit Action Plan/Status Report.

    The audit team also developed a questionnaire that was circulated to planning team members and other ACCC and MNR District staff prior to the on-site audit to assess their perceptions regarding the effectiveness of specific components of forest management on the Whiskey Jack Forest. The results of the survey provided additional focus to IFAPP prescribed interview procedures that occurred on site.

6. On-Site Audit: The objectives of the field site visits were to confirm that activities were conducted according to plan, that they conformed to provincial laws, regulations, and guidelines, and that they were effective. The opening meeting was held in Kenora on September 14, 2009. During the on-site visit portion of this audit, the audit team spoke with staff of ACCC, MNR, and LCC members. The audit team examined documents, records and maps at the MNR Kenora District office, and spent three days in the field viewing selected sites. Representatives of ACCC, MNR Kenora and Red Lake Districts, MNR Forest Management Branch, and a representative of the Forestry Futures Trust Committee (FFTC) accompanied the audit team during a portion of the field audit.

    Many stops provided the opportunity to audit multiple activities such as harvesting, renewal, values protection, etc. The following table presents the actual sampling intensity for each forestry activity examined on the ground as part of the field site visits. Due to access and time constraints, the audit team relied on a helicopter to reach many of the selected field sites. The helicopter also provided opportunities for overviews of the subject areas, enabling overall examination of target blocks.

7. The closing meeting was held in Kenora on September 21, 2009. This meeting provided a forum for the audit team to present and discuss preliminary audit findings with ACCC, MNR and a representative of the Kenora LCC.

Table: Audit sampling intensity for the Whiskey Jack Forest.

Activity	Total Area or Number (2004-2009)	Area or Number Sampled	Percent Sampled
Harvest (ha)	14,283[1]	1,948	14
Artificial Regeneration (ha)	13,967[1]	1,376	10
Natural Regeneration (ha)	7,068[1]	702	10
Tending	1,369[1]	124	9
Declared FTG - Regular (ha)	12,271[1]	1,495	12
Declared FTG - Backlog (ha)	53,042[2]	7,000	13
Protection (ha)	30,805[1]	3,000	10
Area of Concern Categories[3] (#)	22	10	45
Road Construction (km)	19.2[1]	19.2	100
Specified Procedures Review[4] (ha)	4,107	678	17

[1] Source: draft 2008-09 Annual Report
[2] Source: 2007-08 Annual Report
[3] Area of Concern categories refer to the different types of AOCs present on the Forest. Examples include riparian reserves, cold water fisheries, eagle nests, etc. More than one AOC was associated with some sites selected for review of harvest and renewal operations.
[4] The Specified Procedures Review involved the verification of maps, records, and fieldwork associated with Forest Renewal Trust Account expenditures for 2006-2007.

8. Final Report: The audit results are presented in this report following a brief description of the audit process and the forest licence area under review. Within the report the audit team has made recommendations to address instances of non-conformance to a law and/or policy, or an identified lack of effectiveness in forest management activities.

   Recommendations from this audit must be addressed in an action plan developed by the Forest Manager and MNR Kenora and Red Lake Districts, with input and review by MNR Regional and Forest Management Branch representatives. MNR Regional and Forest Management Branch representatives will also develop an action plan to address any recommendations applicable to matters of forest management within the scope of responsibilities of these departments.

   Suggestions are no longer highlighted in audit reports, nor will they be addressed in action plans. Any suggestions of the audit team are incorporated within the regular text of the report.

Nineteen responses to the public notices and survey were received. Commenter's areas of interest in forest management on the Whiskey Jack Forest were recreation, employment, conservation, LCC, tourism and Aboriginal rights.

Local Citizens' Advisory Committee

Letters were mailed to all current members of the LCC to notify them of the audit and invite their input. The lead auditor attended an LCC meeting in Kenora in August, 2009 to discuss the audit and any concerns the LCC members might have about the Forest. The audit team attended an LCC meeting during the site visit to receive additional input and answer questions. A representative from the Kenora LCC and the Red Lake LCC each participated on one of the field days and a Kenora LCC representative was present during the closing meeting.

LCC representatives interviewed were generally complimentary of the support provided to the LCC by MNR; however concern was expressed by one member that the LCC's opinions were not always welcomed by MNR. Both LCCs stated that attendance by the public at information sessions was low despite the sessions being well organized and informative. It was felt that people typically only attend if they are directly affected by proposed forest management activities. A Kenora LCC representative expressed major concerns with the accuracy of the forest resource inventory, and the reliability of SFMM, citing that the LCC has no expertise to satisfy them of the sustainability of the forest and must rely on the audit.

Aboriginal Communities

A letter was mailed to each of the Aboriginal communities on the MNR District contact list inviting them to participate in the audit. The letter explained that their input is welcomed and encouraged them to contact KBM if they wish to participate in the audit or if they require more information before making a decision. Follow-up phone calls were made to further solicit input. Separate in-person meetings were held with representatives of Wabaseemoong First Nation and Grassy Narrows members of the Forest Management Working Group. Grassy Narrows representatives presented a lengthy list of concerns that it considers unresolved and expressed dissatisfaction with what they consider a lack of meaningful progress in discussions under the Process Agreement with MNR. Wabeseemoong representatives did not state that they had specific significant concerns with forest management on the Whiskey Jack Forest at this time.

Overlapping Licensees, Contractors and Commitment Holders

All businesses listed in the MNR District mailing list were sent the one-page KBM survey and letter soliciting input to the audit. Two of three commitment holders responded noting commitments were met in four of the five years. In 2008 commitments were not met due to circumstances beyond the control of the licensee. A meeting with Weyerhaeuser representatives took place during the audit. They expressed concerns that delays in the planning process and deficiencies in operational planning may negatively impact upon their ability to realize their commitments in the future.

SFL Holder

Interviews were held with the company's current planning forester and the former forestry superintendent. Information on the surrender agreement was also provided by SFL senior management. The current planning forester attended the site visit including portions of the field audit. Two senior managers participated in the opening meeting and one in the closing meeting via conference call. The audit team appreciates ACCC's efforts in supporting the audit process.

Ministry of Natural Resources

Interviews were held with Kenora District staff including the District Manager, Area Supervisor, Area Forester, Area Biologist, Area Technicians and Resource Liaison Specialist. MNR District personnel also accompanied the audit team in the field for one day including the Area Supervisor, Area Forester, and Area Technicians. The pre-audit meeting and audit opening and closing meetings were attended by MNR District personnel. The audit team appreciates the cooperation and assistance provided by MNR Kenora District staff in preparing the audit field packages and coordinating the field site visits.

One MNR Northwest Region representative participated in the pre-audit meeting and the closing meeting via teleconference.

Two representatives from MNR Forest Management Branch attended one field day and the Branch was also represented during the pre-audit meeting and closing meeting via teleconference.

Forestry Futures Trust Committee

One representative from the Forestry Futures Trust Committee participated in the pre-audit meeting via conference call, two representatives attended the opening meeting and one field day, and two representatives attended the closing meeting via teleconference.

Appendix 5 – List of Acronyms

ACCC	Abitibi-Consolidated Company of Canada
ACOP	Annual Compliance Operating Plan
AOC	Area of Concern
AR	Annual Report
AWS	Annual Work Schedule
Btk	Bacillus thuringiensis kurstaki
CEA(SFM)	Certified Environmental Auditor (Sustainable Forest Management)
CFSA	Crown Forest Sustainability Act
CP	Contingency Plan
CSA	Canadian Standards Association
EMS	Environmental Management System
EMS(LA)	Environmental Management System Lead Auditor
FFTC	Forestry Futures Trust Committee
FMP	Forest Management Plan
FMPM	Forest Management Planning Manual
FOIP	Forest Operations Information Program
FOP	Forest Operations Prescription
FRI	Forest Resource Inventory
FRTF	Forest Renewal Trust Fund
FTG	Free-to-Grow
GIS	Geographic Information System
GNFN	Grassy Narrows First Nation
IEA	Individual Environmental Assessment
IFA	Independent Forest Audit
IFAPP	Independent Forest Audit Process and Protocol
LCC	Local Citizens Committee
LTMD	long term management direction
MNR	Ministry of Natural Resources
MOA	Memorandum of Agreement
MOE	Ministry of Environment
R.P.F.	Registered Professional Forester
RSA	Resource Stewardship Agreement
SAP	supplemental aerial photography
SFL	Sustainable Forest Licence
SGR	Silviculture Ground Rule
SIP	Site Preparation
SMA	Selected Management Alternative
TAR	Comparison and Trend Analysis of Planned vs. Actual Forest Operations Report

Appendix 6 – Audit Team Members and Qualifications

Name/Role	Mr. Rod Seabrook • Lead Auditor • Public Consultation and Aboriginal Involvement
Responsibilities	Overall audit coordination and oversight of activities of the audit team; including public consultation and Aboriginal involvement in forest management planning; lead the assessment of achievement of management objectives, forest sustainability and contractual obligations
Credentials	M.Sc. Biology; CEA(SFM); EMS(LA); 29 years forestry experience in Ontario; principal area of practice is forest management and environmental auditing; accredited as a Certified Environmental Auditor (Sustainable Forest Management) by the Canadian Environmental Certification Approvals Board and as an Environmental Management System Lead Auditor by the Auditing Association of Canada; Associate member of the Ontario Professional Foresters Association; ten years of auditing experience; participated in 20 Independent Forest Audits for the Province of Ontario (seven as lead auditor; eight as lead and wildlife/ecology auditor; three as wildlife/ecology auditor; two as secretariat); IFA experience covers all Crown managed forest types in Ontario; conducted sustainable forest management audits under the various recognized sustainable forest management standards in Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick, Minnesota, South Carolina, Georgia, Mississippi, Alabama, and Texas; participated in over 90 3rd party audits to the ISO 14001 EMS, CSA Z809, SFIS, FSC, and Chain of Custody standards.
Name/Role	Mr. Peter Higgelke • Wildlife/Ecology/Planning
Responsibilities	Inspect AOC documentation and practices; audit aspects of forest management related to environmental protection and wildlife practices; review access management program; review aspects of planning; assess achievement of management objectives, forest sustainability and contractual obligations
Credentials	R.P.F., M.Sc.F.; 29 years forestry experience in Ontario, Quebec, and Germany; served on one FMA Review and 16 IFAs, under a range of audit roles including Lead, Harvesting, Silviculture, Wildlife and Planning Auditor as well as auditing under FSC, including three forest management certification audits, three forest management scoping audits, six forest management surveillance audits and one chain-of-custody audit; completed ISO 14001 EMS Lead Auditor training through the Quality Management Institute in April 2006. Extensive knowledge and experience with wildlife and forest management as well as Aboriginal communities; interim plan author for the Lake Nipigon Forest 2010-20 FMP; primary areas of practice and disciplinary expertise are forest management, application development for the use of GIS technology in forest management, the integration of timber management and wildlife values, public participation in forest management planning, and participation by Aboriginal communities in forest management.
Name/Role	Mr. Laird Van Damme • Planning/Harvest
Responsibilities	Assess adherence to forest management planning requirements; assess compliance and monitoring programs; assess achievement of management objectives, forest sustainability and contractual obligations
Credentials	R.P.F., M.Sc.F.; 23 years experience as a practising forester, educator and consultant; primary areas of practice are in the disciplines of silviculture, forest management and forest research; completed ISO 14001 EMS Lead

	Auditor training course through the Quality Management Institute; served as a forestry auditor on 14 previous IFAs and several certification audits; Lead Auditor on two IFAs; led the Model Forest Program evaluation and the last National Forest Strategy evaluation; authored four FMPs and published numerous scientific and professional papers as an adjunct professor at Lakehead University; consultant to the government of Saskatchewan on forest management planning standards and landscape planning projects in Alberta; peer reviewer of forest management plans and certification audits.
Name/Role	Mr. Brad Chaulk • Silviculture
Responsibilities	Assess renewal and tending program; assess achievement of management objectives and forest sustainability.
Credentials	R.P.F., H.B.Sc.F.; 17 years of forestry experience; areas of particular experience include silvicultural practices and inventory systems including project management; diverse experiences as a tree plant supervisor, head of propagation and seedbed foreman at one of Ontario's largest nurseries, and as the supervisor and manager of technical services at KBM; member on 14 IFA teams; prepared pre- and post-harvest forest operating prescriptions and developed preferred harvest strategies, site preparation techniques, and planting/ tending regimes for individual harvest blocks; completed Managed Forest Tax Incentive Program plans for private landowners; conducted and written wood supply reports/timber analyses; considerable experience using the Forest Ecosite Classification systems for both Northwestern and Northeastern Ontario as well as the new Harmonized Ecosite Classification System for the Province; co-author Field Guide to Second Generation Progeny Test Establishment, Management and Assessment; plan author for the Black Sturgeon Forest 2006-2026 FMP; lead author of the Silvicultural Ground Rules for the Dog River-Matawin 2005-2025 FMP; project manager for both the Lake Nipigon Forest 2010-2020 FMP and the English River Forest 2009-2019 FMP; certified to interpret aerial photography in Ontario's Boreal Forest; teaches forest management planning at Confederation College.
Name/Role	Mr. Keith Hautala • Modeling
Responsibilities	Review SFMM strategic planning; assist in assessment of achievement of management objectives and forest sustainability.
Credentials	M.Sc.F.; 11 years of forestry experience in Ontario with an emphasis on long-term forest management planning, wildlife habitat analysis, strategic-level forest modeling, and forest auditing; participated in six IFAs in the position of Forest Modeling Auditor and an additional four as Secretariat; auditing responsibilities have included reviewing the assumptions, composition, and documentation of long-term strategic models, examining the development and evaluation of management alternatives, and assessing the achievement of management objectives and forest sustainability; teaches plant biology and wildlife courses at Confederation College.
Name/Role	Ms. Sonia Colombo • Audit Secretariat
Responsibilities	Provide general support in the execution of the IFA including logistics, evidence gathering, and report development.
Credentials	Dipl. For. Tech.; 20 years experience in forestry, focusing on forest renewal; established, and is in charge of, the Seedling Assessment Lab at KBM Forestry Consultants Inc. conducting third-party stock quality testing for private nurseries and forest companies; Administrative Assistant on three Independent Forest Audits; completed ISO 14001:2004 Lead Auditor training; participated in two ISO 14001:2004 audits as a provisional auditor.

Appendix 7 – Comparison and Trend Analysis Report

Tab 12

February 16, 2007

DRAFT
Hardwood Sources for I-Level (Weyco) composite mill

Discussion of alternatives to sourcing from the Whiskey Jack Forest…

Research Question: Are there alternate sources of hardwood supply for the Kenora I-Level Timberstrand composite mill, other than the Whiskey Jack Forest?

Synopsis

A cursory examination of the latest provincial data available reveal that there exist substantial volumes of available hardwood within economically viable trucking distances of Kenora Ontario, and outside the Whiskey Jack Forest (WJ). While annually the Kenora I-Level mill sources 160,000 m3 of hardwood from the WJ, other forests in Northwestern Ontario have over 800,000 m3 of hardwood available in the long or short term. Forests in Eastern Manitoba have an additional 350,000 m3 of hardwood available on a long term basis. These more than ample alternate supplies, combined with low demand for Timberstrand product and the existence of alternate production sites, demonstrate that it is fully possible to implement a moratorium on logging in the Whiskey Jack Forest without impacting the wood supply for the Kenora I-Level mill.

Whiskey Jack Supply

The Weyerheuser I-Level mill product is produced by cutting low-grade species (mostly aspen) into thin strips and bonding them together under high pressure and temperature. This means that log quality is not paramount, and supply specifications can be broad. Birch is also used by the plant, providing additional flexibility.

Despite several explicit attempts to obtain more recent data, the most recent Annual Report data available for the Whiskey Jack forest is for the 2003-04 year. Given that MNR has provided this twice when asked for 2004-05 data, it is perhaps likely that they have not received anything more current from Abitibi.

The data on Manitoba forests was taken from the province's "Five Year Report on the Status of Forestry; April 1996- March 2001." The numbers used in this document are average m3 per year for the five year period. Annual volumes did not vary substantially over this period.

Footnote:
http://www.gov.mb.ca/conservation/forestry/reports/fiveyear02_eng.html

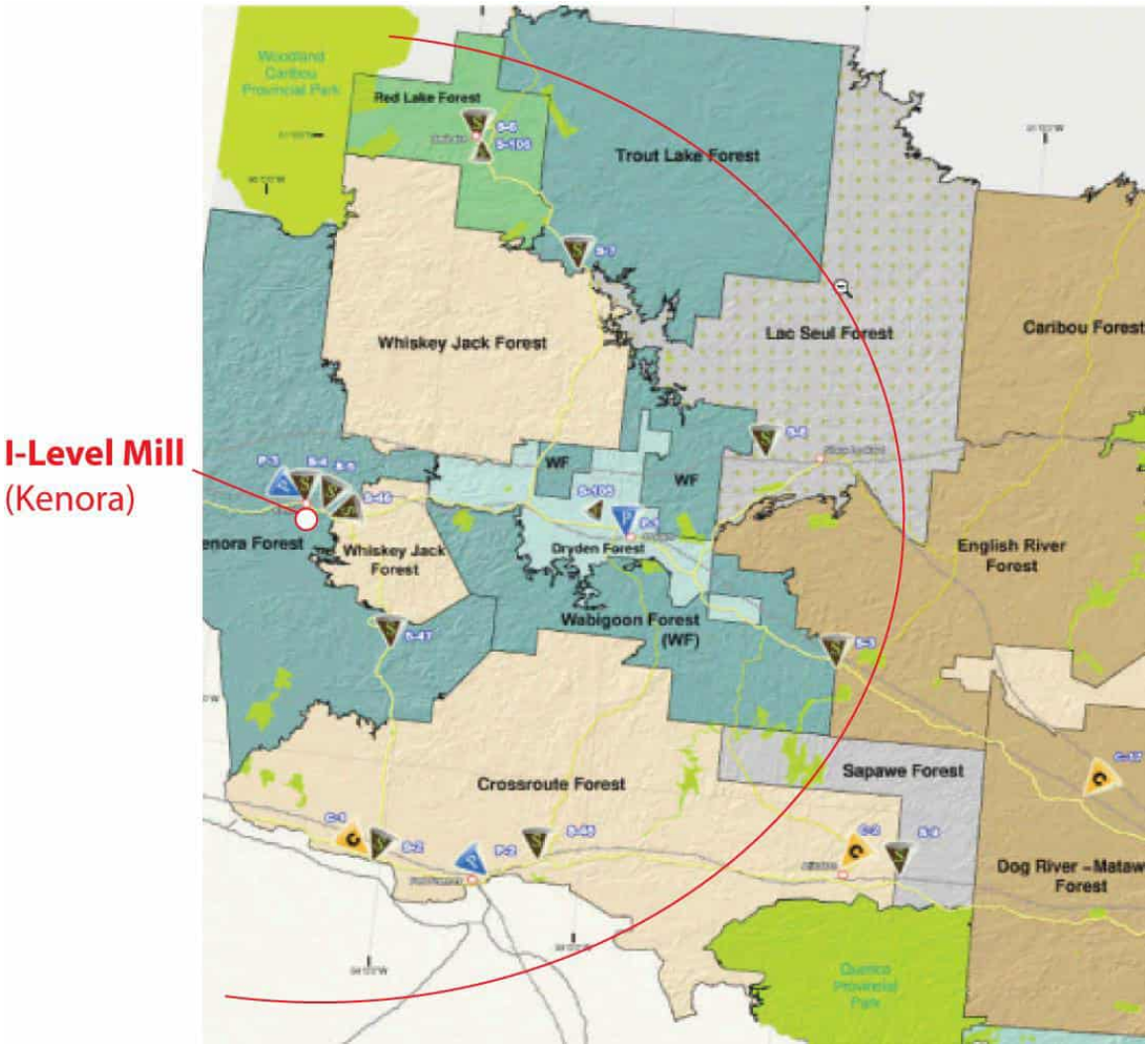
Available supply was found in Table B12: Net Merchantable Annual Allowable Harvest Summary by Forest Management Unit/Section and Species Provincial Crown Land.
Utilization rate was found in Table B13: Annual Forest Product Harvest 1996-2001

156,188 m^3 of Poplar was sourced by this mill from the Whiskey Jack forest in 2003-04 (MNR records, AR-5 data). Because the mill is so new, preliminary figures cannot be used to create any kind of longer term trend or more accurate average as the mill was gearing up production. And as already mentioned, more recent years do not seem to be available. A rounded figure of **160,000 m^3 will be used as the supply to be replaced.**

Alternative Sources

1) Current I-Level reduction in capacity
Due to current market conditions, a significant reduction in mill production is being experienced and is likely to persist for an extended period of time. Weyerhaeuser indicates that the mill is running below 1/3 capacity. This translates into a short-term reduction in feedstock required over the short-term. **[106,000 m^3 – short-mid term]**

2) Shift production to other iLevel Timberstrand mills
Weyerhaeuser has two mills outside Kenora that make the same iLevel Timberstrand product, one in Deerwood MN, and one in Chavies, KY. The company could shift production to those mills to reduce fiber needs in Kenora.



3) Re-allocate unused available hardwood supplies from NW Ontario FMU's

(a) Kenora Forest (Weyerhaeuser tenure) – in 2004-05, the I-Level mill only utilized 48,000 m^3 of a forecasted 125,000 m^3 hardwood harvest, leaving a potential 77,000 m^3 of supply available. **[77,000 m^3 long term]**

(b) Wabigoon Forest (Weyerhaeuser tenure) – in 2004-05, 217,000 m^3 of hardwood was harvested from this Weyerheuser tenure, including some directed to the I-Level facility. 180,000 m3 of this harvest went to the Weyerheuser Dryden Paper operation, which has since idled. This facility is currently only producing kraft pulp. Weyerheuser could increase volumes already destined for I-Level up to the volume used by Dryden's paper mills until such time as they come back online. [**180,000 m^3** short-long term]

(c) Dryden Forest (Independent tenure) – in 2004-05, 63,000m3 of hardwood was forecast for harvesting from the Dryden forest. None of the

destinations used this volume in that year, except for some personal fuel use. 48,000m3 was destined for the idled Dryden paper operation. 12,000 m3 was destined for the closed Dryden sawmill, and 2,000 to the closed Abitibi mill in Kenora (both long-term options). [**62,000m3 long term**]

(d) Crossroute Forest (Abitibi tenure) – in 2004-05, the FibraTech composite mill used 17,000 m^3 less hardwood than forecasted, the Manitou sawmill used 97,000 m^3 less, and an unspecified forecast destination did not report use of its 19,000 m^3 (these last two may represent long-term options). [**133,000 m^3** mostly long term]

(e) English River Forest (Bowater tenure) – in 2004-05, 189,000 $m^3$of a forecast 340,000 m^3 of hardwood was harvested. The now closed Buchanan Northern Hardwood sawmill only harvested 45,000 m^3 of a forecasted 97,000 m^3 (this may represent a long-term option). Both the Weyco Dryden and Bowater Thunder Bay Pulp and Paper mills source hardwood from this unit, and both have indefinitely idled machines, making up the bulk of the rest of the hardwood harvest (another significant short-term option). [**97,000 m^3** long term] and [+/- **200,000 m^3**]

(f) Sapawe Forest (Buchanan tenure) – in 2004-05, the FibraTech composite mill only utilized 28,000 m^3 of a forecast 77,000 m^3, leaving a possible 49,000 m^3 available. [**49,000 m^3**]

Over **800,000 m3 of alternative sourcing** has been identified above for the mill from a cursory examination of the hardwood usage in this particular woodshed during the 2004-05 period. Trends towards even lower levels of hardwood usage could be reasonably expected since this benchmark, though probably combined with a general reduced harvest across most areas. The forests identified here are largely non-intact, outside prime caribou range, and free of high profile First Nations controversies. In some areas, including Weyerhaeuser's Wabigoon forest, Weyerhaeuser has established agreements with local First Nations.

4) Re-allocate unused available hardwood from Eastern Manitoba

(a) Pineland forest - from 1996-2001, the allowable annual harvest of merchantable hardwood in the "open zone" of this forest was 218,000 m3. The actual average annual harvest was 76,000 m3, leaving 142,000 m3 available. This entire forest area is within economically viable trucking distance of Kenora via highway 17. **[142,000 – long-term]**

(b) Lake Winnipeg East forest - from 1996-2001, the allowable annual harvest of merchantable hardwood in the "open zone" of this forest was 327,000 m3. The actual average annual harvest was 12,000 m3,

leaving 315,000 m3 available. We estimate that the southern half of this forest area is safely within viable trucking distance, and outside the largely intact east side of Lake Winnipeg. Much of this area is within Tembec's FML-1. Tembec is a company that has committed to 100% FSC certification, so this likely represents a current or future FSC certified supply. **[157,500 m3 – long-term]**

(c) Aspen Parkland forest - from 1996-2001, the allowable annual harvest of merchantable hardwood in the "open zone" of this forest was 116,000 m3. The actual average annual harvest was 2,000 m3, leaving 114,000 m3 available. We estimate that the eastern half of this forest area is safely within viable trucking distance. **[57,000 m3 – long-term]**

Over **350,000 m3 of viable, long-term, alternative sourcing** has been identified for the above mill from a cursory examination of hardwood usage in Eastern Manitoba during the 1996-2001 period. 20% of Weyerhaeuser's current supply for the mill originates in Manitoba, so clearly the border does not represent a barrier, with highway 17 providing a prime conduit. Overall, Manitoba had 2,622,000 m3 annually of unused and available merchantable hardwood supply. This dramatic oversupply, combined with the fact that Manitoba's top user of hardwood (the Swan Lake mill) is in the distant northwestern part of the province, make it unlikely that this available supply will decline. We therefore assess this to be a long-term supply option.

Conclusion

There are viable hardwood supply alternatives for the I-Level mill to source from, outside the Whiskey Jack forest. Hardwood is not a scarce commodity in NW Ontario at this time. In fact, a provincial committee has been struck to address the problems associated with widespread underutilization of hardwood in the Province. The I-Level mill has historical supply links to several other forests other than the Whiskey Jack forest which it has not always fully utilized. Other historical hardwood users in the region are either closed or idled currently. In addition, the annual volume of viable hardwood available long-term in Eastern Manitoba alone is more than twice the volume sourced from the Whiskey Jack forest in 2004-5. In total, the volume available from the alternate sources outlined here, is greater than seven times the volume currently sourced from the Whiskey Jack Forest. The areas examined are mostly free of high profile First Nations conflicts, and mostly outside of ecological priority areas. The combination of low market demand, alternative production sites, and substantial alternate supplies in Northwestern Ontario and Eastern Manitoba demonstrate that it is fully possible to implement a moratorium on hardwood logging in the Whiskey Jack without substantively impacting the Weyerhaeuser iLevel Timberstrand mill in Kenora.

Tab 13

ASUBPEESCHOSEEWAGONG NETUM ANISHINABEK COMMUNITY HEALTH ASSESSMENT REPORT

(May, 2018)

This report, and the information contained in it, are owned by Asubpeeschoseewagong Netum Anishinabek (ANA, Grassy Narrows First Nation). Do not use or share it unless you have obtained the free, prior, and informed consent of ANA in writing from a quorum of ANA Chief and Council.

2769

For the children and all those who went before

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Acknowledgement:
The First Nation Regional Health Survey for sharing their questionnaire.

INTRODUCTION

In the 1960's, the Asubpeeschoseewagong Netum Anishinabek (ANA, Grassy Narrows First Nation] experienced one of the worst disasters in Canadian history. The community's livelihood, major food source and health were destroyed by the dumping of massive amounts of mercury into their waterways. Fifty years later, concerned by the continuing ill health and conditions in their community, ANA undertook a Community Health Assessment (ANA-CHA) to better understand the health and wellness of ANA adults and children. This community-driven endeavour sought and obtained financial support from Health Canada and the Ontario Ministry of Health and Long-Term Care. Technical assistance was provided by these ministries as well as the Ontario Agency for Health Protection and Promotion, the Ontario Ministry of Indigenous Relations and Reconciliation, and the Northwestern Health Unit of Ontario.

The parties established a Community Health Assessment Team (CHAT) and in September 2016 signed a project Charter that laid out the overall goals, responsibilities of the parties, activities to be carried out and a time line. The Charter endorsed the OCAP® principles of Ownership, Control, Access and Possession of knowledge and information by the First Nation[1].

The objectives of the CHA as stated in the Charter are:

"The overall goal of this project is to provide a better understanding of the health status and its determinants among ANA members; this will serve a number of additional key objectives, including:

- *Support planning of health services for ANA members;*
- *Understand the determinants of health unique to ANA members;*
- *May, along with other research, contribute to scientific knowledge on the impact of mercury contamination; and*
- *May be considered in proposing changes to the Mercury Disability Board."*

In keeping with these goals, the CHA used the First National Regional Health

[1] http://fnigc.ca/ocap.html

Survey Report (2008/2010)[2] (FNRHS Canada) as the basic framework for the survey, adding on the further dimension of the environment, and specifically mercury. Figure 1 shows our schematic model adapted from the FNRHS Report[3]. Our framework includes the natural environment, which affects all of the dimensions of health and wellness. For example, the natural environment can provide food, income, influence behaviours and constitute a place for physical and spiritual activities. Damage to the environment can affect health and wellness directly and indirectly. For example, environmental damage from dumping mercury into the river system or from logging can affect food security, the availability of nutritious foods, personal and community wellness, as well as physical and mental health and chronic disease.

This approach allowed us to i) compare the results of ANA Band members on reserve to other First Nation communities in Canada and Ontario[4], and ii) examine how consumption of mercury-contaminated fish may have contributed to health and wellness. The survey, administered between December 2016 and March 2017,

[2] First Nations Information Governance Centre (FNIGC) (2012). First Nations Regional Health Survey (RHS) 2008/10: National report on adults, youth and children living in First Nations communities. Ottawa (FNRHS Canada).
[3] FNRHS Canada, p.9
[4] The data from the FNRHS Canada was analyzed for First Nations in Ontario and published in the report First Nations Regional Health Survey Phase 2 (2008/10) Ontario Final Region Report by the Chiefs of Ontario in 2012 (FNRHS Ontario)

covered both adults and children. This report presents the results of the adult survey. A second report will address the findings for the children.

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EXECUTIVE SUMMARY

This Community Health Assessment (CHA) stems from a request by the Asubpeeschoseewagong Netum Anishinabek (ANA, Grassy Narrows First Nation) to better understand the health and wellbeing of their community and its determinants. In addition to suffering the plight of many First Nation communities in Canada through relocation, residential schools, colonialism and cultural genocide, poverty, poor access to health care, food and potable water, since the 1960's, mercury contamination of ANA's waters and fish has impacted community members' livelihood, nutritious food sources, and health. The ANA-CHA sought to address these issues in adults and children with a view to improving health and wellbeing of the ANA community.

The overall findings of the Adult ANA-CHA survey show that the health and wellbeing of ANA Band members cannot be understood without taking into account their history of mercury poisoning.

The statistical analyses indicate:

- For the most part, the physical and mental health of the ANA community is considerably worse than that of other First Nations in Ontario and in Canada.
- Mercury exposure, through consumption of contaminated fish, is associated with poor health and well-being.
- This situation has important consequences for the economic and social prosperity of individuals and the community
- Current programs are inadequate in addressing many of these issues.

The results of the survey likewise show that despite their physical and mental health challenges, ANA community members endeavour to maintain and improve their health and wellbeing both individually and collectively.

Below is a summary of the key findings of each chapter:

Chapter 1. Methods: The CHA used a computer-based survey questionnaire, adapted from the First Nations Regional Health Survey (2008/2010) (FNRHS)[5], to which specific questions on mercury exposure and effects were added. This allowed us to identify similarities and differences with other First Nation communities in Canada and in Ontario[6], and to examine the possible impacts of mercury exposure. Since the FNRHS was carried out with Band members living on reserve, all comparisons were limited to ANA Band members on reserve. For mercury-related outcomes, all Band members were included in the analyses.

The field ANA team, led by a coordinator and an assistant coordinator, designed the recruitment strategy, carried out the recruitment, and administered and uploaded the questionnaires. Between December 2016 and March 2017, nine ANA surveyors visited 178 (83.6%) of the houses in Grassy Narrows; 322 adults (78.2%) participated in the survey. A further 101 adults living off reserve were also surveyed. The population analyzed in the present report includes 421 adults, of whom 387 (77%) are Band members and 34 are spouses of Band members or living in Grassy Narrows. The age and sex distributions of ANA-CHA participants are similar to ANA's distributions in the Statistics Canada Aboriginal People's Household Survey 2016, indicating that **the sample is representative of the underlying population.**

Statistical analyses included descriptive statistics, group comparisons, multivariate and multidimensional to explore the complex associations between benefits, risks and outcomes.

Chapter 2. Demographics: Participants' mean age is 38 years of age, ranging from 18 to 80. The **age pyramid** provides important information on a community's development. Similar to other surveys of ANA, the CHA reveals that among ANA Band members on reserve, there are **proportionally fewer elders** and proportionally more children. This not only reflects **premature death**, but also that there are **fewer elders to transmit traditional knowledge and guidance** to the younger generations.

Chapter 3. Mercury exposure: Fish consumption is the route for mercury exposure in Grassy Narrows. The ANA-CHA adult questionnaire contained several questions that sought to estimate mercury exposure through fish consumption over time. Since prenatal and childhood mercury exposure may contribute later-life health, several questions sought to estimate early life exposure for each participant:

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[5] First Nations Information Governance Centre (FNIGC) (2012). First Nations Regional Health Survey (RHS) 2008/10: National report on adults, youth and children living in First Nations communities. Ottawa: FNIGC. (FNRHS, Canada)

[6] First Nations Regional Health Survey (RHS) Phase 2 (2008/2010) Ontario Regional Final Report. First Nations Information Governance Centre (FNIGC). Chiefs of Ontario, 2012. (FNRHS Ontario)

(i) mother's residence during pregnancy; (ii) whether their father was a fishing guide; (iii) the person's fish consumption at 10 years of age. A further question asked about current consumption of walleye and northern pike.

The major source of mercury contamination in Grassy Narrows is from a chlor-alkali chemical plant in Dryden. It began in 1962 and the first measures of human exposure (hair, blood and umbilical cord blood) were made in 1970[7]. We were able to validate the responses about mercury exposure through fish consumption using umbilical cord mercury data for 58 persons between the ages of 26 and 46 years (born between 1970 and 1990), provided by Health Canada. **Persons who answered that their father was a fishing guide and that they themselves consumed fish several times a week or more at age 10 had an average of four times the amount of mercury in their umbilical cord blood compared to those who answered no to both questions.**

Sediment core analysis has shown that total mercury concentration increased abruptly just after 1961, peaked around 1968 at a value approximately 100 times the background level, declined slightly until around 1974, and then dropped rapidly until 1986, whereupon it tailed off gradually but remained an order of magnitude higher than the pre-pollution background level[8] . The changes in mercury exposure and in fish consumption behaviour over time have methodological implications for the statistical analyses in the present report. Age is positively correlated with having a father who worked as a fishing guide and the person's fish eating practices - the proportion of persons who ate fish at least several times a week when he/she was 10 years of age increases with age. Overall, older persons had higher exposures. **To take this change over time into account, all analyses, which include fish-eating variables, are age-adjusted.**

There are still high concentrations of mercury in fish on the Grassy Narrows territory; the highest levels are in walleye and northern pike. A third of ANA Band members report that they often ate walleye over the past year.

Chapter 4. Residential school, education and training: Twice as many Band members from Grassy Narrows (15%) attended residential schools compared to other First Nation communities in Ontario (8%). **For Band members over 60 years of age, 88% were placed in residential schools, almost twice as many as other First Nation communities in Canada (46%).** Among those who had been to residential school, 69% indicated that it negatively impacted their health and

[7] Wheatley B et al. Exposure patterns and long term sequelae on adults and children in two Canadian indigenous communities exposed to methylmercury. Water, Air and Soil Pollution 97: 63-73; 1997.

wellbeing. Over 60% of adult Band members have a least one parent who had been placed in a residential school.

Over 70% of ANA-CHA participants less than 50 years of age have at least some high school and around 20% have a high school diploma. Almost half of all participants (48%) indicate that they had further education, such as trade, technical or vocational school. **School achievement** is an important determinant of later-life health, wellbeing and success. Participants in the ANA-CHA are no exception: taking into account age and sex, **school success is positively associated with:** further education, income, good health, a nutritious diet, a sense of belonging to the community, mastery score ("the extent to which an individual regards their life chances as being under their personal control rather than fatalistically ruled"[9]), having a good social support network and taking part in the community's cultural events.

For those under 50 years of age, we examined the **factors associated with school success**: success in school decreased with age (younger adults report lower school success); women did better than men; those who had been to a residential school reported less success; **school success was lower among those who consumed fish at least several times a week when they were 10 years of age compared to those who consumed less fish.** The latter finding suggests that mercury exposure from fish consumption contributes to poor success in school. Poorer neurodevelopment has been associated with prenatal exposure to mercury in many studies, including in Inuit communities in Canada.[10]

Chapter 5. Work and income: A total of 43% of ANA CHA participants report paid employment. For ANA Band members on reserve, the percentage is 46%, similar to First Nation communities in Canada (47%), but less than other First Nation communities in Ontario (55%). For those who are not working, 41% report that it is due to a health problem or disability. This is twice as high as other First Nations in Ontario and in Canada (20%). Persons who have been told by a health professional that they have mercury poisoning have the highest rate for not working due to health problems or disability (67%).

Approximately **50% of participants report income of less than $20,000 per year and 33% report income of less than $10,000.** Individual and estimated household incomes are positively associated with currently working, school success, while individual income is also associated with good health. Individual and estimated household incomes are lower among those who have been told by a

[9] Pearlin, L. I., & Schooler, C. (1978). The structure of coping. Journal of health and social behavior, 2-21.

[10] Jacobson et al. Relation of prenatal methylmercury exposure from environmental sources to childhood IQ. Environmental Health Perspectives 123:827-833; 2015.

health professional that they have mercury poisoning and persons who receive disability.

Chapter 6. Health status: Self-rated health perception is a measure that is commonly used in First Nation and Canadian surveys. Considerably **fewer ANA Band members (21%) rate their health as very good or excellent, called thriving, compared to other First Nations in Ontario (40%) and First Nations in Canada (44%) and the Canadian non-Indigenous population (60%)**. The proportion of persons who report poor health increases with age and more quickly in women compared to men.

In the ANA-CHA, we used the FNRHS list of ***chronic health problems*** informed by a health professional, which does not include mercury poisoning or neurologic disorders. Sixty-seven (67%) of ANA-CHA participants report that a health professional has told them that they have at least one of the chronic health problems on the list. A higher percentage of women report at least one of these chronic health problems compared to men (73% vs. 60%). In both men and women, the percentage of those reporting at least one diagnosed chronic health condition increases with age. In comparison to First Nation communities in Canada, proportionally more Band members on reserve, under 50 years of age, report at least one chronic health condition. For those 50 years and more the percentage is similar. The largest difference is for persons 40 – 49 years of age (83% vs. 66%).

The FNRHS included several neuropsychological conditions, such as learning disabilities and Attention Deficit/Attention Deficit-Hyperactivity Disorder (ADD/ADHD), cognitive or mental disabilities and psychological or nervous disorders, several of which were added to the ANA-CHA. A total of 53 Band members (14%) report that a health professional had told them that they have at least one of these neuropsychological disorders.

The FNRHS did not include **chronic neurologic conditions**, which were included in the ANA-CHA. A total of 21 Band members report that they have been told by a health professional that they have a neurologic disorder, the most frequently mentioned is Bell's palsy. We combined neuropsychological and neurological disorders, called **nervous system disorders,** which groups persons who have been told by a health professional that they have at least one of the neuropsychological or neurologic health conditions listed in the ANA CHA questionnaire. Twenty-four percent (n = 88) of Band members answered that they had at least one of these conditions.

***Co-morbidity* of 4 chronic health conditions** from the FNRHS list is compared between First Nations in Canada and ANA. While there is no overall difference for men, a large difference is observed for women (27% vs. 13%). Moreover, **the**

differences increase with age, with a higher percentage of ANA Band members reporting 4 or more chronic health conditions: for ANA it is 7% for those under 30 years of age to 69% for those over 60 years of age, compared to 3% to 47% for the same age ranges for First Nations in Canada.

The most frequently ***chronic health conditions*** reported in the ANA CHA survey are: allergies (30%), high blood pressure (27%), nervous system disorders (23%) and diabetes (21%). With the exception of asthma, specific chronic health conditions increase with age and many are more prevalent in women compared to men. The prevalence of many health conditions among ANA Band members on reserve and First Nations in Ontario and Canada are similar, but **ANA Band members on reserve report a higher prevalence of the following chronic health conditions: allergies, stomach and intestinal problems, blindness or visual problems not corrected by glasses, hearing impairment, rheumatism (joint pain), psychological or nervous disorder and tuberculosis.** The prevalence of **diabetes** among ANA Band members on reserve is higher than in other First Nation communities in Canada, but similar to Ontario. Nervous system disorders were not included in the First Nations regional health surveys.

It is noteworthy that the prevalence of persons reporting that a professional has told them that they have ***heart disease*** is considerably lower among ANA Band members than other First Nation communities in Ontario and Canada. For those over 60 years of age, it is 3 times lower than in Ontario (9% vs. 29%). This needs to be examined more closely and better understood since several studies have reported an association between myocardial infarction and mercury exposure.

Body mass index (BMI) was calculated (weight/height^2) in kg/m^2. We used the Canadian Guidelines for Body Weight Classification in Adults for classification. Forty-one percent (41%) of men and 54% of women are classified as 'obese' (equal to or greater than 30 kg/m^2), with 5% of men and 10% of women in the Obese Class III category (equal to or greater than 40 kg/m^2), which is associated with an extremely high risk of developing health problems. **The BMI distribution is similar to other First Nation communities.** In the analyses, we use equal to or greater than 30 kg/m^2, as the cut-off for obesity. Diabetes and high blood pressure are associated with obesity in both men and women, but there are gender differences for other factors. More women who are obese have thoughts about suicide compared to women who are not. For men, high cholesterol is associated with obesity, while more men who report nervous system disorders are not obese. Fewer men who smoke or who are heavy drinkers are obese compared to those who do not smoke or are not heavy drinkers.

We examined the possible association of different factors with the specific chronic health conditions, using multiple regression analyses. When there were too few

persons under 30 years of age with the condition, we only included persons 30 years and more. Most associations were as expected. Noteworthy is the association between asthma and struggling to pay for utilities, which may represent poorly heated homes. For diabetes, in addition to the expected associations with age, high cholesterol and body mass index, **persons who had consumed fish more than several times a week when at ten years of age were 2.5 times more likely to have been told by a health professional that they have diabetes.** The likelihood for **nervous system disorders is twice as high for those whose father was a fishing guide and for those who ate fish several times a week when they were 10 years old, taking into account age and drinking habits.** It is noteworthy that proportionally fewer persons who report nervous system disorders are current heavy drinkers.

Chapter 7. Diabetes: consequences and care: Diabetes is a major health concern in many First Nation communities and among the CHA-ANA participants one person in five reports that a health professional has told them that they have diabetes. The median age for diagnosis was 38.5 years, with the youngest diagnosis at 10 years of age and the oldest at 65 years of age.

When compared to other First Nation communities, **more ANA Band members on reserve with diabetes are attending a diabetics clinic or seeing someone** (doctor, nurse, etc.) (ANA: 72% vs. Other First Nations: 53%). However, fewer are undergoing treatment (ANA: 79% vs. other FN: 90%). Moreover, the proportions for the type of treatment differs significantly: in ANA, proportionally fewer persons treat their diabetes with diet (41% vs. 66%) or exercise (25% vs. 50%) and **proportionally more are being treated with insulin (36% vs. 20%).**

The pattern of diabetic co-morbidity is likewise different: in **ANA proportionally more persons respond that diabetes has affected feeling in their hands and feet (61% vs. 34%), vision (48% vs. 36%), circulation (44% vs. 29%), lower limbs (35% vs. 23%) and resulted in infections (25% vs. 15%),** while there is no difference in the proportion of those who report that their kidney function has been affected (23% vs. 21%). It is noteworthy that the symptoms reported in a higher frequency by ANA Band members with diabetes are also associated with mercury exposure.

The differences in diabetes consequences and care between ANA and other First Nation communities need to be better understood since mercury exposure may contribute to or aggravate diabetes and/or diabetic co-morbidity.

Chapter 8. Mercury poisoning: Several questions on the ANA CHA survey focused on mercury poisoning, including having been previously examined by Dr. Masuzumi Harada's team from Japan, being told by a health professional that you have

mercury poisoning, symptoms of mercury poisoning and claims to the Mercury Disability Board.

A total of 388 ANA Band members answered the question on previous examinations by the Japanese doctors: 56 (14%) were examined once, 31 (8%) were examined more than once and 17 (4%) did not know. Since the first visit by these doctors was in 1975, those who had been examined are significantly older than the others. Harada notes in his 2002/2004 report that all of the persons who had hair mercury concentrations above 50 ppm were deceased[11]. Fifty-seven percent (57%) of persons over 50 years of age had been examined at least once by the Japanese doctors. Most did not remember the diagnosis.

In answer to the question on whether a health professional had told you that you have **mercury poisoning, 60 Band members** responded 'yes', and 125 answered that they did not know (32%). The proportion of those who answered that they did not know is very high compared to the other questions on chronic health conditions, where the percentage of those who responded that that did not know was between 2% and 12%. This may reflect reluctance to answer 'yes' among persons that are experiencing known symptoms of mercury poisoning. Indeed, persons who answered that they didn't know reported significantly more symptoms than persons who answer no, but fewer symptoms compared to those who answered 'yes'.

When considering only persons who answered 'yes' or 'no' to the question, over one out of 5 Band members (23%) responded in the affirmative. There is no difference between the percentage of men and women. **Over 50% of persons over 50 years of age have been told by a health professional that they have mercury poisoning.** More Band members with mercury poisoning (n = 50 (83%)) live on reserve, while 10 (17%) live off reserve. All of the men (n = 28) with mercury poisoning are on reserve; the 10 persons off reserve with mercury poisoning are women.

The likelihood of being told that you have mercury poisoning is almost 5 times higher for those whose father had been a fishing guide, taking into account age and sex. For those under 50 years of age, it was three and half times higher, taking into account age and sex.

Co-morbidity with mercury poisoning is high: **Over half (55%) of those that have been told that they have mercury poisoning report at least four other chronic health conditions, compared to 12% among those who have not been told that**

[11] Masazumi Harada et al. Long-term study on the effects of mercury contamination on two indigenous communities in Canada (1975-2004)". Report in 2005 Translation by Tadashi Orui, proofread by Thor Aitkenhead.

they have mercury poisoning. When adjusted for age and sex, those who have been told that they have mercury poisoning are 4.5 times more likely to have four or more other chronic health conditions. The likelihoods for the specific chronic health conditions are: allergies (5 times), at least one neuropsychological disorder (5 times), blindness or vision problems that are not corrected by glasses (3 times), stomach and intestinal problems (4 times). For those over 30 years of age: hearing impairment (4 times), high cholesterol (4 times), and rheumatism (joint pain) (4 times), chronic back pain (2 times).

There are proportionally more persons who have been told by a health professional that they have **mercury poisoning** who are **not working** (61% vs. 43%) and they constitute 65% of those who indicate that they are not working **because of poor health or they are disabled**. They have **lower incomes** both individually ($p<0.05$) and by household ($p<0.05$).

It is well-established in the scientific literature that mercury poisoning is on a continuum of dysfunction with initial manifestations involving an increase in mercury-related symptoms and the final stages, a debilitating neurologic disorder and death. In the ANA-CHA, we included a list of 58 symptoms that reflect diminished well-being. Participants responded on a 5-point frequency scale from never to all of the time.

Because of the difference in exposure profile over time and the small number of elders that ate less fish when they were young, we included only persons less than 50 years of age in most of the analyses of symptom reporting. Most adults under 50 years of age were exposed to mercury *in utero.* The placenta actively concentrates mercury and the concentration of mercury in the umbilical cord blood is on average approximately twice that of the mother's blood.[12] For this age group, we analyzed symptom reporting with respect to age, sex, obesity, heavy drinking, having at least one chronic health condition, and fish consumption at 10 years of age for persons.

For women, age and at least one chronic health condition are the major factors associated with most symptoms, while fish consumption at 10 years of age is associated with 18 symptoms. For men, almost all symptoms are associated with fish eating at 10 years of age. **The strongest associations with childhood fish consumption for both women and men are symptoms of peripheral neuropathy.**

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12 Mergler D, Anderson HA, Chan LH, Mahaffey KR, Murray M, Sakamoto M, Stern AH. (2007) Panel on Health Risks and Toxicological Effects of Methylmercury. Methylmercury exposure and health effects in humans: a worldwide concern. Ambio. 36:3-311.

Since symptoms are often inter-correlated, we carried out analyses that grouped the symptoms into 6 clusters. We examined whether these cluster of symptoms were associated with childhood and current fish eating, taking into account the other factors that were associated with the cluster, such as age, sex, having at least one chronic illness or diabetes, smoking, drinking, nutrition, mother or parent in a residential school and income adequacy. The results show the following:

Childhood fish consumption is associated with:

- Cluster of symptoms of peripheral neuropathy
- Cluster of symptoms of sensory and sensory-motor loss
- Cluster of symptoms of neuropsychological deficits
- Cluster of symptoms of motor loss and tingling around mouth
- Cluster of symptoms of loss of hearing, vision and speech

Current fish consumption is associated with:

- Cluster of symptoms of peripheral neuropathy
- Cluster of symptoms of sensory and sensory-motor loss
- Cluster of symptoms of motor loss and tingling around mouth

Finally, the analyses were rerun without those who have been told by a professional that they have mercury poisoning (n = 30). There is no difference in the associations between the factors listed above and the dimension outcomes, indicating that even those without diagnosed mercury poisoning, show an increase in the score of most symptom clusters with childhood fish consumption and for some symptom clusters, with eating walleye over the past year.

A total of 95 ANA members report that that they have made a claim to the Mercury Disability Board. Of them, 21 (22%) indicate that their claim was accepted, 11% that their claim is in progress, and 67% report that their claim was refused. **Those who have made a claim have significantly higher total scores for the above clusters compared to those who have not made a claim, but the scores are similar for those who were accepted or refused, independently of age, sex and diabetes.**

Chapter 9. Individual wellness and mental health: The ANA-CHA assessed different dimensions of personal wellness and mental health: i) within the community; ii) outside of the community; iii) mental and emotional health; and (iv) suicide.

- **For personal wellness within the community**, the survey included questions on the sense of belonging to the community and social support, a measure of whether one has people they can talk to about their emotional or mental health.

- 66% of Band members on and off reserve report that their ***sense of belonging to the community*** is somewhat or very important. This sense of belonging is highly correlated to being part of a social network.

- Women have a higher ***social support*** score compared to men. Women talk more to others about their emotional and mental health; the immediate family and friends are particularly important. The social support score is higher among those with a greater sense of belonging to the community, greater mastery over what happens to them, higher income, and for women, with more education, currently working and having children, and lower among those who smoke, are heavy drinkers and use cannabis. It is lower among those who have thought about or attempted suicide.

- For personal wellness outside of the community, the survey addressed some of the issues of ***racism***.

  - **Almost one half of participants (45%) report experiencing racism over the past 12 months**. The percentage is higher for Band members who live off reserve (60%). Among those who experienced racism, 42% indicate that it had at least some effect and 16% answered that it had a strong or very strong effect on their self-esteem.

  - Persons whose self-esteem is affected by racism have higher psychological distress, see themselves as having lower control over what happens to them, and report less social support.

  - Proportionally more ANA Band members on reserve report instances of racism over the past 12 months compared to other First Nations in Ontario and Canada and 48% indicate that it had some or a strong effect on their self-esteem compared to approximately 30% of First Nations in Ontario and Canada.

  - **Over one third of persons who report instances of racism over the past 12 months likewise report that feeling uncomfortable because of racism constituted a barrier to accessing health care (n=56).**

- **Mental and emotional health.** The ANA-CHA used validated questionnaires to assess (i) Mastery: the extent to which an individual regards their life chances as being under their personal control rather than

fatalistically ruled. (ii) Psychological Distress: Questions likewise addressed suicidal ideation and attempted suicide.

- The ***Mastery Score*** is higher among those with more education, those who currently work, those who are food secure, those who eat nutritious meals, non-smokers, those whose health is thriving, and those for whom belonging to the community is important. It is lower for those who struggle to pay their bills, those who are food insecure and those for who racist experiences affect their self-esteem, and heavy drinkers. The average mastery score among ANA Band members on reserve is similar to that of other First Nation communities in Canada.

- ***Psychological distress*** is categorized as low, moderate and high. More men report low psychological distress (47%) compared to women (33%), and more women (21%) report high psychological distress compared to men (9%). Social support is a major protective factor for psychological distress, while food insecurity is a risk factor. The risk for psychological distress is higher among those who suffer from at least one chronic health condition and nervous system disorders. **The proportion of women Band members on reserve who report high psychological distress is almost 3 times higher compared to First Nations in the rest of Canada (21% vs. 8%) and twice as high for men (11% vs. 5%).**

- **Suicide:** Suicide is an important challenge in many First Nation communities. Suicidal behaviour includes not only attempted suicide and fatal suicide, but also ideas and thoughts about suicide that are never acted on. **Among ANA-CHA participants, one third (34%) report that a close friend or family member has died of suicide; 137 persons (37%) have thought about committing suicide;** more women (42%) than men (31%) and more younger people (18-29 years of age (45%), compared to those over 50 years of age (26%). Of these, a total of 50% thought about committing suicide as an adolescent and 30% thought about it during the past year.

  A total of 132 persons (96%) of those who have had suicidal thoughts reported on suicide attempts. Of these, 103 (78%) have attempted suicide, constituting 28% of all participants who answered the questions on suicide. The prevalence of attempted suicide is higher among women (34% vs. 22%). Among the 101 persons who answered the question about when in their lifetime did the suicide attempt occur: 43 persons (42%) answered that it was during adolescence (12 – 17 years of age) and **21 persons (22%) answered that it was during the past year.**

All of these percentages are considerably higher than what is reported for other First Nation communities in Ontario and in Canada.

	ANA on reserve	FN in Ontario	FN in Canada
Close friend or family member died of suicide	**32%**	**7%**	**12%**
Suicidal ideation	**37%**	**25%**	**22%**
Attempted suicide	**28%**	**13%**	**13%**

Chapter 10. Injuries: Around 25% of ANA CHA participants report an injury in the 12 months prior to the survey. The most common injuries were minor cuts, scrapes or bruises (36%), broken or fractured bones (31%), and major sprain or strain (29%). The highest proportion was in the 30 – 49 year age range (47%). For women, heavy drinking is associated with having been injured in the past 12 months.

In addition to the association with heavy drinking, **proportionally more Band members who had been told by a health professional that they had mercury poisoning report having been injured over the past 12 months. For those under 50 years of age, a tendency was observed for those who ate fish several times a week or more at 10 years of age.** Motor difficulties associated with mercury poisoning may explain these results.

Chapter 11. Disability and homecare: Thirty percent of ANA Band members report that they are limited in the kinds or amount of activity they can do at home, work or otherwise because of a physical or mental condition or because of a health problem. Limitations increase with age and are more present among women. The most common limitations are: seeing or reading newsprint (33%), difficulties in climbing a flight of stairs, walking 5 minutes without resting, problems related to hearing (23%), and their speech is not understood by those who speak the same language (23%). Limitations in the kind and amount of activities were related to having an injury in the 12 months prior to the survey, at least one chronic disease, obesity, and poorer health. **The likelihood of activity limitation is almost 3 times higher among those who have been told by a health professional that they have mercury poisoning, taking into account age, sex, heavy drinking, injury in the past year, at least one chronic disease, and obesity.** For persons under 50 years of age, ANA Band members who ate fish several times a week or more at 10 years of age, the Odds Ratio is 2.04 [C.I. 95th 0.98 – 4.26] p = 0.06, taking into account age, sex, heavy drinking, at least one chronic disease, and obesity.

Chapter 12. Health care access: The questions from the First Nations Regional Health Survey on Health care access focussed on the barriers to health care, access to the Non-Insured Health Benefits (NIHB), traditional medicine use and routine medical examinations.

Approximately half of ANA Band members indicate that there was at least one barrier to health care access, notably the availability of services: doctor or nurse not available in the area and long waiting lists. **For Band members on reserve 49% experience barriers to availability of services compared to 30% off reserve.** One person in four indicates that in accessing health care, they feel uncomfortable because of racism or the health care provided was inadequate. Nearly one in four cite economic (21%) or systemic barriers (23%).

Compared to other First Nations in Ontario living on reserve, a larger proportion of ANA Band members on reserve indicate that they feel health care was inadequate (26% vs. 21%), unavailability of doctor or nurse (36% vs. 21%), unavailability of health facility (23% vs. 12%) or service (21% vs. 13%), and difficulty in getting traditional care (21% vs. 14%). On the other hand, a smaller proportion of ANA Band members on reserve indicate long waiting lists (28% vs. 34%), NIHB coverage (14% vs. 27%) and prior approval (10% vs. 19%).

Over two thirds of ANA Band members (67%) report that they have no difficulties in accessing NIHB services. However, women report more difficulties compared to men (38% vs. 25%) and older women (30 – 49 years of age and 50 years and more) report more difficulties compared to younger women (18 – 29 years of age): 41%, 47%, 21%, respectively. More ANA Band members, with difficulties meeting their basic needs in terms of transportation, report difficulties in accessing NIHB services compared to those with none (40% vs. 26%; p=0.03).

Among those who report difficulties accessing NIHB services, 80% have at least one chronic disease and 35% have been told that they have mercury poisoning. **The likelihood of Band members to whom a health professional has told they have mercury poisoning reporting difficulty in accessing NIHB services is twofold higher than the others (Odds Ratio = 2.13 [95th CI: 1.03 – 4.37], taking into account age and sex.**

Proportionally fewer ANA Band members on reserve report difficulties in accessing NIHB services compared to other First Nation communities (ANA: 32%; Ontario: 39%; Canada 35%), however, over twice as many report difficulties accessing vision care (ANA: 20%; Ontario: 8%; Canada; 9%), a condition that this report and several studies have shown is associated with mercury poisoning.

Less than a third (31%) of ANA Band members report using traditional medicine and there is no difference between those who live on or off reserve. The use of traditional medicine increases with age. About 40% of ANA participants report having consulted a traditional healer, either in the 12 months prior to the survey or a longer time ago; almost half of ANA participants report never having consulted a traditional healer. Proportionally fewer ANA Band members on reserve (30%) use traditional medicine compared to 46% among other First Nations in Ontario and 40% among First Nation communities in Canada.

The proportion of Band members who report routine medical examinations for blood pressure and blood sugar is similar among ANA Band members and other First Nation communities in Ontario and in Canada (50% – 70% for men and women); however for vision/eye care, cholesterol, and a complete physical examination, it is approximately 10% lower. A greater proportion of women ANA Band members report that they have never had a mammogram compared to other First Nations in Canada and in Ontario, while the percentages are similar for the PAP smear test.

Chapter 13. Diet, nutrition and food security: About a third of ANA-CHA participants, more women than men, report eating nutritious balanced meals always or almost always, and about half report sometimes. These results are similar to those observed in other First Nations in Canada. However, when examining the types of food, fewer ANA Band members on reserve consume vegetables, fruit and milk products daily compared to First Nations in Ontario and in Canada, and more report daily consumption of fast foods.

Walleye is the most frequently consumed fish species, as well as the most consumed traditional food overall, with 30% of the participants reporting eating it often in the 12 months prior to the survey. Wild blueberries and wild strawberries are the most frequently consumed wild berries and a majority of participants report consuming wild rice at least a few times over the past year. With the exception of moose, most participants do not report consuming game animals or fowl. Most participants (70%) report that someone shared traditional food with them in the previous 12 months.

We calculated food security status using the same questions and calculations as the First Nation Regional Health Survey (2008/2010), which classifies food security into 3 categories: (i) Food secure (ii) Moderately Food Insecure and (iii) Severely Food Insecure. A total of 43% of participants are food secure. About a third (31%) of the participants households are moderately food insecure, and about **a quarter (23%) of the households are severely food insecure**; there is no difference between participants living in Grassy Narrows and those living off reserve.

Food security increases with income (15% in the lowest income adequacy bracket and 82% in the highest) and is higher among those who share traditional food (59% of those who are food secure share in traditional food, compared to 19% of the severely food insecure). Severe food insecurity varies with civil status; 42% among persons who are divorced, separated or widowed; 32% for those who are single, and 15% for those living in couple.

Severe household food insecurity is considerably higher among ANA Band members on reserve than in First Nation communities in Ontario and in rural Canada (25% vs. 15% and 13%), but the percentage of those who are food secure is similar to that of First Nations in rural communities in Canada and about 10% lower than in First Nations communities in Ontario.

Chapter 14. Physical activity: Nearly half of ANA CHA participants report walking or practicing moderate activities at least 35 minutes daily. Men's daily routine is more active than that of women; there are no age-related differences. Physical activity is more common in participants who report thriving, who are not obese, who report fewer limitations in their activities due to a mental or physical condition, and who had a greater sense of control over their life.

The most frequent activities in the year prior to the survey are: walking (80%), fishing (51%) and swimming (35%). Proportionally more persons who fish often eat walleye (between 45% to 50%, depending on age) compared to those who do not fish (16% to 20%, depending on age).

Chapter 15. Smoking, drinking and drug use: Almost half of participants currently smoke (46%), most daily. There is no difference between men and women, but men tend to smoke more cigarettes per day than do women. Although proportionally fewer older persons (50+) smoke compared to younger ones, older persons who do smoke, consume considerably more cigarettes per day. **Compared to the others, proportionally more persons smoke daily among those who are experiencing psychological distress and thought about or attempted suicide.** The proportion of persons who do not smoke is higher among those who have been told by a health professional that they have mercury poisoning, who have high blood pressure, or who report they require homecare.

Despite the high proportion of smokers, 72% of participants live in a smoke-free home. Proportionally slightly more ANA Band members on reserve smoke daily or occasionally (66%) compared to First Nation communities in Ontario (50%) and First Communities in Canada (57%); however for those 60 years and more, proportionally fewer ANA Band members smoke daily or occasionally (ANA: 12%; Ontario: 18%; Canada 25%) and a similar percentage live in smoke-free homes.

One person in four reports using cannabis daily or almost daily with more men than women and more younger persons compared to older persons. Proportionally more Band members on reserve (38%) compared to Band members living off reserve (21%) report cannabis usage daily or almost daily. Few persons report using hard drugs and the maximum frequency was once or twice over the past twelve months.

One person in four (25%) report not drinking alcohol over the past 12 months; proportionally more women compared to men and non-drinkers increased with age. For those over 60 years of age, 71% did not drink over the past year. The First Nation Regional Health survey defines heavy drinking or binge drinking as 5 or more drinks per setting on one occasion at least once a month. Using this definition, we classified persons into (i) non-drinkers (26%), moderate drinkers (20%) and heavy drinkers (54%). Among ANA Band members on reserve, 58% are heavy drinkers compared to 49% among other First Nation communities in Ontario. FNRHS in Canada reports the percentage of drinkers that are heavy drinkers; in communities in Canada, 64% of drinkers binge drink, in ANA, it is 73%. The contribution of drinking was accounted for in all of the analyses on determinants of health status.

There are proportionally more abstinent and moderate drinkers among women, among persons over 50 years of age, non-Band members, non-smokers, persons who have been told by a health professional that that had diabetes, mercury poisoning, persons who don't use cannabis. Abstinent and moderate drinkers have a higher score on the mastery scale and proportionally more have low psychological distress; fewer have thought about committing suicide and fewer have attempted suicide.

A total of 38% report that they have sought treatment for substance abuse. This percentage is over twice as high as those who have sought treatment for substance abuse in other First Nation communities in Ontario (16%). Among those who have sought treatment, 22% were abstinent in the past year and 19% drank moderately.

Chapter 16. Community wellness and traditional culture: The analyses in this section included only persons, Band members and non-Band members, who reside in Grassy Narrows. The survey questions included the challenges listed in the First Nation Regional Health Survey. **Challenges identified by more than half of the persons who live in Grassy Narrows are, in descending order: alcohol and drug abuse, housing, employment, education and training opportunities, water supply, funding and health**. Among those who wrote in other challenges, the top three were mercury poisoning, water quality and logging. As age increases, proportionally more persons see health as a challenge. For those 50 years and over, 62% see it as a challenge. In terms of progress, over 50% indicate that some or

good progress has been made with respect to education and training opportunities and housing, 40 – 46% progress with respect to health and water supply, between 30 and 40% indicate some or good progress for culture, natural environment and resources, funding, employment/number of jobs.

Compared to other First Nations in Canada ANA Band members on reserve are more **positive about changes in their community, particularly as concerns control over decision, funding, natural environment/resources and gang activity, health, educations and training opportunities and housing.** From the FNRHS list, the most commonly reported strength was family values, identified by 53% of the participants and good leisure or recreation activities (44%) are also reported by almost half of the participants. The ANA-CHA survey included **"Persistence in fighting for our rights" as a strength of the community; 45% endorsed this as a strength.**

Almost 60% of persons living in Grassy Narrows participate sometimes, always or almost always in the community's cultural events and **48% report that they participate at the least sometimes in community events to recognize their rights**.

TABLE OF COMPARISON WITH OTHER FIRST NATION COMMUNITIES

The ANA Community Health Assessment survey used many of the same questions as the First Nations Regional Health Survey (2008/2010) (FNRHS). This allowed us to compare ANA responses with other First Nations in Canada (11,043 adults over 18 years and older) and Ontario (1500 adults 18 years and older). Since the FNRHS was carried out on reserves, here we present the ANA-CHA survey responses for ANA members on reserve.

The table includes some of the major differences. For the specific chronic health conditions, we include those that are similar as well as those that are different.
Bold script indicates that ANA is worse off compared to First Nations in Ontario, Canada or both.

	ANA on reserve	**First Nations in Ontario**	**First Nations in Canada**
Socio-demographics			
Persons 40 years and over	**38%**	50%	
Persons 60 years and over	**9%**	16%	13%
Work and income			
Paid employment			
○ 18 - 29 years old	**36%**	41%	56%
○ 30 - 39 years old	**55%**	67%	61%
○ 40 – 49 years old	**54%**	72%	59%
○ 50 – 59 years old	**44%**	71%	21%
○ 60 + years	38%	22%	21%
Labour force participation rate	76%	-	69%
Not working due to health problems or disabilities	**41%**	24%	22%
Struggle to meet basic living requirements			
Struggle to pay for food	**54%**	37%	40%
Struggle to pay for transportation	**46%**	35%	35%
Struggle to pay for utilities	**45%**	40%	32%
Residential schools			
Persons placed in residential schools	**16%**	8%	20%
Residential school negatively impacted health and well-being	**81%**	53%	-
A parent was placed in a residential school	**64%**	36%	**-**

	ANA on reserve	First Nations in Ontario	First Nations in Canada
Health status			
Persons with thriving health	**21%**	40%	44%
At least one chronic health condition (not including mercury poisoning)			
○ 18-29 years	**47%**		36%
○ 30-39 years	**63%**		53%
○ 40-49 years	**83%**		66%
○ 50-59 years	83%		79%
○ 60 years +	92%		89%
Co-morbidity (four or more chronic health conditions, not including mercury poisoning)			
○ 18-29 years	**7%**		3%
○ 30-39 years	**16%**		7%
○ 40-49 years	**23%**		16%
○ 50-59 years	**53%**		26%
○ 60 years +	**69%**		47%
Diagnosed chronic health conditions			
Allergies	**31%**	23%	18%
High blood pressure	26%	27%	22%
Diabetes	23%	22%	16%
Arthritis	17%	23%	20%
Chronic back pain	16%	17%	16%
Stomach and intestinal problems	**15%**	10%	10%
Asthma	11%	11%	10%
Rheumatism (joint pain)	**11%**	4%	4%
Hearing impairment	**13%**	8%	9%
Blindness/visual problems not corrected by glasses	**12%**	3%	4%
Psychological or nervous disorder	**8%**	4%	3%
Cataracts	**7%**	5%	4%
Thyroid problems	5%	6%	4%
Learning disability[a]	5%	5%	4%
Chronic bronchitis	5%	4%	4%
Tuberculosis	**5%**	1%	2%
Glaucoma	4%	2%	2%
Cognitive or mental disorders[a]	2%	2%	1%
Cancer	2%	3%	2%
Stroke	2%	2%	2%
Heart disease[a]	2%	9%	8%
For persons over 60 years of age, comparison with First Nations in Ontario			
• hearing impairment	**42%**	24%	-
• vision problems	**32%**	9%	-
• stomach and intestinal problems	**27%**	13%	-

	ANA on reserve	First Nations in Ontario	First Nations in Canada
Body Mass Index			
equal to or more than 30 kg/m2: obese	45%	48%	40%
Diabetes: consequences and care			
Treat diabetes through diet	**43%**	67%	65%
Treat diabetes with exercise	**26%**	51%	48%
Diabetes is treated with insulin	**41%**	21%	17%
Check blood sugar at least once/day	**36%**	56%	51%
Diabetes affected their circulation	**43%**	-	29%
Diabetes feeling in hands and feet (neuropathy)	**59%**	-	34%
Diabetes affected lower limbs	**33%**	-	23%
Diabetes affected vision	**47%**	38%	36%
Diabetes resulted in infections	**26%**	15%	14%
Attending a diabetes clinic or seeing someone	**74%**	52%	54%
Individual wellness and mental health			
Racism			
Racist experiences in the last 12 months	**42%**	38%	33%
Racist experiences affect your self-esteem	**43%**	28%	33%
Psychological distress			
High psychological distress (women)	**21%**	-	8%
High psychological distress (men)	**10%**	-	5%
Suicide			
Close friend or family member who has committed suicide	**33%**	7%	12%
Thought of committing suicide	**37%**	25%	22%
Attempted suicide	**22%**	13%	13%
Diet & nutrition			
Eat vegetables daily	**48%**	64%	63%
Eat fruit daily (summer/winter)	**32%/29%**	57%	57%
Drink milk or milk products	**43%**	61%	58%
Eat fast food daily	**20%**	13%	11%
Ate freshwater fish over the past year	83%	77%	71%
Ate wild rice over the past year	73%	54%	38%
Ate land-based mammals over the past year	29%	65%	78%
Never received traditional food over the past year	**26%**	16%	14%
Food security			
Severely food insecure	**24%**	15%	13%
Food insecurity for children	**60%**	-	45%

	ANA on reserve	First Nations in Ontario	First Nations in Canada
Smoking drinking and drugs			
Smoke cigarettes	**66%**	50%	57%
Smoke cannabis	**38%**	25%	18%
Abstain from alcohol over past year	**24%**	38%	35%
Heavy drinkers (percentage of total)	**58%**	49%	-
Heavy drinkers (percentage of drinkers)	**76%**	-	64%
Sought treatment for substance abuse	41%	16%	-
Injuries			
Injured in the past 12 months	**29%**	21%	19%
Falls	**46%**	33%	35%
Injury due to motor collision (women)	**12%**	-	2%
Injury due to physical assault	**12%**	4%	8%
Injury due to domestic/family violence	**8%**	3%	4%
Physical activity			
Most of a typical day sitting	**22%**	13%	
Walking or other moderate activities at least 35 minutes a day	**47%**	63%	
Disability			
Activity limitation due to a physical, mental or health problem? (men)			
○ 18-34 years (men)	4%		13%
○ 35-54 years (men)	33%		28%
○ 55+ (men)	42%		48%
Activity limitation due to a physical, mental or health problem? (women)			
○ 18-34 years (women)	17%		17%
○ 35-54 years (women)	**49%**		30%
○ 55+ (women)	**62%**		52%

a The prevalence of these chronic conditions are higher among Band members living off reserve: Learning disability: 11%; Cognitive/mental disorders: 11%; Heart disease: 10%; High blood pressure: 32%.

SUMMARY OF FINDINGS ON MERCURY POISONING AND FISH CONSUMPTION

Health professional has told you that you have mercury poisoning:

For Band members who reported that they have been **told by a health professional that they have mercury poisoning** compared to those who reported that they have not been told by a health professional that they have mercury poisoning:

- There are proportionally more who are **not working** (61% vs. 43%).
- They constitute 65% of those who indicate that they are not working because of **poor health or disabled**.
- They have **lower incomes** both individually ($p<0.05$) and by household ($p<0.05$).
- More are **limited in their activity because of a physical or mental condition or because of a health problem** (often 24% vs. 6%; sometimes: 31% vs. 11%)
    - The likelihood of activity limitation is threefold, taking into account age, sex, heavy drinking, injury in the last 12 months, at least one chronic disease, and obesity.

      Odds Ratio 3.16 [C.I. 95th 1.31 – 7.77]
- More difficulty **accessing NIHB** services, taking into account age and sex.

  Odds Ratio = 2.13 [95th C.I. 1.03 – 4.37]
    - 36% of those who have trouble accessing vision care have been told by a health professional that they have mercury poisoning.
- Co-morbidity:
    - They are over 4 times more likely to have **multiple chronic health conditions** (4 or more chronic health conditions), taking into account age and sex.

      Odds Ratio = 4.62 [95th C.I. 2.18 - 9.80]

- The likelihood of having a health professional tell you that you have one of or more of the above **neuropsychological disorders** is fivefold greater.

  Odds Ratio = 5.23 [95th C.I. 2.29 – 11.9]

- They are 5 times more likely to have been told by a health professional that they have **allergies.**

  Odds Ratio = 5.85 [95th C.I. 2.74 – 11.89]

- The likelihood of **blindness or vision problems that cannot be corrected by glasses** is over three times stronger, taking age into account.

  Odds Ratio = 3.3 [95th C.I" 1.21 – 9.2]

- Those over 30 years of age are almost 4 times more likely to have been told by a professional that they have **high cholesterol**, adjusted for diabetes and high blood pressure.

  Odds Ratio = 3.7 [95th C.I. 1.10 – 12.7]

- Those over 30 years of age are 3 times more likely to have been told by a health professional that they have **arthritis,** taking into account age and sex.

  Odds Ratio = 3.47 [95th C.I. 1.41 – 8.76]

- Those over 30 years of age are 2.5 times more likely to report **chronic back pain**, taking into account age and obesity.

  Odds Ratio = 2.67 [95th C.I. 1.12 – 6.38]

- Those over 30 years of age are 4 times more likely to report **stomach and intestinal problems**, regardless of age or sex.

  Odds Ratio = 3.94 [95th C.I. 1.62-9.80]

  - 40% of persons of persons who have been told by a health professional that they have mercury poisoning suffer from stomach and intestinal problems compared to 12% for those who answer 'no' to this question.

- Those 30 years and over are over 4 times more likely to report **hearing impairment,** taking into account age and sex.

  Odds Ratio = 4.57 [95th C.I. 1.80 – 12.1]

- For those 30 years of age and over, the increased likelihood of being told by a health professional that you have **rheumatism (joint pain)** is almost five fold.

  Odds Ratio = 4.91 [95th C.I. 1.87 – 12.90]

- The likelihood of having had an injury in the past 12 months is over twice as high, taking into account age, education and heavy drinking.

  Odds Ratio = 2.40 [95th C.I. 1.08 – 5.33]

Fish consumption at 10 years of age:

For all Band members who reported that they consumed fish more than several times a week when they were 10 years of age, compared to those who reported that they ate fish less frequently:

- The likelihood of having been told by a health professional that you have **mercury poisoning** is two and half times greater, taking age into account.

  Odds Ratio = 2.51 [95th C.I. 1.17-5.70]

- There is a 2.5 times increased likelihood that a health professional has told them that they have **diabetes**, taking into account age, sex, high cholesterol, eating nutritious meals and body mass index.

  Odds Ratio: 2.58 [95th C.I. 1.05 – 6.36]

- The likelihood of **hearing impairment** is increased 3 times Odds Ratio, taking into account age and sex.

  Odds Ratio: 2.94 [95th C.I. 1.07 – 9.50]

- The likelihood of having been told that you have at least **one nervous system disorder** is twice as high among those who consumed fish more than several times a week.

  Odds Ratio = 2.15 [95th C.I. 1.06 – 4.61]

For Band members **under 50 years of age who report that they consumed fish more than several times a week when they were 10 years old** compared to those who reported that they ate fish less frequently:

- The likelihood of having done **fairly or poorly in school** is almost twice as high (taking into account age and sex.

  Odds Ratio 1.79 [95th C.I. 1.02 – 3.13]

- There are more Band members among those who ate fish several times a week as a child whose **income is under $20,000** compared to those who ate less fish, taking into account age and sex.

  Odds Ratio 1.85 [95th C.I. 1.02 – 3.26]

- For women, fish consumption at 10 years of age is associated with 18 of 58 symptoms, taking into account age, having at least one chronic illness, obesity, drinking and smoking.

- For men, almost all the 58 symptoms are associated with fish eating at 10 years of age, taking into account age, having at least one chronic illness, obesity, drinking and smoking.

- A clustering technique provided a means of grouping symptoms into 6 clusters. Taking into account the relevant co-variables, **childhood fish consumption** is associated with symptom clusters:

  - Peripheral neuropathy
  - Sensory and sensory-motor loss
  - Neuropsychological deficits
  - Motor loss and tingling around mouth
  - Loss of hearing, vision and speech

Current fish consumption:

We examined the prevalence of frequent consumption of **walleye over the 12 months prior to the survey among persons less than 50 years of age,** and whether persons who eat more walleye report more symptoms than those that ate fewer or had not eaten walleye over this period

- One third of all Band members report often eating walleye over the previous year.

- More Band members on reserve (35%) often ate walleye over the past year compared to those living off reserve (19%).

- More Band members off reserve who struggle to pay for food eat more walleye (27% vs. 8%). This is not the case for those who live on reserve.

- Taking into account fish consumption at 10 years of age and other relevant co-variables, for all Band members, **often eating walleye in the past 12 months** is associated with **symptoms clusters** of:

- Peripheral neuropathy
- Sensory and sensory-motor loss
- Motor loss and tingling around the mouth

Finally, all of the symptom cluster analyses were rerun without those who have been told by a professional that they have mercury poisoning (n = 30); the associations were similar.

Father a fishing guide:

For Band members who indicated that their **father was a fishing guide** compared to those who indicated that their father had not been a fishing guide.

- The likelihood of having been told that you have **mercury poisoning** is almost five times more for those whose father was a fishing guide is, taking age into account.

  OR = 4.76 [95th C.I. 1.55-15.0]

- For persons over 30 years of age, the fathers' of almost all of those who have been told that they have mercury poisoning (96%) were fishing guides.

- The likelihood of having been told that you have at least one nervous system disorder is twice as high among those whose father was a fishing guide.

  OR = 2.15 [95th C.I. 1.06 – 4.61]

Mercury Disability Board

- A total of 95 Band members report that they have made a claim to the Mercury Disability Board, of these, 21 (22%) indicate that their claim was accepted, 11% that their claim is in progress, and 67% report that their claim was refused.

- Men whose claim has been accepted by the Mercury Disability Board have more social support that those whose claim has been refused.

OVERALL CONCLUSIONS AND RECOMMENDATIONS

The ANA-CHA is a community driven endeavour, which provided high quality data. Almost 80% of the people living in Grassy Narrows participated in the survey, which was coordinated and administered by ANA Band members. Participants were informed prior to and during the survey that the results belong to ANA and will be used to improve their health and wellbeing. Knowledge of community ownership of the data contributed to the success of the survey.

The questionnaire survey was adapted from the First Nation Regional Health Survey (2008/2010) to meet ANA's needs and concerns, This allowed us to (i) compare the situation of ANA Band members on reserve with other First Nation communities in Canada and in Ontario, and (ii) examine how consumption of mercury-contaminated fish affects ANA's health and wellness.

The findings show that the health and wellbeing of ANA cannot be understood without taking into account their history of mercury poisoning and its consequences. The results of the ANA-CHA provide clear evidence that the physical and mental health of ANA Band members is poorer than that of other First Nation communities in Canada and Ontario. They likewise show that people who ate more fish show worse health and wellbeing. These findings from the ANA-CHA survey are consistent with the extensive scientific literature, which show that methyl mercury from fish consumption is harmful, particularly to the nervous system.

The ANA-CHA survey results reveal that more people with diagnosed mercury poisoning have several other chronic health conditions and lower income, compared to the others, and adults under 50 years of age, who ate more fish as children, report more symptoms of nervous system dysfunction, poorer success in school and lower income.

The major findings are:

- The physical and mental health of ANA Band members is poorer than that of other First Nation communities
- The differences with other First Nations are not observed for all chronic health conditions
- In ANA, diabetes poses further challenges for health care
- A much lower prevalence of diagnosed heart disease in ANA constitutes an unexpected finding.

- Mercury contamination of fish resources has gravely affected ANA's health and social and economic wellbeing, and deprived the community of a traditional, highly nutritious food.
- There are fewer elders in Grassy Narrows compared to other First Nation communities in Ontario and Canada
- For the most part, individual wellness of the ANA community is considerably worse than that of other First Nations in Ontario and in Canada.
- Overall, women report poorer physical and mental health compared to men. Women
- Deprived of a nutritious food source (fish) with omega-3 fatty acids and other nutrients, coupled to a reduced earning capacity, there is a high prevalence of food insecurity in Grassy Narrows.
- Current health and social services programs are inadequate in addressing many of the issues concerning the health and wellbeing in the ANA community.

1. **The physical and mental health of ANA Band members is poorer than that of other First Nation communities.** The most striking differences are for health perception, chronic health conditions, psychological distress, suicide, income, food security and activity limitations. These differences are primarily, but not solely, with outcomes that are associated with childhood fish consumption and/or co-morbidity with mercury poisoning. For many outcomes, the largest differences are for middle aged persons (30 – 49 years)

Recommendation: Because of these differences, ANA requires additional resources for physical and mental health care, as well as programs to compensate for their economic loss.

2. **The differences with other First Nations are not observed for all chronic health conditions:** Of the 28 chronic health conditions that were surveyed among First Nations in Canada, Ontario and ANA, the prevalence for 20 conditions is similar, as is the distribution of Body Mass Index. The prevalence of diabetes in ANA is higher than in other First Nation communities in Canada, but similar to Ontario. ANA Band members on reserve have a higher prevalence of the following chronic health conditions: allergies, stomach and intestinal problems, blindness or visual problems not corrected by glasses, hearing impairment, rheumatism (joint pain), psychological or nervous disorders and tuberculosis. With the exception of tuberculosis, all of these chronic conditions show co-morbidity with mercury poisoning (see below). In contrast, the

prevalence of heart disease is considerably lower in ANA, even among the elderly.

Recommendation: High co-morbidity observed in ANA needs to be considered in clinical care, future studies and compensation for mercury poisoning

3. **Diabetes poses further challenges for health care.** Compared to other First Nation communities, more ANA persons with diabetes are being treated with insulin. Moreover, diabetic co-morbidity is likewise different; proportionally more ANA diabetics report neuropathy, vision problems, circulatory difficulties, lower limb issues and infections. It is noteworthy that these symptoms are likewise associated with mercury exposure, and, survey results show neuropathy, vision problems and lower limb problems are likewise associated with childhood fish consumption.

   The observed association between childhood fish consumption and diabetes requires follow up. Published studies on a possible association between mercury exposure and diabetes are inconsistent, however, most were carried out with populations who eat sea fish and mammals, which have high levels of selenium and omega-3 fatty acids, or with persons whose mercury exposure was well below those that have been reported for Grassy Narrows.

Recommendation: The possible contribution of mercury exposure to diabetes, its consequences and care, is an important issue for this community and needs to be followed up through clinical and/or epidemiological studies in order to ensure that diabetics are receiving appropriate care.

4. **Lower prevalence of heart disease: an unexpected finding.** While this may represent a positive outcome, it may also reflect a higher mortality rate among those with heart disease. This is all the more surprising since myocardial infarction has been associated with methyl mercury exposure at concentrations much lower than those that have been reported for Grassy Narrow residents. The present survey cannot answer the question as to whether heart disease presents differently in mercury-exposed persons or whether mercury, or something else in the Grassy Narrow environment, is protective of heart disease.

Recommendation: There is an urgent need to carry out clinical and/or epidemiologic studies to understand these findings; anecdotally, heart disease is considered by ANA community members as one of the major causes of death.

5. **Mercury contamination of fish resources has gravely affected ANA's health and social and economic wellbeing, and deprived the community of a traditional, highly nutritious food.** The results of the survey are consistent with the extensive scientific literature on the health effects of methyl mercury from fish consumption, notably on the nervous system.

    - **Sixty persons in the ANA community have been told by a health professional that they have mercury poisoning.** Persons with mercury poisoning report significantly more other chronic health conditions compared to those who do not have mercury poisoning, independently of age and sex. These include: neuropsychological disorders, blindness or vision problems that cannot be corrected by glasses, arthritis, chronic back pain, stomach and intestinal pain, high cholesterol, allergies, hearing impairment and rheumatism. While the survey cannot determine whether these ailments are a result of mercury toxicity, this co-morbidity needs to be taken into account when considering health care for persons with mercury poisoning. Persons with mercury poisoning likewise have proportionally more accidents and are more limited in their activities. Over 60% are not working, two thirds of these because of poor health or disability, and as a consequence, they have lower incomes. Despite their illnesses, they have more difficulty than others in accessing Non-Insured Health Benefits (NIHB) services, particularly for vision care, a known outcome of mercury exposure.

Recommendations: There is an urgent need to improve care for persons with mercury poisoning, taking into account co-morbidity, loss of livelihood and loss of mobility.

There needs to be services, such as physiotherapy, occupational therapy, speech therapy, pain management, counselling and traditional healing, not only for those with diagnosed mercury poisoning, but also for others in the community with sub-clinical symptoms (see below).

Greater support for accessible infrastructures and mobility aids are required. There is a clear need for a long-term care facility in Grassy Narrows for those who can no longer care for themselves.

It is noteworthy that a third of Band members responded that they did not know if a professional had told them that they have mercury poisoning, a very much higher proportion compared to responses for the other chronic conditions. Although persons who answered that they 'did not know' report significantly fewer symptoms compared to persons who answered 'yes', they have significantly more symptoms compared to those who

answered 'no' to this questions, taking into account age and sex. It is not possible to know from the survey why there is this high percentage of persons who answered not knowing whether a professional has told them that they have mercury poisoning.

Recommendation: This result reflects the need for regular examinations for sub-clinical and clinical effects of mercury, including neuropsychological assessments.

- **For those under 50 years of age, childhood consumption of fish several times a week or more is significantly associated with many aspects of their health and well-being**. Since mercury toxicity can be progressive, we examined persons less than 50 years of age with respect to their fish consumption during childhood. Those who consumed more than several fish per week as a child did more poorly in school compared to the others. This translates into earning capacity: more Band members who ate fish several times a week as a child report an annual income of under $20,000, compared to those who ate less fish, taking age and sex into account. These persons likewise have more activity limitations, even when considering those with no diagnosis of mercury poisoning. Persons who ate more fish when they were children report a higher frequency of symptoms of nervous system damage, difficulty concentrating and motor disorders, independently of age, sex, chronic health conditions (including diabetes), drinking habits and nutrition.

Recommendations: Prenatal and childhood exposure is known to be particularly harmful for development. The results here indicate that this continues into adulthood, affecting individual and community wellbeing. There is a need for adult education and job training programs, which take into account deficits associated with mercury poisoning, as well as programs to compensate for economic loss.

The study could not answer the question about whether the effects will get progressively worse, but the group that shows the greatest effects are those between 30 and 49 years of age. There is a need for regular medical ad neuropsychological examinations by professionals with a good knowledge of mercury poisoning

6. **The results of the survey are consistent with the extensive scientific literature on the health effects of methyl mercury from fish consumption,** notably on the nervous system. Indeed, mercury is a well-known toxic substance, whose effects on the nervous system are on a dose-dependent continuum of loss of function and wellbeing; prenatal and childhood exposure is

particularly harmful since the nervous system is in rapid development. Although there are fewer studies on other health outcomes, several studies have shown effects on the cardiac function and disease, while the reports on metabolic disorders are less consistent.

Recommendations: Health professionals that treat ANA community members, including providers of visual care, physiotherapy, etc. and indigenous and non-indigenous health care workers and educators, should have training on the effects of mercury poisoning.

Since racism is cited as a barrier to health care, a strong therapeutic relationship with the community and individuals is an important part of effective treatment.

7. **There are fewer elders in Grassy Narrows compared to other First Nation communities in Ontario and Canada.** Since the percentage of elders may result from sampling bias (i.e. fewer older persons participated in the ANA CHA survey) we verified this finding with other surveys and the most recent government census. The proportionally fewer elders in Grassy Narrows suggests that many people have died prematurely and that those who remain are the 'survivors' from the effects of mercury poisoning, but this cannot be verified by the present survey. It should be noted that half of the elders (those over 50 years of age) have been told by a health professional that they have mercury poisoning.

   Fewer elders has far-reaching consequences: (i) Fewer persons are available to transmit traditional culture and knowledge. (ii) Fewer elders are present in immediate and extended families to help out. It is noteworthy that in Grassy Narrows, more elders are currently employed compared to elders in other communities, although this may reflect that, on average, the elders in Grassy Narrows are younger than those in other First Nation communities. Cultural continuity and connectedness have been shown to be protective for emotional wellness (see below).

Recommendations: Long term, stable institutions to facilitate the sharing of knowledge, culture and traditional healing by Grassy Narrows should be supported and augmented. Where local elders are not available, programs such as elder-sharing with other First Nation communities should be explored.

Efforts should be made to ensure that the elders (both present and future) remain as healthy as possible.

8. **For the most part, the mental health and individual wellness of the ANA community is considerably worse than that of other First Nations in Ontario and in Canada.** The most striking evidence of the poorer mental health and wellness is suicide. Etkin, in his book on disaster theory,[13] writes that prior to 1970, no *suicides* were ever recorded at *Grassy Narrows*. In 1977–1978, there were 28 attempted *suicides* of people aged 11–49 years of age out of a population of about 500. In the ANA-CHA survey, 91 Band members indicate that a family member or close friend has committed suicide, 113 have thought of committing suicide (41% of respondents to this question) and of these, 83 (76% of the 109 who responded) have attempted suicide. While 45% of persons who had attempted suicide indicated that it was as a child or adolescent, 55% indicated that it was as an adult and 19 persons responded that the attempt was during the past year.

   When compared to other First Nation communities in Ontario and Canada, approximately three times more ANA Band members report that a close friend or family member committed suicide, approximately one and a half times more have thought of committing suicide and approximately twice as many have attempted suicide. Furthermore, the proportion of those who attempt suicide among those who think about suicide is approximately 54% among other First Nation communities and 76% in Grassy Narrows.

   Psychological distress is the major determinant of suicidal events and the ANA-CHA survey shows that, compared to other First Nation communities in Canada, almost three times as many ANA women and twice as many ANA men suffer from high psychological distress. Among the protective factors for psychological distress are: good health, school success, a nutritious diet, social support, a sense of belonging to the community and mastery over one's destiny. The risk factors include: food insecurity, financial insecurity, disability, injury and chronic health conditions, notably nervous system disorders and heavy drinking. Many of these factors (good health, school success, food insecurity, financial insecurity, disability and chronic health conditions) are associated with mercury poisoning and/or higher fish consumption as a child.

[13] Etkin D. Disaster Theory: An Interdisciplinary Approach to Concepts and Causes. Butterworth-Heinemann, 2014, p. 138.

Recommendations: The results clearly indicate that current mental health and suicide programs are insufficient to reduce suicide and improve mental health. In addition to providing better and more services for individuals, there is a need for a greater community focus.

Long-term stable programs should be improved to maximize the protective factors and minimize the risks. The protective factors for psychological distress identified in the present survey need to be reinforced and coupled with cultural continuity or connectedness, which have been shown to be a factor associated with lower youth suicide in First Nation communities[14] and better mental health.[15]

Interrelationships between the natural environment (benefits and risks) social factors, behaviours and health need to be addressed, particularly in this community that has experienced a continuing environmental disaster.

9. **Overall, women report poorer physical and mental health compared to men**. More women than men report poorer health, at least one chronic health condition, high psychological distress, suicidal ideation and attempted suicide. Women report a higher frequency of symptoms. In the multivariate analyses of symptoms, more factors contribute to increased frequency of symptoms in women compared to men. It is noteworthy that despite poorer health, women work more paid hours compared to men.

Recommendation: There is a need to adequately address gender differences in order to provide adequate physical and mental health care to women as well as men.

10. **Deprived of a nutritious food source (fish) with omega-3 fatty acids and other nutrients, coupled to a reduced earning capacity, there is a high prevalence of food insecurity in Grassy Narrows.** The Grassy Narrows community was not only poisoned by mercury through their fish consumption, but also deprived of an important nutritious food source, known for its health benefits. The life of Grassy Narrows centered on fish for economic, cultural and nutritious benefits. Even today, two thirds of the community fish, and half of those who fish eat fish often. Walleye is the most fished and eaten.

[14] Chandler MJ and Lalonde C. Cultural continuity as a hedge against suicide in Canada's First Nations. Transcultural Psychiatry 35 : 191-219 ; 1998.

[15] Snowshoe A. et al, Cultural Connectedness and Its relation to mental wellness for First Nations youth, Journal of Primary Prevention 38 : 67-86 ; 2017.

The loss of this natural resource, coupled with poverty, is associated among other factors with disability, illness and poor academic achievement. 24% of persons in Grassy Narrows suffer from severe food insecurity; the prevalence is almost twice as other First Nations in Ontario and Canada. Only 15% of those in the lowest income adequacy bracket are food secure.

Food security status is associated with the quality of the diet. 25% of those with severe food insecurity rarely or never eat nutritious meals. Persons who have someone who shares traditional food with them are more food secure. In an article published in the Lancet in February 2018, ***Dr. Jane Philpott wrote:*** *"One First Nations elder reminded me that "words do not feed a table." His point was that rebuilding trust demands action, including the resources to accomplish these goals."*

Recommendations: There is an urgent need for long-term, stable programs, which provide nutritious food to people living in Grassy Narrows.

The efforts to discover and recover clean fishing areas for the community should be intensified. In addition to fish, the community needs the means to harvest other traditional foods, such wild rice, moose and hare to be shared with the entire community.

Community gardens should be established and community kitchens, which can provide nutritious food for those who are disabled and ill, should be set up.

11. **Current health and social services programs are inadequate in addressing many of the issues concerning the health and well-being in the ANA community.** In the same article in the Lancet, **Dr. Philpott** writes: *"Correcting for these inequities [in health] requires more than better health care. Health-care workers who respect Indigenous knowledge and practices are vitally needed, and health-care systems must be improved. But real change requires the recognition of the inherent and treaty rights of Indigenous peoples, along with investments in the social determinants of health."*

Recommendations: Recognition of the consequences of the major disaster that took place in the English-Wabigoon River System and the continuing impact of mercury poisoning should form the basis of designing and delivering an adequate health and social services system.

While many of the problems accessing health care are similar to other First Nation communities, there are differences in the proportion of persons that need to access these services, with a resulting increase in cost. Increased funding should be provided to account for the increased cost of providing services in a mercury-impacted community.

Furthermore, some of the specific needs that results from mercury poisoning, such as visual care, the treatment of diabetes and other diseases, physiotherapy, speech therapy, etc, need to be more available. Off reserve services need to be more accessible and culturally sensitive.

It is noteworthy that in this context twice as many ANA Band members on reserve (11%) have an immediate family member placed in a long-term care facility located outside of the community or off reserve compared to other First Nations in Ontario (6%) and the percentage of those who were placed in a long-term care facility when they were less than 60 years of age is considerably higher.

Recommendation: A long-term care facility, that meets the needs of community members, should be built in Grassy Narrows**.**

12. **Despite many physical and mental disabilities, ANA community members make important individual and collective efforts to improve their health and well-being.** Grassy Narrow's 40 year struggle for recognition of their situation and their fight for adequate compensation and care is well-known, through numerous books, media coverage of their plight and the many community activities, including a long-standing barricade against logging on their territory and community efforts for fish management and remediation of the river system.

    The ANA-CHA provides a glimpse into how individuals are coping with their situation. Almost half of participants in the survey indicate that they have furthered their education, with trade, technical or vocational school, community college, university or training for specific employment. In comparison with other First Nation communities in Canada, the labour force participation rate for Band members on reserve is 76%, while for Canadian First Nation communities it is 69%. Compared to other First Nations in Canada ANA Band

members on reserve are more positive about changes in their community, particularly as concerns control over decision, funding, natural environment/resources and gang activity, health, educations and training opportunities and housing.

The survey reveals the efforts to change personal behaviours that are harmful to health. While the percentage of smokers is higher in Grassy Narrows compared to other First Nation communities, the percentage of those who live in smoke-free homes is similar. Over one-third of the community have sought treatment for substance abuse, and there are fewer heavy drinkers among persons with diabetes and mercury poisoning. Alcohol and drug abuse is recognized as a major challenge of the community. While heavy drinking is higher in ANA compared to other First Nation communities, the analyses in the present report show that alcohol drinking does not explain or influence the associations between fish-eating and poor health outcomes.

Recommendation: Health promotion policies that focus on changing behaviours would benefit from a better understanding of the underlying factors that contribute to these behaviours, such as access to health food, possibility to engage in physical activities due to disabilities, poverty, mental and physical trauma, etc.

From the FNRHS list, the most commonly reported strength is family values, identified by 53% of the participants, and good leisure or recreation activities (44%) are also reported by almost half of the participants. Almost 60% of persons living in Grassy Narrows participate sometimes, always or almost always in the community's cultural events and **48% report that they participate at the least sometimes in community events to recognize their rights**.

In the words of **Dr. Jane Philpott:** ***"The path ahead begins with the recognition of these rights."***

In the words of **Judy Da Silva:** ***"A clean-up [of the river] would be a new beginning. It would help our health and also help our community to see a brighter future. Now we are used to the darkness."***

Asubpeeschoseewagong
Netum Anishinabek
GRASSY NARROWS, ONTARIO P0X 1B0 • PHONE: (807) 925-2201 • FAX: (807) 925-2649

April 4, 2024

Attention: Anjala Purvanathan (Director, Ontario Region) (greatbear@iaac-aeic.gc.ca)
Impact Assessment Agency of Canada
Ontario Region
600-55 York Street
Toronto, Ontario M5J 1R7

Dear IAAC,

RE: The Great Bear Gold Mine Project

On behalf of Asubpeeschoseewagong Anishinabek ("ANA" or "Grassy Narrows First Nation"), we write in response to your March 22, 2024 correspondence to Chief Turtle advising of the Impact Assessment Agency of Canada's (the "Agency") opinion that a federal impact assessment is warranted for the Great Bear Gold Project proposed by Kinross Gold Corporation. In your correspondence you state that "the Agency remains committed to the United Nations Declaration on the Rights of Indigenous Peoples, including the need for meaningful engagement with Indigenous Peoples."

We remind you that the standard for consultation with Indigenous peoples under the United Nations Declaration on the Rights of Indigenous Peoples (the "Declaration") is free, prior, and informed consent. This is the standard of consultation that Grassy Narrows expects with respect to the Great Bear Gold Mine Project, which is consistent with Canada's commitments under the Declaration and the *United Nations Declaration on the Rights of Indigenous Peoples Act* ("UNDRIP Act") and Action Plan.

This letter is provided for the purpose of addressing the role of the Declaration in the Impact Assessment process and should not be taken as Grassy Narrows' comments on Phase 1 of the Impact Assessment.

The Declaration

The Declaration is clear that the standard for consultation with Indigenous peoples is consent:

> Article 32(2): States shall consult and cooperate in good faith with the indigenous peoples concerned through their own representative institutions in order to obtain their free and informed consent prior to the approval of any project affecting their lands or territories and other resources, particularly in connection with the development, utilization or exploitation of mineral, water or other resources.

In 2016, Canada endorsed the Declaration "without qualification" and committed to its "full and effective implementation."[1]

The UNDRIP Act and Action Plan

Under Canada's UNDRIP Act, which provides a framework for Canada's implementation of the Declaration, Canada must ensure that federal laws are consistent with the Declaration. In doing so, Canada must harmonize the *Impact Assessment Act* ("IAA") processes with the Declaration, including Article 32. Canada's June 21, 2023 Action Plan also specifies that the IAA must be implemented in a manner consistent with the Declaration. Measure 51 of the Action Plan, which must be completed in partnership with Indigenous peoples, states that "the Impact Assessment Agency will implement the *Impact Assessment Act* (IAA) in a way that aligns with the objectives and spirit of the UN Declaration." In particular, this includes "carrying out impact assessments in a manner that emphasizes the need to seek free, prior, and informed consent."

Grassy Narrows expects that the Agency will carry out the federal impact assessment process for the Great Bear Gold Project in a manner consistent with the Declaration and that respects Grassy Narrows' right to give or to withhold our free, prior, and informed consent. Anything less would be contrary to Canada's commitments under the Declaration, its own UNDRIP Act and recent Action Plan, and the Crown's stated efforts to "advance reconciliation in a tangible way."[2]

In particular, we urge you to:

a. Carry out the Impact Assessment using a process that is appropriate for Grassy Narrows' unique circumstances, is co-created with Grassy Narrows, and has Grassy Narrows' consent.
b. Pause the Impact Assessment process until the concerns expressed in Grassy Narrows' previous letters have been resolved and Grassy Narrows' consent for the Impact Assessment process is obtained.
c. Include within the scope of the Impact Assessment the question of whether Grassy Narrows' free, prior, and informed consent for the project has been obtained consistent with the Declaration.
d. Ensure that the scope of the Impact Assessment includes all activities that may impact Grassy Narrows' rights and interests.
e. Ensure that no impacts to Grassy Narrows from the project in areas of federal authority are authorized unless Grassy Narrows' free, prior, and informed consent is obtained.
f. Ensure that the decision outcome of the Impact Assessment process has Grassy Narrows' free, prior, and informed consent.
g. Not authorize or otherwise allow the project to proceed without Grassy Narrows' free, prior, and informed consent.

Please provide a written response to this letter, and a written explanation as to how Article 32 of the Declaration will be implemented in the Impact Assessment process in a manner consistent with the Declaration.

[1] https://www.rcaanc-cirnac.gc.ca/eng/1524502914394/1557512757504
[2] https://www.justice.gc.ca/eng/declaration/ap-pa/index.html

The Grassy Narrows Lands Protection Team is willing to meet with the Agency to further discuss the federal Impact Assessment process and our preliminary concerns with the Project as set out in Chief Turtle's March 7, 2024 correspondence to the Agency.

Sincerely,

Joseph B. Fobister
Lead Negotiator, Grassy Narrows Lands Protection Team

Cc:

Chief Rudy Turtle, Chief of Grassy Narrows First Nation (rudyturtle@outlook.com)

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Asubpeeschoseewagong
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Attention: Minister George Pirie (Minister of Mines) (minister.mines@ontario.ca)
99 Wellesley Street West
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Toronto, Ontario M7A 1W3

Attention: Anjala Puvanathan (Director, Ontario Region) (greatbear@iaac-aeic.gc.ca)
Impact Assessment Agency of Canada
Ontario Region
600-55 York Street
Toronto, Ontario M5J 1R7

Attention: Aaron MacDonell, Director of Environmental Services (aaron.macdonell@kinross.com)
Mac Potter, External Relations Manager (mac.potter@kinross.com)
Great Bear Resources Ltd. A Kinross Company
104 Howey Street
Red Lake, Ontario P0V 2M0

Dear MINES, IAAC, Kinross and Great Bear Resources:

RE: The Great Bear Gold Mine Project

I wrote to you on March 29 and April 15 to provide initial findings from Dr. Kevin Morin concerning metal leaching and acid rock drainage, water quality and hydrogeology with respect to the Great Bear Gold Project.

Please find enclosed:

- Dr. Morin's response to Kinross Gold's consultant, WSP. He concludes that he remains concerned about the many potential environmental impacts that are not recognized and not anticipated by Kinross Gold and about the many impacts that are recognized but poorly addressed and characterized. His concerns pertain to both the proposed advanced exploration and the proposed mining.

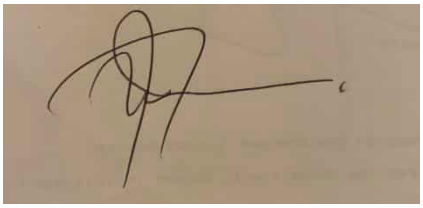
- Dr. Morin's report following his review of the technical documents provided to Grassy Narrows to date: Project Definition; Geochemical Characterization Workplan; Advanced Exploration Program Reclamation Strategy; Program Closure Plan (Draft for Indigenous Review); Hydrogeological Workplan; Surface

Water Quality Workplan; Fugitive Dust Best Management Practices Plan; PTTW Application for Dewatering; Draft Detailed Project Description; Water Treatment during Proposed Exploration and Proposed Mining.

Based on Dr. Morin's export reports, Grassy Narrows is extremely concerned that the project is moving ahead swiftly in the absence of required information and at great risk to the environment, the health, inherent, Treaty and Indigenous rights of Grassy Narrows.

I repeat Grassy Narrows' call to freeze the regulatory process work on this project until full credible information is available and the barriers to Grassy Narrows' meaningful involvement have been resolved. I also repeat Grassy Narrows' position that this project, including the extensive mining of valuable ore that the company is calling "bulk sampling", must be subjected to a rigorous environmental assessment.

Miigwetch,



Joseph B. Fobister, Lead Negotiator of Grassy Narrows Lands Protection Team

CC:

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MINESITE DRAINAGE ASSESSMENT GROUP
(A Division of Morwijk Enterprises Ltd.)

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CANADA

BY EMAIL

April 24, 2024
FILE: 5025.01

Grassy Narrows First Nation
c/o Cavalluzzo
474 Bathurst Street, Suite 300,
Toronto, Ontario M5T 2S6
Attn: Grassy Narrows Lands Protection Team

Dear Grassy Narrows Lands Protection Team,

RE: Great Bear Mining Project - Response to Kinross Gold on MDAG Initial Comments of March 27 2024

I have submitted to you two letters in the past about environmental concerns at the Great Bear Project, dated March 27 and April 11. These letters were based on some of my initial findings from some documents that were within my focus on metal leaching and acid rock drainage (ML-ARD), water quality, and hydrogeology. My review is now complete, including more detailed explanations for those earlier, initial comments as well as additional comments and concerns. My full review accompanies this letter of April 23.

Kinross Gold's consultant, WSP, replied to my first letter of March 27 on April 4. WSP sent a table with 18 issues, listed as "MSDAG [sic] Letter - Comments and Rationale" with a corresponding "GBR Response".

Please note that I did not include full "Rationales" with my initial letters because my detailed review was still in progress. Thus, it was not possible for WSP to provide satisfactory responses. My detailed "Rationales" were provided to you only today.

In any case, I explained that there was little reliable and professionally certified information on ML-ARD, water quality, and hydrogeology at this point for the Great Bear Project. Most Great Bear reports included labels like "preliminary", "draft", and "initial", which meant they were not complete, not certified as reliable, and subject to change one or more times in the future. In fact, some information and designs already changed substantially in 2023, as the accompanying review confirms.

Many of WSP's Responses reflected this. For example, the first WSP Response starts with:

> "The geochemical information presented in these reports represent initial draft documents for the Project, based on data collected in 2022 and early 2023 which was developed [sic] qualified professionals."

As I explained previously, my opinion is that preliminary, draft, and initial reports for the Great Bear Project that are not signed and certified by qualified professionals should not be reviewed. They are subject to change, and already some reports issued in 2023 contradicted others. I expect this to continue for at least a few years until final, reliable monitoring data and testwork are completed.

As a result, it is not worthwhile or meaningful to reply to WSP's Responses to my first letter. There are insufficient information and data at this time to debate and clarify many of my concerns and issues. There may or may not be sufficient information and data in future years. Only time will tell.

Therefore, based on the information available at this time for the Great Bear Project, I remain concerned about the many potential environmental impacts that are not recognized and not anticipated by Kinross Gold and about the many impacts that are recognized but poorly addressed and characterized. My concerns pertain to both the proposed advanced exploration and the proposed mining.

Sincerely,

Kevin A. Morin, Ph.D., P.Geo., L.Hydrogeo.
President

Great Bear Mining Project -

Review of ML-ARD and Water Quality Expected during and after Advanced Exploration and Proposed Mining

prepared for:

Grassy Narrows Lands Protection Team
c/o Cavalluzzo LLP
474 Bathurst Street, Suite 300,
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prepared by:

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April 23, 2024

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Report Summary

This MDAG review has focussed on the potential for contamination of water by metal leaching and acid rock drainage (ML-ARD) on, under, and around the Great Bear Project during proposed exploration and proposed mining.

It is important to note that some report titles for Great Bear contain the words "draft", "preliminary" or "initial", meaning newer drafts and revised final versions from Kinross Gold may or may not change from what has been reviewed here. Also, the first cover page for the Detailed Project Description of November 2023 says "draft" while the second WSP cover page does not. Thus, I have found that the reviewed documents for the Great Bear Project as a whole is a confusing mess of shifting, changing, contradicted, and assumed details, with none signed and certified by qualified professionals.

Also, the contents of some documents are password protected. This protected text and information cannot be extracted for detailed evaluation, quotation, review, and comment now or in the future. Thus, they preclude detailed reviews by Grassy Narrows First Nation, which is what Kinross Gold seeks.

Each section of this MDAG review looked in detail at a particular report on proposed exploration and/or proposed mining. The following paragraphs are the summaries taken from each section, and each section should be consulted for details and context.

Section 2 of this MDAG Review

For the password-protected Project Definition Document of December 2022, sufficient details and omissions are present for me to be very concerned about ML-ARD and water-quality degradation during and after the relatively large, at-least-four-years-long proposed Advanced Exploration that would essentially be a first phase of mining at Great Bear. These concerns carry over to the proposed mining.

Although this document is not marked as "draft" and is thus final, it contains many details contradicted by later documents as explained in later sections of this MDAG review. Thus, it is not possible to know exactly what is proposed for Advanced Exploration and, in turn, to know reliably how bad the environmental problems and impacts could be.

Section 3 of this MDAG Review

Problems detected in the January 2023 Geochemical Characterization Workplan include:

- The ML-ARD program is "in progress" so no one knows how bad the contamination will be and which elements will be at toxic levels requiring treatment, yet Kinross wants to proceed with

Advanced Exploration.

- All that is available now is 96 rock core analyses according to the September 2023 Reclamation Summary (see below), which on their own are not reliable and cannot yet be interpreted reliably for ML-ARD. In fact, these 96 samples were not even of the rock that would be "mined" during Advanced Exploration, but only "proximal" which could also mean "very different". In any case, the 96 samples were not collected and analyzed as required under the Ontario Mining Act (see next bullet). Thus, Kinross Gold and its consultants, WSP, are guessing how bad the contamination will be, but admit that some of it will be bad, and are likely years away from completing the ML-ARD work required under Regulation 240/00 of the Ontario Mining Act (Mine Development and Closure under Part VII Of the Act).

- The stated approach and methodology used for Advanced Exploration is "based on the requirements" of two British Columbia documents from 1997-1998 (Price, 1998; Price and Errington, 1998; Price, Morin and Hutt, 1997). In reality, the Ontario Mining Act says the approach and methodology must be based on the much more detailed 2009 federal Prediction Manual, not just as "guidance" as Great Bear has done. Thus, the work for Advanced Exploration to date does not meet the Ontario Mining Act through Regulation 240/00 and does not meet the 2009 federal ML-ARD Prediction Manual (Price, 2009).

- Even if this Geochemical Characterization Workplan was applicable and consistent with the 2009 federal ML-ARD Prediction Manual, such work requires at least 2-3 years to obtain all required information and interpretations. Therefore, perhaps in 2025 or some year after, there might be sufficient ML-ARD for Advanced Exploration, but not any time soon.

Section 4 of this MDAG Review

Concerns on the Reclamation Strategy from September 2023 include the following.

- The ML-ARD program is "in progress" so no one knows how bad the contamination will be and which elements will be at toxic levels requiring treatment, yet Kinross Gold wants to proceed with Advanced Exploration.

- All that is available now is 96 core analyses, which on their own are not reliable and cannot yet be interpreted reliably for ML-ARD. In fact, these 96 samples were not even of the rock that would be "mined" during Advanced Exploration, but only "proximal" which could also mean "very different". Also, 30 samples of overburden, which is intended to be left on surface and used for reclamation, were collected yet the results are not reported although there is ~50% probability that the overburden will release ML-ARD and thus be toxic. Kinross Gold and WSP are guessing how bad the contamination will be, but admit that some of it will be bad. They are likely years away from completing the ML-ARD work required under the Ontario Mining Act and Regulation 240/00, because the work for Great Bear was not initially consistent with Regulation 240/00. In part, this is because the 2009 federal ML-ARD Prediction Manual (Price, 2009) was not recognized or followed as required. Even the

definitions of ML-ARD acronyms used for the Great Bear Project are not correct according to the federal Manual, which is additional evidence the Prediction Manual is not being followed.

- The bad ML-ARD rock appears to be associated with "rapid acid generation" according to the Program Closure Plan (reviewed in the next section below). This is an incorrect explanation of the phenomenon, but still shows that the bad water quality will start coming out of the disturbed rock, including the underground mine walls, very quickly after initial disturbance. Informally, this is called "lag time" to ML-ARD, but most of the ML-ARD work has not yet been done to quantitatively estimate the lag time beyond "rapid". This contaminating rock will be stored on surface and possibly only later, likely after the lag time, some might be taken underground. When this rock contacts water underground as the workings partially flood and submerge, it will quickly release more contamination. This means the underground water flowing into the surrounding groundwater system, and the surface overflow if any, would have to be monitored and likely be treated for many years or in perpetuity after Advanced Exploration.

Section 5 of this MDAG Review

For the password-protected Program Closure Plan, Draft for Indigenous Review from November 2023, the following concerns were noted.

- In November 2023, the volume of overburden has approximately doubled from previous documents without an explanation. Because overburden generally has a 50% probability of releasing ML-ARD and contaminating water, overburden represents a major but unexamined threat to water quality on, around, and beneath the Great Bear exploration site.

- "Preliminary" criteria are provided for separating "PAG" and "NPAG" rock and for "NML" rock. However, these acronyms are not used in an accurate manner that is consistent with the 2009 federal Prediction Manual (Price, 2009) required by Regulation 240/00. The preliminary criteria are not rational based on ML-ARD science unless justified with detailed and intensive site-specific studies, which have not yet been completed and professionally certified for the Great Bear Project.

- The potential for ML-ARD after closure is presented all the way to detailed predictions of aqueous concentrations in mg/L for on-site water and effluent to the environment, but only after closure and not during operations when the water quality would be reasonably worse. However, these predictions are not explained in any detail, are not justified, appear anomalous, and are not certified by a qualified professional. Some predictions are actually pre-exploration baseline that are erroneously assumed to be re-established immediately at closure. Furthermore, these predictions are missing more than a dozen potential contaminants.

- The "PAG" rock, which would likely create the highest contaminant concentrations, is not included

in this Program Closure Plan, presumably because this "PAG" rock will be backfilled underground. However, when placed underground, this "PAG" rock will likely continue to release severe ML-ARD until submerged, at which point a relatively huge amount of accumulated contamination would be released into the underground water. After the mine is refilled to equilibrium, and the minewater begins flowing into the surrounding groundwater system and through the more than 500 km of permeable drillholes to the environment, it will contaminate large surrounding areas. This major risk to water quality and the environment is not even mentioned in this Closure Plan, which is a major omission.

- The backfilling of "PAG" rock at closure is the largest individual cost item for closure totalling around $10 million. However, this reflects the currently minimum volume based on preliminary, unreliable information. In the worst case, which was assumed in the Great Bear Project Definition and still not disproven here, total closure costs could exceed $20 million.

Section 6 of this MDAG Review

In the Hydrogeological Workplan from December 2022, there is a major omission that would preclude a reliable and comprehensive assessment of current baseline hydrogeologic conditions and of future impacts from proposed mining. The groundwater monitoring network does not extend far enough to the west and northwest, beyond the proposed western portion of the Tailings Management Facility.

Section 7 of this MDAG Review

In the Surface Water Quality Workplan from December 2022, there are insufficient information and details to determine if appropriate work is planned and conducted. This is because important details are listed only as "including". For example, major potential contaminants like manganese and thallium are not specifically listed, but perhaps they are implicitly included? There is no way to know.

Section 8 of this MDAG Review

Based on the final-draft Fugitive Dust Best Management Practices Plan of September 2023 for Advanced Exploration, this work is unacceptable because it grossly underestimates the potential impacts from ML-ARD geochemical contamination of soil, vegetation, water, and biota by dust. This work assumes the on-site sources of dust "would be similar in concentration to the background rock". This is wrong and ignores the ongoing ML-ARD assessment of ore, rock, and overburden.

Section 9 of this MDAG Review

In the PTTW (Permit To Take Water) Application for Dewatering, Final Draft, and its several

important appendices from October 2023, there are alarming errors and ambiguities that should preclude approval of PTTW. These should also trigger a detailed impact assessment, which this PTTW report conversely says is not needed for Advanced Exploration at Great Bear.

In the introduction to the main PTTW report, the only numerical water withdrawal mentioned is up to 250 m^3/day (250,000 L/day) from Dixie Creek. Thus, it is stunning because the actual total water withdrawal from the local groundwater/surface-water balance would be at least 3,203,000 L/day every day and reaching up to 7,703,000 L/day on some days as a contingency. Even these flows are unrealistically low as explained here.

The errors begin with groundwater modelling that is based on long-term "steady state conditions" after the mine is "fully developed" and dewatered, and not on the correct, higher-inflow "transient conditions". Thus, inflow, pumping, and dewatering are significantly underestimated by the groundwater model and the PTTW Application. Additionally, there are problems with unrealistically low estimated effects on partial dewatering of Dixie Creek and other creeks and rivers. For example, simulated groundwater levels are around 9 m higher than measured around the mine and Dixie Creek, which artificially and incorrectly prevent additional dewatering of Dixie Creek.

Groundwater levels are shown to be drawn down during dewatering to a maximum of only 36 m even though the dewatered workings will be 600 m deep. This reflects (1) nearly fully dewatering of the shallow overburden and (2) the lack of admission on the likely huge drawdown and much larger "Zone of Influence" in the rock beneath the overburden.

Baseflows into Dixie Creek and other waterbodies can be critical to aquatic, benthic, and terrestrial ecosystems because of groundwater's typically different water quality and temperature compared to water already flowing at the surface. This becomes more critical during droughts when baseflow may be the main source of surface flows. The PTTW Application ignores the fact that more than 34 to 55% of existing baseflow would be lost during Advanced Exploration. It instead points out that the loss to groundwater would be only 2.4% and less of total flow depending on the chosen surface-flow statistic.

Overburden is routinely ignored in this PTTW document and its appendices, despite the proposed hundreds of thousands of tonnes of overburden likely having at least some ML-ARD potential and capacity to degrade water quality. In fact, some underground dewatering would be sprayed on the overburden for dust suppression, which in turn could lead to contaminated runoff across and off the site.

Section 10 of this MDAG Review

In the perhaps-draft Detailed Project Description of November 2023, the first cover page by Kinross says this document is "draft", but the second cover page by the authors, WSP, does not say "draft" so perhaps this is or is not the final document. If so, it has not been signed by qualified professionals and thus should be rejected.

In any case, there are so many problems, misleading statements, errors and omission concerning ML-ARD, water quality, and environmental impacts that they cannot all be summarized well here. These problems include the following.

- There is a false statement that there will be no sources of mercury from the ore processing when in fact the tailings and concentrate from the process will contain mercury. The processing could even cause mercury and other elements to leach more quickly and become more mobile.

- Contrary to the impression given by this Detailed Project Description, cyanide destruction is not perfect and can simply mask the cyanide temporarily in the environment, but the important testwork to determine this has not yet been done for the Great Bear Project.

- Significant impacts on water quality can arise from seemingly benign proposed activities like paste backfill of tailings into the underground mine and dewatered filter-cake tailings. However, the potentials for serious impacts are not recognized or not even mentioned in this perhaps-draft Great Bear document that can supposedly be used to determine what impacts could occur.

- Storm events and equipment upsets can lead to relatively large variations and unexpected impacts, day-to-day or even hour-to-hour, during proposed exploration and proposed mining. Instead, these Great Bear documents use averages like monthly which incorrectly assume flows will be the same every day of a month which is far from reality. Environmental impacts and spills can also be caused by large variations, as well as longer-term averages, so the environmental risks of proposed exploration and proposed mining at Great Bear remain mostly unknown and not identified.

- Nonsense pseudo-scientific statements are used, like the aggregate required to build the project would be “nonreactive mine rock and overburden” which does not exist. This clearly shows that experienced and qualified professionals were not included in the writing of this perhaps-draft Detailed Project Description. If there is a true commitment to “nonreactive mine rock and overburden” which does not exist, then the Great Bear Project stops now.

- There is a lack of ML-ARD assessments for some site components like aggregate.

- There is a prevalent but likely false belief that “NPAG”rock will have little to no impacts on ML-ARD, water quality, and the environment. However, this has not been proven for the Great Bear Project and is likely wrong based on other minesites around Canada. “NPAG” rock can actually generate more acid than “PAG” rock and could still release seriously contaminated levels of many metals and other elements at near-neutral pH.

- The financial assurance to ensure proper and fully paid closure of the proposed Great Bear Project is grossly underestimated based on existing information. Furthermore, the financial assurance should also include contingencies for costs of early or premature closure, but it does not.

- There are likely devastating, expensive, and unrecognized ML-ARD consequences on water quality from the proposed relocation of "PAG" rock into the underground workings after operation.

- The ongoing, unproven, and likely wrong, belief continues that overburden would be environmentally benign, can be used across the site for reclamation, and can be sprayed with water to control dusting when it could instead create contaminating water around, below, and beyond the Great Bear site.

- There are unfounded beliefs that dewatering during exploration and mining would have minimal effects on the local and regional water balance, and would not significantly dewater surface creeks and lakes including their environmentally important baseflow. These false beliefs are based on flawed groundwater modelling for the Great Bear Project explained earlier in this MDAG review.

- There is a false belief that dust blown off the site during proposed exploration and proposed mining and into the surrounding environment, vegetation, soil, water, and aquatic ecosystems is benign at "background" levels.

- A false belief is stated that only elevated and toxic ammonia, and no other contaminating nitrogen species from explosives that consistently accompany the ammonia, will appear in mine water during proposed exploration and proposed mining.

- There is an unsupported and likely substantially underestimated statement that the mine walls in the pits and underground workings "may potentially contribute minor quantities of metals to the mine water" instead of the more typical significant quantities of metals seen at many other minesites around Canada. This is taken as far as the likely ludicrous statement that there would be "Potential for creation of fish habitat in new pit lakes, expected to be re-connected [sic] to the Dixie Creek system".

- There is no recognition of the implications, costs, and impacts of storing months of contaminated mine water on the site should one or more "unexpected" yet currently predictable inorganic contaminants and ML-ARD occur on the site water during and after proposed exploration or proposed mining.

Section 11 of this MDAG Review

In summary for water treatment, Great Bear documents invoke water treatment as the major process that would prevent or minimize environmental impacts of proposed exploration and proposed mining. This is not literally true, because there will be fugitive contaminated water and contaminated dust leaving the site, but this fugitive contamination is ignored or not recognized in many reviewed Great Bear documents.

In any case, water treatment is the last "line of defence" between the on-site ML-ARD and contamination and the off-site impacts, and thus requires intensive study and characterization.

However, at this time, water treatment for proposed exploration and proposed mining is ambiguous and contradictory among the documents. This should be expected because the input flows and input contaminant concentrations (ML-ARD) will not be known reliably for at least a few years. Nevertheless, there are serious concerns about water treatment now including the following.

- Kinross Gold does not expect to treat site water to non-toxic levels. Instead, treatment would only be down to still-toxic levels based on the Metal and Diamond Mine Effluent Regulations (MDMER). Thus, Kinross Gold intends to rely on significant dilution of its contaminated effluent within a "mixing zone" in the Chukuni River. Such a mixing zone would include zones of significant toxicity and would require formal authorization from Fisheries and Oceans Canada. In any case, this discharge of effluent would add to cumulative effects, which is a particular concern of Grassy Narrows First Nation.

- Expensive and intensive treatment for ammonia, derived from blasting residues, is proposed. However, toxic levels of nitrate and nitrite, that always accompany the ammonia and which can cause eutrophication and other impacts in the Chukuni River and Dixie Creek, are completely ignored.

- Sulphate concentrations in the treated effluent, which I understand can increase toxic methylation of mercury and other elements like cadmium and arsenic, are not mentioned at all.

- Ultrafiltration may substantially reduce effluent concentrations of elements not fully dissolved, mixing-zone size, and cumulative effects. However, there are no details on this ultrafiltration in the reviewed Great Bear documents.

- Mine water treatment plants remove metals and other elements from the water, by creating concentrated and toxic treatment waste commonly called "sludge", which can reach "hazardous" and "special" waste levels in some jurisdictions. Thus, treatment sludge requires the most careful and secure handling and long-term storage under contaminated-sites regulations. Spills of this sludge can result in toxic conditions in water and sediments including soils and benthic ecosystems. All the Great Bear documents I have reviewed so far are completely silent on the annual volumes, handling, storage, long-term protection, and potential environmental impacts of treatment sludge that will remain and be managed somewhere in perpetuity.

1. Introduction

Metal leaching (ML) and acid rock drainage (ARD) are often water-chemistry and water-quality issues for minesites (e.g., Morin and Hutt, 1997 and 2001). As a result, the accurate prediction and control of ML-ARD at mining projects and proposed minesites in Ontario are high priorities of the provincial and federal governments.

This is explained in Part 7 (*Metal Leaching and Acid Rock Drainage Requirements*) of Ontario Regulation 240/00 (*Advanced Exploration, Mine Development and Closure under Part VII of the Act*), and in the federal ML-ARD Prediction Manual (Price, 2009). Section 57(1) of Regulation 240/00 states,

> "A program shall be undertaken to sample all materials remaining on the site that have been excavated, exposed or otherwise disturbed by mining activities, including but not limited to,
>
> (a) drill core;
> (b) metallurgical samples;
> (c) pit walls;
> (d) existing waste rock, ore, concentrate and *overburden* [MDAG emphasis] piles;
> (e) construction rock; and
> (f) tailings."

For detailed guidance, Ontario Regulation 240/00 states,

> "The sampling program shall be conducted by a person who is qualified in Ontario as a professional geoscientist, professional agrologist or professional engineer in accordance with a report prepared by William A. Price on behalf of the Mine Environment Neutral Drainage (MEND) program, entitled 'Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials', MEND Report 1.20.1, dated December, 2009, as that report may be amended from time to time..." [Price, 2009]

ARD is caused by oxidation of sulphide minerals, which are found at the Great Bear Project, particularly iron-bearing sulphides like pyrite and pyrrhotite. Whether sulphide minerals are present or not, weathering can still lead to accelerated metal leaching (ML). For example, the simple dissolution of near-neutral or alkaline carbonate minerals can release metals like manganese and zinc into the water. Thus, ARD is a subset of the more generic ML.

In practice, ML is not limited to true metals in the Periodic Table, but to all elements that could become potential environmental contaminants. For example, sulphate and nitrate are regularly included in ML assessments. Sulphate can reportedly increase the methylation of mercury and other elements like cadmium and arsenic.

Therefore, ML-ARD is an acronym representing the full spectrum of inorganic water chemistry and quality on, beneath, and around a minesite. Put simply, ML-ARD potential is synonymous with the potential for inorganic water contamination and the degradation of on-site water quality.

Kinross Gold Corporation (Kinross Gold) proposes Advanced Exploration and later mining at its Great Bear Gold Mining Project in the Red Lake mining district of Ontario, approximately 25 km southeast of the Town of Red Lake. The Great Bear Project is located in the Interim Area of Interest for Mining of Asubpeeschoseewagong Netum Anishinabek (ANA), which Kinross documents also name as Grassy Narrows First Nation (GNFN). The Great Bear Project is also in an area where Grassy Narrows First Nation people use the land and water to practice their Indigenous way of life. It is located upstream of the English River which flows directly to the Grassy Narrows village site and Grassy Narrows' most important fishing grounds.

Through Cavalluzzo LLP, the Grassy Narrows Lands Protection Team has asked me, Dr. Kevin Morin of the Minesite Drainage Assessment Group (MDAG), to review and comment on the proposed exploration and proposed mining. This MDAG review focuses on predicted surficial and subsurface ML-ARD and water quality on and around the Great Bear Project.

My qualifications for making the comments in this review document include the following. I have been assessing water contamination at minesites by metal leaching and acid rock drainage (ML-ARD) for 46 years. I have done this at several hundreds of exploration, operating, and closed mining-related sites on all continents except Antarctica, from north of the Arctic Circle to south of the Tropic of Capricorn, in biogeoclimatic zones ranging from virtually no annual precipitation up to a rare daily rainfall of one meter. I earned my Doctor of Philosophy degree in contaminant hydrogeology from the University of Waterloo, where my supervisor was the renowned Dr. John Cherry along with a thesis committee including Drs. Emil Frind (a well-known groundwater modeller) and Eric Reardon (a well-known geochemist). To date, I have authored or co-authored 99 published papers and presentations, five books, and 80 online case studies. I have been and am a peer reviewer for a number of international journals related to ML-ARD and environmental contamination. More details can be found at www.MDAG.com.

The Kinross documents reviewed in the following sections are listed below. Again, the main focus is on the potential for contamination of water by ML-ARD on, under, and around the Great Bear Project during proposed exploration and proposed mining.

- Project Definition Document (December 2022)
- Updated Site Plan
- PTTW Application for Dewatering, final draft (October 2023)
- Fugitive Dust Best Management Practices Plan, final draft (September 2023)
- Reclamation Strategy (September 5, 2023)
- Program Closure Plan, Draft For Indigenous Review (November 2023)
- Surface Water Quality Workplan (December 21, 2022)
- Hydrogeological Workplan (December 21, 2022)
- Geochemical Characterization Workplan (January 9, 2023)
- Preliminary Impact Assessment Methodology, draft (May 31, 2023)
- Preliminary Listing of Potential Valued Components for the Great Bear Project (May 31, 2023)
- Initial Project Description (June 1, 2023)
- Detailed Project Description (November 2023)

- PowerPoint Presentation by Kinross to ANA (November 10, 2023)
- ANA IPCA Map

It is important to note that some report titles above contain the words “draft”, “preliminary” or “initial”, meaning newer drafts and revised final versions from Kinross Gold may or may not change from what has been reviewed here.

Also, the contents of some documents above are password protected. This protected text and information cannot be extracted for detailed evaluation, quotation, review, and comment now or in the future. This precludes the detailed review by Grassy Narrows First Nation that Kinross Gold seeks. I strongly recommend that unlocked versions of all Kinross documents be obtained and kept by Cavalluzzo LLP and the Grassy Narrows First Nation for future reference and usage.

2. Project Definition Document (December 2022)

The Great Bear Resources Great Bear Advanced Exploration Project Project Definition Document, dated December 2022 by WSP E&I Canada Limited (WSP), is a password-protected document from which its content cannot be extracted or copied for detailed evaluation and reinterpretation.

In the Preface of this document, WSP states,

> "The Project as described in this document is subject to change as engineering progresses, in response to feedback from government agencies, Indigenous communities and stakeholders, as well as constraints not currently known, that are identified by ongoing environmental baseline and engineering works, and Indigenous consultation and engagement."

No new or updated Project Definition could be located and thus this version from December 2022 is reviewed here from the perspective of ML-ARD and potential water contamination.

Section 1.3 explains the objective of the proposed Advanced Exploration and its key activities:

> "The objective of this Project is to obtain additional information on the known mineralized zones (LP Fault, Limb Zone and Hinge Zone; Figure 1-3) through underground drilling, and to extract a bulk ore sample of up to 60,000 tonne (t) by underground mining methods. Extraction of a bulk sample allows the testing of representative areas of the mineralization off site, in order to gain a better understanding of the geology of the mineralized zones including, grade, structural controls on the mineralization, continuity, mining dilution, optical sorter performance and metallurgical recoveries. This information will support the assessment and development of a viable commercial production scenario.
>
> "The Project will also support future engineering designs by improving knowledge of key factors (ground conditions, water inflows, costs, labor, etc.). It will also improve the knowledge base to increase the confidence in environmental predictions associated with the proposed underground mine and to a lesser extent open pit mine.
>
> "Key Project activities are provided below:
> - Establish portal(s) and decline(s) to provide access underground in order to establish required underground workings
> - Develop drill platforms off the decline to facilitate efficient underground drilling of the known mineralized zones at depth
> - Extract up to 60,000 t of ore (bulk) sample from test stopes and drifts in the mineralized zones
> - Transport the ore to surface along the decline(s) by truck for crushing, sorting and sampling; samples will transported off site by highway truck for test processing
> - Mine rock that must be removed from the underground workings in order to provide access to the ore will be brought to surface by truck and will be stored in stockpile(s) unless appropriate for use as a construction material on site
> - Additional activities on surface and underground, such as environmental management."

These quotations raise several concerns as explained next.

Section 1.4 "Consultation to Date" with First Nations mentions Wabauskang First Nation (WFN) and Lac Seul First Nation (LSFN) in several places including an Exploration Accommodation Agreement. In contrast, Grassy Narrows First Nation (GNFN) in mentioned only twice, including where the Ontario Ministry of Mines instructed Kinross Gold to include GNFN in notifications of significant updates on exploration works. Later, Section 7.4.1 adds,

> "On September 29, 2022, the Company communicated its interest in an introductory meeting to GNFN, who respectfully declined the offer."

Section 1.5 on "Involvement of Federal Agencies" in this Project Definition starts by saying "Not currently applicable". Then it clarifies:

> "No Federal government departments or agencies are expected to grant Federal land or providing financial support to the project (include indirect funding support, such as for infrastructure and training). There is the potential that Federal departments may be required to provide environmental approvals or authorizations (see Section 7.3.1)."

Federal agencies like Fisheries and Oceans Canada will very likely be involved in authorizations as the Great Bear Project intends to discharge toxic water including from its advanced-exploration treatment plant into fish-bearing waters and fish habitat as "mixing zones" requiring authorizations. This is discussed further in Section 11 of this MDAG review.

Section 5.1.1 on Existing / Previous Development, Operations and Facilities says:

> "The first exploration work documented by Geology Ontario on the Property dates from 1944. Prior to acquisition by Great Bear Resources Ltd. in 2017, 176 diamond drillholes had been completed totalling 32,602.8 metres (m).... As of October 2022, there has been over 500,000 m of diamond drilling on the Property."

For understanding how groundwater might move during and after proposed Advanced Exploration, these hundreds of drillholes more than 500 km in total length create very permeable pathways for subsurface water to travel long distances quickly, in violation of normal hydrogeologic principles like hydraulic gradients and hydraulic conductivities. This is not acknowledged in other Great Bear documents, as explained in sections of this MDAG review such as Sections 6 and 9.2.

Section 5.1.3 on Geology and Mineralogy says:

> "The Property lies locally within a regional northwest-southeast trending belt of metavolcanic and metasedimentary rocks, bound by intrusive batholiths (see Figure 5-1). The Project is targeting gold mineralization, currently identified within three mineralized zones (see Figure 1-3):
>
> - LP Fault Zone, disseminated gold within high strain
> - Limb Zone (previously known as the Dixie Limb), silica-sulphide replacement
> - Hinge Zone, quartz veining."

The 2009 federal ML-ARD Prediction Manual (Price, 2009) shows that the ML-ARD and potential contamination from each of these zones requires separate ML-ARD evaluations. However, the proposed underground drifts are from a limited area of the ore zones, contrary to a statement that Advanced Exploration is needed to check "the continuity of underground access gold deposits" (see below).

Section 5.1.4 on Geochemical and Geotechnical Considerations states:

> "Geochemical characterization work has been initiated in order to support potential future development, including meeting the requirements of the Mine Rehabilitation Code for a future Advanced Exploration Closure Plan. Ongoing work include static testing (acid base accounting, short-term leaching), mineralogy and metal content. Humidity cells and rain barrel tests are also proposed. The conservative [worst-case] assumption pending results of the comprehensive testing program, is that ore and mine rock is potentially acid generating. This assumption will be amended on receipt of the pending test results and further assessment."

This worst-case assumption (incorrectly stated as "potentially acid generating" in comparison to the federal ML-ARD Prediction Manual) that all ore and mine rock will release ML-ARD could still be the case now, despite recent statements to the contrary (see the sections below in this review). This is because important ML-ARD work has not been completed and then certified by a qualified professional.

Section 5.1.4 also describes the overburden at the Project, which requires ML-ARD assessment equal to those of waste rock and ore according to the federal ML-ARD Prediction Manual and Ontario Regulation 240/00.

> "At the northwest portion of the Property, surficial soils are glaciofluvial in origin, consisting of sands and gravels. In the central portion of the Property, the surficial soils are described as deep-water deposits comprised of laminated to varved clay, silt and fine sand (Natural Resources Canada, 1996). Based on current exploration drilling information, overburden thickness at the Property is expected to range between 0 to 40 m. There are limited bedrock exposures within the Project area. Overburden encountered to date is a mix of sand, gravel and clay; however zones of soft sensitive clays may be encountered. An extensive geotechnical drilling program is currently underway on the Property to further investigate these and other aspects."

Section 5.1.5 on Proposed Mining Activities contains many important details such as:

> "There is no production mining proposed for the site." [MDAG Note: This appears to be a play on words because significant mining for several years is in fact proposed and Section 5.1.5 is specifically entitled "Proposed Mining Activities"; see my comments below on Section 5.1.8]. This Project includes use of underground mining methods to obtain a bulk sample of up to 60,000 t. The work is to be initiated in 2023, pending consultation, regulatory approvals and a corporate decision to proceed."

Kinross Gold further explained details of the proposed Advanced Exploration in Section 5.1.5:

> "The goal of the advanced exploration program (and ongoing exploration drilling from surface), is to collect additional information to support a decision on whether to proceed to develop a mine and to support engineering design. The advanced exploration bulk ore sample will be trucked off site over the existing Provincial road network to an existing mineral testing facility. No onsite processing is proposed.
>
> "GBR proposes to collar one or two portals from surface (approximately 6 m by 6 m) and to develop associated decline ramp(s) of approximately the same dimension. Secondary

egress and ventilation may be provided through a raise. The ramp is projected to extend to a vertical depth of approximately 600 m below surface and length of approximately 9,000 m during the Project. A preliminary long-section and plan view of the advanced exploration underground workings showing the preferred portal and raise location is provided in Figure 5-2 and Figure 5-3. The ramp is designed to provide access to the investigation areas, promote efficient truck haulage and reduce ventilation losses. Personnel will access the underground workings by means of the ramp. A shaft is not proposed for the Project.

"A bulk sample will be extracted from underground workings developed from the ramp(s) using conventional drilling and blasting using explosives, from several locations within the deposit. Blasting is proposed to use prepackaged and bulk explosive products....

"The objective of this Project is to obtain additional information on the known mineralized zones (LP Fault, Limb Zone and Hinge Zone; see Figure 1-3) through underground drilling and extraction of a bulk ore sample. Extraction of bulk sample allows testing of representative areas of the mineralization in order to gain a better understanding of the geology of the mineralized zones including, grade, structural controls on the mineralization, continuity, mining dilution, optical sorter performance, crushing and grinding properties and metallurgical recoveries to support development of a viable commercial production scenario.

"Industry-specific factors that were considered by GBR when establishing the size of the bulk sample include as follows:

- The proposed bulk sample is approximately 1% of the currently defined mineralized envelope and is consistent with other Ontario advanced exploration projects, such as the Timmins West Project (100,000 t), Sugar Zone Project (70,000 t) and Upper Beaver Project (60,000 t)
- Representative bulk samples extracted using realistic mining methods that help to prove the continuity of underground access gold deposits are very important to potential financiers
- National Instrument 43-101 resource definition and economic modeling standards are becoming more stringent to satisfy stricter due diligence standards imposed by industry and the investment community, often requiring bulk samples to validate and refine resource models prior to production decisions."

The problem with these details is that the three reasons given by Kinross Gold do not justify the 60,000 t bulk sample nor the proposed locations for the removal of the bulk sample. For example, the figure shows that most of the bulk sample will be taken from two laterally-limited areas. As a result, most of the ore from northwest to southeast will not be sampled. This is not consistent with proving "the continuity of underground access gold deposits".

Section 5.1.8 on Project Duration and Rate of Mining shows that Underground Development will take place across more than four years "on a continuous (24-hour) basis" and the Bulk Sample will be collected across roughly 2.5 years. These details plus the two 6x6 m portals show this is not typical Advanced Exploration to determine if future mining might be justified, but this is the first phase of mining.

Section 5.3.8 Buildings and Large Facilities includes Table 5.2 "Primary Buildings and Facilities on Surface". "Mine Rock Stockpiles (2)" has an approximate scale of 1,000,000 t, although it is not clear on whether this is maximum capacity or expected capacity. This is only clarified later under Section 5.4.3 (see below) which is the only description of the volume of disturbed waste rock (1,000,000 t) left on site simply to obtain 60,000 t of ore (a ratio of 17:1). This implies a large percentage of waste rock will be mined during Advanced Exploration, which further supports the view that Advanced Exploration would be the first phase of mining.

Remarkably, the various ponds listed in Table 5.2 are only described as lateral areas and do not provide depths and volumes, precluding a discussion of mass balances and spills due to extreme weather events and failures of the treatment plant. Also, the total catchment of this proposed exploration site is not provided despite all its runoff and infiltration requiring routine monitoring and treatment as needed. These are serious omissions. These omissions continue in the perhaps-draft Detailed Project Description, reviewed in Section 10 below.

Despite 60,000 t of ore being mentioned many times in this Project Definition, Section 5.4.3 "Stockpiles" is the only section of this Project Definition that mentions the substantially greater amount of waste rock with ML-ARD potential:

> "It is estimated that a total quantity of approximately 1,000,000 t of mine rock will be generated and stockpiled during the Project."

Additionally:

> "A stockpile of up to 100,000 m^3 [of overburden] is proposed", which likely means about an additional 200,000 t of disturbed overburden.

Notably, less than a year later, documents (see the later sections of this MDAG review below) have increased the overburden to ~400,000 t with no clear explanation for it.

Overburden stockpiles at minesites around Canada have released significant ML-ARD, which is why they are specifically mentioned and referenced through the Ontario Mining Act, but this Project Definition fails to recognize this. Later Kinross Gold documents fail to show the overburden stockpile and fail to show its runoff reporting to ML-ARD treatment (e.g., the undated "AEX Site Plan - Updated.pdf" on which overburden is called "topsoil"). For example, "Memo - Reclamation Strategy - Sept 5 2023.pdf" says,

> "Runoff from the overburden stockpiles (will be monitored and treated to manage suspended solids as required and discharged)".

The undated "AEX Site Plan - Updated.pdf" does not show this. This is one of many glaring contradictions and errors among the Great Bear documents reviewed here.

The understanding of groundwater at this Project is incomplete or contradictory. Section 6.25. Says:

> "The bedrock is generally tight with some potential for limited groundwater flow in the upper fractured bedrock and a few deep structures."

However, a figure in Section 5.5.2 shows groundwater as the only source of inflowing water to the underground workings. Thus, Kinross is saying groundwater inflow is "limited" but also is the only source of this water that has to be actively pumped out of the mine. This escalates to serious errors in groundwater modelling explained in Section 9.2 below that incorrectly predicts relatively low groundwater inflow and relatively little dewatering of surface creeks and lakes.

Section 6.2.6 Air Emission Information has an important omission concerning ML-ARD, environmental impacts, and cumulative effects. This section simply says,

> "A meteorological station has been established on the site, and baseline air quality and sound data is being collected. Based on a review of current Project, air emissions are anticipated to be limited and no offsite impacts are predicted. A management plan will be established to mitigated dust from materials movement and traffic on gravel roads."

However, hundreds of thousands of tonnes of blasted waste rock plus disturbed overburden will remain on site in piles up to 30 m high, likely in perpetuity after Advanced Exploration. This contaminated, blasted, and disturbed materials can release ML-ARD contaminated dust that can be carried into the surrounding environment where it can affect and degrade water quality, soil quality, vegetation, microbes, fish, and animals. As explained in Section 8 of this MDAG review, this invalidates the fugitive dust study for the Great Bear Project.

In summary of this password-protected Project Definition Document of December 2022, sufficient details and omissions are present to be very concerned about ML-ARD and water-quality degradation during and after the relatively large, at-least-four-years-long proposed Advanced Exploration that would be essentially a first phase of mining at Great Bear. These concerns carry over to the proposed mining. Although this document is not marked as "draft" and is thus final, it contains many details contradicted by later documents as explained in later sections of this MDAG review. Thus, it is not possible to know exactly what is proposed for Advanced Exploration and thus to know reliably how bad the environmental problems and impacts could be.

3. Geochemical Characterization Workplan (January 9, 2023)

This very short, three-page summary of ML-ARD "geochemical characterization", apparently issued in January 2023 by WSP, does not provide much information to review and comment on since it is only a "Workplan". However, later documents show this Workplan was not followed.

Under "Purpose of the 2023 Program", it says:

> "Samples that have been or will be tested as part of the geochemistry program include drill core (representing mine rock), overburden, and synthetic tailings generated from metallurgical test programs conducted in the laboratory. Related water quality modelling will be undertaken in 2023, focusing on the proposed Advanced Exploration (AEX) phase. Additional water quality modelling, representing the overall Project, will be undertaken at a later date."

As explained below, this Workplan is not sufficiently thorough and complete under the 2009 federal ML-ARD Prediction Manual (Price, 2009) to justify water-quality modelling and its conclusions. In any case, it is now April 2024 and no verified modelling results from 2023 have been found.

Under "Mine Rock Static Testing", this Workplan states,

> "A mine rock characterization program was initiated in 2022. A total of approximately 300 samples of drill core were collected for this purpose as part of field work in 2022. Drill core samples were obtained from a variety of locations and depths around the deposit, including rock in the vicinity of the proposed open pit and underground developments, along with the proposed AEX volume. Samples of all major rock types were collected. The purpose of this work is to evaluate the ML/ARD potential of the rock and help determine how mine rock may need to be managed.... Testwork is underway and results will be available in the first quarter (Q1) of 2023."

However, nine months later in September 2023, the Reclamation Strategy (see the next section of this MDAG review) mentions only 96 samples that are only "proximal" and thus not necessarily representative of rock to be removed for Advanced Exploration or proposed mining. Perhaps the other 200 samples are not relevant for Advanced Exploration and proposed mining, but then because they are "proximal" it is possible that the 96 samples are not relevant either.

Under "Mine Rock Static Testing", it says

> "All samples will be tested for Acid Base Accounting (ABA) parameters (that includes paste pH, sulphur content and speciation, and Neutralization Potential content and form) and elemental content analysis (aqua regia digestion and ICP analysis). Some of the samples will be subjected to more detailed static tests including the Shake Flask Extraction (SFE) test, Net Acid Generation (NAG) test, and Rietveld X-Ray Diffraction. Testwork is underway and results will be available in the first quarter (Q1) of 2023."

This is insufficient detail to ensure the correct tests are being done. In fact, "aqua regia" is a partial digestion that detects only part of the heavy metals and other elements in a sample, and thus is not acceptable for most ML-ARD work including comparisons to total crustal abundances.

Also, the September 2023 Reclamation Strategy (see the next section) mentions the results of 96 core samples, without stating which methods were used and what the analytical results were. All this information "will be available in the first quarter (Q1) of 2023", but more than a year later the information is not available as qualified-professional-certified results and interpretations.

Under "Mine Rock Kinetic Testing Programs", it says:

> "Kinetic tests are used to assess how a material responds to oxidation / weathering processes over time, and are used to estimate the time until samples may start to produce acidity and the rates at which the samples release metals. Several mine rock kinetic testing programs will be conducted in 2023, including a program conducted in the laboratory (humidity cell tests) and a program conducted in the field (field leach barrel tests).
>
> • The humidity cell test program will be initiated in the laboratory in 2023. Ten tests are currently planned and the specific number of tests will be confirmed following receipt of the static testing results. Samples to be tested will include key mine rock materials with a risk for ML/ARD along with test samples that are representative of typical Project mine rock. Initial reporting on the humidity cell tests will be available in Q4 2023."
>
> • A field leach barrel program will be initiated in the spring of 2023. Ten tests are currently planned but the specific number of tests will be confirmed following receipt of the static testing results. The objective of this program is to evaluate rates of sulphide oxidation and metal release under field conditions. This information will be integrated with the results of ongoing laboratory humidity cell tests to evaluate lag times to acid onset and metal release from mine rock. The tests will be routinely monitored throughout the open water season in 2023. Initial reporting on the field leach barrel program will be available in Q4 2023."

It is now April 2024. Where are the progress reports "available in Q4 2023"? In any case, these tests take at least one year, and often longer, to complete according to the federal ML-ARD Prediction Manual (Price, 2009). Thus, reliable and professionally certified results will not likely be available until late 2024 or 2025 at the earliest.

Under "Overburden Characterization", it says:

> "A preliminary geochemical characterization program for overburden is underway. Thirty samples of the various types of overburden present around the property were collected as part of field work conducted in 2022. Samples were submitted to the laboratory for static testing (ABA and elemental content) and a subset of samples were selected for more detailed static tests. Results will be available in Q2 2023."

Strangely, in the September 2023 Reclamation Strategy (see next section), the preliminary results are mentioned for mine rock but not for overburden. This is important because this Project Definition estimates there will be about 200,000 tonnes of overburden disturbed (with recent documents less than a year later saying ~400,000 t). This is about three times more overburden than the ore being mined as a bulk sample. On average around Canada, about half of overburden at mineral deposits has significant ML-ARD potential, so there is a significant risk that Great Bear overburden will devastate water quality on, beneath, and around the site.

Under "Mine Water Quality Estimates", this Workplan states:

> "Mine water quality estimates for the AEX phase will be prepared in Q1 2023. Modelling will be conducted via mass balance approaches and will be supported by the AEX site water balance and available geochemistry data. The model results will be used to ensure that site water management needs are identified and addressed. Additional water quality modelling, representing the overall Project, will be undertaken at a later date as the project advances."

Mine-water mass balances are not often representative of leachates from sulphide-bearing rock and overburden as found at the Great Bear Project. There is no justification here for mass-balance modelling and its results could be irrelevant for Advanced Exploration as well as proposed mining. This approach should be examined in detail including the data on which it is based once qualified-professional-certified documents become available.

Under "Technical Data Collection Methodologies", it says:

> "The approach and methodology for the geochemistry programs were based on the requirements described under the Ontario Mining Act; namely guidance found within the documents DRAFT Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia (Price 1997), and Policy for Metal Leaching and Acid Rock Drainage at Minesites in British Columbia (MEM 1998). Additional guidance was provided by the reference document Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND 2009), which represents best practice and industry standard approaches and methodologies for ML/ARD sampling and characterization in Canada."

In fact, this is wrong. The Ontario Mining Act states:

> "The sampling program shall be conducted by a person who is qualified in Ontario … in accordance with a report prepared by William A. Price on behalf of the [federal] Mine Environment Neutral Drainage (MEND) program, entitled "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials", MEND Report 1.20.1, dated December, 2009, as that report may be amended from time to time..."

Therefore, for the Great Bear Project, "[t]he approach and methodology for the geochemistry programs were based on" 1997 and 1998 British Columbia documents with only "guidance" from the federal Prediction Manual. In reality, the approach and methodology are required under the Act to be based fully on the 2009 600-page federal Prediction Manual, which instead was only used for "additional guidance". The 1997 and 1998 BC documents (Price, 1998; Price and Errington, 1998; Price, Morin and Hutt, 1997) provided relatively little detailed instructions compared with the federal Prediction Manual, so the Great Bear ML-ARD testwork started off as likely insufficient under the Prediction Manual and would have to be expanded.

Under "Field and Laboratory Work Timing", it says:

> "Some field and laboratory work associated with the geochemical characterization programs was conducted in 2022 as described in the previous sections. Additional lab work is planned for 2023 as outlined above. Field work will be conducted in 2023 to construct the Field Leach Barrel tests and monitor and collect leachate from the tests. Reporting for the various programs will be available through 2023 as described above."

I have not yet seen this reporting from 2023 and am not aware if it has in fact been reported and

certified in 2023.

In summary, problems encountered in this January 2023 Geochemical Characterization Workplan include:

- The ML-ARD program is "in progress" so no one knows how bad the contamination will be and which elements will be at toxic levels requiring treatment, yet Kinross wants to proceed with Advanced Exploration.

- All that is available now is 96 rock core analyses according to the September 2023 Reclamation Summary (see below), which on their own are not reliable and cannot yet be interpreted reliably for ML-ARD. In fact, these 96 samples were not even of the rock that would be "mined" during Advanced Exploration, but only "proximal" which could also mean "very different". In any case, the 96 samples were not collected and analyzed as required under the Ontario Mining Act (see next bullet). Thus, Kinross Gold and WSP are guessing on how bad the contamination will be, but admit that some of it will be bad, and are likely years away from completing the ML-ARD work required under the Ontario Mining Act and its Regulation 240/00 (Mine Development and Closure under Part VII Of the Act).

- The stated approach and methodology used for Advanced Exploration is "based on the requirements" of two British Columbia documents from 1997-1998 (Price, 1998; Price and Errington, 1998; Price, Morin and Hutt, 1997). In reality, the Ontario Mining Act says the approach and methodology must be based on the 2009 federal Prediction Manual, not just as "guidance" as Great Bear has done. Thus, the work for Advanced Exploration to date does not meet the Ontario Mining Act through Regulation 240/00 and does not meet the 2009 federal ML-ARD Prediction Manual (Price, 2009).

- Even if this Geochemical Characterization Workplan was applicable and consistent with the 2009 federal ML-ARD Prediction Manual, such work requires at least 2 to 3 years to obtain all required information and interpretations. Thus, perhaps in 2025 or some year after there might be sufficient ML-ARD for Advanced Exploration, but not any time soon.

4. Great Bear Advanced Exploration Program Reclamation Strategy (September 2023)

The Introduction of this document explains:

> "This memorandum was prepared to summarize the reclamation strategy for the AEX [Advanced Exploration] Program. The regulatory Closure Plan which will be filed with the Ontario Ministry of Mines is currently being developed. The purpose of this memorandum is to seek input from Indigenous communities regarding the proposed closure strategy for the AEX Program."

Thus, this memo is only to "summarize" the reclamation strategy in order to "seek input from Indigenous communities". As shown below, this summary is insufficient for Grassy Narrows First Nation to provide input and this reclamation "summary" in fact already reveals errors and misconceptions.

Section 2 entitled Project Information lists "major components" for Advanced Exploration. For tonnages and sizes, only the ore is mentioned and it will be shipped offsite. So there is no overall summary of areas, volumes, and heights of waste and disturbed materials remaining on site and requiring careful reclamation. This is important, because there will be at least 17 tonnes of mine waste rock generated for each 1 tonne of ore (see Sections 2 and 10 of this MDAG review), which is a substantial ore:waste ratio and one that requires intensive efforts to protect the surrounding environment. There would also be ~7 tonnes of overburden mined for each 1 tonne of ore, which increased through 2023 from an initial ~3:1 ratio.

Therefore, this Reclamation Strategy does not sufficiently protect the environment due to the lack of sufficient data, which is replaced by information that at best "suggests". The decision to mine a huge bulk sample of ore worth tens of millions of dollars, likely to offset exploration costs, has not been based on suggestions, so why are associated reclamation and environmental protection based on suggestions?

There is no explanation in this or other documents on why an underground bulk sample requires the destruction of surface vegetation and shallow soils to remove a relatively enormous volume of 400,000 tonnes of overburden (the most recent estimate, which had been increasing). Additionally, 96 ML-ARD samples are mentioned for rock "proximal" to the underground workings, but there is no mention of the 30 samples of overburden also tested for ML-ARD potential.

Because roughly half of overburden stockpiles at sites similar to Great Bear have significant ML-ARD potential, the Great Bear overburden should be assumed to have the same strong potential for water contamination and ARD (called "PAG" in this document) unless proven otherwise. It is alarming that Kinross Gold is assuming 100% of the overburden is environmentally benign.

Figure 2 of this Reclamation Strategy shows an unlined overburden stockpile where its seepage can contaminate local water and soil, and Figure 3 shows the overburden runoff and seepage is completely ignored. This serious omission can also be seen in Section 2.3 which ignores contaminant potential from overburden by simply addressing surface runoff and not subsurface

seepage and groundwater:

> "Runoff from the overburden stockpiles (will be monitored and treated to manage suspended solids as required and discharged)"

Section 2.1 on Underground Mining Methods Summary does not describe advanced exploration where a bulk sample of several tonnes is obtained and tested. Instead, Section 2.1 describes an initial four-year phase of mining of more than 1 million tonnes of waste rock and 200,000 tonnes (more recently, ~400,000 t) of overburden to obtain only 60,000 tonnes of ore worth tens of millions of dollars. In reality, four years of this type of advanced exploration is essentially being used as the first phase of the underground mine plan so that there is relatively little delay to start mining should the project be approved.

In the Project Definition (see Section 2 of this MDAG review), Kinross Gold provided three reasons for a relatively huge bulk sample along with 17 times more waste rock and now 7 times more overburden. However, as explained above, these reasons do not make sense. For example, Kinross says that bulk samples help to prove the continuity of underground access gold deposits and are very important to potential financiers. Yet, most of the proposed underground workings are focussed into two small lateral areas and not throughout the ore zone "to prove the continuity".

In Section 2.2 on Geochemistry Summary, it says:

> "The sampling approach and testing methods for the preliminary geochemical assessment are based on the requirements described under the Ontario Mining Act, namely guidance found within the DRAFT Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia (MEM 1998)."

This same error occurs in the January 2023 Geochemical Characterization Workplan. The Ontario Mining Act through its Regulation 240/00 does not mention the 1998 British Columbia document. Instead, the relevant wording is:

> "The sampling program shall be conducted by a person who is qualified in Ontario … in accordance with a report prepared by William A. Price on behalf of the [federal] Mine Environment Neutral Drainage (MEND) program, entitled "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials", MEND Report 1.20.1, dated December, 2009, as that report may be amended from time to time..."

Page P-24 of this 600-page federal Prediction Manual specified by the Ontario Regulation 240/00 says, "Major technical assistance was provided by Kevin Morin (Mine[site] Drainage Assessment Group)... and Kevin Morin provided major editorial assistance." Therefore, for the Great Bear Project, I can attest that "[t]he sampling approach and testing methods" are based on the wrong document.

Based on the 2009 federal Prediction Manual required by Regulation 240/00, the proposed ML-ARD work "in progress" is not sufficient, likely because the Manual was used by Kinross Gold only as "[a]dditional guidance" instead of a required document. This is easily seen in words like "preliminary geochemical assessment" and "initial evaluation". The ML-ARD predictions and information are the main basis for design of water treatment and for reclamation/closure. Thus, it is not acceptable for treatment and closure to be based on "preliminary" and "initial" information.

This can lead to misleading impact assessments and receiving-environment effects.

There are already errors in the Great Bear ML-ARD work as found in this Reclamation Strategy. These range from an incorrect definitions of the fundamental acronyms of "PAG" and "NPAG", to major problems with samples collected to date. For ML-ARD, all that is mentioned as of September 2023 is 96 rock-core analyses, which on their own are not reliable and cannot yet be interpreted reliably for ML-ARD. In fact, these 96 samples were not even of the rock that would be mined during Advanced Exploration, but only "proximal" which could also mean "very different". Some percentage of this proximal rock, such as 50% to 67%, is considered not to have much ML-ARD potential based on "preliminary" data, but that is unreliable or wrong.

Kinross Gold is guessing on how bad the ML-ARD contamination will be, and admits some of it will be bad. However, it is likely years away from completing the appropriate ML-ARD work required under the Ontario Mining Act and Regulation 240/00, including the federal ML-ARD Prediction Manual (Price, 2009).

Section 2.4 of this Reclamation Strategy on Closure Objectives says:

> "The primary objective of closure is to rehabilitate the area to a long-term safe and sustainable state that considers the desires of local Indigenous land users to the extent practical (such as post closure land uses) by promoting vegetation communities that support habitat for local species diversity and aquatic habitat that will support healthy fish populations. The purpose of this memorandum is to seek input from indigenous communities regarding end land uses and closure concepts."

It is remarkable that Kinross Gold considers leaving "NPAG" rock perhaps with a cover of 0.3 m of potentially contaminated overburden, plus a large amount of stockpiled overburden at the surface, to be a "long-term safe and sustainable state...". To the contrary, this reclamation strategy can result in perpetual water treatment. A cover over "NPAG" rock does not stop ML and contaminated effluent, which could instead require perpetual water treatment. The closure plan and its estimated cost of only ~$10 million would not pay for this.

Section 3 on Progressive Rehabilitation Measures says:

> "Mine rock will be moved underground during the program as needed for use as road material, and potentially as backfill in underground areas for stability."

This issue arises later where "PAG" rock is proposed to be moved underground after mining of the bulk sample and the many underground workings. The seriously major problem here is that "PAG" rock can release relatively enormous amounts of heavy metals and other elements as it is flooded and submerged. This can create a toxic "soup" of underground water, worse than any seen at the surface, that eventually flows out into the surrounding environment and groundwater system. This would likely require long-term pump-and-treat remediation of the surrounding groundwater. Such pump-and-treat remediation is not included or costed in the ~$10 million total closure costs, and would likely cost much more than $10 million itself.

As part of closure, Section 5.1 says:

> "The portals will be backfilled with NPAG rockfill."

Because this rock will probably be an ML concern, including leaching heavy metals and other elements, backfilling the portals with this NPAG rock that will remain partially exposed and oxidizing will lead to perpetual ongoing water contamination. Adding to this contamination will be backfilled oxidized-and-contaminated PAG material that will likely release relatively large amounts of heavy metal and other elements. Contaminated water from this PAG material, backfilled into the underground workings and partially flooded to the maximum level, and from the NPAG material plugging the portals, would start flowing out of the mine area and into the surrounding groundwater system unless there is perpetual collection and treatment.

Section 5.6 on Soils Testing mistakenly says:

> "The primary soil contamination that could be expected from the AEX activities would result from the use / spillage of petroleum / diesel fuels. A soil sampling plan will be developed at the time of closure to evaluate potential hydrocarbon or chemical contamination, as appropriate."

In reality, the primary soil contamination would likely be from the elevated levels of heavy metals and other elements in wind-blown fugitive dust (see Section 8 of this MDAG review). This dust would come from the PAG and NPAG blasted-rock stockpiles, from the overburden stockpile(s), and from mine roads and building foundations made of the blasted rock and overburden.

Section 5.7 of this Reclamation Strategy says:

> "The primary long term closure concern with respect to the mine rock stockpiles is acid rock drainage and metals leaching. Preliminary geochemical investigations suggest that up to approximately 35% of the AEX mine rock could be PAG, as discussed in Section 2.2. During the AEX Program, the PAG and NPAG mine rock will be segregated in accordance with the AEX Mine Waste Management Plan, which is currently being developed at the time this document was prepared."

"Preliminary geochemical investigations suggest that..." is not acceptable for design of the waste-rock piles and the treatment system. Preliminary geochemical investigations can be seriously wrong and substantially underestimate contamination from the rock and overburden.

Section 5.7 also says:

> "It is anticipated that up to 127,200 m^3 of PAG mine rock will be stockpiled at the AEX Program and will need to be appropriately rehabilitated either progressively or at closure."

The closure costs from the Program Closure Plan (see Section 5 of this MDAG review below) show it will cost $30.00 per m^3 to relocate the PAG rock back into the underground workings, where it would then contaminate the underground water that will eventually flow into the environment. This would be a total cost of $3,816,000. However, Table 12-1 from the Program Closure Plan (issued two months after this Reclamation Strategy) estimates PAG rock higher at 191,000 m^3 (a remarkable 50% more) costing $5,730,000.

Section 5.7 also says:

> "The NPAG Stockpile footprint may be covered with up to 0.5 m of overburden and seeded for revegetation. Additional cover depth is provided overlying the NPAG Stockpile to account for potential losses to void spaces in the mine rock. It is anticipated that the overburden material will fill in the void spaces and support revegetation."

However, the overburden could have ML-ARD potential, and thus would not support vegetation but instead kill vegetation.

In summary of the Reclamation Strategy from September 2023,

- The ML-ARD program is "in progress" so no one knows how bad the contamination will be and which elements will be at toxic levels requiring treatment, yet Kinross Gold wants to proceed with Advanced Exploration.

- All that is available now is 96 core analyses, which on their own are not reliable and cannot yet be interpreted reliably for ML-ARD. In fact, these 96 samples were not even of the rock that would be "mined" during Advanced Exploration, but only "proximal" which could also mean "very different". Also, 30 samples of overburden, which is intended to be left on surface and used for reclamation, were collected yet the results are not reported although there is ~50% probability that the overburden will release ML-ARD and thus be toxic. Kinross Gold and WSP are guessing how bad the contamination will be, but admit that some of it will be bad. They are likely years away from completing the ML-ARD work required under the Ontario Mining Act and its Regulation 240/00, because the work for Great Bear was not initially stated as consistent with Regulation 240/00. Even the definitions of ML-ARD acronyms used for the Great Bear Project are not correct according to the federal Manual specified by Regulation 240/00, which is additional evidence the Prediction Manual is not being followed.

- The bad ML-ARD rock appears to be associated with "rapid acid generation" according to the Program Closure Plan (reviewed in the next section below). This is an incorrect explanation of the phenomenon, but shows that the bad water quality will start coming out of the disturbed rock, including the underground mine walls, very quickly after initial disturbance. Informally, this is called "lag time" to ML-ARD, but most of the ML-ARD work has not yet been done to quantitatively estimate the lag time beyond "rapid". This contaminating rock will be stored on surface and possibly only later, likely after the lag time, some might be taken underground. When it contacts water underground as the workings partially flood and submerge, it will quickly release more contamination. This means the underground water moving into the surrounding groundwater system, and surface overflow if any, would have to be monitored and likely be treated for many years or in perpetuity after Advanced Exploration.

5. Program Closure Plan, Draft for Indigenous Review (November 2023)

This password-protected draft document for Advanced Exploration is only "for Indigenous review". This is odd to me since it is Kinross Gold's responsibility to design and justify the closure plan through certified professionals, rather than submit a draft to see if any First Nations notice the weaknesses and problems explained below.

In fact, since this draft report it is password protected, none of its content can be extracted for detailed re-interpretation and review. Thus, Kinross Gold is limiting the "Indigenous review" it is seeking.

In Table 5-3 entitled Approximate Mine Rock and Overburden Volume and Production Schedule in Section 5.7 on Mineral Materials Management, the total waste rock remains around 1,060,000 t relative to past documents (see the sections of this MDAG review above).

However, overburden has risen remarkably from past documents to "~170,400 m^3", expressed as m^3 instead of tonnes like the waste rock. It would be ~350,000 to ~400,000 tonnes of overburden. The overburden's ML-ARD status and its impact on water quality are poorly defined. This means that overburden at Great Bear becomes an environmental danger capable of substantial environmental impacts not currently identified or estimated.

Table 5-4 contains Preliminary Threshold Criteria for Segregation the AEX Program Mine Rock. The criteria for "PAG" do not say whether the criteria are "AND" or "OR", which is a huge difference and serious omission. Thus, ML-ARD is clearly still not reliably estimated, predicted, and understood at the Great Bear Project as of November 2023.

The text in Section 5.7.2 alarmingly says,

> "A preliminary sulphur threshold (TS) of 0.15% has also been proposed to differentiate between PAG rock and NPAG rock. The proposed threshold values are generally accepted as industry best practices in the absence of a site specific geochemical value."

No, 0.15%S is not "industry best practices". Quebec uses ~0.05%S and other provinces have not established a minimum value because technically there is no minimum value. Furthermore, it is rarely the sulphur level alone that distinguishes "PAG" (incorrectly defined in this document as "potentially acid generating" and "NPAG" (incorrectly defined in this document as "non-potentially acid generating"). Instead, according to the federal ML-ARD Prediction Manual (Price, 2009), the amount of Effective Neutralization Potential (ENP) plays a major role, as does site-specific criteria for the ENP-to-sulphur ratio.

This is explained in detail in the 600-page federal ML-ARD Prediction Manual that this ML-ARD work for the Great Bear Project is legally supposed to follow but does not. As a result, this "preliminary sulphur threshold" is an unreliable, questionable, and uncertified attempt to proceed with the design and planning for Advanced Exploration. Insufficient reliable information is available at this time, and even Appendix A "Certifications" is missing from this document. As a professional

in ML-ARD, I want to know the certified professional(s) who created these "preliminary" criteria.

"NML" is defined in this Closure Plan as "non-metal leaching" which does not apply to any rock in the world, as all rock is capable of leaching some metals and even nonmetals. In any case, "NML" in Table 5-4 for the Great Bear Project is rarely definable by the solid-phase level of a single element like "Arsenic < 30 mg/kg", but Kinross Gold does not know this because it has not yet completed the on-site and laboratory-based kinetic tests. If leaching were dependent on solid-phase levels as believed here, then Great Bear waters would contain thousands of mg/L of aluminum and silica because most of its rock is made of those elements. But this is not the case. This is why these are called "preliminary threshold criteria" in Table 5-4, which in reality are likely wrong and nonsensical.

Section 9.16 on Watercourses and Site Drainage contains Tables 9-1 to 9-5. Tables 9-4 and 9-5 contain predictions of on-site and effluent contaminant levels only after closure, which would obviously be much less than during active exploration. However, the text does not even discuss or explain Tables 9-4 and 9-5. They appear to be "thrown in" to appear complete.

Table 9-4 contains Geochemical Source Terms, which are the predicted aqueous concentrations for all contaminants in Great Bear water caused by Advanced Exploration. In reality, there are many problems with this Table 9-4 including:

- It does not include "PAG" concentrations which will be much worse and will be present for at least four years, because this Table is intended only for closure but alarmingly does not include the likely more severe PAG contamination when it is backfilled into the underground workings.
- It assumes closure drainage from "Covered and Revegetated Area" will be instantaneously at pre-exploration "baseline water quality", which is wrong.
- It shows elements likely requiring perpetual post-closure treatment include aluminum, antimony, arsenic, and selenium.
- It does not include predictions for many potential contaminants such as manganese, magnesium, sodium, potassium, barium, hardness, alkalinity, acidity, fluoride, chloride, bismuth, chromium 6+, lithium, silicon, strontium, tellurium, thorium, tin, titanium, and zirconium.
- It does not allow for federal emerging contaminants such as platinum-group metals and tantalum.
- It is based on a report "WSP 2023f" which is the draft "WSP, 2023f. Advanced Exploration (AEX) Phase – Preliminary Water Quality Estimate Update - Draft. WSP E&I Limited, April 2023". This report is only draft and thus is unreliable and not professionally certified.

Table 9-5 contains Mine Water Pond Overflow Estimated Water Quality which apparently would be overflow off the exploration site upon closure. It raises important questions, like how does aqueous sulphate decrease from 75-100 mg/L (Table 9-4) to 18-25 mg/L (Table 9-5) in mine-water-pond overflow when there is no treatment? In any case, some predicted concentrations are likely too high to discharge to the environment like arsenic. Also, sulphate reportedly increases the methylation of mercury and other elements.

Table 12-1 is the Closure Cost Estimate. The cost for moving PAG rock back underground is set at $30.00/m^3 which is ~$15.00 /tonne. The total waste rock from Advanced Exploration is estimated at 1,060,000 t. Kinross Gold currently guesses, based on preliminary uncertified information, the waste rock will be about one-third to one-half "PAG" requiring backfilling to the underground. Therefore, the cost for this task alone is $5,000,000 to $7,500,000 based on the unverified guess, and could reach a maximum of $15,000,000. Because the current Grand Total for Closure is estimated at ~$10,000,000, the backfilling of rock is the major cost item and could cost much more than the $5,730,000 currently estimated. In turn, Total Cost could cost many millions of dollars more than currently estimated from the guessed minimal amount. Put simply, closure costs are likely grossly underestimated.

All six appendices of this Program Closure Plan are missing, including professional certifications. This is likely not an error or oversight, meaning this Program Closure Plan should not be considered reliable and dependable.

In summary of the password-protected Program Closure Plan, Draft for Indigenous Review from November 2023,

- In November 2023, the volume of overburden has approximately doubled from previous documents without an explanation. Because overburden generally has a 50% probability of releasing ML-ARD and contaminating water, overburden represents a major but unexamined threat to water quality on, around, and beneath the Great Bear exploration site.

- "Preliminary" criteria are provided for separating "PAG" and "NPAG" rock and for "NML" rock. However, these acronyms are not used in an accurate manner consistent with the 2009 federal Prediction Manual (Price, 2009) required under Regulation 240/00. The preliminary criteria are not rational based on ML-ARD science unless justified with detailed and intensive site-specific studies, which have not yet been completed and certified for the Great Bear Project.

- The potential for ML-ARD after closure is presented all the way to detailed predictions of aqueous concentrations in mg/L for on-site water and effluent to the environment only after closure. However, these predictions are not explained in any detail, are not justified, appear anomalous, and are not certified by a qualified professional. Some predictions are actually pre-exploration baseline which are erroneously assumed to be re-established immediately at closure. Furthermore, these predictions are missing more than a dozen potential contaminants.

- The "PAG" rock, which would likely create the highest contaminant concentrations, is not included in this Program Closure Plan, presumably because this "PAG" rock will be backfilled underground. However, when placed underground, this "PAG" rock will likely continue to release severe ML-ARD until submerged, at which point a relatively huge amount of accumulated contamination would be released into the underground water. After the mine is refilled to equilibrium and the minewater begins flowing into the surrounding groundwater system and through the many permeable drillholes more than 500 km long to the

environment, it will contaminate large surrounding areas. This major risk to water quality and the environment is not even mentioned in this Closure Plan, which is a major omission.

- The backfilling of "PAG" rock at closure is the largest individual cost item for closure totalling around $10 million. However, this reflects the currently minimum volume based on preliminary, unreliable information. In the worst case, which was assumed for the Great Bear Project Definition and still not disproven, total closure costs could exceed $20 million.

6. Hydrogeological Workplan (December 21, 2022)

This Workplan for 2023 says:

> "The purpose of the program will be to develop a refined hydrogeological model of the site, support groundwater model calibration and be used for long-term monitoring. The information collected in the upcoming field surveys will supplement the existing information.... Hydrogeological testing and groundwater sampling will occur at specific locations near the Project site shown in Figure 1."

However, Figure 1 of the Hydrogeologic Workplan shows a major omission which would preclude fully meeting its purpose and objectives. The currently proposed mine plan shows the "Tailings Management Facility" extending at least 2 km to the west and northwest of Tear Drop Lake. Figure 1 shows that the Tailings Management Facility and its hydrogeologic effects would extend far beyond the western limit of the monitoring wells. Thus, many more monitor wells are needed westward and northward at least to Stone Lake, Gullrock Lake, and Genessee Lake.

In summary of this Hydrogeological Workplan from December 2022, there is a major omission that would preclude a reliable and comprehensive assessment of current baseline hydrogeologic conditions and of future impacts from proposed mining. The groundwater monitoring network does not extend far enough to the west and northwest, beyond the proposed western portion of the Tailings Management Facility.

7. Surface Water Quality Workplan (December 21, 2022)

This Workplan for 2023says:

> "Baseline surface water quality work has been ongoing for the proposed Great Bear Project (the Project) since 2020. This proposed workplan for 2023 is to gather supplemental water quality data that will be used to further support long term monitoring and the development of the Project."

This Surface Water Quality Workplan provides incomplete lists of important details prefaced by "including", like "These sampling locations include..." and "Standard suite of total and dissolved metals including...". This can lead to major problems in the future if a sampling location or water-quality parameter is missing.

For example, the "Standard suite of total and dissolved metals including..." does not mention important elements like manganese, titanium, thallium, and federal emerging elements like tantalum and platinum-group elements. Therefore, Kinross Gold is risking major omissions and flaws that can arise later by not being comprehensive in its "including" lists.

In summary of this Surface Water Quality Workplan from December 2022, there are insufficient information and details to determine if appropriate work is planned and conducted. This is because important details are listed only as "including". For example, major potential contaminants like manganese and thallium are not specifically listed, but perhaps they are implicitly included? There is no way to know.

8. Fugitive Dust Best Management Practices Plan, final draft (September 2023)

Section 4.5 on Material Stockpiles in this "Final Draft" states there will be two overburden stockpiles created during Advanced Exploration, one north of the mine-rock pile and another east of the crusher area. Some Great Bear documents reviewed above and the undated "AEX Site Plan - Updated.pdf" do not show this. Because the overburden has a general 50% probability of contaminating water and because overburden is specifically listed as a site component requiring ML-ARD evaluation and potential mitigation, this contradiction on overburden stockpiles is not acceptable. It further shows that Kinross Gold's ongoing issuing of "preliminary", "initial, and "draft" documents is causing confusion inside the project itself and thus should not be approved at this time.

Section 5.1 on the Composition and Characterization of Particulate Emissions contains a major error that would grossly underestimate the geochemical contamination of soil, vegetation, water, and biota by dust, and is thus not acceptable. Section 5.1 says:

> "Fugitive dusts from roadways and stockpiles may contain trace metals which may be considered negligible as these would be similar in concentration to the background rock."

The ML-ARD studies currently underway on ore, waste rock, and overburden have already shown that some material will contain substantial solid-phase levels of many elements and will leach to some degree. This is certainly not "background rock" as assumed in this fugitive-dust study. Therefore, fugitive dust should be an important component of impact assessment for Advanced Exploration and proposed mining.

Furthermore, proposed dust suppression by watering could lead to widespread metal leaching and water-quality degradation across and around the proposed exploration site.

In summary of the final-draft Fugitive Dust Best Management Practices Plan of September 2023 for Advanced Exploration, this work is unacceptable because it grossly underestimates the potential impacts from geochemical contamination of soil, vegetation, water, and biota by dust. This work assumes the on-site sources of dust "would be similar in concentration to the background rock". This is wrong and ignores the ongoing ML-ARD assessment of ore, rock, and overburden.

9. PTTW Application for Dewatering, final draft (October 2023)

This is one of the few Great Bear documents that provide names for the qualified person writing the report, appropriately signed as "DRAFT" at this time. However, the reviewer but not the author is a P. Geo. So additional information is needed on the qualifications and certifications of the author(s). PPTW stands for "Permit To Take Water", meaning using and removing water from the Great Bear site.

9.1 Main Report

The tone of this "final draft" report for Advanced Exploration is apparent from Section 1.1 on the Purpose and Scope of This Submission. It says:
"Water takings during the AEX Program will include:

- Water pumped from the underground exploration workings (underground dewatering)
- Incidental surface water and groundwater takings, expected to occur during excavation of water management ponds.
- Direct taking from Dixie Creek (up to 250 cubic metres per day; m^3/day) to be used for dust suppression, industrial activity (e.g. in support of development pad construction and packing) and advanced exploration drill water cooling (underground drilling).

"No other takings from other area waterbodies (lakes, rivers, streams) are proposed.

"Most of the dewatering water pumped from the underground exploration workings will be directed to ponds within the AEX water management system, treated and ultimately discharged to the environment to be approved under an Environmental Compliance Approval for Industrial Sewage Works (ECA ISW)"

First, note that the only numerical water withdrawal mentioned is up to 250 m^3/day (250,000 L/day) from Dixie Creek. Thus, it is stunning that the actual total water withdrawal from the local water balance, as shown in Table 4-1 (discussed below), would be at least 3,203,000 L/day every day and reaching up to 7,703,000 L/day on some days as a contingency. Even these values are unrealistically low (see Section 9.2 below). This major withdrawal of water, that could upset and dewater groundwater zones like aquifers and surface waterbodies like creeks and lakes, is much more extreme that numerically indicated in Section 1.1. This justifies an impact assessment on the proposed Advanced Exploration, despite this final-draft document stating:

> "The AEX Program does not meet the requirements of the Impact Assessment Act, Physical Activities Regulations. A Federal Impact Assessment is therefore not anticipated to be required."

Second, note that the quotation above states that water taken from Dixie Creek would be used for "dust suppression" among others. As explained in the previous Section 8 of this MDAG review, adding such water to ML-ARD dust from ore, rock, and overburden could seriously degrade water quality throughout the site and surrounding environment. However, this major environmental risk

is not considered or even mentioned here or in the fugitive-dust study. In fact, it is unreliably assumed to be no environmental risk at all.

Third, the discharge of up to 7,703,000 L/day of water that is only partially treated (see the details in other sections of this MDAG review like Sections 5 and 11) into any receiving environment could cause significant impacts from (1) the physical volume of the additional water and/or (2) its altered chemistry from baseline with implications on the receiving environment and cumulative effects.

Table 4-1 on Requested Water Takings shows that the requested surface-water withdrawal from Dixie Creek is 250,000 L/day and an additional 170,000 L/day from pond excavations. However, more than 10 times this amount will be removed from the groundwater system every day. The additional groundwater withdrawal is estimated at 783,000 L/day from pond excavations, 2,000,000 L/day from underground pumping, and on perhaps 30 days each year an additional 4,500,000 L/day removed as a contingency. Furthermore, as explained below for Appendix B of this PTTW document (see Section 9.2 of this MDAG review), the groundwater model incorrectly underestimates the much higher inflows that would arise during desaturation of the overburden and the rock surrounding the mine inside its "Zone of Influence".

Total water withdrawal from the existing water balance could thus likely be much more than 7,703,000 L/day relative to the Dixie Creek withdrawal of only 250,000 L/day. All this water would be taken from the existing baseline groundwater/surface-water balance which has likely reached some type of baseline equilibrium over the last thousands of years. When up to 7,703,000 L/day or more is removed from this equilibrium, there could be major disruptions to local and regional surface waters and groundwaters.

For example, a significant portion of the underground pumping of more than 6,500,000 L/day could be pulled from Dixie Creek through the underlying groundwater system. Thus, "takings" from Dixie Creek could in reality be 250,000 L/day plus substantially much more than this through groundwater. "Takings" could also come from other streams, lakes, and groundwater zones like aquifers, despite this report clearly stating, "No other takings from other area waterbodies (lakes, rivers, streams) are proposed". This statement is not reliable and could be seriously wrong.

Section 5 of this PTTW Application discusses Potential Environmental Impacts, with Section 5.2.1 specifically on Dixie Creek. There appears to be significant confusion here on the impacts of dewatering the underground workings on Dixie Creek.

Part of this confusion arises in the false thinking that baseflow coming from groundwater is simply part of the total flow in Dixie Creek. In reality, groundwater baseflow likely has a different, more stable temperature and a different water quality than the surface water flowing past the Great Bear Project. Therefore, it is important environmentally and to the benthic ecosystem to consider baseflow coming from groundwater separately from surface flow already in the creek.

Another part of this confusion on the physical impact of mine dewatering on Dixie Creek is related to which surface flow is used. Section 5.2.1 uses Average Annual Flow, Low Flow Period Average Flow (March), and Low Flow 7Q20. These show that mine dewatering will reduce flow in Dixie

Creek by only 0.2 to 2.4%. Again, these impacts would be greater because the groundwater of Appendix B (see Section 9.2 below) has underestimated the amount of underground water that has to be pumped.

Table 5-2 is more relevant for Dixie Creek, also copied as Table 7-2 in Appendix B. It shows the important, separate baseline baseflow for Dixie Creek is 2,601,000 L/day. This is predicted to be reduced by 873,000 L/day during dewatering for Advanced Exploration, although this is likely substantially underestimated by the groundwater model. Thus, much more than 34% of Dixie Creek baseflow will be taken away by the mine, which would have significant adverse effects during drought periods and on the quality of the benthic aquatic habitat. Additionally, the baseflow for Unnamed Waterbody 3 (called "Dixie Creek Tributary (TL-3)" in Appendix B) would be reduced a substantial 55%. This justifies an impact assessment for the proposed PTTW Application.

It is very important to note that this PTTW Application for Dewatering, final draft, contains and is based on critical information in its Appendices. The following comments pertain to these appendices, which in turn shows the main report is not reliable and not reasonable as a PTTW Application.

9.2 Appendix B

Appendix B of this PTTW report is a "Draft" Groundwater Modelling Report to Support PPTW Application for Underground Dewatering Final Draft. It contains a serious error in the groundwater modelling that underestimates initial groundwater inflow rates and thus dewatering pumping rates.

Table 4-1 of the main report says 3,203,000 L/day of groundwater would be removed every day, reaching up to 7,703,000 L/day on some days. Table 6-2 of this groundwater appendix says that the groundwater grid, from Genessee Lake on the west to half of Rice Lake to the east, has total groundwater inflows and outflows of ~10,000,000 L/day. If this modelling were correct, this means that roughly 32% of all groundwater in the area of the Great Bear Project will be drawn into and out of the mine on a daily basis, with up to 77% drawn into and out of the mine on some days as a contingency. However, it could well be worse as explained next. This justifies an impact assessment for the proposed PTTW Application.

If dewatering starts and continues for several years as proposed for Advanced Exploration at the Great Bear Project, and later during the expansion of proposed mining, groundwater inflow will come from two basic sources. The first, initial inflow will predominantly reflect the desaturating drainage of pores in the overburden and fractures in the rock, which will be relatively high at first and then decrease. Notably, the modelling currently shows that the overburden will eventually be virtually 100% dewatered to its base. This is called "transient conditions" and reflects the "specific yield" of the overburden and the "storage coefficient" of the rock. As this first transient inflow slows, likely years after Advanced Exploration ceases, the groundwater inflow will then come from "steady state", reflecting the hydraulic gradients and the hydraulic conductivities.

This modelling for Great Bear in Appendix B and for the PTTW Application is solely "steady state",

with no high transient inflow considered and no values for specific yields and storage coefficients even mentioned. Section 6 of Appendix B on Groundwater Model Development is clear on this:

> "Groundwater modelling was conducted for two phases: pre-mining site conditions for model calibration and mine operations conditions to predict *groundwater discharge rate to the proposed fully developed and dewatered underground mine workings* [MDAG emphasis]. These numerical groundwater flow models consider 3D *steady-state flow conditions* [MDAG emphasis] and implement an Equivalent Porous Media (EPM) approach, which is deemed sufficient for characterizing the overall groundwater flow regime at the scale of this analysis."

Thus, groundwater inflows in the years of active mining during Advanced Exploration have been clearly underestimated by considering only steady-state inflows after the proposed workings are "fully developed". Also note the ambiguous and unjustified "deemed sufficient" for the overall "EPM" modelling of groundwater at the Great Bear Project.

Table 6-3 showed that pre-mining single-value "measured interpreted" baseflows at two locations agreed with the Simulated Baseflow reflecting only long-term steady-state conditions by 14% or better. These single-value baseflows were 2,281,000 L/day and 847,000 L/day, which are less than the total groundwater that would be pumped from the mine during Advanced Exploration. Thus, a concern arises on whether baseflows could be significantly decreased by this pumping during Advanced Exploration. The main report (see comments above in Section 9.1 of this MDAG review) says the (underestimated) pumping effect would be minimal on most statistical values of flow in Dixie Creek. It is not emphasized that pumping would substantially reduce baseflow, with differing water quality and temperature than the surface water, and would be even more significant during droughts.

Figure 6-6 shows that the pre-mining Simulated Groundwater Levels were often 5 to 10 m higher than Observed Groundwater Levels, showing a strong bias towards overestimated (higher) simulated groundwater levels. It is not clear if this suggests simulated hydraulic conductivities may be too low. In any case, this problem manifests in Figure 6-7 where the simulated levels around Great Bear and Dixie Creek are typically around 9 m too high, which incorrectly and falsely indicate Dixie Creek could not be significantly dewatered during pumping because the water table is simulated to be very high. This is probably why Table 7-2 shows that the substantial yet likely underestimated partial dewatering of Dixie Creek Tributary (TL-3) and baseflow of Dixie Creek is 55% and 34%, respectively, and these dewatering percentages could be much higher if modelling were more accurate.

Of note, Table 7-1 indicates dewatering of Dixie Creek is only 1% because it uses the average annual flow that includes the sum of all storm events. It does not consider lost baseflow during dry times when aquatic life, vegetation, and water quality can be more severely degraded. Again, the simulated groundwater levels around Dixie Creek and Great Bear are often modelled around 9 m too high and thus actual dewatering of creeks and lakes could be much higher than stated in this groundwater report. In this case, Section 10 incorrectly states and underestimates based on the modelling that:

> "At the end of the AEX project, when dewatering is at its maximum, the model simulates a baseflow reduction for the Dixie Creek of 8.5% of the estimated 7Q20 (10,368 m^3/d) and 1% of the average annual flow (114,912 m^3/d), which is unlikely to change the nature of the flow

regime in the creeks."

In Section 7.1 on Groundwater Inflow Rate and Zone of Influence:

> "... the simulated long-term groundwater inflow rate into underground mine workings is 1,920 m^3/d [1,920,000 L/day]. This estimate of groundwater inflow into the fully developed mine does not consider uncertainty, seasonal variations or any loss from aquifer storage."

This simulated inflow is consistent with the estimated 2,000,000 L/day requested "taking" in the main report and in Table 8-1. However, the occasional contingency of 6,500,000 L/day which is apparently from "uncertainty, seasonal variations or any loss from aquifer storage" is relatively major. It highlights the expected variability of withdrawals and discharges of water into the surrounding environment during Advanced Exploration. Moreover, the reference to "aquifer storage" highlights the failure of the modelling to consider higher-inflow transient conditions which would be most important in the early several years of Advanced Exploration.

However, even ignoring the important high-flow transient conditions, Table 7-1 shows that the steady-state 2,000,000 L/day can be easily exceeded by non-base-case conditions like three-times-higher hydraulic conductivity of bedrock and by the water-conducting LP Shear Fault 1.

Section 7.1 explains:

> "The model-predicted Zone Of Influence (ZOI), defined here as 1 m drawdown of head in the glacial till unit is shown in Figure 7-1. The ZOI is predicted to extend about 1.2 to 2.5 km from the centre of the AEX site to surrounding environs."

Using the 1 m drawdown contour is not appropriate here, because modelled groundwater levels are already around 9 m too high and because Figures 4-9 and 4-12 show that some shallow groundwater levels can vary by 1 m naturally. Thus, the Zone of Influence could turn out to be much larger and thus affect lakes and creeks. In any case, even a 1 m decrease in groundwater level beneath a creek or lake can lead to substantial dewatering.

Figure 7-1 shows Simulated Drawdown Contours in Glacial Till. However, drawdown is only shown as a maximum of around 36 m, which is obviously not correct for dewatered drifts up to 600 m deep. Moreover, the maximum drawdown of 36 m in the overburden means most of the pores of the overburden would be primarily drained into the mine, which occurs during the ignored transient conditions.

The apparent explanation for the discrepancy between the maximum 36 m drawdown and the dewatered workings 600 m deep is that the drawdown in the bedrock is not shown, but would locally obviously be around 600 m. This 600-m drawdown would likely create a relatively huge drawdown zone in bedrock around the Advanced Exploration and the proposed mine extending for many kilometers around. This would be much larger than in the Zone of Influence in the overburden shown in Appendix B Figure 7-1. This justifies an impact assessment of this proposed dewatering since many impacts of the dewatering have been ignored or underestimated.

9.3 Appendix C and Its Several Draft Monitoring Programs

Appendix C contains draft monitoring programs. The "Working Draft" AEX ISW Groundwater Monitoring Plan, like many other Great Bear documents, ignores the overburden that likely has ML-ARD potential and can seriously contaminate water. This lack of consideration for potentially contaminating overburden can be seen in Figure 1-7 Water Management Schematic that has no mention or recognition of the overburden stockpile(s). The same is noted in Figure 1-6 of both the "Draft" ECA ISW - Advanced Exploration Surface Water Monitoring Plan Draft and the "draft" AEX ECA ISW Aquatic Resources Monitoring Plan in Appendix C.

9.4 Appendix D

Appendix D Consultation Records is missing from this file.

9.5 Summary

In summary of this PTTW (Permit To Take Water) Application for Dewatering, Final Draft, and its several important appendices from October 2023, there are alarming errors and ambiguities that should preclude approval of PTTW. These should also trigger a detailed impact assessment, which this PTTW report conversely says is not needed for Advanced Exploration at Great Bear.

In the introduction to the main PTTW report, the only numerical water withdrawal mentioned is up to 250 m^3/day (250,000 L/day) from Dixie Creek. Thus, it is stunning because the actual total water withdrawal from the local groundwater/surface-water balance would be at least 3,203,000 L/day every day and reaching up to 7,703,000 L/day on some days as a contingency. Even these values are unrealistically low as explained here.

The errors begin with groundwater modelling that is based on long-term "steady state conditions" after the mine is "fully developed" and dewatered, and not on the correct, higher-inflow "transient conditions". Thus, inflow, pumping, and dewatering are significantly underestimated by the groundwater model and the PTTW Application. Additionally, there are problems with unrealistically low estimated effects on partial dewatering of Dixie Creek and other creeks and rivers. For example, simulated groundwater levels are modelled around 9 m higher than measured around the mine and Dixie Creek, which artificially and incorrectly prevent additional dewatering of Dixie Creek.

Groundwater levels are shown to be drawn down during dewatering to a maximum of only 36 m even though the dewatered workings will be 600 m deep. This reflects (1) nearly fully dewatering of the shallow overburden and (2) the lack of admission on the likely huge drawdown and much larger "Zone of Influence" in the rock beneath the overburden.

Baseflows into Dixie Creek and other waterbodies can be critical to aquatic, benthic, and terrestrial ecosystems because of groundwater's typically different water quality and temperature compared to water already flowing at the surface. This becomes more critical during droughts when baseflow

may be the main source of surface flows. The PTTW Application ignores the fact that more than 34 to 55% of existing baseflow would be lost during Advanced Exploration. It instead points out that the loss to groundwater would be only 2.4% and less of total flow depending on the chosen surface-flow statistic.

Overburden is routinely ignored in this PTTW document and its appendices, despite the proposed hundreds of thousands of tonnes of overburden likely having at least some ML-ARD potential and capacity to degrade water quality. In fact, some of the underground dewatering would be sprayed on the overburden for dust suppression, which in turn could lead to contaminated runoff across and off the site.

10. Draft (?) Detailed Project Description (November 2023)

In June 2023, Kinross Gold released the [final] Initial Project Description for the Great Bear Gold Project. Five months later, Kinross Gold issued the Detailed Project Description, where the first cover page showing "Kinross" says "DRAFT", but the second cover page for WSP E&I Canada Limited does not say "Draft".

The Kinross/WSP documents reviewed so far for proposed exploration and proposed mining are a mess with confusions over draft, preliminary, initial, and final. There is no reliable way to know what information issued by WSP and Kinross is considered final, reliable, and still applicable. In my opinion, all reviews for Great Bear should stop until Kinross Gold and WSP identify the final designs and plans for proposed exploration and proposed mining. Only then should they issue the final documents, signed and approved by qualified professionals.

Because the Initial Project Description was followed five months later by this perhaps-draft-perhaps-not-draft Detailed Project Description that apparently includes responses to Initial concerns, only the latter document is reviewed here.

10.1 Section C.3.3 Proposed Mine Facilities and Infrastructure

Section C.3.3 and Table C.1 provide a detailed list of all proposed mine facilities, many of which would be created during Advanced Exploration, which as explained above is closer to a first phase of mining. Many of the listed facilities require ML-ARD assessment including all under the headings of Underground and Open Pit Mine including mine walls and sumps, Stockpiles including overburden and waste rock, Tailings and Site Water Management including ditches, Aggregate Supply, Waste Management, Fuels and Reagents, all access roads and haul roads, all excavations and foundations for buildings, facilities, pipeline corridors, upgrades to bridge crossings, and the core shack including core-storage areas. Because these ML-ARD assessments are not completed at this time, it is prudent to conduct an impact assessment on all these components.

The Stockpiles section says:

> "Stockpiles will be created on the surface near the mine to store ore, mine rock, and overburden / organics resulting from site and mine development. Preliminary storage capacities of the stockpiles for the Project are the following, subject to revision as a result of ongoing exploration and technical studies:
>
> - Run of mine (i.e., uncrushed rock as transported from the mine) ore stockpile: approximately 0.1 to 0.5 million tonnes (Mt)
> - Low grade ore stockpile: approximately 5 to 20 Mt
> - Mine rock stockpile(s): approximately 210 Mt
> - Overburden / organics stockpile: approximately 40 Mt."

Thus, upon full mining, there would hundreds of millions of tonnes of mine waste, with most of it likely remaining on the surface and requiring perpetual maintenance. Additionally, low-grade ore

stockpiles are sometimes left on site after closure as waste-rock dumps. Because of this, some jurisdictions require financial assurances on perpetual maintenance of the low-grade dumps until/if they are processed. This should also be done for the Great Bear Project.

> " Based on the scale of the stockpiles and the environmental baseline studies which are in progress, it is expected that one or more of the Project stockpiles will overprint minor creeks which may contain fish."

Thus, there will be "overprint" impacts through destruction of fish, fish habitat, and associated water quality.

The Ore Processing section says:

> "Ore processing will entail several stages of conventional mineral processing such as grinding and classification, and cyanide leaching to separate the gold / silver from the gangue leading to production of doré bars."

Thus, the processing will add contaminants including cyanide and accelerated leaching of metals and other elements that will contaminate the water in the process, in the tailings impoundment, and in the fugitive seepage that will flow into the environment.

Also:

> "There are no sources of mercury from the ore processing."

This appears impossible because the ore rock going in, and the tailings and concentrate coming out, of ore processing should and will contain some level of mercury. The processing could even increase the solubility or leaching rate of mercury and other elements. Therefore, this appears to be an error unless Kinross Gold can prove the tailings and concentrate from the ore processing contain absolutely no mercury. This is highly unlikely if not impossible to prove.

The section on Tailings Management explains:

> "The primary by-product of ore processing is tailings. Tailings consist of ground rock and associated process effluents that result from the processing of ore. Tailings will be treated for cyanide destruction before storage. As part of the ongoing geochemistry investigations it was determined that the tailings may be potentially acid generating, Kinross is investigating the potential to desulphurize the initial tailings stream resulting in a non acid generating flotation tailings, and a smaller quantity of sulphide tailings that would be managed in a manner to mitigate their acid generating potential."

Cyanide destruction is rarely perfect and sometimes simply converts the cyanide to thiocyanide or cyanate which can then revert to cyanide after release to the environment. Because the details of Great Bear's cyanide destruction are not given, it is prudent to assess it for potential environmental impacts.

Tailings Management further says:

> "Tailings will be transferred from the processing plant to an onsite surface management facility as a slurry, or potentially as a filtered cake. A quantity of the tailings will also be sent to a paste backfill plant where they will be mixed with a binder (such as cement) to increase their strength, so that they can be returned to the underground workings to provide additional underground stability. Tailings could also potentially be stored in the open pit after mining

is complete.

Tailings paste backfill, dewatered filter-cake tailings, and the relocation and in-pit disposal of tailings each could have unique adverse impacts on water quality and this should be assessed by Kinross Gold.

> "Further detail on tailings management facility, including dam designs as applicable, will be developed as engineering progresses for the Project. The facility will be designed in accordance with all regulatory requirements including the Canadian Dam Association Dam Safety Guidelines as applicable."

Thus, the details for evaluating potential environmental impacts will not be available until "engineering progresses", which is consistent with the ML-ARD work which will not be completed for at least a few years.

Notably, this section on Tailings Management has no detailed description of water management including any water recirculation. This is a major omission that precludes a reliable assessment of impacts from how much water would be needed daily to run this proposed mine.

The section on Buildings and Yard Areas states:

"The following new permanent facilities are planned for the Project:

- Process plant and crusher / conveying system
- Mine office / dry / maintenance / wash bay complex
- Cold and warm storage buildings
- Reagent storage facilities
- General laydown areas and parking
- Additional core shack, laboratory and outbuildings
- Accommodations / camp
- Explosives storage facilities.

These will be supported by related road, piping and power infrastructure as needed."

The disturbed rock or overburden used in any of these Areas requires an ML-ARD assessment as explained in the 2009 federal ML-ARD Prediction Manual (Price, 2009).

The section on Water Management Facilities and Drainage Works explains:

> "Kinross proposes to establish an integrated water management system for the site to manage contact water from the underground mine, open pits and surface facilities. The underground mine will intercept groundwater, while the open pit will collect groundwater, runoff and direct precipitation. Mine water from the required dewatering of the underground mine and open pit, to enable mining to occur will be collected in sumps and pumped to the surface for additional management. The mine water management and treatment infrastructure developed for the AEX program is expected to be re-used at the beginning of operations and will potentially be incorporated into the overall integrated water management system for the operating mine.
>
> "Precipitation and surface runoff that comes into contact with mine-related facilities on surface will be collected in ditches and collection ponds designed. As needed, the water will be directed to the integrated water management system for treatment and discharge with

other site contact water.

> "The integrated water management system and associated effluent treatment plant will be designed and operated to ensure that effluent from the site meets all regulatory requirements and can be discharged to the environment. Effluent will be discharged to the Chukuni River a large watercourse with high assimilative capacity. This will allow continued use of the pipeline corridor established for the AEX program. The additional infrastructure required for the mine has not yet been determined."

This section on Water Management Facilities and Drainage Works does not explain the storm return periods for which the drainage works would be sized. Nor does it specify the design return period for the post-closure water management, such as the 24-hour 1-in-200-year precipitation or the Probable Maximum Flood. This is a major omission that precludes a reliable assessment of impacts from storm events that could lead to spills of contaminated site water, and thus confuses the decision on whether an impact assessment should be conducted.

Under Access and Site Roads:

> "A network of roads of will be established within the site as needed, minimizing water crossings. New roads will be constructed of aggregate or non-potentially acid generating mine rock. New major road and watercourse crossings are not expected for the Project, although minor crossings and cross drainages may be needed. The water pipeline corridor which will be developed for the AEX program, and potentially expanded with additional pipelines for the mine, includes an access road to allow for pipeline inspections, environmental monitoring and maintenance, and is expected to cross four headwater creeks / low-lying swales, likely as culverts (Figure C.1 and Figure C.2). The existing prefabricated truss bridge across Dixie Creek may be upgraded."

Any surface and subsurface disturbance including new roads require ML-ARD assessments before an impact assessment can be done according to the 2009 federal ML-ARD Prediction Manual (Price, 2009).

The Section on Aggregate Operations contains a serious error:

> "Aggregate will be required to develop the Project. The primary source of material is proposed to be *nonreactive mine rock and overburden* [MDAG emphasis] from stripping and other construction activities within the site. There are licensed commercial aggregate pits nearby (along Tuzyk's Road) that also represent a potential source of aggregate for the Project. Discussions with the owners of these aggregate facilities are planned to explore potential commercial arrangements.
>
> "New quarries for crushed rock and sand and gravel pits may be established on the Property if needed under the care and control of Kinross. Locations are not as yet known but may be situated at future development locations (such as within the tailing management area)."

Because there is no such thing as "nonreactive mine rock and overburden", then there will be no aggregate which is "required to develop the Project", which in turn literally means there can be no Great Bear Project or mine. This illustrates how Kinross Gold is submitting perhaps-draft

documents with statements intended to alleviate concerns that are instead false and misleading.

This document is not signed and certified by Qualified Professionals, so at least portions of this Detailed Project Description are more akin to Public Relations than technical accuracy. Grassy Narrows First Nation should be aware of these false statements in important documents supposed to describe accurately and reliably the proposed exploration and proposed mining of the Great Bear site. It is not prudent to decide impacts of proposed exploration and mining based on false technical statements.

10.2 Section C.3.4 Preliminary List of Mine Activities

This section C.3.4 lists many "preliminary" activities during Construction, Operations, and Decommissioning and Closure. While many sound like generally good ideas, they can turn out to be bad ideas and not even possible at the Great Bear Project.

For example, here are some "preliminary" activities:

> "Overburden and organic material from the open pits will be either stockpiled or used for progression reclamation"
>
> "Mine rock extracted from the underground workings and open pits will be stockpiled, re-used as aggregate, or potentially re-used a consolidated rockfill underground"

The Project Definition Document of December 2022 assumed all the mine rock would have strong ML-ARD potential and would substantially contaminate water. Overburden was not even assessed although required by Ontario Regulation 240/00. It is understandable that the initial worst-case scenario may be modified as years go by and as ML-ARD studies are completed according to the 2009 federal ML-ARD Prediction Manual. However, there may be little change from the worst case at the Great Bear Project, but no one knows at this time. Thus, these "preliminary" activities can cause wider and worse impacts; no one knows at this time. Nevertheless, this perhaps-draft Detailed Project Description lists them anyway without pointing out their potential for adverse impacts.

This section also says,

> "As operations continue the open pit will have a progressively larger surface area and will become deeper"

The proposed pits are a concern to me as I do not see them justified by Kinross Gold. In fact, Figure C.5 shows that most of proposed pits and excavations are not needed to access most of the ore. Thus, there seems to be another, unstated reason for them, but I cannot see what it is.

10.3 Section C.3.5 Preliminary Decommission Approach

This section says:

> "Decommissioning and final closure of the Project site will be governed by the Ontario Mining Act, and its associated Regulations and Codes, and will be informed by ongoing engagement with Indigenous Nations and potentially affected stakeholders. The Act requires

> that a Closure Plan be filed for mining project before construction, and that financial assurance be provided so sufficient funds are in place to carry out the decommissioning activities.
>
> "A preliminary description of the proposed decommissioning and reclamation measures is provided in the text that follows. The preliminary measures are subject to consultation, additional engineering and regulatory review. The active phase of decommissioning and reclamation is expected to be completed within approximately three years of the end of operations. Environmental monitoring will continue after reclamation is completed, until such time as the closure objectives as determined in the Closure Plan have been achieved."

It is important to note that this preliminary closure plan, which should include early and unexpected closure but does not, will determine the initial financial security. Thus, all potential major sources of contamination should be identified and costed now, but this is far from the case.

Many serious long-term concerns are omitted and thus cannot be added at this time to the cost of the initial financial assurance. For example, the section on the Underground Mine does not mention the costly and serious water-quality degradation that would likely accompany the backfilling of "PAG" rock into the mine, where the rising, flooding water can become seriously contaminated beyond that seen at the surface. This seriously contaminated flooding water would likely eventually reach an equilibrium level where it would begin flowing out into the surrounding groundwater system and the environment years after closure. This would require long-term or perpetual pumping and treatment of groundwater, which could substantially or enormously raise the financial assurance.

Alternatively, the "PAG" rock (and overburden) could be kept in a stockpile at the surface where its ongoing seepage of infiltrating water through some type of cover would require perpetual collection and treatment. This section implies the ML-ARD would stop by incorrectly saying:

> "Reclamation measures will be designed to mitigate acid mine drainage / metal leaching concerns as needed. This may include design and placement of an appropriate cover over the mineral waste."

ML-ARD is not mitigated cheaply and permeable covers do not stop infiltration but may reduce it if well maintained in perpetuity, still leading to perpetual maintenance and water treatment. Very expensive impermeable covers may virtually encapsulate and isolate the contaminating rock and overburden if carefully maintained in perpetuity, which also includes additional costs for perpetual maintenance and repair.

Or perhaps as Section C.6 on Potential Alternatives states, the mine rock would be used as "reclamation material" where it could contaminate more of the site. Or the mine rock would be placed into "storage in depleted open pit". In the pits, the backfilled mine rock would contaminate inflowing water that would eventually fill and flow into the surrounding environment, or eventually drain down into the underground workings where the second paragraph above explains the fate of the underground water.

One way or the other, the closure cost only for the rock and overburden alone will likely be much higher than envisioned in this perhaps-draft Detailed Project Description.

There are other examples like this that are not recognized and costed in this Section C.3.5.

Therefore, whatever the current estimated cost of financial assurance based on Section C.3.5, it should be raised substantially higher. This would also cover the expense should early or unexpected closure occurs, which is credible and often expected but is not mentioned or considered in this Great Bear document.

10.4 Section F Potential Effects of The Project

Section F on potential effects of the project during Construction, Operations, and Closure starts with Table F.1 Preliminary List of Change to the Environment under Federal Jurisdiction.

The row of Table F.1 for the Fisheries Act during the Construction Phase says:

> "Alteration, disruption and destruction of fish and benthic fauna habitat from direct disturbance (including potentially from overprinting by mine rock and tailings management facilities), blasting and mine dewatering" with the Preliminary Area of Influence only "Project footprint"

For mine dewatering, the ongoing drawdown of groundwater and ongoing dewatering of surface waterbodies does not stop immediately as the pumps are turned off at the end of Operations, but can continue for many years afterwards through Closure. Also, the Area of Influence could be much greater than the Project Footprint (see Section 9.2 of this MDAG review). However, Operations and Closure does not mention this long-term ongoing impact. This illustrates how "Preliminary Changes" are only partially recognized in this Detailed Project Description, and important ones are not mentioned and considered.

Additionally, for Closure under the Fisheries Act Table F.1 says:

> "Potential for creation of fish habitat in new pit lakes, expected to be re-connected to the Dixie Creek system"

This shows a lack of understanding of water-quality impacts and ML-ARD, similar to the Great Bear "nonreactive mine rock and overburden" that does not exist (see Section 10.1 of this review). It sounds good to non-technical readers to say the pit lakes will be fish habitat and "re-connected" to Dixie Creek although they are not currently connected. On the other hand, technical readers know this is highly unlikely considering the type of rock and ML-ARD likely to come from Great Bear rock, pit walls, and underground mine walls. These Great Bear pits as proposed, long after Closure, should not be expected to meet the requirements of the Fisheries Act.

Table F.2 Preliminary Summary of Potential Environmental Effects says:

> "- Underground mine and open pit dewatering will affect the local groundwater levels and may affect surface water flows
> - Groundwater quality is not expected to be affected"
>
> "Preliminary Areal Extent:
> - Dewatering may result in a depression in the local groundwater level which is currently under investigation"

Section 9.2 of this MDAG review explains how Kinross Gold's groundwater modelling is aware of, but avoids showing, the substantial lowering of groundwater levels by dewatering to a remarkable depth of ~600 m in the rock, while the overlying overburden is virtually fully dewatered to its base. This dramatic lowering will be much more than the comfortable sounding word of "local" in the above quotations. It will be much worse than "local". This will also likely have a major impact on groundwater quality, as Section 9 of this MDAG review explains, despite Kinross Gold's unjustified and unreasonable expectation that "Groundwater quality is not expected to be affected".

Furthermore, surface creeks and lakes could be dewatered much more than modelled because modelled groundwater levels are simulated around 9 m higher than measured, reducing the modelled and predicted dewatering below reality. Baseline flows to local surface waterbodies, which are critical to the benthic ecosystem and aquatic life due to their differing chemistry and temperature, will be reduced by 34% and more, but no one yet knows how much more.

Section F.6.1 on Atmospheric Emissions has a major omission that shows the environmental impact from atmospheric emissions would be much greater than stated. Section 8 of this MDAG review has explained that fugitive dust at Great Bear, and any water used to suppress this dust, would have a substantially larger environmental impact than currently recognized and modelled. Thus, impacts from air emissions have been underestimated in this Detailed Project Description that could be used to determine an impact assessment.

Section F.6.2 Liquid Discharges states:

> "Mine water will contain suspended solids from mining and earthmoving activities, ammonia residuals from ammonia-based explosives, and residual hydrocarbons from heavy equipment operation. Leaching of the exposed bedrock within the underground mine and open pit may potentially contribute minor quantities of metals to the mine water."

This is another example of bad science appearing as technical information in this perhaps-draft Detailed Project Description.

- First, underground mine water will also contain dissolved metals and other inorganic contaminants.
- Second, since ammonia is expected to be so high from underground explosives that a special treatment circuit is needed for it, then the always accompanying high nitrate and nitrite that will not be treated but discharged to the environment will also be high and contaminating.
- Third, since underground mine water will contain hydrocarbons, why is there no option to treat these potential organic contaminants?
- Fourth, leaching of mine walls in underground workings and open pits can, and elsewhere have, seriously contaminated the mine water, with the contamination increasing as the area of mine walls increases during mining. This could happen at Great Bear because more than 10 km of underground workings would likely be mined. However, the ML-ARD testwork to predict this under the federal ML-ARD Prediction Manual will be in progress for at least a few years. So, once again this Detailed Project Description misleads by already concluding that the leaching "may potentially contribute minor quantities of metals to the mine water". The reality could just as easily turn out to be "the leaching will contribute substantially high and toxic quantities of metals to the mine water". No one knows yet, not even Kinross Gold and its consultant, WSP.

Some day in a future year, reliable "Modelling will be completed to assess the volume and quality of the water requiring management, which will be used in the design of the integrated water management and treatment facilities on site." At this time, the groundwater requiring management has clearly already been underestimated (see Section 9.2 of this MDAG review). Until then, no one knows with reasonable confidence how much water has to be treated, how severely it will be contaminated, and how thoroughly it will be treated.

The subsection on Process Plant says:

> "Excess process plant water is expected to be pumped with the tailings to a tailings management facility for storage. The tailings and process plant water will contain metals from the processing of metal-containing ore and residual processing reagent products. A cyanide destruction circuit will be established within the process plant to treat residual cyanide concentrations in the tailings and process plant water, prior to pumping to the tailings management facility."

A major aspect of water management and tailings management is the percentage of discharged process water that will be recirculated back to the process to minimize freshwater usage and contamination by "metal from the processing". This issue is not mentioned and thus is a serious omission. Additionally, "cyanide destruction" is not perfect and may not literally destroy cyanide but temporarily mask it until its release to the environment. These important issues are not mentioned either. Thus, this quotation gives the false impression that cyanide and metals will only be "residual" and will be treated to minimize them, but this is simply guessing that is not consistent with ML-ARD testwork so far.

Section F.6.4 on the Environmental Management System does not explain the currently likely scenario that one or more additional contaminants not currently recognized will arise in on-site water (see also Section 11 of this MDAG review). This would require at least months of storage of contaminated water on site until the treatment plant is expanded and updated. Therefore, the on-site storage of months of site-contaminated surface water and groundwater should be a major objective of the Environmental Management System.

10.5 Summary

In summary of this perhaps-draft Detailed Project Description of November 2023, the first cover page by Kinross says this document is "draft", but the second cover page by the authors, WSP, does not say "draft" so perhaps this is the final document. If so, it has not been signed by qualified professionals and thus should be rejected.

In any case, there are so many problems, misleading statements, errors and omission concerning ML-ARD, water quality, and environmental impacts that they cannot all be summarized well here. These problems include the following.

- The false statement that there will be no sources of mercury from the ore processing when in fact the tailings and concentrate from the process will contain mercury. The processing could even cause mercury and other elements to leach more quickly and become more mobile.

- Contrary to the impression given by this Detailed Project Description, cyanide destruction is not perfect and can simply mask the cyanide temporarily in the environment, but the important testwork to determine this has not yet been done for the Great Bear Project.

- Significant impacts on water quality can arise from seemingly benign proposed activities like paste backfill of tailings into the underground mine and dewatered filter-cake tailings, but the potentials for serious impacts are not recognized or not even mentioned in this perhaps-draft Great Bear document.

- Storm events and equipment upsets can lead to relatively large variations and unexpected impacts, day-to-day or even hour-to-hour, during proposed exploration and proposed mining. Instead, these Great Bear documents use averages like monthly which incorrectly assume flows will be the same every day of a month which is far from reality. Environmental impacts and spills can be caused by large variations, as well as longer-term averages, so the environmental risks of proposed exploration and proposed mining at Great Bear remain mostly unknown and not identified.

- Nonsense pseudo-scientific statements are used, like the aggregate required to build the Great Bear Project would be "nonreactive mine rock and overburden" which does not exist. This clearly shows that experienced and qualified professionals were not included in the writing of this perhaps-draft Detailed Project Description. If there is a true commitment to "nonreactive mine rock and overburden" which does not exist, then the Great Bear Project stops now.

- There is a lack of ML-ARD assessments for some site components like aggregate.

- There is a prevalent but likely false belief that "NPAG"rock will have little to no impacts on ML-ARD, water quality, and the environment. However, this has not been proven for the Great Bear Project and is likely wrong based on other minesites around Canada. "NPAG" rock can actually generate more acid than "PAG" rock and still release seriously contaminated levels of many metals and other elements at near-neutral pH.

- The financial assurance to ensure proper and fully paid closure of the proposed Great Bear Project is grossly underestimated based on existing information. Furthermore, the financial assurance should also include contingency costs for early or premature closure but it does not.

- There are likely devastating, expensive, and unrecognized ML-ARD consequences on water quality from the proposed relocation of "PAG" rock into the underground workings after operation.

- The ongoing, unproven, and likely wrong, belief continues that overburden would be environmentally benign, can be used across the site for reclamation, and can be sprayed with water to control dusting when it could instead create contaminating water around, below, and beyond the Great Bear site.

- There are unfounded beliefs that dewatering during exploration and mining would have minimal

effect on the local and regional water balance, and would not significantly dewater surface creeks and lakes including their environmentally important baseflow. These false beliefs are based on flawed groundwater modelling for the Great Bear Project explained earlier in this MDAG review.

- There is a false belief that dust blown off the site during proposed exploration and proposed mining and into the surrounding environment, vegetation, soil, water, and aquatic ecosystems is benign at "background" levels.

- A false belief is stated that only elevated and toxic ammonia, and no other contaminating nitrogen species from explosives that consistently accompany the ammonia, will appear in mine water during proposed exploration and proposed mining.

- There is an unsupported and likely substantially underestimated statement that the mine walls in the pits and underground workings "may potentially contribute minor quantities of metals to the mine water" instead of the more typical significant quantities of metals seen at many other minesites around Canada. This is taken to the likely ludicrous statement that there would be "Potential for creation of fish habitat in new pit lakes, expected to be re-connected [sic] to the Dixie Creek system".

- There is no recognition of the implications, costs, and impacts of storing months of contaminated mine water on the site should one or more "unexpected" yet currently predictable inorganic contaminants and ML-ARD occur on the site water during and after proposed exploration or proposed mining.

11. Water Treatment during Proposed Exploration and Proposed Mining

Most of the contaminated water at the Great Bear Project during proposed exploration and proposed mining would be subjected to water treatment. There would remain some fugitive contaminated water and contaminated dust that would impact the surrounding environment. This fugitive contamination has not been assessed in detail by Kinross Gold, and is even ignored or not recognized in several Great Bear documents as shown above in this MDAG review.

If fugitive contamination turns out to be minimal, then water treatment is the last "line of defence" between the on-site ML-ARD and contamination and the off-site impacts. Therefore, proposed water treatment should be examined and justified in great detail. This has not yet happened for the Great Bear Project.

At this time, I could not find any detailed and professionally certified report on water treatment for proposed exploration and proposed mining. The previous sections of this MDAG review have discussed water treatment as it appeared in some documents, where the current information was found lacking or misleading.

Minewater-treatment plants are not off-the-shelf available at stores like Canadian Tire. This is because their treated effluent concentrations to the environment are very sensitive to the site-specific inflow rate of water and to the inflowing variations in aqueous concentrations of each contaminant element requiring treatment.

These treatment plants can be unstable when exposed to variable flows or to variable inflowing contaminant concentrations, resulting in only partially treated and still-contaminated effluents. Therefore, water treatment for proposed exploration and then again for proposed mining at the Great Bear Project has to be carefully designed, based on well-justified and professionally certified information on surface hydrology, subsurface hydrogeology, ML-ARD, and on-site geochemical source terms.

As shown in the previous sections of this MDAG review, this "input" information into the site-specific and reliable design of water treatment at Great Bear does not exist and will not likely exist for at least a few years. Until then, the available preliminary information is corrupted by errors and missing details. Therefore, it is not possible at this time to reliably define and design the required water treatment at Great Bear, or to estimate effluent concentrations, environmental impacts, and cumulative effects.

To provide some guidance to Grassy Narrows First Nation on aspects of water treatment at the Great Bear Project, it is helpful to review and comment on one of the latest documents that contain some details on possible water treatment. This document is: Great Bear Project Proposed Underground and Open Pit Gold Mine, a PowerPoint presentation made to Asubpeeschoseewagong Netum Anishinabek, dated November 10, 2023

Slide 20 of this presentation is entitled "Water Treatment". It points out that:

> "Contact water discharged to the Chukuni River will be managed to achieve regulatory requirements."

It is important for Grassy Narrows First Nation to recognize that "regulatory requirements" can vary vastly and that the applicable and protective requirements have to be carefully chosen based on site-specific information like flow rates and variations in influent (ML-ARD) and effluent concentrations. Alarmingly, Table 5-6 shown on Slide 20 invokes the "MDMER" or Metal and Diamond Mine Effluent Regulations, which allow toxic levels of metals and other elements. For example, normally toxic levels of 100 ug/L and more are allowed for arsenic and copper, and normally toxic 80 ug/L and more are allowed for lead.

This should be an immediate warning to Grassy Narrows First Nation that Kinross Gold does not intend to treat the site water to safe levels. Instead, treatment will only reduce concentrations to still-toxic levels and then rely on dilution in the Chukuni River to eventually reduce it almost to background levels.

The usage of toxicity dilution in the Chukuni River would create a "mixing zone" for some distance in the river, in which toxicity still exists and for which Fisheries and Oceans Canada would have to authorize the mixing zone. There appears to be some hydrodynamic modelling already done for this mixing zone in the River, but no details like flow rates and their variabilities were provided. Because the previous sections of this MDAG review showed that long-term to perpetual treatment and dilution may be needed for the Great Bear Project, Grassy Narrows First Nation should understand this will represent a very-long-term impact.

Additionally, such long-term ongoing discharge and dilution will add to cumulative effects, about which Grassy Narrows First Nation has expressed serious concerns.

Slides 20 and 21 present additional details on treatment. For example, a special and likely expensive ammonia treatment circuit will be included to treat elevated and toxic ammonia from blasting residues. Remarkably, nitrate and nitrite, which can also be toxic and can stimulate eutrophication in the Chukuni River and Dixie Creek, always accompany ammonia from the blasting residues. However, they are not even recognized here or in other Great Bear documents. This is a serious and unacceptable omission for the Great Bear Project.

Sulphate concentrations in the treated effluent, which I understand can increase toxic methylation of mercury and other elements like cadmium and arsenic, are not mentioned at all.

Slide 20 also commits to "ultrafiltration" which typically removes all suspended particles coarser than about 0.02 um. Because "dissolved" concentrations include nanoparticles and small particles up to about 0.45 um, this proposed ultrafiltration would also lower the functionally "dissolved" concentrations, but not those of fully dissolved elements. Thus, Great Bear treatment should be capable of approaching CCME (Canadian Council of Ministers of the Environment) safe criteria for aquatic life, but may not meet Grassy Narrows First Nation water-quality criteria (GNFNWQC). CCME aquatic-life guidelines and GNFNWQC could replace the toxic MDMER criteria and significantly reduce or eliminate the mixing zone and cumulative effects in the Chukuni River.

However, none of these details are discussed or mentioned in Great Bear documents.

Mine water treatment plants remove metals and other elements from the water, by creating concentrated and toxic treatment waste commonly called "sludge". In many jurisdictions, treatment sludge like that proposed for the Great Bear Project can reach "hazardous" or "special" waste levels, requiring the most careful and secure handling and long-term storage under contaminated-sites regulations. Spills of this sludge can result in toxic conditions in water and in sediments including soils and benthic ecosystems.

All the Great Bear documents I have reviewed so far are completely silent on the annual volumes, handling, storage, long-term protection, and potential environmental impacts of treatment sludge. This is a major risk for serious environmental impacts that should be addressed in great detail for proposed exploration and proposed mining. I recommend that Grassy Narrows First Nation require intensive studies on the treatment sludge that will remain and be managed somewhere in perpetuity.

In summary for water treatment, Great Bear documents invoke water treatment as the major process that would prevent or minimize environmental impacts of proposed exploration and proposed mining. This is not literally true, because there will be fugitive contaminated water and contaminated dust leaving the site, but this fugitive contamination is ignored or not recognized in many reviewed Great Bear documents.

In any case, water treatment is the last "line of defence" between the on-site ML-ARD and contamination and the off-site impacts, and thus requires intensive study and characterization. However, at this time, water treatment for proposed exploration and proposed mining is ambiguous and contradictory among the documents. This should be expected because the input flows and input contaminant concentrations (ML-ARD) will not be known reliably for at least a few years. Nevertheless, there are serious concerns about water treatment now including the following.

- Kinross Gold does not expect to treat site water to non-toxic levels. Instead, treatment would only be down to still-toxic levels based on the Metal and Diamond Mine Effluent Regulations. Thus, Kinross Gold intends to rely on significant dilution of its contaminated effluent within a "mixing zone" in the Chukuni River. Such a mixing zone would include zones of significant toxicity and would require formal authorization from Fisheries and Oceans Canada. In any case, this discharge of effluent would add to cumulative effects, which is a particular concern of Grassy Narrows First Nation.

- Expensive and intensive treatment for ammonia, derived from blasting residues, is proposed. However, toxic levels of nitrate and nitrite, that always accompany the ammonia and which can cause eutrophication and other impacts in the Chukuni River and Dixie Creek, are completely ignored.

- Sulphate concentrations in the treated effluent, which I understand can increase toxic methylation of mercury and other elements like cadmium and arsenic, are not mentioned at all.

- Ultrafiltration may substantially reduce effluent concentrations for those elements not fully

dissolved, mixing-zone size, and cumulative effects. However, there are no details on this ultrafiltration in the reviewed Great Bear documents.

- Mine water treatment plants remove metals and other elements from the water, by creating concentrated and toxic treatment waste commonly called "sludge", which can reach "hazardous" and "special" waste levels in some jurisdictions. Thus, treatment sludge requires the most careful and secure handling and long-term storage under contaminated-sites regulations. Spills of this sludge can result in toxic conditions in water and sediments including soils and benthic ecosystems. All the Great Bear documents I have reviewed so far are completely silent on the annual volumes, handling, storage, long-term protection, and potential environmental impacts of treatment sludge that will remain and be managed somewhere in perpetuity.

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March 6, 2024

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Boozhoo MINES, IAAC, Kinross and Great Bear Resources:

RE: The Great Bear Gold Mine Project

On behalf of Asubpeeschoseewagong Anishinabek ("ANA" or "Grassy Narrows First Nation"), we write to share with you Grassy Narrows' preliminary position with respect to your activities in relation to the Great Bear Gold Project.

The Project will have an adverse impact and requires an impact assessment

Grassy Narrows is deeply concerned by the Great Bear Gold Project being pursued by Kinross and Great Bear Resources with support from the Ministry of MINES as well as the process recently begun by the Impact Assessment Agency of Canada (IAAC).

Decades of industrial activity, authorized and encouraged by Ontario and contrary to Grassy Narrows' will, have led to well-documented and extensive harm to our Territory, our way of life, our rights, and our health. As a result, our people suffer intensely from impacts including premature death, disease, poverty, and suicide.

The Great Bear Gold Project falls within the area that Grassy Narrows people have historically and currently use for the exercise of our rights and way of life. It is also upstream from our community. Pollutants in the water and impacts on the surrounding land, fish and wildlife will have a direct impact upon us and could also exacerbate mercury contamination in our waterways.

ANA has repeatedly and clearly communicated with the Crown and the mining industry that our people are in crisis, the environment which supports us is severely impacted, our health is failing. The cumulative impacts continue to significantly interfere with our treaty, Aboriginal and inherent rights.

The Great Bear Gold Project will have an impact upon areas that Canada claims as within federal jurisdiction, such as species at risk, fisheries, waterways and Indigenous peoples. Grassy Narrows asserts that the IAAC must conduct an impact assessment in the circumstances.

The Crown's outstanding obligations to Grassy Narrows should be resolved in a nation-to-nation process.

For many years, ANA has written to Ontario to invite the Crown to a government-to- government table to address fundamental issues between us, including the Crown's unmet obligations to us about our rights, our land, our self-determination, and the impacts of industry and government policy on our land and people. These issues have been unresolved between our governments for many decades. Reaching agreement in good faith through a government-to-government table is the way to resolve these important issues and to put in place effective measures to protect us from further harm.

Ontario and Canada have yet to accept this invitation. Most recently, by letter dated November 27, 2023, Ontario explicitly refused to participate in a table to discuss "jurisdictional issues" raised and rejected nearly all of the issues proposed by ANA including most of those related to mining.

Instead, Ontario has explicitly recommended that mining companies explore on and around our Territory, has unilaterally granted roughly 6,000 mining claims on our Indigenous Protected and Conserved Area, and allowed companies to pursue increasingly advanced work towards mines that pose a serious threat to Grassy Narrows. This activity has occurred without our consent, without meaningful consultation and accommodation, and usually without even prior notice under the antiquated "free entry" mining regime.

Grassy Narrows' concerns about the process

Until recently, the Crown and the companies associated with the Great Bear Gold Project have shown little willingness to meet with us, nor respond substantively to many of our communications. Indeed, we have only recently learned that the Crown and companies provided notice to other Indigenous Nations of permit applications concerning the Great Bear Gold Project

as early as 2017 and have signed Advanced Exploration Agreements with Wabauskang and Lac Seul First Nations. In contrast, Ontario approved a number of permits without notice of any kind to Grassy Narrows.

Now that gold has been found, the Crown and Kinross are suddenly interested in giving the appearance of consulting with us, but only to the extent that it furthers the already advanced plans, made without Grassy Narrows' involvement, to develop an industrial gold mine in our headwaters.

Even if Ontario had complied with its own laws, Ontario's "free entry" mining exploration and mine development process is not the correct way to make key decisions between our two governments. This process is deeply unfair and biased in the favour of multi-billion-dollar mining companies. It ignores our laws, our vision for our land and people, and our processes for making decisions affecting our territories.

Our ongoing and urgent crisis leaves us unable to meaningfully engage about mining. To make matters worse, we receive no support from Ontario to inform ourselves, gain technical and legal advice, and to engage in a fair way about mining. The IAAC has offered a mere $5,000 in capacity funding to respond to a 100-page technical Initial Project Description and the funding was made available only after the submission deadline for comments has passed.

The path to reconciliation

We are on a healing journey to recover from the extreme damage that colonization, and attempted forced assimilation have done to our people, including through the imposition of Crown policy and regulatory schemes related to residential schools, dams, relocation, mercury contamination, child apprehension, industrial logging, and mining. We need to allow the land to heal because healthy land will help to heal our people. This is what reconciliation means to Grassy Narrows. Let us protect our land and water so that we can heal our people.

The boom in mining exploration in our area is causing great anxiety and fear among our people. It is setting back our healing. If the Crown decides to allow mining, and the risk of further pollution and other impacts, there will be more heartache, sickness and loss for our people. This mining activity will only lead to more grassroots resistance, litigation, and public controversy over conflict minerals. It will take the relationship between the Crown and Grassy Narrows further away from the path of healing and reconciliation.

Grassy Narrows says 'no' to the Great Bear mine and related activities.

We strongly urge the Crown and your companies to reconsider your unilateral and bullying approach to pushing mining activity on our First Nation. We urge you to seize this opportunity to set a course for a future that is free of conflict over mining in Ontario.

We call on the Crown and your companies to respect the healing path for Grassy Narrows and not to further impair the exercise of our constitutionally protected Aboriginal and treaty rights, our inherent Indigenous rights, our health, and wellbeing.

Grassy Narrows provides preliminary comment on the project under duress

We know that Ontario and Canada will move ahead with approvals for damaging mining activity if we do not speak up. For that reason, we are writing to you under duress to express our preliminary concerns about this project before it advances any further. These serious concerns with both how the project has been pursued and the impacts on our rights and interests, are set out in the attached document. These submissions are by necessity preliminary in the absence of capacity and support to conduct our own studies and obtain expert technical advice.

Please ensure that you copy our Land Protection Team on all communications on this and related matters.

Awsa,

Asubpeeschoseewagong Anishinabek (Grassy Narrows First Nation) Chief and Council (quorum of three)

Chief Rudy Turtle

Councillor Sherry Ackabee

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ANA PRELIMINARY CONCERNS ABOUT THE GREAT BEAR GOLD PROJECT

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I. The Context

Who is Grassy Narrows

Asubpeeschoseewagong Anishinabek (Grassy Narrows First Nation) is an Anishinaabe First Nation with traditional territory in what is called northwestern Ontario. Grassy Narrows people exercise inherent Indigenous rights, and Aboriginal and Treaty rights. We have cared for and lived on our lands for countless generations. Grassy Narrows people hunt, trap, fish and practice our Anishinaabe way of life to provide for ourselves, our families and community.

We exercise our inherent right to self-determination and law-making powers. Our inherent rights are given to us by the Creator. In addition to our inherent rights, Grassy Narrows people exercise Aboriginal rights and established Treaty 3 rights which are protected by section 35 of the *Constitution Act, 1982*.

In 1873, the Anishinaabe adhered to Treaty 3. The Treaty 3 Commissioner promised the Anishinaabe that the Treaty promises would protect our harvesting practices forever, which would allow our people to hunt, fish, trap, gather, and harvest throughout the Territory as they had before "as long as the sun shone and the waters flowed." This promise was more than a continuation of our pre-existing harvesting rights. The Anishinaabe did not agree to the erosion of our harvesting rights.[1]

Our territory is located in the Boreal Shield ecoregion in a mixed forest transition zone from the Great Lakes St Lawrence Forest to the Boreal Forest. The Whiskey Jack Forest is the English name of the forest that covers a large portion of the Territory; the English-Wabigoon River System is a central waterway in the Territory. The land and waterways of the Territory sustain Grassy Narrows peoples' way of life.

Grassy Narrows' Territory is the foundation of who Grassy Narrows people are as Anishinaabe people. We follow the teachings of the Elders to be responsible for the Territory and to *Manaachitootaa Aki* (protect the land).

Social and Cultural Impacts of Crown Law and Policy.

Despite these sacred promises, for many generations the Crown has imposed harmful law and policy on us, including through the *Indian Act*, the banning of our ceremonies, regulation of our hunting and trapping, residential schools, regulation of the wild rice, relocation, the 60s scoop, the underfunding of our schools, inadequate health care, and the ongoing removal of our children from the community.

These policies have caused grave harm to our people and impaired the exercise of our rights. They have undermined our strong society and way of life and have left us more

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[1] *Keewatin v Minister of Natural Resources*, 2011 ONSC 4801 [*Keewatin* ONSC], rev'd 2013 ONCA 1158, aff'd 2014 SCC 48 ["*Keewatin* litigation"].

vulnerable to the impacts of industry.

The Cumulative Effects of the Mercury Crisis and Industrial Activities Impacts.

Starting in at least 1962, a chlor-alkali plant in Dryden, Ontario, began discharging mercury into the English-Wabigoon River system. Approximately 9,000 kilograms of mercury were discharged into the river system that flows through our Territory and is a lifeline for Grassy Narrows people. Our live-giving river became a source of invisible poison.

The impacts of the mercury contamination have been devastating to the people of Grassy Narrows and our Territory. The presence of mercury led to the methylmercury contamination of the fish and Grassy Narrows people. The local commercial fishery shut down; Grassy Narrows' economy collapsed; Grassy Narrows people descended into poverty; Grassy Narrows people suffered, as they continue to do, from debilitating health symptoms and premature death; and our Anishinaabe way of life was gravely threatened and changed when we could no longer safely eat fish and exercise our fishing practices as we had before.

In the 1970s and 1980s, Grassy Narrows called on Ontario to respond to the mercury crisis by taking concrete action, including by agreeing that Grassy Narrows would control our Territory. As the river was poisoned, we wanted to have more control over our Territory and the natural resources in it to be able to protect and benefit from the part of our Territory that was still healthy – the land. Instead, Ontario authorized extensive clearcut logging in the Territory from roughly 1980 to 2008, which likely released new, or additional, sources of mercury into the watershed, and increased methyl mercury contamination of fish.

Multiple expert reports and publications have detailed the impacts of mercury contamination on the health of Grassy Narrows people, including the following, which are enclosed:

- 2015 Expert Report of Dr. Donna Mergler
- Grassy Narrows Community Health Assessment Summary Reports, 2018
- Philibert et. al. (2020), "Mercury exposure and premature mortality in the Grassy Narrows First Nation community: a retrospective longitudinal study", *The Lancet: Planetary Health* Vol. 4(4), E141-E148
- Philibert et. al. (2022), "Past mercury exposure and current symptoms of nervous system dysfunction in adults of a First Nation community (Canada)" *Environmental Health* 21:34.
- Mergler. D. et. al. (2023), "The Contribution across Three Generations of Mercury Exposure to Attempted Suicide among Children and Youth in Grassy Narrows First Nation, Canada: An Intergenerational Analysis" *Environmental Health Perspectives* 131(7).

These reports highlight the grave impacts of mercury on the health and wellbeing of

Grassy Narrows. They establish that Grassy Narrows people cannot withstand further impacts from the release of new mercury into Grassy Narrows' land, lakes, rivers, fish, and people, nor an increase in the net methylation of existing mercury. Our rights have already been highly compromised by the mercury crisis. Our nation cannot withstand further infringements of rights. No further impairment of our rights, our health, and our wellbeing can be justified.

Our fish in the Wabigoon River remain the most mercury contaminated in the province. Our people of all ages continue to suffer from mercury related diseases and loss of wellbeing. Our employment remains far below what it was in the 1960s following the collapse of our subsistence, sport, and commercial fishery due to mercury.

The mercury crisis is but one in a long series of industrial attacks which have been imposed on us against our will. These include the damming of our rivers, industrial logging, and mining activity. Each of these industrial attacks has had grave impacts on its own. In addition, each of these industrial attacks has compounded the existing harm that remains from previous attacks, creating unbearable cumulative impacts, thereby prolonging, and exacerbating our inter-generational crisis.

These extreme and compounding industrial impacts have been authorized and encouraged by the Crown without any serious consideration of their cumulative effects on Grassy Narrows and the exercise of Grassy Narrows' rights. We have raised clear concerns since at least the 1970s that our environment, rights, way of life, and our health, were at or beyond, the breaking point due to the impacts of industry on the resources on which we have heavily relied for our wellbeing, livelihood and the viability of our community. In the 1980s, and again in 2007, we declared moratoria on further industry on our Territory so that we could heal our people and rebuild our independence and wellness.

And yet, to this day, with respect to our Territory and vicinity, Ontario has failed to increase our control and use, failed to conduct a collaborative Landuse Plan; failed to complete a source water protection plan; failed to carry out a comprehensive environmental assessment; and failed to undertake an assessment of cumulative effects. The repeated failures of the Crown to act honourably to resolve the crisis have resulted in serious, compounding adverse impacts over time, including:

(1) Severe cumulative impacts on our territory and Treaty harvesting, hunting and fishing rights, making these rights impossible to exercise in a meaningful way;

(2) Severe adverse health effects and death, including, as found in recent scientific research, high rates of conditions impacting learning in children, disease, suicide attempts, and the premature death of our people; and

(3) Extreme poverty, food insecurity, loss of Anishinaabe way of life, and other poor socio-economic indicators of wellbeing which are ranked significantly worse than average Indigenous communities in Ontario and Canada.

(4) Collective impacts to our society and community.

Ontario ignored our pleas and our moratoria and continued to allow industrial activity, including the granting of mining claims on our Territory against our will, and advancement of mines all around us, without considering how mining activities add to, compound, exacerbate, and prolong previous harms. The cumulative impacts of industry have been devastating. The impacts include, but are not limited to:

- Our river that gives us life remains poisoned.
- Our walleye are unsafe to eat.
- Our sturgeon are rare.
- Our moose are scarce.
- Our caribou are nearly extirpated.
- Our pine marten habitat is depleted.
- Our forests are fragmented.
- Our medicines are tainted.
- Our sacred landscape is desecrated and scarred and traplines have been clear cut.
- Our way of life is diminished.
- Our people suffer from poverty, food insecurity, disease, premature death, and suicide.
- Our inherent, aboriginal, and treaty rights are impaired
- Our health has been harmed.
- We have been discriminated against.

II. Ongoing Breaches of Crown Obligations: The 1978 Memorandum of Understanding, Honour of the Crown, and Fiduciary Duty

Ontario and Canada (collectively, the "Crown") are our treaty partners. As elaborated below, through the treaty relationship and Crown actions over time, including entering into legal agreements following the start of the mercury crisis, the Crown assumed obligations and duties owing to Grassy Narrows. The Crown must uphold the treaty promises, uphold terms of its agreements, and act honourably in its dealings with Grassy Narrows.

Authorizing and permitting mining activities in our territory without our consent violates Ontario's and Canada's outstanding obligations and duties to Grassy Narrows and violates the Crown's duty to act honourably in all its dealings with Grassy Narrows.

1978 MOU and Dishonourable Conduct.

In 1978, Ontario and Canada signed a Memorandum of Understanding with Grassy Narrows in which the Crown committed to resolve in good faith the impacts of mercury on the environment that Grassy Narrows people rely upon for the viability of our community, and the related health, social, economic, cultural, and environmental impacts on the people of Grassy Narrows ("1978 MOU"). It was agreed that the issues would be resolved through a combination of financial compensation and land, and

furthermore in a manner that would enhance Grassy Narrows' self-determination, self-sufficiency, and control over local affairs wherever possible.

Some agreements were reached that partially implemented some of the 1978 commitments. For example, agreements were reach with Canada in 1984 and with Canada, Ontario and the mercury polluters in 1985.

However, the Crown has outstanding obligations owing under the 1978 MOU. These outstanding obligations include (but are not limited to) increasing Grassy Narrows' access to, protection of, and control over lands and natural resources in our Territory.

Moreover, the Crown has engaged in a course of dishonourable conduct before, during the negotiations, and since, and has consequently failed to meaningfully support Grassy Narrows' recovery from the mercury crisis.

The Crown's unmet fiduciary duties

The Crown and Grassy Narrows have a *sui generis* fiduciary relationship, and our treaty rights attract fiduciary obligations. In the time since the Crown and Grassy Narrows entered into a treaty relationship, the Crown seized functional management and control of our lands and water. The Crown assumed a duty to Grassy Narrows when exercising that control over our Indigenous interests including our pre-existing legal interests in exercising our fishing, hunting and trapping rights and other traditional practices such as medicine gathering and wild rice picking.

Grassy Narrows has been at the mercy of the exercise of Ontario's imposed fiduciary decision-making over our land as Ontario unilaterally authorized industrial activity, and otherwise has made decisions that affect the land, water and other natural resources of our area which we rely on to exercise our rights, practice our way of life, and maintain our health.

Under imposed Crown management and discretionary control, the health of our land and our people have seriously declined, our way of life has been degraded, and the exercise of our treaty rights has been impaired.

The Crown's abandonment of negotiations required by the 1978 MOU

From the outset of our discussions under the 1978 MOU, Grassy Narrows was clear that to recover from the impacts of mercury and other harms, we need Crown recognition of Grassy Narrows' ownership, control, and protection of a large part of Territory, which will allow Grassy Narrows to make decisions with respect to our land that support our way of life and our livelihood. In the 1970s, 1980s, and 1990s Ontario committed to negotiate increased Grassy Narrows control over our lands, in addition to providing meaningful compensation for our people.

In the 1980s, and since, we called for a moratorium on industrial activity in our Territory until our negotiations with Ontario were concluded. However, rather than honour this moratorium, the treaty promises, and the 1978 MOU obligations, Ontario unilaterally

abandoned the negotiations in the mid 1990s and exercised its imposed control in a way that further unleashed industry on our area to our detriment.

Ontario has repeatedly acted unilaterally to encumber and degrade our Territory against our will, including by granting industrial logging licenses and nearly 6,000 mining claims; industrially logging our forests; and constructing industrial access roads and bridges (e.g. The Separation Lake Road and bridge) to facilitate further resource extraction and environmental degradation. Canada has stood by and watched, allowing our lands, waters, rights, and way of life to be trampled.

The Crown's dishonourable conduct and abandonment of its fiduciary obligations continue. Ontario's Ministry of Mines has granted thousands of mining claims against our will, including granting mining exploration permits without any prior notice to us.

Ontario has failed to accurately identify the ANA Area of Interest on mining activities.

The Ontario Ministry of Mines has never meaningfully addressed the question of the extent of Grassy Narrows' area of interest with respect to mining.

In the 1980s, the Ontario Ministry of Natural Resources created its own map to identify a Grassy Narrows Traditional Land Use Area (the "1980s TLUA Map") for the purposes of mediated negotiations between Grassy Narrows and Ontario with respect to a section of the Territory required by Grassy Narrows to restore its economic self-sufficiency. The map used straight lines, which are not reflective of the boundaries of the full Territory and does not include the northern portion of the Territory.

Between 2008 and 2017 Grassy Narrows and Ontario engaged in discussions on forestry pursuant to the Grassy Narrows Ontario Process Agreement (the "Process Agreement"). As part of that process, Grassy Narrows submitted a map of the "Grassy Narrows area of interest for forestry", which included areas that are outside the 1980s TLUA Map boundaries.

When Grassy Narrows passed our Land Declaration in 2018, we shared a map of an area we have identified as the "Indigenous Protected and Conservation Area" (IPCA). The IPCA boundaries mirror part of the area of interest for forestry. The IPCA boundaries have always been provisional, as Grassy Narrows continues to engage in a process of reviewing the knowledge of our historical and current land use. In addition, the western notion of linear boundaries on maps conflicts with our Indigenous knowledge systems, which are based on relationships and complex webs of protection, use, kinship, sharing, travel and trade that do not begin and end at a line.

Shockingly, Ontario relied on the 1980s TLUA Map as the consultation area for mining, despite having knowledge that the map was not accurate.

Grassy Narrows is currently pursuing litigation challenging nine mining exploration permits (not related to the Great Bear Gold Project) that Ontario approved without

notice to Grassy Narrows.[2]

Among other relief, Grassy Narrows seeks the following remedies in the litigation:

> a declaration that Ontario cannot consider mining activities in the subject area of the Territory, including issuing exploration permits, until the parties negotiate and reach agreement on **timely enforceable mechanisms to assess and manage the cumulative impacts of mining, logging, hydro-electricity projects, other industrial development, mercury contamination, and governmental policies or programs that may infringe Grassy Narrows' treaty rights, and to ensure that these constitutional rights are respected**;

These mechanisms are not yet in place and the judicial review remains unresolved.

As further described below, Grassy Narrows has only very recently learned that the Ministry of MINES approved a number of permits for the Great Bear Gold mine with no notice to Grassy Narrows.

It is only in very recent times, and after much conflict, that Ontario has begun to ask Grassy Narrows about what our area of interest for mining is. After many years of advocacy by Grassy Narrows, Ontario's Minister responsible for mines finally responded on November 1, 2022 with a new map that Ontario proposed as the area for consultation on mining related activities.

Ontario's proposed consultation area on mining appeared to deliberately carve out the Great Bear Project Area. The information provided by Ontario to explain how they arrived at the proposed boundaries was cursory and insufficient for understanding how the boundaries were arrived at. Grassy Narrows informed the Ministry that their proposed map is not complete and requested capacity support to do the work necessary to respond. However, no support has been provided to date.

On November 2, 2023, Grassy Narrows provided two versions of a map setting out our Interim "Area of Interest" for mining. The maps differed in scale only. The map was provided with the following cautions:

- The maps are an interim product created under duress arising from the escalation of imposed mining activity by the Crown and industry and for the sole purpose of identifying an interim area for negotiations on mining related activity.

- The maps are not a complete representation of Grassy Narrows' area of interest. Due to the unique circumstances and capacity constraints, Grassy Narrows has not completed comprehensive studies required to fully determine its area of interest including, but not limited to, land use and occupancy, ethnohistory, archaeology, biology, and hydrology. For example, rights and interests

[2] Grassy Narrows First Nation v. Director of Exploration, Ministry of Northern Development, Mines, Natural Resources and Forestry, Ontario Divisional Court File No. 881/21.

associated with air quality, migratory birds, travel routes, marten, lake sturgeon, wolves, eastern cougar, landscape intactness, climate resilience, biodiversity, genetic diversity, and many other factors are not reflected in these maps.

- In addition, linear boundaries are an imposed non-Indigenous concept that do not accord with the nature of Grassy Narrows' relationship with the land which includes extensive interconnectedness, reciprocity, travel, sharing, and trade.

- These maps do not limit any claims by Grassy Narrows people to assert their rights and interests throughout their territory and to protect themselves from harm to their health, rights, way of life, livelihood, society, and environment. Grassy Narrows people have Treaty rights, and practice them, throughout the Treaty 3 area. Grassy Narrows people also have inalienable inherent rights given by the Creator, some of which are affirmed in international law and instruments. The Grassy Narrows people are the true experts about their land, rights, and interests.

<u>The Great Bear project area falls within the core area of Grassy Narrows' Interim Area of Interest for Mining map.</u>

Despite Grassy Narrows' efforts to further these negotiations, there is no agreed upon area for consultation on mining activities.

Sharing of information about our Homeland is a sensitive topic that requires deep trust. After so many decades of having our trust, our vulnerability, and our lands abused by Ontario, many of our knowledge holders do not consent to sharing sensitive lands information with Ontario. Trust must be rebuilt to meaningfully engage on this topic.

Grassy Narrows Laws Have Not Been Respected.

Neither the Crown nor the companies have formally acknowledged and respected Grassy Narrows' moratorium and Land Declaration. The Crown has not joined us to harmonize Crown law with Grassy Narrows law and to find a path forward towards reconciliation that provides space for Grassy Narrows' inherent Indigenous rights and constitutionally protected Aboriginal and treaty rights to be meaningfully realized and protected.

We have written many times to request that the Crown come to a senior negotiation table with Grassy Narrows to address the wrongs committed against our people, the effects of which continue to this day, and to prevent further damage. We call on Ontario to return to the mediation process first established in 1978 in response to the mercury disaster to finally reach an honourable agreement regarding the control and protection of our Territory and fair compensation for Grassy Narrows people.

Instead of coming to the table to honourably resolve outstanding issues and obligations, Ontario has unilaterally granted mining claims and permits and now is supporting the development of a gold mine in our headwaters.

III. The Crown Must Address Capacity Barriers

Grassy Narrows has repeatedly advised both the Crown and the Companies that it cannot meaningfully engage in negotiations while it faces significant and unique barriers.

1) Insufficient information: Upon learning of the Great Bear Gold project, Grassy Narrows immediately requested additional information about the project and the extent to which our Laws had been taken into account and its adverse impacts considered. This information is essential for us to understand and respond to any efforts at engagement. After a lengthy delay, the Ministry recently provided responses that can only be characterized as preliminary and partial.

2) Capacity funding: The process of evaluating proposed mining activities and engaging with MINES, the IAAC, and mining companies comes at an expense to ANA. We must hire staff, engage our community, carry out our governance process, and obtain professional support from experts, lawyers, and advisors to engage in a meaningful way.

Grassy Narrows is even more impoverished than our First Nation peers due to the ongoing impacts of mercury poisoning. We lack the funds required to engage in an informed and fair way.

During the summer of 2023, MINES staff indicated that, after many years of requests, MINES will fund some ANA capacity needs. We provided MINES with a document summarizing the kinds of capacity supports that we would need in order to meaningfully engage on mining, including compensation for staff and to hire experts. After many months of awaiting an update, on November 27, 2023 MINES clarified that its promises of capacity supports amount only to funding in an unspecified amount for a “Mineral Development Advisor”, a position that Grassy Narrows has never requested funding for.

No funding is currently in place. MINES must come to the table on our issues and commit to funding ANA’s reasonable costs of engaging in an informed and fair way.

While IAAC offered $5,000 in capacity funding to ANA, this funding was offered after the deadline for submissions on the List of Issues. The amount offered is insufficient to meaningfully review lengthy technical documents that engage many areas of expertise, to engage with our people, to carry out our governance process, and to prepare a response. This is the same on-size-fits-all funding offered to other First Nations, NGOs, and other ‘stakeholders’. It does not consider our unique circumstances nor our position as an Indigenous nation.

3) Pandemic Considerations: COVID-19 infection rates, as well as other respiratory illnesses in this region of Ontario are high again. Our people are especially vulnerable to disease because of our high pre-existing rates of co-morbidity, crowded and inadequate housing, inadequate nutrition due to food insecurity, and the immune impacts of mercury. The health of our people is our priority. We are informing you that, in addition to our other concerns, mining exploration proposals are unwelcome during outbreaks

and other public health emergencies.

4) Mercury Crisis and Industrial Impacts: Our territory has already experienced a great deal of harm from industrial activities including mercury, damming, industrial logging, and mining. The cumulative effects of these industrial impacts have already passed the point of an unreasonable, unjustifiable impact on the exercise of our Treaty rights, and on our health and wellbeing. As a result, our community suffers from unusually high rates of conditions including poverty, food insecurity, disease, neurological conditions, conditions affecting learning, premature death, and child and youth suicide. The social conditions created by mercury poisoning and the cumulative impacts of industry place us in an ongoing extreme crisis. As a result, we are unable to meaningfully engage on mining exploration in the absence of the necessary supports to resolve and recover from the ongoing mercury crisis.

5) Fundamental outstanding issues must be addressed before meaningful engagement can occur: As described above, many fundamental issues remain unresolved between Grassy Narrows and the Crown including unmet obligations, broken promises, conflicting laws, cumulative impacts, violated trust, justice owed, and outstanding reconciliation. These are upstream strategic issues to which individual mining projects are subsidiary. We cannot address one mining project meaningfully, when the fundamental questions are not addressed. These questions include:

- How will the Crown respect Grassy Narrows' inherent rights and rights recognized under international law and related instruments?
- How can the Treaty relationship between the Crown and Grassy Narrows be respected and restored?
- How can the written text of the Treaty be reconciled with the oral and written histories, and Ontario Superior Court findings, that the taking up clause and the cede and surrender clause were never discussed nor agreed to?
- Who has decision making authority over lands and resources in our area?
- How can Grassy Narrows law and Crown law be harmonized with respect to the land?
- What lands should be open to mining and what lands should be protected?
- How will the Crown's unmet obligations arising from the Treaty, the 1978 MOU, and other sources be fulfilled?
- How will Grassy Narrows' ownership, control, and use of our lands be increased as promised?
- How can the damage already done to our land and our water be restored?
- How can the harm to our sacred landscape, our spirituality, and our relations be repaired?
- How can we assess and prevent the cumulative impacts of industrial activity from further harming us?
- How can the collective damage to our society, our community, and our families be reversed?
- How can our health, our wellness and our way of life be returned to its former status?

- How can our self-determination, our independence, and our self-sufficiency be rebuilt?
- Is it possible to reconcile while the harm continues, while we bury our youth?

For many years we have been seeking to resolve important issues with the Crown that relate to mining. A summary list of some of these issues can be found at **APPENDIX A**.

The Crown apparently has little interest in these questions and little willingness to address them with us, to act honourably, nor even to come to the table with us about them. When we meet with senior officials from MINES and MNRF, they tell us that they have no mandate to discuss these issues, but they will bring them to the Minister.

After years of seeking a meeting with the Minister our then Chief and Council finally met with then MNDMNRF Minister Rickford in Toronto on November 18, 2021. At the long-awaited meeting Minister Rickford refused to discuss our mining concerns but promised to come to Grassy Narrows soon to discuss mining at an open forum in our community. Neither Minister Rickford nor his successors have honoured this promise.

In a largely analogous situation where Grassy Narrows and the Crown had a conflict over a different form or resource extraction, the 2004-2009 Whiskey Jack Independent Forest Audit found that:

> There are fundamental differences in the viewpoints between GNFN and MNR regarding forest management principles and practices. It is the audit team's opinion that these differences cannot be resolved without the Province setting aside many of the requirements to manage the Whiskey Jack Forest under the CFSA and the FMPM, and relinquishing significant authority to the First Nation to manage portions of the Whiskey Jack Forest according to the desires of the GNFN community. The audit team further believes that the forest management planning process did not anticipate, nor was it designed to resolve the type of dispute currently being experienced on the Whiskey Jack Forest.

Similarly, the *Mining Act* and its regulations and the IAAC regulations did not anticipate, nor were they designed to resolve the serious grievances, outstanding obligations, and the type of dispute currently being experienced over mining around Grassy Narrows. Resolving this dispute will require sincere, honourable, government-to-government engagement on the fundamental issues that have brought us to this point. Only once that occurs, can we meaningfully engage about specific permits and projects without repeating and exacerbating the legacy of past and ongoing harms.

IV. The Great Bear Gold Project: The Crown's failure to inform, meaningfully consult, and gain our consent for project activities.

The Great Bear Gold Project falls within Grassy Narrows' Interim Area of Interest for Mining

We have enclosed a copy of Grassy Narrows' map of our Interim Area of Interest for Mining, which is described above.

The limited preliminary research that we have been able to conduct confirms that the Great Bear Gold Project is within the area where Grassy Narrows people have historically, and continue to, practice our way of life and our Treaty rights.

There is strong ethno-historical evidence that Grassy Narrows has a longstanding connection to this area dating back to the time of the Treaty and before. This includes historical reports, fur trade records, ethnological work, and other records. Grassy Narrows First Nation historically hunted, fished, trapped, collected plants, gardened and conducted spiritual practices in and around the Red Lake fur trading routes, and traded products obtained in the area.

There are Grassy Narrows families with continuing family ties to this area and the surrounding areas. Grassy Narrows people, including the Chief, continue to practice our inherent and Treaty rights in this area, including the moose hunt. The moose hunt is extremely important to our way of life and sustenance. Due to the precipitous decline in moose elsewhere in our area, the area south of Red Lake is one of the only remaining productive moose hunting grounds that our people use.

The Great Bear Gold Project falls within moose, wolverine and caribou habitat that ranges within our IPCA. In addition, walleye within the project area migrate to the waterways on which Grassy Narrows exercises its treaty rights to fish and on which the community reliese for food. The project area is also within nearby quatermary watersheds that flow into the IPCA.

Grassy Narrows people fish extensively on the English River around Grassy Narrows. Grassy Narrows people also fish on the English River and its tributaries near the inflow of the Chukuni River. We are aware that the fish that we eat swim a distance of 30 km, or more, up and downstream in the course of their lifecycle and are exposed to, and bioaccumulate, toxins throughout their travels. In particular, our walleye travel long distances upstream in order to spawn.

Caribou are an important clan animal to Grassy Narrows and used to be seen throughout our Territory. The Great Bear Gold Project area is within the range of the Sydney Caribou herd, the last remaining herd in our Territory. This range is already degraded beyond the threshold at which it is able to sustain Caribou in the long term, unless its intactness is restored. All of the habitat within the range is considered critical.

As noted above and confirmed by the Supreme Court, the Treaty 3 Commissioner promised the Anishinaabe that the Treaty promises would protect our harvesting practices forever which would allow our people to hunt, fish, trap, gather, and harvest throughout the Territory as they had before “as long as the sun shone and the waters flowed”. The Anishinaabe did not agree to an increasing erosion of our harvesting rights that would significantly interfere with the exercise of our rights.[3]

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[3] *Keewatin v Minister of Natural Resources*, 2011 ONSC 4801 [*Keewatin* ONSC], rev’d 2013 ONCA 1158, aff’d 2014 SCC 48 [“*Keewatin* litigation”].

Grassy Narrows has a communal connection, right, and interest in this area. It is possible that other First Nations do too, but that does not in any way diminish our own connection, rights and interests nor the Crown's obligations to us.

In addition, Grassy Narrows must be consulted on activities that may have off-site impacts on our territory, such as downstream, downwind, or migratory species impacts. Grassy Narrows continues to document the full extent of its Territory and the "ANA Preliminary Area of Interest With Respect to Mining" is without prejudice to the determination of the full geographical extent of Grassy Narrows' Territory.

The Crown requires Grassy Narrows' consent for the Great Bear Gold Project

The standard that correctly applies to this project is the right to say 'no', also known as the right to give or withhold "free prior and informed consent."

Under Grassy Narrows law, we are the first people of this land. The Creator gave us this land and only the Creator can take it away. We live in relationship with the land; we care for it and the land provides for us. We must take care of the land and not disrupt this balance. Nothing that threatens this balance may take place on the land without our permission. We say no to mining.

The United Nations has recognized this right in the *UN Declaration on the Rights of Indigenous Peoples* and in other international laws and instruments to which Canada is a signatory.

The *Declaration on the Rights of Indigenous Peoples* requires States to consult and cooperate in good faith with the indigenous peoples concerned through their own representative institutions in order to obtain their free, prior and informed consent before adopting and implementing legislative or administrative measures that may affect them (article 19). This includes:

- The adoption of legislation or administrative policies that affect indigenous peoples (article 19)
- The undertaking of projects that affect indigenous peoples' rights to land, territory and resources, including mining and other utilization or exploitation of resources (article 32).

The principle of free, prior and informed consent is linked to treaty norms, including the right to self-determination affirmed in common Article 1 of the International Human Rights Covenants. When affirming that the requirement flows from other rights, including the right to develop and maintain cultures, under article 27 of the International Covenant on Civil and Political Rights (ICCPR) and article 15 of the International Covenant on Economic Social and Cultural Rights (ICECSR), the treaty bodies have framed the requirement also in light of the right to self-determination.

Canada is bound by international law to these abide by these standards.

While Crown law has often failed to adequately implement international human rights standards, and often seeks to take a reductionist view of its international obligations to us, even under Crown law our consent is required for this project for reasons including, but not limited to:

a) The cumulative impacts of Crown policy and industry on our people already exceed any reasonable threshold of impact on our rights, our way of life, our people, and our environment. No further impacts can be made without consent.

b) The Companies' goal is to open a gold mine. A recent study demonstrated the extensive impacts of metal mining contamination on rivers and floodplains across the world, with an estimated 23 million people believed to be affected by potentially dangerous concentrations of toxic waste.[4] Gold mines have high risk of impact to our well established and strong rights, including our rights under Treaty #3. Our waters are already contaminated with mercury. Therefore, we are at the high end of the consultation spectrum where consent is required.

c) The "taking up" clause and the "cede and surrender" clause which the Crown relies on for its asserted legal authority were never explained, translated, discussed, nor agreed to, during the negotiation of Treaty #3. This is reflected consistently in the multiple, independent, written records of the Treaty negotiations. To the contrary, Treaty Commissioner Simon Dawson informed the legislature that "As an inducement to the Indians to sign the Treaty, the commissioners pointed out to them that, along with the land reserves and money payments, they would forever have the use of their fisheries. The point was strongly insisted upon and it had great weight with the Indians, who for some years previously had persistently refused to enter into any Treaty" (NA RG 10 vol 3800 file 48542, 28 May 1888). The Ontario Court of Justice found that the Indigenous signatories to Treaty 3 were not advised and did not understand that the Crown could authorize land uses inconsistent with Harvesting Rights and pass legislation to extinguish or limit Harvesting rights. They expected that Canada would protect their harvesting rights away from the Dawson Route or CPR right or way, not limit, extinguish or ignore them.[5] No court of appeal, including the Supreme Court of Canada has overturned this finding of fact.

Beyond the requirements under Grassy Narrows Law, International Law, and Crown Law to obtain consent in these circumstances, there is the simple practical requirement for consent in today's business, investment, and political environment.

The business case for obtaining consent is reflected in the mining industry's own trade association policies through the International Council on Mining & Metals (ICMM) position statement on Indigenous Peoples and Mining, which states that "[t]he outcome

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[4] Phys.Org (September 21, 2023), "Global study reveals extensive impact of mining contamination on rivers and floodplains."

[5] Keewatin v. Minister of Natural Resources, 2011 ONSC 4801 (CanLII), at para 865, <https://canlii.ca/t/fmzc4#par865>, retrieved on 2023-09-23

is that Indigenous Peoples can give or withhold their consent to a project, through a process that strives to be consistent with their traditional decision-making processes while respecting internationally recognised human rights and is based on good faith negotiation."[6]

Even Barrick Gold, infamous for their violations of human rights internationally, stated in their $100M statement of claim against Red Lake Gold when addressing the need to for Grassy Narrows' consent that:

> Virtually all successful mining ventures in Canada require a strong and genuine working relationship with local communities, including First Nations. Without such a relationship, it can be extraordinarily difficult, if not impossible, to proceed with a mining venture beyond early stage exploration work and into development work (e.g., by constructing a working mine).
>
> Strong, genuine and reliable relationships with First Nations are built on mutual trust and respect. Any perceived or actual breach of that trust or respect can have devastating consequences for a mining venture or company, and these commercial and reputational consequences can extend well beyond any particular project or First Nation group.[7]

No large mine has opened in Canada for decades without Indigenous consent. It is simply too difficult and risky to carry out such an expensive and intensive project without all relevant First Nations on board.

As a First Nation living immediately downstream from this project, we will live with the consequences for many generations to come. It is our children who will drink the water, eat the fish, pick the wild rice, swim, and learn what it means to be *Asubpeeschoseewagong Anishinabek* on this river whose waters will carry the effluent from this gold mine if it is built. It is our people who will search in vain for moose and caribou to hunt on the landscape that has had its forests fragmented and degraded by access roads, clearcuts, seismic lines, pits, trenches, clearings, and mines. It is our people who will be impacted if the tailings dam fails. It is our people who will be poisoned if toxics leach into the water. It is our people whose fear and anxiety, already far to high and fatal due to the mercury crisis, will be heightened by the threat this mining project poses to our wellbeing.

We know, and everyone in Canada who has cared to learn our story knows, that decisions made and activities carried out upstream can have a devastating impact on us. The chlor-alkali plant in Dryden that discharged mercury into the Wabigoon River was 150 km upstream of our village. But the flow of the river does not obey any human boundaries. The distance did not stop the mercury from being carried downstream,

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[6] International Council on Mining & Metals (May 16, 2013), "Indigenous Peoples and Mining: Position Statement".
[7] Barrick Statement of Claim against Red Lake Gold, 2022/23, p. 20, 21.

bioaccumulating in the fish that we eat, destroying our livelihood, poisoning our people, and dramatically disrupting our way of life. More than 50 years after the discharge of mercury was ordered halted, our mercury crisis rages on. There is no end in sight to the contamination of our river and to the intergenerational impacts of mercury.

The correct standard for this project, which threatens to impact Grassy Narrows' future for many generations, is consent. Grassy Narrows has not given its consent. Grassy Narrows says 'no'.

Far from seeking consent, Ontario has approved numerous permits for the Great Bear Gold Project with no notice to Grassy Narrows

With respect to the Great Bear Gold Project, there has been a failure to inform, to consult meaningfully with ANA and to gain our consent, even though the ANA village site is the first community downstream from the project site. In spite of the infamous pre-existing impacts on the English River and Grassy Narrows from hydro damming, mercury pollution, and clearcut logging, and Grassy Narrows' well knowns concerns about mining exploration. The fact that Grassy Narrows is downstream of this project, potentially impacted, and likely concerned should be evident to any diligent person with access to Google.

Exploration permits for this project date back to January 2017, including permits for extensive exploration work, drilling, stripping of the land, and taking of water. The following permits were authorized without notice to Grassy Narrows and, for the most part, prior to any communications from either the Crown or the companies with our First Nation:

- January 6, 2017: PR-16-10995 – permit for mineral exploration
- April 11, 2019: PR-18-000295 – permit for mineral exploration
- November 22, 2019: PR-19-000264 – permit for mineral exploration
- November 27, 2019: PR-19-000227 – permit for mineral exploration
- July 16, 2020: PR20-000178 – permit for mineral exploration
- October 13, 2020: PR20-000276 – permit for mineral exploration
- July 13, 2021: PR-21-000190 – permit for mineral exploration
- October 4, 2021: PR-21-000258 – permit for mineral exploration
- August 15, 2022: 5115-CJ9QRR – permit to take water
- September 15, 2022: Permit 5115-CJ9QRR to take water

The failure to take the minimal step of giving notice to Grassy Narrows about any of the above permits is all the more shocking because while this extensive work was being done on the Great Bear Gold Project, Grassy Narrows was writing to Ontario and to the companies seeking to share information and initiate negotiations about protection for Grassy Narrows' lands, waters, and people. Grassy Narrows has written to Ontario repeatedly about land protection concerns for decades, and most recently in a long series of official letters dating back to 2018 requesting a government-to-government table to resolve Lands issues including mining.

The history of communications between Grassy Narrows, Great Bear Resources, Kinross and Ontario's Ministry of Mines demonstrates that none of these parties have demonstrated a genuine intention to meaningfully engage with Grassy Narrows. This summary is current to December 15, 2023:

- **February 25, 2020:** Having learned about Great Bear Resource's presence in the area, but unaware of the permit applications and authorizations, Grassy Narrows Chief and Council wrote to Great Bear Resources to notify the Company about ANA's mining concerns and to ask if Great Bear Resources had any proposed work that would put Grassy Narrows at risk and conflict with our laws. There was no response. Indeed, Great Bear Resources has never responded to Grassy Narrows' communications.

- **October 1, 2020:** Upon learning of Kinross's presence in the area, Grassy Narrows Chief and Council wrote to Kinross Gold Corp. with a request to meet and a list of questions about their work.

- **October 6, 2020:** Chief and Council wrote to Great Bear Resources.

- **October 7, 2020:** Chief and Council wrote to follow up with Kinross.

- **November 2, 2020:** Kinross responded to acknowledge our letter but did not provide any substantive response to our questions, make any mention of the Great Bear Project, nor accept our request to meet. We did not hear from Kinross again for almost two years.

- **December, 2021:** Kinross reached an agreement with Great Bear Resources.

- **August 29, 2022:** Kinross sent a letter of introduction to our Chief.

- **September 15, 2022:** Less than three weeks later, Kinross submitted an exploration permit to Ontario claiming to have consulted with Aboriginal communities.

- **October 4, 2022:** Grassy Narrows wrote again to Great Bear Resources.

- **October 6, 2022:** Grassy Narrows received its first notice of an application for an exploration permit related to this project from Ontario (PR-22-000284). Ontario gave Grassy Narrows only one month to provide comment on the application.

- **November 18, 2022:** With no capacity, and in the midst of the COVID-19 pandemic, Grassy Narrows wrote back to advise Ontario that we intended to respond but could not do so substantively within the time provided.

- **November 24, 2022:** MINES notified Grassy Narrows that Kinross's application (PR-22-000284) had been approved with the exception of 44 claims that were

being held pending further comment from Grassy Narrows but offering no capacity supports.

- **December 28, 2022:** MINES notified Grassy Narrows of seven mining lease applications and advised that MINES would proceed if it did not receive comments by February 26, 2023.

- **January 19, 2023:** MINES notified Grassy Narrows that it was considering granting the mining permit for the 44 claims that had been held, pending comments from Grassy Narrows by February 3, 2023. Again, no capacity supports were offered.

- **February 6, 2023:** Grassy Narrows wrote to MINES to reiterate the barriers to participation that had been communicated over many years; in the absence of addressing those barriers Grassy Narrows cannot engage or comment substantively to the permit applications.

- **February 14, 2023:** MINES gives Grassy Narrows until February 28, 2023 to respond with comments.

- **February 27, 2023:** Grassy Narrows official writes to MINES indicating that Grassy Narrows does want to comment but that further time is required to review the information, and that the company has yet to respond to the questions that ANA has sent them.

- **March 3, 2023:** Grassy Narrows sent a follow up letter to MINES regarding the seven proposed mining leases and Grassy Narrows' requests for a government-to-government negotiation table.

- **March 10, 2023:** MINES wrote to Grassy Narrows to ask for a copy of the questions posed to the companies in 2020.

- **March 20, 2023:** Grassy Narrows wrote to Great Bear and Kinross to request a meeting about the Great Bear Gold Project in early April and for an answer to the questions posed to the company in 2020.

- **March 21, 2023:** MINES followed up on its request for a copy of the questions posed to the companies in 2020.

- **March 31, 2023:** Grassy Narrows followed up with Great Bear Resources and Kinross to request a meeting in early April and to obtain answers to the questions posed in 2020.

- **April 12, 2023:** Grassy Narrows repeated its request for a meeting with MINES and answer to questions concerning Great Bear Resources and Kinross.

- **April 24, 2023:** Kinross finally responds to the request to meet.

- **June 22, 2023:** Kinross attended an introductory meeting with Grassy Narrows. The meeting was not a consultation on the project. Kinross representatives stated that MINES would be providing answers to the questions posed in 2020. Grassy Narrows raised serious concerns about the project, including capacity constraints and concerns about impacts.

- **June 27, 2023:** Kinross wrote to confirm that MINES would be providing answers to the questions posed in 2020. MINES did in fact provide a partial and incomplete response to the questions posed in 2020. MINES gives Grassy Narrows two weeks to provide comment on the 44 outstanding claims.

- **July 12, 2023:** MINES gives Grassy Narrows a further extension to July 27, 2023.

- **July 24, 2023:** Kinross wrote to invite Grassy Narrows to a meeting to learn about the project and to advise that it was setting up a Sharepoint site to share information about the project. The Sharepoint link was not provided. Kinross further advised that the federal impact assessment process had been initiated.

- **July 28, 2023:** MINES wrote to advise Grassy Narrows that Ontario will not provide capacity support for consultation and asked for comments on the 44 claims by August 10, 2023.

- **August 11, 2023:** MINES approves the mining exploration permit for the 44 claims.

- **August 12, 2023:** Kinross provided a copy of Great Bear industrial Sewage Works documentation. Grassy Narrows does not have capacity to analyze or respond to this technical document.

- **September 7, 2023:** Kinross provided a copy of the Great Bear Advanced Exploration Reclamation Strategy for comment. Grassy Narrows does not have capacity to analyze or respond to this technical document.

- **September 13, 2023:** Chief Turtle writes to the IAAC to advise that Grassy Narrows has learned that Kinross and Great Bear have initiated the interim assessment process. Grassy Narrows was not provided notice in accordance with its protocols and demanded that the process recommence in accordance with procedural requirements.

- **September 14, 2023:** Grassy Narrows sent a follow up inquiry to the IAAC.

- **September 15, 2023:** IAAC provided a two-week extension to respond to Kinross's Initial Project Description.

- **September 20, 2023:** Grassy Narrows responded to IAAC by reiterating that the IAAC had not complied with procedural requirements for the pre-planning stage and repeating its demand to recommence the process.

- **September 26, 2023:** Kinross wrote to Grassy Narrows to request a meeting to discuss capacity funding.

- **September 28, 2023:** Kinross wrote to Grassy Narrows to provide two technical documents for comment (AEX Industrial Sewage Application and Aquatics Monitoring Plan; AEX ECA Air and Noise, Emissions Modelling and Dust Management). Kinross offered to meet and provide capacity support.

- **October 4, 2023:** Kinross wrote to Grassy Narrows about a draft permit to take water application.

- **October 6, 2023:** Grassy Narrows Lands Protection Team was given access to the Great Bear Sharepoint site, with extensive technical documents that were not shared previously. IAAC also provided its Summary of Issues for comment and offered to meet.

- **October 20, 2023:** Kinross provided its groundwater monitoring plan for the project and its preliminary mine rock management and monitoring plan.

- **November 3, 2023:** Kinross provided its draft closure plan for comment.

- **November 10, 2023:** Kinross provided its Detailed Project Description for comment. Grassy Narrows met with Kinross and IAAC. Grassy Narrows asked Kinross to pause the impact assessment process until an engagement protocol could be put in place along with capacity supports.

- **November 14, 2023:** Ontario wrote to Grassy Narrows with belated notice that in or around April 2023 it had delegated the “procedural” aspects of consultation on certain matters relating to the Great Bear Gold Project to Great Bear Resources. Ontario’s letter to this effect dated April 6, 2023 was sent to the Chief and not pursuant to Grassy Narrows consultation protocols. Ontario takes the position that the duty to consult is at the “low end” of the spectrum.”

- **November 20, 2023:** Kinross wrote to Grassy Narrows concerning participation in a Stage 3 Archaeological Assessment.

- **December 15, 2023:** Kinross meets with Grassy Narrows and refuses to pause its activities for any length of time to accommodate Grassy Narrows’ unique circumstances.

As the foregoing chronology demonstrates, the companies and Crown left Grassy Narrows in the dark for years about the Great Bear Gold Project. Since September 2023, Grassy Narrows has been flooded with technical documents, belated offers of capacity support, none of which has flowed, and impossible deadlines for engagement.

Kinross spent billions to buy the project and has clearly already decided to build a gold mine regardless of Grassy Narrows' wishes. Failing to engage with Grassy Narrows on this project for more than four and half years was not an error of omission, but rather a deliberate decision not to engage, and to withhold, information about this project from Grassy Narrows. The fact that other First Nations, who are located far upstream of the project, but who have a reputation for welcoming mining activity, were engaged far earlier (as early as 2017), raises the question of whether a decision was made not to engage Grassy Narrows because of Grassy Narrows' well-known concerns about mining exploration.

It took Ontario and the companies nearly three and half years to provide initial responses to questions posed by Grassy Narrows to Great Bear Resources in February of 2020. And yet, within 60 days of providing those initial responses, without providing any capacity support to review them, and without addressing Grassy Narrows' many other barriers and fundamental issues, the Ministry approved further work on the project in spite of Grassy Narrows' request for capacity support and time.

Even Indigenous Services Canada flagged concern about Kinross's level of engagement to date with Grassy Narrows in its comment to the IAAC:

> The perception of contamination to the land, water, traditional food sources and Indigenous Peoples by industrial development may be a serious concern for the identified Indigenous Nations, especially for Grassy Narrows ... During the late 1990s and early 1970s, the English-Wabigoon River system was contaminated with inorganic mercury from a pulp mill located upstream in Dryden, Ontario. This discharge of inorganic mercury contaminated their water and traditional food sources (i.e. fish) and lead to cases of mercury poisoning and intergenerational challenges. The proponent, Kinross Gold Corporation, started engaging with Grassy Narrows First Nation in 2022, whereas their engagements with Wabuskang First Nation and Lac Seul First Nation began in 2017. Due to Grassy Narrows First Nation's negative and detrimental experience with industrial development, it is recommended that more engagement take place. The Indigenous Nations need to gain a greater understanding of the contaminants that may be released into the environment. They should be provided an opportunity to express concerns or uncertainties about potential exposure to chemicals used in the gold mining process, such as cyanide and heavy metals.[8]

Given this history, including the Crown's outstanding obligations to Grassy Narrows, it is highly inappropriate for Ontario to delegate any aspect of consultation to Great Bear

[8] Indigenous Services Canada, Federal Authority Advice Record – Great Bear Gold Project, p. 5.

Resources. Grassy Narrows does not agree that the Crown can delegate its duty to consult with a treaty nation to a third party. Nor does Grassy Narrows agree, given Grassy Narrows' strong rights, existing cumulative impacts, and the companies' intention to open large gold mines upstream from the community, that the duty is at the low end of the spectrum.

The IAAC has failed to consult as required with Grassy Narrows

According to the attached IAAC document summarizing the impact assessment process, the process begins with Phase 0 (Pre-Planning), a phase that requires engagement by both the Proponent and the Agency with Indigenous groups. None of the required pre-planning steps with respect to Grassy Narrows have been complied with.

The Proponent was required to engage Grassy Narrows to present the project, learn Grassy Narrows' views, including potential effects and how we wish to be engaged and to incorporate this information into the Initial Project Description. Grassy Narrows has expressed, both in writing and in meetings on June 22, 2023, and November 10, 2023 with representatives from Kinross, our significant concerns about potential impacts upon our community, which are not reflected in the Initial Project Description. Grassy Narrows also provided Kinross with our communications protocol, which includes communication with the Lands Protection Team. That protocol was not included in the Initial Project Description.

The Agency was aware, based on the Initial Project Description, that Grassy Narrows may be affected by the project. In the pre-planning phase, the Agency was required to inform Grassy Narrows about the impact assessment process to support us in understanding how we can participate. The Agency was obligated to learn Grassy Narrows' views and context, including potential effects and how we wish to be engaged. The Agency did not comply with these requirements of the pre-planning stage.

Crown and Company efforts to engage Grassy Narrows since 2022 have been performative and do not meet the standards required for engagement

The decisions to open our land to mineral staking and exploration, to carry out extensive exploration, and to build a gold mine, have already been made, and billions of dollars spent towards that end, all behind Grassy Narrows' back. In this context, it is hard to believe that requests for belated input at this late stage are sincere. Clearly, the companies and Ontario have already decided to build a gold mine if investors will support it and we are an afterthought.

Kinross is now flooding us with technical documents created by highly paid experts, while knowing that we have no capacity support to engage experts to review the technical documents, nor to engage our community about them. When we sought a pause in the process to gain capacity support, retain experts, complete a process agreement, and engage in our governance process, we are refused. In this context it is hard to believe that anything Grassy Narrows says will be taken seriously and will have

the potential to meaningfully influence the major decisions that have been made.

We live downstream, our established rights and our health are at stake, and we are concerned. Under Crown law the Crown clearly had a duty to meaningfully consult and meaningfully accommodate us at every stage of this project, including during the strategic level upstream decisions (such as land use planning, land use designation, tenure, etc.) as well as the more minor decisions which flow from them (such as specific exploration permits, water takings, leases, etc.). As a First Nation whose Treaty rights and health have already been severely impacted by the cumulative impacts of industry and government decisions our consent is required. Under our inherent rights, Anishaabe law, and International law our consent is also required.

Ontario has failed for many years in their duty to consult on this project and we call for an immediate freeze on all project activities until sufficient capacity support has been provided to allow Grassy Narrows to complete an ethno-historical report, land use and occupancy study, archaeological assessment of the area and study into cumulative impacts, and until we have been meaningfully engaged and our free, prior and informed consent obtained.

V. Adverse Impacts: ANA Preliminary Specific Concerns

As Asubpeeschoseewagong Anishinabek we have a holistic, interconnected, and spiritual relationship to our sacred landscape. We are the land and the land is us. What happens to the land happens to us and to our children for many generations.

This is an area where our ancestors have practiced, and we currently practice our Anishinaabe way of life; a way of life that relies on a healthy environment and is central to our identity, health, wellness, and livelihood. This area is part of the whole that forms the sacred landscape which gives us life and which we are in relationship within every aspect of our lives, hearts, spirits, and dreams.

While some areas may appear to an outside observer to be on the periphery of our Territory, this is a grave misperception. All our territory is core to our way of life and connection to the land. For example, we have always traveled to hunt. A moose that is harvested a few days' travel from our village site will still feed a family for many weeks and be shared with Elders, relatives, and friends. The dramatic decline in the moose population near our village means that the area around Red Lake is even more critical to our moose hunt. These areas are deeply embedded in our memories, our lives, and our hearts. We are strongly tied to this land.

We know that MINES, IAAC and the companies do not respect this relationship and seek to reduce it to a series of finite, bounded sites of 'values'. Our concerns are disregarded unless they are expressed in extremely specific and reductionist terms that ties adverse impacts to particular pieces of the land that are viewed in isolation from the whole. MINES and IAAC want us to engage in an exercise of, for example, identifying a specific hole that is a specific distance from a specific cabin and thus should be moved a bit to the west. Or, this type of machinery produces noise that will make hunting

difficult in this specific blind during this month, so please do not use it in October. Or, this wastewater discharge site is next to that fishing hole, so please put it a bit further downstream.

This approach fails to see the forest for the trees. What use is a remote cabin retreat without the serenity of the surrounding area from which we draw our physical and spiritual sustenance? How can we use it for healing and to teach our children their way of life while over the ridge heavy machinery encroaches ever closer and non-native users buzz around us in ATVs and motorboats? What use is a hunting site if the ancestral moose trails have been destroyed, there is no winter refuge, and unmanaged access routes have allowed non-native hunters to deplete the population precipitously? What use is a fishing spot if the fish has absorbed a dangerous burden of toxins from its food sources everywhere it swims throughout its life, including those carried from upstream? How can we carry out our ceremonies when the spirits who live in the rocks have been disturbed by drilling and blasting. What point is there in commenting on a small drill program in isolation, when everyone knows that your plan is to open a huge open pit and underground gold mine?

In spite of this fundamental difference in world view, the barriers, unresolved fundamental issues, and concerns noted above, we know that MINES, the Companies and IAAC will try to proceed with this project unless we raise specific concerns. In the absence of the necessary supports, Grassy Narrows cannot substantively respond to the technical information provided to date about the Great Bear Gold Project. We provide these preliminary concerns under protest and based upon the limited research we can undertake, which should not be taken as a complete overview of our concerns.

Industrial disturbances will release even more mercury into our ecosystem and further impair our Treaty rights.

The Great Bear Gold Project will require industrial mining exploration, access roads, clearing of trees, modification to water levels and other activity within the English River watershed. The waters from those areas flow into the English River in short order via the Chukuni River. They flow into the areas where we fish, boat, camp, and practice our way of life, and directly past our community.

The scientific literature establishes that industrial activity in the boreal forest releases mercury into local lakes and rivers.

Building machine tracks, trails, and roads is a common part of mining exploration and mine development work. However, simply driving heavy machinery through the boreal forest can contribute to the release of mercury. In one documented instance, a temporary machine track was inadvertently placed across a small, long-term reference catchment. This disturbance increased outputs of MeHg by a factor of over five for more than a decade.[9]

[9] J. Munthe and H. Hultberg (2004), “Mercury and Methylmercury in Runoff from a Forested Catchment -

Clearing the forest has also been found to release mercury into local water bodies where it bioaccumulates in fish to dangerous levels. The foremost study on this subject was completed in Quebec by Dr. Carignan. The study found that 100% of lakes with clearcut watersheds had walleye and pike with mercury levels that exceeded the World Health Organization advisory limit for human consumption. Meanwhile, only 18% of unlogged lakes, and only one burned lake exceeded the limit.[10]

In the only field study on the topic done by Ontario of which we are aware, there was roughly a doubling of mercury exported from a watershed near Thunder Bay via a stream after logging activity. This release of mercury occurred even though all the required regulatory measures, including those with respect to riparian buffers, were followed.

Despite these findings, Ontario does no downstream monitoring of actual industrial operations to monitor or assess mercury impacts.[11]

Both the Carignan and Ontario studies concluded that that the increase in mercury export is largely due to changes in local watershed level hydrology from the loss of tree cover. Mining exploration and mining activity also involve the clearing of trees from the land and risk similar impacts to local hydrology (e.g., Lower evapotranspiration rates, changes to snow and rain interception, etc.) and therefore leads to similar increases in mercury export to local logging.

Mining exploration and mining activities often have the effect of artificially changing water levels. This can happen through water takings, water discharges, dewatering of areas, and other industrial processes. Studies have found that the artificial lowering and raising of water levels in boreal water bodies often causes the release of mercury. Monitoring studies of the De Beers Victor Diamond Mine have found increased levels of mercury in fish in water bodies downstream.

For a more detailed discussion of the science on mercury and boreal forest clearing please refer to our enclosed evidentiary record filed with the Divisional Court in our 2015 Judicial Review Application, and the associated expert reports by Dr. Carignan, Dr. Podur, Dr. Mergler, and Dr. Willow.

Mining exploration and mining activities also risk altering water quality in ways that increase the methylation of existing mercury in downstream watersheds. This can be through the addition of sulfate, change in acidity, water colour, temperature, and other parameters. In Grassy Narrows, where mercury levels are already elevated by emissions from Dryden, any increase in net methylation is intolerable.

Concentrations, Fluxes, and Their Response to Manipulations", Vol. 4 at 607-618.

[10] Globe and Mail (March 12, 2001), "Mercury levels tied to logging practices."

[11] Toronto Star (September 14, 2016), "Ontario environment officials concerned that clear-cut logging releases mercury."

The Crown still has no remediation plan for the mercury that remains in the English-Wabigoon River system from discharges in the 1960s and 1970s. Mercury released into the watershed or methylated as a result of mining activity, especially dissolved mercury, will eventually find its way into the English River and further raise the mercury levels in fish and poison our people, exacerbating and prolonging our mercury crisis.

This is not acceptable. We cannot tolerate any additional mercury.

New releases of mercury or increased methylation will unjustifiably impair Grassy Narrows' treaty rights, health and wellbeing, and are discriminatory. This is an intolerable outcome for our treaty partner to impose on us against our will in the absence of consent.

Adverse impacts on Grassy Narrows' Treaty Land Entitlement Claim.

Grassy Narrows has an active Treaty Land Entitlement Claim (TLE) that has been accepted by the Crown and is under negotiation for resolution. Part of the resolution of the claim will include an addition to Grassy Narrows' reserve lands, and compensation for lost use. Grassy Narrows is currently engaged in a process to select its additional reserve lands. All the area around Grassy Narrows is currently potential reserve lands additions under consideration.

The Crown has asserted that lands which have encumbrances, such as mining claims and leases, will be more challenging to designate as additional reserve lands. This means that your mining claims and leases adversely impact our ability to select reserve land additions and are an impediment to the successful resolution of our TLE.

Further, lands which have been impacted by mining exploration such as cutting lines, pitting, trenching, stripping, and drilling, decline in ecological health, experience a degradation of their intactness, and therefore become less suitable as additional reserve lands.

Lands which are downstream of industrial projects also have their value, and suitability as additional reserve lands degraded. Lands along the shores of the English River and its tributaries have been core to our people for countless generations and are prime candidates for our reserve lands additions. If you were selecting lands for your home, your cottage, or your reserve, would you want a huge industrial gold mine to be opened up stream of them? No one would.

Over the last few decades vast parts of our Territory have been encumbered and degraded through industrial actions imposed on Grassy Narrows and upstream of Grassy Narrows. This has severely restricted the available suitable additional reserve lands.

Grassy Narrows has been clear that there should be no new encumbrances on our area, and no new degradation to our area (including from upstream), as this would unfairly further reduce the available suitable additional reserve lands (in addition to other impacts outlined elsewhere). This would impair the ability to correct the injustice

that was done to us by having been denied a fairly sized reserve for over a century.

On-site Impacts

According to the Ontario Auditor General "Mining activities can have a significant impact on the surrounding environment. They can affect groundwater and surface water, aquatic life, soil, vegetation, wildlife and air quality. The changes mining makes to the environment can have serious implications for public safety and health."[12]

While we are unable to meaningfully review the thousands of pages of technical documents that have been sent to us, it appears that the on-site impacts of the project will be extreme.

Large parts of the site will be deforested for decades at least. Three open pit mines will be created along with three underground mines, large tailings holding areas will be created, and a large ore processing facility will be built.

The project area will effectively be completely removed for the foreseeable future from the land base that is accessible to us to live our way of life and to practice our rights.

It also appears that water bodies including lakes and creeks on the site will be at extremely risk because they will be located immediately adjacent to and downstream / downgradient of heavy industrial operations including mining, ore processing, and tailings storage. We are concerned that the on-site water bodies will be damaged and we know that once they are damaged it can be hundreds, if not thousands of years before they are safe again.

Downstream / wind / migration impacts

We know far too well that industry can have impacts far beyond the industrial site itself. The chlor-alkali plant in Dryden that discharged mercury into the Wabigoon River was 150 km upstream of our village. The distance did not stop the mercury from being carried downstream, bioaccumulating in the fish that we eat, destroying our livelihood, poisoning our people, and dramatically disrupting our way of life. More than 50 years after the discharge of mercury was ordered halted, our mercury crisis rages on.

We fear that the impacts from the Great Bear Gold Project site will extend far beyond the mine site itself, further disrupting the balance of the environment that the Creator has established for us and which gives us what we need for a good life.

Impacts from industrial sites can propagate off site in many far-reaching ways and we cannot list them all here. Pollutants can be carried hundreds of kilometers downstream. Water quality changes that may appear innocuous in themselves, and which are not regulated, can alter the cycling of pollutants, nutrients, and other aquatic processes in damaging ways. For example, dissolved organic carbon (DOC), sulphate, and other

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[12] Auditor General of Ontario (2015), "2015 Annual Report: chapter 3.11: Mines and Minerals Program."

substances are a naturally occurring part of aquatic ecosystems and are not considered toxic. However, they known to play a strong role in mercury cycling affecting mercury speciation, solubility, mobility, and toxicity in the aquatic environment. Alteration of water chemistry can have serious consequences.

The wind can carry pollutants and other chemicals long distances before they are breathed by our people and deposited on the ground and in the water. For example, PCBs generated in the industrial centers can be deposited in the arctic and bioaccumulate to levels that are dangerous for subsistence consumers. Acid rain created by the Sudbury mines killed hundreds of lakes for scores of kilometers downstream and the area has yet to fully recover many decades later. We fear that the operation of the mine, including heavy machinery, blasting, and ore processing, will create airborne pollution and changes that can be carried long distances throughout our Territory and beyond, and will compound the existing impacts of other sources of airborne pollution including the Dryden and Kenora mills, other mines, and municipalities.

Off-site impacts can also happen through animals, fish, and birds and other forms of life that travel. If moose can no long find winter refuge on the project site, or if roads, trails and clearings created associated with the project increase access and success for non-native hunters and predators, then fewer moose will be available to hunt. That impact will not be restricted to the boundary of the project site but will extend as far as a moose would range from the project site, or conversely the area from which moose would range into the project site and face predation, hunting, and lack of suitable habitat.

Other animals like wolverine, wolf, bear and cougar travel even further distances. Impacts to their populations, their travel routes, and their hunting success in turn influence the populations of the moose, caribou, rabbits, and other animals that are important to us.

We know that walleye travel large distances throughout their lifespan, especially when they are spawning. Throughout their travels they breath the water, eat the local food sources, and are exposed to local toxins. Many of these toxins stay in the walleye for a very long time and accumulate throughout their lifespan, which can be decades long. As a result, walleye that are not at the project site, nor even within a downstream area impacted by the project site, may migrate into impacted areas and accumulate toxins which we are exposed to when we eat them. In turn, otters, eagles, pelicans and other beings eat the fish and then travel further distances, carrying the toxins with them.

Landscape impacts (e.g. intact forests)

Beyond the on-site and off-site impacts, the project will have landscape-level impacts. Looking at each site in isolation fails to see that the landscape as a whole and its many processes and functions that sustain life. The many parts of the landscape work together, each playing their part. If one is disturbed, then all are disturbed. If too many are disturbed, then the landscape's ability to sustain our good Anishinaabe way of life can be severely undermined.

For example, intact forest landscapes “are critical for stabilizing terrestrial carbon storage, harboring biodiversity, regulating hydrological regimes, and providing other ecosystem functions.”[13] Many species rely on intact forests. For example, the Government of Canada believes that once a landscape exceeds 35% disturbance it crosses a threshold beyond which the landscape becomes unable to reliably sustain a population of woodland caribou and extirpation becomes likely.

Indeed, this is what we experienced in the southern part our Territory where no single project alone caused the local extinction of caribou, but rather it was a death of a thousand cuts as more and more impacts over time made the landscape unable to sustain caribou. We know that the landscape in the range of the Sydney Caribou herd already exceeds this disturbance threshold and is need of recovery. The Gold Bear Gold project will add further disturbance, making the local extinction of caribou even more likely.

Caribou are a sentinel species whose fate is an indicator of the health of the landscape and a range of species and values that rely on intact forests.

Although they behave very differently, moose also rely on a healthy landscape. When there is too much industry, the dense mature conifer forests that moose require for winter shelter become too small, fragmented, and scattered to support moose. When too may roads are put in, outside hunters gain easier access, and when clearings are made those hunters have higher kill rates. When the forest becomes too disturbed, the deer move in, and with them comes sicknesses that hurt the moose.

Again, no one project alone can be blamed for the loss of our moose. But taken together the many industrial changes to our landscape have led to the near elimination of our once healthy moose population.

In spite of our many requests, Ontario refuses to work with us to plan at a landscape level to ensure that our health and way of life can be maintained and recovered. Instead, Ontario allows more and more disturbances to compound each other, further and further degrading the landscape that we rely on. The Great Bear Gold project will further undermine the forest landscape.

Spiritual Impacts

Spiritual impacts are a sensitive topic because it involves some of our deepest and most personal aspects of our selves. It is also sensitive and difficult to share because, not long ago, our spiritual practices were outlawed and we suffered persecution for them. To this day our spirituality is mis-represented, misunderstood, and disrespected by government and industry. For these reasons, this information is only the tip of the iceberg pointing to the presence of a deep and far larger concern.

Our people believe that may aspects of a human being are important to health,

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[13] Intact Forests, “Intact Forest Landscapes”.

wellness, and the good way of life. A critical aspect is spirituality. The landscape and our way of life are connected and sacred. We have a spiritual relationship of reciprocity with the landscape that requires us to take care of the land so that the land can continue to provide for us. This is a sacred responsibility given to us by the Creator.

Our sacred relationship and responsibility is with the landscape as a whole, and with all of its parts. It is not restricted to a finite set of point values such as ceremony sites, burial sites, and medicine patches. Although those are important, they are focal points in a far broader and all-encompassing spiritual fabric. Our spirituality emanates from, and is infused by the entire landscape. It is practiced throughout the landscape and supported by the entire landscape.

Without the spiritual landscape intact, the spiritual sites are desecrated and cannot function. The medicines do not work if they grow in a clearcut, or if herbicides and pollution have drifted on the wind towards them. How can the ceremony summon a spirit who has fled from the noise of machinery and blasting? How can an offering be made to a spirit-being whose trails and territory have been destroyed? How can the prayer for the success of our hunters be answered when our industrially transformed landscape is nearly empty of moose? How can we fulfill our responsibilities to our clan animals Atik (woodland caribou) and Numeh (sturgeon) when they are extirpated or at risk in much of our Territory? How can we fulfill our duties and ceremonies to the water when it has been polluted, dammed, and an invisible remains within it? How can we identify our grave sites when our people have been laid to rest throughout this land for countless generations?

In addition to our broader sacred relationship with the landscape, there are spirit beings who inhabit the landscape and who have relationships with the Anishinaabe and important roles in the landscape. We have duties to carry out in our relationships with these beings and if we do not fulfill our duties there can be negative repercussions. Some of these important spirit beings live in the rocks. When the are disturbed, hammered, drilled, bulldozed, blasted, or extracted, these spirit beings are impacted, and the spiritual realm is disrupted.

Past government policies and industrial activities have already deeply disrupted our spirituality and the spiritual dimensions of our way of life and wellness. If the Great Bear gold mine, and associated work, goes ahead, then it will have a further intense spiritual impact.

Spiritual impacts lead to bad things for our people. When we cannot fulfill our sacred duties it causes feelings of sadness, anxiety, loss of identity, loss of meaning, depression, and helplessness. When the spiritual realm and relationships are disrupted, it can cause fear, accidents, discord, conflict, bad harvest, unsuccessful hunts, drought, floods, hunger, ill health, and other terrible things.

We understand that the government and industry have a different way of seeing things, and that you see the natural world as separate from you, inanimate, spiritless, and there for the taking. We know that you always tell us that you know best and that the industrial

activities you plan will only cause minor, contained, short term impacts and that we need not worry. And yet, we are suffering from all the terrible consequences that our ancestors warned us would come from your industry and your violation of our spiritual landscape including illness, poverty, hunger, depression, suicide, and conflict.

Our way of understanding the world deserves respect. It is not right for you to force your worldview and all its impacts on us while we suffer the consequences.

Long-term risks – Tailings

We are particularly and deeply concerned by the long-term nature of the changes that you are making to the landscape and the risks that you are creating.

On August 13, 1970, a few months after closing the fisheries due to mercury pollution, the Ontario Minister of the Environment, George Kerr, declared that the Wabigoon River would recover on its own, without a cleanup or intervention. He said it would happen naturally in 12 weeks.[14] More than five decades later, our walleye in the Wabigoon River remain the most mercury contaminated in all of Ontario and it is unsafe to eat even one meal. Recent studies indicate that it will take many hundreds, if not thousands, of years for river sediment to recover on its own. Many sites are not recovering at all, and some are getting worse.

Some of the long-term risks that you are proposing to create include the creation of huge piles of waste rock that contains acid, heavy metals, the creation of new lakes in former open pit mines and tunnelling deep underground. These activities create long-term risks of leaching, groundwater contamination, dam failure, cave ins and falls, among many other things. We know that the impacts of industry can last many generations and for thousands of years.

And yet, our Treaty is only 150 years old. In that time the Crown has shown little ability to plan for the long term in a way that is not disastrous for us. How can we believe that the risks that you are creating will be safely taken care of for longer than Canada has existed as country, for longer than the time that Europeans have been in contact with us? How can we know that Canada, Ontario, Kinross, or Great Bear Resources will even exist in the timeframe that these risks will exist, let alone fulfil your responsibilities to take care of these risks in a way that you never have before?

You say that you will contain, monitor, and prevent these risks from impacting us, our water, and our landscape. But Ontario's own Auditor General has repeatedly found a failure to effectively remediate and monitor mining risks (see the section on failure to regulate below). Senior officials in the provincial government have noted the urgent and dangerous gaps in Ontario's regulatory ability to ensure the safety of tailings dams. You cannot safely carry out these duties now. Who will maintain the tailings dams in 100

[14] The Guardian (October 16, 2018), "The Warrior Society rises: how a mercury spill in Canada inspired a movement."

years? Who will monitor in 200 years?

We, the people living downstream, do not accept these risks.

Impacts to relationship with the Crown

The Great Bear Gold project is a massive one, with great risks to Grassy Narrows and that can have a major impact on many aspects of Grassy Narrows' relationship with the Crown including our Treaty, the honour of the Crown, fiduciary duties, outstanding obligations, unmet duties, and reconciliation.

Yet, the Crown refuses to come to the table with us about the major issues from which all these problems flows. At the same time, Ontario is attempting to delegate nearly all aspects of our relationship with the Crown to a gold mining company that is not party to our Treaty and that is primarily accountable to creating profits for its shareholders. A gold mining company has no ability to address our important issues with the Crown. We do not accept a gold mining company stepping into the shoes of our Treaty partner.

Adding insult to injury, Ontario has informed the company that the duty to consult on this project is at the low end of the spectrum. This is incorrect. For many reasons, even under Crown law, we are at the high end of the spectrum where consent is required. The reasons include but are not limited to the significant potential adverse impacts of the proposed project on our rights and health, the strength of our rights, the cumulative impacts of past industry, the outstanding Crown obligations and unmet duties towards us, the honour of the Crown, and fiduciary duties.

The failures of the Crown have led to a situation where we have been notified of this project only after the land was designated as "general use" and open to mineral exploration, after cumulative impacts of industry had been allowed to severely impact our rights and our health, after mining claims to the land were registered, after five years of exploration work had taken place, after over a billion dollars had been spent to purchase the property, and after the company had decided to open up a huge gold mine here.

The Great Bear Gold project is a runaway train, and we have no meaningful opportunity to shape decisions that will forever impact our people and our land. These decisions include: determining what parts of the landscape should be protected and what should be exploited; the threshold for industrial impacts that can occur before our rights are infringed and our health is harmed; the process for making decisions among Treaty partners; the role of third parties seeking to profit in the Treaty relationship; how to repair harms created in the past but impacting the present; how to prevent future harms; how to reconcile the relationship between the Crown and Grassy Narrows.

The Crown acts as though Grassy Narrows has no say in these decisions. The Crown seems to think that we should accept that a massive gold mine is a foregone conclusion and we should only have a say in things like where the effluent pipe discharges, where the tailings piles are located, and where the processing plant should be sited. We disagree.

This project, the failure of the relationship with the Crown which has allowed the project to become so advanced without our involvement and consent, is having, and threatens to have further major impacts to our relationship with the Crown. Rather than taking a minimal and reductionist view of the minimum that the Crown can do in this situation, a robust understanding of the duties is required, as well as an appreciation for the unique circumstances and history of Grassy Narrows. Only involvement of senior representatives of the Crown can resolve this problem.

Federally Regulated Impacts

Federal involvement is required because of the numerous areas of claimed federal jurisdiction that will be affected by the Great Bear Gold project, including the completion of a Federal Impact Assessment.

Some, but not all, of these areas of claimed federal authority are listed here:

Species at Risk: The Federal Crown claims authority within the Constitutional division of powers over Species at Risk. Although we have not been able to carry out a thorough assessment due to the lack of capacity supports, the project site has a strong potential to impact the following species at risk:

- Woodland Caribou – the project site is within the range of the Sydney Caribou Herd. The range of the Sydney Caribou Herd is currently approximately 64% disturbed (likely higher due to recent fires in Woodland Caribou Provincial Park). This amount of disturbance exceeds the threshold above which the range becomes unlikely to be able to support a viable caribou population. The range is in need of recovery to lower the level of disturbance and therefore the entire range is considered critical habitat. The project will add disturbance, further degrading the ability of the range to sustain caribou and increasing the likelihood that Woodland Caribou, a threatened species, will be extirpated from this area. Caribou is an important clan animal for Grassy Narrows.

  It should be noted that while Ontario does have a *Species at Risk Act*, it has exempted mining and logging from the applicability of that Act. The provincial government cannot be counted on to ensure that the Great Bear Gold project proceeds in a manner that protects species at risk.

- Wolverine – Wolverine play an important and unique role in our ecosystem and in the balance of life. The company has indicated that wolverine have been observed on the project site using trail cameras. Direct observation of wolverines is a rare. Wolverine avoid humans and human impacted areas. The project is almost certain to permanently displace the wolverine that have been observed at the site and to destroy any wolverine dens, trails, habitat, and food sources that are on the site.

  The Committee on the Status of Endangered Wildlife in Canada (“COSEWIC”) reports that wolverines prefer ecologically intact areas and avoid disturbance.

According to COSEWIC "[a] study of the cumulative effects of developments on Arctic wildlife (Johnson et al. 2005) found that mines and other major developments had the largest negative effect on species occurrence, followed by exploration activities, and outfitter camps."[15]

Due to past degradation of southern habitats, wolverine left Grassy Narrows' area. However, our success in stopping logging has resulted in the beginning of a return of wolverine. Grassy Narrows is now near the southern edge of the currently occupied range of wolverine. If the project goes ahead, wolverine will leave our area and may not come back, further disrupting the balance of the landscape.

- Sturgeon – Sturgeon are an important clan animal in Grassy Narrows an important food source for the Anishinaabe of the Treaty 3 area. The damming of the English River has had a big impact on sturgeon. A small and delicate population remains in the river, which we are trying to protect and recover. Sturgeon live for many years, are sensitive to industrial disturbances, and can accumulate large amounts of toxins in their bodies.

There are many other species at risk that may be affected by the Great Bear Gold project, including bats, birds, turtles, Eastern Cougar, American Badger, and others. Each have a role to play in the web of life.

Fisheries: The Federal Government claims jurisdiction over inland fisheries, the prevention of harm to fish from pollution, and the protection of their habitat.

While the Federal Government has cooperative agreements with Ontario for licensing of fisheries the Federal Government maintains jurisdiction and responsibility for prevention of harm and protection of fish habitat.

Under Crown law, even the construction of a small water crossing can trigger the need to apply to the Department of Fisheries and Oceans for permits. In contrast, Ontario does not require a provincial impact assessment before a mine is opened.

We are a river people and fish have always played an extremely important role in our way of life, our sustenance, and our livelihood.

The companies propose to take water from our river system, use it in the industrial gold extraction process, and then return it to our river. The companies propose to create three open pit mines, three underground mines, store large amounts of waste rock and operate an industrial ore processing facility, all in close proximity to water bodies and streams that flow into our river system. Finally, the companies propose to create three new lakes in the empty open pits created by gold mine, and to allow water to flow out of those pits and into other local water bodies. All these activities, and others, put our fish

[15] Government of Canada, "Wolverine (Gulo gulo): COSEWIC assessment and status report 2014" (date modified: January 6, 2015).

at risk.

The Crown has failed to protect our fish for many decades from the impacts of mercury and this has had grave consequences for the rights, health and wellbeing of our people. Given the Crown's failure, and its ongoing impacts, all levels of the Crown should be diligent and alert in carrying out their duty to protect our fish from further harm.

Indigenous Peoples: The Federal Government claims jurisdiction over Indigenous Peoples and the lands reserved for them. This jurisdiction includes claimed authority over our health, culture, and wellbeing, responsibility for environmental contaminants and their impacts on Indigenous traditional foods and on the health of Indigenous Peoples.

The Great Bear Gold project has potential to impact Grassy Narrows' relationship with the Crown, the safety of our traditional foods, and our health, culture, and wellbeing. The project also has the potential to impact waters that flow into and through our reserve and which can impact our reserve.

Due to the Crown's longstanding and ongoing failures to meet its duties to Grassy Narrows, all levels of the Crown should be diligent and alert in carrying out their duty to protect us, our health, our traditional foods, and our further harm.

There are further areas of Federal claimed authority that likely apply here as well and that are at risk in this project, including but not limited to migratory birds, transboundary waters, transboundary air pollutants, international laws and instruments.

Due to the many important areas of claimed Federal authority that are at serious risk in this project, it is essential that a robust and comprehensive Federal Impact Assessment is carried out.

Grassy Narrows seeks to engage with the Federal Government and our consent is required to the form that the Impact Assessment will take.

Site-specific parameters and guidance levels needed

In its Initial Project Description, Kinross states that water, effluent, tailings leachate, and other substances will be tested and will be released back into the environment after they meet guideline levels. However, the Initial Project Description does not identify the guideline levels that will be used. Guideline levels are a very important and complex topic that must be explored in far more detail. Our discussion here is intended to illuminate that there is a serious problem.

Although there are many substances of concern here, we are most familiar with mercury and so we will use it as an example.

There are many guidelines that we have seen applied upstream of our community for allowable mercury levels. Some of these guidelines are wildly inappropriate, but all of them are insufficient.

According to the Government of Canada "(m)ercury is a toxic element and serves no beneficial physiological function in man; a maximum acceptable concentration of 0.001 mg/L (1 µ g/L) in drinking water has therefore been established."[16]

A concentration of 0.001 mg/L corresponds to **1000 ng/L** (nanograms per liter), which is the unit we will use here.

One might think that if the mercury level is good for drinking, then it would be fine to put in our river, but that is not the case. Provincial Water Quality Objectives ("PWQO") are numerical and narrative criteria that serve as chemical and physical indicators representing a satisfactory level for surface waters (i.e. lakes and rivers) and, where it discharges to the surface, the ground water of the Province.

The PWQO guideline level for mercury in surface water is **200 ng/L.**

The PWQO guideline has historically been applied to mercury contaminated groundwater seeping out of the banks of the Wabigoon River next to the Dryden mill to claim that it is safe. However, this too, is irresponsible.

The Canadian Council for Ministers of the Environment (CCME) provides guidelines for mercury levels in freshwater bodies that attempt to account for the risk to fish and wildlife through exposure to mercury.

The CCME guideline level for mercury in surface water is **26 ng/L.**

One might think that if this level of mercury in water is safe for the fish and wildlife, it must be safe to put water with that level of mercury into Grassy Narrows' river. However, the CCME guideline does not consider bioconcentration of mercury as it moves up through the food chain.

As the Government of Canada explains "[t[he presence of mercury in water has become a source of concern because of the finding that organic mercury is bioconcentrated by fish. Elevated mercury levels have been found in all freshwater fish taken from areas with suspected mercury contamination and frequently render the fish unacceptable for human consumption."[17]

The mercury levels that are found in predatory fish like the walleye, can commonly be a million times the level that is found in the water that they swim in.

Recent monitoring studies of the Wabigoon River upstream from the Dryden mill show that **baseline level of mercury in the Wabigoon River is around 1 ng/L.** Even at those baseline levels of mercury in water, large adult walleye in Wabigoon Lake often exceed 0.5 ppm mercury, the level above which the commercial sale of fish for human

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[16] Health Canada (1986), "Healthy Living: Water and Mercury."
[17] Health Canada (1986), "Healthy Living: Water and Mercury."

consumption is banned.

If the level of mercury in the River is raised to **2 ng/L**, then mercury levels in adult walleye will approximately double, making them far more dangerous to eat. If other chemicals that stimulate net methylation in the environment are added as well, then the effect will be even more grave.

That means that river water with 2 ng/L of mercury will have serious impacts on the health of Grassy Narrows people's ability to safely practice their right to fish, even though this level is less than 10% of the level allowed by the CCME guideline, the most restrictive of the guidelines we are aware of.

A similarly broad range of guidelines exist and are applied for mercury levels in fish safe for human consumption.

The Ontario Ministry of the Environment "Guide to Sportfish Consumption" allows for some consumption of fish by the non-sensitive population (adult men and women who are not of child bearing age) if the fish have mercury levels below **1.8 ppm.**

On the other hand, the sale of fish for human consumption in Canada is banned if the fish have mercury levels over **0.5 ppm**. Grassy Narrows fishermen have been charged for selling their catch based on this rule.

In the 1980s, Canada established **0.2 ppm** as the guideline limit for safe consumption of fish by Grassy Narrows and other Indigenous subsistence eaters of fish.

The US Environmental Protection Agency ("EPA") lists **0.1 ppm** as their guideline level for Indigenous subsistence eaters of fish.

Renowned mercury expert Dr. Mergler has written in expert reports (some of which are enclosed), all of which have been provided to Ontario, that among these guidelines the US EPA level is most relevant to Grassy Narrows. However, she notes that all these guidelines are based on safe levels for a lifetime of exposure in a regular population. Mercury impacts are cumulative throughout the lifespan. None of these guidelines take into account the high, and far above guideline, levels of exposure that many Grassy Narrows people have already been exposed to. She writes that Grassy Narrows people have generally already been exposed to too much mercury and cannot safely be exposed to any additional mercury.

Clearly, off-the-shelf guidelines are not sufficient. It is necessary to develop and apply in close collaboration with Grassy Narrows locally specific guidelines that take into account the local background levels, ecology, food chain, cultural practices, and cumulative impacts from other industry, and history of exposure.

Other specific concerns

Given the constraints that we have noted, it is not possible to provide a comprehensive list of concerns here. However, some further concerns that we have identified to date,

which will require future elaboration, include:

- The contamination of the water within our Territory and water that flows into our Territory from effluents, discharges, by-products, leaching (including of metals), and changes in mercury cycling
- The creation of acid rock drainage and other forms of toxic drainage
- Changes to the flow, level, and quality of our water from water takings and discharges.
- The contamination of our air and air that flows into our Territory
- The loss of our caribou and moose, and of those who travel into and out of our Territory through impacts including habitat degradation and outside hunting pressure
- Disrupting the delicate balance of animals, predators, prey, and the web of life that supports us.
- The contamination and loss of our fish for food, commercial fishing, sport fishing, and way of life, including fish that migrate in and out of our Territory
- The loss and contamination of our birds and insects including migratory birds
- The loss of our valuable fur bearing animals including marten and otter
- The fragmentation and degradation of our forests and the loss of intact forest landscapes and old growth forest areas
- The changing of mercury exports and mercury cycling, including methylation
- The creation of additional anxiety, fear, depression, disempowerment, and despair among our people
- The further disruption of our society, our culture, and our way of life.
- The exacerbation of our suicide crisis
- The desecration of our sacred landscape
- The disturbing of spirits and beings that live in the rocks
- The tainting of our medicines
- The disruption of our people who are out on the land living their way of life
- The loss of peace and quiet for our people who are out on the land

- The loss of the ability to use the land as a healing place for our people
- The loss of our ability to teach our kids our way of life, identity, knowledge, and ways of wellness
- Impacts to our individual and collective health and wellbeing
- The loss of our ability to make a living in a way that is harmonious with our culture
- The violation of our Indigenous laws and jurisdiction
- The violation of our Treaty rights, our Treaty relationship
- The violation of the honour of the Crown and Fiduciary duties.

Other harmful impacts of industry on ANA people and Territory include, but are not limited to, the following:

- Impacts to game animal populations and their habitat including moose, and caribou which are central to our hunt and an important part of our way of life, our sustenance, our livelihood, and the exercise of our Treaty rights;
- Impacts to fur bearing animal populations and their habitat including pine marten which are central to our trapping and an important part of our way of life, our sustenance, our livelihood, and the exercise of our Treaty rights;
- Changes in forest composition including a shift from extensive coniferous dominated stands to fragmented deciduous dominated stands;
- Failure to regenerate forests or failure to regenerate to their previous composition;
- Loss of productive land base through tertiary roads, machine trails, landings, mines, tailings, buildings, erosion, etc.;
- Loss of species and genetic diversity;
- Loss of shrubs, including berries and medicines including through the use of herbicides;
- Tainting of our medicines and rendering areas unfit for sacred medicine harvesting and ceremony;
- degradation of forest soils, including compaction, rutting, scarification, and erosion;

- Disruption of nutrient cycles including the depletion of calcium in our watersheds, leading to calcium deficiency in aquatic biota;

- Increased competition with non-Indigenous hunters and fishers using forest access roads and associated depletion of animal and fish populations;

- Increased road traffic and danger of collision of people and wildlife with forest industry vehicles;

- Loss of traditional travel routes, sacred places, heritage, and archaeological sites;

- Negative impacts on water quality, fish habitat, fish populations, and fish contaminants;

- Risk of increased violence against ANA people, including gender-based violence, from an influx in workers coming into the Territory to log, and the potential establishment of man camps;

- Lack of recognition of cultural Anishinaabe way of being;

- Violation of our inherent, Treaty, and Aboriginal rights; and

- Violation of ANA Law and the will of our people.

Failure to Effectively Regulate and Remediate

According to the Government of Ontario, there "are over 5,700 abandoned mine sites in Ontario that have over 17,000 mine features, known as hazards… Deaths due to mine hazards in Ontario are rare, but deaths happen in North America every year."[18]

As of 2015, only four mines were listed as fully closed out. Only three are identified as undergoing remediation. On the other hand, there were 56 abandoned mines with 629 contaminated sites meeting provincial criteria for liability recognition. A further 306 abandoned mines had over 3,000 contaminated sites that do not meet the criteria for liability recognition.[19]

There are already many abandoned mine sites in our Interim Area of Interest for Mining, mostly in the Red Lake Area, many of which have been left in an unremediated state for decades. A number are classified as dangerous by the Ministry.

According to the Ontario Auditor 2015 report, the Ministry of Mines has not estimated

[18] Ontario, "Abandoned mines hazards" (last updated February 17, 2023).
[19] Auditor General of Ontario (2015), "2015 Annual Report: chapter 3.11: Mines and Minerals Program."

the total cost of rehabilitating the 4,400 abandoned mine sites in Ontario since 1993 and therefore does not know the current cost for doing so. It also does not have a long-term plan for rehabilitating these sites. These sites may pose risks to public health and safety and the environment.[20]

The Auditor General found that the "Ministry conducts minimal inspection and follow-ups on abandoned mines."[21] In the five years before the audit "the Ministry has inspected only about 6% (248) of abandoned mines to ensure that they do not pose a risk to public health and the environment."[22]

The Crown often assures us that despite the legacy of past bad practices, mining regulation is done safely now. To the contrary, the Auditor General found many glaring flaws in Ontario's regulatory regime for current mining, including that "Ontario is the only province in Canada that does not require a provincial environmental assessment to be performed for mining projects."[23] The Auditor General's report further explained that "in Ontario, the *Mining Act* only requires mining companies to submit closure plans prior to the development of the mine… In other provinces in Canada, larger mining projects automatically trigger a provincial environmental assessment."[24]

The Auditor General found that the closure plan process lacks sufficient funding, is subject to pro-industry bias, plans are not updated, and inspections are insufficient to ensure safety.

As of 2022, the government had not inspected nearly half of Ontario's operational mines since 2011.[25] The news media has also reported that Ontario senior officials are highly concerned that following several recent tailings dam failures "there is little to no legislative authority to prevent similar situations from occurring in Ontario."[26] According to the media the regulatory gap is outlined in a section of a briefing binder for Minister Pirie dedicated to "critical decisions. Senior bureaucrats, who told Minister Pirie that the gap in offline tailings dam rules was a "high-risk gap in the regulatory framework that requires urgent attention."

Far from improving the overall mining regulatory situation, the Government of Ontario has recently watered down its regulations with respect to requirements for closure planning and closure funding through the *Build More Mines Act*. The Act gives the Minister extremely broad discretion over nearly all aspects of mining including closure planning and funding. Under the new rules the position of Director of Mine Rehabilitation

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[20] Auditor General of Ontario (2015), "2015 Annual Report: chapter 3.11: Mines and Minerals Program" at p. 444.
[21] Auditor General of Ontario (2015), "2015 Annual Report: chapter 3.11: Mines and Minerals Program."
[22] Auditor General of Ontario (2015), "2015 Annual Report: chapter 3.11: Mines and Minerals Program."
[23] Auditor General of Ontario (2015), "2015 Annual Report: chapter 3.11: Mines and Minerals Program."
[24] Auditor General of Ontario (2015), "2015 Annual Report: chapter 3.11: Mines and Minerals Program."
[25] The Narwhal (June 24, 2023), "Ontario minister was privately urged to fix 'high-risk gap' to avoid mining disaster."
[26] The Narwhal (June 24, 2023), "Ontario minister was privately urged to fix 'high-risk gap' to avoid mining disaster."

was removed, Ministry staff no longer review closure plans and instead industry staff may carry out the review, contrary to the Auditor's 2015 recommendations.

Given this context, Grassy Narrows does not trust that the appropriate regulations are in place to ensure mining sites will be kept safe for many generations to come. You have not earned our trust.

Lack of Protected Areas, Need for Regional Balance.

There is an imbalance in the region because nearly all forests south of Red Lake are open to industrial mining. For example, much of our Territory is in ecodistrict 4S-2 where only 4.1% of the ecodistrict is protected. Part of our Territory is in ecodistrict 4S-3 where only 3.3% of the ecodistrict is protected. The lack of protection for our landscape is the clear outcome of an unbalanced landuse designation process that did not involve us meaningfully and ignored our rights and interests.

In contrast, conservation biology generally dictates that at least half of an ecosystem must be protected to avoid loss of biodiversity and ecosystem functions. Ontario has committed to community-based land use planning in the Far North based on a joint planning process between the First Nations and the province.[27] It committed to protecting 50% of the landbase in partnership with First Nations following First Nations-led landuse planning.

Canada has committed to protecting 30% of the land in Canada by 2030 in partnership with First Nations. Respecting ANA's efforts to protect our environment will contribute to the maintenance and recovery of biodiversity and ecosystem functions and will support a balance in this region, where the vast majority of forests have been open to industrial logging and mining.

Nature Based Climate Change Solutions

Climate change and biodiversity loss are major threats to Grassy Narrows and to the world. Nature based solutions have been identified as an important part of preventing and mitigating both problems. The boreal forest is one of the world's largest storehouses of carbon. After logging or clearing of the land for mining, much of this carbon is released from the forest, plants and soils, contributing to climate change. On the other hand, protecting forests helps to keep the carbon safely stored and safeguards biodiversity. These are important ecosystem-based services that contribute to mitigating climate change and that have a significant value.

Fighting climate change and biodiversity loss are important priorities for Grassy Narrows and for Canada and respecting Grassy Narrows' land protection will contribute to progress on these priorities.

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[27] *Far North Act, 2010*, SO 2010, c 18.

VI. Mining activity without Grassy Narrows' consent risks conflict

Barrick writes that "[a]ny perceived or actual breach of … trust or respect can have devastating consequences for a mining venture or company, and these commercial and reputational consequences can extend well beyond any particular project or First Nation group." In so writing, Barrick raises the spectre of conflict minerals, also commonly knowns as blood minerals.

Global concerns about unethical practices by mining companies, including Canadian gold mining companies, have led to increased scrutiny of the social, environmental, and ethical practices of mining companies. For the mining industry, the problem with conflict minerals is that no one wants them. Conflict minerals are hard to market, and they increase corporate risks and uncertainties associated with investment, timelines, regulatory approvals, litigation, social conflict, and brand damage.

As a consequence, Ontario and Canada have sought to market themselves as stable, safe, ethical, jurisdictions from which to source conflict-free, or ethical minerals. While there are cheaper jurisdictions in which to operate, the conflict-free reputation of Ontario and Canadian minerals is a significant competitive advantage relative to many of other global mining jurisdictions.

However, as Barrick noted, for the mining industry and a mining jurisdiction, trust is hard to gain and easy to lose. It only takes one high profile conflict to taint an entire company, a sector and an entire jurisdiction and to undermine decades of marketing.

Ontario learned this lesson in the analogous conflict with Grassy Narrows over unwanted logging. After decades of unliterally forcing clearcuts on Grassy Narrows against their will, the First Nation turned to protests, boycotts, media campaigns, public education, litigation, and grassroots blockades. Within six years, major sourcing contracts were being threatened and shortly afterwards Abitibi, the world's largest newsprint producer, withdrew from Grassy Narrows Territory.

The City of Kenora, in their 2009 report to the Ontario Good Roads Association / Rural Ontario Municipalities Association, wrote that "[t]he issue with Grassy Narrows on the Whiskey Jack Forest must be resolved... Without resolution of these issues, **the wood coming off the Whiskey Jack Forest cannot be sold**. **There is no current customer willing to accept wood products from a forest unit which is involved in a perceived controversy."** (emphasis added)

This dynamic is beginning now with respect to mining. A long and growing list of mining companies, including Barrick, Trillium, Bounty, and Kenorland have voluntarily committed not to explore without consent or have left the area. Their withdrawal reflects an enduring reality in the mining industry where compliance with international law, third party certification standards, customer, investor, and shareholder expectations, and social license preclude the use of conflict minerals.

The Crown would be wise to avoid instigating conflict with Grassy Narrows again by approving unwanted mining. Controversy with Grassy Narrows about one mine could

taint the reputation of Ontario as a conflict-free place to mine. It could give the entire regional industry a stain that heightens risk and uncertainty and discourages investment throughout the supply and production chain.

The entire region and industry benefit from an environment free of conflict. It is in the interest of Ontario and industry to resolve, not inflame, the conflict with Grassy Narrows.

VII. Gold does not justify the impact to Grassy Narrows

Gold does not serve an essential and irreplaceable function in society. The largest use of gold by far is for jewelry, followed by investment and central banks demand. Technology, a distance fourth, used only six percent of gold production in 2022 (309t out of 4,721t produced globally). Much of that technology is electronics with short life spans and abysmal recycling rates.

Because gold is not essential, but is valuable, the rationale for mining gold by Great Bear and Kinross is purely financial. Shareholders demand a return on their investment, but Ontario need not repeat the mistake of sacrificing Grassy Narrows' rights and wellbeing for the interests of corporate shareholders.

The flow of resource wealth has been used to justify the damming of our river, dumping of mercury, logging of our trees, and now proposed gold mining. The impacts we have suffered from this approach are extreme and ongoing. The mine is projected to operate for a mere 25 years, but we will be here for many generations. No longer can the Crown and third-party companies seek to sacrifice our health, way of life, livelihood, rights, and environment for short term shareholder gains. Enough is enough.

It is important to remember that it is tourism, recreation and services – not resource extraction – that now forms the backbone of Kenora's employment. This shift is not due to a lack of available wood or minerals, but rather reflects increasing mechanization and marginal profitability in the extractive sector in contrast to the growing demand and labour intensiveness of the non-extractive sector. Grassy Narrows' work to protect our landscape and our environment have helped to foster Kenora's greatest economic strength.

The Kenora and Red Lake area enjoy substantial benefits for tourism, wildlife, hunters, fishers, trappers, recreational users, and non-extractive industries. According to the municipal website "[t]he City of Kenora has transitioned from a pulp and paper mill town to a destination and lifestyle community."[28]

The tourism and services industries are Kenora's largest employers by far. The visitor and cottager sectors contribute $300 million annually to the Kenora economy. In contrast, it is estimated that the Weyerhaeuser mill contributes $60 million to the local economy, even when counting indirect economic benefits throughout the region.

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[28] City of Kenora, "Key Industries" (accessed January 23, 2021)

Kenora's tourism labour force makes up 38% (3,314 jobs) of Kenora's total employment, while Tourism related occupations account for 51.5% (4,405 jobs) of Kenora's total employment.[29] The growth of this industry is key to Kenora's economic plans.

According to the current Whiskey Jack Forest Management Plan ("FMP"), "[t]here are numerous tourist operators in the Whiskey Jack Forest. The recreational activities provided by these outfitters include options for fishing, hunting, camping and other eco-tourism opportunities. The number of individuals, residents and non-residents, procuring services from these tourist establishments are numerous, and they contribute a significant amount of economic resources to local communities ... The Sunset Country Economic Study reports that in 2001, 443 operators provided employment to 3,785 persons of which 1,221 were located in the Whiskey Jack Forest".[30]

In contrast, the Evolution gold mine in Red Lake employs 740 people, only a sixth of the number employed in tourism related jobs in Kenora and is chronically at risk of shutting down if profitability cannot be increased for its Australian owner.[31]

As set out in the Lake of the Woods Tourism Sector Report, "[o]ngoing investments in tourist services and resources only compliment the pristine natural environment that has attracted visitors to Lake of the Woods for over a century."[32]

The current FMP notes that "public and municipal officials should be aware that provincial parks help to make their communities attractive for business as well as for tourists and retirees. The retirement community brings in pension income, which is often indexed to inflation and is "recession proof'.[33]

Respecting and supporting Grassy Narrows' efforts to protect the landscape would contribute to the region's tourism economy and maintain opportunities to grow that economy as well as to become a leader in the conservation economy through future protected areas and associated eco-tourism attractions. A conservation economy creates long-term sustainable employment potential for local and regional residents by maximizing existing skills and knowledge.

VIII. A Choice, an Opportunity

Our youth are crying out. They want to see the land protected so that we can use it to heal our people and our spirits. This is reconciliation for us. They deserve to see the light at the end of the tunnel. We do not want to have to fight, again and again, to protect out land.

However, the community of Grassy Narrows is strong. We know our history, our rights,

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[29] LOTW Tourism Sector Report (2017), pp. 37, 38.
[30] Whiskey Jack Forest FMP 2012-2022, p 95.
[31] CKDR 927 FM Dryden (June 19, 2020), "114 Layoffs at Red Lake Evolution Mine."
[32] LOTW Tourism Sector Report, 2017.
[33] Whiskey Jack Forest FMP 2012-2022, p 98.

our language, our teachings, and our way of life. We have allies across the country and across the world. The days of forcing harm on us against our will are over.

Respecting Grassy Narrows' land protection is the best available way to minimize conflict and move towards a path of reconciliation and respect for our inherent, Aboriginal and Treaty rights in compliance with international Indigenous rights standards.

Grassy Narrows has borne the brunt of the impacts of industry in the region, while our voice has long been ignored by Crown and industry decision makers. Part of the outcome of this mistreatment has been conflict over logging and one of Canada's most infamous environmental poisoning sagas. As a consequence, the region, and the country, has a stain on its honour, its reputation and credibility.

Times have changed. It is no longer acceptable, nor viable for the Crown to approve extractive industrial activities without Indigenous parties' consent. Across Canada there is a commitment and an expectation for reconciliation. We have an opportunity now to learn from the mistakes of the past and to heed the voice of Grassy Narrows. In the process, we can move from conflict to cooperation, from destruction to restoration, from harm to hope. Grassy Narrows invites the Crown to join us in righting this historical wrong. Respecting Grassy Narrows' land protection would be an important show of good faith that would be a positive step on the path towards reconciliation.

The Crown is at a crossroads.

On the one hand, the companies are proposing to open a large and toxic gold mine upstream from us against our will. If implemented, the mine risks irreparable harm to Grassy Narrows' rights and interests including, but not limited to, harms caused by cumulative effects, neglected obligations, Treaty infringement, harm to our health, release of mercury, and loss of way of life and livelihood. This harm would be immoral, unjustified, unreasonable, dishonourable, and a breach of Ontario's fiduciary duties to Grassy Narrows.

On the other hand, respecting Grassy Narrows land protection would have a beneficial impact on the exercise of Treaty rights and on the environment, cause no harm to anyone's health, and be beneficial for the growing non-extractive economy. There is an opportunity for calm that will allow ANA and the Crown to focus on long-term resolution of our issues and that will help ANA return to the health, self-determination, and prosperity that we once enjoyed.

We are inviting you to walk with us on the path of protection, healing and reconciliation. Will you work with us, or against us?

APPENDIX A

INTERIM Issues for Negotiation/Engagement/Consultation with MINES

August 18, 2023

1. Recognition and respect for ANA inherent, aboriginal and Treaty rights
2. Recognition and respect for the ANA Land Declaration
3. Recognition and respect for the ANA IPCA
4. Harmonization of Crown Law and ANA Law with respect to mining related activities
5. Repairing the Crown – ANA relationship with respect to mining related activities
6. Outstanding Ontario obligations to ANA including those arising out of the 1978 MOU and subsequent commitments such as increased ANA control and ownership over its land base
7. Land-use redesignation of the ANA IPCA
8. Interim measures including the withdrawal of the ANA IPCA from staking
9. Suspension of all mining exploration activities on the ANA IPCA and vicinity
10. Resolution of existing third-party mining interests on the ANA IPCA created by the Crown
11. Issuing a Notice of Caution for mining related activities on lands where ANA rights and interests could be impacted
12. MINES Minister's unfulfilled commitment of November 2021 to visit Grassy Narrows to discuss mining issues in an open forum.
13. Cumulative impacts of past mining related activities on ANA
14. Cumulative impacts of mining activities and other industrial and crown policy impacts on ANA including mercury
15. Resolution of issues arising from past mining related activities which have occurred without ANA consent (restoration, compensation, apology, etc.)
16. Ending Free Entry mining exploration and resolving the issues it has created
17. ANA concerns re off-site impacts and risks of existing mining activity (e.g. at Red Lake and Goliath mines, Red Lake and Separation Rapids exploration) on ANA
18. ANA concerns and MINES failure to take into account risk of off-site impacts of proposed mining exploration and other mining related activity on ANA (including downstream, migratory, downwind, landscape level, and other impacts)
19. Addressing ANA concerns re: Changes to the Mining Act
20. Addressing ANA concerns re: Regulation and enforcement of tailings management
21. Impacts of mining related activity on mercury mobilization and cycling
22. Impacts of mining related activity on Intact Forest Landscapes and associated values and ecosystem functions
23. Impacts of mining related activity on source water protection and source water planning and management
24. Impacts of mining related activity on moose, caribou, marten, fish, and other wildlife
25. Impacts of mining related activity on ANA sacred landscape, spirituality, ceremonies, medicines

26. Impacts of mining related activity on ANA land based healing
27. Impacts of mining related activity on ANA travel routes, camp sites, occupancy sites, burials, etc.
28. Impacts of mining related activity on ANA archaeological and historical values
29. Impacts of mining related activity on ANA safety, and risk of racial and gender based violence including man camps.
30. Unanswered correspondence from ANA to MINES and Ontario
31. Barriers to meaningful ANA engagement including the ongoing Mercury Crisis, housing crisis, water crisis suicide crisis
32. Reimbursement of past ANA expenses for unfunded engagement with the Crown and mining companies.
33. Capacity support required by ANA to begin meaningful engagement
34. ANA Consultation Area with respect to mining
35. Proposed and existing mining exploration and other mining related permits

Asubpeeschoseewagong
Netum Anishinabek
GRASSY NARROWS, ONTARIO P0X 1B0 • PHONE: (807) 925-2201 • FAX: (807) 925-2649

March 26, 2024

Attention: Trina Rawn (Director, Mineral Development Branch)
Ministry of Mines
933 Ramsey Lake Road, B6
Sudbury, Ontario P3E 6B5

Dear Trina Rawn:

RE: Great Bear Gold Project – Advanced Exploration Permits

Further to our meeting on March 19, 2024, we understand that MINES is considering a suite of permits for extensive activities at the Great Bear Gold Project site within our Interim Core Area of Interest for Mining.

We have informed you many times about the unique circumstances and extreme barriers that Grassy Narrows faces that prevent meaningful engagement until these barriers have been addressed. In the interim, we fear that you will move ahead without us, so we share this preliminary information.

The activities that are being proposed as advanced exploration for the Great Bear Gold project appear to be extensive and likely to have very serious impacts on our rights and interests both on and off the project site. While the activities have been called “advanced exploration” by MINES, what is in fact proposed is better described as a proposal to open a small to medium sized mine. Large amounts of overburden, waste rock, and ore would be removed. Waste rock would be stored on site long term. These activities are likely to have significant and adverse impacts to water, including the risk of mercury methylation as substances such as sulfate interact with the mercury already in the river system.

Based on our preliminary review of the advanced exploration application materials, it appears that there are significant gaps in information and unanswered questions concerning the types and levels of substances that will be released into the environment as a result of the bulk sampling process as well as the impact that these substances will have on fish, wildlife and the Grassy Narrows community downstream. ANA requires expert advice to fully assess the permit materials.

However, it is apparent that ANA's meaningful consultation and free, prior, and informed consent is required.

ANA requires substantially more time, and capacity support, to be able to meaningfully review and respond to these proposals. We caution you not to interpret our inability to respond in detail to the proposals yet as a lack of concern. We urge you not to make a decision about these proposals before we have completed our review and been meaningfully consulted and our free, prior, and informed consent has been obtained.

The process with respect to these proposals to date has been fatally flawed, including as a result of MINES' erroneous assessment of the strength of the duty to consult with Grassy Narrows about these permits as 'low'; the delegation of most consultation activities to Kinross, and approval of Kinross' consultation plan designed on the basis of a 'low' strength of duty to consult.

At our meeting with MINES officials on March 20, 2024, we learned the following information:

1. When making the 'low' scoping determination, MINES did not seek any information nor input from Grassy Narrows about the nature of our rights and uses in this area.
2. Prior to Grassy Narrows' recent Judicial Review application about 9 mining exploration permits, MINES had never asked Grassy Narrows what our "area of interest" with respect to mining is, nor what the extent of our Territory, the area we practice our rights on, or what our "consultation area" for mining is.
3. When making the 'low' strength determination MINES erroneously believed that that Grassy Narrows people do not use the project area and vicinity for the practice of our rights. This was based on the reasons provided in your recent correspondence, including that Grassy Narrows had not objected to earlier exploration activity on the site in a context in which MINES failed to provide notice or seek to consult with ANA.
4. MINES has assessed that the proposed work, including the extraction of a bulk sample, long term storage of waste rock and tailings on site, taking water from the Chukuni River, and discharging treated wastewater into the Chukuni River, had "very low to negligible" risks of impacts to the environment.
5. MINES is in the process of re-assessing the strength of the duty to consult in this instance.
6. MINES remains unwilling to negotiate with Grassy Narrows about cumulative impacts, outstanding obligations, increased control over landuse, which activities are appropriate for which parts of the Territory, and other issues raised by ANA except for Mining permit applications submitted by proponents and Capacity Funding sufficient for one Mining Advisor community staff position.

7. The process that MINES and Kinross are using to engage Grassy Narrows is the same as that which would be applied in any part of Ontario and does not take into account Grassy Narrows' unique circumstances.

In fact, the following contrary information should have been apparent to MINES, and would have been abundantly clear to MINES if it had engaged meaningfully with Grassy Narrows:

a. The project area and vicinity are part of the area where Grassy Narrows people hunt for moose.

b. Grassy Narrows' ancestors have used this area and vicinity since before the time of the Treaty.

c. Grassy Narrows is the first community downstream of the project site.

d. Grassy Narrows has already suffered intense cumulative effects and cannot bear further impacts.

e. The Crown has outstanding obligations to Grassy Narrows under International Law, the Treaty, the Charter, and commitments made by the Crown to Grassy Narrows.

f. The proposed work is extensive and has the potential for high impacts to the environment that Grassy Narrows people rely on both on-site and off-site.

g. The project documents do not contain sufficient information to allow Ontario, as the regulator, to fully quantify and assess the full range of impacts that the project will create, nor to allow Grassy Narrows to fully evaluate the impacts on our people and our rights.

MINES' erroneous determination that the duty to consult with ANA was "low" was based on inadequate information, did not involve communication with Grassy Narrows, and therefore used false assumptions and shoddy interpretation that lead to an unreasonable decision.

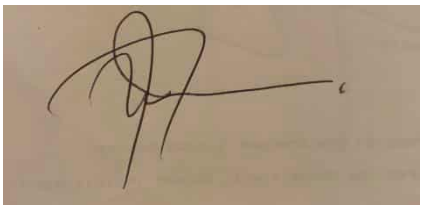
All of the engagement with Grassy Narrows on these permits to date has been fatally flawed because, among other reasons, it has been based on the erroneous determination of a 'low' strength of duty to consult.

The decision-making process on these permits must be halted and re-started with proper information and process. The strength of the duty to consult must be re-assessed. The decision to delegate consultation to the proponent must be reconsidered. The consultation plan must be re-written in light of the information Grassy Narrows has provided about the strength of its claim and information it intends to provide (subject to capacity) about the potential adverse impacts.

The barriers preventing Grassy Narrows' meaningful participation must be resolved, including unresolved foundational issues, the mercury crisis, lack of capacity support,

and lack of sufficient time. Grassy Narrows must be meaningfully consulted and our free, prior, and informed consent must be obtained.

Sincerely,



Joseph Fobister

Lead Land Protection Negotiator for Grassy Narrows First Nation.

C.C.:

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MINESITE DRAINAGE ASSESSMENT GROUP
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CANADA

BY EMAIL

April 11, 2024
FILE: 5025.01

Grassy Narrows First Nation
c/o Cavalluzzo
474 Bathurst Street, Suite 300,
Toronto, Ontario M5T 2S6
Attn: Grassy Narrows Lands Protection Team

Dear Grassy Narrows Lands Protection Team,

RE: Great Bear Mining Project Owned by Kinross Gold - Initial Comments on ML-ARD and Contaminant Source Terms for the Proposed Mine Plan

Introduction

I understand that the federal impact assessment of the proposed mine plan for the Great Bear Mining Project in Ontario will start soon. There are major issues and a major lack of information that should preclude the environmental assessment from starting at this time, as explained below. This includes the proposed large Advanced Exploration which itself could have significant environmental impacts as explained below.

The Impact Assessment Agency of Canada (IAAC) explains on its website:

> *"The assessment considers potential environmental, health, social and economic impacts of proposed projects, including benefits. Potential impacts on Aboriginal and treaty rights are also assessed and consulted on. The Agency or review panel uses the information to develop an impact assessment report."*

My focus here is purely environmental. Nevertheless, I realize there are some strong environmental connections to health, social, and economic. Thus, my comments below may also be relevant to these other portions of impact assessment.

Please note my qualifications for making the comments below include the following. I have been assessing water contamination at minesites by metal leaching and acid rock drainage (ML-ARD) for 46 years. I have done this at several hundreds of exploration, operating, and closed mining-related sites on all continents except Antarctica, from north of the Arctic Circle to south of the Tropic of Capricorn, in biogeoclimatic zones ranging from virtually no annual precipitation up to a rare daily

rainfall of one meter. I earned my Doctor of Philosophy degree in contaminant hydrogeology from the University of Waterloo, where my supervisor was the renowned Dr. John Cherry along with a thesis committee including Drs. Emil Frind (a well-known groundwater modeller) and Eric Reardon (a well-known geochemist). To date, I have authored or co-authored 99 published papers and presentations, five books, and 80 online case studies. I have been and am a peer reviewer for a number of international journals related to ML-ARD and environmental contamination. More details can be found at www.MDAG.com.

Prediction of Environmental Impacts at the Proposed Great Bear Project if Mined

The classic steps to environmental assessment are:

1) identify and quantify all potential contaminant sources including the rock walls of underground workings, waste-rock dumps, low-grade ore stockpiles, tailings, overburden, treatment plants, roads, and broken-rock foundations for buildings, including their rates of contaminant release, concentrations, and loadings (concentration multiplied by flow) for each of these sources;

2) identify and quantify subsurface, surface, and airborne pathways for contaminants to leave each of the on-site sources including velocities and loadings of all water pathways and all dust pathways; and

3) identify and quantify the expected physical, chemical, and biological impacts resulting from the on-site sources and their on-site/off-site pathways above.

On the chemical side, Step 1 above is often called "ML-ARD" or "geochemical source terms". If Step 1 is based on uncertain preliminary information and assumptions, which is currently the case for the Great Bear Project, then every source, pathway, impact, and outcome of the environmental impact assessment is also uncertain and assumed. To put it another way, impacts cannot be reliably estimated if the contaminants, their concentrations, and their loadings at their sources are not reliably known or predicted.

The 600-page federal-government ML-ARD Prediction Manual[1] from 2009, and required by Ontario Regulation 240/00 on ML-ARD, lays out a phase-by-phase approach to reliably defining each potential contaminant source and its contaminant release including rate, intensity, and severity. This often requires at least two to three years. Even then, for the Great Bear Project, another phase may be needed as explained in the federal Prediction Manual, but no one knows for sure until the initial phases are completed for the Great Bear Project.

[1] Price, W.A. 2009. Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials. Canadian MEND Report 1.20.1, Natural Resources Canada, dated December 2009.

It is important to note that some of this ML-ARD work for the Great Bear Project started last year (2023) and apparently more has started this year. Thus, I expect the phases of ML-ARD work and the reliable geochemical source terms to become available sometime in or after 2026 for the Great Bear Project. This applies to both Advanced Exploration and proposed mining. While preliminary information will be available before this time, it cannot be confirmed as reliable under the federal ML-ARD Prediction Manual.

Until the years of ML-ARD prediction work is done, a reliable plan for water treatment cannot be made for the Great Bear Project. Minewater-treatment plants are not off-the-shelf available at stores like Canadian Tire. This is because their treated effluent concentrations to the environment are very sensitive to the site-specific inflow rate of water and to the inflowing variations in aqueous concentrations of each element requiring treatment.

If upon mining, another "unexpected" yet predictable chemical element becomes a contaminant, then partially-treated toxic water would be discharged to the environment until a new treatment circuit could be added to the treatment plant. This would normally take at least months of time. After a new circuit is added, large overall changes can happen like the flow through the treatment plant ("residence time") could change and the concentrations of some other elements might not be lowered as much as predicted by initial treatment. Thus, environmental impacts of treated effluent can increase as "unexpected" but predictable contaminants arise.

For these reasons, concentrations and flows in water and air leaving the Great Bear site after treatment cannot be assumed in advance. This requires site-specific water-treatment tests, which have not been done for Great Bear and cannot be done until after the ML-ARD work is finished in a few years.

To cut short and bypass this issue, you may hear some people say something like, "We will continue with the impact assessment using this table of aqueous concentrations leaving the treatment plant." At this time, such a statement is uncertain, speculative, and based on assumptions. It would be an attempt to get through the impact-assessment process without reliable knowledge of (1) ML-ARD source terms and (2) the site-specific capability of the eventually-chosen treatment process. Also, this approach would ignore the fugitive contamination through water and air that inevitably escapes treatment and can cause environmental impacts.

It has been known for decades by many mining companies that ML-ARD work for contaminant predictions has to be started years before the final, reliable, expert-certified results are needed. This has been recognized for decades to avoid forcing environmental assessments using preliminary and initial information. If agencies choose to accept such preliminary information and assumptions, then they become participants in agreeing to or approving an impact assessment based on unverified and uncertified information. In the worst case, this can lead to environmental disasters. In the best case, this can lead to additional, apparently "unexpected" yet predictable cumulative effects about which Grassy Narrows First Nation is very concerned.

Prediction of Environmental Impacts at the Proposed Great Bear Project during Advanced Exploration

Please note that, further to my letter of March 27 to you, in some provinces no tonnage more than 10,000 tonnes is allowed during each five year period of advanced exploration. As a result, such a relatively large bulk sample of 60,000 tonnes at the Great Bear Project, with a gold value likely worth tens of millions of dollars, and spanning at least four years, can be considered a first phase of mining in some jurisdictions. This is not typical of advanced exploration elsewhere, where significant uncertainty normally remains about whether a project should continue. The Project Definition Document (December 2022) points out this is not unheard of in Ontario:

> "... such as the Timmins West Project (100,000 t), Sugar Zone Project (70,000 t) and Upper Beaver Project (60,000 t)".[2]

Advanced Exploration at the Great Bear Project is expected to remove up to 60,000 tonnes of ore as a bulk sample, requiring approximately four years. However, the potential for large and serious environmental impacts goes much farther than this, and includes the following.

- Around 1,000,000 tonnes of waste rock will be mined along with the bulk sample, of which at least some significant portion is expected to seriously contaminate infiltrating rainfall and snowmelt by ML-ARD for several years. The potential for severe environmental impacts by this waste rock continues because the worst rock would be excavated and placed back underground. When underground, the ML-ARD rock would eventually be submerged after an unspecified number of years. The rising underground water levels would rapidly flush years of accumulated contaminants off this rock. As a result, there could reasonably be far worse contaminant levels in the groundwater, that would eventually flow into the surrounding environment, than observed during active years of Advanced Exploration.
- At least ~400,000 tonnes of overburden (increased from ~200,000 tonnes in earlier documents) will be piled at the surface where it is intended to remain and even be used for reclamation. Based on percentages around Canada, there is a 50% probability that significant portions of the overburden will contaminate water with ML-ARD. However, to date overburden has been poorly characterized at the Great Bear Project and is assumed to be benign, where it will be spread around the site for reclamation.
- The proposed water treatment, for the contaminated water that does not escape into the environment during Advanced Exploration, is ambiguous and thus unreliable. This is understandable because of the missing ML-ARD input to design the treatment process reliably for all relevant contaminants. Currently proposed treatment includes aspects such as (1) pH adjustment, (2) flocculation which only affects suspended particles, (3) ultrafiltration that does not seem to match what is normally considered ultrafiltration, and (4) specialized ammonia treatment with no explanation why

[2] WSP E&I Canada Limited. 2022. Great Bear Advanced Exploration Project Project Definition Document. Report to the Great Bear Project, dated December 2022

nitrate and nitrite normally accompanying elevated ammonia are not included. Additionally, I understand that aqueous sulphate concentrations can increase the methylation of mercury and other elements like cadmium and arsenic, which is a major concern of Grassy Narrows First Nation. However, sulphate is not mentioned at all for Advanced Exploration at the Great Bear Project, despite the recognition that ML-ARD that releases sulphate is expected during Advanced Exploration.

- There are many more potential environmental impacts from Advanced Exploration that I am currently compiling for you at this time.

Because of the substantial potential for on-site and off-site environmental impacts by the proposed Advanced Exploration at the Great Bear Project, which includes surface water, groundwater, creeks and lakes, aquatic life including fish, and fugitive dust, a detailed impact assessment is warranted for the proposed Advanced Exploration. This current lapse of no planned impact assessment is environmentally risky and environmentally dangerous. This lapse could in the worst case result in very serious impacts to Grassy Narrows First Nation.

Summary

In summary, I understand Grassy Narrows First Nation's intention to make the impact-assessment process as comprehensive and rigorous as possible. However, this will not be possible for at least a few years. All estimated environmental impacts before that time will be preliminary and subject to major changes, because the final on-source contamination will not be reliably defined and quantified. The ML-ARD and geochemical source terms, which is the first step on which all subsequent steps of impact assessment rely, will not be known reliably for at least a few years for both proposed Advanced Exploration and proposed mining.

Sincerely,

Kevin A. Morin, Ph.D., P.Geo., L.Hydrogeo.
President

Asubpeeschoseewagong
Netum Anishinabek
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Attention: Minister George Pirie (Minister of Mines) (minister.mines@ontario.ca)
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Great Bear Resources Ltd. A Kinross Company
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Red Lake, Ontario P0V 2M0

Dear MINES, IAAC, Kinross and Great Bear Resources:

RE: The Great Bear Gold Mine Project

I wrote to you on March 29 and April 15 to provide initial findings from Dr. Kevin Morin concerning metal leaching and acid rock drainage, water quality and hydrogeology with respect to the Great Bear Gold Project.

Please find enclosed:

- Dr. Morin's response to Kinross Gold's consultant, WSP. He concludes that he remains concerned about the many potential environmental impacts that are not recognized and not anticipated by Kinross Gold and about the many impacts that are recognized but poorly addressed and characterized. His concerns pertain to both the proposed advanced exploration and the proposed mining.

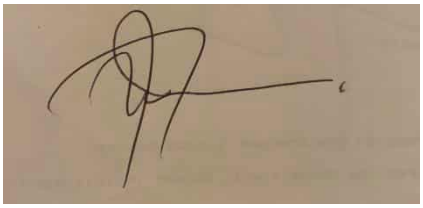
- Dr. Morin's report following his review of the technical documents provided to Grassy Narrows to date: Project Definition; Geochemical Characterization Workplan; Advanced Exploration Program Reclamation Strategy; Program Closure Plan (Draft for Indigenous Review); Hydrogeological Workplan; Surface

Water Quality Workplan; Fugitive Dust Best Management Practices Plan; PTTW Application for Dewatering; Draft Detailed Project Description; Water Treatment during Proposed Exploration and Proposed Mining.

Based on Dr. Morin's export reports, Grassy Narrows is extremely concerned that the project is moving ahead swiftly in the absence of required information and at great risk to the environment, the health, inherent, Treaty and Indigenous rights of Grassy Narrows.

I repeat Grassy Narrows' call to freeze the regulatory process work on this project until full credible information is available and the barriers to Grassy Narrows' meaningful involvement have been resolved. I also repeat Grassy Narrows' position that this project, including the extensive mining of valuable ore that the company is calling "bulk sampling", must be subjected to a rigorous environmental assessment.

Miigwetch,



Joseph B. Fobister, Lead Negotiator of Grassy Narrows Lands Protection Team

CC:

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MINESITE DRAINAGE ASSESSMENT GROUP
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BY EMAIL

April 24, 2024
FILE: 5025.01

Grassy Narrows First Nation
c/o Cavalluzzo
474 Bathurst Street, Suite 300,
Toronto, Ontario M5T 2S6
Attn: Grassy Narrows Lands Protection Team

Dear Grassy Narrows Lands Protection Team,

RE: Great Bear Mining Project - Response to Kinross Gold on MDAG Initial Comments of March 27 2024

I have submitted to you two letters in the past about environmental concerns at the Great Bear Project, dated March 27 and April 11. These letters were based on some of my initial findings from some documents that were within my focus on metal leaching and acid rock drainage (ML-ARD), water quality, and hydrogeology. My review is now complete, including more detailed explanations for those earlier, initial comments as well as additional comments and concerns. My full review accompanies this letter of April 23.

Kinross Gold's consultant, WSP, replied to my first letter of March 27 on April 4. WSP sent a table with 18 issues, listed as "MSDAG [sic] Letter - Comments and Rationale" with a corresponding "GBR Response".

Please note that I did not include full "Rationales" with my initial letters because my detailed review was still in progress. Thus, it was not possible for WSP to provide satisfactory responses. My detailed "Rationales" were provided to you only today.

In any case, I explained that there was little reliable and professionally certified information on ML-ARD, water quality, and hydrogeology at this point for the Great Bear Project. Most Great Bear reports included labels like "preliminary", "draft", and "initial", which meant they were not complete, not certified as reliable, and subject to change one or more times in the future. In fact, some information and designs already changed substantially in 2023, as the accompanying review confirms.

Many of WSP's Responses reflected this. For example, the first WSP Response starts with:

> "The geochemical information presented in these reports represent initial draft documents for the Project, based on data collected in 2022 and early 2023 which was developed [sic] qualified professionals."

As I explained previously, my opinion is that preliminary, draft, and initial reports for the Great Bear Project that are not signed and certified by qualified professionals should not be reviewed. They are subject to change, and already some reports issued in 2023 contradicted others. I expect this to continue for at least a few years until final, reliable monitoring data and testwork are completed.

As a result, it is not worthwhile or meaningful to reply to WSP's Responses to my first letter. There are insufficient information and data at this time to debate and clarify many of my concerns and issues. There may or may not be sufficient information and data in future years. Only time will tell.

Therefore, based on the information available at this time for the Great Bear Project, I remain concerned about the many potential environmental impacts that are not recognized and not anticipated by Kinross Gold and about the many impacts that are recognized but poorly addressed and characterized. My concerns pertain to both the proposed advanced exploration and the proposed mining.

Sincerely,

Kevin A. Morin, Ph.D., P.Geo., L.Hydrogeo.
President

Great Bear Mining Project -

Review of ML-ARD and Water Quality Expected during and after Advanced Exploration and Proposed Mining

prepared for:

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April 23, 2024

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Report Summary

This MDAG review has focussed on the potential for contamination of water by metal leaching and acid rock drainage (ML-ARD) on, under, and around the Great Bear Project during proposed exploration and proposed mining.

It is important to note that some report titles for Great Bear contain the words "draft", "preliminary" or "initial", meaning newer drafts and revised final versions from Kinross Gold may or may not change from what has been reviewed here. Also, the first cover page for the Detailed Project Description of November 2023 says "draft" while the second WSP cover page does not. Thus, I have found that the reviewed documents for the Great Bear Project as a whole is a confusing mess of shifting, changing, contradicted, and assumed details, with none signed and certified by qualified professionals.

Also, the contents of some documents are password protected. This protected text and information cannot be extracted for detailed evaluation, quotation, review, and comment now or in the future. Thus, they preclude detailed reviews by Grassy Narrows First Nation, which is what Kinross Gold seeks.

Each section of this MDAG review looked in detail at a particular report on proposed exploration and/or proposed mining. The following paragraphs are the summaries taken from each section, and each section should be consulted for details and context.

Section 2 of this MDAG Review

For the password-protected Project Definition Document of December 2022, sufficient details and omissions are present for me to be very concerned about ML-ARD and water-quality degradation during and after the relatively large, at-least-four-years-long proposed Advanced Exploration that would essentially be a first phase of mining at Great Bear. These concerns carry over to the proposed mining.

Although this document is not marked as "draft" and is thus final, it contains many details contradicted by later documents as explained in later sections of this MDAG review. Thus, it is not possible to know exactly what is proposed for Advanced Exploration and, in turn, to know reliably how bad the environmental problems and impacts could be.

Section 3 of this MDAG Review

Problems detected in the January 2023 Geochemical Characterization Workplan include:

- The ML-ARD program is "in progress" so no one knows how bad the contamination will be and which elements will be at toxic levels requiring treatment, yet Kinross wants to proceed with

Advanced Exploration.

- All that is available now is 96 rock core analyses according to the September 2023 Reclamation Summary (see below), which on their own are not reliable and cannot yet be interpreted reliably for ML-ARD. In fact, these 96 samples were not even of the rock that would be "mined" during Advanced Exploration, but only "proximal" which could also mean "very different". In any case, the 96 samples were not collected and analyzed as required under the Ontario Mining Act (see next bullet). Thus, Kinross Gold and its consultants, WSP, are guessing how bad the contamination will be, but admit that some of it will be bad, and are likely years away from completing the ML-ARD work required under Regulation 240/00 of the Ontario Mining Act (Mine Development and Closure under Part VII Of the Act).

- The stated approach and methodology used for Advanced Exploration is "based on the requirements" of two British Columbia documents from 1997-1998 (Price, 1998; Price and Errington, 1998; Price, Morin and Hutt, 1997). In reality, the Ontario Mining Act says the approach and methodology must be based on the much more detailed 2009 federal Prediction Manual, not just as "guidance" as Great Bear has done. Thus, the work for Advanced Exploration to date does not meet the Ontario Mining Act through Regulation 240/00 and does not meet the 2009 federal ML-ARD Prediction Manual (Price, 2009).

- Even if this Geochemical Characterization Workplan was applicable and consistent with the 2009 federal ML-ARD Prediction Manual, such work requires at least 2-3 years to obtain all required information and interpretations. Therefore, perhaps in 2025 or some year after, there might be sufficient ML-ARD for Advanced Exploration, but not any time soon.

Section 4 of this MDAG Review

Concerns on the Reclamation Strategy from September 2023 include the following.

- The ML-ARD program is "in progress" so no one knows how bad the contamination will be and which elements will be at toxic levels requiring treatment, yet Kinross Gold wants to proceed with Advanced Exploration.

- All that is available now is 96 core analyses, which on their own are not reliable and cannot yet be interpreted reliably for ML-ARD. In fact, these 96 samples were not even of the rock that would be "mined" during Advanced Exploration, but only "proximal" which could also mean "very different". Also, 30 samples of overburden, which is intended to be left on surface and used for reclamation, were collected yet the results are not reported although there is ~50% probability that the overburden will release ML-ARD and thus be toxic. Kinross Gold and WSP are guessing how bad the contamination will be, but admit that some of it will be bad. They are likely years away from completing the ML-ARD work required under the Ontario Mining Act and Regulation 240/00, because the work for Great Bear was not initially consistent with Regulation 240/00. In part, this is because the 2009 federal ML-ARD Prediction Manual (Price, 2009) was not recognized or followed as required. Even the

definitions of ML-ARD acronyms used for the Great Bear Project are not correct according to the federal Manual, which is additional evidence the Prediction Manual is not being followed.

- The bad ML-ARD rock appears to be associated with "rapid acid generation" according to the Program Closure Plan (reviewed in the next section below). This is an incorrect explanation of the phenomenon, but still shows that the bad water quality will start coming out of the disturbed rock, including the underground mine walls, very quickly after initial disturbance. Informally, this is called "lag time" to ML-ARD, but most of the ML-ARD work has not yet been done to quantitatively estimate the lag time beyond "rapid". This contaminating rock will be stored on surface and possibly only later, likely after the lag time, some might be taken underground. When this rock contacts water underground as the workings partially flood and submerge, it will quickly release more contamination. This means the underground water flowing into the surrounding groundwater system, and the surface overflow if any, would have to be monitored and likely be treated for many years or in perpetuity after Advanced Exploration.

Section 5 of this MDAG Review

For the password-protected Program Closure Plan, Draft for Indigenous Review from November 2023, the following concerns were noted.

- In November 2023, the volume of overburden has approximately doubled from previous documents without an explanation. Because overburden generally has a 50% probability of releasing ML-ARD and contaminating water, overburden represents a major but unexamined threat to water quality on, around, and beneath the Great Bear exploration site.

- "Preliminary" criteria are provided for separating "PAG" and "NPAG" rock and for "NML" rock. However, these acronyms are not used in an accurate manner that is consistent with the 2009 federal Prediction Manual (Price, 2009) required by Regulation 240/00. The preliminary criteria are not rational based on ML-ARD science unless justified with detailed and intensive site-specific studies, which have not yet been completed and professionally certified for the Great Bear Project.

- The potential for ML-ARD after closure is presented all the way to detailed predictions of aqueous concentrations in mg/L for on-site water and effluent to the environment, but only after closure and not during operations when the water quality would be reasonably worse. However, these predictions are not explained in any detail, are not justified, appear anomalous, and are not certified by a qualified professional. Some predictions are actually pre-exploration baseline that are erroneously assumed to be re-established immediately at closure. Furthermore, these predictions are missing more than a dozen potential contaminants.

- The "PAG" rock, which would likely create the highest contaminant concentrations, is not included

in this Program Closure Plan, presumably because this "PAG" rock will be backfilled underground. However, when placed underground, this "PAG" rock will likely continue to release severe ML-ARD until submerged, at which point a relatively huge amount of accumulated contamination would be released into the underground water. After the mine is refilled to equilibrium, and the minewater begins flowing into the surrounding groundwater system and through the more than 500 km of permeable drillholes to the environment, it will contaminate large surrounding areas. This major risk to water quality and the environment is not even mentioned in this Closure Plan, which is a major omission.

- The backfilling of "PAG" rock at closure is the largest individual cost item for closure totalling around $10 million. However, this reflects the currently minimum volume based on preliminary, unreliable information. In the worst case, which was assumed in the Great Bear Project Definition and still not disproven here, total closure costs could exceed $20 million.

Section 6 of this MDAG Review

In the Hydrogeological Workplan from December 2022, there is a major omission that would preclude a reliable and comprehensive assessment of current baseline hydrogeologic conditions and of future impacts from proposed mining. The groundwater monitoring network does not extend far enough to the west and northwest, beyond the proposed western portion of the Tailings Management Facility.

Section 7 of this MDAG Review

In the Surface Water Quality Workplan from December 2022, there are insufficient information and details to determine if appropriate work is planned and conducted. This is because important details are listed only as "including". For example, major potential contaminants like manganese and thallium are not specifically listed, but perhaps they are implicitly included? There is no way to know.

Section 8 of this MDAG Review

Based on the final-draft Fugitive Dust Best Management Practices Plan of September 2023 for Advanced Exploration, this work is unacceptable because it grossly underestimates the potential impacts from ML-ARD geochemical contamination of soil, vegetation, water, and biota by dust. This work assumes the on-site sources of dust "would be similar in concentration to the background rock". This is wrong and ignores the ongoing ML-ARD assessment of ore, rock, and overburden.

Section 9 of this MDAG Review

In the PTTW (Permit To Take Water) Application for Dewatering, Final Draft, and its several

important appendices from October 2023, there are alarming errors and ambiguities that should preclude approval of PTTW. These should also trigger a detailed impact assessment, which this PTTW report conversely says is not needed for Advanced Exploration at Great Bear.

In the introduction to the main PTTW report, the only numerical water withdrawal mentioned is up to 250 m^3/day (250,000 L/day) from Dixie Creek. Thus, it is stunning because the actual total water withdrawal from the local groundwater/surface-water balance would be at least 3,203,000 L/day every day and reaching up to 7,703,000 L/day on some days as a contingency. Even these flows are unrealistically low as explained here.

The errors begin with groundwater modelling that is based on long-term "steady state conditions" after the mine is "fully developed" and dewatered, and not on the correct, higher-inflow "transient conditions". Thus, inflow, pumping, and dewatering are significantly underestimated by the groundwater model and the PTTW Application. Additionally, there are problems with unrealistically low estimated effects on partial dewatering of Dixie Creek and other creeks and rivers. For example, simulated groundwater levels are around 9 m higher than measured around the mine and Dixie Creek, which artificially and incorrectly prevent additional dewatering of Dixie Creek.

Groundwater levels are shown to be drawn down during dewatering to a maximum of only 36 m even though the dewatered workings will be 600 m deep. This reflects (1) nearly fully dewatering of the shallow overburden and (2) the lack of admission on the likely huge drawdown and much larger "Zone of Influence" in the rock beneath the overburden.

Baseflows into Dixie Creek and other waterbodies can be critical to aquatic, benthic, and terrestrial ecosystems because of groundwater's typically different water quality and temperature compared to water already flowing at the surface. This becomes more critical during droughts when baseflow may be the main source of surface flows. The PTTW Application ignores the fact that more than 34 to 55% of existing baseflow would be lost during Advanced Exploration. It instead points out that the loss to groundwater would be only 2.4% and less of total flow depending on the chosen surface-flow statistic.

Overburden is routinely ignored in this PTTW document and its appendices, despite the proposed hundreds of thousands of tonnes of overburden likely having at least some ML-ARD potential and capacity to degrade water quality. In fact, some underground dewatering would be sprayed on the overburden for dust suppression, which in turn could lead to contaminated runoff across and off the site.

Section 10 of this MDAG Review

In the perhaps-draft Detailed Project Description of November 2023, the first cover page by Kinross says this document is "draft", but the second cover page by the authors, WSP, does not say "draft" so perhaps this is or is not the final document. If so, it has not been signed by qualified professionals and thus should be rejected.

In any case, there are so many problems, misleading statements, errors and omission concerning ML-ARD, water quality, and environmental impacts that they cannot all be summarized well here. These problems include the following.

- There is a false statement that there will be no sources of mercury from the ore processing when in fact the tailings and concentrate from the process will contain mercury. The processing could even cause mercury and other elements to leach more quickly and become more mobile.

- Contrary to the impression given by this Detailed Project Description, cyanide destruction is not perfect and can simply mask the cyanide temporarily in the environment, but the important testwork to determine this has not yet been done for the Great Bear Project.

- Significant impacts on water quality can arise from seemingly benign proposed activities like paste backfill of tailings into the underground mine and dewatered filter-cake tailings. However, the potentials for serious impacts are not recognized or not even mentioned in this perhaps-draft Great Bear document that can supposedly be used to determine what impacts could occur.

- Storm events and equipment upsets can lead to relatively large variations and unexpected impacts, day-to-day or even hour-to-hour, during proposed exploration and proposed mining. Instead, these Great Bear documents use averages like monthly which incorrectly assume flows will be the same every day of a month which is far from reality. Environmental impacts and spills can also be caused by large variations, as well as longer-term averages, so the environmental risks of proposed exploration and proposed mining at Great Bear remain mostly unknown and not identified.

- Nonsense pseudo-scientific statements are used, like the aggregate required to build the project would be “nonreactive mine rock and overburden” which does not exist. This clearly shows that experienced and qualified professionals were not included in the writing of this perhaps-draft Detailed Project Description. If there is a true commitment to “nonreactive mine rock and overburden” which does not exist, then the Great Bear Project stops now.

- There is a lack of ML-ARD assessments for some site components like aggregate.

- There is a prevalent but likely false belief that “NPAG”rock will have little to no impacts on ML-ARD, water quality, and the environment. However, this has not been proven for the Great Bear Project and is likely wrong based on other minesites around Canada. “NPAG” rock can actually generate more acid than “PAG” rock and could still release seriously contaminated levels of many metals and other elements at near-neutral pH.

- The financial assurance to ensure proper and fully paid closure of the proposed Great Bear Project is grossly underestimated based on existing information. Furthermore, the financial assurance should also include contingencies for costs of early or premature closure, but it does not.

- There are likely devastating, expensive, and unrecognized ML-ARD consequences on water quality from the proposed relocation of "PAG" rock into the underground workings after operation.

- The ongoing, unproven, and likely wrong, belief continues that overburden would be environmentally benign, can be used across the site for reclamation, and can be sprayed with water to control dusting when it could instead create contaminating water around, below, and beyond the Great Bear site.

- There are unfounded beliefs that dewatering during exploration and mining would have minimal effects on the local and regional water balance, and would not significantly dewater surface creeks and lakes including their environmentally important baseflow. These false beliefs are based on flawed groundwater modelling for the Great Bear Project explained earlier in this MDAG review.

- There is a false belief that dust blown off the site during proposed exploration and proposed mining and into the surrounding environment, vegetation, soil, water, and aquatic ecosystems is benign at "background" levels.

- A false belief is stated that only elevated and toxic ammonia, and no other contaminating nitrogen species from explosives that consistently accompany the ammonia, will appear in mine water during proposed exploration and proposed mining.

- There is an unsupported and likely substantially underestimated statement that the mine walls in the pits and underground workings "may potentially contribute minor quantities of metals to the mine water" instead of the more typical significant quantities of metals seen at many other minesites around Canada. This is taken as far as the likely ludicrous statement that there would be "Potential for creation of fish habitat in new pit lakes, expected to be re-connected [sic] to the Dixie Creek system".

- There is no recognition of the implications, costs, and impacts of storing months of contaminated mine water on the site should one or more "unexpected" yet currently predictable inorganic contaminants and ML-ARD occur on the site water during and after proposed exploration or proposed mining.

Section 11 of this MDAG Review

In summary for water treatment, Great Bear documents invoke water treatment as the major process that would prevent or minimize environmental impacts of proposed exploration and proposed mining. This is not literally true, because there will be fugitive contaminated water and contaminated dust leaving the site, but this fugitive contamination is ignored or not recognized in many reviewed Great Bear documents.

In any case, water treatment is the last "line of defence" between the on-site ML-ARD and contamination and the off-site impacts, and thus requires intensive study and characterization.

However, at this time, water treatment for proposed exploration and proposed mining is ambiguous and contradictory among the documents. This should be expected because the input flows and input contaminant concentrations (ML-ARD) will not be known reliably for at least a few years. Nevertheless, there are serious concerns about water treatment now including the following.

- Kinross Gold does not expect to treat site water to non-toxic levels. Instead, treatment would only be down to still-toxic levels based on the Metal and Diamond Mine Effluent Regulations (MDMER). Thus, Kinross Gold intends to rely on significant dilution of its contaminated effluent within a "mixing zone" in the Chukuni River. Such a mixing zone would include zones of significant toxicity and would require formal authorization from Fisheries and Oceans Canada. In any case, this discharge of effluent would add to cumulative effects, which is a particular concern of Grassy Narrows First Nation.

- Expensive and intensive treatment for ammonia, derived from blasting residues, is proposed. However, toxic levels of nitrate and nitrite, that always accompany the ammonia and which can cause eutrophication and other impacts in the Chukuni River and Dixie Creek, are completely ignored.

- Sulphate concentrations in the treated effluent, which I understand can increase toxic methylation of mercury and other elements like cadmium and arsenic, are not mentioned at all.

- Ultrafiltration may substantially reduce effluent concentrations of elements not fully dissolved, mixing-zone size, and cumulative effects. However, there are no details on this ultrafiltration in the reviewed Great Bear documents.

- Mine water treatment plants remove metals and other elements from the water, by creating concentrated and toxic treatment waste commonly called "sludge", which can reach "hazardous" and "special" waste levels in some jurisdictions. Thus, treatment sludge requires the most careful and secure handling and long-term storage under contaminated-sites regulations. Spills of this sludge can result in toxic conditions in water and sediments including soils and benthic ecosystems. All the Great Bear documents I have reviewed so far are completely silent on the annual volumes, handling, storage, long-term protection, and potential environmental impacts of treatment sludge that will remain and be managed somewhere in perpetuity.

1. Introduction

Metal leaching (ML) and acid rock drainage (ARD) are often water-chemistry and water-quality issues for minesites (e.g., Morin and Hutt, 1997 and 2001). As a result, the accurate prediction and control of ML-ARD at mining projects and proposed minesites in Ontario are high priorities of the provincial and federal governments.

This is explained in Part 7 (*Metal Leaching and Acid Rock Drainage Requirements*) of Ontario Regulation 240/00 (*Advanced Exploration, Mine Development and Closure under Part VII of the Act*), and in the federal ML-ARD Prediction Manual (Price, 2009). Section 57(1) of Regulation 240/00 states,

> "A program shall be undertaken to sample all materials remaining on the site that have been excavated, exposed or otherwise disturbed by mining activities, including but not limited to,
>
> (a) drill core;
> (b) metallurgical samples;
> (c) pit walls;
> (d) existing waste rock, ore, concentrate and *overburden* [MDAG emphasis] piles;
> (e) construction rock; and
> (f) tailings."

For detailed guidance, Ontario Regulation 240/00 states,

> "The sampling program shall be conducted by a person who is qualified in Ontario as a professional geoscientist, professional agrologist or professional engineer in accordance with a report prepared by William A. Price on behalf of the Mine Environment Neutral Drainage (MEND) program, entitled 'Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials', MEND Report 1.20.1, dated December, 2009, as that report may be amended from time to time..." [Price, 2009]

ARD is caused by oxidation of sulphide minerals, which are found at the Great Bear Project, particularly iron-bearing sulphides like pyrite and pyrrhotite. Whether sulphide minerals are present or not, weathering can still lead to accelerated metal leaching (ML). For example, the simple dissolution of near-neutral or alkaline carbonate minerals can release metals like manganese and zinc into the water. Thus, ARD is a subset of the more generic ML.

In practice, ML is not limited to true metals in the Periodic Table, but to all elements that could become potential environmental contaminants. For example, sulphate and nitrate are regularly included in ML assessments. Sulphate can reportedly increase the methylation of mercury and other elements like cadmium and arsenic.

Therefore, ML-ARD is an acronym representing the full spectrum of inorganic water chemistry and quality on, beneath, and around a minesite. Put simply, ML-ARD potential is synonymous with the potential for inorganic water contamination and the degradation of on-site water quality.

Kinross Gold Corporation (Kinross Gold) proposes Advanced Exploration and later mining at its Great Bear Gold Mining Project in the Red Lake mining district of Ontario, approximately 25 km southeast of the Town of Red Lake. The Great Bear Project is located in the Interim Area of Interest for Mining of Asubpeeschoseewagong Netum Anishinabek (ANA), which Kinross documents also name as Grassy Narrows First Nation (GNFN). The Great Bear Project is also in an area where Grassy Narrows First Nation people use the land and water to practice their Indigenous way of life. It is located upstream of the English River which flows directly to the Grassy Narrows village site and Grassy Narrows' most important fishing grounds.

Through Cavalluzzo LLP, the Grassy Narrows Lands Protection Team has asked me, Dr. Kevin Morin of the Minesite Drainage Assessment Group (MDAG), to review and comment on the proposed exploration and proposed mining. This MDAG review focuses on predicted surficial and subsurface ML-ARD and water quality on and around the Great Bear Project.

My qualifications for making the comments in this review document include the following. I have been assessing water contamination at minesites by metal leaching and acid rock drainage (ML-ARD) for 46 years. I have done this at several hundreds of exploration, operating, and closed mining-related sites on all continents except Antarctica, from north of the Arctic Circle to south of the Tropic of Capricorn, in biogeoclimatic zones ranging from virtually no annual precipitation up to a rare daily rainfall of one meter. I earned my Doctor of Philosophy degree in contaminant hydrogeology from the University of Waterloo, where my supervisor was the renowned Dr. John Cherry along with a thesis committee including Drs. Emil Frind (a well-known groundwater modeller) and Eric Reardon (a well-known geochemist). To date, I have authored or co-authored 99 published papers and presentations, five books, and 80 online case studies. I have been and am a peer reviewer for a number of international journals related to ML-ARD and environmental contamination. More details can be found at www.MDAG.com.

The Kinross documents reviewed in the following sections are listed below. Again, the main focus is on the potential for contamination of water by ML-ARD on, under, and around the Great Bear Project during proposed exploration and proposed mining.

- Project Definition Document (December 2022)
- Updated Site Plan
- PTTW Application for Dewatering, final draft (October 2023)
- Fugitive Dust Best Management Practices Plan, final draft (September 2023)
- Reclamation Strategy (September 5, 2023)
- Program Closure Plan, Draft For Indigenous Review (November 2023)
- Surface Water Quality Workplan (December 21, 2022)
- Hydrogeological Workplan (December 21, 2022)
- Geochemical Characterization Workplan (January 9, 2023)
- Preliminary Impact Assessment Methodology, draft (May 31, 2023)
- Preliminary Listing of Potential Valued Components for the Great Bear Project (May 31, 2023)
- Initial Project Description (June 1, 2023)
- Detailed Project Description (November 2023)

- PowerPoint Presentation by Kinross to ANA (November 10, 2023)
- ANA IPCA Map

It is important to note that some report titles above contain the words “draft”, “preliminary” or “initial”, meaning newer drafts and revised final versions from Kinross Gold may or may not change from what has been reviewed here.

Also, the contents of some documents above are password protected. This protected text and information cannot be extracted for detailed evaluation, quotation, review, and comment now or in the future. This precludes the detailed review by Grassy Narrows First Nation that Kinross Gold seeks. I strongly recommend that unlocked versions of all Kinross documents be obtained and kept by Cavalluzzo LLP and the Grassy Narrows First Nation for future reference and usage.

2. Project Definition Document (December 2022)

The Great Bear Resources Great Bear Advanced Exploration Project Project Definition Document, dated December 2022 by WSP E&I Canada Limited (WSP), is a password-protected document from which its content cannot be extracted or copied for detailed evaluation and reinterpretation.

In the Preface of this document, WSP states,

> "The Project as described in this document is subject to change as engineering progresses, in response to feedback from government agencies, Indigenous communities and stakeholders, as well as constraints not currently known, that are identified by ongoing environmental baseline and engineering works, and Indigenous consultation and engagement."

No new or updated Project Definition could be located and thus this version from December 2022 is reviewed here from the perspective of ML-ARD and potential water contamination.

Section 1.3 explains the objective of the proposed Advanced Exploration and its key activities:

> "The objective of this Project is to obtain additional information on the known mineralized zones (LP Fault, Limb Zone and Hinge Zone; Figure 1-3) through underground drilling, and to extract a bulk ore sample of up to 60,000 tonne (t) by underground mining methods. Extraction of a bulk sample allows the testing of representative areas of the mineralization off site, in order to gain a better understanding of the geology of the mineralized zones including, grade, structural controls on the mineralization, continuity, mining dilution, optical sorter performance and metallurgical recoveries. This information will support the assessment and development of a viable commercial production scenario.
>
> "The Project will also support future engineering designs by improving knowledge of key factors (ground conditions, water inflows, costs, labor, etc.). It will also improve the knowledge base to increase the confidence in environmental predictions associated with the proposed underground mine and to a lesser extent open pit mine.
>
> "Key Project activities are provided below:
> - Establish portal(s) and decline(s) to provide access underground in order to establish required underground workings
> - Develop drill platforms off the decline to facilitate efficient underground drilling of the known mineralized zones at depth
> - Extract up to 60,000 t of ore (bulk) sample from test stopes and drifts in the mineralized zones
> - Transport the ore to surface along the decline(s) by truck for crushing, sorting and sampling; samples will transported off site by highway truck for test processing
> - Mine rock that must be removed from the underground workings in order to provide access to the ore will be brought to surface by truck and will be stored in stockpile(s) unless appropriate for use as a construction material on site
> - Additional activities on surface and underground, such as environmental management."

These quotations raise several concerns as explained next.

Section 1.4 "Consultation to Date" with First Nations mentions Wabauskang First Nation (WFN) and Lac Seul First Nation (LSFN) in several places including an Exploration Accommodation Agreement. In contrast, Grassy Narrows First Nation (GNFN) in mentioned only twice, including where the Ontario Ministry of Mines instructed Kinross Gold to include GNFN in notifications of significant updates on exploration works. Later, Section 7.4.1 adds,

> "On September 29, 2022, the Company communicated its interest in an introductory meeting to GNFN, who respectfully declined the offer."

Section 1.5 on "Involvement of Federal Agencies" in this Project Definition starts by saying "Not currently applicable". Then it clarifies:

> "No Federal government departments or agencies are expected to grant Federal land or providing financial support to the project (include indirect funding support, such as for infrastructure and training). There is the potential that Federal departments may be required to provide environmental approvals or authorizations (see Section 7.3.1)."

Federal agencies like Fisheries and Oceans Canada will very likely be involved in authorizations as the Great Bear Project intends to discharge toxic water including from its advanced-exploration treatment plant into fish-bearing waters and fish habitat as "mixing zones" requiring authorizations. This is discussed further in Section 11 of this MDAG review.

Section 5.1.1 on Existing / Previous Development, Operations and Facilities says:

> "The first exploration work documented by Geology Ontario on the Property dates from 1944. Prior to acquisition by Great Bear Resources Ltd. in 2017, 176 diamond drillholes had been completed totalling 32,602.8 metres (m).... As of October 2022, there has been over 500,000 m of diamond drilling on the Property."

For understanding how groundwater might move during and after proposed Advanced Exploration, these hundreds of drillholes more than 500 km in total length create very permeable pathways for subsurface water to travel long distances quickly, in violation of normal hydrogeologic principles like hydraulic gradients and hydraulic conductivities. This is not acknowledged in other Great Bear documents, as explained in sections of this MDAG review such as Sections 6 and 9.2.

Section 5.1.3 on Geology and Mineralogy says:

> "The Property lies locally within a regional northwest-southeast trending belt of metavolcanic and metasedimentary rocks, bound by intrusive batholiths (see Figure 5-1). The Project is targeting gold mineralization, currently identified within three mineralized zones (see Figure 1-3):
>
> - LP Fault Zone, disseminated gold within high strain
> - Limb Zone (previously known as the Dixie Limb), silica-sulphide replacement
> - Hinge Zone, quartz veining."

The 2009 federal ML-ARD Prediction Manual (Price, 2009) shows that the ML-ARD and potential contamination from each of these zones requires separate ML-ARD evaluations. However, the proposed underground drifts are from a limited area of the ore zones, contrary to a statement that Advanced Exploration is needed to check "the continuity of underground access gold deposits" (see below).

Section 5.1.4 on Geochemical and Geotechnical Considerations states:

> "Geochemical characterization work has been initiated in order to support potential future development, including meeting the requirements of the Mine Rehabilitation Code for a future Advanced Exploration Closure Plan. Ongoing work include static testing (acid base accounting, short-term leaching), mineralogy and metal content. Humidity cells and rain barrel tests are also proposed. The conservative [worst-case] assumption pending results of the comprehensive testing program, is that ore and mine rock is potentially acid generating. This assumption will be amended on receipt of the pending test results and further assessment."

This worst-case assumption (incorrectly stated as "potentially acid generating" in comparison to the federal ML-ARD Prediction Manual) that all ore and mine rock will release ML-ARD could still be the case now, despite recent statements to the contrary (see the sections below in this review). This is because important ML-ARD work has not been completed and then certified by a qualified professional.

Section 5.1.4 also describes the overburden at the Project, which requires ML-ARD assessment equal to those of waste rock and ore according to the federal ML-ARD Prediction Manual and Ontario Regulation 240/00.

> "At the northwest portion of the Property, surficial soils are glaciofluvial in origin, consisting of sands and gravels. In the central portion of the Property, the surficial soils are described as deep-water deposits comprised of laminated to varved clay, silt and fine sand (Natural Resources Canada, 1996). Based on current exploration drilling information, overburden thickness at the Property is expected to range between 0 to 40 m. There are limited bedrock exposures within the Project area. Overburden encountered to date is a mix of sand, gravel and clay; however zones of soft sensitive clays may be encountered. An extensive geotechnical drilling program is currently underway on the Property to further investigate these and other aspects."

Section 5.1.5 on Proposed Mining Activities contains many important details such as:

> "There is no production mining proposed for the site." [MDAG Note: This appears to be a play on words because significant mining for several years is in fact proposed and Section 5.1.5 is specifically entitled "Proposed Mining Activities"; see my comments below on Section 5.1.8]. This Project includes use of underground mining methods to obtain a bulk sample of up to 60,000 t. The work is to be initiated in 2023, pending consultation, regulatory approvals and a corporate decision to proceed."

Kinross Gold further explained details of the proposed Advanced Exploration in Section 5.1.5:

> "The goal of the advanced exploration program (and ongoing exploration drilling from surface), is to collect additional information to support a decision on whether to proceed to develop a mine and to support engineering design. The advanced exploration bulk ore sample will be trucked off site over the existing Provincial road network to an existing mineral testing facility. No onsite processing is proposed.
>
> "GBR proposes to collar one or two portals from surface (approximately 6 m by 6 m) and to develop associated decline ramp(s) of approximately the same dimension. Secondary

egress and ventilation may be provided through a raise. The ramp is projected to extend to a vertical depth of approximately 600 m below surface and length of approximately 9,000 m during the Project. A preliminary long-section and plan view of the advanced exploration underground workings showing the preferred portal and raise location is provided in Figure 5-2 and Figure 5-3. The ramp is designed to provide access to the investigation areas, promote efficient truck haulage and reduce ventilation losses. Personnel will access the underground workings by means of the ramp. A shaft is not proposed for the Project.

"A bulk sample will be extracted from underground workings developed from the ramp(s) using conventional drilling and blasting using explosives, from several locations within the deposit. Blasting is proposed to use prepackaged and bulk explosive products....

"The objective of this Project is to obtain additional information on the known mineralized zones (LP Fault, Limb Zone and Hinge Zone; see Figure 1-3) through underground drilling and extraction of a bulk ore sample. Extraction of bulk sample allows testing of representative areas of the mineralization in order to gain a better understanding of the geology of the mineralized zones including, grade, structural controls on the mineralization, continuity, mining dilution, optical sorter performance, crushing and grinding properties and metallurgical recoveries to support development of a viable commercial production scenario.

"Industry-specific factors that were considered by GBR when establishing the size of the bulk sample include as follows:

- The proposed bulk sample is approximately 1% of the currently defined mineralized envelope and is consistent with other Ontario advanced exploration projects, such as the Timmins West Project (100,000 t), Sugar Zone Project (70,000 t) and Upper Beaver Project (60,000 t)
- Representative bulk samples extracted using realistic mining methods that help to prove the continuity of underground access gold deposits are very important to potential financiers
- National Instrument 43-101 resource definition and economic modeling standards are becoming more stringent to satisfy stricter due diligence standards imposed by industry and the investment community, often requiring bulk samples to validate and refine resource models prior to production decisions."

The problem with these details is that the three reasons given by Kinross Gold do not justify the 60,000 t bulk sample nor the proposed locations for the removal of the bulk sample. For example, the figure shows that most of the bulk sample will be taken from two laterally-limited areas. As a result, most of the ore from northwest to southeast will not be sampled. This is not consistent with proving "the continuity of underground access gold deposits".

Section 5.1.8 on Project Duration and Rate of Mining shows that Underground Development will take place across more than four years "on a continuous (24-hour) basis" and the Bulk Sample will be collected across roughly 2.5 years. These details plus the two 6x6 m portals show this is not typical Advanced Exploration to determine if future mining might be justified, but this is the first phase of mining.

Section 5.3.8 Buildings and Large Facilities includes Table 5.2 "Primary Buildings and Facilities on Surface". "Mine Rock Stockpiles (2)" has an approximate scale of 1,000,000 t, although it is not clear on whether this is maximum capacity or expected capacity. This is only clarified later under Section 5.4.3 (see below) which is the only description of the volume of disturbed waste rock (1,000,000 t) left on site simply to obtain 60,000 t of ore (a ratio of 17:1). This implies a large percentage of waste rock will be mined during Advanced Exploration, which further supports the view that Advanced Exploration would be the first phase of mining.

Remarkably, the various ponds listed in Table 5.2 are only described as lateral areas and do not provide depths and volumes, precluding a discussion of mass balances and spills due to extreme weather events and failures of the treatment plant. Also, the total catchment of this proposed exploration site is not provided despite all its runoff and infiltration requiring routine monitoring and treatment as needed. These are serious omissions. These omissions continue in the perhaps-draft Detailed Project Description, reviewed in Section 10 below.

Despite 60,000 t of ore being mentioned many times in this Project Definition, Section 5.4.3 "Stockpiles" is the only section of this Project Definition that mentions the substantially greater amount of waste rock with ML-ARD potential:

> "It is estimated that a total quantity of approximately 1,000,000 t of mine rock will be generated and stockpiled during the Project."

Additionally:

> "A stockpile of up to 100,000 m^3 [of overburden] is proposed", which likely means about an additional 200,000 t of disturbed overburden.

Notably, less than a year later, documents (see the later sections of this MDAG review below) have increased the overburden to ~400,000 t with no clear explanation for it.

Overburden stockpiles at minesites around Canada have released significant ML-ARD, which is why they are specifically mentioned and referenced through the Ontario Mining Act, but this Project Definition fails to recognize this. Later Kinross Gold documents fail to show the overburden stockpile and fail to show its runoff reporting to ML-ARD treatment (e.g., the undated "AEX Site Plan - Updated.pdf" on which overburden is called "topsoil"). For example, "Memo - Reclamation Strategy - Sept 5 2023.pdf" says,

> "Runoff from the overburden stockpiles (will be monitored and treated to manage suspended solids as required and discharged)".

The undated "AEX Site Plan - Updated.pdf" does not show this. This is one of many glaring contradictions and errors among the Great Bear documents reviewed here.

The understanding of groundwater at this Project is incomplete or contradictory. Section 6.25. Says:

> "The bedrock is generally tight with some potential for limited groundwater flow in the upper fractured bedrock and a few deep structures."

However, a figure in Section 5.5.2 shows groundwater as the only source of inflowing water to the underground workings. Thus, Kinross is saying groundwater inflow is "limited" but also is the only source of this water that has to be actively pumped out of the mine. This escalates to serious errors in groundwater modelling explained in Section 9.2 below that incorrectly predicts relatively low groundwater inflow and relatively little dewatering of surface creeks and lakes.

Section 6.2.6 Air Emission Information has an important omission concerning ML-ARD, environmental impacts, and cumulative effects. This section simply says,

> "A meteorological station has been established on the site, and baseline air quality and sound data is being collected. Based on a review of current Project, air emissions are anticipated to be limited and no offsite impacts are predicted. A management plan will be established to mitigated dust from materials movement and traffic on gravel roads."

However, hundreds of thousands of tonnes of blasted waste rock plus disturbed overburden will remain on site in piles up to 30 m high, likely in perpetuity after Advanced Exploration. This contaminated, blasted, and disturbed materials can release ML-ARD contaminated dust that can be carried into the surrounding environment where it can affect and degrade water quality, soil quality, vegetation, microbes, fish, and animals. As explained in Section 8 of this MDAG review, this invalidates the fugitive dust study for the Great Bear Project.

In summary of this password-protected Project Definition Document of December 2022, sufficient details and omissions are present to be very concerned about ML-ARD and water-quality degradation during and after the relatively large, at-least-four-years-long proposed Advanced Exploration that would be essentially a first phase of mining at Great Bear. These concerns carry over to the proposed mining. Although this document is not marked as "draft" and is thus final, it contains many details contradicted by later documents as explained in later sections of this MDAG review. Thus, it is not possible to know exactly what is proposed for Advanced Exploration and thus to know reliably how bad the environmental problems and impacts could be.

3. Geochemical Characterization Workplan (January 9, 2023)

This very short, three-page summary of ML-ARD "geochemical characterization", apparently issued in January 2023 by WSP, does not provide much information to review and comment on since it is only a "Workplan". However, later documents show this Workplan was not followed.

Under "Purpose of the 2023 Program", it says:

> "Samples that have been or will be tested as part of the geochemistry program include drill core (representing mine rock), overburden, and synthetic tailings generated from metallurgical test programs conducted in the laboratory. Related water quality modelling will be undertaken in 2023, focusing on the proposed Advanced Exploration (AEX) phase. Additional water quality modelling, representing the overall Project, will be undertaken at a later date."

As explained below, this Workplan is not sufficiently thorough and complete under the 2009 federal ML-ARD Prediction Manual (Price, 2009) to justify water-quality modelling and its conclusions. In any case, it is now April 2024 and no verified modelling results from 2023 have been found.

Under "Mine Rock Static Testing", this Workplan states,

> "A mine rock characterization program was initiated in 2022. A total of approximately 300 samples of drill core were collected for this purpose as part of field work in 2022. Drill core samples were obtained from a variety of locations and depths around the deposit, including rock in the vicinity of the proposed open pit and underground developments, along with the proposed AEX volume. Samples of all major rock types were collected. The purpose of this work is to evaluate the ML/ARD potential of the rock and help determine how mine rock may need to be managed.... Testwork is underway and results will be available in the first quarter (Q1) of 2023."

However, nine months later in September 2023, the Reclamation Strategy (see the next section of this MDAG review) mentions only 96 samples that are only "proximal" and thus not necessarily representative of rock to be removed for Advanced Exploration or proposed mining. Perhaps the other 200 samples are not relevant for Advanced Exploration and proposed mining, but then because they are "proximal" it is possible that the 96 samples are not relevant either.

Under "Mine Rock Static Testing", it says

> "All samples will be tested for Acid Base Accounting (ABA) parameters (that includes paste pH, sulphur content and speciation, and Neutralization Potential content and form) and elemental content analysis (aqua regia digestion and ICP analysis). Some of the samples will be subjected to more detailed static tests including the Shake Flask Extraction (SFE) test, Net Acid Generation (NAG) test, and Rietveld X-Ray Diffraction. Testwork is underway and results will be available in the first quarter (Q1) of 2023."

This is insufficient detail to ensure the correct tests are being done. In fact, "aqua regia" is a partial digestion that detects only part of the heavy metals and other elements in a sample, and thus is not acceptable for most ML-ARD work including comparisons to total crustal abundances.

Also, the September 2023 Reclamation Strategy (see the next section) mentions the results of 96 core samples, without stating which methods were used and what the analytical results were. All this information "will be available in the first quarter (Q1) of 2023", but more than a year later the information is not available as qualified-professional-certified results and interpretations.

Under "Mine Rock Kinetic Testing Programs", it says:

> "Kinetic tests are used to assess how a material responds to oxidation / weathering processes over time, and are used to estimate the time until samples may start to produce acidity and the rates at which the samples release metals. Several mine rock kinetic testing programs will be conducted in 2023, including a program conducted in the laboratory (humidity cell tests) and a program conducted in the field (field leach barrel tests).
>
> • The humidity cell test program will be initiated in the laboratory in 2023. Ten tests are currently planned and the specific number of tests will be confirmed following receipt of the static testing results. Samples to be tested will include key mine rock materials with a risk for ML/ARD along with test samples that are representative of typical Project mine rock. Initial reporting on the humidity cell tests will be available in Q4 2023."
>
> • A field leach barrel program will be initiated in the spring of 2023. Ten tests are currently planned but the specific number of tests will be confirmed following receipt of the static testing results. The objective of this program is to evaluate rates of sulphide oxidation and metal release under field conditions. This information will be integrated with the results of ongoing laboratory humidity cell tests to evaluate lag times to acid onset and metal release from mine rock. The tests will be routinely monitored throughout the open water season in 2023. Initial reporting on the field leach barrel program will be available in Q4 2023."

It is now April 2024. Where are the progress reports "available in Q4 2023"? In any case, these tests take at least one year, and often longer, to complete according to the federal ML-ARD Prediction Manual (Price, 2009). Thus, reliable and professionally certified results will not likely be available until late 2024 or 2025 at the earliest.

Under "Overburden Characterization", it says:

> "A preliminary geochemical characterization program for overburden is underway. Thirty samples of the various types of overburden present around the property were collected as part of field work conducted in 2022. Samples were submitted to the laboratory for static testing (ABA and elemental content) and a subset of samples were selected for more detailed static tests. Results will be available in Q2 2023."

Strangely, in the September 2023 Reclamation Strategy (see next section), the preliminary results are mentioned for mine rock but not for overburden. This is important because this Project Definition estimates there will be about 200,000 tonnes of overburden disturbed (with recent documents less than a year later saying ~400,000 t). This is about three times more overburden than the ore being mined as a bulk sample. On average around Canada, about half of overburden at mineral deposits has significant ML-ARD potential, so there is a significant risk that Great Bear overburden will devastate water quality on, beneath, and around the site.

Under "Mine Water Quality Estimates", this Workplan states:

> "Mine water quality estimates for the AEX phase will be prepared in Q1 2023. Modelling will be conducted via mass balance approaches and will be supported by the AEX site water balance and available geochemistry data. The model results will be used to ensure that site water management needs are identified and addressed. Additional water quality modelling, representing the overall Project, will be undertaken at a later date as the project advances."

Mine-water mass balances are not often representative of leachates from sulphide-bearing rock and overburden as found at the Great Bear Project. There is no justification here for mass-balance modelling and its results could be irrelevant for Advanced Exploration as well as proposed mining. This approach should be examined in detail including the data on which it is based once qualified-professional-certified documents become available.

Under "Technical Data Collection Methodologies", it says:

> "The approach and methodology for the geochemistry programs were based on the requirements described under the Ontario Mining Act; namely guidance found within the documents DRAFT Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia (Price 1997), and Policy for Metal Leaching and Acid Rock Drainage at Minesites in British Columbia (MEM 1998). Additional guidance was provided by the reference document Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND 2009), which represents best practice and industry standard approaches and methodologies for ML/ARD sampling and characterization in Canada."

In fact, this is wrong. The Ontario Mining Act states:

> "The sampling program shall be conducted by a person who is qualified in Ontario … in accordance with a report prepared by William A. Price on behalf of the [federal] Mine Environment Neutral Drainage (MEND) program, entitled "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials", MEND Report 1.20.1, dated December, 2009, as that report may be amended from time to time..."

Therefore, for the Great Bear Project, "[t]he approach and methodology for the geochemistry programs were based on" 1997 and 1998 British Columbia documents with only "guidance" from the federal Prediction Manual. In reality, the approach and methodology are required under the Act to be based fully on the 2009 600-page federal Prediction Manual, which instead was only used for "additional guidance". The 1997 and 1998 BC documents (Price, 1998; Price and Errington, 1998; Price, Morin and Hutt, 1997) provided relatively little detailed instructions compared with the federal Prediction Manual, so the Great Bear ML-ARD testwork started off as likely insufficient under the Prediction Manual and would have to be expanded.

Under "Field and Laboratory Work Timing", it says:

> "Some field and laboratory work associated with the geochemical characterization programs was conducted in 2022 as described in the previous sections. Additional lab work is planned for 2023 as outlined above. Field work will be conducted in 2023 to construct the Field Leach Barrel tests and monitor and collect leachate from the tests. Reporting for the various programs will be available through 2023 as described above."

I have not yet seen this reporting from 2023 and am not aware if it has in fact been reported and

certified in 2023.

In summary, problems encountered in this January 2023 Geochemical Characterization Workplan include:

- The ML-ARD program is "in progress" so no one knows how bad the contamination will be and which elements will be at toxic levels requiring treatment, yet Kinross wants to proceed with Advanced Exploration.

- All that is available now is 96 rock core analyses according to the September 2023 Reclamation Summary (see below), which on their own are not reliable and cannot yet be interpreted reliably for ML-ARD. In fact, these 96 samples were not even of the rock that would be "mined" during Advanced Exploration, but only "proximal" which could also mean "very different". In any case, the 96 samples were not collected and analyzed as required under the Ontario Mining Act (see next bullet). Thus, Kinross Gold and WSP are guessing on how bad the contamination will be, but admit that some of it will be bad, and are likely years away from completing the ML-ARD work required under the Ontario Mining Act and its Regulation 240/00 (Mine Development and Closure under Part VII Of the Act).

- The stated approach and methodology used for Advanced Exploration is "based on the requirements" of two British Columbia documents from 1997-1998 (Price, 1998; Price and Errington, 1998; Price, Morin and Hutt, 1997). In reality, the Ontario Mining Act says the approach and methodology must be based on the 2009 federal Prediction Manual, not just as "guidance" as Great Bear has done. Thus, the work for Advanced Exploration to date does not meet the Ontario Mining Act through Regulation 240/00 and does not meet the 2009 federal ML-ARD Prediction Manual (Price, 2009).

- Even if this Geochemical Characterization Workplan was applicable and consistent with the 2009 federal ML-ARD Prediction Manual, such work requires at least 2 to 3 years to obtain all required information and interpretations. Thus, perhaps in 2025 or some year after there might be sufficient ML-ARD for Advanced Exploration, but not any time soon.

4. Great Bear Advanced Exploration Program Reclamation Strategy (September 2023)

The Introduction of this document explains:

> "This memorandum was prepared to summarize the reclamation strategy for the AEX [Advanced Exploration] Program. The regulatory Closure Plan which will be filed with the Ontario Ministry of Mines is currently being developed. The purpose of this memorandum is to seek input from Indigenous communities regarding the proposed closure strategy for the AEX Program."

Thus, this memo is only to "summarize" the reclamation strategy in order to "seek input from Indigenous communities". As shown below, this summary is insufficient for Grassy Narrows First Nation to provide input and this reclamation "summary" in fact already reveals errors and misconceptions.

Section 2 entitled Project Information lists "major components" for Advanced Exploration. For tonnages and sizes, only the ore is mentioned and it will be shipped offsite. So there is no overall summary of areas, volumes, and heights of waste and disturbed materials remaining on site and requiring careful reclamation. This is important, because there will be at least 17 tonnes of mine waste rock generated for each 1 tonne of ore (see Sections 2 and 10 of this MDAG review), which is a substantial ore:waste ratio and one that requires intensive efforts to protect the surrounding environment. There would also be ~7 tonnes of overburden mined for each 1 tonne of ore, which increased through 2023 from an initial ~3:1 ratio.

Therefore, this Reclamation Strategy does not sufficiently protect the environment due to the lack of sufficient data, which is replaced by information that at best "suggests". The decision to mine a huge bulk sample of ore worth tens of millions of dollars, likely to offset exploration costs, has not been based on suggestions, so why are associated reclamation and environmental protection based on suggestions?

There is no explanation in this or other documents on why an underground bulk sample requires the destruction of surface vegetation and shallow soils to remove a relatively enormous volume of 400,000 tonnes of overburden (the most recent estimate, which had been increasing). Additionally, 96 ML-ARD samples are mentioned for rock "proximal" to the underground workings, but there is no mention of the 30 samples of overburden also tested for ML-ARD potential.

Because roughly half of overburden stockpiles at sites similar to Great Bear have significant ML-ARD potential, the Great Bear overburden should be assumed to have the same strong potential for water contamination and ARD (called "PAG" in this document) unless proven otherwise. It is alarming that Kinross Gold is assuming 100% of the overburden is environmentally benign.

Figure 2 of this Reclamation Strategy shows an unlined overburden stockpile where its seepage can contaminate local water and soil, and Figure 3 shows the overburden runoff and seepage is completely ignored. This serious omission can also be seen in Section 2.3 which ignores contaminant potential from overburden by simply addressing surface runoff and not subsurface

seepage and groundwater:

> "Runoff from the overburden stockpiles (will be monitored and treated to manage suspended solids as required and discharged)"

Section 2.1 on Underground Mining Methods Summary does not describe advanced exploration where a bulk sample of several tonnes is obtained and tested. Instead, Section 2.1 describes an initial four-year phase of mining of more than 1 million tonnes of waste rock and 200,000 tonnes (more recently, ~400,000 t) of overburden to obtain only 60,000 tonnes of ore worth tens of millions of dollars. In reality, four years of this type of advanced exploration is essentially being used as the first phase of the underground mine plan so that there is relatively little delay to start mining should the project be approved.

In the Project Definition (see Section 2 of this MDAG review), Kinross Gold provided three reasons for a relatively huge bulk sample along with 17 times more waste rock and now 7 times more overburden. However, as explained above, these reasons do not make sense. For example, Kinross says that bulk samples help to prove the continuity of underground access gold deposits and are very important to potential financiers. Yet, most of the proposed underground workings are focussed into two small lateral areas and not throughout the ore zone "to prove the continuity".

In Section 2.2 on Geochemistry Summary, it says:

> "The sampling approach and testing methods for the preliminary geochemical assessment are based on the requirements described under the Ontario Mining Act, namely guidance found within the DRAFT Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia (MEM 1998)."

This same error occurs in the January 2023 Geochemical Characterization Workplan. The Ontario Mining Act through its Regulation 240/00 does not mention the 1998 British Columbia document. Instead, the relevant wording is:

> "The sampling program shall be conducted by a person who is qualified in Ontario … in accordance with a report prepared by William A. Price on behalf of the [federal] Mine Environment Neutral Drainage (MEND) program, entitled "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials", MEND Report 1.20.1, dated December, 2009, as that report may be amended from time to time..."

Page P-24 of this 600-page federal Prediction Manual specified by the Ontario Regulation 240/00 says, "Major technical assistance was provided by Kevin Morin (Mine[site] Drainage Assessment Group)... and Kevin Morin provided major editorial assistance." Therefore, for the Great Bear Project, I can attest that "[t]he sampling approach and testing methods" are based on the wrong document.

Based on the 2009 federal Prediction Manual required by Regulation 240/00, the proposed ML-ARD work "in progress" is not sufficient, likely because the Manual was used by Kinross Gold only as "[a]dditional guidance" instead of a required document. This is easily seen in words like "preliminary geochemical assessment" and "initial evaluation". The ML-ARD predictions and information are the main basis for design of water treatment and for reclamation/closure. Thus, it is not acceptable for treatment and closure to be based on "preliminary" and "initial" information.

This can lead to misleading impact assessments and receiving-environment effects.

There are already errors in the Great Bear ML-ARD work as found in this Reclamation Strategy. These range from an incorrect definitions of the fundamental acronyms of "PAG" and "NPAG", to major problems with samples collected to date. For ML-ARD, all that is mentioned as of September 2023 is 96 rock-core analyses, which on their own are not reliable and cannot yet be interpreted reliably for ML-ARD. In fact, these 96 samples were not even of the rock that would be mined during Advanced Exploration, but only "proximal" which could also mean "very different". Some percentage of this proximal rock, such as 50% to 67%, is considered not to have much ML-ARD potential based on "preliminary" data, but that is unreliable or wrong.

Kinross Gold is guessing on how bad the ML-ARD contamination will be, and admits some of it will be bad. However, it is likely years away from completing the appropriate ML-ARD work required under the Ontario Mining Act and Regulation 240/00, including the federal ML-ARD Prediction Manual (Price, 2009).

Section 2.4 of this Reclamation Strategy on Closure Objectives says:

> "The primary objective of closure is to rehabilitate the area to a long-term safe and sustainable state that considers the desires of local Indigenous land users to the extent practical (such as post closure land uses) by promoting vegetation communities that support habitat for local species diversity and aquatic habitat that will support healthy fish populations. The purpose of this memorandum is to seek input from indigenous communities regarding end land uses and closure concepts."

It is remarkable that Kinross Gold considers leaving "NPAG" rock perhaps with a cover of 0.3 m of potentially contaminated overburden, plus a large amount of stockpiled overburden at the surface, to be a "long-term safe and sustainable state...". To the contrary, this reclamation strategy can result in perpetual water treatment. A cover over "NPAG" rock does not stop ML and contaminated effluent, which could instead require perpetual water treatment. The closure plan and its estimated cost of only ~$10 million would not pay for this.

Section 3 on Progressive Rehabilitation Measures says:

> "Mine rock will be moved underground during the program as needed for use as road material, and potentially as backfill in underground areas for stability."

This issue arises later where "PAG" rock is proposed to be moved underground after mining of the bulk sample and the many underground workings. The seriously major problem here is that "PAG" rock can release relatively enormous amounts of heavy metals and other elements as it is flooded and submerged. This can create a toxic "soup" of underground water, worse than any seen at the surface, that eventually flows out into the surrounding environment and groundwater system. This would likely require long-term pump-and-treat remediation of the surrounding groundwater. Such pump-and-treat remediation is not included or costed in the ~$10 million total closure costs, and would likely cost much more than $10 million itself.

As part of closure, Section 5.1 says:

> "The portals will be backfilled with NPAG rockfill."

Because this rock will probably be an ML concern, including leaching heavy metals and other elements, backfilling the portals with this NPAG rock that will remain partially exposed and oxidizing will lead to perpetual ongoing water contamination. Adding to this contamination will be backfilled oxidized-and-contaminated PAG material that will likely release relatively large amounts of heavy metal and other elements. Contaminated water from this PAG material, backfilled into the underground workings and partially flooded to the maximum level, and from the NPAG material plugging the portals, would start flowing out of the mine area and into the surrounding groundwater system unless there is perpetual collection and treatment.

Section 5.6 on Soils Testing mistakenly says:

> "The primary soil contamination that could be expected from the AEX activities would result from the use / spillage of petroleum / diesel fuels. A soil sampling plan will be developed at the time of closure to evaluate potential hydrocarbon or chemical contamination, as appropriate."

In reality, the primary soil contamination would likely be from the elevated levels of heavy metals and other elements in wind-blown fugitive dust (see Section 8 of this MDAG review). This dust would come from the PAG and NPAG blasted-rock stockpiles, from the overburden stockpile(s), and from mine roads and building foundations made of the blasted rock and overburden.

Section 5.7 of this Reclamation Strategy says:

> "The primary long term closure concern with respect to the mine rock stockpiles is acid rock drainage and metals leaching. Preliminary geochemical investigations suggest that up to approximately 35% of the AEX mine rock could be PAG, as discussed in Section 2.2. During the AEX Program, the PAG and NPAG mine rock will be segregated in accordance with the AEX Mine Waste Management Plan, which is currently being developed at the time this document was prepared."

"Preliminary geochemical investigations suggest that..." is not acceptable for design of the waste-rock piles and the treatment system. Preliminary geochemical investigations can be seriously wrong and substantially underestimate contamination from the rock and overburden.

Section 5.7 also says:

> "It is anticipated that up to 127,200 m^3 of PAG mine rock will be stockpiled at the AEX Program and will need to be appropriately rehabilitated either progressively or at closure."

The closure costs from the Program Closure Plan (see Section 5 of this MDAG review below) show it will cost $30.00 per m^3 to relocate the PAG rock back into the underground workings, where it would then contaminate the underground water that will eventually flow into the environment. This would be a total cost of $3,816,000. However, Table 12-1 from the Program Closure Plan (issued two months after this Reclamation Strategy) estimates PAG rock higher at 191,000 m^3 (a remarkable 50% more) costing $5,730,000.

Section 5.7 also says:

> "The NPAG Stockpile footprint may be covered with up to 0.5 m of overburden and seeded for revegetation. Additional cover depth is provided overlying the NPAG Stockpile to account for potential losses to void spaces in the mine rock. It is anticipated that the overburden material will fill in the void spaces and support revegetation."

However, the overburden could have ML-ARD potential, and thus would not support vegetation but instead kill vegetation.

In summary of the Reclamation Strategy from September 2023,

- The ML-ARD program is "in progress" so no one knows how bad the contamination will be and which elements will be at toxic levels requiring treatment, yet Kinross Gold wants to proceed with Advanced Exploration.

- All that is available now is 96 core analyses, which on their own are not reliable and cannot yet be interpreted reliably for ML-ARD. In fact, these 96 samples were not even of the rock that would be "mined" during Advanced Exploration, but only "proximal" which could also mean "very different". Also, 30 samples of overburden, which is intended to be left on surface and used for reclamation, were collected yet the results are not reported although there is ~50% probability that the overburden will release ML-ARD and thus be toxic. Kinross Gold and WSP are guessing how bad the contamination will be, but admit that some of it will be bad. They are likely years away from completing the ML-ARD work required under the Ontario Mining Act and its Regulation 240/00, because the work for Great Bear was not initially stated as consistent with Regulation 240/00. Even the definitions of ML-ARD acronyms used for the Great Bear Project are not correct according to the federal Manual specified by Regulation 240/00, which is additional evidence the Prediction Manual is not being followed.

- The bad ML-ARD rock appears to be associated with "rapid acid generation" according to the Program Closure Plan (reviewed in the next section below). This is an incorrect explanation of the phenomenon, but shows that the bad water quality will start coming out of the disturbed rock, including the underground mine walls, very quickly after initial disturbance. Informally, this is called "lag time" to ML-ARD, but most of the ML-ARD work has not yet been done to quantitatively estimate the lag time beyond "rapid". This contaminating rock will be stored on surface and possibly only later, likely after the lag time, some might be taken underground. When it contacts water underground as the workings partially flood and submerge, it will quickly release more contamination. This means the underground water moving into the surrounding groundwater system, and surface overflow if any, would have to be monitored and likely be treated for many years or in perpetuity after Advanced Exploration.

5. Program Closure Plan, Draft for Indigenous Review (November 2023)

This password-protected draft document for Advanced Exploration is only "for Indigenous review". This is odd to me since it is Kinross Gold's responsibility to design and justify the closure plan through certified professionals, rather than submit a draft to see if any First Nations notice the weaknesses and problems explained below.

In fact, since this draft report it is password protected, none of its content can be extracted for detailed re-interpretation and review. Thus, Kinross Gold is limiting the "Indigenous review" it is seeking.

In Table 5-3 entitled Approximate Mine Rock and Overburden Volume and Production Schedule in Section 5.7 on Mineral Materials Management, the total waste rock remains around 1,060,000 t relative to past documents (see the sections of this MDAG review above).

However, overburden has risen remarkably from past documents to "~170,400 m^3", expressed as m^3 instead of tonnes like the waste rock. It would be ~350,000 to ~400,000 tonnes of overburden. The overburden's ML-ARD status and its impact on water quality are poorly defined. This means that overburden at Great Bear becomes an environmental danger capable of substantial environmental impacts not currently identified or estimated.

Table 5-4 contains Preliminary Threshold Criteria for Segregation the AEX Program Mine Rock. The criteria for "PAG" do not say whether the criteria are "AND" or "OR", which is a huge difference and serious omission. Thus, ML-ARD is clearly still not reliably estimated, predicted, and understood at the Great Bear Project as of November 2023.

The text in Section 5.7.2 alarmingly says,

> "A preliminary sulphur threshold (TS) of 0.15% has also been proposed to differentiate between PAG rock and NPAG rock. The proposed threshold values are generally accepted as industry best practices in the absence of a site specific geochemical value."

No, 0.15%S is not "industry best practices". Quebec uses ~0.05%S and other provinces have not established a minimum value because technically there is no minimum value. Furthermore, it is rarely the sulphur level alone that distinguishes "PAG" (incorrectly defined in this document as "potentially acid generating" and "NPAG" (incorrectly defined in this document as "non-potentially acid generating"). Instead, according to the federal ML-ARD Prediction Manual (Price, 2009), the amount of Effective Neutralization Potential (ENP) plays a major role, as does site-specific criteria for the ENP-to-sulphur ratio.

This is explained in detail in the 600-page federal ML-ARD Prediction Manual that this ML-ARD work for the Great Bear Project is legally supposed to follow but does not. As a result, this "preliminary sulphur threshold" is an unreliable, questionable, and uncertified attempt to proceed with the design and planning for Advanced Exploration. Insufficient reliable information is available at this time, and even Appendix A "Certifications" is missing from this document. As a professional

in ML-ARD, I want to know the certified professional(s) who created these "preliminary" criteria.

"NML" is defined in this Closure Plan as "non-metal leaching" which does not apply to any rock in the world, as all rock is capable of leaching some metals and even nonmetals. In any case, "NML" in Table 5-4 for the Great Bear Project is rarely definable by the solid-phase level of a single element like "Arsenic < 30 mg/kg", but Kinross Gold does not know this because it has not yet completed the on-site and laboratory-based kinetic tests. If leaching were dependent on solid-phase levels as believed here, then Great Bear waters would contain thousands of mg/L of aluminum and silica because most of its rock is made of those elements. But this is not the case. This is why these are called "preliminary threshold criteria" in Table 5-4, which in reality are likely wrong and nonsensical.

Section 9.16 on Watercourses and Site Drainage contains Tables 9-1 to 9-5. Tables 9-4 and 9-5 contain predictions of on-site and effluent contaminant levels only after closure, which would obviously be much less than during active exploration. However, the text does not even discuss or explain Tables 9-4 and 9-5. They appear to be "thrown in" to appear complete.

Table 9-4 contains Geochemical Source Terms, which are the predicted aqueous concentrations for all contaminants in Great Bear water caused by Advanced Exploration. In reality, there are many problems with this Table 9-4 including:

- It does not include "PAG" concentrations which will be much worse and will be present for at least four years, because this Table is intended only for closure but alarmingly does not include the likely more severe PAG contamination when it is backfilled into the underground workings.
- It assumes closure drainage from "Covered and Revegetated Area" will be instantaneously at pre-exploration "baseline water quality", which is wrong.
- It shows elements likely requiring perpetual post-closure treatment include aluminum, antimony, arsenic, and selenium.
- It does not include predictions for many potential contaminants such as manganese, magnesium, sodium, potassium, barium, hardness, alkalinity, acidity, fluoride, chloride, bismuth, chromium 6+, lithium, silicon, strontium, tellurium, thorium, tin, titanium, and zirconium.
- It does not allow for federal emerging contaminants such as platinum-group metals and tantalum.
- It is based on a report "WSP 2023f" which is the draft "WSP, 2023f. Advanced Exploration (AEX) Phase – Preliminary Water Quality Estimate Update - Draft. WSP E&I Limited, April 2023". This report is only draft and thus is unreliable and not professionally certified.

Table 9-5 contains Mine Water Pond Overflow Estimated Water Quality which apparently would be overflow off the exploration site upon closure. It raises important questions, like how does aqueous sulphate decrease from 75-100 mg/L (Table 9-4) to 18-25 mg/L (Table 9-5) in mine-water-pond overflow when there is no treatment? In any case, some predicted concentrations are likely too high to discharge to the environment like arsenic. Also, sulphate reportedly increases the methylation of mercury and other elements.

Table 12-1 is the Closure Cost Estimate. The cost for moving PAG rock back underground is set at $30.00/m^3 which is ~$15.00 /tonne. The total waste rock from Advanced Exploration is estimated at 1,060,000 t. Kinross Gold currently guesses, based on preliminary uncertified information, the waste rock will be about one-third to one-half "PAG" requiring backfilling to the underground. Therefore, the cost for this task alone is $5,000,000 to $7,500,000 based on the unverified guess, and could reach a maximum of $15,000,000. Because the current Grand Total for Closure is estimated at ~$10,000,000, the backfilling of rock is the major cost item and could cost much more than the $5,730,000 currently estimated. In turn, Total Cost could cost many millions of dollars more than currently estimated from the guessed minimal amount. Put simply, closure costs are likely grossly underestimated.

All six appendices of this Program Closure Plan are missing, including professional certifications. This is likely not an error or oversight, meaning this Program Closure Plan should not be considered reliable and dependable.

In summary of the password-protected Program Closure Plan, Draft for Indigenous Review from November 2023,

- In November 2023, the volume of overburden has approximately doubled from previous documents without an explanation. Because overburden generally has a 50% probability of releasing ML-ARD and contaminating water, overburden represents a major but unexamined threat to water quality on, around, and beneath the Great Bear exploration site.

- "Preliminary" criteria are provided for separating "PAG" and "NPAG" rock and for "NML" rock. However, these acronyms are not used in an accurate manner consistent with the 2009 federal Prediction Manual (Price, 2009) required under Regulation 240/00. The preliminary criteria are not rational based on ML-ARD science unless justified with detailed and intensive site-specific studies, which have not yet been completed and certified for the Great Bear Project.

- The potential for ML-ARD after closure is presented all the way to detailed predictions of aqueous concentrations in mg/L for on-site water and effluent to the environment only after closure. However, these predictions are not explained in any detail, are not justified, appear anomalous, and are not certified by a qualified professional. Some predictions are actually pre-exploration baseline which are erroneously assumed to be re-established immediately at closure. Furthermore, these predictions are missing more than a dozen potential contaminants.

- The "PAG" rock, which would likely create the highest contaminant concentrations, is not included in this Program Closure Plan, presumably because this "PAG" rock will be backfilled underground. However, when placed underground, this "PAG" rock will likely continue to release severe ML-ARD until submerged, at which point a relatively huge amount of accumulated contamination would be released into the underground water. After the mine is refilled to equilibrium and the minewater begins flowing into the surrounding groundwater system and through the many permeable drillholes more than 500 km long to the

environment, it will contaminate large surrounding areas. This major risk to water quality and the environment is not even mentioned in this Closure Plan, which is a major omission.

- The backfilling of "PAG" rock at closure is the largest individual cost item for closure totalling around $10 million. However, this reflects the currently minimum volume based on preliminary, unreliable information. In the worst case, which was assumed for the Great Bear Project Definition and still not disproven, total closure costs could exceed $20 million.

6. Hydrogeological Workplan (December 21, 2022)

This Workplan for 2023 says:

> "The purpose of the program will be to develop a refined hydrogeological model of the site, support groundwater model calibration and be used for long-term monitoring. The information collected in the upcoming field surveys will supplement the existing information.... Hydrogeological testing and groundwater sampling will occur at specific locations near the Project site shown in Figure 1."

However, Figure 1 of the Hydrogeologic Workplan shows a major omission which would preclude fully meeting its purpose and objectives. The currently proposed mine plan shows the "Tailings Management Facility" extending at least 2 km to the west and northwest of Tear Drop Lake. Figure 1 shows that the Tailings Management Facility and its hydrogeologic effects would extend far beyond the western limit of the monitoring wells. Thus, many more monitor wells are needed westward and northward at least to Stone Lake, Gullrock Lake, and Genessee Lake.

In summary of this Hydrogeological Workplan from December 2022, there is a major omission that would preclude a reliable and comprehensive assessment of current baseline hydrogeologic conditions and of future impacts from proposed mining. The groundwater monitoring network does not extend far enough to the west and northwest, beyond the proposed western portion of the Tailings Management Facility.

7. Surface Water Quality Workplan (December 21, 2022)

This Workplan for 2023says:

> "Baseline surface water quality work has been ongoing for the proposed Great Bear Project (the Project) since 2020. This proposed workplan for 2023 is to gather supplemental water quality data that will be used to further support long term monitoring and the development of the Project."

This Surface Water Quality Workplan provides incomplete lists of important details prefaced by "including", like "These sampling locations include..." and "Standard suite of total and dissolved metals including...". This can lead to major problems in the future if a sampling location or water-quality parameter is missing.

For example, the "Standard suite of total and dissolved metals including..." does not mention important elements like manganese, titanium, thallium, and federal emerging elements like tantalum and platinum-group elements. Therefore, Kinross Gold is risking major omissions and flaws that can arise later by not being comprehensive in its "including" lists.

In summary of this Surface Water Quality Workplan from December 2022, there are insufficient information and details to determine if appropriate work is planned and conducted. This is because important details are listed only as "including". For example, major potential contaminants like manganese and thallium are not specifically listed, but perhaps they are implicitly included? There is no way to know.

8. Fugitive Dust Best Management Practices Plan, final draft (September 2023)

Section 4.5 on Material Stockpiles in this "Final Draft" states there will be two overburden stockpiles created during Advanced Exploration, one north of the mine-rock pile and another east of the crusher area. Some Great Bear documents reviewed above and the undated "AEX Site Plan - Updated.pdf" do not show this. Because the overburden has a general 50% probability of contaminating water and because overburden is specifically listed as a site component requiring ML-ARD evaluation and potential mitigation, this contradiction on overburden stockpiles is not acceptable. It further shows that Kinross Gold's ongoing issuing of "preliminary", "initial, and "draft" documents is causing confusion inside the project itself and thus should not be approved at this time.

Section 5.1 on the Composition and Characterization of Particulate Emissions contains a major error that would grossly underestimate the geochemical contamination of soil, vegetation, water, and biota by dust, and is thus not acceptable. Section 5.1 says:

> "Fugitive dusts from roadways and stockpiles may contain trace metals which may be considered negligible as these would be similar in concentration to the background rock."

The ML-ARD studies currently underway on ore, waste rock, and overburden have already shown that some material will contain substantial solid-phase levels of many elements and will leach to some degree. This is certainly not "background rock" as assumed in this fugitive-dust study. Therefore, fugitive dust should be an important component of impact assessment for Advanced Exploration and proposed mining.

Furthermore, proposed dust suppression by watering could lead to widespread metal leaching and water-quality degradation across and around the proposed exploration site.

In summary of the final-draft Fugitive Dust Best Management Practices Plan of September 2023 for Advanced Exploration, this work is unacceptable because it grossly underestimates the potential impacts from geochemical contamination of soil, vegetation, water, and biota by dust. This work assumes the on-site sources of dust "would be similar in concentration to the background rock". This is wrong and ignores the ongoing ML-ARD assessment of ore, rock, and overburden.

9. PTTW Application for Dewatering, final draft (October 2023)

This is one of the few Great Bear documents that provide names for the qualified person writing the report, appropriately signed as "DRAFT" at this time. However, the reviewer but not the author is a P. Geo. So additional information is needed on the qualifications and certifications of the author(s). PPTW stands for "Permit To Take Water", meaning using and removing water from the Great Bear site.

9.1 Main Report

The tone of this "final draft" report for Advanced Exploration is apparent from Section 1.1 on the Purpose and Scope of This Submission. It says:
"Water takings during the AEX Program will include:

- Water pumped from the underground exploration workings (underground dewatering)
- Incidental surface water and groundwater takings, expected to occur during excavation of water management ponds.
- Direct taking from Dixie Creek (up to 250 cubic metres per day; m^3/day) to be used for dust suppression, industrial activity (e.g. in support of development pad construction and packing) and advanced exploration drill water cooling (underground drilling).

"No other takings from other area waterbodies (lakes, rivers, streams) are proposed.

"Most of the dewatering water pumped from the underground exploration workings will be directed to ponds within the AEX water management system, treated and ultimately discharged to the environment to be approved under an Environmental Compliance Approval for Industrial Sewage Works (ECA ISW)"

First, note that the only numerical water withdrawal mentioned is up to 250 m^3/day (250,000 L/day) from Dixie Creek. Thus, it is stunning that the actual total water withdrawal from the local water balance, as shown in Table 4-1 (discussed below), would be at least 3,203,000 L/day every day and reaching up to 7,703,000 L/day on some days as a contingency. Even these values are unrealistically low (see Section 9.2 below). This major withdrawal of water, that could upset and dewater groundwater zones like aquifers and surface waterbodies like creeks and lakes, is much more extreme that numerically indicated in Section 1.1. This justifies an impact assessment on the proposed Advanced Exploration, despite this final-draft document stating:

> "The AEX Program does not meet the requirements of the Impact Assessment Act, Physical Activities Regulations. A Federal Impact Assessment is therefore not anticipated to be required."

Second, note that the quotation above states that water taken from Dixie Creek would be used for "dust suppression" among others. As explained in the previous Section 8 of this MDAG review, adding such water to ML-ARD dust from ore, rock, and overburden could seriously degrade water quality throughout the site and surrounding environment. However, this major environmental risk

is not considered or even mentioned here or in the fugitive-dust study. In fact, it is unreliably assumed to be no environmental risk at all.

Third, the discharge of up to 7,703,000 L/day of water that is only partially treated (see the details in other sections of this MDAG review like Sections 5 and 11) into any receiving environment could cause significant impacts from (1) the physical volume of the additional water and/or (2) its altered chemistry from baseline with implications on the receiving environment and cumulative effects.

Table 4-1 on Requested Water Takings shows that the requested surface-water withdrawal from Dixie Creek is 250,000 L/day and an additional 170,000 L/day from pond excavations. However, more than 10 times this amount will be removed from the groundwater system every day. The additional groundwater withdrawal is estimated at 783,000 L/day from pond excavations, 2,000,000 L/day from underground pumping, and on perhaps 30 days each year an additional 4,500,000 L/day removed as a contingency. Furthermore, as explained below for Appendix B of this PTTW document (see Section 9.2 of this MDAG review), the groundwater model incorrectly underestimates the much higher inflows that would arise during desaturation of the overburden and the rock surrounding the mine inside its "Zone of Influence".

Total water withdrawal from the existing water balance could thus likely be much more than 7,703,000 L/day relative to the Dixie Creek withdrawal of only 250,000 L/day. All this water would be taken from the existing baseline groundwater/surface-water balance which has likely reached some type of baseline equilibrium over the last thousands of years. When up to 7,703,000 L/day or more is removed from this equilibrium, there could be major disruptions to local and regional surface waters and groundwaters.

For example, a significant portion of the underground pumping of more than 6,500,000 L/day could be pulled from Dixie Creek through the underlying groundwater system. Thus, "takings" from Dixie Creek could in reality be 250,000 L/day plus substantially much more than this through groundwater. "Takings" could also come from other streams, lakes, and groundwater zones like aquifers, despite this report clearly stating, "No other takings from other area waterbodies (lakes, rivers, streams) are proposed". This statement is not reliable and could be seriously wrong.

Section 5 of this PTTW Application discusses Potential Environmental Impacts, with Section 5.2.1 specifically on Dixie Creek. There appears to be significant confusion here on the impacts of dewatering the underground workings on Dixie Creek.

Part of this confusion arises in the false thinking that baseflow coming from groundwater is simply part of the total flow in Dixie Creek. In reality, groundwater baseflow likely has a different, more stable temperature and a different water quality than the surface water flowing past the Great Bear Project. Therefore, it is important environmentally and to the benthic ecosystem to consider baseflow coming from groundwater separately from surface flow already in the creek.

Another part of this confusion on the physical impact of mine dewatering on Dixie Creek is related to which surface flow is used. Section 5.2.1 uses Average Annual Flow, Low Flow Period Average Flow (March), and Low Flow 7Q20. These show that mine dewatering will reduce flow in Dixie

Creek by only 0.2 to 2.4%. Again, these impacts would be greater because the groundwater of Appendix B (see Section 9.2 below) has underestimated the amount of underground water that has to be pumped.

Table 5-2 is more relevant for Dixie Creek, also copied as Table 7-2 in Appendix B. It shows the important, separate baseline baseflow for Dixie Creek is 2,601,000 L/day. This is predicted to be reduced by 873,000 L/day during dewatering for Advanced Exploration, although this is likely substantially underestimated by the groundwater model. Thus, much more than 34% of Dixie Creek baseflow will be taken away by the mine, which would have significant adverse effects during drought periods and on the quality of the benthic aquatic habitat. Additionally, the baseflow for Unnamed Waterbody 3 (called "Dixie Creek Tributary (TL-3)" in Appendix B) would be reduced a substantial 55%. This justifies an impact assessment for the proposed PTTW Application.

It is very important to note that this PTTW Application for Dewatering, final draft, contains and is based on critical information in its Appendices. The following comments pertain to these appendices, which in turn shows the main report is not reliable and not reasonable as a PTTW Application.

9.2 Appendix B

Appendix B of this PTTW report is a "Draft" Groundwater Modelling Report to Support PPTW Application for Underground Dewatering Final Draft. It contains a serious error in the groundwater modelling that underestimates initial groundwater inflow rates and thus dewatering pumping rates.

Table 4-1 of the main report says 3,203,000 L/day of groundwater would be removed every day, reaching up to 7,703,000 L/day on some days. Table 6-2 of this groundwater appendix says that the groundwater grid, from Genessee Lake on the west to half of Rice Lake to the east, has total groundwater inflows and outflows of ~10,000,000 L/day. If this modelling were correct, this means that roughly 32% of all groundwater in the area of the Great Bear Project will be drawn into and out of the mine on a daily basis, with up to 77% drawn into and out of the mine on some days as a contingency. However, it could well be worse as explained next. This justifies an impact assessment for the proposed PTTW Application.

If dewatering starts and continues for several years as proposed for Advanced Exploration at the Great Bear Project, and later during the expansion of proposed mining, groundwater inflow will come from two basic sources. The first, initial inflow will predominantly reflect the desaturating drainage of pores in the overburden and fractures in the rock, which will be relatively high at first and then decrease. Notably, the modelling currently shows that the overburden will eventually be virtually 100% dewatered to its base. This is called "transient conditions" and reflects the "specific yield" of the overburden and the "storage coefficient" of the rock. As this first transient inflow slows, likely years after Advanced Exploration ceases, the groundwater inflow will then come from "steady state", reflecting the hydraulic gradients and the hydraulic conductivities.

This modelling for Great Bear in Appendix B and for the PTTW Application is solely "steady state",

with no high transient inflow considered and no values for specific yields and storage coefficients even mentioned. Section 6 of Appendix B on Groundwater Model Development is clear on this:

> "Groundwater modelling was conducted for two phases: pre-mining site conditions for model calibration and mine operations conditions to predict *groundwater discharge rate to the proposed fully developed and dewatered underground mine workings* [MDAG emphasis]. These numerical groundwater flow models consider 3D *steady-state flow conditions* [MDAG emphasis] and implement an Equivalent Porous Media (EPM) approach, which is deemed sufficient for characterizing the overall groundwater flow regime at the scale of this analysis."

Thus, groundwater inflows in the years of active mining during Advanced Exploration have been clearly underestimated by considering only steady-state inflows after the proposed workings are "fully developed". Also note the ambiguous and unjustified "deemed sufficient" for the overall "EPM" modelling of groundwater at the Great Bear Project.

Table 6-3 showed that pre-mining single-value "measured interpreted" baseflows at two locations agreed with the Simulated Baseflow reflecting only long-term steady-state conditions by 14% or better. These single-value baseflows were 2,281,000 L/day and 847,000 L/day, which are less than the total groundwater that would be pumped from the mine during Advanced Exploration. Thus, a concern arises on whether baseflows could be significantly decreased by this pumping during Advanced Exploration. The main report (see comments above in Section 9.1 of this MDAG review) says the (underestimated) pumping effect would be minimal on most statistical values of flow in Dixie Creek. It is not emphasized that pumping would substantially reduce baseflow, with differing water quality and temperature than the surface water, and would be even more significant during droughts.

Figure 6-6 shows that the pre-mining Simulated Groundwater Levels were often 5 to 10 m higher than Observed Groundwater Levels, showing a strong bias towards overestimated (higher) simulated groundwater levels. It is not clear if this suggests simulated hydraulic conductivities may be too low. In any case, this problem manifests in Figure 6-7 where the simulated levels around Great Bear and Dixie Creek are typically around 9 m too high, which incorrectly and falsely indicate Dixie Creek could not be significantly dewatered during pumping because the water table is simulated to be very high. This is probably why Table 7-2 shows that the substantial yet likely underestimated partial dewatering of Dixie Creek Tributary (TL-3) and baseflow of Dixie Creek is 55% and 34%, respectively, and these dewatering percentages could be much higher if modelling were more accurate.

Of note, Table 7-1 indicates dewatering of Dixie Creek is only 1% because it uses the average annual flow that includes the sum of all storm events. It does not consider lost baseflow during dry times when aquatic life, vegetation, and water quality can be more severely degraded. Again, the simulated groundwater levels around Dixie Creek and Great Bear are often modelled around 9 m too high and thus actual dewatering of creeks and lakes could be much higher than stated in this groundwater report. In this case, Section 10 incorrectly states and underestimates based on the modelling that:

> "At the end of the AEX project, when dewatering is at its maximum, the model simulates a baseflow reduction for the Dixie Creek of 8.5% of the estimated 7Q20 (10,368 m^3/d) and 1% of the average annual flow (114,912 m^3/d), which is unlikely to change the nature of the flow

regime in the creeks."

In Section 7.1 on Groundwater Inflow Rate and Zone of Influence:

> "... the simulated long-term groundwater inflow rate into underground mine workings is 1,920 m^3/d [1,920,000 L/day]. This estimate of groundwater inflow into the fully developed mine does not consider uncertainty, seasonal variations or any loss from aquifer storage."

This simulated inflow is consistent with the estimated 2,000,000 L/day requested "taking" in the main report and in Table 8-1. However, the occasional contingency of 6,500,000 L/day which is apparently from "uncertainty, seasonal variations or any loss from aquifer storage" is relatively major. It highlights the expected variability of withdrawals and discharges of water into the surrounding environment during Advanced Exploration. Moreover, the reference to "aquifer storage" highlights the failure of the modelling to consider higher-inflow transient conditions which would be most important in the early several years of Advanced Exploration.

However, even ignoring the important high-flow transient conditions, Table 7-1 shows that the steady-state 2,000,000 L/day can be easily exceeded by non-base-case conditions like three-times-higher hydraulic conductivity of bedrock and by the water-conducting LP Shear Fault 1.

Section 7.1 explains:

> "The model-predicted Zone Of Influence (ZOI), defined here as 1 m drawdown of head in the glacial till unit is shown in Figure 7-1. The ZOI is predicted to extend about 1.2 to 2.5 km from the centre of the AEX site to surrounding environs."

Using the 1 m drawdown contour is not appropriate here, because modelled groundwater levels are already around 9 m too high and because Figures 4-9 and 4-12 show that some shallow groundwater levels can vary by 1 m naturally. Thus, the Zone of Influence could turn out to be much larger and thus affect lakes and creeks. In any case, even a 1 m decrease in groundwater level beneath a creek or lake can lead to substantial dewatering.

Figure 7-1 shows Simulated Drawdown Contours in Glacial Till. However, drawdown is only shown as a maximum of around 36 m, which is obviously not correct for dewatered drifts up to 600 m deep. Moreover, the maximum drawdown of 36 m in the overburden means most of the pores of the overburden would be primarily drained into the mine, which occurs during the ignored transient conditions.

The apparent explanation for the discrepancy between the maximum 36 m drawdown and the dewatered workings 600 m deep is that the drawdown in the bedrock is not shown, but would locally obviously be around 600 m. This 600-m drawdown would likely create a relatively huge drawdown zone in bedrock around the Advanced Exploration and the proposed mine extending for many kilometers around. This would be much larger than in the Zone of Influence in the overburden shown in Appendix B Figure 7-1. This justifies an impact assessment of this proposed dewatering since many impacts of the dewatering have been ignored or underestimated.

9.3 Appendix C and Its Several Draft Monitoring Programs

Appendix C contains draft monitoring programs. The "Working Draft" AEX ISW Groundwater Monitoring Plan, like many other Great Bear documents, ignores the overburden that likely has ML-ARD potential and can seriously contaminate water. This lack of consideration for potentially contaminating overburden can be seen in Figure 1-7 Water Management Schematic that has no mention or recognition of the overburden stockpile(s). The same is noted in Figure 1-6 of both the "Draft" ECA ISW - Advanced Exploration Surface Water Monitoring Plan Draft and the "draft" AEX ECA ISW Aquatic Resources Monitoring Plan in Appendix C.

9.4 Appendix D

Appendix D Consultation Records is missing from this file.

9.5 Summary

In summary of this PTTW (Permit To Take Water) Application for Dewatering, Final Draft, and its several important appendices from October 2023, there are alarming errors and ambiguities that should preclude approval of PTTW. These should also trigger a detailed impact assessment, which this PTTW report conversely says is not needed for Advanced Exploration at Great Bear.

In the introduction to the main PTTW report, the only numerical water withdrawal mentioned is up to 250 m^3/day (250,000 L/day) from Dixie Creek. Thus, it is stunning because the actual total water withdrawal from the local groundwater/surface-water balance would be at least 3,203,000 L/day every day and reaching up to 7,703,000 L/day on some days as a contingency. Even these values are unrealistically low as explained here.

The errors begin with groundwater modelling that is based on long-term "steady state conditions" after the mine is "fully developed" and dewatered, and not on the correct, higher-inflow "transient conditions". Thus, inflow, pumping, and dewatering are significantly underestimated by the groundwater model and the PTTW Application. Additionally, there are problems with unrealistically low estimated effects on partial dewatering of Dixie Creek and other creeks and rivers. For example, simulated groundwater levels are modelled around 9 m higher than measured around the mine and Dixie Creek, which artificially and incorrectly prevent additional dewatering of Dixie Creek.

Groundwater levels are shown to be drawn down during dewatering to a maximum of only 36 m even though the dewatered workings will be 600 m deep. This reflects (1) nearly fully dewatering of the shallow overburden and (2) the lack of admission on the likely huge drawdown and much larger "Zone of Influence" in the rock beneath the overburden.

Baseflows into Dixie Creek and other waterbodies can be critical to aquatic, benthic, and terrestrial ecosystems because of groundwater's typically different water quality and temperature compared to water already flowing at the surface. This becomes more critical during droughts when baseflow

may be the main source of surface flows. The PTTW Application ignores the fact that more than 34 to 55% of existing baseflow would be lost during Advanced Exploration. It instead points out that the loss to groundwater would be only 2.4% and less of total flow depending on the chosen surface-flow statistic.

Overburden is routinely ignored in this PTTW document and its appendices, despite the proposed hundreds of thousands of tonnes of overburden likely having at least some ML-ARD potential and capacity to degrade water quality. In fact, some of the underground dewatering would be sprayed on the overburden for dust suppression, which in turn could lead to contaminated runoff across and off the site.

10. Draft (?) Detailed Project Description (November 2023)

In June 2023, Kinross Gold released the [final] Initial Project Description for the Great Bear Gold Project. Five months later, Kinross Gold issued the Detailed Project Description, where the first cover page showing "Kinross" says "DRAFT", but the second cover page for WSP E&I Canada Limited does not say "Draft".

The Kinross/WSP documents reviewed so far for proposed exploration and proposed mining are a mess with confusions over draft, preliminary, initial, and final. There is no reliable way to know what information issued by WSP and Kinross is considered final, reliable, and still applicable. In my opinion, all reviews for Great Bear should stop until Kinross Gold and WSP identify the final designs and plans for proposed exploration and proposed mining. Only then should they issue the final documents, signed and approved by qualified professionals.

Because the Initial Project Description was followed five months later by this perhaps-draft-perhaps-not-draft Detailed Project Description that apparently includes responses to Initial concerns, only the latter document is reviewed here.

10.1 Section C.3.3 Proposed Mine Facilities and Infrastructure

Section C.3.3 and Table C.1 provide a detailed list of all proposed mine facilities, many of which would be created during Advanced Exploration, which as explained above is closer to a first phase of mining. Many of the listed facilities require ML-ARD assessment including all under the headings of Underground and Open Pit Mine including mine walls and sumps, Stockpiles including overburden and waste rock, Tailings and Site Water Management including ditches, Aggregate Supply, Waste Management, Fuels and Reagents, all access roads and haul roads, all excavations and foundations for buildings, facilities, pipeline corridors, upgrades to bridge crossings, and the core shack including core-storage areas. Because these ML-ARD assessments are not completed at this time, it is prudent to conduct an impact assessment on all these components.

The Stockpiles section says:

> "Stockpiles will be created on the surface near the mine to store ore, mine rock, and overburden / organics resulting from site and mine development. Preliminary storage capacities of the stockpiles for the Project are the following, subject to revision as a result of ongoing exploration and technical studies:
>
> - Run of mine (i.e., uncrushed rock as transported from the mine) ore stockpile: approximately 0.1 to 0.5 million tonnes (Mt)
> - Low grade ore stockpile: approximately 5 to 20 Mt
> - Mine rock stockpile(s): approximately 210 Mt
> - Overburden / organics stockpile: approximately 40 Mt."

Thus, upon full mining, there would hundreds of millions of tonnes of mine waste, with most of it likely remaining on the surface and requiring perpetual maintenance. Additionally, low-grade ore

stockpiles are sometimes left on site after closure as waste-rock dumps. Because of this, some jurisdictions require financial assurances on perpetual maintenance of the low-grade dumps until/if they are processed. This should also be done for the Great Bear Project.

> " Based on the scale of the stockpiles and the environmental baseline studies which are in progress, it is expected that one or more of the Project stockpiles will overprint minor creeks which may contain fish."

Thus, there will be "overprint" impacts through destruction of fish, fish habitat, and associated water quality.

The Ore Processing section says:

> "Ore processing will entail several stages of conventional mineral processing such as grinding and classification, and cyanide leaching to separate the gold / silver from the gangue leading to production of doré bars."

Thus, the processing will add contaminants including cyanide and accelerated leaching of metals and other elements that will contaminate the water in the process, in the tailings impoundment, and in the fugitive seepage that will flow into the environment.

Also:

> "There are no sources of mercury from the ore processing."

This appears impossible because the ore rock going in, and the tailings and concentrate coming out, of ore processing should and will contain some level of mercury. The processing could even increase the solubility or leaching rate of mercury and other elements. Therefore, this appears to be an error unless Kinross Gold can prove the tailings and concentrate from the ore processing contain absolutely no mercury. This is highly unlikely if not impossible to prove.

The section on Tailings Management explains:

> "The primary by-product of ore processing is tailings. Tailings consist of ground rock and associated process effluents that result from the processing of ore. Tailings will be treated for cyanide destruction before storage. As part of the ongoing geochemistry investigations it was determined that the tailings may be potentially acid generating, Kinross is investigating the potential to desulphurize the initial tailings stream resulting in a non acid generating flotation tailings, and a smaller quantity of sulphide tailings that would be managed in a manner to mitigate their acid generating potential."

Cyanide destruction is rarely perfect and sometimes simply converts the cyanide to thiocyanide or cyanate which can then revert to cyanide after release to the environment. Because the details of Great Bear's cyanide destruction are not given, it is prudent to assess it for potential environmental impacts.

Tailings Management further says:

> "Tailings will be transferred from the processing plant to an onsite surface management facility as a slurry, or potentially as a filtered cake. A quantity of the tailings will also be sent to a paste backfill plant where they will be mixed with a binder (such as cement) to increase their strength, so that they can be returned to the underground workings to provide additional underground stability. Tailings could also potentially be stored in the open pit after mining

is complete.

Tailings paste backfill, dewatered filter-cake tailings, and the relocation and in-pit disposal of tailings each could have unique adverse impacts on water quality and this should be assessed by Kinross Gold.

> "Further detail on tailings management facility, including dam designs as applicable, will be developed as engineering progresses for the Project. The facility will be designed in accordance with all regulatory requirements including the Canadian Dam Association Dam Safety Guidelines as applicable."

Thus, the details for evaluating potential environmental impacts will not be available until "engineering progresses", which is consistent with the ML-ARD work which will not be completed for at least a few years.

Notably, this section on Tailings Management has no detailed description of water management including any water recirculation. This is a major omission that precludes a reliable assessment of impacts from how much water would be needed daily to run this proposed mine.

The section on Buildings and Yard Areas states:

"The following new permanent facilities are planned for the Project:

- Process plant and crusher / conveying system
- Mine office / dry / maintenance / wash bay complex
- Cold and warm storage buildings
- Reagent storage facilities
- General laydown areas and parking
- Additional core shack, laboratory and outbuildings
- Accommodations / camp
- Explosives storage facilities.

These will be supported by related road, piping and power infrastructure as needed."

The disturbed rock or overburden used in any of these Areas requires an ML-ARD assessment as explained in the 2009 federal ML-ARD Prediction Manual (Price, 2009).

The section on Water Management Facilities and Drainage Works explains:

> "Kinross proposes to establish an integrated water management system for the site to manage contact water from the underground mine, open pits and surface facilities. The underground mine will intercept groundwater, while the open pit will collect groundwater, runoff and direct precipitation. Mine water from the required dewatering of the underground mine and open pit, to enable mining to occur will be collected in sumps and pumped to the surface for additional management. The mine water management and treatment infrastructure developed for the AEX program is expected to be re-used at the beginning of operations and will potentially be incorporated into the overall integrated water management system for the operating mine.
>
> "Precipitation and surface runoff that comes into contact with mine-related facilities on surface will be collected in ditches and collection ponds designed. As needed, the water will be directed to the integrated water management system for treatment and discharge with

other site contact water.

> "The integrated water management system and associated effluent treatment plant will be designed and operated to ensure that effluent from the site meets all regulatory requirements and can be discharged to the environment. Effluent will be discharged to the Chukuni River a large watercourse with high assimilative capacity. This will allow continued use of the pipeline corridor established for the AEX program. The additional infrastructure required for the mine has not yet been determined."

This section on Water Management Facilities and Drainage Works does not explain the storm return periods for which the drainage works would be sized. Nor does it specify the design return period for the post-closure water management, such as the 24-hour 1-in-200-year precipitation or the Probable Maximum Flood. This is a major omission that precludes a reliable assessment of impacts from storm events that could lead to spills of contaminated site water, and thus confuses the decision on whether an impact assessment should be conducted.

Under Access and Site Roads:

> "A network of roads of will be established within the site as needed, minimizing water crossings. New roads will be constructed of aggregate or non-potentially acid generating mine rock. New major road and watercourse crossings are not expected for the Project, although minor crossings and cross drainages may be needed. The water pipeline corridor which will be developed for the AEX program, and potentially expanded with additional pipelines for the mine, includes an access road to allow for pipeline inspections, environmental monitoring and maintenance, and is expected to cross four headwater creeks / low-lying swales, likely as culverts (Figure C.1 and Figure C.2). The existing prefabricated truss bridge across Dixie Creek may be upgraded."

Any surface and subsurface disturbance including new roads require ML-ARD assessments before an impact assessment can be done according to the 2009 federal ML-ARD Prediction Manual (Price, 2009).

The Section on Aggregate Operations contains a serious error:

> "Aggregate will be required to develop the Project. The primary source of material is proposed to be *nonreactive mine rock and overburden* [MDAG emphasis] from stripping and other construction activities within the site. There are licensed commercial aggregate pits nearby (along Tuzyk's Road) that also represent a potential source of aggregate for the Project. Discussions with the owners of these aggregate facilities are planned to explore potential commercial arrangements.
>
> "New quarries for crushed rock and sand and gravel pits may be established on the Property if needed under the care and control of Kinross. Locations are not as yet known but may be situated at future development locations (such as within the tailing management area)."

Because there is no such thing as "nonreactive mine rock and overburden", then there will be no aggregate which is "required to develop the Project", which in turn literally means there can be no Great Bear Project or mine. This illustrates how Kinross Gold is submitting perhaps-draft

documents with statements intended to alleviate concerns that are instead false and misleading.

This document is not signed and certified by Qualified Professionals, so at least portions of this Detailed Project Description are more akin to Public Relations than technical accuracy. Grassy Narrows First Nation should be aware of these false statements in important documents supposed to describe accurately and reliably the proposed exploration and proposed mining of the Great Bear site. It is not prudent to decide impacts of proposed exploration and mining based on false technical statements.

10.2 Section C.3.4 Preliminary List of Mine Activities

This section C.3.4 lists many "preliminary" activities during Construction, Operations, and Decommissioning and Closure. While many sound like generally good ideas, they can turn out to be bad ideas and not even possible at the Great Bear Project.

For example, here are some "preliminary" activities:

> "Overburden and organic material from the open pits will be either stockpiled or used for progression reclamation"
>
> "Mine rock extracted from the underground workings and open pits will be stockpiled, re-used as aggregate, or potentially re-used a consolidated rockfill underground"

The Project Definition Document of December 2022 assumed all the mine rock would have strong ML-ARD potential and would substantially contaminate water. Overburden was not even assessed although required by Ontario Regulation 240/00. It is understandable that the initial worst-case scenario may be modified as years go by and as ML-ARD studies are completed according to the 2009 federal ML-ARD Prediction Manual. However, there may be little change from the worst case at the Great Bear Project, but no one knows at this time. Thus, these "preliminary" activities can cause wider and worse impacts; no one knows at this time. Nevertheless, this perhaps-draft Detailed Project Description lists them anyway without pointing out their potential for adverse impacts.

This section also says,

> "As operations continue the open pit will have a progressively larger surface area and will become deeper"

The proposed pits are a concern to me as I do not see them justified by Kinross Gold. In fact, Figure C.5 shows that most of proposed pits and excavations are not needed to access most of the ore. Thus, there seems to be another, unstated reason for them, but I cannot see what it is.

10.3 Section C.3.5 Preliminary Decommission Approach

This section says:

> "Decommissioning and final closure of the Project site will be governed by the Ontario Mining Act, and its associated Regulations and Codes, and will be informed by ongoing engagement with Indigenous Nations and potentially affected stakeholders. The Act requires

> that a Closure Plan be filed for mining project before construction, and that financial assurance be provided so sufficient funds are in place to carry out the decommissioning activities.
>
> "A preliminary description of the proposed decommissioning and reclamation measures is provided in the text that follows. The preliminary measures are subject to consultation, additional engineering and regulatory review. The active phase of decommissioning and reclamation is expected to be completed within approximately three years of the end of operations. Environmental monitoring will continue after reclamation is completed, until such time as the closure objectives as determined in the Closure Plan have been achieved."

It is important to note that this preliminary closure plan, which should include early and unexpected closure but does not, will determine the initial financial security. Thus, all potential major sources of contamination should be identified and costed now, but this is far from the case.

Many serious long-term concerns are omitted and thus cannot be added at this time to the cost of the initial financial assurance. For example, the section on the Underground Mine does not mention the costly and serious water-quality degradation that would likely accompany the backfilling of "PAG" rock into the mine, where the rising, flooding water can become seriously contaminated beyond that seen at the surface. This seriously contaminated flooding water would likely eventually reach an equilibrium level where it would begin flowing out into the surrounding groundwater system and the environment years after closure. This would require long-term or perpetual pumping and treatment of groundwater, which could substantially or enormously raise the financial assurance.

Alternatively, the "PAG" rock (and overburden) could be kept in a stockpile at the surface where its ongoing seepage of infiltrating water through some type of cover would require perpetual collection and treatment. This section implies the ML-ARD would stop by incorrectly saying:

> "Reclamation measures will be designed to mitigate acid mine drainage / metal leaching concerns as needed. This may include design and placement of an appropriate cover over the mineral waste."

ML-ARD is not mitigated cheaply and permeable covers do not stop infiltration but may reduce it if well maintained in perpetuity, still leading to perpetual maintenance and water treatment. Very expensive impermeable covers may virtually encapsulate and isolate the contaminating rock and overburden if carefully maintained in perpetuity, which also includes additional costs for perpetual maintenance and repair.

Or perhaps as Section C.6 on Potential Alternatives states, the mine rock would be used as "reclamation material" where it could contaminate more of the site. Or the mine rock would be placed into "storage in depleted open pit". In the pits, the backfilled mine rock would contaminate inflowing water that would eventually fill and flow into the surrounding environment, or eventually drain down into the underground workings where the second paragraph above explains the fate of the underground water.

One way or the other, the closure cost only for the rock and overburden alone will likely be much higher than envisioned in this perhaps-draft Detailed Project Description.

There are other examples like this that are not recognized and costed in this Section C.3.5.

Therefore, whatever the current estimated cost of financial assurance based on Section C.3.5, it should be raised substantially higher. This would also cover the expense should early or unexpected closure occurs, which is credible and often expected but is not mentioned or considered in this Great Bear document.

10.4 Section F Potential Effects of The Project

Section F on potential effects of the project during Construction, Operations, and Closure starts with Table F.1 Preliminary List of Change to the Environment under Federal Jurisdiction.

The row of Table F.1 for the Fisheries Act during the Construction Phase says:

> "Alteration, disruption and destruction of fish and benthic fauna habitat from direct disturbance (including potentially from overprinting by mine rock and tailings management facilities), blasting and mine dewatering" with the Preliminary Area of Influence only "Project footprint"

For mine dewatering, the ongoing drawdown of groundwater and ongoing dewatering of surface waterbodies does not stop immediately as the pumps are turned off at the end of Operations, but can continue for many years afterwards through Closure. Also, the Area of Influence could be much greater than the Project Footprint (see Section 9.2 of this MDAG review). However, Operations and Closure does not mention this long-term ongoing impact. This illustrates how "Preliminary Changes" are only partially recognized in this Detailed Project Description, and important ones are not mentioned and considered.

Additionally, for Closure under the Fisheries Act Table F.1 says:

> "Potential for creation of fish habitat in new pit lakes, expected to be re-connected to the Dixie Creek system"

This shows a lack of understanding of water-quality impacts and ML-ARD, similar to the Great Bear "nonreactive mine rock and overburden" that does not exist (see Section 10.1 of this review). It sounds good to non-technical readers to say the pit lakes will be fish habitat and "re-connected" to Dixie Creek although they are not currently connected. On the other hand, technical readers know this is highly unlikely considering the type of rock and ML-ARD likely to come from Great Bear rock, pit walls, and underground mine walls. These Great Bear pits as proposed, long after Closure, should not be expected to meet the requirements of the Fisheries Act.

Table F.2 Preliminary Summary of Potential Environmental Effects says:

> "- Underground mine and open pit dewatering will affect the local groundwater levels and may affect surface water flows
> - Groundwater quality is not expected to be affected"
>
> "Preliminary Areal Extent:
> - Dewatering may result in a depression in the local groundwater level which is currently under investigation"

Section 9.2 of this MDAG review explains how Kinross Gold's groundwater modelling is aware of, but avoids showing, the substantial lowering of groundwater levels by dewatering to a remarkable depth of ~600 m in the rock, while the overlying overburden is virtually fully dewatered to its base. This dramatic lowering will be much more than the comfortable sounding word of "local" in the above quotations. It will be much worse than "local". This will also likely have a major impact on groundwater quality, as Section 9 of this MDAG review explains, despite Kinross Gold's unjustified and unreasonable expectation that "Groundwater quality is not expected to be affected".

Furthermore, surface creeks and lakes could be dewatered much more than modelled because modelled groundwater levels are simulated around 9 m higher than measured, reducing the modelled and predicted dewatering below reality. Baseline flows to local surface waterbodies, which are critical to the benthic ecosystem and aquatic life due to their differing chemistry and temperature, will be reduced by 34% and more, but no one yet knows how much more.

Section F.6.1 on Atmospheric Emissions has a major omission that shows the environmental impact from atmospheric emissions would be much greater than stated. Section 8 of this MDAG review has explained that fugitive dust at Great Bear, and any water used to suppress this dust, would have a substantially larger environmental impact than currently recognized and modelled. Thus, impacts from air emissions have been underestimated in this Detailed Project Description that could be used to determine an impact assessment.

Section F.6.2 Liquid Discharges states:

> "Mine water will contain suspended solids from mining and earthmoving activities, ammonia residuals from ammonia-based explosives, and residual hydrocarbons from heavy equipment operation. Leaching of the exposed bedrock within the underground mine and open pit may potentially contribute minor quantities of metals to the mine water."

This is another example of bad science appearing as technical information in this perhaps-draft Detailed Project Description.

- First, underground mine water will also contain dissolved metals and other inorganic contaminants.
- Second, since ammonia is expected to be so high from underground explosives that a special treatment circuit is needed for it, then the always accompanying high nitrate and nitrite that will not be treated but discharged to the environment will also be high and contaminating.
- Third, since underground mine water will contain hydrocarbons, why is there no option to treat these potential organic contaminants?
- Fourth, leaching of mine walls in underground workings and open pits can, and elsewhere have, seriously contaminated the mine water, with the contamination increasing as the area of mine walls increases during mining. This could happen at Great Bear because more than 10 km of underground workings would likely be mined. However, the ML-ARD testwork to predict this under the federal ML-ARD Prediction Manual will be in progress for at least a few years. So, once again this Detailed Project Description misleads by already concluding that the leaching "may potentially contribute minor quantities of metals to the mine water". The reality could just as easily turn out to be "the leaching will contribute substantially high and toxic quantities of metals to the mine water". No one knows yet, not even Kinross Gold and its consultant, WSP.

Some day in a future year, reliable "Modelling will be completed to assess the volume and quality of the water requiring management, which will be used in the design of the integrated water management and treatment facilities on site." At this time, the groundwater requiring management has clearly already been underestimated (see Section 9.2 of this MDAG review). Until then, no one knows with reasonable confidence how much water has to be treated, how severely it will be contaminated, and how thoroughly it will be treated.

The subsection on Process Plant says:

> "Excess process plant water is expected to be pumped with the tailings to a tailings management facility for storage. The tailings and process plant water will contain metals from the processing of metal-containing ore and residual processing reagent products. A cyanide destruction circuit will be established within the process plant to treat residual cyanide concentrations in the tailings and process plant water, prior to pumping to the tailings management facility."

A major aspect of water management and tailings management is the percentage of discharged process water that will be recirculated back to the process to minimize freshwater usage and contamination by "metal from the processing". This issue is not mentioned and thus is a serious omission. Additionally, "cyanide destruction" is not perfect and may not literally destroy cyanide but temporarily mask it until its release to the environment. These important issues are not mentioned either. Thus, this quotation gives the false impression that cyanide and metals will only be "residual" and will be treated to minimize them, but this is simply guessing that is not consistent with ML-ARD testwork so far.

Section F.6.4 on the Environmental Management System does not explain the currently likely scenario that one or more additional contaminants not currently recognized will arise in on-site water (see also Section 11 of this MDAG review). This would require at least months of storage of contaminated water on site until the treatment plant is expanded and updated. Therefore, the on-site storage of months of site-contaminated surface water and groundwater should be a major objective of the Environmental Management System.

10.5 Summary

In summary of this perhaps-draft Detailed Project Description of November 2023, the first cover page by Kinross says this document is "draft", but the second cover page by the authors, WSP, does not say "draft" so perhaps this is the final document. If so, it has not been signed by qualified professionals and thus should be rejected.

In any case, there are so many problems, misleading statements, errors and omission concerning ML-ARD, water quality, and environmental impacts that they cannot all be summarized well here. These problems include the following.

- The false statement that there will be no sources of mercury from the ore processing when in fact the tailings and concentrate from the process will contain mercury. The processing could even cause mercury and other elements to leach more quickly and become more mobile.

- Contrary to the impression given by this Detailed Project Description, cyanide destruction is not perfect and can simply mask the cyanide temporarily in the environment, but the important testwork to determine this has not yet been done for the Great Bear Project.

- Significant impacts on water quality can arise from seemingly benign proposed activities like paste backfill of tailings into the underground mine and dewatered filter-cake tailings, but the potentials for serious impacts are not recognized or not even mentioned in this perhaps-draft Great Bear document.

- Storm events and equipment upsets can lead to relatively large variations and unexpected impacts, day-to-day or even hour-to-hour, during proposed exploration and proposed mining. Instead, these Great Bear documents use averages like monthly which incorrectly assume flows will be the same every day of a month which is far from reality. Environmental impacts and spills can be caused by large variations, as well as longer-term averages, so the environmental risks of proposed exploration and proposed mining at Great Bear remain mostly unknown and not identified.

- Nonsense pseudo-scientific statements are used, like the aggregate required to build the Great Bear Project would be "nonreactive mine rock and overburden" which does not exist. This clearly shows that experienced and qualified professionals were not included in the writing of this perhaps-draft Detailed Project Description. If there is a true commitment to "nonreactive mine rock and overburden" which does not exist, then the Great Bear Project stops now.

- There is a lack of ML-ARD assessments for some site components like aggregate.

- There is a prevalent but likely false belief that "NPAG"rock will have little to no impacts on ML-ARD, water quality, and the environment. However, this has not been proven for the Great Bear Project and is likely wrong based on other minesites around Canada. "NPAG" rock can actually generate more acid than "PAG" rock and still release seriously contaminated levels of many metals and other elements at near-neutral pH.

- The financial assurance to ensure proper and fully paid closure of the proposed Great Bear Project is grossly underestimated based on existing information. Furthermore, the financial assurance should also include contingency costs for early or premature closure but it does not.

- There are likely devastating, expensive, and unrecognized ML-ARD consequences on water quality from the proposed relocation of "PAG" rock into the underground workings after operation.

- The ongoing, unproven, and likely wrong, belief continues that overburden would be environmentally benign, can be used across the site for reclamation, and can be sprayed with water to control dusting when it could instead create contaminating water around, below, and beyond the Great Bear site.

- There are unfounded beliefs that dewatering during exploration and mining would have minimal

effect on the local and regional water balance, and would not significantly dewater surface creeks and lakes including their environmentally important baseflow. These false beliefs are based on flawed groundwater modelling for the Great Bear Project explained earlier in this MDAG review.

- There is a false belief that dust blown off the site during proposed exploration and proposed mining and into the surrounding environment, vegetation, soil, water, and aquatic ecosystems is benign at "background" levels.

- A false belief is stated that only elevated and toxic ammonia, and no other contaminating nitrogen species from explosives that consistently accompany the ammonia, will appear in mine water during proposed exploration and proposed mining.

- There is an unsupported and likely substantially underestimated statement that the mine walls in the pits and underground workings "may potentially contribute minor quantities of metals to the mine water" instead of the more typical significant quantities of metals seen at many other minesites around Canada. This is taken to the likely ludicrous statement that there would be "Potential for creation of fish habitat in new pit lakes, expected to be re-connected [sic] to the Dixie Creek system".

- There is no recognition of the implications, costs, and impacts of storing months of contaminated mine water on the site should one or more "unexpected" yet currently predictable inorganic contaminants and ML-ARD occur on the site water during and after proposed exploration or proposed mining.

11. Water Treatment during Proposed Exploration and Proposed Mining

Most of the contaminated water at the Great Bear Project during proposed exploration and proposed mining would be subjected to water treatment. There would remain some fugitive contaminated water and contaminated dust that would impact the surrounding environment. This fugitive contamination has not been assessed in detail by Kinross Gold, and is even ignored or not recognized in several Great Bear documents as shown above in this MDAG review.

If fugitive contamination turns out to be minimal, then water treatment is the last "line of defence" between the on-site ML-ARD and contamination and the off-site impacts. Therefore, proposed water treatment should be examined and justified in great detail. This has not yet happened for the Great Bear Project.

At this time, I could not find any detailed and professionally certified report on water treatment for proposed exploration and proposed mining. The previous sections of this MDAG review have discussed water treatment as it appeared in some documents, where the current information was found lacking or misleading.

Minewater-treatment plants are not off-the-shelf available at stores like Canadian Tire. This is because their treated effluent concentrations to the environment are very sensitive to the site-specific inflow rate of water and to the inflowing variations in aqueous concentrations of each contaminant element requiring treatment.

These treatment plants can be unstable when exposed to variable flows or to variable inflowing contaminant concentrations, resulting in only partially treated and still-contaminated effluents. Therefore, water treatment for proposed exploration and then again for proposed mining at the Great Bear Project has to be carefully designed, based on well-justified and professionally certified information on surface hydrology, subsurface hydrogeology, ML-ARD, and on-site geochemical source terms.

As shown in the previous sections of this MDAG review, this "input" information into the site-specific and reliable design of water treatment at Great Bear does not exist and will not likely exist for at least a few years. Until then, the available preliminary information is corrupted by errors and missing details. Therefore, it is not possible at this time to reliably define and design the required water treatment at Great Bear, or to estimate effluent concentrations, environmental impacts, and cumulative effects.

To provide some guidance to Grassy Narrows First Nation on aspects of water treatment at the Great Bear Project, it is helpful to review and comment on one of the latest documents that contain some details on possible water treatment. This document is: Great Bear Project Proposed Underground and Open Pit Gold Mine, a PowerPoint presentation made to Asubpeeschoseewagong Netum Anishinabek, dated November 10, 2023

Slide 20 of this presentation is entitled "Water Treatment". It points out that:

> "Contact water discharged to the Chukuni River will be managed to achieve regulatory requirements."

It is important for Grassy Narrows First Nation to recognize that "regulatory requirements" can vary vastly and that the applicable and protective requirements have to be carefully chosen based on site-specific information like flow rates and variations in influent (ML-ARD) and effluent concentrations. Alarmingly, Table 5-6 shown on Slide 20 invokes the "MDMER" or Metal and Diamond Mine Effluent Regulations, which allow toxic levels of metals and other elements. For example, normally toxic levels of 100 ug/L and more are allowed for arsenic and copper, and normally toxic 80 ug/L and more are allowed for lead.

This should be an immediate warning to Grassy Narrows First Nation that Kinross Gold does not intend to treat the site water to safe levels. Instead, treatment will only reduce concentrations to still-toxic levels and then rely on dilution in the Chukuni River to eventually reduce it almost to background levels.

The usage of toxicity dilution in the Chukuni River would create a "mixing zone" for some distance in the river, in which toxicity still exists and for which Fisheries and Oceans Canada would have to authorize the mixing zone. There appears to be some hydrodynamic modelling already done for this mixing zone in the River, but no details like flow rates and their variabilities were provided. Because the previous sections of this MDAG review showed that long-term to perpetual treatment and dilution may be needed for the Great Bear Project, Grassy Narrows First Nation should understand this will represent a very-long-term impact.

Additionally, such long-term ongoing discharge and dilution will add to cumulative effects, about which Grassy Narrows First Nation has expressed serious concerns.

Slides 20 and 21 present additional details on treatment. For example, a special and likely expensive ammonia treatment circuit will be included to treat elevated and toxic ammonia from blasting residues. Remarkably, nitrate and nitrite, which can also be toxic and can stimulate eutrophication in the Chukuni River and Dixie Creek, always accompany ammonia from the blasting residues. However, they are not even recognized here or in other Great Bear documents. This is a serious and unacceptable omission for the Great Bear Project.

Sulphate concentrations in the treated effluent, which I understand can increase toxic methylation of mercury and other elements like cadmium and arsenic, are not mentioned at all.

Slide 20 also commits to "ultrafiltration" which typically removes all suspended particles coarser than about 0.02 um. Because "dissolved" concentrations include nanoparticles and small particles up to about 0.45 um, this proposed ultrafiltration would also lower the functionally "dissolved" concentrations, but not those of fully dissolved elements. Thus, Great Bear treatment should be capable of approaching CCME (Canadian Council of Ministers of the Environment) safe criteria for aquatic life, but may not meet Grassy Narrows First Nation water-quality criteria (GNFNWQC). CCME aquatic-life guidelines and GNFNWQC could replace the toxic MDMER criteria and significantly reduce or eliminate the mixing zone and cumulative effects in the Chukuni River.

However, none of these details are discussed or mentioned in Great Bear documents.

Mine water treatment plants remove metals and other elements from the water, by creating concentrated and toxic treatment waste commonly called "sludge". In many jurisdictions, treatment sludge like that proposed for the Great Bear Project can reach "hazardous" or "special" waste levels, requiring the most careful and secure handling and long-term storage under contaminated-sites regulations. Spills of this sludge can result in toxic conditions in water and in sediments including soils and benthic ecosystems.

All the Great Bear documents I have reviewed so far are completely silent on the annual volumes, handling, storage, long-term protection, and potential environmental impacts of treatment sludge. This is a major risk for serious environmental impacts that should be addressed in great detail for proposed exploration and proposed mining. I recommend that Grassy Narrows First Nation require intensive studies on the treatment sludge that will remain and be managed somewhere in perpetuity.

In summary for water treatment, Great Bear documents invoke water treatment as the major process that would prevent or minimize environmental impacts of proposed exploration and proposed mining. This is not literally true, because there will be fugitive contaminated water and contaminated dust leaving the site, but this fugitive contamination is ignored or not recognized in many reviewed Great Bear documents.

In any case, water treatment is the last "line of defence" between the on-site ML-ARD and contamination and the off-site impacts, and thus requires intensive study and characterization. However, at this time, water treatment for proposed exploration and proposed mining is ambiguous and contradictory among the documents. This should be expected because the input flows and input contaminant concentrations (ML-ARD) will not be known reliably for at least a few years. Nevertheless, there are serious concerns about water treatment now including the following.

- Kinross Gold does not expect to treat site water to non-toxic levels. Instead, treatment would only be down to still-toxic levels based on the Metal and Diamond Mine Effluent Regulations. Thus, Kinross Gold intends to rely on significant dilution of its contaminated effluent within a "mixing zone" in the Chukuni River. Such a mixing zone would include zones of significant toxicity and would require formal authorization from Fisheries and Oceans Canada. In any case, this discharge of effluent would add to cumulative effects, which is a particular concern of Grassy Narrows First Nation.

- Expensive and intensive treatment for ammonia, derived from blasting residues, is proposed. However, toxic levels of nitrate and nitrite, that always accompany the ammonia and which can cause eutrophication and other impacts in the Chukuni River and Dixie Creek, are completely ignored.

- Sulphate concentrations in the treated effluent, which I understand can increase toxic methylation of mercury and other elements like cadmium and arsenic, are not mentioned at all.

- Ultrafiltration may substantially reduce effluent concentrations for those elements not fully

dissolved, mixing-zone size, and cumulative effects. However, there are no details on this ultrafiltration in the reviewed Great Bear documents.

- Mine water treatment plants remove metals and other elements from the water, by creating concentrated and toxic treatment waste commonly called "sludge", which can reach "hazardous" and "special" waste levels in some jurisdictions. Thus, treatment sludge requires the most careful and secure handling and long-term storage under contaminated-sites regulations. Spills of this sludge can result in toxic conditions in water and sediments including soils and benthic ecosystems. All the Great Bear documents I have reviewed so far are completely silent on the annual volumes, handling, storage, long-term protection, and potential environmental impacts of treatment sludge that will remain and be managed somewhere in perpetuity.

12. References

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Riverbank Mercury Methylation Study

Technical Report

May 14, 2024

Submitted by:

Dr. Brian Branfireun, PhD (Professor) Western University

The numerical data presented in this report are validated and certified. The interpretations are based on best available information at this time, and may be subject to change pending further information and expert input.

The opinions expressed in this report are the opinions of the author and should not be represented as the opinions of ANA, the EWRR Panel, or any other party.

Brian Branfireun at London, Canada. May 14, 2024

1 Plain-Language Summary

As part of a larger study of where methylmercury is produced in the Wabigoon River system, a laboratory experiment was done to determine if the water that is discharged from the Dryden Mill to the Wabigoon River makes the methylmercury contamination problem in the Wabigoon River ecosystem worse than it would otherwise be. This water does not contain additional mercury, however it does have high levels **sulphate** and **organic matter**; both are ingredients that are well-known to feed the bacteria that produce methylmercury from inorganic mercury in the environment.

Mercury contaminated sediments were added to small bottles, and water with different chemistries were added to the bottles, including different levels of pure sulphate, and different levels of Mill effluent. Bottles were sampled at different times over a month, and methylmercury and other chemistry was measured in the experimental water.

The results of the experiment showed that when added to mercury contaminated sediments, the Mill effluent containing sulphate and organic matter results in the production of large amounts of methylmercury. At low levels of sulphate, ~50% more methylmercury was produced than with upstream Wabigoon River water that is low in sulphate. At higher levels of sulphate that are like those that are found in the Wabigoon River just downstream of the mill, almost 3 times more methylmercury was formed.

These results clearly indicate that the Dryden Mill industrial wastewater that is discharged to the Wabigoon River is making the mercury contamination in fish worse than it would be if it were not present. The increase in sulphate in the Wabigoon River from the mill source can been seen all the way to Ball Lake, so the impact of this chemistry on methylmercury levels is throughout the river system. Although both mercury and methylmercury levels are very high because of the historical release of mercury to the river in the 1960s which still requires remediation, the problem is amplified by the current mill wastewater discharges. If these discharges were eliminated, there would be a reduction in methylmercury produced in the river system, and a reduction of methylmercury in fish.

2 Acknowledgements

Eric Grimm conducted this experiment as part of his MSc thesis research at the University of Western Ontario under the supervision of Dr. Branfireun. He provided figures, data tables, and some methodological information that are included in this report. The written interpretation of the data in this report are solely that of Dr. Brian Branfireun.

List of Abbreviations

Cl^-	Chloride
DI	Deionized water
DMA	Direct Mercury Analysis
DOC	Dissolved Organic Carbon
EPA	Environmental Protection Agency
HCl	Hydrochloric acid
Hg	Mercury
IHg	Inorganic Mercury
MeHg	Methyl Mercury
QA/QC	Quality Assurance/ Quality Control
RPD	Relative Percent Difference
Sed	Sediment
SO_4^{2-}	Sulphate
S^-	Sulphide
SW	Surface Water
THg	Total Mercury

3 Introduction

3.1 Project Background and Overview

The overall purpose of this project was to characterize the impacts of elevated sulfate from Dryden Mill effluent on mercury methylation in the English-Wabigoon Rivers System, and evaluate porewater concentrations of Hg, methylmercury and relevant parameters affecting MeHg production (e.g. sulfate, DOC, sulfide, chloride) in the Wabigoon River sediments.

Recent studies have shown that there is significant methylation of mercury in the Wabigoon River downstream of the Dryden Mill (as shown by both the persistent increase in river water methylmercury concentrations, the percent of total mercury as methylmercury, and elevated methylmercury in biota). While there are several factors that could contribute to mercury methylation, one significant question is whether the current Mill wastewater effluent could enhance methylation, amplifying the existing issue of contamination by excess inorganic mercury from historical inputs. Addressing this knowledge gap has been identified as a high priority by EWRRP in the data priorities table: "Evaluation of water quality parameters affecting methylmercury production, e.g., sulphate, DOC, pH, chloride, temperature). Consider an experimental study to identify the contributions of these factors."

It has been established for nearly 40 years that sulphate-reducing bacteria (SRB) are methylators of inorganic mercury[1], and are the principal mercury methylators in freshwater ecosystems[2], responsible for forming the species of mercury that bioaccumulates and biomagnifies (methylmercury). As their name indicates, SRB require sulphate (to 'breathe'), and also organic matter (to 'eat') for their metabolism and growth. The 'respiration' product of sulphate-reduction is sulphide. When SRB are active in an environment where available inorganic mercury is present, the process of mercury methylation can occur within the bacterial cell, resulting in the conversion of inorganic mercury to the more toxic methylmercury. Therefore the mercury methylating activity of SRB is regulated by the supply of three ingredients: organic matter, sulphate and bioavailable inorganic mercury. It is well established that even in environments with background levels of mercury and sulphate, the addition of a sulphate can substantially increase the proportion of mercury that is transformed into methyl mercury in porewater and surface waters[3]; sulphate supply is typically the limiting factor on the mercury methylation process in most freshwater ecosystems under the required biogeochemical conditions. The availability of organic matter is equally important for the mercury methylation process[4]. Although often not limited in an absolute sense, all organic matter is not created equal for

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1 Compeau GC, Bartha R. **1985**. Sulfate-reducing bacteria: principal methylators of mercury in anoxic estuarine sediment. Appl Environ Microbiol. 50(2):498-502.

2 Gilmour CC, Henry EA, and Mitchell R. **1992**. Sulfate stimulation of mercury methylation in freshwater sediments. Environmental Science & Technology, 26: 2281–2287.

3 Jeremiason, J. D.; Engstrom, D. R.; Swain, E. B.; Nater, E. A.; Johnson, B. M.; Almendinger, J. E.; Monson, B. A.; Kolka, R. K. **2006.** Sulfate addition increases methylmercury production in an experimental wetland. Environ. Sci. Technol. 2006, 40, 3800−3806.

4 Ravichandran, M. **2004**. Interactions between mercury and dissolved organic matter--a review. Chemosphere, 55(3), 319-331.

bacterial metabolism – for example the addition of easily digested dissolved organic matter can be just as important as the addition of sulphate, resulting in the amplification of the sulphate reduction and mercury methylation process[5].

Our prior research (Nearshore Riverbank Sediment and Pore Water Sampling near the Dryden Mill Final Report, 2021) clearly demonstrated that water concentrations of sulphate in the Wabigoon River increased from a mean of 1.61 mg/L upstream of the Dryden Mill to an overall mean of greater than 12 mg/L (with individual samples over 20 mg/L during summer flows) downstream of the continuous discharge of mill aeration stabilization basin (ASB) effluent from a diffuser in the middle of the Wabigoon River (an average increase of about ten times the upstream concentrations). We hypothesized in that report that these elevated sulphate concentrations likely contribute to increased methylation downstream.

3.2 Objectives

This project proposal identified the elevated sulphate concentrations in surface waters as an issue potentially contributing to MeHg production. The work done tested two central hypotheses relating to the role of Dryden Mill effluent discharge on methylmercury formation downstream:

Hypothesis 1: Given that the sulphate-reducing bacteria have been well-established as principle methylators of inorganic mercury in freshwater systems for nearly 40 years, the continuous addition of excess sulphate from the current mill operations in Dryden significantly increases methylmercury formation in this otherwise sulphate-limited environment at both local and more distant locations where conditions suitable for mercury methylation exist.

Hypothesis 2: Low-lying floodplain sediments and wetlands immediately adjacent to the river channel that are contaminated with inorganic mercury are "hot spots" of mercury methylation, with the highest concentrations of methylmercury associated with sediments receiving additional sulphate from upstream.

Information collected will help to understand:

- If the continuous addition of excess sulphate from current Dryden Mill operations significantly increases methyl mercury formation in an otherwise sulphate-limited environment
- If low-lying floodplain sediments and wetlands immediately adjacent to the river are potential hot spots of mercury methylation
- How methylmercury production potential (reflected by % of total mercury as methyl mercury, and partitioning between sediments and porewaters) varies downstream in the English-Wabigoon River System.

This technical report focusses on Hypothesis 1, which was tested using a laboratory approach. Field data associated with Hypothesis 2 will be reported on subsequently.

[5] Mitchell, CPJ, BA Branfireun, and RK Kolka, **2008**. Assessing sulfate and carbon controls on net methylmercury production in peatlands: An in situ mesocosm approach, Applied Geochemistry, 23, 503-518.

4 Methods – Sampling & Analysis

4.1 Laboratory Experiment Methods

Previous experiments in the Branfireun Lab have been successful in using glass chromatography columns to test the effects of sulphate addition upon peatland soils, and the current ANA methylation project proposed to use the same general approach. Sediments collected from the mercury contaminated riparian wetland upstream of the effluent discharge were uniformly much finer-grained than anticipated, making the use of a flow through column experiment unfeasible. During preliminary testing, very low hydraulic conductivity (water-passing ability) resulted in a build up of back-pressure in the columns even at flow rates that were minimally feasible to collect sufficient sample volumes in a reasonable time. This created very unrealistic flow conditions, leaks from sample lines, inconsistent flow between columns, and visual channelling of flow along the glass column bypassing sediments. These issues necessitate a change in experimental design and protocol.

A bottle incubation protocol was used to address the question of the effects of different levels sulphate and Mill Effluent containing sulphate on mercury methylation. The experimental treatments were effectively the same as proposed, however instead of columns, Hg contaminated sediments and the various solutions of pure sulphate Mill effluent containing sulphate and were placed in 500ml PETG bottles and destructively sampled over time. Bottle incubations such as this have also been used successfully in the Branfireun lab to assess mercury methylation processes in contaminated sediment.

70 g of sediment collected from a mercury-contaminated wetland downstream of the historic mercury source at the Dryden mill and upstream of the contemporary sulphate source at the operational mill discharge (**Hg concentration 49 mg/kg**), and 70 g of sediment and 140 mL of solution were added to each bottle and allowed to react for between 3 and 28 days. Each bottle was purged with nitrogen gas to expedite the establishment of reducing conditions. and 140 mL of the various solutions (Table 1) were placed in each bottle, mixed, and purged with nitrogen gas to promote reducing conditions. Triplicate samples (3 bottles) were destructively sampled at prescribed intervals (Table 2) from each treatment level on each sampling day, and bottles were gently agitated daily.

Table 2.1. Bottle experiment treatment levels and sample numbers.

Treatment	Description	Number of Samples
Deionized Water – Control	Control – Ultra clean filtered water.	33
Upstream Wabigoon River Water	Control – Unimpacted Wabigoon river water from upstream of the Dryden mill.	33
2 mg/L SO_4^{2-} in Deionized Water	Low Sulphate – Made with pure laboratory reagent (K_2SO_4).	33
10 mg/L SO_4^{2-} in Deionized Water	Medium Sulphate – Made with pure laboratory reagent (K_2SO_4).	33
30 mg/L SO_4^{2-} in Deionized Water	High Sulphate – Made with pure laboratory reagent (K_2SO_4).	33
2 mg/L SO_4^{2-} Effluent Solution	Low Sulphate – Made with diluted effluent collected from the Dryden mill effluent diffuser.	33
10 mg/L SO_4^{2-} Effluent Solution	Medium Sulphate – Made with diluted effluent collected from the Dryden mill effluent diffuser.	33
30 mg/L SO_4^{2-} Effluent Solution	High Sulphate – Made with diluted effluent collected from the Dryden mill effluent diffuser.	33
TOTAL		**264**

Table 2.2. Sampling schedule, including reaction time.

Sample #	*Reaction Time*	*Sampling Date*
Sample 1	3 Days	November 26th
Sample 2	4 Days	November 27th
Sample 3	5 Days	November 28th
Sample 4	7 Days	November 30th
Sample 5	9 Days	December 2nd
Sample 6	11 Days	December 4th
Sample 7	14 Days	December 7th
Sample 8	17 Days	December 10th
Sample 9	20 Days	December 13th
Sample 10	24 Days	December 17th
Sample 11	28 Days	December 21st

On each sampling day redox potential were measured directly using a platinum redox electrode in both the supernatant water and the sediment of each bottle. A subsample was taken for sulphide, sulphate and DOC analyses. Supernatant water was centrifuged at 4000 RPM for 20 minutes, filtered with a 0.45 um, then preserved with 0.5% v/v ultrapure HCl prior to analyses for THg and MeHg.

Water samples were analysed for Total Mercury (THg) and Methylmercury (MeHg), SO_4^{2-}, dissolved HS^- DOC, and dissolved organic matter characterization analysis using fluorescence and absorbance spectroscopy.

Benefits of the Bottle Experiment Approach: Although very different from the column experiment, this approach more closely mimicked the interaction of river water with interface sediments. We were also able to measure redox potential directly (not possible with the column experiment). We were also able to recover and measure THg and MeHg in sediment for each sampled bottle, providing a time series in sediment that would not be possible from the column experiment.

4.2 Laboratory Methods

THg and MeHg analyses were conducted in the Biotron Analytical Laboratory at Western University. This is an ISO17025-accredited laboratory and as such, all of the analytical processes that are within its accredited scope comply fully with accepted standard methods. Quality assurance and quality control measures are in place both during the analytical process that meet or exceed the standard methods, and all certified data are reviewed independent of analyses prior to release.

All water samples were filtered through a 0.45 um filter and one aliquot preserved with 0.5% v/v HCl for subsequent analyses for mercury and methylmercury, and another aliquot transferred into pre-cleaned 60 ml amber glass bottles and stored in the dark at 4 °C until analyses for DOC, DOM characteristics, and ions. Sulphide samples were transferred directly into a new, sterile vaccutainer® and analysed immediately.

2.1.1 Total Mercury - Water

Overlying water from the experimental bottles were all analyzed for THg, following EPA method 1631. The day before analysis, samples are brominated. 25 mL of sample is decanted into a glass vial. 125 µL of BrCl is pipetted into each sample vial (including blanks, duplicates, calibration blanks and calibration standards, IPR, and OPR), shaken, and left for analysis the next day. New calibration standards, IPRs, and OPRs are made the day of analysis. Quantification of THg is by CVAFS detection on a Tekran® 2600 total mercury analysis system. Before being loaded into the autosample rack, 30 µL of hydroxylamine hydrochloride and 60 µL of $SnCl_2$ is added to each vial, waiting 30 min between each addition and before analysis. For QA/QC, acceptable recoveries are 71-125% with an RPD < 24% for matrix spikes, < 0.2 ng/L for calibration blanks, < 0.5 ng /L for method blanks, and RPD < 20 % for duplicates.

2.1.2 Methylmercury - Water

Water samples were analyzed for methyl mercury, following EPA method 1630. To analyze MeHg there are two main steps, 1) distilling MeHg out of a sample to eliminate environmental interferences (e.g., organic matter), and 2) quantifying MeHg by aqueous phase ethylation, chromatographic separations, and CVAFS detection in the Tekran® 2700 methylmercury analysis system. 40 mL of sample is poured into a Teflon distillation vessel and capped with a distillation cap. For every 10 samples in the analysis run there is a duplicate sample, a matrix spike sample, a matrix spike duplicate sample, and a method blank. To each prepared Teflon vessel, 180 µL of 1% APDC is added before beginning distillation. Samples are distilled at 125 °C purging with nitrogen gas, in a Tekran distillation unit until 40-48 mL of sample is transferred in the chilled receiving vial.

Following distillation, 30 mL of distilled sample is decanted into a new instrument vial and loaded into the Tekran 2700 sample rack. Reagents (30 µL ascorbic acid, 225 µL buffer solution, 30 µL $NaBet_4$) are added to each sample vial and shaken after each addition to mix thoroughly. Each set of samples includes a set of sample duplicates, matrix spikes, and method blank. For QA/QC, acceptable recoveries are 100 +/- 35% with an < 35% for method spikes, < 0.01 ng/L for reagent blanks, < 0.045 ng CH_3Hg/L for method blanks, and RPD < 35% for duplicates.

2.1.3 Dissolved Organic Carbon

Overlying water in the experimental water samples were analyzed for dissolved organic carbon (DOC) using an OI Analytical Aurora 1030 total organic carbon (TOC) analyser (Xylem, College Station, TX) at the Branfireun Lab, in London, ON. Each run included Milli Q deionized (DI) water blanks, check standards (1 ppm, 5 ppm, 10 ppm, 25 ppm, and 100 ppm) and a sample duplicate at least every 8-10 samples. The minimum detection limit for TOC is 0.01 mg/L C.

2.1.4 Major Anions

Concentrations of target anions (chloride, sulfate) in surface water and porewater samples were analysed using a Dionex® DX-1600 Ion Chromatography System (ICS - Thermo Scientific, Waltham, MA) at the Branfireun Lab. A 0.5 mL aliquot of each pre-filtered sample was dispensed into a sampling vial and a filter cap was placed on top. Each run included two Milli Q deionized (DI) water blanks, matrix spikes, check standards (5 ppm, 10 ppm, and 25 ppm) and a sample duplicate at least every 8-10 samples. If the samples had analyte concentrations outside the range of calibration, they were diluted with Millipore DI water and rerun. The minimum detection limit of the ICS is 0.025 mg/L.

2.1.5 Sulphide

Sulphide analysis was completed immediately during destructive sampling of incubation bottles according to the methylene blue method described in Cline (1969)[6]. 5 mL of supernatant water was extracted under nitrogen and immediately injected into a vacutainer tube to prevent sample oxidation. Each sample reacted with 0.4 mL of a diamene reagent for 20 minutes before measuring absorbance at 670 nm with an integration time of 0.1 s using a Horiba Aqualog spectrofluorometer.

The diamene reagent contains N,N-dimethyl-p-phenylenediamine which reacts with sulphide to form a blue colour. Standard concentration curves were prepared using the same procedure described above, using deoxygenated water and differing concentrations of disodium sulfide nonahydrate.

[6] Cline, J. D. (1969). Spectrophotometric determination of hydrogen sulfide in natural waters. Limnology and Oceanography, 14(3), 454-458.

5 Results & Interpretation: Laboratory Methylation Study

5.1 Reduction-Oxidation Conditions in Experimental Water and Sediment

In the first 5-6 days of the experiment measured redox values indicated that the incubation water in all treatments was still oxic or sub-oxic, which would not support sulphate reduction or Hg methylation (typically at ~ - 200mV) (Figure 1). By Day 7 all treatment waters (including those with no additional sulphate) were strongly anaerobic without significant differentiation and remained so throughout the experiment (Figure 3.1).

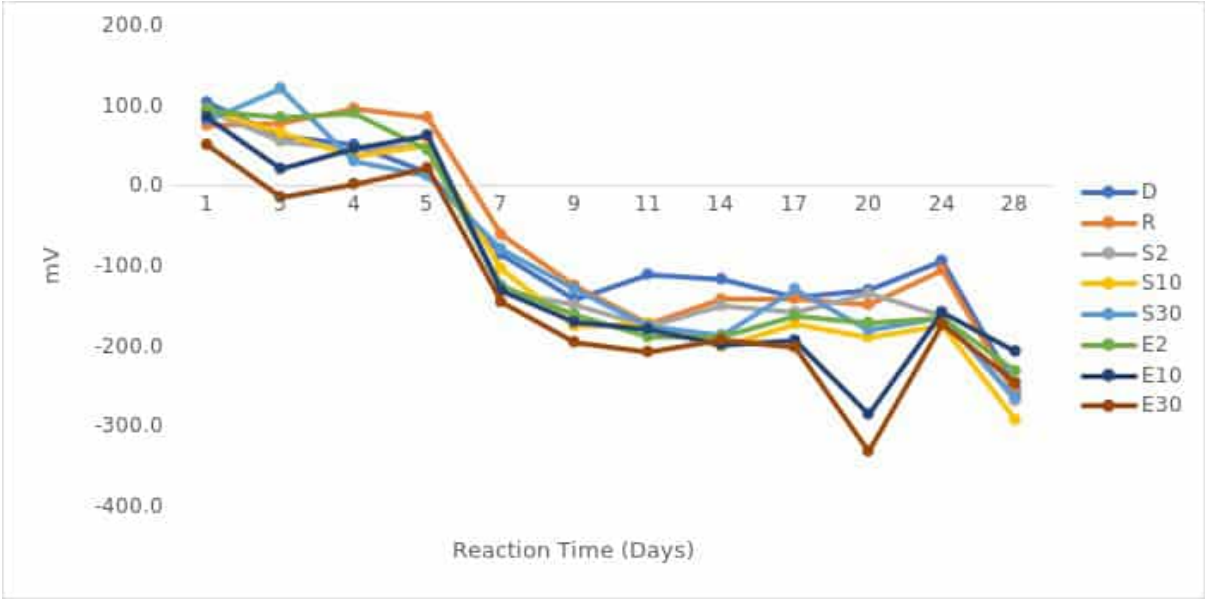

Figure 3.1: Measured redox potential (Eh) in the incubation bottle **water** over the course of the experiment. D = Deionized water. R = Wabigoon River water. S2, S10, S30 = sulphate only treatments at 2, 10 and 30 mg/L.

In contrast, redox potentials in sediments were all sub-oxic at the beginning of the experiment, becoming increasingly negative, settling into deeply anaerobic conditions -200 to -300mV) that would support sulphate reduction and methylation (Figure 3.2).

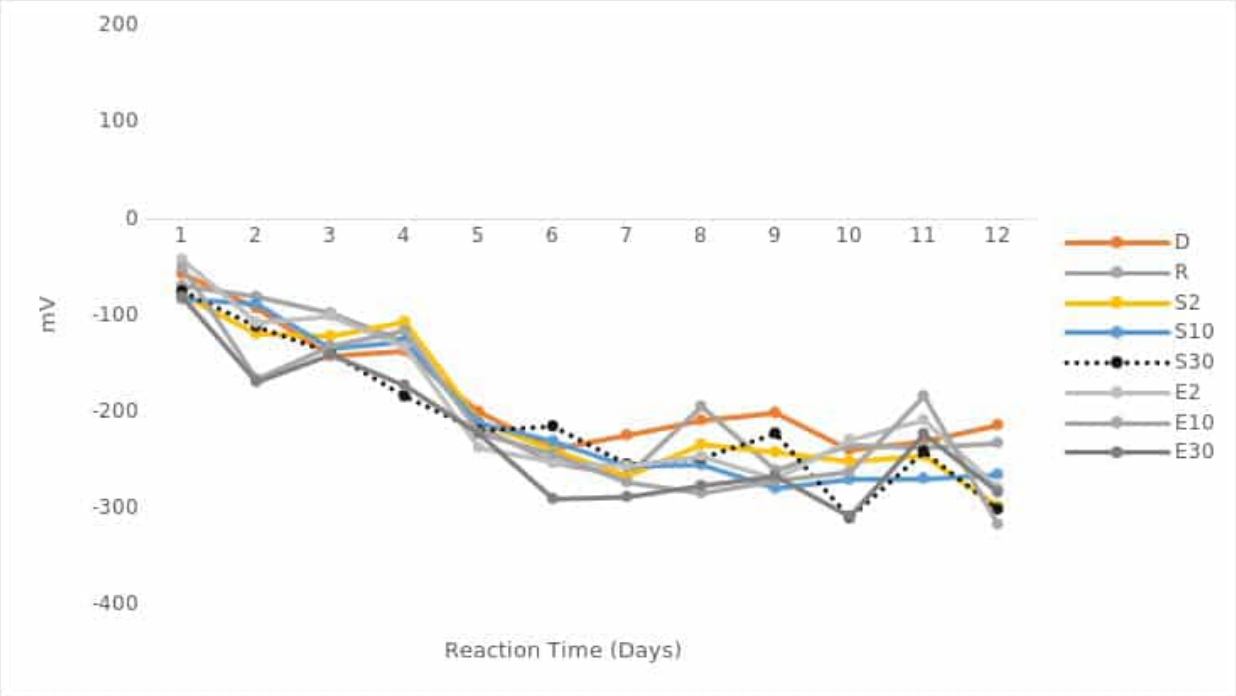

Figure 3.2: Measured redox potential (Eh) in the incubation bottle **sediment** over the course of the experiment. D = Deionized water. R = Wabigoon River water. S2, S10, S30 = sulphate only treatments at 2, 10 and 30 mg/L.

From these data, we can conclude all of the experimental treatments and replicates had suitable biogeochemical conditions to support sulphate reduction and mercury methylation by Day 7 of the incubation.

5.2 Methylmercury Concentrations in Incubation Waters

Methylmercury concentrations in all incubation bottles began clearly increasing at incubation day 7 when the redox potentials in both the sediment and overlying water were sufficiently negative (Figure 3A and 3B). Methylmercury concentrations even increased in the control treatment with only ultra-pure deionized water added, indicating that MeHg was released into overlying water through desorption from the sediments which contained a pre-existing pool of MeHg, or that there was a sufficient amount of oxidized sulphate present in the solid phase or in the field moist sediment to support reasonable rates of Hg methylation (Figure 3.3). The deionized water treatment produced a nearly equivalent amount of MeHg over the course of the incubation, indicating that the additional sulphate found in the Wabigoon River water (1.3 mg/L for the water used in the experiment) had no significant overall impact on MeHg production in this experiment. After Day 9, the average MeHg concentrations were 103.36 and 123.50 ng/L in Deionized water and Wabigoon River water treatments, respectively (Table 3.1).

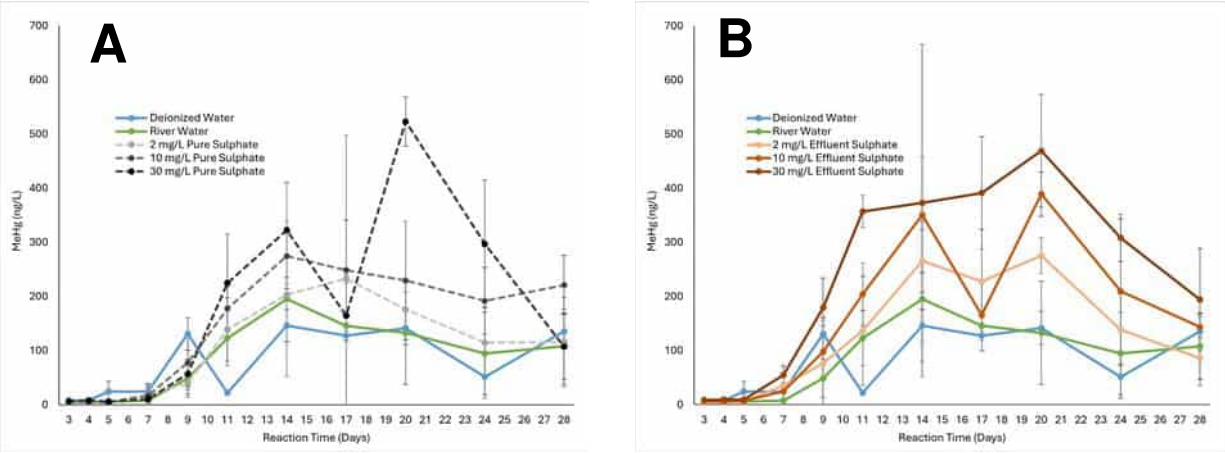

Figure 3.3: Methylmercury (MeHg) concentrations (ng/L) in supernatant water over the duration of the bottle incubation experiment. Sulphate in ultrapure water treatments are presented in Figure 3A, and the sulphate in mill-derived effluent treatments are presented in figure 3B. Deionized water and Wabigoon river water treatments are presented on both panels. Error bars are the standard deviation among replicates.

For the experimental treatments of both sulphate in ultrapure water and mill-derived effluent containing sulphate, average MeHg concentrations exhibited a pattern of clear increase between day 7-11, a stabilization until day 20-22, then some evidence of decline. This pattern is what would be expected in a microbial incubation, where bacteria have both nutrients and organic matter to increase their population and activity (exponential growth phase), and then maintain metabolism with available resources (stationary phase) until a required metabolite becomes limiting or the environment toxic. Since no additional nutrients (sulphate) or organic matter was added to the experiment, it was expected that at some point the experimental conditions would become unfavourable for bacterial metabolism. This would not occur in the natural environment where nutrient supply and organic matter inputs are replenished from advective water flows, plant roots, soil biota, etc. The achievement of stationary phase allows us to examine differences among experimental treatments under these (relatively) more stable conditions (i.e. between days 9 and 24 of the experiment).

Methylmercury concentrations increased in all of the sulphate addition treatments, with higher MeHg concentrations associated with the higher sulphate additions. MeHg concentration increases were not proportional with sulphate concentrations (i.e. they do not increase proportionally to the same degree) but are still in increasing order with treatment level (Table 5.1). Relative to Wabigoon River water with sulphate concentrations of 1.3 mg/L, it is consistent that the 2 mg/L pure sulphate treatment would result in slightly higher concentrations. Indeed, MeHg concentrations are 22% higher, in line with the 53% higher sulphate amount and the overall sub-linear response (Table 5.2). The relative percent difference between Wabigoon River water and the 2 mg/L mill effluent sulphate treatment was over twice as great as for the pure sulphate treatment alone (51% vs 22 %) indicating a dramatic and important additive effect of the Dryden Mill effluent chemistry.

Table 3.1. Average methylmercury (MeHg) concentrations (ng/L) measured in supernatant water from experimental samples during stationary phase of bottle incubation (Day 9-24).

Treatment Level	Average MeHg in Supernatant Water (ng/L)
Deionized Water	103.36
Upstream Wabigoon River Water	123.50
2 mg/L Pure Sulphate	151.01
10 mg/L Pure Sulphate	200.04
30mg/L Pure Sulphate	264.96
2 mg/L Mill Effluent Sulphate	186.80
10 mg/L Mill Effluent Sulphate	236.29
30mg/L Mill Effluent Sulphate	346.52

Table 3.1. % difference in methylmercury concentrations of experimental treatments relative to deionized water control and Wabigoon River water (1.3 mg/L sulphate) during the stationary phase of bottle incubation (Day 9-24).

Treatment Level	Increase in MeHg (%) above Deionized Water	Increase in MeHg (%) above Upstream Wabigoon River Water
2 mg/L Pure Sulphate	46%	22%
10 mg/L Pure Sulphate	94%	62%
30mg/L Pure Sulphate	156%	115%
2 mg/L Mill Effluent Sulphate	81%	51%
10 mg/L Mill Effluent Sulphate	129%	91%
30mg/L Mill Effluent Sulphate	235%	181%

This relative enhancement of Hg methylation by mill effluent over pure sulphate was clear for all treatments. At the highest levels of sulphate addition (30 mg/L), the mill effluent treated bottles had MeHg concentrations that were 2.8 times greater the Wabigoon River water treatment, and 3.4 times greater than the deionized water treatment. Even at the lowest level 2 mg/L sulphate treatment in mill effluent, these increases were 1.5 and 1.8 times greater, respectively. It is clear that the addition of mill effluent (which at the discharge point after mixing with river water can routinely exceed 50 mg/L) substantially enhanced MeHg production in the laboratory experiment. The addition of sulphate increased MeHg production consistent with pre-existing scientific knowledge; the additive effect of the other mill effluent chemistry on MeHg production paints an alarming picture for the conditions in the English-Wabigoon River system, where increases in sulphate and dissolved organic matter due to the mill discharges are evident as far down as data clearly exist (Ball Lake outflow, and potentially beyond).

5.3 Total Mercury and Percent of Total Mercury as Methylmercury

It would be expected that THg in overlying water in the bottle experiments would increase for two reasons: 1) Thg comprises all forms of mercury, and therefore contains BOTH inorganic Hg and MeHg. Since MeHg increased substantially in the experimental treatments, and we may reason that this MeHg was derived from sediment pore waters, then THg would increase at least proportionally to that increase in MeHg. 2) We may also expect the fraction of THg as IHg to increase given the level of Hg contamination in the experimental sediments. Given the concentration difference, there would be diffusion of IHg from sediment porewaters to the overlying waters due to the concentration gradient.

Consistent with this, changes in THg concentrations over time (Figure 3.4) mirrored the changes in concentrations in MeHg (Figure 3.3). The pattern over time and the relative magnitude of changes (increases) mirrored those of MeHg largely because a substantial fraction of THg in the overlying water was MeHg (Figure 3.5).

During the stationary phase of the experiment. the overall differences %MeHg generally fall in line with the relative amounts of sulphate added (30>10>2 mg/L) (Figure 3.5). The sulphate source (Mill Effluent Sulphate vs. pure Sulphate) trends were less differentiated, however all treatments subjected to Mill Effluent had more consistent, and higher %MeHg. During the stationary phase of the experiment, all Mill Effluent sulphate treatments had >60% MeHg; a very high fraction given that there is no fresh inputs of either sulphate or organic matter.

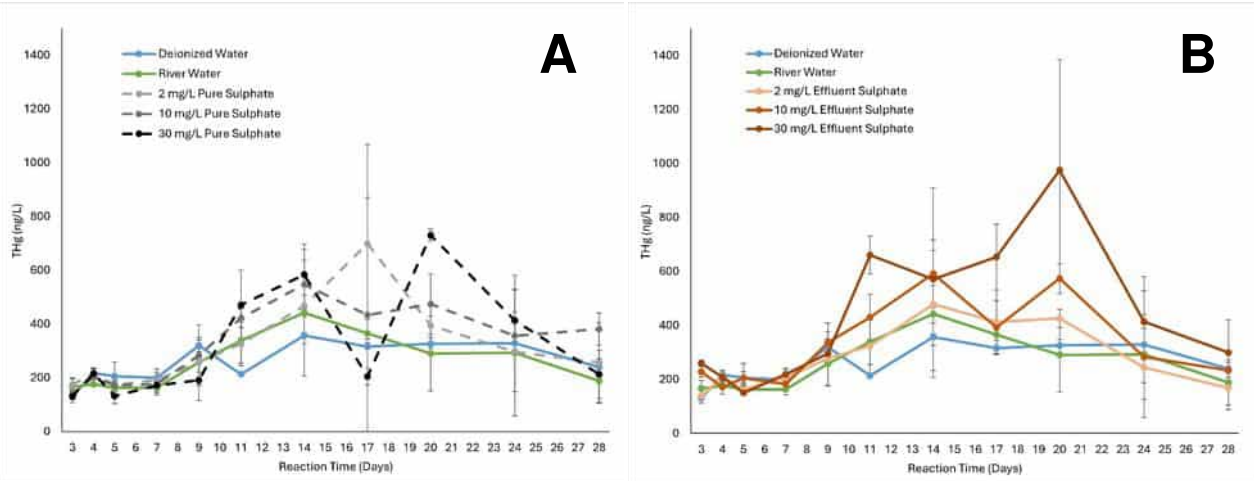

Figure 3.4: Total Mercury (THg) concentrations (ng/L)
in supernatant water over the duration of the bottle incubation experiment. Sulphate in ultrapure water treatments are presented in Figure 3A, and the sulphate in mill-derived effluent treatments are presented in figure 3B. Deionized water and Wabigoon river water treatments are presented on both panels. Error bars are the standard deviation among replicates.

The inorganic fraction of THg (IHg, calculated at THg – MeHg) showed an almost immediate partitioning of a substantial amount of IHg from sediment and sediment pore waters to the overlying water (Figure 3.6). Given that the deionized water treatment had no measurable Hg of any form, this partitioning was not only rapid, it remained relatively constant over time and across treatments suggesting that there was no other biogeochemical factor other than concentration difference that was driving the transfer of IHg into overlying water. This finding is relevant, because it revealed that the exchange of "clean" water with contaminated sediments resulted in the rapid partitioning of 100s of ng/L of IHg into overlying water in the bottle experiments; concentrations that are 2 orders of magnitude above background Wabigoon River water concentrations. Although not an explicit objective of this experiment, it demonstrates that the Hg in legacy contaminated sediments in the English-Wabigoon system is easily partitioned into pore waters and surface waters.

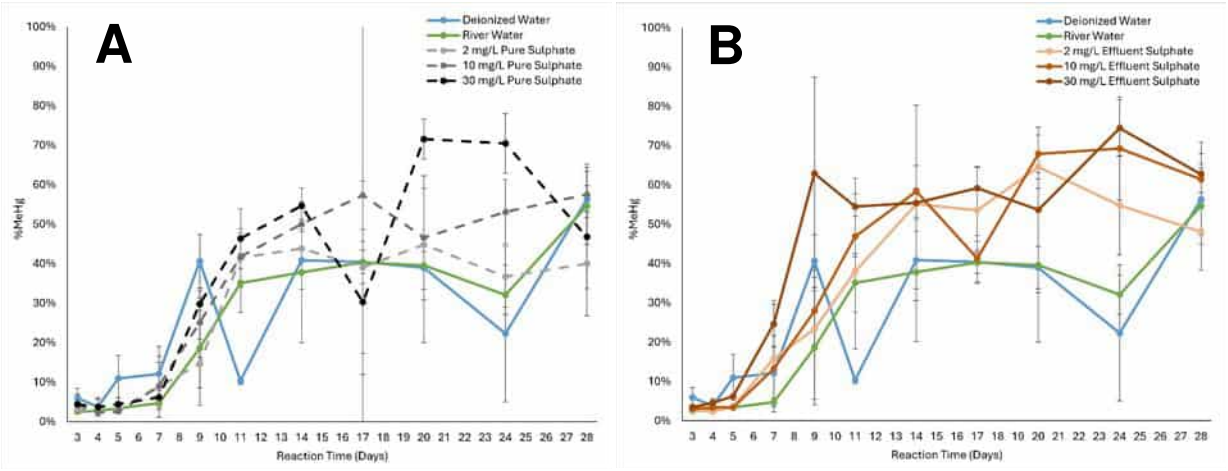

Figure 3.5: Percent of Total Mercury as Methylmercury (%MeHg) in supernatant water over the duration of the bottle incubation experiment. Sulphate in ultrapure water treatments are presented in Figure 3A, and the sulphate in mill-derived effluent treatments are presented in figure 3B. Deionized water and Wabigoon river water treatments are presented on both panels. Error bars are the standard deviation among replicates.

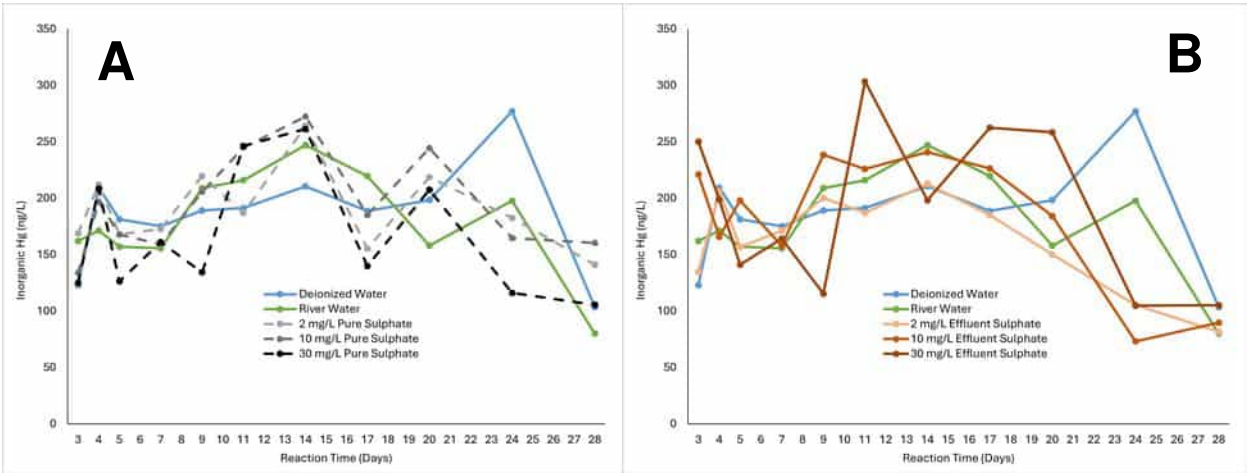

Figure 3.6: Inorganic mercury (IHg) in supernatant water over the duration of the bottle incubation experiment. Sulphate in ultrapure water treatments are presented in Figure 3A, and the sulphate in mill-derived effluent treatments are presented in figure 3B. Deionized water and Wabigoon river water treatments are presented on both panels. **Error bars to be added to this figure**

5.4 Sulphide Concentrations in Incubation Waters

Dissolved sulphide concentrations unsurprisingly increased in all of the incubation flasks, indicating that active sulphate reduction was occurring in all bottles, including the deionized water treatments (Figure 3.7). Since no additional sulphate was associated with these 'controls' it is clear that there was sufficient available sulphur in the incubation sediments to support Hg methylation and produce the MeHg concentrations measured (Figure 3.3).

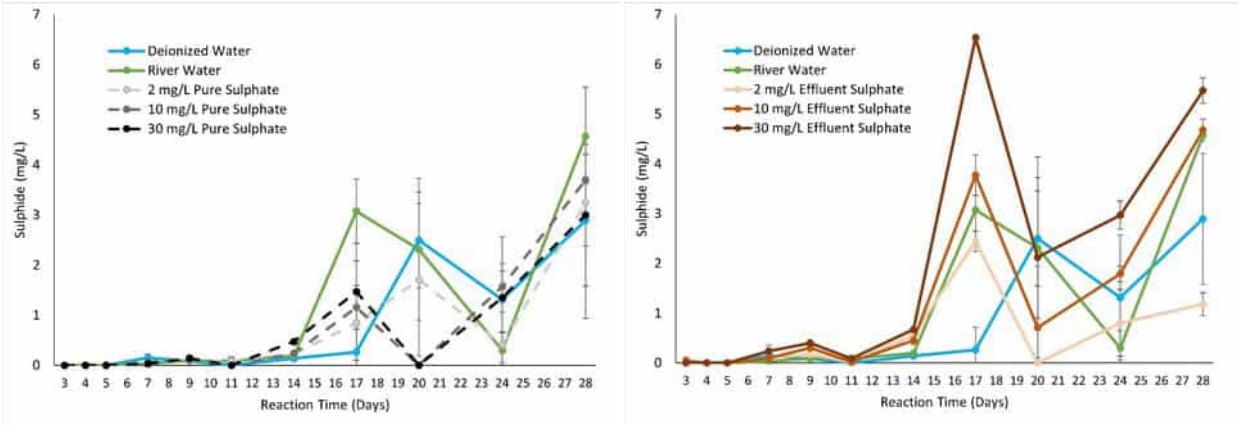

Figure 3.7: Dissolved sulphide (S^-) in supernatant water over the duration of the bottle incubation experiment. Sulphate in ultrapure water treatments are presented in Figure 3A, and the sulphate in mill-derived effluent treatments are presented in figure 3B. Deionized water and Wabigoon river water treatments are presented on both panels. Error bars are the standard deviation among replicates.

Dissolved sulphide concentrations in the experimental treatments did NOT correspond with sulphate addition levels, which indicates that at the highest sulphate concentrations there is likely the formation of precipitated insoluble S^- complexes, and/or an inhibition of sulphate reduction by sulphide toxicity. Indeed in the pure sulphate treatments, the sulphate addition treatments were no different, or even lower than the deionized water and Wabigoon River water treatments. In contrast, the provision of additional sulphate in Mill Effluent generally produced more sulphide than an equivalent treatment of pure sulphate, indicating that the sulphate reduction process was intensified by the Mill Effluent chemistry, or that sulphide was maintained in solution to a greater degree because of differences in water chemistry. **It is my opinion that the former is more likely, and that the provision of both sulphide and bioavailable organic matter in the Mill Effluent intensifies the activity of sulphate reducers (as indicated by the concentration of the sulphide product) and thus produces more MeHg (as indicated by the absolute concentration of MeHg, and the relative difference in %MeHg).** During the stationary phase, there is a clear, positive relationship between MeHg and S^- ($r^2 = 0.32$) confirming that sulphate reduction/active mercury methylation is driving the release of MeHg into overlying waters, not desorption from an existing pool of MeHg in sediments.

6 EXPERIMENTAL LIMITATIONS AND APPLICATION TO FIELD CONDITIONS

As a bottle incubation with destructive sampling of separate replicate samples at each time interval, there was considerable and expected variability among replicates, and between sampling times. Despite homogenization of sediments used for the experiment, the relatively small amounts placed in each bottle have variable amounts of organic matter, mercury contamination, and even biological activity. Rather than compromising the interpretation of the results, the fact that the experimental treatments resulted in clear patterns *despite* this variability lends confidence that the mechanisms (and magnitudes of effect) are real.

The sulphate (and diluted effluent) added to the experimental bottles was only a single 'dose' at the beginning of the experiment. This dose was metabolized by the bacterial community over the duration of the experiment until the replicate was sampled, and was not replenished. Therefore the amount of sulphate added (and the designation given to each treatment) is merely the initial amount, which would decline over time until such time that it was completely metabolized. Under field conditions, not only would the supply of sulphate (and organic matter) be effectively continuous to the sediment-water interface and hydrologically-connected riverbank locations, but sulphide would also be transported away, reducing the potential for sulphide toxicity which would limit sulphate reduction rates. Therefore under field conditions in locations where suitable biogeochemical conditions exist, methylmercury production would be more continuous and potentially less rate limited. In locations that are subjected to more episodic flooding, the dose-response pattern may be more similar to what was observed in this experiment.

The sediments used in this experiment (from Wetland 1 immediately downstream of the Mill but upstream of the mill effluent diffuser were lower in organic matter content relative to other wetland sites that were sampled as part of this project; riparian wetlands with higher natural organic matter content in sediments would likely support higher rates of Hg methylation.

7 CONCLUSIONS

The results of the laboratory incubation experiment component of this project showed that:

1) the addition of water with even small amounts of additional sulphate increases the net production of methylmercury in mercury-contaminated river bank sediments.

2) the amount of methylmercury produced is positively related to the amount of sulphate added, but the increase in methylmercury production is not proportional (i.e. double the sulphate does not produce double the methylmercury).

3) Sulphate added as a component of Mill Effluent resulted in approximately double methylmercury being produced than just sulphate alone. Data from this experiment suggests that this is a result of greater activity/growth of sulphate-reducing bacteria, which are the primary methylators of inorganic mercury in freshwater systems. The mechanism of this enhanced microbial activity is the provision of bioavailable organic matter in the Mill Effluent water.

We can extend these clear results to the English-Wabigoon River system, and draw several broader conclusions that have important implications for the recovery of mercury contamination in fish:

4) The experimental results clearly support Hypothesis 1: *The continuous addition of excess sulphate from the current mill operations in Dryden significantly increases methylmercury formation in this otherwise sulphate-limited environment at both local and more distant locations where conditions suitable for mercury methylation exist.* The large increase in sulphate and organic matter above Wabigoon River background levels by past and current Dryden mill operations amplifies the methylation of mercury in contaminated sediments throughout the English-Wabigoon River system. Even considering the effects of dilution, this effect extends as far as the sulphate input from the Mill can be detected (at least to Ball Lake outflow) since the data from this experiment show that even small increases in sulphate above background levels increased methylmercury production.

5) Given the record of sulphate concentration data from the Wabigoon River and the results of this experiment, there is likely *at least* twice as much methylmercury being produced than would be expected under background sulphate and organic matter conditions. Given that the amount of methylmercury in fish is ultimately proportional to the amount of methylmercury available to biota, fish methylmercury is likely at least twice as high as would be expected under background sulphate and organic matter conditions.

6) The elimination of excess industrial sulphate and organic matter inputs to the Wabigoon River from the Dryden Mill would reduce the amount of methylmercury produced throughout the English-Wabigoon system, and reduce methylmercury in

aquatic organisms and fish. Based on published scientific literature, the reduction in methylmercury concentrations in water and biota could be relatively rapid (several years).

7) Since sediments are still highly mercury contaminated and there will always be background levels of methylmercury production, the amount of methylmercury present will still be well above what would be expected under uncontaminated conditions even when industrial sulphate and organic matter inputs are eliminated. Ultimately a reduction in the pool of available inorganic mercury for methylation is required to return the ecosystem to levels of mercury in fish that would be present without past and present mill impacts.

Canadian Environmental Law Association
EQUITY. JUSTICE. HEALTH.

June 17, 2024 **BY EMAIL**

The Hon. Steven Guilbeault
Minister of Environment and Climate Change
200 Sacré-Coeur Boulevard
Gatineau QC K1A 0H3

Dear Minister Guilbeault:

RE: IMPACT ASSESSMENT OF GREAT BEAR GOLD PROJECT – REFERRAL TO REVIEW PANEL [REFERENCE NUMBER 85832]

Please be advised that we are co-counsel for Asubpeeschoseewagong Anishinabek ("ANA" or "Grassy Narrows First Nation") in relation to the above-noted designated project.

On behalf of ANA, we hereby request that you refer the impact assessment of the Great Bear Gold Project to a review panel pursuant to section 36 of the *Impact Assessment Act* (*IAA*). This review panel should be an independent panel composed of experts and respected people mutually agreeable to ANA and Canada.

For the reasons set out below, our client's requested referral of the impact assessment to a review panel is in the public interest, facilitates protection of ANA's Aboriginal, treaty, and inherent rights, and supports ensuring that the adverse effects of the project upon matters of federal jurisdiction will be assessed, mitigated and prevented in a more credible, participatory, and accountable manner.

Please be advised that ANA's preliminary comments on the draft Tailored Impact Statement Guidelines and the proposed Indigenous Engagement and Partnership Plan for this project have been provided to the Impact Assessment Agency of Canada ("Agency") under separate cover.

Please note that ANA does not consent to the Great Bear Gold Project and ANA reserves the right to file further submissions regarding this referral request as additional information, new documentation and/or technical capacity becomes available to ANA.

This request for Ministerial referral to a review panel should be read in conjunction with all the previous comments, letters, and other communications sent from ANA to your Ministry and/or the Impact Assessment Agency of Canada to date, including expert reports by Dr. Carignan, Dr. Podur, Dr. Mergler, Dr. Willow, Dr. Morin, Dr. Branfireun and the reports and scientific literature on mercury and Grassy Narrows that have been shared with Crown or are publicly available.

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BACKGROUND

As noted in ANA's letter to the Agency, proponent, and Ontario government dated March 6, 2024 (attached), our client remains deeply concerned about, and continues to strongly object to, this proposed project.

The overall context for ANA's opposition to the Great Bear Gold Project is provided by the significant adverse environmental, socio-economic, and human health impacts that the ANA community has suffered – and still suffers – due to industrial resource-based activities undertaken in, around, and upstream of our client's territory without ANA consent, meaningful consultation and accommodation with ANA, and often without prior notice to ANA.

The ANA letter also states that the designated project, if approved, would be sited within ANA's traditional use area and cause adverse impacts to the local environment, water quality, fish and wildlife, species at risk, migratory birds, and the downstream ANA community:

> The Great Bear Gold Project falls within the area that Grassy Narrows people have historically and currently use for the exercise of our rights and way of life. It is also upstream from our community. Pollutants in the water and impacts on the surrounding land, fish and wildlife will have a direct impact upon us and could also exacerbate mercury contamination in our waterways.
>
> ANA has repeatedly and clearly communicated with the Crown and the mining industry that our people are in crisis, the environment which supports us is severely impacted, our health is failing. The cumulative impacts continue to significantly interfere with our treaty, Aboriginal and inherent rights.
>
> The Great Bear Gold Project will have an impact upon areas that Canada claims as within federal jurisdiction, such as species at risk, fisheries, waterways and Indigenous peoples (page 2).

Notably, the proponent's Detailed Project Description (January 2024) indicates that the following factors were used to identify Indigenous communities that should be engaged in the impact assessment process:

- Proximity to the Project, including known historic and current Indigenous traditional land use and occupation, location of Reserve lands
- Potential for their interest to be affected Project activities
- Past or current interest in similar projects or developments in the region
- Guidance from government agencies, such as the provincial Ministry of Mines(page 9) .

Applying these factors in this case, the Detailed Project Description correctly lists ANA as an Indigenous community to be engaged in the assessment process since ANA is interested in, or may

be "materially affected" by, the Great Bear Gold Project (page 9). Accordingly, ANA has the requisite standing and constitutionally protected rights to request referral of the impact assessment to a review panel under the *IAA*. Notably, ANA is the first community downstream of the project site, and is already subject to extreme cumulative impacts, and therefore ANA is acutely, and uniquely, at risk from this Project.

REASONS FOR REFERRAL TO REVIEW PANEL

(i) The *IAA* Test for Referral to a Review Panel

Section 36(1) of the *IAA* empowers you to refer an impact assessment to a review panel if you opine that it is in the public interest to do so. This referral must generally occur no later than 45 days after the Notice of Commencement of an impact assessment has been posted online.

Section 36(2) of the *IAA* outlines the mandatory factors to be considered when making the public interest determination about referring an impact assessment to a review panel:

> **36(2).** The Minister's determination regarding whether the referral of the impact assessment of the designated project to a review panel is in the public interest must include a consideration of the following factors:
>
> (a) the extent to which the effects within federal jurisdiction or the direct or incidental effects that the carrying out of the designated project may cause are adverse;
>
> (b) public concerns related to those effects;
>
> (c) opportunities for cooperation with any jurisdiction that has powers, duties or functions in relation to an assessment of the environmental effects of the designated project or any part of it; and
>
> (d) any adverse impact that the designated project may have on the rights of the Indigenous peoples of Canada recognized and affirmed by section 35 of the *Constitution Act, 1982*.

We are aware that the federal government has recently proposed various amendments to the *IAA* in response to the 2023 ruling by the Supreme Court of Canada that aspects of the legislation are unconstitutional for division-of-powers reasons.

However, aside from some minor changes in certain upfront definitions (e.g., "adverse effects within federal jurisdiction" and "direct or incidental adverse effects"), no specific amendments have been proposed to date in relation to your statutory discretion under section 36 of the *IAA*. Therefore, your referral authority under this provision remains fully intact and should be exercised in this case, as discussed below.

(ii) Applying the *IAA* Test to the Great Bear Gold Project

For the purposes of this referral request, ANA's submissions focus on three public interest factors listed in section 36(2)(a), (c) and (d) of the *IAA*.

Adverse Effects on Matters of Federal Jurisdiction

The current *IAA* definition of "effects within federal jurisdiction" is generally limited to fisheries, aquatic species at risk, migratory birds, and Indigenous physical/cultural heritage, Indigenous land/resource uses for traditional purposes, Indigenous structures/sites of historical/archaeological significance, and changes to the health, social or economic interests of the Indigenous peoples of Canada (section 2 of the *IAA*). The proposed amendment to this definition presently being considered by Parliament essentially repeats the same listed items but inserts the qualifier that these effects must be "adverse", which is further defined as a "non-negligible adverse change."

Regardless of whether the current or amended definition is applied in this case, it is indisputable that the Great Bear Gold Project, if approved, has considerable potential to cause significant (non-negligible) adverse impacts upon most or all the above-noted items within federal jurisdiction.

For example, as noted in the attached ANA letter, the Great Bear Gold Project site falls within Grassy Narrows' Interim Area of Interest for Mining. Accordingly, the project will likely cause negative impacts on the lands and resources (e.g. moose, caribou, wolverine, walleye, wild rice, medicines, etc.) which were traditionally used – and are still being used today – by ANA members for hunting, fishing, trapping, and other harvesting activities or spiritual practices in the vicinity of the project and generally throughout the English River watershed.

ANA is also concerned that the proposed forest/vegetation clearing, other destructive disturbances, and industrial-scale activities associated with the project (e.g., surface water takings, aquifer de-watering, wastewater discharges, waste rock and tailings storage, etc.) may cause localized and downstream water pollution problems and exacerbate the well-documented health impacts of the mercury and methylmercury known to be present in the watercourses (and bioaccumulating in fish) within ANA territory. This is particularly true because sulfate will be present in wastewater discharges, which leads to an increase in mercury methylation in the receiving bodies of water.

Similarly, ANA is alarmed by the potential adverse impacts on groundwater, surface water, and aquatic ecosystems arising from metal leaching and acidic drainage from the 1 million tonnes of waste rock that will be excavated during advance exploration and stored in perpetuity on-site either above-ground or below-ground, and by the far larger mass of tailings that will be generated during mining and stored on-site in perpetuity if the project is approved.

ANA's preliminary submission to the Impact Assessment Agency of Canada about this project elaborates in greater detail on the likely adverse impacts in areas of federal jurisdiction from this Project including on species at risk and on the rights, health, wellbeing, and livelihood of Grassy Narrows people.

By any objective standard, these and other effects upon matters of federal jurisdiction are profound, significant and deleterious in nature. Accordingly, ANA submits that it is imperative to ensure that such impacts are properly identified and assessed in an open, accessible and rigorous manner, which is best achieved by referring the impact assessment to a review panel.

Opportunities for Inter-Jurisdictional Cooperation

Ontario's *Environmental Assessment Act* (*EAA*) does not automatically apply to mining projects in the province. In addition, the Ontario government has taken no steps to date to designate the Great Bear Gold Project as an undertaking that requires a Comprehensive EA under Part II.3 of the *EAA*.

Accordingly, referral of the impact assessment to a review panel in this case poses no constraints on, and has no negative implications for, inter-jurisdictional cooperation with Ontario for the purposes of evaluating impacts under the *IAA* and *EAA*. For example, since the Great Bear Gold Project is not currently subject to Part II.3 of the *EAA*, there is no opportunity for ANA to request that the matter be referred to the Ontario Land Tribunal for a public hearing and decision.

However, if Ontario decides to designate the Great Bear Gold Project, then referral to a review panel under the *IAA* preserves the opportunity to integrate the two assessments pursuant to the joint review panel provisions of the *IAA* (section 39) and the harmonization provisions of the *EAA* (section 3.1) to ensure that risks of adverse impacts to all relevant areas of purported federal and provincial jurisdiction are assessed comprehensively in a holistic and participatory manner.

ANA also notes that the Great Bear Gold Project requires various provincial permits, licences, and approvals (e.g., Permit to Take Water, Environmental Compliance Approval (Sewage), etc.., However, none of these permits considers the Project as whole in its full context, which further illustrates the need for inter-jurisdictional coordination and cooperation between the federal and provincial governments.

Adverse Effects on Section 35 Rights

As described in the attached ANA letter, ANA is an Anishinaabe First Nation with traditional territory in what is now called northwestern Ontario and the ANA people have cared for and lived on these lands for countless generations.

As noted above, ANA people hunt, trap, fish and practice their Anishinaabe way of life throughout this territory to provide for themselves, their families and their community. This territory is the foundation of who Grassy Narrows people are as Anishinaabe people, who follow the teachings of the Elders to be responsible for the territory and to *Manaachitootaa Aki* (protect the land).

The ANA community has an inherent right to self-determination and law-making powers, as conferred upon ANA by the Creator. In addition to these inherent rights, ANA exercises Aboriginal rights and established Treaty 3 rights which are protected by section 35 of the *Constitution Act, 1982*.

In 1873, the Anishinaabe adhered to Treaty 3. The Treaty 3 Commissioner promised the Anishinaabe that the Treaty would protect their harvesting practices forever, which would allow ANA people to hunt, fish, trap, gather, and harvest throughout the Territory as they had before "as long as the sun shone and the waters flowed." At no time did the Anishinaabe agree to the erosion, impairment. or termination of their harvesting rights within the traditional territory beyond the Dawson route.

Accordingly, the attached ANA letter states that the intrusive, large-scale, and complex nature of the Great Bear Gold Project poses sizeable risks to, and impacts upon, the community's Treaty 3 rights:

> The Great Bear Gold project is a massive one, with great risks to Grassy Narrows and that can have a major impact on many aspects of Grassy Narrows' relationship with the Crown including our Treaty, the honour of the Crown, fiduciary duties, outstanding obligations, unmet duties, and reconciliation.

In these circumstances, referral of the impact assessment to a review panel will provide an important forum for ANA to pursue and present their concerns, lay and opinion evidence, and communal perspectives on the project's impacts on Aboriginal, treaty, and inherent rights.

Granting ANA's requested referral would also be consistent with the current *IAA* preamble and the federal government's mandate under section 6 of the *IAA* (and the proposed amendments thereto) which invoke the *United Nations Declaration of the Rights of Indigenous Peoples*, require respect for Aboriginal/treaty rights recognized and affirmed by section 35 of the *Constitution Act, 1982*, and emphasize reconciliation with the Indigenous peoples of Canada.

ANA hastens to add that the referral to a review panel does not, in and of itself, remedy the continuing failure of the Crown to meaningfully notify, consult, and accommodate ANA, and gain ANA's free, prior, and informed consent, in relation to the Great Bear Gold Project.

On this point, ANA maintains its position that honourable, sincere and timely government-to-government engagement must occur in relation to the Great Bear Gold Project (including the threshold question of whether the project can proceed at all). Moreover, the Crown's duty to consult cannot be delegated to the proponent in the impact assessment process, regardless of whether the ANA referral request is granted.

Part of the mandate of the review panel should be assess and to make recommendations to the Minister on whether, or not, ANA's free, prior, and informed consent for the project has been obtained and on whether allowing the project to proceed would be consistent with the *United Nations Declarations of the Rights of Indigenous Peoples*.

(iii) Past Practice regarding Referral of Mining Projects

Under the *IAA* and its predecessor legislation (i.e., *Canadian Environmental Assessment Act, 2012* and *Canadian Environmental Assessment Act, 1992*), there are several precedents where

assessments of mining projects throughout Canada have been referred to independent review panels, including the following proposed mines:

- Marathon Platinum Group Metals and Copper Mine Project (Ontario)
- Suncor Base Mine Extension Project (Alberta)
- Rose Lithium – Tantalum Mine Project and the James Bay Lithium Mine Project (Quebec)
- Grassy Mountain Coal Project (Alberta)
- Robb Trend Coal Mine Expansion Project (Alberta)
- Frontier Oil Sands Mine Project (Alberta)
- Jackpine Mine Expansion Project (Alberta)
- Pierre River Mine Project (Alberta)
- Prosperity Gold-Copper Mine Project (British Columbia)

Given the well-documented adverse environmental effects of major mine projects, this referral track record is reasonable, intelligible, and justifiable to ensure that robust assessments of mining impacts on areas of federal jurisdiction are carried out by review panels.

In relation to the above-noted Marathon mining project in northwestern Ontario, ANA notes that the proposal referred to the review panel in that case included three open pits, an ore processing plant, tailings and mine rock storage facilities, site access roads, a power transmission line, explosives factory and magazines, water management facilities, ancillary mine infrastructure, associated activities, and an estimated lifespan of 11.5 years.

In comparison, as indicated in the Detailed Project Description (pages 15 to 29), the components of the Great Bear Gold Project are substantially similar to the Marathon proposal in terms of size, scale, infrastructure, and potential environmental impacts. However, the Great Bear Gold Project includes not only three new open pits but also features an underground mine, storage of 1 million tonnes of waste rock arising from advanced exploration, extensive water-takings from surface water and groundwater resources, discharges of treated effluent to the Chukuni River, and an overall lifespan of approximately 25 years. In additions the Great Bear Gold Project is proposed to take place in an area with extreme pre-existing, current, and planned cumulative impacts to land and water from industrial activities which have resulted in horrific and well-documented impacts to the health and wellbeing of Grassy Narrows people. If the Marathon mine project warranted a review panel referral, then the Great Bear Gold Project clearly does as well for the site-specific reasons outlined above.

More generally, ANA notes that Ministerial decisions to refer mining and non-mining projects to review panel hearings have been typically based on various considerations, including: (a) potential adverse environmental effects to fish and fish habitat, aquatic species at risk, and migratory birds, (b) potential impacts on the rights of Indigenous peoples; (c) general public concern; and (d) the opportunity to cooperate with provincial governments. In ANA's view, these considerations are directly relevant and fully applicable in relation to the Great Bear Gold Project.

The plight of Grassy Narrows, and the threat of additional impacts to Grassy Narrows from mining activities, are one of the most notorious matters of general public concern in Canada as evidenced by the hundreds of prominent news media reports and thousands of public letters addressing this matter in recent years. Accordingly, there is no compelling policy reason or evidence-based rationale to depart from the well-established federal practice of referring mining project impact assessments to review panel hearings. Indeed, the Great Bear Gold Project is at least as worthy, if not more, of a review panel hearing, than the precedent projects listed above.

(iv) Public Interest Benefits of Referral to a Review Panel

At present, the forthcoming impact assessment of the Great Bear Gold Project will be conducted by the Agency unless the matter is referred to a review panel.

With all due respect to the Agency's institutional experience in environmental assessment, ANA submits that it would be preferable, from the public interest perspective, to appoint and empower an independent review panel in relation to the Great Bear Gold Project.

First, as a matter of law, the members appointed to the review panel must be "unbiased and free from any conflict of interest relative to the designated project" and must "have knowledge or experience relevant to the designated project's anticipated effects or have knowledge of the interests and concerns of the Indigenous peoples of Canada that are relevant to the assessment" (section 41 of the *IAA*, emphasis added). These important qualifications do not expressly apply to Agency officials conducting impact assessments (see sections 153 to 165 of the *IAA*). All of Canada will be watching this impact assessment process, and the persons carrying out this impact assessment must be, and must be universally perceived to be, unbiased and expert in the relevant subject matter.

Second, review panels are obligated under the *IAA* to hold public hearings that offer "the public an opportunity to participate meaningfully, in the manner that the review panel considers appropriate and within the time period that it specifies, in the impact assessment" (section 51(1)(c) of the *IAA*). The public hearings held by review panels may be flexible or informal, but they must be generally consistent with "the rules of procedural fairness and natural justice" (section 54 of the *IAA*). Again, this latter statutory provision does not expressly apply to Agency-led impact assessments.

Third, the public hearings held by review panels provide more extensive participatory opportunities for Indigenous communities such as ANA to present factual, technical and scientific evidence about the designated project and the factors listed in section 22 of the *IAA*. Similarly, review panel hearings enable Indigenous communities such as ANA to test or respond to the

evidence offered by proponents and government ministries or agencies in relation to the impact assessment. As correctly noted by a leading commentator:

> The most important opportunity for public involvement in federal environmental assessment is a panel review triggered by the Minister of Environment.[1]

Fourth, the hearing process (including full public disclosure of information, ability to summons witnesses, etc.) will greatly assist in ensuring the accuracy, reliability. and soundness of the review panel's report to the Minister (section 51(1)(e) of the *IAA*). These procedural mechanisms, in turn, will help to ensure credible, transparent, and informed decision-making under sections 60 to 65 of the *IAA*.

For the foregoing reasons, ANA submits that a review panel hearing is the preferable procedure for gathering information, generating recommendations, and making decisions under the *IAA* about the adverse effects of the Great Bear Gold Project on matters of federal jurisdiction. Put another way, ANA believes that participating in a review panel hearing is far superior to merely reviewing and commenting on documents posted on the Registry (or participating in non-public workshops or meetings) in an Agency-led impact assessment.

FORMAT OF THE REVIEW PANEL

Due to the extreme and unique circumstance of Grassy Narrows, and of the risks posed to Grassy Narrows by the Great Bear Gold Project, the review panel should:

1) be jointly selected together with Grassy Narrows such that all review panel members have Grassy Narrows' free, prior, and informed, consent.

2) have the review panel members' scope, process, and timeline set in a way that gains Grassy Narrows' free, prior, and informed consent.

3) include within their scope an assessment of whether Grassy Narrows' free, prior and informed consent for the Project has been obtained, and of whether approval of the Project would be consistent with the *United Nations Declaration on the Rights of Indigenous Peoples*.

CONCLUSION AND REQUESTED ORDER

In the circumstances of this case, ANA concludes that referring this matter to a review panel will provide a more effective, efficient, and equitable process for conducting the impact assessment required for this designated project under the *IAA*. Given the project's location, size, scale, design/operations, and direct, indirect, and cumulative adverse effects on matters of federal jurisdiction as well as on ANA's aboriginal, treaty, and inherent rights, referral of the impact assessment to a review panel is both warranted and appropriate from the public interest perspective.

---

[1] Rod Northey, *Guide to the Canadian Environmental Assessment Act (2019 ed.)* (Toronto: Lexis Nexis), page 587.

Accordingly, ANA requests that you refer the impact assessment of the Great Bear Gold Project to a review panel at the earliest opportunity. Once this referral is made under the *IAA*, our client requests a meaningful partnership in jointly appointing review panel members and in the establishment of the terms of reference for the review panel.

Please feel free to contact the undersigned if you require additional information about this referral request, and we look forward to your reply.

Yours truly,

CANADIAN ENVIRONMENTAL LAW ASSOCIATION

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Counsel

Richard D. Lindgren
Counsel

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ANA Land Protection Team
Anjala Puvanathan (IAAC Director, Ontario Region)
Jackie Esmonde / Sydney Lang, Cavalluzzo LLP
David Sone, ANA Advisor
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June 24, 2024

VIA ELECTRONIC MAIL

The Hon. Andrea Khanjin
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The Hon. George Pirie
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RE: Request to Designate Kinross Gold Corporation Great Bear Gold Mine Project as Subject to a Part II.3 Comprehensive Environmental Assessment under the *Environmental Assessment Act*

We are counsel to Asubpeeschoseewagong Anishinabek ("ANA" or "Grassy Narrows First Nation" or "Grassy Narrows") in connection with the above matter. By this letter, ANA is requesting that you:

(1) designate by order; or
(2) initiate the process with the provincial cabinet that will lead to the designation by regulation,

the Kinross Gold Corporation Great Bear Gold Mine Project (the "Project"), including all ancillary facilities, infrastructure, and all activities with a risk of adverse impacts such as advanced exploration and closure plan related to the Project, as subject to a Part II.3 comprehensive environmental assessment under the *Environmental Assessment Act* ("*EAA*").

Background

Grassy Narrows is a First Nation, whose members have inherent, aboriginal and treaty rights under section 35 of the *Constitution Act, 1982*, and the status of a "band" within the meaning of the *Indian Act*. Members of Grassy Narrows live on and off the English River 21 Reserve, which is a reserve within the meaning of the *Indian Act* located in their traditional territory, in northwest Ontario. The members of Grassy Narrows, who exercise rights enshrined in Treaty No. 3, are Anishinabe people, many of whom engage in the practice of traditional Anishinabe activities, such as hunting, trapping, fishing, gathering, teaching, ceremony, and healing in their traditional territory. These activities are central to their identity, diet, culture, spirituality, health, wellbeing, and economy.

These traditional activities are and have been, under continual threat for more than half a century due to pulp and paper, logging, damming, and mining activities in, around, and upstream of, the traditional territory of Grassy Narrows. To take just one aspect of that threat – the release of mercury, a known human nerve poison, from these various operations. The sufferings members

the Grassy Narrows community have faced over more than half a century are well-documented due to pulp and paper industry discharges of mercury into the English-Wabigoon River system that have contaminated the fish and wildlife that community members eat. The community has also made efforts to prevent further mercury exposure of their food and environment from clearcut logging and dam activities in their traditional territory over the years. It has recently been confirmed that current effluent discharges from the Dryden pulp mill are elevating methylmercury levels in the English-Wabigoon River system by adding sulfate and dissolved organic carbon. The most imminent new mercury and methylmercury threats currently come from the proposed expansion of mining activities throughout their traditional territory.

Great Bear Gold Mine Project

A prime example of this problem is the Project, proposed by the Kinross Gold Corporation. The company proposes an advanced mining exploration program at Great Bear that will produce 1 million tonnes of waste rock and 400,000 tonnes of overburden, and with that waste rock release a number of toxic substances, including mercury, arsenic, cadmium, and substances which stimulate methylmercury production in the aquatic environment. An April 2024 report of an expert retained by the Grassy Narrows community, Dr. Kevin Morin, noted the following:

- there will be sources of mercury from ore processing as the tailings and concentrate from the process will contain mercury, with the processing possibly even causing mercury and other elements to leach more quickly and become more mobile in the environment; and

- sulphate concentrations in the treated effluent, can increase toxic methylation of mercury and other elements like cadmium and arsenic.

Dr. Morin concluded in the cover letter to his report:

> "…based on the information available at this time for the Great Bear Project, I remain concerned about the many potential environmental impacts that are not recognized and not anticipated by Kinross Gold and about the many impacts that are recognized but poorly addressed and characterized. My concerns pertain to both the proposed advanced exploration and the proposed mining".

Designation of the Great Bear Gold Mine Project Under Part II.3 of the *EAA*

Designation of the Project under Part II.3 of the *EAA* would contribute to a complete examination and understanding of the environmental, social, economic, and cultural impacts potentially faced by the Grassy Narrows community were the advanced exploration and proposed mining Project to proceed. It would also allow the province, pursuant to section 3.1 of the *EAA*, to harmonize its *EAA* regime with that of the federal *Impact Assessment Act* ("*IAA*") as the latter is not being applied by the federal government to the advanced exploration part of the Project, which expert reports have noted poses serious risks. Furthermore, the information-gathering and decision-making provisions under the *IAA* are primarily aimed at the project's effects within federal jurisdiction, not effects within provincial jurisdiction. Thus, application of the *EAA* to the Project, including its

advanced exploration phase, would: (1) contribute to a comprehensive environmental assessment review of the Project; (2) increase understanding of the measures necessary to protect the Grassy Narrows community from further harm to their health, well-being, and environment; and (3) contribute to ensuring, as a consequence of section 2.1 of the *EAA*, that there is no abrogation or derogation from the existing aboriginal and treaty rights of Grassy Narrows people under section 35 of the *Constitution Act, 1982*.

The Grassy Narrows community also understands that the constitutional status and scope of the *IAA* is currently in flux nationally and in Ontario due to a number of factors, including:

- the October 2023 Supreme Court of Canada ("SCC") reference opinion, which found the *IAA* to be substantially unconstitutional except in respect of federal projects or projects on federal lands;
- recent amendments to the *IAA* enacted by the Parliament of Canada that would appear to further shrink the jurisdictional scope and application of the *IAA* in respect of projects on non-federal lands; and
- the position of the Ontario government which argued before the SCC that the *IAA* was unconstitutional and which has also advanced that position in subsequent proceedings it has brought before the Federal Court of Canada.

In these circumstances, the application of the provincial *EAA* appears entirely warranted in order to avoid a complete gap in the coverage of federal and Ontario environmental assessment law in areas of purported provincial jurisdiction concerning advanced exploration and mining projects of the kind represented by the Project.

Designation of the Project by Order

As you are aware, section 2 of the *EAA* states that the Act's purpose "is the betterment of the people of the whole or any part of Ontario by providing for the protection, conservation and wise management in Ontario of the environment". However, from the information available to us it is not clear if the Project, or any part thereof, is an undertaking currently subject to the *EAA* under the class environmental assessment provisions of the Act. Section 15 of the *EAA* states that the class environmental assessment provisions of the Act (Part II.1) apply to:

> "9. Class Environmental Assessment for Activities of the Ministry of Northern Development and Mines under the Mining Act approved by the Lieutenant Governor in Council on December 12, 2012 under Order in Council 1952/2012."

The class environmental assessment document itself states that discretionary tenure decisions (related to surface rights and mining rights) and discretionary rehabilitation activities made by the Mines ministry are subject to the *EAA*.[1] Moreover, at page 20 of the class environmental assessment document it states that:

[1] Ontario, A Class Environmental Assessment for Activities of the Ministry of Northern Development and Mines under the *Mining Act* (Approved December 12, 2012; Amended July 3, 2014; Amended February 28, 2018) at 12.

> "Discretionary rehabilitation activities range from being small in size with minimal potential environmental effects to large-scale engineering and design activities that involve the disposal of hazardous materials and containment and treatment of acidic and metal-laden discharges."[2]

In the view of Grassy Narrows "large-scale engineering and design activities that involve the disposal of hazardous materials and containment and treatment of acidic and metal-laden discharges" fall squarely within the four-corners of the Project. Pages 46-47 of the attached report of Dr. Morin identify the following problems with water treatment during Kinross's proposed exploration and proposed mining for the Project:

> In summary for water treatment, Great Bear documents invoke water treatment as the major process that would prevent or minimize environmental impacts of proposed exploration and proposed mining. This is not literally true, because there will be fugitive contaminated water and contaminated dust leaving the site, but this fugitive contamination is ignored or not recognized in many reviewed Great Bear documents.
>
> In any case, water treatment is the last "line of defence" between the on-site ML-ARD and contamination and the off-site impacts, and thus requires intensive study and characterization. However, at this time, water treatment for proposed exploration and proposed mining is ambiguous and contradictory among the documents. This should be expected because the input flows and input contaminant concentrations (ML-ARD) will not be known reliably for at least a few years. Nevertheless, there are serious concerns about water treatment now including the following.
>
> - Kinross Gold does not expect to treat site water to non-toxic levels. Instead, treatment would only be down to still-toxic levels based on the Metal and Diamond Mine Effluent Regulations. Thus, Kinross Gold intends to rely on significant dilution of its contaminated effluent within a "mixing zone" in the Chukuni River. Such a mixing zone would include zones of significant toxicity and would require formal authorization from Fisheries and Oceans Canada. In any case, this discharge of effluent would add to cumulative effects, which is a particular concern of Grassy Narrows First Nation.
>
> - Expensive and intensive treatment for ammonia, derived from blasting residues, is proposed. However, toxic levels of nitrate and nitrite, that always accompany the ammonia and which can cause eutrophication and other impacts in the Chukuni River and Dixie Creek, are completely ignored.
>
> - Sulphate concentrations in the treated effluent, which I understand can increase toxic methylation of mercury and other elements like cadmium and arsenic, are not mentioned at all.
>
> - Ultrafiltration may substantially reduce effluent concentrations for those elements not fully dissolved, mixing-zone size, and cumulative effects. However, there are no details on this ultrafiltration in the reviewed Great Bear documents.

[2] Ontario, A Class Environmental Assessment for Activities of the Ministry of Northern Development and Mines under the *Mining Act* (Approved December 12, 2012; Amended July 3, 2014; Amended February 28, 2018) at 20.

> - Mine water treatment plants remove metals and other elements from the water, by creating concentrated and toxic treatment waste commonly called "sludge", which can reach "hazardous" and "special" waste levels in some jurisdictions. Thus, treatment sludge requires the most careful and secure handling and long-term storage under contaminated-sites regulations. Spills of this sludge can result in toxic conditions in water and sediments including soils and benthic ecosystems. All the Great Bear documents I have reviewed so far are completely silent on the annual volumes, handling, storage, long-term protection, and potential environmental impacts of treatment sludge that will remain and be managed somewhere in perpetuity.

Grassy Narrows also notes the following from the MNDM Class Environmental Assessment document:

> Projects that have known or unknown and potentially substantial environmental effects (e.g., the rehabilitation of a large area of *tailings*) are classified as Category D. This category will involve extensive and detailed planning processes, including the preparation of a consultation plan and an analysis of *alternatives methods*. Projects assigned to this category will consist of MNDM's large-scale discretionary rehabilitation activities.
>
> The process by which an interested person(s) can make a request to the Minister of the Environment and Climate Change (or delegate) that a Category D project be made subject to an *individual environmental assessment* is described in Section 7.5.[3]

If the Project, or the advanced exploration part of it, is captured by the above provision, and Grassy Narrows suggests that it is, then, pursuant to section 16(6) of the *EAA*, a person may request that the Minister make an order on the grounds that the order may prevent, mitigate, or remedy adverse impacts on the existing aboriginal and treaty rights of the aboriginal peoples of Canada as recognized and affirmed in section 35 of the *Constitution Act, 1982*. By this letter, Grassy Narrows is making such a request because it asserts that its rights under section 35 will be violated by the Project, including the advanced exploration part of the Project. This is especially the case for this Project given the context of the extreme pre-existing cumulative impacts on this First Nation and its Territory and river. You, as Minister, have the authority under section 16(1) of the *EAA* to make such an order declaring a proposed undertaking referred to in section 15 to be a Part II.3 project and subject to comprehensive environmental assessment.

Designation of the Project by Regulation

In the alternative, if the Project is not subject to Part II.1 of the *EAA* as part of the class environmental assessment regime, then Grassy Narrows requests that you initiate a process whereby the provincial cabinet authorizes, pursuant to section 3(1) of the *EAA*, a regulation to be promulgated designating the Project, including its advanced exploration portion, as one to which the comprehensive environmental assessment requirements of Part II.3 of the Act apply.

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[3] Ontario, A Class Environmental Assessment for Activities of the Ministry of Northern Development and Mines under the *Mining Act* (Approved December 12, 2012; Amended July 3, 2014; Amended February 28, 2018) at 45.

Designation of the Advanced Exploration Portion of the Project by Order or Regulation

In the further alternative, if the government is not willing to designate the entirety of the Project as subject to Part II.3 of the *EAA*, Grassy Narrows submits that it should at least designate the advanced exploration portion of the Project, including the closure plan, as subject to a comprehensive environmental assessment under Part II.3. In conjunction with the *IAA's* application to the mining portion of the Project, this would ensure that between the two laws, both the advanced exploration and mining portions of the Project would be subject to some environmental assessment. Although this is a less-than-ideal alternative to the comprehensive application of provincial environmental assessment authority to the full project, it is preferable to having no environmental assessment whatsoever given the serious risks posed by the extensive advanced exploration work proposed.

Summary

Given the historic harms from mercury exposure the people of Grassy Narrows have experienced due to industrial operations in their traditional territory, including the cumulative impacts of other industrial activities and land uses, the proposed advanced exploration and full mining activities from the Kinross Project that may result in their further exposure to mercury and other toxic substances, and the potential for a complete gap in the coverage of federal and Ontario environmental assessment law to this Project, Grassy Narrows requests that the Project, including its advanced exploration aspects or, in the alternative, just the advanced exploration portion of it, including the closure plan, be designated by order, or by regulation, as subject to Part II.3 of the *EAA* and its comprehensive environmental assessment requirements.

Yours truly,
CANADIAN ENVIRONMENTAL LAW ASSOCIATION

Joseph F. Castrilli
Counsel

Richard D. Lindgren
Counsel

Encl. Morin Report – April 2024 (appended to letter of Joseph B. Fobister – Lead Negotiator ANA Land Protection Team)

cc. ANA Land Protection Team
Jackie Esmonde / Sydney Lang, Cavalluzzo LLP
David Sone, ANA Advisor
Luke Crosby / David Bursey, Counsel for Great Bear / Kinross

Asubpeeschoseewagong
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Attention: Minister George Pirie (Minister of Mines) (minister.mines@ontario.ca)
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Attention: Aaron MacDonell, Director of Environmental Services (aaron.macdonell@kinross.com)
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Great Bear Resources Ltd. A Kinross Company
104 Howey Street
Red Lake, Ontario P0V 2M0

Dear MINES, IAAC, Kinross and Great Bear Resources:

RE: The Great Bear Gold Mine Project

I wrote to you on March 29 and April 15 to provide initial findings from Dr. Kevin Morin concerning metal leaching and acid rock drainage, water quality and hydrogeology with respect to the Great Bear Gold Project.

Please find enclosed:

- Dr. Morin's response to Kinross Gold's consultant, WSP. He concludes that he remains concerned about the many potential environmental impacts that are not recognized and not anticipated by Kinross Gold and about the many impacts that are recognized but poorly addressed and characterized. His concerns pertain to both the proposed advanced exploration and the proposed mining.

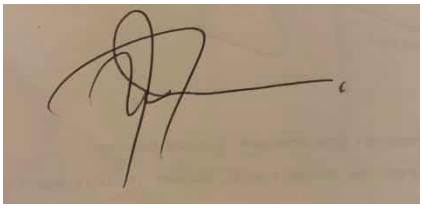
- Dr. Morin's report following his review of the technical documents provided to Grassy Narrows to date: Project Definition; Geochemical Characterization Workplan; Advanced Exploration Program Reclamation Strategy; Program Closure Plan (Draft for Indigenous Review); Hydrogeological Workplan; Surface

Water Quality Workplan; Fugitive Dust Best Management Practices Plan; PTTW Application for Dewatering; Draft Detailed Project Description; Water Treatment during Proposed Exploration and Proposed Mining.

Based on Dr. Morin's export reports, Grassy Narrows is extremely concerned that the project is moving ahead swiftly in the absence of required information and at great risk to the environment, the health, inherent, Treaty and Indigenous rights of Grassy Narrows.

I repeat Grassy Narrows' call to freeze the regulatory process work on this project until full credible information is available and the barriers to Grassy Narrows' meaningful involvement have been resolved. I also repeat Grassy Narrows' position that this project, including the extensive mining of valuable ore that the company is calling "bulk sampling", must be subjected to a rigorous environmental assessment.

Miigwetch,



Joseph B. Fobister, Lead Negotiator of Grassy Narrows Lands Protection Team

CC:

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MINESITE DRAINAGE ASSESSMENT GROUP
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CANADA

BY EMAIL

April 24, 2024
FILE: 5025.01

Grassy Narrows First Nation
c/o Cavalluzzo
474 Bathurst Street, Suite 300,
Toronto, Ontario M5T 2S6
Attn: Grassy Narrows Lands Protection Team

Dear Grassy Narrows Lands Protection Team,

RE: Great Bear Mining Project - Response to Kinross Gold on MDAG Initial Comments of March 27 2024

I have submitted to you two letters in the past about environmental concerns at the Great Bear Project, dated March 27 and April 11. These letters were based on some of my initial findings from some documents that were within my focus on metal leaching and acid rock drainage (ML-ARD), water quality, and hydrogeology. My review is now complete, including more detailed explanations for those earlier, initial comments as well as additional comments and concerns. My full review accompanies this letter of April 23.

Kinross Gold's consultant, WSP, replied to my first letter of March 27 on April 4. WSP sent a table with 18 issues, listed as "MSDAG [sic] Letter - Comments and Rationale" with a corresponding "GBR Response".

Please note that I did not include full "Rationales" with my initial letters because my detailed review was still in progress. Thus, it was not possible for WSP to provide satisfactory responses. My detailed "Rationales" were provided to you only today.

In any case, I explained that there was little reliable and professionally certified information on ML-ARD, water quality, and hydrogeology at this point for the Great Bear Project. Most Great Bear reports included labels like "preliminary", "draft", and "initial", which meant they were not complete, not certified as reliable, and subject to change one or more times in the future. In fact, some information and designs already changed substantially in 2023, as the accompanying review confirms.

Many of WSP's Responses reflected this. For example, the first WSP Response starts with:

> "The geochemical information presented in these reports represent initial draft documents for the Project, based on data collected in 2022 and early 2023 which was developed [sic] qualified professionals."

As I explained previously, my opinion is that preliminary, draft, and initial reports for the Great Bear Project that are not signed and certified by qualified professionals should not be reviewed. They are subject to change, and already some reports issued in 2023 contradicted others. I expect this to continue for at least a few years until final, reliable monitoring data and testwork are completed.

As a result, it is not worthwhile or meaningful to reply to WSP's Responses to my first letter. There are insufficient information and data at this time to debate and clarify many of my concerns and issues. There may or may not be sufficient information and data in future years. Only time will tell.

Therefore, based on the information available at this time for the Great Bear Project, I remain concerned about the many potential environmental impacts that are not recognized and not anticipated by Kinross Gold and about the many impacts that are recognized but poorly addressed and characterized. My concerns pertain to both the proposed advanced exploration and the proposed mining.

Sincerely,

Kevin A. Morin, Ph.D., P.Geo., L.Hydrogeo.
President

Great Bear Mining Project -

Review of ML-ARD and Water Quality Expected during and after Advanced Exploration and Proposed Mining

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April 23, 2024

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Report Summary

This MDAG review has focussed on the potential for contamination of water by metal leaching and acid rock drainage (ML-ARD) on, under, and around the Great Bear Project during proposed exploration and proposed mining.

It is important to note that some report titles for Great Bear contain the words "draft", "preliminary" or "initial", meaning newer drafts and revised final versions from Kinross Gold may or may not change from what has been reviewed here. Also, the first cover page for the Detailed Project Description of November 2023 says "draft" while the second WSP cover page does not. Thus, I have found that the reviewed documents for the Great Bear Project as a whole is a confusing mess of shifting, changing, contradicted, and assumed details, with none signed and certified by qualified professionals.

Also, the contents of some documents are password protected. This protected text and information cannot be extracted for detailed evaluation, quotation, review, and comment now or in the future. Thus, they preclude detailed reviews by Grassy Narrows First Nation, which is what Kinross Gold seeks.

Each section of this MDAG review looked in detail at a particular report on proposed exploration and/or proposed mining. The following paragraphs are the summaries taken from each section, and each section should be consulted for details and context.

Section 2 of this MDAG Review

For the password-protected Project Definition Document of December 2022, sufficient details and omissions are present for me to be very concerned about ML-ARD and water-quality degradation during and after the relatively large, at-least-four-years-long proposed Advanced Exploration that would essentially be a first phase of mining at Great Bear. These concerns carry over to the proposed mining.

Although this document is not marked as "draft" and is thus final, it contains many details contradicted by later documents as explained in later sections of this MDAG review. Thus, it is not possible to know exactly what is proposed for Advanced Exploration and, in turn, to know reliably how bad the environmental problems and impacts could be.

Section 3 of this MDAG Review

Problems detected in the January 2023 Geochemical Characterization Workplan include:

- The ML-ARD program is "in progress" so no one knows how bad the contamination will be and which elements will be at toxic levels requiring treatment, yet Kinross wants to proceed with

Advanced Exploration.

- All that is available now is 96 rock core analyses according to the September 2023 Reclamation Summary (see below), which on their own are not reliable and cannot yet be interpreted reliably for ML-ARD. In fact, these 96 samples were not even of the rock that would be "mined" during Advanced Exploration, but only "proximal" which could also mean "very different". In any case, the 96 samples were not collected and analyzed as required under the Ontario Mining Act (see next bullet). Thus, Kinross Gold and its consultants, WSP, are guessing how bad the contamination will be, but admit that some of it will be bad, and are likely years away from completing the ML-ARD work required under Regulation 240/00 of the Ontario Mining Act (Mine Development and Closure under Part VII Of the Act).

- The stated approach and methodology used for Advanced Exploration is "based on the requirements" of two British Columbia documents from 1997-1998 (Price, 1998; Price and Errington, 1998; Price, Morin and Hutt, 1997). In reality, the Ontario Mining Act says the approach and methodology must be based on the much more detailed 2009 federal Prediction Manual, not just as "guidance" as Great Bear has done. Thus, the work for Advanced Exploration to date does not meet the Ontario Mining Act through Regulation 240/00 and does not meet the 2009 federal ML-ARD Prediction Manual (Price, 2009).

- Even if this Geochemical Characterization Workplan was applicable and consistent with the 2009 federal ML-ARD Prediction Manual, such work requires at least 2-3 years to obtain all required information and interpretations. Therefore, perhaps in 2025 or some year after, there might be sufficient ML-ARD for Advanced Exploration, but not any time soon.

Section 4 of this MDAG Review

Concerns on the Reclamation Strategy from September 2023 include the following.

- The ML-ARD program is "in progress" so no one knows how bad the contamination will be and which elements will be at toxic levels requiring treatment, yet Kinross Gold wants to proceed with Advanced Exploration.

- All that is available now is 96 core analyses, which on their own are not reliable and cannot yet be interpreted reliably for ML-ARD. In fact, these 96 samples were not even of the rock that would be "mined" during Advanced Exploration, but only "proximal" which could also mean "very different". Also, 30 samples of overburden, which is intended to be left on surface and used for reclamation, were collected yet the results are not reported although there is ~50% probability that the overburden will release ML-ARD and thus be toxic. Kinross Gold and WSP are guessing how bad the contamination will be, but admit that some of it will be bad. They are likely years away from completing the ML-ARD work required under the Ontario Mining Act and Regulation 240/00, because the work for Great Bear was not initially consistent with Regulation 240/00. In part, this is because the 2009 federal ML-ARD Prediction Manual (Price, 2009) was not recognized or followed as required. Even the

definitions of ML-ARD acronyms used for the Great Bear Project are not correct according to the federal Manual, which is additional evidence the Prediction Manual is not being followed.

- The bad ML-ARD rock appears to be associated with "rapid acid generation" according to the Program Closure Plan (reviewed in the next section below). This is an incorrect explanation of the phenomenon, but still shows that the bad water quality will start coming out of the disturbed rock, including the underground mine walls, very quickly after initial disturbance. Informally, this is called "lag time" to ML-ARD, but most of the ML-ARD work has not yet been done to quantitatively estimate the lag time beyond "rapid". This contaminating rock will be stored on surface and possibly only later, likely after the lag time, some might be taken underground. When this rock contacts water underground as the workings partially flood and submerge, it will quickly release more contamination. This means the underground water flowing into the surrounding groundwater system, and the surface overflow if any, would have to be monitored and likely be treated for many years or in perpetuity after Advanced Exploration.

Section 5 of this MDAG Review

For the password-protected Program Closure Plan, Draft for Indigenous Review from November 2023, the following concerns were noted.

- In November 2023, the volume of overburden has approximately doubled from previous documents without an explanation. Because overburden generally has a 50% probability of releasing ML-ARD and contaminating water, overburden represents a major but unexamined threat to water quality on, around, and beneath the Great Bear exploration site.

- "Preliminary" criteria are provided for separating "PAG" and "NPAG" rock and for "NML" rock. However, these acronyms are not used in an accurate manner that is consistent with the 2009 federal Prediction Manual (Price, 2009) required by Regulation 240/00. The preliminary criteria are not rational based on ML-ARD science unless justified with detailed and intensive site-specific studies, which have not yet been completed and professionally certified for the Great Bear Project.

- The potential for ML-ARD after closure is presented all the way to detailed predictions of aqueous concentrations in mg/L for on-site water and effluent to the environment, but only after closure and not during operations when the water quality would be reasonably worse. However, these predictions are not explained in any detail, are not justified, appear anomalous, and are not certified by a qualified professional. Some predictions are actually pre-exploration baseline that are erroneously assumed to be re-established immediately at closure. Furthermore, these predictions are missing more than a dozen potential contaminants.

- The "PAG" rock, which would likely create the highest contaminant concentrations, is not included

in this Program Closure Plan, presumably because this "PAG" rock will be backfilled underground. However, when placed underground, this "PAG" rock will likely continue to release severe ML-ARD until submerged, at which point a relatively huge amount of accumulated contamination would be released into the underground water. After the mine is refilled to equilibrium, and the minewater begins flowing into the surrounding groundwater system and through the more than 500 km of permeable drillholes to the environment, it will contaminate large surrounding areas. This major risk to water quality and the environment is not even mentioned in this Closure Plan, which is a major omission.

- The backfilling of "PAG" rock at closure is the largest individual cost item for closure totalling around $10 million. However, this reflects the currently minimum volume based on preliminary, unreliable information. In the worst case, which was assumed in the Great Bear Project Definition and still not disproven here, total closure costs could exceed $20 million.

Section 6 of this MDAG Review

In the Hydrogeological Workplan from December 2022, there is a major omission that would preclude a reliable and comprehensive assessment of current baseline hydrogeologic conditions and of future impacts from proposed mining. The groundwater monitoring network does not extend far enough to the west and northwest, beyond the proposed western portion of the Tailings Management Facility.

Section 7 of this MDAG Review

In the Surface Water Quality Workplan from December 2022, there are insufficient information and details to determine if appropriate work is planned and conducted. This is because important details are listed only as "including". For example, major potential contaminants like manganese and thallium are not specifically listed, but perhaps they are implicitly included? There is no way to know.

Section 8 of this MDAG Review

Based on the final-draft Fugitive Dust Best Management Practices Plan of September 2023 for Advanced Exploration, this work is unacceptable because it grossly underestimates the potential impacts from ML-ARD geochemical contamination of soil, vegetation, water, and biota by dust. This work assumes the on-site sources of dust "would be similar in concentration to the background rock". This is wrong and ignores the ongoing ML-ARD assessment of ore, rock, and overburden.

Section 9 of this MDAG Review

In the PTTW (Permit To Take Water) Application for Dewatering, Final Draft, and its several

important appendices from October 2023, there are alarming errors and ambiguities that should preclude approval of PTTW. These should also trigger a detailed impact assessment, which this PTTW report conversely says is not needed for Advanced Exploration at Great Bear.

In the introduction to the main PTTW report, the only numerical water withdrawal mentioned is up to 250 m^3/day (250,000 L/day) from Dixie Creek. Thus, it is stunning because the actual total water withdrawal from the local groundwater/surface-water balance would be at least 3,203,000 L/day every day and reaching up to 7,703,000 L/day on some days as a contingency. Even these flows are unrealistically low as explained here.

The errors begin with groundwater modelling that is based on long-term "steady state conditions" after the mine is "fully developed" and dewatered, and not on the correct, higher-inflow "transient conditions". Thus, inflow, pumping, and dewatering are significantly underestimated by the groundwater model and the PTTW Application. Additionally, there are problems with unrealistically low estimated effects on partial dewatering of Dixie Creek and other creeks and rivers. For example, simulated groundwater levels are around 9 m higher than measured around the mine and Dixie Creek, which artificially and incorrectly prevent additional dewatering of Dixie Creek.

Groundwater levels are shown to be drawn down during dewatering to a maximum of only 36 m even though the dewatered workings will be 600 m deep. This reflects (1) nearly fully dewatering of the shallow overburden and (2) the lack of admission on the likely huge drawdown and much larger "Zone of Influence" in the rock beneath the overburden.

Baseflows into Dixie Creek and other waterbodies can be critical to aquatic, benthic, and terrestrial ecosystems because of groundwater's typically different water quality and temperature compared to water already flowing at the surface. This becomes more critical during droughts when baseflow may be the main source of surface flows. The PTTW Application ignores the fact that more than 34 to 55% of existing baseflow would be lost during Advanced Exploration. It instead points out that the loss to groundwater would be only 2.4% and less of total flow depending on the chosen surface-flow statistic.

Overburden is routinely ignored in this PTTW document and its appendices, despite the proposed hundreds of thousands of tonnes of overburden likely having at least some ML-ARD potential and capacity to degrade water quality. In fact, some underground dewatering would be sprayed on the overburden for dust suppression, which in turn could lead to contaminated runoff across and off the site.

Section 10 of this MDAG Review

In the perhaps-draft Detailed Project Description of November 2023, the first cover page by Kinross says this document is "draft", but the second cover page by the authors, WSP, does not say "draft" so perhaps this is or is not the final document. If so, it has not been signed by qualified professionals and thus should be rejected.

In any case, there are so many problems, misleading statements, errors and omission concerning ML-ARD, water quality, and environmental impacts that they cannot all be summarized well here. These problems include the following.

- There is a false statement that there will be no sources of mercury from the ore processing when in fact the tailings and concentrate from the process will contain mercury. The processing could even cause mercury and other elements to leach more quickly and become more mobile.

- Contrary to the impression given by this Detailed Project Description, cyanide destruction is not perfect and can simply mask the cyanide temporarily in the environment, but the important testwork to determine this has not yet been done for the Great Bear Project.

- Significant impacts on water quality can arise from seemingly benign proposed activities like paste backfill of tailings into the underground mine and dewatered filter-cake tailings. However, the potentials for serious impacts are not recognized or not even mentioned in this perhaps-draft Great Bear document that can supposedly be used to determine what impacts could occur.

- Storm events and equipment upsets can lead to relatively large variations and unexpected impacts, day-to-day or even hour-to-hour, during proposed exploration and proposed mining. Instead, these Great Bear documents use averages like monthly which incorrectly assume flows will be the same every day of a month which is far from reality. Environmental impacts and spills can also be caused by large variations, as well as longer-term averages, so the environmental risks of proposed exploration and proposed mining at Great Bear remain mostly unknown and not identified.

- Nonsense pseudo-scientific statements are used, like the aggregate required to build the project would be “nonreactive mine rock and overburden” which does not exist. This clearly shows that experienced and qualified professionals were not included in the writing of this perhaps-draft Detailed Project Description. If there is a true commitment to “nonreactive mine rock and overburden” which does not exist, then the Great Bear Project stops now.

- There is a lack of ML-ARD assessments for some site components like aggregate.

- There is a prevalent but likely false belief that “NPAG”rock will have little to no impacts on ML-ARD, water quality, and the environment. However, this has not been proven for the Great Bear Project and is likely wrong based on other minesites around Canada. “NPAG” rock can actually generate more acid than “PAG” rock and could still release seriously contaminated levels of many metals and other elements at near-neutral pH.

- The financial assurance to ensure proper and fully paid closure of the proposed Great Bear Project is grossly underestimated based on existing information. Furthermore, the financial assurance should also include contingencies for costs of early or premature closure, but it does not.

- There are likely devastating, expensive, and unrecognized ML-ARD consequences on water quality from the proposed relocation of "PAG" rock into the underground workings after operation.

- The ongoing, unproven, and likely wrong, belief continues that overburden would be environmentally benign, can be used across the site for reclamation, and can be sprayed with water to control dusting when it could instead create contaminating water around, below, and beyond the Great Bear site.

- There are unfounded beliefs that dewatering during exploration and mining would have minimal effects on the local and regional water balance, and would not significantly dewater surface creeks and lakes including their environmentally important baseflow. These false beliefs are based on flawed groundwater modelling for the Great Bear Project explained earlier in this MDAG review.

- There is a false belief that dust blown off the site during proposed exploration and proposed mining and into the surrounding environment, vegetation, soil, water, and aquatic ecosystems is benign at "background" levels.

- A false belief is stated that only elevated and toxic ammonia, and no other contaminating nitrogen species from explosives that consistently accompany the ammonia, will appear in mine water during proposed exploration and proposed mining.

- There is an unsupported and likely substantially underestimated statement that the mine walls in the pits and underground workings "may potentially contribute minor quantities of metals to the mine water" instead of the more typical significant quantities of metals seen at many other minesites around Canada. This is taken as far as the likely ludicrous statement that there would be "Potential for creation of fish habitat in new pit lakes, expected to be re-connected [sic] to the Dixie Creek system".

- There is no recognition of the implications, costs, and impacts of storing months of contaminated mine water on the site should one or more "unexpected" yet currently predictable inorganic contaminants and ML-ARD occur on the site water during and after proposed exploration or proposed mining.

Section 11 of this MDAG Review

In summary for water treatment, Great Bear documents invoke water treatment as the major process that would prevent or minimize environmental impacts of proposed exploration and proposed mining. This is not literally true, because there will be fugitive contaminated water and contaminated dust leaving the site, but this fugitive contamination is ignored or not recognized in many reviewed Great Bear documents.

In any case, water treatment is the last "line of defence" between the on-site ML-ARD and contamination and the off-site impacts, and thus requires intensive study and characterization.

However, at this time, water treatment for proposed exploration and proposed mining is ambiguous and contradictory among the documents. This should be expected because the input flows and input contaminant concentrations (ML-ARD) will not be known reliably for at least a few years. Nevertheless, there are serious concerns about water treatment now including the following.

- Kinross Gold does not expect to treat site water to non-toxic levels. Instead, treatment would only be down to still-toxic levels based on the Metal and Diamond Mine Effluent Regulations (MDMER). Thus, Kinross Gold intends to rely on significant dilution of its contaminated effluent within a "mixing zone" in the Chukuni River. Such a mixing zone would include zones of significant toxicity and would require formal authorization from Fisheries and Oceans Canada. In any case, this discharge of effluent would add to cumulative effects, which is a particular concern of Grassy Narrows First Nation.

- Expensive and intensive treatment for ammonia, derived from blasting residues, is proposed. However, toxic levels of nitrate and nitrite, that always accompany the ammonia and which can cause eutrophication and other impacts in the Chukuni River and Dixie Creek, are completely ignored.

- Sulphate concentrations in the treated effluent, which I understand can increase toxic methylation of mercury and other elements like cadmium and arsenic, are not mentioned at all.

- Ultrafiltration may substantially reduce effluent concentrations of elements not fully dissolved, mixing-zone size, and cumulative effects. However, there are no details on this ultrafiltration in the reviewed Great Bear documents.

- Mine water treatment plants remove metals and other elements from the water, by creating concentrated and toxic treatment waste commonly called "sludge", which can reach "hazardous" and "special" waste levels in some jurisdictions. Thus, treatment sludge requires the most careful and secure handling and long-term storage under contaminated-sites regulations. Spills of this sludge can result in toxic conditions in water and sediments including soils and benthic ecosystems. All the Great Bear documents I have reviewed so far are completely silent on the annual volumes, handling, storage, long-term protection, and potential environmental impacts of treatment sludge that will remain and be managed somewhere in perpetuity.

1. Introduction

Metal leaching (ML) and acid rock drainage (ARD) are often water-chemistry and water-quality issues for minesites (e.g., Morin and Hutt, 1997 and 2001). As a result, the accurate prediction and control of ML-ARD at mining projects and proposed minesites in Ontario are high priorities of the provincial and federal governments.

This is explained in Part 7 (*Metal Leaching and Acid Rock Drainage Requirements*) of Ontario Regulation 240/00 (*Advanced Exploration, Mine Development and Closure under Part VII of the Act*), and in the federal ML-ARD Prediction Manual (Price, 2009). Section 57(1) of Regulation 240/00 states,

> "A program shall be undertaken to sample all materials remaining on the site that have been excavated, exposed or otherwise disturbed by mining activities, including but not limited to,
>
> (a) drill core;
> (b) metallurgical samples;
> (c) pit walls;
> (d) existing waste rock, ore, concentrate and *overburden* [MDAG emphasis] piles;
> (e) construction rock; and
> (f) tailings."

For detailed guidance, Ontario Regulation 240/00 states,

> "The sampling program shall be conducted by a person who is qualified in Ontario as a professional geoscientist, professional agrologist or professional engineer in accordance with a report prepared by William A. Price on behalf of the Mine Environment Neutral Drainage (MEND) program, entitled 'Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials', MEND Report 1.20.1, dated December, 2009, as that report may be amended from time to time..." [Price, 2009]

ARD is caused by oxidation of sulphide minerals, which are found at the Great Bear Project, particularly iron-bearing sulphides like pyrite and pyrrhotite. Whether sulphide minerals are present or not, weathering can still lead to accelerated metal leaching (ML). For example, the simple dissolution of near-neutral or alkaline carbonate minerals can release metals like manganese and zinc into the water. Thus, ARD is a subset of the more generic ML.

In practice, ML is not limited to true metals in the Periodic Table, but to all elements that could become potential environmental contaminants. For example, sulphate and nitrate are regularly included in ML assessments. Sulphate can reportedly increase the methylation of mercury and other elements like cadmium and arsenic.

Therefore, ML-ARD is an acronym representing the full spectrum of inorganic water chemistry and quality on, beneath, and around a minesite. Put simply, ML-ARD potential is synonymous with the potential for inorganic water contamination and the degradation of on-site water quality.

Kinross Gold Corporation (Kinross Gold) proposes Advanced Exploration and later mining at its Great Bear Gold Mining Project in the Red Lake mining district of Ontario, approximately 25 km southeast of the Town of Red Lake. The Great Bear Project is located in the Interim Area of Interest for Mining of Asubpeeschoseewagong Netum Anishinabek (ANA), which Kinross documents also name as Grassy Narrows First Nation (GNFN). The Great Bear Project is also in an area where Grassy Narrows First Nation people use the land and water to practice their Indigenous way of life. It is located upstream of the English River which flows directly to the Grassy Narrows village site and Grassy Narrows' most important fishing grounds.

Through Cavalluzzo LLP, the Grassy Narrows Lands Protection Team has asked me, Dr. Kevin Morin of the Minesite Drainage Assessment Group (MDAG), to review and comment on the proposed exploration and proposed mining. This MDAG review focuses on predicted surficial and subsurface ML-ARD and water quality on and around the Great Bear Project.

My qualifications for making the comments in this review document include the following. I have been assessing water contamination at minesites by metal leaching and acid rock drainage (ML-ARD) for 46 years. I have done this at several hundreds of exploration, operating, and closed mining-related sites on all continents except Antarctica, from north of the Arctic Circle to south of the Tropic of Capricorn, in biogeoclimatic zones ranging from virtually no annual precipitation up to a rare daily rainfall of one meter. I earned my Doctor of Philosophy degree in contaminant hydrogeology from the University of Waterloo, where my supervisor was the renowned Dr. John Cherry along with a thesis committee including Drs. Emil Frind (a well-known groundwater modeller) and Eric Reardon (a well-known geochemist). To date, I have authored or co-authored 99 published papers and presentations, five books, and 80 online case studies. I have been and am a peer reviewer for a number of international journals related to ML-ARD and environmental contamination. More details can be found at www.MDAG.com.

The Kinross documents reviewed in the following sections are listed below. Again, the main focus is on the potential for contamination of water by ML-ARD on, under, and around the Great Bear Project during proposed exploration and proposed mining.

- Project Definition Document (December 2022)
- Updated Site Plan
- PTTW Application for Dewatering, final draft (October 2023)
- Fugitive Dust Best Management Practices Plan, final draft (September 2023)
- Reclamation Strategy (September 5, 2023)
- Program Closure Plan, Draft For Indigenous Review (November 2023)
- Surface Water Quality Workplan (December 21, 2022)
- Hydrogeological Workplan (December 21, 2022)
- Geochemical Characterization Workplan (January 9, 2023)
- Preliminary Impact Assessment Methodology, draft (May 31, 2023)
- Preliminary Listing of Potential Valued Components for the Great Bear Project (May 31, 2023)
- Initial Project Description (June 1, 2023)
- Detailed Project Description (November 2023)

- PowerPoint Presentation by Kinross to ANA (November 10, 2023)
- ANA IPCA Map

It is important to note that some report titles above contain the words “draft”, “preliminary” or “initial”, meaning newer drafts and revised final versions from Kinross Gold may or may not change from what has been reviewed here.

Also, the contents of some documents above are password protected. This protected text and information cannot be extracted for detailed evaluation, quotation, review, and comment now or in the future. This precludes the detailed review by Grassy Narrows First Nation that Kinross Gold seeks. I strongly recommend that unlocked versions of all Kinross documents be obtained and kept by Cavalluzzo LLP and the Grassy Narrows First Nation for future reference and usage.

2. Project Definition Document (December 2022)

The Great Bear Resources Great Bear Advanced Exploration Project Project Definition Document, dated December 2022 by WSP E&I Canada Limited (WSP), is a password-protected document from which its content cannot be extracted or copied for detailed evaluation and reinterpretation.

In the Preface of this document, WSP states,

> "The Project as described in this document is subject to change as engineering progresses, in response to feedback from government agencies, Indigenous communities and stakeholders, as well as constraints not currently known, that are identified by ongoing environmental baseline and engineering works, and Indigenous consultation and engagement."

No new or updated Project Definition could be located and thus this version from December 2022 is reviewed here from the perspective of ML-ARD and potential water contamination.

Section 1.3 explains the objective of the proposed Advanced Exploration and its key activities:

> "The objective of this Project is to obtain additional information on the known mineralized zones (LP Fault, Limb Zone and Hinge Zone; Figure 1-3) through underground drilling, and to extract a bulk ore sample of up to 60,000 tonne (t) by underground mining methods. Extraction of a bulk sample allows the testing of representative areas of the mineralization off site, in order to gain a better understanding of the geology of the mineralized zones including, grade, structural controls on the mineralization, continuity, mining dilution, optical sorter performance and metallurgical recoveries. This information will support the assessment and development of a viable commercial production scenario.
>
> "The Project will also support future engineering designs by improving knowledge of key factors (ground conditions, water inflows, costs, labor, etc.). It will also improve the knowledge base to increase the confidence in environmental predictions associated with the proposed underground mine and to a lesser extent open pit mine.
>
> "Key Project activities are provided below:
> - Establish portal(s) and decline(s) to provide access underground in order to establish required underground workings
> - Develop drill platforms off the decline to facilitate efficient underground drilling of the known mineralized zones at depth
> - Extract up to 60,000 t of ore (bulk) sample from test stopes and drifts in the mineralized zones
> - Transport the ore to surface along the decline(s) by truck for crushing, sorting and sampling; samples will transported off site by highway truck for test processing
> - Mine rock that must be removed from the underground workings in order to provide access to the ore will be brought to surface by truck and will be stored in stockpile(s) unless appropriate for use as a construction material on site
> - Additional activities on surface and underground, such as environmental management."

These quotations raise several concerns as explained next.

Section 1.4 "Consultation to Date" with First Nations mentions Wabauskang First Nation (WFN) and Lac Seul First Nation (LSFN) in several places including an Exploration Accommodation Agreement. In contrast, Grassy Narrows First Nation (GNFN) in mentioned only twice, including where the Ontario Ministry of Mines instructed Kinross Gold to include GNFN in notifications of significant updates on exploration works. Later, Section 7.4.1 adds,

> "On September 29, 2022, the Company communicated its interest in an introductory meeting to GNFN, who respectfully declined the offer."

Section 1.5 on "Involvement of Federal Agencies" in this Project Definition starts by saying "Not currently applicable". Then it clarifies:

> "No Federal government departments or agencies are expected to grant Federal land or providing financial support to the project (include indirect funding support, such as for infrastructure and training). There is the potential that Federal departments may be required to provide environmental approvals or authorizations (see Section 7.3.1)."

Federal agencies like Fisheries and Oceans Canada will very likely be involved in authorizations as the Great Bear Project intends to discharge toxic water including from its advanced-exploration treatment plant into fish-bearing waters and fish habitat as "mixing zones" requiring authorizations. This is discussed further in Section 11 of this MDAG review.

Section 5.1.1 on Existing / Previous Development, Operations and Facilities says:

> "The first exploration work documented by Geology Ontario on the Property dates from 1944. Prior to acquisition by Great Bear Resources Ltd. in 2017, 176 diamond drillholes had been completed totalling 32,602.8 metres (m).... As of October 2022, there has been over 500,000 m of diamond drilling on the Property."

For understanding how groundwater might move during and after proposed Advanced Exploration, these hundreds of drillholes more than 500 km in total length create very permeable pathways for subsurface water to travel long distances quickly, in violation of normal hydrogeologic principles like hydraulic gradients and hydraulic conductivities. This is not acknowledged in other Great Bear documents, as explained in sections of this MDAG review such as Sections 6 and 9.2.

Section 5.1.3 on Geology and Mineralogy says:

> "The Property lies locally within a regional northwest-southeast trending belt of metavolcanic and metasedimentary rocks, bound by intrusive batholiths (see Figure 5-1). The Project is targeting gold mineralization, currently identified within three mineralized zones (see Figure 1-3):
>
> - LP Fault Zone, disseminated gold within high strain
> - Limb Zone (previously known as the Dixie Limb), silica-sulphide replacement
> - Hinge Zone, quartz veining."

The 2009 federal ML-ARD Prediction Manual (Price, 2009) shows that the ML-ARD and potential contamination from each of these zones requires separate ML-ARD evaluations. However, the proposed underground drifts are from a limited area of the ore zones, contrary to a statement that Advanced Exploration is needed to check "the continuity of underground access gold deposits" (see below).

Section 5.1.4 on Geochemical and Geotechnical Considerations states:

> "Geochemical characterization work has been initiated in order to support potential future development, including meeting the requirements of the Mine Rehabilitation Code for a future Advanced Exploration Closure Plan. Ongoing work include static testing (acid base accounting, short-term leaching), mineralogy and metal content. Humidity cells and rain barrel tests are also proposed. The conservative [worst-case] assumption pending results of the comprehensive testing program, is that ore and mine rock is potentially acid generating. This assumption will be amended on receipt of the pending test results and further assessment."

This worst-case assumption (incorrectly stated as "potentially acid generating" in comparison to the federal ML-ARD Prediction Manual) that all ore and mine rock will release ML-ARD could still be the case now, despite recent statements to the contrary (see the sections below in this review). This is because important ML-ARD work has not been completed and then certified by a qualified professional.

Section 5.1.4 also describes the overburden at the Project, which requires ML-ARD assessment equal to those of waste rock and ore according to the federal ML-ARD Prediction Manual and Ontario Regulation 240/00.

> "At the northwest portion of the Property, surficial soils are glaciofluvial in origin, consisting of sands and gravels. In the central portion of the Property, the surficial soils are described as deep-water deposits comprised of laminated to varved clay, silt and fine sand (Natural Resources Canada, 1996). Based on current exploration drilling information, overburden thickness at the Property is expected to range between 0 to 40 m. There are limited bedrock exposures within the Project area. Overburden encountered to date is a mix of sand, gravel and clay; however zones of soft sensitive clays may be encountered. An extensive geotechnical drilling program is currently underway on the Property to further investigate these and other aspects."

Section 5.1.5 on Proposed Mining Activities contains many important details such as:

> "There is no production mining proposed for the site." [MDAG Note: This appears to be a play on words because significant mining for several years is in fact proposed and Section 5.1.5 is specifically entitled "Proposed Mining Activities"; see my comments below on Section 5.1.8]. This Project includes use of underground mining methods to obtain a bulk sample of up to 60,000 t. The work is to be initiated in 2023, pending consultation, regulatory approvals and a corporate decision to proceed."

Kinross Gold further explained details of the proposed Advanced Exploration in Section 5.1.5:

> "The goal of the advanced exploration program (and ongoing exploration drilling from surface), is to collect additional information to support a decision on whether to proceed to develop a mine and to support engineering design. The advanced exploration bulk ore sample will be trucked off site over the existing Provincial road network to an existing mineral testing facility. No onsite processing is proposed.
>
> "GBR proposes to collar one or two portals from surface (approximately 6 m by 6 m) and to develop associated decline ramp(s) of approximately the same dimension. Secondary

egress and ventilation may be provided through a raise. The ramp is projected to extend to a vertical depth of approximately 600 m below surface and length of approximately 9,000 m during the Project. A preliminary long-section and plan view of the advanced exploration underground workings showing the preferred portal and raise location is provided in Figure 5-2 and Figure 5-3. The ramp is designed to provide access to the investigation areas, promote efficient truck haulage and reduce ventilation losses. Personnel will access the underground workings by means of the ramp. A shaft is not proposed for the Project.

"A bulk sample will be extracted from underground workings developed from the ramp(s) using conventional drilling and blasting using explosives, from several locations within the deposit. Blasting is proposed to use prepackaged and bulk explosive products....

"The objective of this Project is to obtain additional information on the known mineralized zones (LP Fault, Limb Zone and Hinge Zone; see Figure 1-3) through underground drilling and extraction of a bulk ore sample. Extraction of bulk sample allows testing of representative areas of the mineralization in order to gain a better understanding of the geology of the mineralized zones including, grade, structural controls on the mineralization, continuity, mining dilution, optical sorter performance, crushing and grinding properties and metallurgical recoveries to support development of a viable commercial production scenario.

"Industry-specific factors that were considered by GBR when establishing the size of the bulk sample include as follows:

- The proposed bulk sample is approximately 1% of the currently defined mineralized envelope and is consistent with other Ontario advanced exploration projects, such as the Timmins West Project (100,000 t), Sugar Zone Project (70,000 t) and Upper Beaver Project (60,000 t)
- Representative bulk samples extracted using realistic mining methods that help to prove the continuity of underground access gold deposits are very important to potential financiers
- National Instrument 43-101 resource definition and economic modeling standards are becoming more stringent to satisfy stricter due diligence standards imposed by industry and the investment community, often requiring bulk samples to validate and refine resource models prior to production decisions."

The problem with these details is that the three reasons given by Kinross Gold do not justify the 60,000 t bulk sample nor the proposed locations for the removal of the bulk sample. For example, the figure shows that most of the bulk sample will be taken from two laterally-limited areas. As a result, most of the ore from northwest to southeast will not be sampled. This is not consistent with proving "the continuity of underground access gold deposits".

Section 5.1.8 on Project Duration and Rate of Mining shows that Underground Development will take place across more than four years "on a continuous (24-hour) basis" and the Bulk Sample will be collected across roughly 2.5 years. These details plus the two 6x6 m portals show this is not typical Advanced Exploration to determine if future mining might be justified, but this is the first phase of mining.

Section 5.3.8 Buildings and Large Facilities includes Table 5.2 "Primary Buildings and Facilities on Surface". "Mine Rock Stockpiles (2)" has an approximate scale of 1,000,000 t, although it is not clear on whether this is maximum capacity or expected capacity. This is only clarified later under Section 5.4.3 (see below) which is the only description of the volume of disturbed waste rock (1,000,000 t) left on site simply to obtain 60,000 t of ore (a ratio of 17:1). This implies a large percentage of waste rock will be mined during Advanced Exploration, which further supports the view that Advanced Exploration would be the first phase of mining.

Remarkably, the various ponds listed in Table 5.2 are only described as lateral areas and do not provide depths and volumes, precluding a discussion of mass balances and spills due to extreme weather events and failures of the treatment plant. Also, the total catchment of this proposed exploration site is not provided despite all its runoff and infiltration requiring routine monitoring and treatment as needed. These are serious omissions. These omissions continue in the perhaps-draft Detailed Project Description, reviewed in Section 10 below.

Despite 60,000 t of ore being mentioned many times in this Project Definition, Section 5.4.3 "Stockpiles" is the only section of this Project Definition that mentions the substantially greater amount of waste rock with ML-ARD potential:

> "It is estimated that a total quantity of approximately 1,000,000 t of mine rock will be generated and stockpiled during the Project."

Additionally:

> "A stockpile of up to 100,000 m^3 [of overburden] is proposed", which likely means about an additional 200,000 t of disturbed overburden.

Notably, less than a year later, documents (see the later sections of this MDAG review below) have increased the overburden to ~400,000 t with no clear explanation for it.

Overburden stockpiles at minesites around Canada have released significant ML-ARD, which is why they are specifically mentioned and referenced through the Ontario Mining Act, but this Project Definition fails to recognize this. Later Kinross Gold documents fail to show the overburden stockpile and fail to show its runoff reporting to ML-ARD treatment (e.g., the undated "AEX Site Plan - Updated.pdf" on which overburden is called "topsoil"). For example, "Memo - Reclamation Strategy - Sept 5 2023.pdf" says,

> "Runoff from the overburden stockpiles (will be monitored and treated to manage suspended solids as required and discharged)".

The undated "AEX Site Plan - Updated.pdf" does not show this. This is one of many glaring contradictions and errors among the Great Bear documents reviewed here.

The understanding of groundwater at this Project is incomplete or contradictory. Section 6.25. Says:

> "The bedrock is generally tight with some potential for limited groundwater flow in the upper fractured bedrock and a few deep structures."

However, a figure in Section 5.5.2 shows groundwater as the only source of inflowing water to the underground workings. Thus, Kinross is saying groundwater inflow is "limited" but also is the only source of this water that has to be actively pumped out of the mine. This escalates to serious errors in groundwater modelling explained in Section 9.2 below that incorrectly predicts relatively low groundwater inflow and relatively little dewatering of surface creeks and lakes.

Section 6.2.6 Air Emission Information has an important omission concerning ML-ARD, environmental impacts, and cumulative effects. This section simply says,

> "A meteorological station has been established on the site, and baseline air quality and sound data is being collected. Based on a review of current Project, air emissions are anticipated to be limited and no offsite impacts are predicted. A management plan will be established to mitigated dust from materials movement and traffic on gravel roads."

However, hundreds of thousands of tonnes of blasted waste rock plus disturbed overburden will remain on site in piles up to 30 m high, likely in perpetuity after Advanced Exploration. This contaminated, blasted, and disturbed materials can release ML-ARD contaminated dust that can be carried into the surrounding environment where it can affect and degrade water quality, soil quality, vegetation, microbes, fish, and animals. As explained in Section 8 of this MDAG review, this invalidates the fugitive dust study for the Great Bear Project.

In summary of this password-protected Project Definition Document of December 2022, sufficient details and omissions are present to be very concerned about ML-ARD and water-quality degradation during and after the relatively large, at-least-four-years-long proposed Advanced Exploration that would be essentially a first phase of mining at Great Bear. These concerns carry over to the proposed mining. Although this document is not marked as "draft" and is thus final, it contains many details contradicted by later documents as explained in later sections of this MDAG review. Thus, it is not possible to know exactly what is proposed for Advanced Exploration and thus to know reliably how bad the environmental problems and impacts could be.

3. Geochemical Characterization Workplan (January 9, 2023)

This very short, three-page summary of ML-ARD "geochemical characterization", apparently issued in January 2023 by WSP, does not provide much information to review and comment on since it is only a "Workplan". However, later documents show this Workplan was not followed.

Under "Purpose of the 2023 Program", it says:

> "Samples that have been or will be tested as part of the geochemistry program include drill core (representing mine rock), overburden, and synthetic tailings generated from metallurgical test programs conducted in the laboratory. Related water quality modelling will be undertaken in 2023, focusing on the proposed Advanced Exploration (AEX) phase. Additional water quality modelling, representing the overall Project, will be undertaken at a later date."

As explained below, this Workplan is not sufficiently thorough and complete under the 2009 federal ML-ARD Prediction Manual (Price, 2009) to justify water-quality modelling and its conclusions. In any case, it is now April 2024 and no verified modelling results from 2023 have been found.

Under "Mine Rock Static Testing", this Workplan states,

> "A mine rock characterization program was initiated in 2022. A total of approximately 300 samples of drill core were collected for this purpose as part of field work in 2022. Drill core samples were obtained from a variety of locations and depths around the deposit, including rock in the vicinity of the proposed open pit and underground developments, along with the proposed AEX volume. Samples of all major rock types were collected. The purpose of this work is to evaluate the ML/ARD potential of the rock and help determine how mine rock may need to be managed.... Testwork is underway and results will be available in the first quarter (Q1) of 2023."

However, nine months later in September 2023, the Reclamation Strategy (see the next section of this MDAG review) mentions only 96 samples that are only "proximal" and thus not necessarily representative of rock to be removed for Advanced Exploration or proposed mining. Perhaps the other 200 samples are not relevant for Advanced Exploration and proposed mining, but then because they are "proximal" it is possible that the 96 samples are not relevant either.

Under "Mine Rock Static Testing", it says

> "All samples will be tested for Acid Base Accounting (ABA) parameters (that includes paste pH, sulphur content and speciation, and Neutralization Potential content and form) and elemental content analysis (aqua regia digestion and ICP analysis). Some of the samples will be subjected to more detailed static tests including the Shake Flask Extraction (SFE) test, Net Acid Generation (NAG) test, and Rietveld X-Ray Diffraction. Testwork is underway and results will be available in the first quarter (Q1) of 2023."

This is insufficient detail to ensure the correct tests are being done. In fact, "aqua regia" is a partial digestion that detects only part of the heavy metals and other elements in a sample, and thus is not acceptable for most ML-ARD work including comparisons to total crustal abundances.

Also, the September 2023 Reclamation Strategy (see the next section) mentions the results of 96 core samples, without stating which methods were used and what the analytical results were. All this information "will be available in the first quarter (Q1) of 2023", but more than a year later the information is not available as qualified-professional-certified results and interpretations.

Under "Mine Rock Kinetic Testing Programs", it says:

> "Kinetic tests are used to assess how a material responds to oxidation / weathering processes over time, and are used to estimate the time until samples may start to produce acidity and the rates at which the samples release metals. Several mine rock kinetic testing programs will be conducted in 2023, including a program conducted in the laboratory (humidity cell tests) and a program conducted in the field (field leach barrel tests).
>
> • The humidity cell test program will be initiated in the laboratory in 2023. Ten tests are currently planned and the specific number of tests will be confirmed following receipt of the static testing results. Samples to be tested will include key mine rock materials with a risk for ML/ARD along with test samples that are representative of typical Project mine rock. Initial reporting on the humidity cell tests will be available in Q4 2023."
>
> • A field leach barrel program will be initiated in the spring of 2023. Ten tests are currently planned but the specific number of tests will be confirmed following receipt of the static testing results. The objective of this program is to evaluate rates of sulphide oxidation and metal release under field conditions. This information will be integrated with the results of ongoing laboratory humidity cell tests to evaluate lag times to acid onset and metal release from mine rock. The tests will be routinely monitored throughout the open water season in 2023. Initial reporting on the field leach barrel program will be available in Q4 2023."

It is now April 2024. Where are the progress reports "available in Q4 2023"? In any case, these tests take at least one year, and often longer, to complete according to the federal ML-ARD Prediction Manual (Price, 2009). Thus, reliable and professionally certified results will not likely be available until late 2024 or 2025 at the earliest.

Under "Overburden Characterization", it says:

> "A preliminary geochemical characterization program for overburden is underway. Thirty samples of the various types of overburden present around the property were collected as part of field work conducted in 2022. Samples were submitted to the laboratory for static testing (ABA and elemental content) and a subset of samples were selected for more detailed static tests. Results will be available in Q2 2023."

Strangely, in the September 2023 Reclamation Strategy (see next section), the preliminary results are mentioned for mine rock but not for overburden. This is important because this Project Definition estimates there will be about 200,000 tonnes of overburden disturbed (with recent documents less than a year later saying ~400,000 t). This is about three times more overburden than the ore being mined as a bulk sample. On average around Canada, about half of overburden at mineral deposits has significant ML-ARD potential, so there is a significant risk that Great Bear overburden will devastate water quality on, beneath, and around the site.

Under "Mine Water Quality Estimates", this Workplan states:

> "Mine water quality estimates for the AEX phase will be prepared in Q1 2023. Modelling will be conducted via mass balance approaches and will be supported by the AEX site water balance and available geochemistry data. The model results will be used to ensure that site water management needs are identified and addressed. Additional water quality modelling, representing the overall Project, will be undertaken at a later date as the project advances."

Mine-water mass balances are not often representative of leachates from sulphide-bearing rock and overburden as found at the Great Bear Project. There is no justification here for mass-balance modelling and its results could be irrelevant for Advanced Exploration as well as proposed mining. This approach should be examined in detail including the data on which it is based once qualified-professional-certified documents become available.

Under "Technical Data Collection Methodologies", it says:

> "The approach and methodology for the geochemistry programs were based on the requirements described under the Ontario Mining Act; namely guidance found within the documents DRAFT Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia (Price 1997), and Policy for Metal Leaching and Acid Rock Drainage at Minesites in British Columbia (MEM 1998). Additional guidance was provided by the reference document Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND 2009), which represents best practice and industry standard approaches and methodologies for ML/ARD sampling and characterization in Canada."

In fact, this is wrong. The Ontario Mining Act states:

> "The sampling program shall be conducted by a person who is qualified in Ontario … in accordance with a report prepared by William A. Price on behalf of the [federal] Mine Environment Neutral Drainage (MEND) program, entitled "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials", MEND Report 1.20.1, dated December, 2009, as that report may be amended from time to time..."

Therefore, for the Great Bear Project, "[t]he approach and methodology for the geochemistry programs were based on" 1997 and 1998 British Columbia documents with only "guidance" from the federal Prediction Manual. In reality, the approach and methodology are required under the Act to be based fully on the 2009 600-page federal Prediction Manual, which instead was only used for "additional guidance". The 1997 and 1998 BC documents (Price, 1998; Price and Errington, 1998; Price, Morin and Hutt, 1997) provided relatively little detailed instructions compared with the federal Prediction Manual, so the Great Bear ML-ARD testwork started off as likely insufficient under the Prediction Manual and would have to be expanded.

Under "Field and Laboratory Work Timing", it says:

> "Some field and laboratory work associated with the geochemical characterization programs was conducted in 2022 as described in the previous sections. Additional lab work is planned for 2023 as outlined above. Field work will be conducted in 2023 to construct the Field Leach Barrel tests and monitor and collect leachate from the tests. Reporting for the various programs will be available through 2023 as described above."

I have not yet seen this reporting from 2023 and am not aware if it has in fact been reported and

certified in 2023.

In summary, problems encountered in this January 2023 Geochemical Characterization Workplan include:

- The ML-ARD program is "in progress" so no one knows how bad the contamination will be and which elements will be at toxic levels requiring treatment, yet Kinross wants to proceed with Advanced Exploration.

- All that is available now is 96 rock core analyses according to the September 2023 Reclamation Summary (see below), which on their own are not reliable and cannot yet be interpreted reliably for ML-ARD. In fact, these 96 samples were not even of the rock that would be "mined" during Advanced Exploration, but only "proximal" which could also mean "very different". In any case, the 96 samples were not collected and analyzed as required under the Ontario Mining Act (see next bullet). Thus, Kinross Gold and WSP are guessing on how bad the contamination will be, but admit that some of it will be bad, and are likely years away from completing the ML-ARD work required under the Ontario Mining Act and its Regulation 240/00 (Mine Development and Closure under Part VII Of the Act).

- The stated approach and methodology used for Advanced Exploration is "based on the requirements" of two British Columbia documents from 1997-1998 (Price, 1998; Price and Errington, 1998; Price, Morin and Hutt, 1997). In reality, the Ontario Mining Act says the approach and methodology must be based on the 2009 federal Prediction Manual, not just as "guidance" as Great Bear has done. Thus, the work for Advanced Exploration to date does not meet the Ontario Mining Act through Regulation 240/00 and does not meet the 2009 federal ML-ARD Prediction Manual (Price, 2009).

- Even if this Geochemical Characterization Workplan was applicable and consistent with the 2009 federal ML-ARD Prediction Manual, such work requires at least 2 to 3 years to obtain all required information and interpretations. Thus, perhaps in 2025 or some year after there might be sufficient ML-ARD for Advanced Exploration, but not any time soon.

4. Great Bear Advanced Exploration Program Reclamation Strategy (September 2023)

The Introduction of this document explains:

> "This memorandum was prepared to summarize the reclamation strategy for the AEX [Advanced Exploration] Program. The regulatory Closure Plan which will be filed with the Ontario Ministry of Mines is currently being developed. The purpose of this memorandum is to seek input from Indigenous communities regarding the proposed closure strategy for the AEX Program."

Thus, this memo is only to "summarize" the reclamation strategy in order to "seek input from Indigenous communities". As shown below, this summary is insufficient for Grassy Narrows First Nation to provide input and this reclamation "summary" in fact already reveals errors and misconceptions.

Section 2 entitled Project Information lists "major components" for Advanced Exploration. For tonnages and sizes, only the ore is mentioned and it will be shipped offsite. So there is no overall summary of areas, volumes, and heights of waste and disturbed materials remaining on site and requiring careful reclamation. This is important, because there will be at least 17 tonnes of mine waste rock generated for each 1 tonne of ore (see Sections 2 and 10 of this MDAG review), which is a substantial ore:waste ratio and one that requires intensive efforts to protect the surrounding environment. There would also be ~7 tonnes of overburden mined for each 1 tonne of ore, which increased through 2023 from an initial ~3:1 ratio.

Therefore, this Reclamation Strategy does not sufficiently protect the environment due to the lack of sufficient data, which is replaced by information that at best "suggests". The decision to mine a huge bulk sample of ore worth tens of millions of dollars, likely to offset exploration costs, has not been based on suggestions, so why are associated reclamation and environmental protection based on suggestions?

There is no explanation in this or other documents on why an underground bulk sample requires the destruction of surface vegetation and shallow soils to remove a relatively enormous volume of 400,000 tonnes of overburden (the most recent estimate, which had been increasing). Additionally, 96 ML-ARD samples are mentioned for rock "proximal" to the underground workings, but there is no mention of the 30 samples of overburden also tested for ML-ARD potential.

Because roughly half of overburden stockpiles at sites similar to Great Bear have significant ML-ARD potential, the Great Bear overburden should be assumed to have the same strong potential for water contamination and ARD (called "PAG" in this document) unless proven otherwise. It is alarming that Kinross Gold is assuming 100% of the overburden is environmentally benign.

Figure 2 of this Reclamation Strategy shows an unlined overburden stockpile where its seepage can contaminate local water and soil, and Figure 3 shows the overburden runoff and seepage is completely ignored. This serious omission can also be seen in Section 2.3 which ignores contaminant potential from overburden by simply addressing surface runoff and not subsurface

seepage and groundwater:

> "Runoff from the overburden stockpiles (will be monitored and treated to manage suspended solids as required and discharged)"

Section 2.1 on Underground Mining Methods Summary does not describe advanced exploration where a bulk sample of several tonnes is obtained and tested. Instead, Section 2.1 describes an initial four-year phase of mining of more than 1 million tonnes of waste rock and 200,000 tonnes (more recently, ~400,000 t) of overburden to obtain only 60,000 tonnes of ore worth tens of millions of dollars. In reality, four years of this type of advanced exploration is essentially being used as the first phase of the underground mine plan so that there is relatively little delay to start mining should the project be approved.

In the Project Definition (see Section 2 of this MDAG review), Kinross Gold provided three reasons for a relatively huge bulk sample along with 17 times more waste rock and now 7 times more overburden. However, as explained above, these reasons do not make sense. For example, Kinross says that bulk samples help to prove the continuity of underground access gold deposits and are very important to potential financiers. Yet, most of the proposed underground workings are focussed into two small lateral areas and not throughout the ore zone "to prove the continuity".

In Section 2.2 on Geochemistry Summary, it says:

> "The sampling approach and testing methods for the preliminary geochemical assessment are based on the requirements described under the Ontario Mining Act, namely guidance found within the DRAFT Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia (MEM 1998)."

This same error occurs in the January 2023 Geochemical Characterization Workplan. The Ontario Mining Act through its Regulation 240/00 does not mention the 1998 British Columbia document. Instead, the relevant wording is:

> "The sampling program shall be conducted by a person who is qualified in Ontario … in accordance with a report prepared by William A. Price on behalf of the [federal] Mine Environment Neutral Drainage (MEND) program, entitled "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials", MEND Report 1.20.1, dated December, 2009, as that report may be amended from time to time..."

Page P-24 of this 600-page federal Prediction Manual specified by the Ontario Regulation 240/00 says, "Major technical assistance was provided by Kevin Morin (Mine[site] Drainage Assessment Group)... and Kevin Morin provided major editorial assistance." Therefore, for the Great Bear Project, I can attest that "[t]he sampling approach and testing methods" are based on the wrong document.

Based on the 2009 federal Prediction Manual required by Regulation 240/00, the proposed ML-ARD work "in progress" is not sufficient, likely because the Manual was used by Kinross Gold only as "[a]dditional guidance" instead of a required document. This is easily seen in words like "preliminary geochemical assessment" and "initial evaluation". The ML-ARD predictions and information are the main basis for design of water treatment and for reclamation/closure. Thus, it is not acceptable for treatment and closure to be based on "preliminary" and "initial" information.

This can lead to misleading impact assessments and receiving-environment effects.

There are already errors in the Great Bear ML-ARD work as found in this Reclamation Strategy. These range from an incorrect definitions of the fundamental acronyms of "PAG" and "NPAG", to major problems with samples collected to date. For ML-ARD, all that is mentioned as of September 2023 is 96 rock-core analyses, which on their own are not reliable and cannot yet be interpreted reliably for ML-ARD. In fact, these 96 samples were not even of the rock that would be mined during Advanced Exploration, but only "proximal" which could also mean "very different". Some percentage of this proximal rock, such as 50% to 67%, is considered not to have much ML-ARD potential based on "preliminary" data, but that is unreliable or wrong.

Kinross Gold is guessing on how bad the ML-ARD contamination will be, and admits some of it will be bad. However, it is likely years away from completing the appropriate ML-ARD work required under the Ontario Mining Act and Regulation 240/00, including the federal ML-ARD Prediction Manual (Price, 2009).

Section 2.4 of this Reclamation Strategy on Closure Objectives says:

> "The primary objective of closure is to rehabilitate the area to a long-term safe and sustainable state that considers the desires of local Indigenous land users to the extent practical (such as post closure land uses) by promoting vegetation communities that support habitat for local species diversity and aquatic habitat that will support healthy fish populations. The purpose of this memorandum is to seek input from indigenous communities regarding end land uses and closure concepts."

It is remarkable that Kinross Gold considers leaving "NPAG" rock perhaps with a cover of 0.3 m of potentially contaminated overburden, plus a large amount of stockpiled overburden at the surface, to be a "long-term safe and sustainable state...". To the contrary, this reclamation strategy can result in perpetual water treatment. A cover over "NPAG" rock does not stop ML and contaminated effluent, which could instead require perpetual water treatment. The closure plan and its estimated cost of only ~$10 million would not pay for this.

Section 3 on Progressive Rehabilitation Measures says:

> "Mine rock will be moved underground during the program as needed for use as road material, and potentially as backfill in underground areas for stability."

This issue arises later where "PAG" rock is proposed to be moved underground after mining of the bulk sample and the many underground workings. The seriously major problem here is that "PAG" rock can release relatively enormous amounts of heavy metals and other elements as it is flooded and submerged. This can create a toxic "soup" of underground water, worse than any seen at the surface, that eventually flows out into the surrounding environment and groundwater system. This would likely require long-term pump-and-treat remediation of the surrounding groundwater. Such pump-and-treat remediation is not included or costed in the ~$10 million total closure costs, and would likely cost much more than $10 million itself.

As part of closure, Section 5.1 says:

> "The portals will be backfilled with NPAG rockfill."

Because this rock will probably be an ML concern, including leaching heavy metals and other elements, backfilling the portals with this NPAG rock that will remain partially exposed and oxidizing will lead to perpetual ongoing water contamination. Adding to this contamination will be backfilled oxidized-and-contaminated PAG material that will likely release relatively large amounts of heavy metal and other elements. Contaminated water from this PAG material, backfilled into the underground workings and partially flooded to the maximum level, and from the NPAG material plugging the portals, would start flowing out of the mine area and into the surrounding groundwater system unless there is perpetual collection and treatment.

Section 5.6 on Soils Testing mistakenly says:

> "The primary soil contamination that could be expected from the AEX activities would result from the use / spillage of petroleum / diesel fuels. A soil sampling plan will be developed at the time of closure to evaluate potential hydrocarbon or chemical contamination, as appropriate."

In reality, the primary soil contamination would likely be from the elevated levels of heavy metals and other elements in wind-blown fugitive dust (see Section 8 of this MDAG review). This dust would come from the PAG and NPAG blasted-rock stockpiles, from the overburden stockpile(s), and from mine roads and building foundations made of the blasted rock and overburden.

Section 5.7 of this Reclamation Strategy says:

> "The primary long term closure concern with respect to the mine rock stockpiles is acid rock drainage and metals leaching. Preliminary geochemical investigations suggest that up to approximately 35% of the AEX mine rock could be PAG, as discussed in Section 2.2. During the AEX Program, the PAG and NPAG mine rock will be segregated in accordance with the AEX Mine Waste Management Plan, which is currently being developed at the time this document was prepared."

"Preliminary geochemical investigations suggest that..." is not acceptable for design of the waste-rock piles and the treatment system. Preliminary geochemical investigations can be seriously wrong and substantially underestimate contamination from the rock and overburden.

Section 5.7 also says:

> "It is anticipated that up to 127,200 m^3 of PAG mine rock will be stockpiled at the AEX Program and will need to be appropriately rehabilitated either progressively or at closure."

The closure costs from the Program Closure Plan (see Section 5 of this MDAG review below) show it will cost $30.00 per m^3 to relocate the PAG rock back into the underground workings, where it would then contaminate the underground water that will eventually flow into the environment. This would be a total cost of $3,816,000. However, Table 12-1 from the Program Closure Plan (issued two months after this Reclamation Strategy) estimates PAG rock higher at 191,000 m^3 (a remarkable 50% more) costing $5,730,000.

Section 5.7 also says:

> "The NPAG Stockpile footprint may be covered with up to 0.5 m of overburden and seeded for revegetation. Additional cover depth is provided overlying the NPAG Stockpile to account for potential losses to void spaces in the mine rock. It is anticipated that the overburden material will fill in the void spaces and support revegetation."

However, the overburden could have ML-ARD potential, and thus would not support vegetation but instead kill vegetation.

In summary of the Reclamation Strategy from September 2023,

- The ML-ARD program is "in progress" so no one knows how bad the contamination will be and which elements will be at toxic levels requiring treatment, yet Kinross Gold wants to proceed with Advanced Exploration.

- All that is available now is 96 core analyses, which on their own are not reliable and cannot yet be interpreted reliably for ML-ARD. In fact, these 96 samples were not even of the rock that would be "mined" during Advanced Exploration, but only "proximal" which could also mean "very different". Also, 30 samples of overburden, which is intended to be left on surface and used for reclamation, were collected yet the results are not reported although there is ~50% probability that the overburden will release ML-ARD and thus be toxic. Kinross Gold and WSP are guessing how bad the contamination will be, but admit that some of it will be bad. They are likely years away from completing the ML-ARD work required under the Ontario Mining Act and its Regulation 240/00, because the work for Great Bear was not initially stated as consistent with Regulation 240/00. Even the definitions of ML-ARD acronyms used for the Great Bear Project are not correct according to the federal Manual specified by Regulation 240/00, which is additional evidence the Prediction Manual is not being followed.

- The bad ML-ARD rock appears to be associated with "rapid acid generation" according to the Program Closure Plan (reviewed in the next section below). This is an incorrect explanation of the phenomenon, but shows that the bad water quality will start coming out of the disturbed rock, including the underground mine walls, very quickly after initial disturbance. Informally, this is called "lag time" to ML-ARD, but most of the ML-ARD work has not yet been done to quantitatively estimate the lag time beyond "rapid". This contaminating rock will be stored on surface and possibly only later, likely after the lag time, some might be taken underground. When it contacts water underground as the workings partially flood and submerge, it will quickly release more contamination. This means the underground water moving into the surrounding groundwater system, and surface overflow if any, would have to be monitored and likely be treated for many years or in perpetuity after Advanced Exploration.

5. Program Closure Plan, Draft for Indigenous Review (November 2023)

This password-protected draft document for Advanced Exploration is only "for Indigenous review". This is odd to me since it is Kinross Gold's responsibility to design and justify the closure plan through certified professionals, rather than submit a draft to see if any First Nations notice the weaknesses and problems explained below.

In fact, since this draft report it is password protected, none of its content can be extracted for detailed re-interpretation and review. Thus, Kinross Gold is limiting the "Indigenous review" it is seeking.

In Table 5-3 entitled Approximate Mine Rock and Overburden Volume and Production Schedule in Section 5.7 on Mineral Materials Management, the total waste rock remains around 1,060,000 t relative to past documents (see the sections of this MDAG review above).

However, overburden has risen remarkably from past documents to "~170,400 m^3", expressed as m^3 instead of tonnes like the waste rock. It would be ~350,000 to ~400,000 tonnes of overburden. The overburden's ML-ARD status and its impact on water quality are poorly defined. This means that overburden at Great Bear becomes an environmental danger capable of substantial environmental impacts not currently identified or estimated.

Table 5-4 contains Preliminary Threshold Criteria for Segregation the AEX Program Mine Rock. The criteria for "PAG" do not say whether the criteria are "AND" or "OR", which is a huge difference and serious omission. Thus, ML-ARD is clearly still not reliably estimated, predicted, and understood at the Great Bear Project as of November 2023.

The text in Section 5.7.2 alarmingly says,

> "A preliminary sulphur threshold (TS) of 0.15% has also been proposed to differentiate between PAG rock and NPAG rock. The proposed threshold values are generally accepted as industry best practices in the absence of a site specific geochemical value."

No, 0.15%S is not "industry best practices". Quebec uses ~0.05%S and other provinces have not established a minimum value because technically there is no minimum value. Furthermore, it is rarely the sulphur level alone that distinguishes "PAG" (incorrectly defined in this document as "potentially acid generating" and "NPAG" (incorrectly defined in this document as "non-potentially acid generating"). Instead, according to the federal ML-ARD Prediction Manual (Price, 2009), the amount of Effective Neutralization Potential (ENP) plays a major role, as does site-specific criteria for the ENP-to-sulphur ratio.

This is explained in detail in the 600-page federal ML-ARD Prediction Manual that this ML-ARD work for the Great Bear Project is legally supposed to follow but does not. As a result, this "preliminary sulphur threshold" is an unreliable, questionable, and uncertified attempt to proceed with the design and planning for Advanced Exploration. Insufficient reliable information is available at this time, and even Appendix A "Certifications" is missing from this document. As a professional

in ML-ARD, I want to know the certified professional(s) who created these "preliminary" criteria.

"NML" is defined in this Closure Plan as "non-metal leaching" which does not apply to any rock in the world, as all rock is capable of leaching some metals and even nonmetals. In any case, "NML" in Table 5-4 for the Great Bear Project is rarely definable by the solid-phase level of a single element like "Arsenic < 30 mg/kg", but Kinross Gold does not know this because it has not yet completed the on-site and laboratory-based kinetic tests. If leaching were dependent on solid-phase levels as believed here, then Great Bear waters would contain thousands of mg/L of aluminum and silica because most of its rock is made of those elements. But this is not the case. This is why these are called "preliminary threshold criteria" in Table 5-4, which in reality are likely wrong and nonsensical.

Section 9.16 on Watercourses and Site Drainage contains Tables 9-1 to 9-5. Tables 9-4 and 9-5 contain predictions of on-site and effluent contaminant levels only after closure, which would obviously be much less than during active exploration. However, the text does not even discuss or explain Tables 9-4 and 9-5. They appear to be "thrown in" to appear complete.

Table 9-4 contains Geochemical Source Terms, which are the predicted aqueous concentrations for all contaminants in Great Bear water caused by Advanced Exploration. In reality, there are many problems with this Table 9-4 including:

- It does not include "PAG" concentrations which will be much worse and will be present for at least four years, because this Table is intended only for closure but alarmingly does not include the likely more severe PAG contamination when it is backfilled into the underground workings.
- It assumes closure drainage from "Covered and Revegetated Area" will be instantaneously at pre-exploration "baseline water quality", which is wrong.
- It shows elements likely requiring perpetual post-closure treatment include aluminum, antimony, arsenic, and selenium.
- It does not include predictions for many potential contaminants such as manganese, magnesium, sodium, potassium, barium, hardness, alkalinity, acidity, fluoride, chloride, bismuth, chromium 6+, lithium, silicon, strontium, tellurium, thorium, tin, titanium, and zirconium.
- It does not allow for federal emerging contaminants such as platinum-group metals and tantalum.
- It is based on a report "WSP 2023f" which is the draft "WSP, 2023f. Advanced Exploration (AEX) Phase – Preliminary Water Quality Estimate Update - Draft. WSP E&I Limited, April 2023". This report is only draft and thus is unreliable and not professionally certified.

Table 9-5 contains Mine Water Pond Overflow Estimated Water Quality which apparently would be overflow off the exploration site upon closure. It raises important questions, like how does aqueous sulphate decrease from 75-100 mg/L (Table 9-4) to 18-25 mg/L (Table 9-5) in mine-water-pond overflow when there is no treatment? In any case, some predicted concentrations are likely too high to discharge to the environment like arsenic. Also, sulphate reportedly increases the methylation of mercury and other elements.

Table 12-1 is the Closure Cost Estimate. The cost for moving PAG rock back underground is set at $30.00/m^3 which is ~$15.00 /tonne. The total waste rock from Advanced Exploration is estimated at 1,060,000 t. Kinross Gold currently guesses, based on preliminary uncertified information, the waste rock will be about one-third to one-half "PAG" requiring backfilling to the underground. Therefore, the cost for this task alone is $5,000,000 to $7,500,000 based on the unverified guess, and could reach a maximum of $15,000,000. Because the current Grand Total for Closure is estimated at ~$10,000,000, the backfilling of rock is the major cost item and could cost much more than the $5,730,000 currently estimated. In turn, Total Cost could cost many millions of dollars more than currently estimated from the guessed minimal amount. Put simply, closure costs are likely grossly underestimated.

All six appendices of this Program Closure Plan are missing, including professional certifications. This is likely not an error or oversight, meaning this Program Closure Plan should not be considered reliable and dependable.

In summary of the password-protected Program Closure Plan, Draft for Indigenous Review from November 2023,

- In November 2023, the volume of overburden has approximately doubled from previous documents without an explanation. Because overburden generally has a 50% probability of releasing ML-ARD and contaminating water, overburden represents a major but unexamined threat to water quality on, around, and beneath the Great Bear exploration site.

- "Preliminary" criteria are provided for separating "PAG" and "NPAG" rock and for "NML" rock. However, these acronyms are not used in an accurate manner consistent with the 2009 federal Prediction Manual (Price, 2009) required under Regulation 240/00. The preliminary criteria are not rational based on ML-ARD science unless justified with detailed and intensive site-specific studies, which have not yet been completed and certified for the Great Bear Project.

- The potential for ML-ARD after closure is presented all the way to detailed predictions of aqueous concentrations in mg/L for on-site water and effluent to the environment only after closure. However, these predictions are not explained in any detail, are not justified, appear anomalous, and are not certified by a qualified professional. Some predictions are actually pre-exploration baseline which are erroneously assumed to be re-established immediately at closure. Furthermore, these predictions are missing more than a dozen potential contaminants.

- The "PAG" rock, which would likely create the highest contaminant concentrations, is not included in this Program Closure Plan, presumably because this "PAG" rock will be backfilled underground. However, when placed underground, this "PAG" rock will likely continue to release severe ML-ARD until submerged, at which point a relatively huge amount of accumulated contamination would be released into the underground water. After the mine is refilled to equilibrium and the minewater begins flowing into the surrounding groundwater system and through the many permeable drillholes more than 500 km long to the

environment, it will contaminate large surrounding areas. This major risk to water quality and the environment is not even mentioned in this Closure Plan, which is a major omission.

- The backfilling of "PAG" rock at closure is the largest individual cost item for closure totalling around $10 million. However, this reflects the currently minimum volume based on preliminary, unreliable information. In the worst case, which was assumed for the Great Bear Project Definition and still not disproven, total closure costs could exceed $20 million.

6. Hydrogeological Workplan (December 21, 2022)

This Workplan for 2023 says:

> "The purpose of the program will be to develop a refined hydrogeological model of the site, support groundwater model calibration and be used for long-term monitoring. The information collected in the upcoming field surveys will supplement the existing information.... Hydrogeological testing and groundwater sampling will occur at specific locations near the Project site shown in Figure 1."

However, Figure 1 of the Hydrogeologic Workplan shows a major omission which would preclude fully meeting its purpose and objectives. The currently proposed mine plan shows the "Tailings Management Facility" extending at least 2 km to the west and northwest of Tear Drop Lake. Figure 1 shows that the Tailings Management Facility and its hydrogeologic effects would extend far beyond the western limit of the monitoring wells. Thus, many more monitor wells are needed westward and northward at least to Stone Lake, Gullrock Lake, and Genessee Lake.

In summary of this Hydrogeological Workplan from December 2022, there is a major omission that would preclude a reliable and comprehensive assessment of current baseline hydrogeologic conditions and of future impacts from proposed mining. The groundwater monitoring network does not extend far enough to the west and northwest, beyond the proposed western portion of the Tailings Management Facility.

7. Surface Water Quality Workplan (December 21, 2022)

This Workplan for 2023says:

> "Baseline surface water quality work has been ongoing for the proposed Great Bear Project (the Project) since 2020. This proposed workplan for 2023 is to gather supplemental water quality data that will be used to further support long term monitoring and the development of the Project."

This Surface Water Quality Workplan provides incomplete lists of important details prefaced by "including", like "These sampling locations include..." and "Standard suite of total and dissolved metals including...". This can lead to major problems in the future if a sampling location or water-quality parameter is missing.

For example, the "Standard suite of total and dissolved metals including..." does not mention important elements like manganese, titanium, thallium, and federal emerging elements like tantalum and platinum-group elements. Therefore, Kinross Gold is risking major omissions and flaws that can arise later by not being comprehensive in its "including" lists.

In summary of this Surface Water Quality Workplan from December 2022, there are insufficient information and details to determine if appropriate work is planned and conducted. This is because important details are listed only as "including". For example, major potential contaminants like manganese and thallium are not specifically listed, but perhaps they are implicitly included? There is no way to know.

8. Fugitive Dust Best Management Practices Plan, final draft (September 2023)

Section 4.5 on Material Stockpiles in this "Final Draft" states there will be two overburden stockpiles created during Advanced Exploration, one north of the mine-rock pile and another east of the crusher area. Some Great Bear documents reviewed above and the undated "AEX Site Plan - Updated.pdf" do not show this. Because the overburden has a general 50% probability of contaminating water and because overburden is specifically listed as a site component requiring ML-ARD evaluation and potential mitigation, this contradiction on overburden stockpiles is not acceptable. It further shows that Kinross Gold's ongoing issuing of "preliminary", "initial, and "draft" documents is causing confusion inside the project itself and thus should not be approved at this time.

Section 5.1 on the Composition and Characterization of Particulate Emissions contains a major error that would grossly underestimate the geochemical contamination of soil, vegetation, water, and biota by dust, and is thus not acceptable. Section 5.1 says:

> "Fugitive dusts from roadways and stockpiles may contain trace metals which may be considered negligible as these would be similar in concentration to the background rock."

The ML-ARD studies currently underway on ore, waste rock, and overburden have already shown that some material will contain substantial solid-phase levels of many elements and will leach to some degree. This is certainly not "background rock" as assumed in this fugitive-dust study. Therefore, fugitive dust should be an important component of impact assessment for Advanced Exploration and proposed mining.

Furthermore, proposed dust suppression by watering could lead to widespread metal leaching and water-quality degradation across and around the proposed exploration site.

In summary of the final-draft Fugitive Dust Best Management Practices Plan of September 2023 for Advanced Exploration, this work is unacceptable because it grossly underestimates the potential impacts from geochemical contamination of soil, vegetation, water, and biota by dust. This work assumes the on-site sources of dust "would be similar in concentration to the background rock". This is wrong and ignores the ongoing ML-ARD assessment of ore, rock, and overburden.

9. PTTW Application for Dewatering, final draft (October 2023)

This is one of the few Great Bear documents that provide names for the qualified person writing the report, appropriately signed as "DRAFT" at this time. However, the reviewer but not the author is a P. Geo. So additional information is needed on the qualifications and certifications of the author(s). PPTW stands for "Permit To Take Water", meaning using and removing water from the Great Bear site.

9.1 Main Report

The tone of this "final draft" report for Advanced Exploration is apparent from Section 1.1 on the Purpose and Scope of This Submission. It says:
"Water takings during the AEX Program will include:

- Water pumped from the underground exploration workings (underground dewatering)
- Incidental surface water and groundwater takings, expected to occur during excavation of water management ponds.
- Direct taking from Dixie Creek (up to 250 cubic metres per day; m^3/day) to be used for dust suppression, industrial activity (e.g. in support of development pad construction and packing) and advanced exploration drill water cooling (underground drilling).

"No other takings from other area waterbodies (lakes, rivers, streams) are proposed.

"Most of the dewatering water pumped from the underground exploration workings will be directed to ponds within the AEX water management system, treated and ultimately discharged to the environment to be approved under an Environmental Compliance Approval for Industrial Sewage Works (ECA ISW)"

First, note that the only numerical water withdrawal mentioned is up to 250 m^3/day (250,000 L/day) from Dixie Creek. Thus, it is stunning that the actual total water withdrawal from the local water balance, as shown in Table 4-1 (discussed below), would be at least 3,203,000 L/day every day and reaching up to 7,703,000 L/day on some days as a contingency. Even these values are unrealistically low (see Section 9.2 below). This major withdrawal of water, that could upset and dewater groundwater zones like aquifers and surface waterbodies like creeks and lakes, is much more extreme that numerically indicated in Section 1.1. This justifies an impact assessment on the proposed Advanced Exploration, despite this final-draft document stating:

> "The AEX Program does not meet the requirements of the Impact Assessment Act, Physical Activities Regulations. A Federal Impact Assessment is therefore not anticipated to be required."

Second, note that the quotation above states that water taken from Dixie Creek would be used for "dust suppression" among others. As explained in the previous Section 8 of this MDAG review, adding such water to ML-ARD dust from ore, rock, and overburden could seriously degrade water quality throughout the site and surrounding environment. However, this major environmental risk

is not considered or even mentioned here or in the fugitive-dust study. In fact, it is unreliably assumed to be no environmental risk at all.

Third, the discharge of up to 7,703,000 L/day of water that is only partially treated (see the details in other sections of this MDAG review like Sections 5 and 11) into any receiving environment could cause significant impacts from (1) the physical volume of the additional water and/or (2) its altered chemistry from baseline with implications on the receiving environment and cumulative effects.

Table 4-1 on Requested Water Takings shows that the requested surface-water withdrawal from Dixie Creek is 250,000 L/day and an additional 170,000 L/day from pond excavations. However, more than 10 times this amount will be removed from the groundwater system every day. The additional groundwater withdrawal is estimated at 783,000 L/day from pond excavations, 2,000,000 L/day from underground pumping, and on perhaps 30 days each year an additional 4,500,000 L/day removed as a contingency. Furthermore, as explained below for Appendix B of this PTTW document (see Section 9.2 of this MDAG review), the groundwater model incorrectly underestimates the much higher inflows that would arise during desaturation of the overburden and the rock surrounding the mine inside its "Zone of Influence".

Total water withdrawal from the existing water balance could thus likely be much more than 7,703,000 L/day relative to the Dixie Creek withdrawal of only 250,000 L/day. All this water would be taken from the existing baseline groundwater/surface-water balance which has likely reached some type of baseline equilibrium over the last thousands of years. When up to 7,703,000 L/day or more is removed from this equilibrium, there could be major disruptions to local and regional surface waters and groundwaters.

For example, a significant portion of the underground pumping of more than 6,500,000 L/day could be pulled from Dixie Creek through the underlying groundwater system. Thus, "takings" from Dixie Creek could in reality be 250,000 L/day plus substantially much more than this through groundwater. "Takings" could also come from other streams, lakes, and groundwater zones like aquifers, despite this report clearly stating, "No other takings from other area waterbodies (lakes, rivers, streams) are proposed". This statement is not reliable and could be seriously wrong.

Section 5 of this PTTW Application discusses Potential Environmental Impacts, with Section 5.2.1 specifically on Dixie Creek. There appears to be significant confusion here on the impacts of dewatering the underground workings on Dixie Creek.

Part of this confusion arises in the false thinking that baseflow coming from groundwater is simply part of the total flow in Dixie Creek. In reality, groundwater baseflow likely has a different, more stable temperature and a different water quality than the surface water flowing past the Great Bear Project. Therefore, it is important environmentally and to the benthic ecosystem to consider baseflow coming from groundwater separately from surface flow already in the creek.

Another part of this confusion on the physical impact of mine dewatering on Dixie Creek is related to which surface flow is used. Section 5.2.1 uses Average Annual Flow, Low Flow Period Average Flow (March), and Low Flow 7Q20. These show that mine dewatering will reduce flow in Dixie

Creek by only 0.2 to 2.4%. Again, these impacts would be greater because the groundwater of Appendix B (see Section 9.2 below) has underestimated the amount of underground water that has to be pumped.

Table 5-2 is more relevant for Dixie Creek, also copied as Table 7-2 in Appendix B. It shows the important, separate baseline baseflow for Dixie Creek is 2,601,000 L/day. This is predicted to be reduced by 873,000 L/day during dewatering for Advanced Exploration, although this is likely substantially underestimated by the groundwater model. Thus, much more than 34% of Dixie Creek baseflow will be taken away by the mine, which would have significant adverse effects during drought periods and on the quality of the benthic aquatic habitat. Additionally, the baseflow for Unnamed Waterbody 3 (called "Dixie Creek Tributary (TL-3)" in Appendix B) would be reduced a substantial 55%. This justifies an impact assessment for the proposed PTTW Application.

It is very important to note that this PTTW Application for Dewatering, final draft, contains and is based on critical information in its Appendices. The following comments pertain to these appendices, which in turn shows the main report is not reliable and not reasonable as a PTTW Application.

9.2 Appendix B

Appendix B of this PTTW report is a "Draft" Groundwater Modelling Report to Support PPTW Application for Underground Dewatering Final Draft. It contains a serious error in the groundwater modelling that underestimates initial groundwater inflow rates and thus dewatering pumping rates.

Table 4-1 of the main report says 3,203,000 L/day of groundwater would be removed every day, reaching up to 7,703,000 L/day on some days. Table 6-2 of this groundwater appendix says that the groundwater grid, from Genessee Lake on the west to half of Rice Lake to the east, has total groundwater inflows and outflows of ~10,000,000 L/day. If this modelling were correct, this means that roughly 32% of all groundwater in the area of the Great Bear Project will be drawn into and out of the mine on a daily basis, with up to 77% drawn into and out of the mine on some days as a contingency. However, it could well be worse as explained next. This justifies an impact assessment for the proposed PTTW Application.

If dewatering starts and continues for several years as proposed for Advanced Exploration at the Great Bear Project, and later during the expansion of proposed mining, groundwater inflow will come from two basic sources. The first, initial inflow will predominantly reflect the desaturating drainage of pores in the overburden and fractures in the rock, which will be relatively high at first and then decrease. Notably, the modelling currently shows that the overburden will eventually be virtually 100% dewatered to its base. This is called "transient conditions" and reflects the "specific yield" of the overburden and the "storage coefficient" of the rock. As this first transient inflow slows, likely years after Advanced Exploration ceases, the groundwater inflow will then come from "steady state", reflecting the hydraulic gradients and the hydraulic conductivities.

This modelling for Great Bear in Appendix B and for the PTTW Application is solely "steady state",

with no high transient inflow considered and no values for specific yields and storage coefficients even mentioned. Section 6 of Appendix B on Groundwater Model Development is clear on this:

> "Groundwater modelling was conducted for two phases: pre-mining site conditions for model calibration and mine operations conditions to predict *groundwater discharge rate to the proposed fully developed and dewatered underground mine workings* [MDAG emphasis]. These numerical groundwater flow models consider 3D *steady-state flow conditions* [MDAG emphasis] and implement an Equivalent Porous Media (EPM) approach, which is deemed sufficient for characterizing the overall groundwater flow regime at the scale of this analysis."

Thus, groundwater inflows in the years of active mining during Advanced Exploration have been clearly underestimated by considering only steady-state inflows after the proposed workings are "fully developed". Also note the ambiguous and unjustified "deemed sufficient" for the overall "EPM" modelling of groundwater at the Great Bear Project.

Table 6-3 showed that pre-mining single-value "measured interpreted" baseflows at two locations agreed with the Simulated Baseflow reflecting only long-term steady-state conditions by 14% or better. These single-value baseflows were 2,281,000 L/day and 847,000 L/day, which are less than the total groundwater that would be pumped from the mine during Advanced Exploration. Thus, a concern arises on whether baseflows could be significantly decreased by this pumping during Advanced Exploration. The main report (see comments above in Section 9.1 of this MDAG review) says the (underestimated) pumping effect would be minimal on most statistical values of flow in Dixie Creek. It is not emphasized that pumping would substantially reduce baseflow, with differing water quality and temperature than the surface water, and would be even more significant during droughts.

Figure 6-6 shows that the pre-mining Simulated Groundwater Levels were often 5 to 10 m higher than Observed Groundwater Levels, showing a strong bias towards overestimated (higher) simulated groundwater levels. It is not clear if this suggests simulated hydraulic conductivities may be too low. In any case, this problem manifests in Figure 6-7 where the simulated levels around Great Bear and Dixie Creek are typically around 9 m too high, which incorrectly and falsely indicate Dixie Creek could not be significantly dewatered during pumping because the water table is simulated to be very high. This is probably why Table 7-2 shows that the substantial yet likely underestimated partial dewatering of Dixie Creek Tributary (TL-3) and baseflow of Dixie Creek is 55% and 34%, respectively, and these dewatering percentages could be much higher if modelling were more accurate.

Of note, Table 7-1 indicates dewatering of Dixie Creek is only 1% because it uses the average annual flow that includes the sum of all storm events. It does not consider lost baseflow during dry times when aquatic life, vegetation, and water quality can be more severely degraded. Again, the simulated groundwater levels around Dixie Creek and Great Bear are often modelled around 9 m too high and thus actual dewatering of creeks and lakes could be much higher than stated in this groundwater report. In this case, Section 10 incorrectly states and underestimates based on the modelling that:

> "At the end of the AEX project, when dewatering is at its maximum, the model simulates a baseflow reduction for the Dixie Creek of 8.5% of the estimated 7Q20 (10,368 m^3/d) and 1% of the average annual flow (114,912 m^3/d), which is unlikely to change the nature of the flow

regime in the creeks."

In Section 7.1 on Groundwater Inflow Rate and Zone of Influence:

> "... the simulated long-term groundwater inflow rate into underground mine workings is 1,920 m^3/d [1,920,000 L/day]. This estimate of groundwater inflow into the fully developed mine does not consider uncertainty, seasonal variations or any loss from aquifer storage."

This simulated inflow is consistent with the estimated 2,000,000 L/day requested "taking" in the main report and in Table 8-1. However, the occasional contingency of 6,500,000 L/day which is apparently from "uncertainty, seasonal variations or any loss from aquifer storage" is relatively major. It highlights the expected variability of withdrawals and discharges of water into the surrounding environment during Advanced Exploration. Moreover, the reference to "aquifer storage" highlights the failure of the modelling to consider higher-inflow transient conditions which would be most important in the early several years of Advanced Exploration.

However, even ignoring the important high-flow transient conditions, Table 7-1 shows that the steady-state 2,000,000 L/day can be easily exceeded by non-base-case conditions like three-times-higher hydraulic conductivity of bedrock and by the water-conducting LP Shear Fault 1.

Section 7.1 explains:

> "The model-predicted Zone Of Influence (ZOI), defined here as 1 m drawdown of head in the glacial till unit is shown in Figure 7-1. The ZOI is predicted to extend about 1.2 to 2.5 km from the centre of the AEX site to surrounding environs."

Using the 1 m drawdown contour is not appropriate here, because modelled groundwater levels are already around 9 m too high and because Figures 4-9 and 4-12 show that some shallow groundwater levels can vary by 1 m naturally. Thus, the Zone of Influence could turn out to be much larger and thus affect lakes and creeks. In any case, even a 1 m decrease in groundwater level beneath a creek or lake can lead to substantial dewatering.

Figure 7-1 shows Simulated Drawdown Contours in Glacial Till. However, drawdown is only shown as a maximum of around 36 m, which is obviously not correct for dewatered drifts up to 600 m deep. Moreover, the maximum drawdown of 36 m in the overburden means most of the pores of the overburden would be primarily drained into the mine, which occurs during the ignored transient conditions.

The apparent explanation for the discrepancy between the maximum 36 m drawdown and the dewatered workings 600 m deep is that the drawdown in the bedrock is not shown, but would locally obviously be around 600 m. This 600-m drawdown would likely create a relatively huge drawdown zone in bedrock around the Advanced Exploration and the proposed mine extending for many kilometers around. This would be much larger than in the Zone of Influence in the overburden shown in Appendix B Figure 7-1. This justifies an impact assessment of this proposed dewatering since many impacts of the dewatering have been ignored or underestimated.

9.3 Appendix C and Its Several Draft Monitoring Programs

Appendix C contains draft monitoring programs. The "Working Draft" AEX ISW Groundwater Monitoring Plan, like many other Great Bear documents, ignores the overburden that likely has ML-ARD potential and can seriously contaminate water. This lack of consideration for potentially contaminating overburden can be seen in Figure 1-7 Water Management Schematic that has no mention or recognition of the overburden stockpile(s). The same is noted in Figure 1-6 of both the "Draft" ECA ISW - Advanced Exploration Surface Water Monitoring Plan Draft and the "draft" AEX ECA ISW Aquatic Resources Monitoring Plan in Appendix C.

9.4 Appendix D

Appendix D Consultation Records is missing from this file.

9.5 Summary

In summary of this PTTW (Permit To Take Water) Application for Dewatering, Final Draft, and its several important appendices from October 2023, there are alarming errors and ambiguities that should preclude approval of PTTW. These should also trigger a detailed impact assessment, which this PTTW report conversely says is not needed for Advanced Exploration at Great Bear.

In the introduction to the main PTTW report, the only numerical water withdrawal mentioned is up to 250 m^3/day (250,000 L/day) from Dixie Creek. Thus, it is stunning because the actual total water withdrawal from the local groundwater/surface-water balance would be at least 3,203,000 L/day every day and reaching up to 7,703,000 L/day on some days as a contingency. Even these values are unrealistically low as explained here.

The errors begin with groundwater modelling that is based on long-term "steady state conditions" after the mine is "fully developed" and dewatered, and not on the correct, higher-inflow "transient conditions". Thus, inflow, pumping, and dewatering are significantly underestimated by the groundwater model and the PTTW Application. Additionally, there are problems with unrealistically low estimated effects on partial dewatering of Dixie Creek and other creeks and rivers. For example, simulated groundwater levels are modelled around 9 m higher than measured around the mine and Dixie Creek, which artificially and incorrectly prevent additional dewatering of Dixie Creek.

Groundwater levels are shown to be drawn down during dewatering to a maximum of only 36 m even though the dewatered workings will be 600 m deep. This reflects (1) nearly fully dewatering of the shallow overburden and (2) the lack of admission on the likely huge drawdown and much larger "Zone of Influence" in the rock beneath the overburden.

Baseflows into Dixie Creek and other waterbodies can be critical to aquatic, benthic, and terrestrial ecosystems because of groundwater's typically different water quality and temperature compared to water already flowing at the surface. This becomes more critical during droughts when baseflow

may be the main source of surface flows. The PTTW Application ignores the fact that more than 34 to 55% of existing baseflow would be lost during Advanced Exploration. It instead points out that the loss to groundwater would be only 2.4% and less of total flow depending on the chosen surface-flow statistic.

Overburden is routinely ignored in this PTTW document and its appendices, despite the proposed hundreds of thousands of tonnes of overburden likely having at least some ML-ARD potential and capacity to degrade water quality. In fact, some of the underground dewatering would be sprayed on the overburden for dust suppression, which in turn could lead to contaminated runoff across and off the site.

10. Draft (?) Detailed Project Description (November 2023)

In June 2023, Kinross Gold released the [final] Initial Project Description for the Great Bear Gold Project. Five months later, Kinross Gold issued the Detailed Project Description, where the first cover page showing "Kinross" says "DRAFT", but the second cover page for WSP E&I Canada Limited does not say "Draft".

The Kinross/WSP documents reviewed so far for proposed exploration and proposed mining are a mess with confusions over draft, preliminary, initial, and final. There is no reliable way to know what information issued by WSP and Kinross is considered final, reliable, and still applicable. In my opinion, all reviews for Great Bear should stop until Kinross Gold and WSP identify the final designs and plans for proposed exploration and proposed mining. Only then should they issue the final documents, signed and approved by qualified professionals.

Because the Initial Project Description was followed five months later by this perhaps-draft-perhaps-not-draft Detailed Project Description that apparently includes responses to Initial concerns, only the latter document is reviewed here.

10.1 Section C.3.3 Proposed Mine Facilities and Infrastructure

Section C.3.3 and Table C.1 provide a detailed list of all proposed mine facilities, many of which would be created during Advanced Exploration, which as explained above is closer to a first phase of mining. Many of the listed facilities require ML-ARD assessment including all under the headings of Underground and Open Pit Mine including mine walls and sumps, Stockpiles including overburden and waste rock, Tailings and Site Water Management including ditches, Aggregate Supply, Waste Management, Fuels and Reagents, all access roads and haul roads, all excavations and foundations for buildings, facilities, pipeline corridors, upgrades to bridge crossings, and the core shack including core-storage areas. Because these ML-ARD assessments are not completed at this time, it is prudent to conduct an impact assessment on all these components.

The Stockpiles section says:

> "Stockpiles will be created on the surface near the mine to store ore, mine rock, and overburden / organics resulting from site and mine development. Preliminary storage capacities of the stockpiles for the Project are the following, subject to revision as a result of ongoing exploration and technical studies:
>
> - Run of mine (i.e., uncrushed rock as transported from the mine) ore stockpile: approximately 0.1 to 0.5 million tonnes (Mt)
> - Low grade ore stockpile: approximately 5 to 20 Mt
> - Mine rock stockpile(s): approximately 210 Mt
> - Overburden / organics stockpile: approximately 40 Mt."

Thus, upon full mining, there would hundreds of millions of tonnes of mine waste, with most of it likely remaining on the surface and requiring perpetual maintenance. Additionally, low-grade ore

stockpiles are sometimes left on site after closure as waste-rock dumps. Because of this, some jurisdictions require financial assurances on perpetual maintenance of the low-grade dumps until/if they are processed. This should also be done for the Great Bear Project.

> " Based on the scale of the stockpiles and the environmental baseline studies which are in progress, it is expected that one or more of the Project stockpiles will overprint minor creeks which may contain fish."

Thus, there will be "overprint" impacts through destruction of fish, fish habitat, and associated water quality.

The Ore Processing section says:

> "Ore processing will entail several stages of conventional mineral processing such as grinding and classification, and cyanide leaching to separate the gold / silver from the gangue leading to production of doré bars."

Thus, the processing will add contaminants including cyanide and accelerated leaching of metals and other elements that will contaminate the water in the process, in the tailings impoundment, and in the fugitive seepage that will flow into the environment.

Also:

> "There are no sources of mercury from the ore processing."

This appears impossible because the ore rock going in, and the tailings and concentrate coming out, of ore processing should and will contain some level of mercury. The processing could even increase the solubility or leaching rate of mercury and other elements. Therefore, this appears to be an error unless Kinross Gold can prove the tailings and concentrate from the ore processing contain absolutely no mercury. This is highly unlikely if not impossible to prove.

The section on Tailings Management explains:

> "The primary by-product of ore processing is tailings. Tailings consist of ground rock and associated process effluents that result from the processing of ore. Tailings will be treated for cyanide destruction before storage. As part of the ongoing geochemistry investigations it was determined that the tailings may be potentially acid generating, Kinross is investigating the potential to desulphurize the initial tailings stream resulting in a non acid generating flotation tailings, and a smaller quantity of sulphide tailings that would be managed in a manner to mitigate their acid generating potential."

Cyanide destruction is rarely perfect and sometimes simply converts the cyanide to thiocyanide or cyanate which can then revert to cyanide after release to the environment. Because the details of Great Bear's cyanide destruction are not given, it is prudent to assess it for potential environmental impacts.

Tailings Management further says:

> "Tailings will be transferred from the processing plant to an onsite surface management facility as a slurry, or potentially as a filtered cake. A quantity of the tailings will also be sent to a paste backfill plant where they will be mixed with a binder (such as cement) to increase their strength, so that they can be returned to the underground workings to provide additional underground stability. Tailings could also potentially be stored in the open pit after mining

is complete.

Tailings paste backfill, dewatered filter-cake tailings, and the relocation and in-pit disposal of tailings each could have unique adverse impacts on water quality and this should be assessed by Kinross Gold.

> "Further detail on tailings management facility, including dam designs as applicable, will be developed as engineering progresses for the Project. The facility will be designed in accordance with all regulatory requirements including the Canadian Dam Association Dam Safety Guidelines as applicable."

Thus, the details for evaluating potential environmental impacts will not be available until "engineering progresses", which is consistent with the ML-ARD work which will not be completed for at least a few years.

Notably, this section on Tailings Management has no detailed description of water management including any water recirculation. This is a major omission that precludes a reliable assessment of impacts from how much water would be needed daily to run this proposed mine.

The section on Buildings and Yard Areas states:

"The following new permanent facilities are planned for the Project:

- Process plant and crusher / conveying system
- Mine office / dry / maintenance / wash bay complex
- Cold and warm storage buildings
- Reagent storage facilities
- General laydown areas and parking
- Additional core shack, laboratory and outbuildings
- Accommodations / camp
- Explosives storage facilities.

These will be supported by related road, piping and power infrastructure as needed."

The disturbed rock or overburden used in any of these Areas requires an ML-ARD assessment as explained in the 2009 federal ML-ARD Prediction Manual (Price, 2009).

The section on Water Management Facilities and Drainage Works explains:

> "Kinross proposes to establish an integrated water management system for the site to manage contact water from the underground mine, open pits and surface facilities. The underground mine will intercept groundwater, while the open pit will collect groundwater, runoff and direct precipitation. Mine water from the required dewatering of the underground mine and open pit, to enable mining to occur will be collected in sumps and pumped to the surface for additional management. The mine water management and treatment infrastructure developed for the AEX program is expected to be re-used at the beginning of operations and will potentially be incorporated into the overall integrated water management system for the operating mine.
>
> "Precipitation and surface runoff that comes into contact with mine-related facilities on surface will be collected in ditches and collection ponds designed. As needed, the water will be directed to the integrated water management system for treatment and discharge with

other site contact water.

> "The integrated water management system and associated effluent treatment plant will be designed and operated to ensure that effluent from the site meets all regulatory requirements and can be discharged to the environment. Effluent will be discharged to the Chukuni River a large watercourse with high assimilative capacity. This will allow continued use of the pipeline corridor established for the AEX program. The additional infrastructure required for the mine has not yet been determined."

This section on Water Management Facilities and Drainage Works does not explain the storm return periods for which the drainage works would be sized. Nor does it specify the design return period for the post-closure water management, such as the 24-hour 1-in-200-year precipitation or the Probable Maximum Flood. This is a major omission that precludes a reliable assessment of impacts from storm events that could lead to spills of contaminated site water, and thus confuses the decision on whether an impact assessment should be conducted.

Under Access and Site Roads:

> "A network of roads of will be established within the site as needed, minimizing water crossings. New roads will be constructed of aggregate or non-potentially acid generating mine rock. New major road and watercourse crossings are not expected for the Project, although minor crossings and cross drainages may be needed. The water pipeline corridor which will be developed for the AEX program, and potentially expanded with additional pipelines for the mine, includes an access road to allow for pipeline inspections, environmental monitoring and maintenance, and is expected to cross four headwater creeks / low-lying swales, likely as culverts (Figure C.1 and Figure C.2). The existing prefabricated truss bridge across Dixie Creek may be upgraded."

Any surface and subsurface disturbance including new roads require ML-ARD assessments before an impact assessment can be done according to the 2009 federal ML-ARD Prediction Manual (Price, 2009).

The Section on Aggregate Operations contains a serious error:

> "Aggregate will be required to develop the Project. The primary source of material is proposed to be *nonreactive mine rock and overburden* [MDAG emphasis] from stripping and other construction activities within the site. There are licensed commercial aggregate pits nearby (along Tuzyk's Road) that also represent a potential source of aggregate for the Project. Discussions with the owners of these aggregate facilities are planned to explore potential commercial arrangements.
>
> "New quarries for crushed rock and sand and gravel pits may be established on the Property if needed under the care and control of Kinross. Locations are not as yet known but may be situated at future development locations (such as within the tailing management area)."

Because there is no such thing as "nonreactive mine rock and overburden", then there will be no aggregate which is "required to develop the Project", which in turn literally means there can be no Great Bear Project or mine. This illustrates how Kinross Gold is submitting perhaps-draft

documents with statements intended to alleviate concerns that are instead false and misleading.

This document is not signed and certified by Qualified Professionals, so at least portions of this Detailed Project Description are more akin to Public Relations than technical accuracy. Grassy Narrows First Nation should be aware of these false statements in important documents supposed to describe accurately and reliably the proposed exploration and proposed mining of the Great Bear site. It is not prudent to decide impacts of proposed exploration and mining based on false technical statements.

10.2 Section C.3.4 Preliminary List of Mine Activities

This section C.3.4 lists many "preliminary" activities during Construction, Operations, and Decommissioning and Closure. While many sound like generally good ideas, they can turn out to be bad ideas and not even possible at the Great Bear Project.

For example, here are some "preliminary" activities:

> "Overburden and organic material from the open pits will be either stockpiled or used for progression reclamation"
>
> "Mine rock extracted from the underground workings and open pits will be stockpiled, re-used as aggregate, or potentially re-used a consolidated rockfill underground"

The Project Definition Document of December 2022 assumed all the mine rock would have strong ML-ARD potential and would substantially contaminate water. Overburden was not even assessed although required by Ontario Regulation 240/00. It is understandable that the initial worst-case scenario may be modified as years go by and as ML-ARD studies are completed according to the 2009 federal ML-ARD Prediction Manual. However, there may be little change from the worst case at the Great Bear Project, but no one knows at this time. Thus, these "preliminary" activities can cause wider and worse impacts; no one knows at this time. Nevertheless, this perhaps-draft Detailed Project Description lists them anyway without pointing out their potential for adverse impacts.

This section also says,

> "As operations continue the open pit will have a progressively larger surface area and will become deeper"

The proposed pits are a concern to me as I do not see them justified by Kinross Gold. In fact, Figure C.5 shows that most of proposed pits and excavations are not needed to access most of the ore. Thus, there seems to be another, unstated reason for them, but I cannot see what it is.

10.3 Section C.3.5 Preliminary Decommission Approach

This section says:

> "Decommissioning and final closure of the Project site will be governed by the Ontario Mining Act, and its associated Regulations and Codes, and will be informed by ongoing engagement with Indigenous Nations and potentially affected stakeholders. The Act requires

> that a Closure Plan be filed for mining project before construction, and that financial assurance be provided so sufficient funds are in place to carry out the decommissioning activities.
>
> "A preliminary description of the proposed decommissioning and reclamation measures is provided in the text that follows. The preliminary measures are subject to consultation, additional engineering and regulatory review. The active phase of decommissioning and reclamation is expected to be completed within approximately three years of the end of operations. Environmental monitoring will continue after reclamation is completed, until such time as the closure objectives as determined in the Closure Plan have been achieved."

It is important to note that this preliminary closure plan, which should include early and unexpected closure but does not, will determine the initial financial security. Thus, all potential major sources of contamination should be identified and costed now, but this is far from the case.

Many serious long-term concerns are omitted and thus cannot be added at this time to the cost of the initial financial assurance. For example, the section on the Underground Mine does not mention the costly and serious water-quality degradation that would likely accompany the backfilling of "PAG" rock into the mine, where the rising, flooding water can become seriously contaminated beyond that seen at the surface. This seriously contaminated flooding water would likely eventually reach an equilibrium level where it would begin flowing out into the surrounding groundwater system and the environment years after closure. This would require long-term or perpetual pumping and treatment of groundwater, which could substantially or enormously raise the financial assurance.

Alternatively, the "PAG" rock (and overburden) could be kept in a stockpile at the surface where its ongoing seepage of infiltrating water through some type of cover would require perpetual collection and treatment. This section implies the ML-ARD would stop by incorrectly saying:

> "Reclamation measures will be designed to mitigate acid mine drainage / metal leaching concerns as needed. This may include design and placement of an appropriate cover over the mineral waste."

ML-ARD is not mitigated cheaply and permeable covers do not stop infiltration but may reduce it if well maintained in perpetuity, still leading to perpetual maintenance and water treatment. Very expensive impermeable covers may virtually encapsulate and isolate the contaminating rock and overburden if carefully maintained in perpetuity, which also includes additional costs for perpetual maintenance and repair.

Or perhaps as Section C.6 on Potential Alternatives states, the mine rock would be used as "reclamation material" where it could contaminate more of the site. Or the mine rock would be placed into "storage in depleted open pit". In the pits, the backfilled mine rock would contaminate inflowing water that would eventually fill and flow into the surrounding environment, or eventually drain down into the underground workings where the second paragraph above explains the fate of the underground water.

One way or the other, the closure cost only for the rock and overburden alone will likely be much higher than envisioned in this perhaps-draft Detailed Project Description.

There are other examples like this that are not recognized and costed in this Section C.3.5.

Therefore, whatever the current estimated cost of financial assurance based on Section C.3.5, it should be raised substantially higher. This would also cover the expense should early or unexpected closure occurs, which is credible and often expected but is not mentioned or considered in this Great Bear document.

10.4 Section F Potential Effects of The Project

Section F on potential effects of the project during Construction, Operations, and Closure starts with Table F.1 Preliminary List of Change to the Environment under Federal Jurisdiction.

The row of Table F.1 for the Fisheries Act during the Construction Phase says:

> "Alteration, disruption and destruction of fish and benthic fauna habitat from direct disturbance (including potentially from overprinting by mine rock and tailings management facilities), blasting and mine dewatering" with the Preliminary Area of Influence only "Project footprint"

For mine dewatering, the ongoing drawdown of groundwater and ongoing dewatering of surface waterbodies does not stop immediately as the pumps are turned off at the end of Operations, but can continue for many years afterwards through Closure. Also, the Area of Influence could be much greater than the Project Footprint (see Section 9.2 of this MDAG review). However, Operations and Closure does not mention this long-term ongoing impact. This illustrates how "Preliminary Changes" are only partially recognized in this Detailed Project Description, and important ones are not mentioned and considered.

Additionally, for Closure under the Fisheries Act Table F.1 says:

> "Potential for creation of fish habitat in new pit lakes, expected to be re-connected to the Dixie Creek system"

This shows a lack of understanding of water-quality impacts and ML-ARD, similar to the Great Bear "nonreactive mine rock and overburden" that does not exist (see Section 10.1 of this review). It sounds good to non-technical readers to say the pit lakes will be fish habitat and "re-connected" to Dixie Creek although they are not currently connected. On the other hand, technical readers know this is highly unlikely considering the type of rock and ML-ARD likely to come from Great Bear rock, pit walls, and underground mine walls. These Great Bear pits as proposed, long after Closure, should not be expected to meet the requirements of the Fisheries Act.

Table F.2 Preliminary Summary of Potential Environmental Effects says:

> "- Underground mine and open pit dewatering will affect the local groundwater levels and may affect surface water flows
> - Groundwater quality is not expected to be affected"
>
> "Preliminary Areal Extent:
> - Dewatering may result in a depression in the local groundwater level which is currently under investigation"

Section 9.2 of this MDAG review explains how Kinross Gold's groundwater modelling is aware of, but avoids showing, the substantial lowering of groundwater levels by dewatering to a remarkable depth of ~600 m in the rock, while the overlying overburden is virtually fully dewatered to its base. This dramatic lowering will be much more than the comfortable sounding word of "local" in the above quotations. It will be much worse than "local". This will also likely have a major impact on groundwater quality, as Section 9 of this MDAG review explains, despite Kinross Gold's unjustified and unreasonable expectation that "Groundwater quality is not expected to be affected".

Furthermore, surface creeks and lakes could be dewatered much more than modelled because modelled groundwater levels are simulated around 9 m higher than measured, reducing the modelled and predicted dewatering below reality. Baseline flows to local surface waterbodies, which are critical to the benthic ecosystem and aquatic life due to their differing chemistry and temperature, will be reduced by 34% and more, but no one yet knows how much more.

Section F.6.1 on Atmospheric Emissions has a major omission that shows the environmental impact from atmospheric emissions would be much greater than stated. Section 8 of this MDAG review has explained that fugitive dust at Great Bear, and any water used to suppress this dust, would have a substantially larger environmental impact than currently recognized and modelled. Thus, impacts from air emissions have been underestimated in this Detailed Project Description that could be used to determine an impact assessment.

Section F.6.2 Liquid Discharges states:

> "Mine water will contain suspended solids from mining and earthmoving activities, ammonia residuals from ammonia-based explosives, and residual hydrocarbons from heavy equipment operation. Leaching of the exposed bedrock within the underground mine and open pit may potentially contribute minor quantities of metals to the mine water."

This is another example of bad science appearing as technical information in this perhaps-draft Detailed Project Description.

- First, underground mine water will also contain dissolved metals and other inorganic contaminants.
- Second, since ammonia is expected to be so high from underground explosives that a special treatment circuit is needed for it, then the always accompanying high nitrate and nitrite that will not be treated but discharged to the environment will also be high and contaminating.
- Third, since underground mine water will contain hydrocarbons, why is there no option to treat these potential organic contaminants?
- Fourth, leaching of mine walls in underground workings and open pits can, and elsewhere have, seriously contaminated the mine water, with the contamination increasing as the area of mine walls increases during mining. This could happen at Great Bear because more than 10 km of underground workings would likely be mined. However, the ML-ARD testwork to predict this under the federal ML-ARD Prediction Manual will be in progress for at least a few years. So, once again this Detailed Project Description misleads by already concluding that the leaching "may potentially contribute minor quantities of metals to the mine water". The reality could just as easily turn out to be "the leaching will contribute substantially high and toxic quantities of metals to the mine water". No one knows yet, not even Kinross Gold and its consultant, WSP.

Some day in a future year, reliable "Modelling will be completed to assess the volume and quality of the water requiring management, which will be used in the design of the integrated water management and treatment facilities on site." At this time, the groundwater requiring management has clearly already been underestimated (see Section 9.2 of this MDAG review). Until then, no one knows with reasonable confidence how much water has to be treated, how severely it will be contaminated, and how thoroughly it will be treated.

The subsection on Process Plant says:

> "Excess process plant water is expected to be pumped with the tailings to a tailings management facility for storage. The tailings and process plant water will contain metals from the processing of metal-containing ore and residual processing reagent products. A cyanide destruction circuit will be established within the process plant to treat residual cyanide concentrations in the tailings and process plant water, prior to pumping to the tailings management facility."

A major aspect of water management and tailings management is the percentage of discharged process water that will be recirculated back to the process to minimize freshwater usage and contamination by "metal from the processing". This issue is not mentioned and thus is a serious omission. Additionally, "cyanide destruction" is not perfect and may not literally destroy cyanide but temporarily mask it until its release to the environment. These important issues are not mentioned either. Thus, this quotation gives the false impression that cyanide and metals will only be "residual" and will be treated to minimize them, but this is simply guessing that is not consistent with ML-ARD testwork so far.

Section F.6.4 on the Environmental Management System does not explain the currently likely scenario that one or more additional contaminants not currently recognized will arise in on-site water (see also Section 11 of this MDAG review). This would require at least months of storage of contaminated water on site until the treatment plant is expanded and updated. Therefore, the on-site storage of months of site-contaminated surface water and groundwater should be a major objective of the Environmental Management System.

10.5 Summary

In summary of this perhaps-draft Detailed Project Description of November 2023, the first cover page by Kinross says this document is "draft", but the second cover page by the authors, WSP, does not say "draft" so perhaps this is the final document. If so, it has not been signed by qualified professionals and thus should be rejected.

In any case, there are so many problems, misleading statements, errors and omission concerning ML-ARD, water quality, and environmental impacts that they cannot all be summarized well here. These problems include the following.

- The false statement that there will be no sources of mercury from the ore processing when in fact the tailings and concentrate from the process will contain mercury. The processing could even cause mercury and other elements to leach more quickly and become more mobile.

- Contrary to the impression given by this Detailed Project Description, cyanide destruction is not perfect and can simply mask the cyanide temporarily in the environment, but the important testwork to determine this has not yet been done for the Great Bear Project.

- Significant impacts on water quality can arise from seemingly benign proposed activities like paste backfill of tailings into the underground mine and dewatered filter-cake tailings, but the potentials for serious impacts are not recognized or not even mentioned in this perhaps-draft Great Bear document.

- Storm events and equipment upsets can lead to relatively large variations and unexpected impacts, day-to-day or even hour-to-hour, during proposed exploration and proposed mining. Instead, these Great Bear documents use averages like monthly which incorrectly assume flows will be the same every day of a month which is far from reality. Environmental impacts and spills can be caused by large variations, as well as longer-term averages, so the environmental risks of proposed exploration and proposed mining at Great Bear remain mostly unknown and not identified.

- Nonsense pseudo-scientific statements are used, like the aggregate required to build the Great Bear Project would be "nonreactive mine rock and overburden" which does not exist. This clearly shows that experienced and qualified professionals were not included in the writing of this perhaps-draft Detailed Project Description. If there is a true commitment to "nonreactive mine rock and overburden" which does not exist, then the Great Bear Project stops now.

- There is a lack of ML-ARD assessments for some site components like aggregate.

- There is a prevalent but likely false belief that "NPAG"rock will have little to no impacts on ML-ARD, water quality, and the environment. However, this has not been proven for the Great Bear Project and is likely wrong based on other minesites around Canada. "NPAG" rock can actually generate more acid than "PAG" rock and still release seriously contaminated levels of many metals and other elements at near-neutral pH.

- The financial assurance to ensure proper and fully paid closure of the proposed Great Bear Project is grossly underestimated based on existing information. Furthermore, the financial assurance should also include contingency costs for early or premature closure but it does not.

- There are likely devastating, expensive, and unrecognized ML-ARD consequences on water quality from the proposed relocation of "PAG" rock into the underground workings after operation.

- The ongoing, unproven, and likely wrong, belief continues that overburden would be environmentally benign, can be used across the site for reclamation, and can be sprayed with water to control dusting when it could instead create contaminating water around, below, and beyond the Great Bear site.

- There are unfounded beliefs that dewatering during exploration and mining would have minimal

effect on the local and regional water balance, and would not significantly dewater surface creeks and lakes including their environmentally important baseflow. These false beliefs are based on flawed groundwater modelling for the Great Bear Project explained earlier in this MDAG review.

- There is a false belief that dust blown off the site during proposed exploration and proposed mining and into the surrounding environment, vegetation, soil, water, and aquatic ecosystems is benign at "background" levels.

- A false belief is stated that only elevated and toxic ammonia, and no other contaminating nitrogen species from explosives that consistently accompany the ammonia, will appear in mine water during proposed exploration and proposed mining.

- There is an unsupported and likely substantially underestimated statement that the mine walls in the pits and underground workings "may potentially contribute minor quantities of metals to the mine water" instead of the more typical significant quantities of metals seen at many other minesites around Canada. This is taken to the likely ludicrous statement that there would be "Potential for creation of fish habitat in new pit lakes, expected to be re-connected [sic] to the Dixie Creek system".

- There is no recognition of the implications, costs, and impacts of storing months of contaminated mine water on the site should one or more "unexpected" yet currently predictable inorganic contaminants and ML-ARD occur on the site water during and after proposed exploration or proposed mining.

11. Water Treatment during Proposed Exploration and Proposed Mining

Most of the contaminated water at the Great Bear Project during proposed exploration and proposed mining would be subjected to water treatment. There would remain some fugitive contaminated water and contaminated dust that would impact the surrounding environment. This fugitive contamination has not been assessed in detail by Kinross Gold, and is even ignored or not recognized in several Great Bear documents as shown above in this MDAG review.

If fugitive contamination turns out to be minimal, then water treatment is the last "line of defence" between the on-site ML-ARD and contamination and the off-site impacts. Therefore, proposed water treatment should be examined and justified in great detail. This has not yet happened for the Great Bear Project.

At this time, I could not find any detailed and professionally certified report on water treatment for proposed exploration and proposed mining. The previous sections of this MDAG review have discussed water treatment as it appeared in some documents, where the current information was found lacking or misleading.

Minewater-treatment plants are not off-the-shelf available at stores like Canadian Tire. This is because their treated effluent concentrations to the environment are very sensitive to the site-specific inflow rate of water and to the inflowing variations in aqueous concentrations of each contaminant element requiring treatment.

These treatment plants can be unstable when exposed to variable flows or to variable inflowing contaminant concentrations, resulting in only partially treated and still-contaminated effluents. Therefore, water treatment for proposed exploration and then again for proposed mining at the Great Bear Project has to be carefully designed, based on well-justified and professionally certified information on surface hydrology, subsurface hydrogeology, ML-ARD, and on-site geochemical source terms.

As shown in the previous sections of this MDAG review, this "input" information into the site-specific and reliable design of water treatment at Great Bear does not exist and will not likely exist for at least a few years. Until then, the available preliminary information is corrupted by errors and missing details. Therefore, it is not possible at this time to reliably define and design the required water treatment at Great Bear, or to estimate effluent concentrations, environmental impacts, and cumulative effects.

To provide some guidance to Grassy Narrows First Nation on aspects of water treatment at the Great Bear Project, it is helpful to review and comment on one of the latest documents that contain some details on possible water treatment. This document is: Great Bear Project Proposed Underground and Open Pit Gold Mine, a PowerPoint presentation made to Asubpeeschoseewagong Netum Anishinabek, dated November 10, 2023

Slide 20 of this presentation is entitled "Water Treatment". It points out that:

> "Contact water discharged to the Chukuni River will be managed to achieve regulatory requirements."

It is important for Grassy Narrows First Nation to recognize that "regulatory requirements" can vary vastly and that the applicable and protective requirements have to be carefully chosen based on site-specific information like flow rates and variations in influent (ML-ARD) and effluent concentrations. Alarmingly, Table 5-6 shown on Slide 20 invokes the "MDMER" or Metal and Diamond Mine Effluent Regulations, which allow toxic levels of metals and other elements. For example, normally toxic levels of 100 ug/L and more are allowed for arsenic and copper, and normally toxic 80 ug/L and more are allowed for lead.

This should be an immediate warning to Grassy Narrows First Nation that Kinross Gold does not intend to treat the site water to safe levels. Instead, treatment will only reduce concentrations to still-toxic levels and then rely on dilution in the Chukuni River to eventually reduce it almost to background levels.

The usage of toxicity dilution in the Chukuni River would create a "mixing zone" for some distance in the river, in which toxicity still exists and for which Fisheries and Oceans Canada would have to authorize the mixing zone. There appears to be some hydrodynamic modelling already done for this mixing zone in the River, but no details like flow rates and their variabilities were provided. Because the previous sections of this MDAG review showed that long-term to perpetual treatment and dilution may be needed for the Great Bear Project, Grassy Narrows First Nation should understand this will represent a very-long-term impact.

Additionally, such long-term ongoing discharge and dilution will add to cumulative effects, about which Grassy Narrows First Nation has expressed serious concerns.

Slides 20 and 21 present additional details on treatment. For example, a special and likely expensive ammonia treatment circuit will be included to treat elevated and toxic ammonia from blasting residues. Remarkably, nitrate and nitrite, which can also be toxic and can stimulate eutrophication in the Chukuni River and Dixie Creek, always accompany ammonia from the blasting residues. However, they are not even recognized here or in other Great Bear documents. This is a serious and unacceptable omission for the Great Bear Project.

Sulphate concentrations in the treated effluent, which I understand can increase toxic methylation of mercury and other elements like cadmium and arsenic, are not mentioned at all.

Slide 20 also commits to "ultrafiltration" which typically removes all suspended particles coarser than about 0.02 um. Because "dissolved" concentrations include nanoparticles and small particles up to about 0.45 um, this proposed ultrafiltration would also lower the functionally "dissolved" concentrations, but not those of fully dissolved elements. Thus, Great Bear treatment should be capable of approaching CCME (Canadian Council of Ministers of the Environment) safe criteria for aquatic life, but may not meet Grassy Narrows First Nation water-quality criteria (GNFNWQC). CCME aquatic-life guidelines and GNFNWQC could replace the toxic MDMER criteria and significantly reduce or eliminate the mixing zone and cumulative effects in the Chukuni River.

However, none of these details are discussed or mentioned in Great Bear documents.

Mine water treatment plants remove metals and other elements from the water, by creating concentrated and toxic treatment waste commonly called "sludge". In many jurisdictions, treatment sludge like that proposed for the Great Bear Project can reach "hazardous" or "special" waste levels, requiring the most careful and secure handling and long-term storage under contaminated-sites regulations. Spills of this sludge can result in toxic conditions in water and in sediments including soils and benthic ecosystems.

All the Great Bear documents I have reviewed so far are completely silent on the annual volumes, handling, storage, long-term protection, and potential environmental impacts of treatment sludge. This is a major risk for serious environmental impacts that should be addressed in great detail for proposed exploration and proposed mining. I recommend that Grassy Narrows First Nation require intensive studies on the treatment sludge that will remain and be managed somewhere in perpetuity.

In summary for water treatment, Great Bear documents invoke water treatment as the major process that would prevent or minimize environmental impacts of proposed exploration and proposed mining. This is not literally true, because there will be fugitive contaminated water and contaminated dust leaving the site, but this fugitive contamination is ignored or not recognized in many reviewed Great Bear documents.

In any case, water treatment is the last "line of defence" between the on-site ML-ARD and contamination and the off-site impacts, and thus requires intensive study and characterization. However, at this time, water treatment for proposed exploration and proposed mining is ambiguous and contradictory among the documents. This should be expected because the input flows and input contaminant concentrations (ML-ARD) will not be known reliably for at least a few years. Nevertheless, there are serious concerns about water treatment now including the following.

- Kinross Gold does not expect to treat site water to non-toxic levels. Instead, treatment would only be down to still-toxic levels based on the Metal and Diamond Mine Effluent Regulations. Thus, Kinross Gold intends to rely on significant dilution of its contaminated effluent within a "mixing zone" in the Chukuni River. Such a mixing zone would include zones of significant toxicity and would require formal authorization from Fisheries and Oceans Canada. In any case, this discharge of effluent would add to cumulative effects, which is a particular concern of Grassy Narrows First Nation.

- Expensive and intensive treatment for ammonia, derived from blasting residues, is proposed. However, toxic levels of nitrate and nitrite, that always accompany the ammonia and which can cause eutrophication and other impacts in the Chukuni River and Dixie Creek, are completely ignored.

- Sulphate concentrations in the treated effluent, which I understand can increase toxic methylation of mercury and other elements like cadmium and arsenic, are not mentioned at all.

- Ultrafiltration may substantially reduce effluent concentrations for those elements not fully

dissolved, mixing-zone size, and cumulative effects. However, there are no details on this ultrafiltration in the reviewed Great Bear documents.

- Mine water treatment plants remove metals and other elements from the water, by creating concentrated and toxic treatment waste commonly called "sludge", which can reach "hazardous" and "special" waste levels in some jurisdictions. Thus, treatment sludge requires the most careful and secure handling and long-term storage under contaminated-sites regulations. Spills of this sludge can result in toxic conditions in water and sediments including soils and benthic ecosystems. All the Great Bear documents I have reviewed so far are completely silent on the annual volumes, handling, storage, long-term protection, and potential environmental impacts of treatment sludge that will remain and be managed somewhere in perpetuity.

12. References

Morin, K.A., and N.M. Hutt. 2001. Environmental Geochemistry of Minesite Drainage: Practical Theory and Case Studies, Digital Edition. MDAG Publishing (www.mdag.com), Surrey, British Columbia. ISBN: 0-9682039-1-4.

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A Kinross Company
104 Howey Street
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July 9, 2024

The Hon. Steven Guilbeault
Minister of Environment and Climate Change
200 Sacré-Coeur Boulevard
Gatineau QC K1A 0H

Impact Assessment Agency of Canada
Ontario Region
600-55 York Street
Toronto, Ontario MSJ 1R7
Attention: Anjala Puvanathan (Director, Ontario Region)

Re: Great Bear Resources Ltd. ("Great Bear") – Great Bear Gold Project ("Project") – Response to Asubpeeschoseewagong Netum Anishinabek ("ANA") Request for Review Panel

We are writing in response to the letter dated 17 June 2024 ("**Request Letter**") from ANA to the Impact Assessment Agency ("**IAAC**") requesting a review panel pursuant to section 36 of the *Impact Assessment Act* ("**Act**") to review the Project.

For the reasons set out in this letter, Great Bear submits that a review panel is not necessary for the assessment of the Project under the Act. A thorough, comprehensive impact assessment ("**IA**") can be undertaken through the IAAC-led process. The IAAC-led process is also adaptable to respond in detail to specific issues that may arise related to Indigenous community interests.

1. Section 36(2) establishes the Minister's decision criteria

The Minister's authority to refer an impact assessment to a review panel is set out in section 36(2) of the Act, which reads as follows:

> 36(2). The Minister's determination regarding whether the referral of the impact assessment of the designated project to a review panel is in the public interest must include a consideration of the following factors:
>
> (a) the extent to which the effects within federal jurisdiction or the direct or incidental effects that the carrying out of the designated project may cause are adverse;
>
> (b) public concerns related to those effects;
>
> (c) opportunities for cooperation with any jurisdiction that has powers, duties or functions in relation to an assessment of the environmental effects of the designated project or any part of it; and

(d) any adverse impact that the designated project may have on the rights of the Indigenous peoples of Canada recognized and affirmed by section 35 of the Constitution Act, 1982.

The circumstances of this Project assessment do not warrant a panel review based on a reasonable consideration of any of the relevant criteria in section 36(2). The ANA request focusses on potential impacts that fall under section 36(2)(d), which we respond to in section 4.

2. Mining activity in the Red Lake area is common, and the effects are well-understood.

The Project is in the Red Lake District in Ontario, a prolific mining district with an almost 100-year mining history. Given the large number of mining projects that have operated in this area, the geological, environmental, and social characteristics of the area are well-studied and understood. The local communities derive many benefits from the mining in the area, including employment and contracting to support those communities, and support mining.

Mining activities in the Red Lake District are subject to stringent environmental regulations and oversight by federal and provincial authorities. Accordingly, mining operations adhere to applicable environmental standards and manage any risks to local ecosystems and communities to appropriate standards.

Indigenous communities in the area have experience engaging with mining proponents and have negotiated various agreements and economic collaborations, resulting in community investments, employment opportunities, sustainable development, local land stewardship protocols, and an increase in positive, equitable relationships.

The existing record within the relevant provincial and federal regulatory agencies establishes a solid foundation to provide additional context for the Project-specific information that Great Bear will file for this IA.

3. Local Indigenous communities support mining if their interests are met

Great Bear has engaged with local Indigenous communities throughout the federal environmental assessment process thus far. Because of Great Bear's meaningful consultation and engagement, Lac Seul First Nation ("**Lac Seul**") and Wabauskang First Nation ("**WFN**") have indicated that they are open to the Project if the Project meets their interests.

Lac Seul and WFN have supported the Advanced Exploration program preceding the Project, and are engaged in negotiations with Great Bear for an agreement on the mine phase of the Project which would establish the basis upon with the Project would proceed with their support.

The Minister and IAAC must assess and reconcile the interests of Great Bear and all the local communities that will be affected by the AEX Permit and the Project. [1]

[1] See the *Ermineskin Cree Nation v. Canada (Environment and Climate Change)*, 2021 FC 758 (CanLII) case, in which the Federal Court decided that the Crown must consult with and consider the impact on the economic rights and benefits of Indigenous communities who have economic accommodation agreements.

4. The location, nature, and scale of the Project do not create the potential for adverse impacts that warrant the appointment of a Review Panel

In its letter to the IAAC, ANA cited various mine projects that had been referred to an independent review panel. Each of these projects had unique circumstances and potential impacts that are not analogous to the Great Bear Project. Specifically, those projects had circumstances that added to the complexity of their assessment, including the following: unique environmental conditions; a larger scale and scope of the construction or operation; a larger operational footprint or facilities; or local opposition.

It is more relevant to consider the Project on its own merits and against projects in the same region or Ontario. As noted in section 3 above, the region is a prolific mining region with many mine projects. Compared to other projects in the region, the Great Bear Project has less potential for adverse effects for the following reasons:

- The geographic footprint is relatively small.
- The construction and operation will involve well-understood practices that do not involve any complications or novel features.
- The potential environmental effects are limited in nature and scale and can be minimized by reasonable mitigation measures.
- The mining and processing will occur on the same site.
- The logistics to support the operation will be limited in nature and scale.
- The construction and operation will employ leading industry practice.

Other Ontario projects that have been larger in nature, scale and complexity have been assessed without the need for an independent review panel, including the following examples:

- The Greenstone Gold Project near Geraldton involved moving a highway, diverting a fish-bearing stream, a brownfield site with contaminated arsenic issues, a much larger processing plant, and required the relocation of historical tailings into the newly constructed tailings facility.
- The Côté Gold Project near Sudbury involved moving and draining streams and lakes, and a has much larger processing plant than what is planned for the Great Bear Project.
- The Magino Gold Project near Wawa involved moving and draining streams and a lake.
- The Detour Gold Project near Cochrane involved moving and draining streams and lakes, and a much larger processing plant.

The projects cited by ANA in other regions also involved elements that differ from the Great Bear Project. For example:

- The Marathon Platinum Group Metals and Copper Mine Project was an open-pit mine for platinum group metals and copper in Ontario. It involved substantial surface disturbance and

potential effects on the environment, including effects on wetlands and water bodies, water quality, aquatic ecosystems, and wildlife habitats. Indigenous communities raised issues regarding the adequacy and meaningfulness of consultation processes, as well as voiced concerns about the potential impacts of mining activities on culturally significant sites, archaeological resources and sacred areas within the project area.

- Suncor Base Mine Extension Project (Alberta)
- Rose Lithium – Tantalum Mine Project and the James Bay Lithium Mine Project (Quebec)
- The Grassy Mountain Coal Project in Alberta was large-scale open-pit coal mine that involved substantial changes to the landscape and local ecosystems and raised concerns about potential impacts on water quality, wildlife habitat, and Indigenous rights.
- Robb Trend Coal Mine Expansion Project (Alberta)
- Frontier Oil Sands Mine Project (Alberta)
- Jackpine Mine Expansion Project (Alberta)
- Pierre River Mine Project (Alberta)
- The Prosperity Gold-Copper and New Prosperity Gold-Copper Mine Projects in British Columbia was an open-pit gold-copper mine located in the Fish Creek Watershed, a part of the Fraser River watershed. The area is ecologically sensitive and supports critical spawning and rearing habitats for salmon species, and the project's development would have involved significant disturbances to the local environment, including the potential for acid mine drainage and impacts on water quality. Local communities, environmental organization, and Indigenous communities raised concerns about the potential for long-term environmental damage, risks to local water resources, impacts on recreational and tourism activities, and overall sustainability of the proposed development in the area.

5. The IAAC-led IA is comprehensive and sufficient

The IAAC-led IA is comprehensive and adaptable to meet the needs of the participants. It is more than sufficient to assess any potential environmental, social, health, cultural, or economic impacts of the Project. IAAC can call on expertise from the other federal agencies as needed and work collaboratively with the provincial agencies with expertise.

IAAC has expertise and experience to consult with and respond to all reasonable concerns raised by Indigenous and local communities.

6. Concluding comments

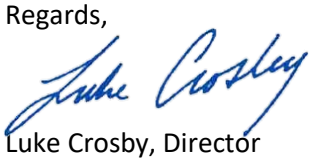
Great Bear seeks to establish a positive, collaborative relationship with the local Indigenous communities and will respond to all reasonable interests. Great Bear believes it can undertake all phases of the Project in a manner that respects those interests through good practice in the design and implementation of the Project, incorporating input from the Indigenous communities.

Great Bear follows industry best practices, adhering to all relevant and applicable federal, provincial, and local regulations governing mining activities. A key tenet of Great Bear's operations is its commitment to meeting or exceeding environmental standards through their environmental management plans, mitigation measures and monitoring protocols.

Great Bear would be pleased to elaborate on any of the points in this letter.

We look forward to your response.

Regards,



Luke Crosby, Director
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Rudy Turtle, Chief, Asubpeeschoseewagong Netum Anishinabek

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3 Sept 2024

The Hon. Steven Guilbeault
Minister of Environment and Climate Change
200 Sacré-Coeur Boulevard
Gatineau QC K1A 0H

Impact Assessment Agency of Canada
Ontario Region
600-55 York Street
Toronto, Ontario MSJ 1R7
Attention: Anjala Puvanathan (Director, Ontario Region)

Re: Great Bear Resources Ltd. ("Great Bear") – Great Bear Gold Project ("Project") – Response to Asubpeeschoseewagong Netum Anishinabek ("ANA") Request for Review Panel – Supplemental Comment

For the reasons set out in Great Bear letter dated 9 July 2024, Great Bear maintains that a Review Panel is not required for this Project.

We understand that Lac Seul First Nation ("**LSFN**") and Wabauskang First Nation ("**WFN**") have filed or will file a submission in which they also explain that they also do not see a Panel review as necessary.

LSFN and WFN explain that they have designed an Anishinaabe-led Assessment ("**ALA**") process to complement an Agency-led review of the Great Bear Project, rather than a Panel review. Great Bear has agreed to assist LSFN and WFN on this ALA and will respect the outcome of that review.

Great Bear would be pleased to elaborate on any of the points in this letter.

Regards,

<Original signed by>

Luke Crosby
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cc.

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Chief Bull, Lac Seul First Nation
Luke Hildebrand, Travis Moffat and Charlotte Connolly, counsel to LSFN
Chief Petiquan, Waubuskang First Nation
Kate Kempton and Nick Leeson, counsel to WFN

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NEWS RELEASE

Kinross completes Great Bear Preliminary Economic Assessment

Annual production over 500,000 ounces[1]
Impressive margins with low AISC[2] of ~$800/oz
Drilling beyond PEA inventory shows high-grade mineralization at depth

Toronto, Ontario – September 10, 2024 – Kinross Gold Corporation (TSX: K, NYSE: KGC) ("Kinross" or the "Company") today is pleased to provide an update on the Great Bear project (the "Project"), located in Red Lake, Ontario, Canada.

This news release contains forward-looking information about expected future events and financial and operating performance of the Company. We refer to the risks and assumptions set out in our Cautionary Statement on Forward-Looking Information located on page 13 of this release. All dollar amounts are expressed in U.S. dollars, unless otherwise noted.

Kinross has completed a Preliminary Economic Assessment (PEA) for the Great Bear project which supports the Company's acquisition thesis of a top tier high-margin operation in a stable jurisdiction with strong infrastructure. Based on mineral resources drilled to date, the PEA outlines a high-grade combined open pit and underground mine with an initial planned mine life of approximately 12 years and production cost of sales[3] of $594 per ounce. The Project is expected to produce over 500,000 ounces per year at an all-in sustaining cost (AISC)[2] of approximately $800 per ounce during the first 8 years through a conventional, modest capital 10,000 tonne per day (tpd) mill.

Kinross has also released an updated mineral resource estimate increasing the inferred resource estimate by 568koz. to 3.884 Moz. which is in addition to the existing M&I resource estimate of 2.738 Moz[4]. The mineral resource estimate and PEA for the Great Bear project are available here.

CEO Commentary:

"This PEA marks an important milestone for Great Bear and reaffirms our view of it as a high-quality asset with robust economics and a clear path to become a world class operating mine," said Paul Rollinson, Chief Executive Officer of Kinross Gold Corporation. "The Project represents a strong combination of high-margin production and modest capital requirements, with the opportunity for significant resource growth in the future.

"This PEA represents the first view of unlocking Great Bear's full potential. Based on surface drilling to date, the PEA provides an initial snapshot in time of the Project. The ongoing drilling to depth has already shown multiple wide, high-grade intercepts beyond the current resource used in the PEA. This deep drilling from surface demonstrates the continuation of mineralization at depth and the upside potential for further resource and mine life additions in the future as we progress exploration from depth.

"These positive results are underpinned by a strong mining jurisdiction with a skilled labour pool and solid regional infrastructure. We have both the financial and technical resources to advance the development of this exciting new Project in our portfolio."

[1] *Annual production over 500,000 ounces for the first 8 years.*
[2] *AISC is a non-GAAP financial measure. The definition and purpose of this non-GAAP financial measure is included on page 11 of this news release. Non-GAAP financial measures and ratios have no standardized meaning under IFRS and therefore, may not be comparable to similar measures presented by other issuers. Please see average production cost of sales in the table entitled "PEA study financial highlights" for the related estimated GAAP financial measure.*
[3] *"Production cost of sales per ounce" is defined as production cost of sales divided by total ounces sold. In the PEA, production costs of sales is referred to as production cash costs.*
[4] *See the table below titled "Great Bear Summary of project mineral resources" for grade and quantity of mineral resource estimate.*

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Key PEA Highlights:

- The Great Bear PEA demonstrates a top-tier high margin operation in a stable jurisdiction in Ontario, Canada. The Project is located within the prolific Red Lake Greenstone Belt 24 kilometres from Red Lake, a town with a long history of mining, significant infrastructure including a paved highway and provincial power lines, and access to experienced, skilled labour.
- The results from the PEA affirm that Great Bear has the potential to be a cornerstone asset with a top tier production profile, low costs, and significant value.
- The PEA mine plan demonstrates an excellent estimated internal rate of return (IRR) and after-tax net present value (NPV) at a range of gold prices.

PEA study physical highlights[5]	
Annual production (koz. / first 8 years)	518
Annual production (koz. / life of mine average)	431
Life of mine production (Moz. Au)	5.3
Mill Processing rate (tpd)	10,000
Underground peak mining rate (tpd)	6,000
Life of mine tonnes processed (million tonnes)	44.6
Average grade processed (g/t Au)	3.87
Average recovery rate (% Au)	95.7

PEA study financial highlights	
Average production cost of sales (per Au oz.)[3,6]	$594
Average all-in sustaining costs (per Au oz.)[2,6]	$812
Total initial construction capital cost (US$ millions)	$1,181
Total capitalized mine development (US$ millions)	$248
Total initial project capital (US$ millions)	$1,429

Great Bear IRR and NPV estimates based on gold price[7,8,9,10]	$1,900/oz.	$2,500/oz.
IRR	24.3%	35.5%
NPV	$1.9 billion	$3.3 billion
Payback period (years)	2.7	1.7

[5] The PEA is preliminary in nature and is based, in part, on Inferred Mineral Resources. Inferred Mineral Resources are considered too geologically speculative to have the economic considerations applied to them that would enable them to be categorized as Mineral Reserves. There is no certainty that the economic forecasts on which the PEA is based will be realized.
[6] Average production cost of sales and average AISC represent costs for projected production for the life of mine.
[7] The economic analysis of the project was carried out using a discounted cash flow approach on a pre-tax and after-tax basis, based on a long-term gold price of $1,900/oz in USD and cost estimates prepared in CAD.
[8] An exchange rate of 0.74 USD per 1.00 CAD was assumed to convert CAD market price projections and particular components of the capital cost estimates into USD.
[9] The IRR on total investment that is presented in the economic analysis was calculated assuming 100% equity financing except open pit fleet, though Kinross may decide in the future to finance part of the project with debt financing.
[10] The NPV was calculated from the after-tax cash flow generated by the project, based on a discount rate of 5% and a valuation date of January 1, 2026.

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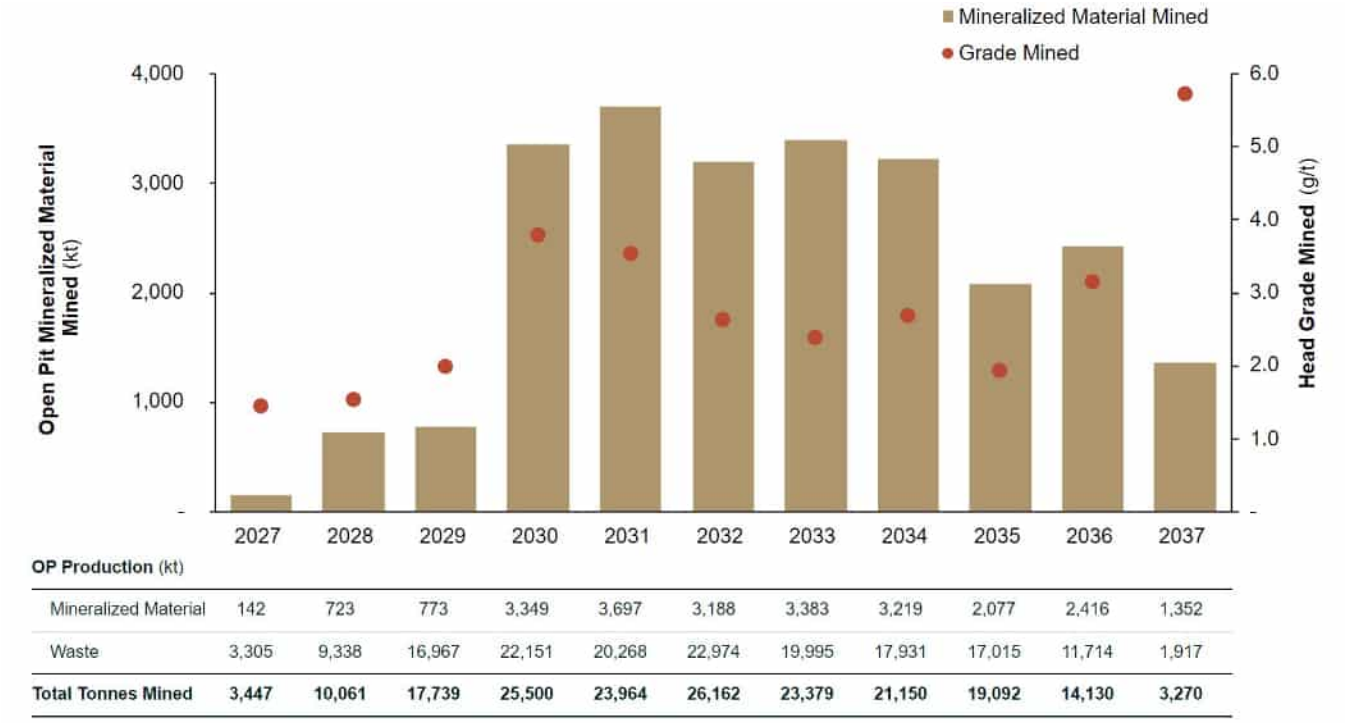
Mine Plan

The initial mine plan outlines concurrent open pit and underground mining over the first 8 years followed by combined underground mining and stockpile processing in years 8 to 12. The decision to mine the open pit and underground concurrently from the start provides significant production flexibility and time to continue exploration drilling from underground to further expand the resource and mine life.

The PEA demonstrates an initial life-of-mine (LOM) of approximately 12 years with total production of approximately 5.3 Moz. of gold. However this represents a point in time estimate of the mine plan and is only a window into the long-term potential of the asset given the limitations of drilling at depth from surface. Exploration drilling at depths up to 1,600 metres has already demonstrated continuation of high-grade mineralization with strong widths well below the current PEA inventory, highlighting the upside potential of this asset.

The high-grade open pit will be mined with a dual fleet strategy to provide selective mining of the high-grade material and lower cost mining of the waste, mining a peak of 26 million tonnes of material, and providing a peak of 9,000 tpd of mineralized material.

Figure 1: Open Pit mining plan



OP Production (kt)	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Mineralized Material	142	723	773	3,349	3,697	3,188	3,383	3,219	2,077	2,416	1,352
Waste	3,305	9,338	16,967	22,151	20,268	22,974	19,995	17,931	17,015	11,714	1,917
Total Tonnes Mined	**3,447**	**10,061**	**17,739**	**25,500**	**23,964**	**26,162**	**23,379**	**21,150**	**19,092**	**14,130**	**3,270**

For the underground, the primary mining method is long hole open stoping with paste backfill and cemented rock fill. First stope production is expected to begin in 2029, subject to permitting, and to continue for 12 years with a peak production rate of 6,000 tpd, with potential to expand beyond this run rate as extensions to the underground resource are targeted. At peak, the underground will have a mining rate of 6,000 tpd between 2035 and 2038, producing an average of 327koz. per annum.

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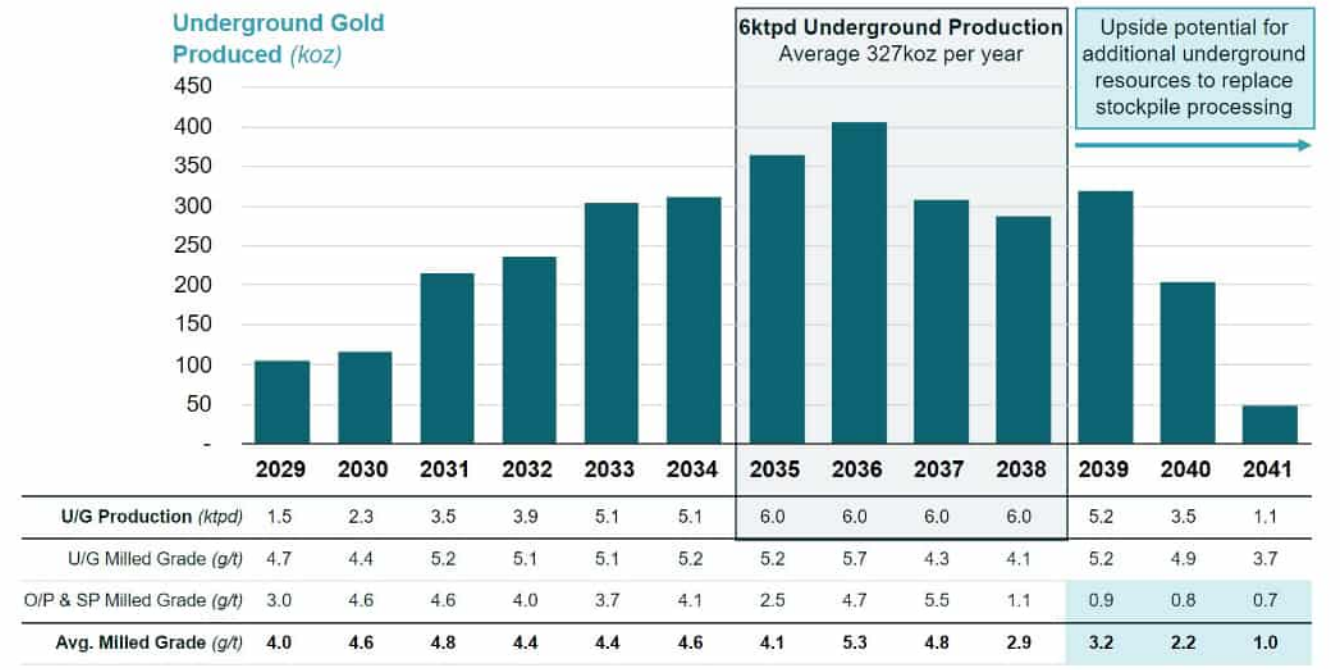
Figure 2: Underground mining plan



	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
U/G Production *(ktpd)*	1.5	2.3	3.5	3.9	5.1	5.1	6.0	6.0	6.0	6.0	5.2	3.5	1.1
U/G Milled Grade *(g/t)*	4.7	4.4	5.2	5.1	5.1	5.2	5.2	5.7	4.3	4.1	5.2	4.9	3.7
O/P & SP Milled Grade *(g/t)*	3.0	4.6	4.6	4.0	3.7	4.1	2.5	4.7	5.5	1.1	0.9	0.8	0.7
Avg. Milled Grade *(g/t)*	**4.0**	**4.6**	**4.8**	**4.4**	**4.4**	**4.6**	**4.1**	**5.3**	**4.8**	**2.9**	**3.2**	**2.2**	**1.0**

The combination of the open pit and underground production in the years 1 to 8 will allow for processing of higher-grade material and stockpiling of the remaining feed to supplement underground production in the latter years of the mine life. This strategy drives a milled grade of 4.6 g/t in years 1 to 8 and an average production of 518koz. per annum over these years.

Figure 3: Concurrent Open Pit and Underground Gold Production

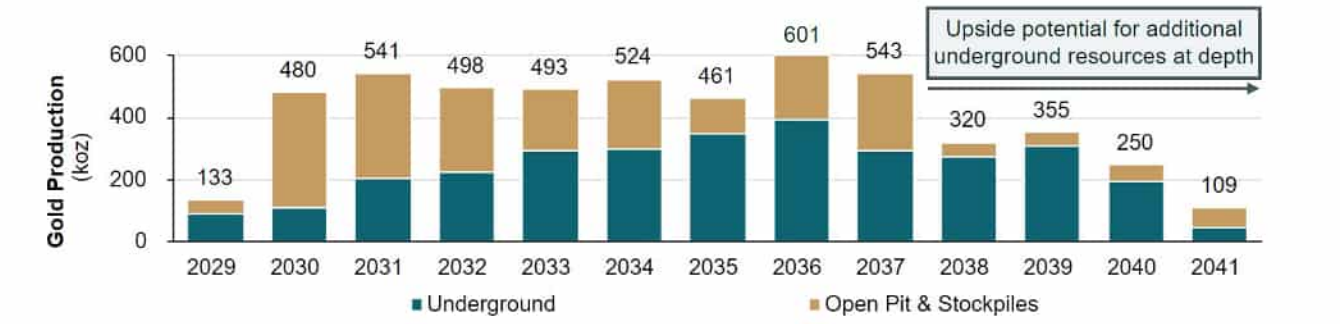


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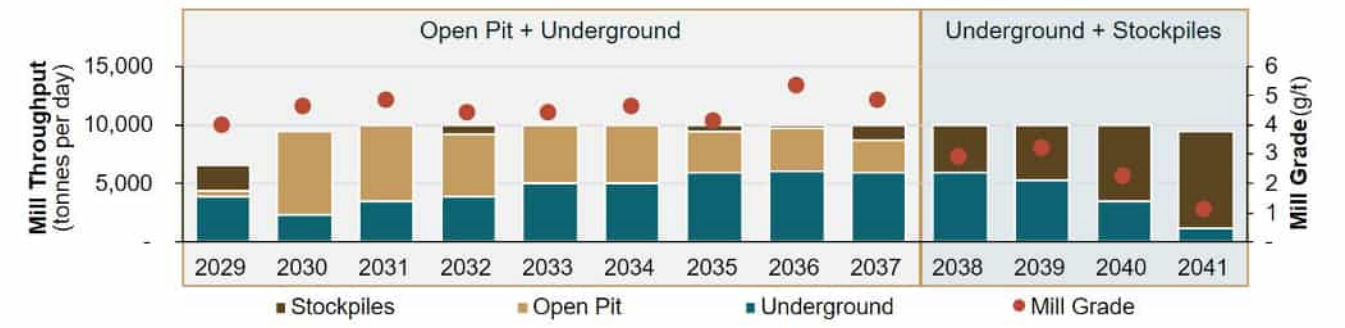
Figure 4: Mill Throughput



Open pit mining operations	
LOM material mined	187.9 Mt
LOM plant feed mined	24.3 Mt
Average grade	3.0 g/t Au
Strip ratio	6.7 (waste: plant feed)
Peak mining rate (all materials)	26.2 Mtpa
Mining unit cost (including capitalized mining)	$3.59 ($/t mined)
Underground mining operations	
LOM plant feed mined	20.3 Mt
Average grade	4.9 g/t Au
Steady State Mining Rate (plant feed)	6,000 tpd
Mining unit cost (excluding capitalized mining)	$68.70 ($/t processed)

Mill, Processing and Tailings Design

For the PEA, a conventional milling circuit for free milling mineralization was selected, targeting an average processing rate of 10,000 tpd. This scale of plant configuration simplifies construction, drives high margins and production scale in the early years with selective processing of higher-grade material when mining both open pit and underground, and avoids oversizing the mill for a potential underground only scenario in the latter years of the mine life at Great Bear.

Kinross has completed a comprehensive metallurgical test work program including detailed chemical head analysis, mineralogy, gold deportment, comminution, and leaching and gravity recovery testing across a selection of composite samples. The results of the test work program indicated clean metallurgy with no deleterious elements and very strong recoveries, with average LOM recovery of 95.7% projected in the PEA. The clean metallurgy and conventional circuit are expected to further de-risk project construction and execution.

Based on the metallurgical test results, Great Bear's processing plant has been designed as a conventional circuit with a proposed flowsheet including semi-autogenous grinding (SAG) and ball milling, pebble crushing, gravity concentration, leaching followed by carbon-in-pulp adsorption (CIP), elution, electrowinning, and smelting to produce gold doré.

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Key Processing Data	
Mill processing rate (tpd)	10,000
Total plant feed (Mt)	44.6
LOM avg. feed grade (g/t Au)	3.87
LOM contained gold (Moz)	5.5
LOM avg. recovery (% Au)	95.7
LOM recovered gold (Moz)	5.3

Kinross has invested substantial effort into early technical studies and design for tailings processing and management facilities at Great Bear leveraging the best available technologies to ensure the highest environmental standards.

As a result, the PEA design includes the addition of a desulphurization flotation circuit to remove sulphides and render the tailings non-acid generating, and a rigorous design criteria for all tailings storage facilities at the site.

As well, the LP Viggo Pit has been pulled forward to be mined during project construction in order to provide a robust in-pit tailings storage facility for the sulphide concentrate from the desulphurization flotation circuit, eliminating the need for a dam to impound the sulphide concentrate.

Capital Expenditure

The total initial construction capital is forecasted at $1.2 billion. Capitalized mine development prior to commercial production is expected to be approximately $250 million, comprised of $105 million related to open pit mining and $143 million related to underground capital development which will support higher production in the early years. The majority of the capitalized open pit mining is driven by the strategic decision to pull forward mining of the Viggo pit during construction to provide low-cost construction rock, early mill feed and a robust in-pit solution for the tailings concentrate.

Within the construction capital, the site development, water treatment and infrastructure area includes the truck shop, admin facilities, and camp. It also includes state of the art water treatment including ultra-filtration and a robust site-wide water management strategy to ensure the highest environmental standards.

Additionally, the capital estimate includes indirect and contingency costs, where indirect and owner costs are 40% of total direct costs and the contingency is 22%, providing further confidence in the PEA's total estimate.

The Project's capital requirements are expected to be manageable for Kinross and are forecasted within the Company's planned annual capex profile in the range of $1 billion. Kinross is confident it can continue to prioritize its investment grade balance sheet and comfortably fund Great Bear, along with other planned capital spending.

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Great Bear capital cost estimates *(US$ millions)*		
Direct Capital Costs		
	Mine equipment	$85
	Site development, water treatment and infrastructure	$239
	UG Infrastructure	$49
	Processing	$217
	Power	$47
	Tailings management facility	$52
	Total Direct Costs	**$689**
	Indirect	$276
	Contingency	$216
Total Initial Construction Capital Cost		**$1,181**
	Capitalized open pit mining	$105
	Capitalized underground development	$143
Total Capitalized Mine Development		**$248**
Total Initial Project Capital		**$1,429**
Life of Mine Sustaining Capital		**$1,034**
Total Growth Capital		**$97**[11]

Next Steps and Permitting

Kinross is continuing to progress work in several areas across the Project, for both the advanced exploration program (AEX) and the Main Project. Both the AEX and Main Project remain subject to permitting, which continues to advance. The AEX permitting is a provincial process and Kinross is working closely with the authorities on finalizing the permits. The Main Project's permitting is mainly a federal permitting review process driven by the Impact Assessment Agency of Canada (IAAC), with some provincial permitting components. Kinross was pleased to recently receive the Tailored Impact Statement Guidelines from IAAC, which will assist with completing the draft Impact Statement.

For the AEX, detailed engineering, execution planning, and procurement continues to progress well. The Company is targeting to commence surface works in 2024, subject to receiving provincial permits.

For the Main Project, Kinross expects to advance engineering definition and execution planning following the selection of design partners later this year. Work on permitting of the Main Project is ongoing and will require federal review under the Impact Assessment Act. An Impact Statement is currently in process and is expected to be submitted to the IAAC next year.

Kinross has actively engaged and consulted with Indigenous communities and organizations and has commenced negotiations of a Project Agreement with its First Nations partners, Lac Seul and Wabauskang, on whose traditional territories the Great Bear project is located.

11 The long-term power supply strategy for the Project is to obtain enough power supply from the Ontario power grid to avoid self-generation and the use of natural gas. To secure the necessary grid power supply, Kinross estimates it will need to make a capital contribution of approximately $97 million.

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Resource update and exploration

The Mineral Resources[12] at the property have been estimated for three zones: LP, Hinge, and Limb. As of April 2, 2024, approximately 568,000 ounces of inferred resources have been added from the LP zone to the total resource compared to year end 2023, bringing the total inferred resource to 3.9 Moz., in addition to 2.7 Moz. of M&I resources.

Mineral resources have been calculated at a gold price of $1,700 and the open pit reflects a $1,400 pit shell. The open pit cutoff grade is 0.55 g/t and the underground cut off grade of is 2.3 g/t for the main LP zone. The $1,400 pit shell has been chosen as this represents the optimal trade-off point at which underground extraction below the pit shows higher potential margins then deepening the open pit.

Great Bear Summary of project mineral resources[13,14,15,16,17,18]
(as at April 2, 2024)

Classification	Tonnes (000)	Grade (g/t Au)	Gold Ounces (000)
Measured	1,556	3.04	152
Indicated	28,711	2.80	2,586
TOTAL M&I	**30,267**	**2.81**	**2,738**
Inferred	**25,480**	**4.74**	**3,884**

Given the Company's current understanding of the orogenic system, and the significant high-grade extensions realized at the main LP zone, Kinross expects the strong grades to continue as drilling extends deeper. To date, Kinross has completed more than 420 kilometres of drilling on the property and results have been very strong, supporting the Company's view that high-grade mineralization extends at depth and indicating the potential for resource growth over time.

Kinross' 2023 and 2024 exploration program resulted in the addition of significant ounces at improved grades compared with the initial project mineral resource declared at year end 2022, with the bulk of additions in the high-grade underground between 500 metres and 1 kilometre.

This recent drilling, highlighted by the deepest hole drilled on the property to date, which returned 3.8 metres at a grade of 9.5 g/t at nearly 1.6 kilometres vertical depth at the LP zone, demonstrates the impressive continuity of this system. Exploration drilling at Great Bear continues to see success beyond the PEA inventory. Drill holes BR-888 and BR-888C2 are the deepest drill holes on the property to date and have intersected high grade mineralization 1,600 metre vertically below surface.

Furthermore, exploration drilling at both the Discovery and Yauro zones have also intersected mineralization beyond the PEA inventory. Drill hole BR-770C3 intersected 22.7 metres at 6.51 g/t at Yauro and BR-896 intersected 5.4 metres at 7.82 g/t at Discovery. These drill holes demonstrate the successful expansion of mineralization through drilling, not just at depth, but along strike and linking zones.

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[12] Mineral Resources are stated in accordance with CIM (2014) Definitions as incorporated by reference into NI 43-101. Mineral Resources are estimated for the LP zone and satellite Hinge and Limb zones and have an effective date of April 2, 2024.
[13] Mineral resources estimated according to CIM (2014) Definitions.
[14] Mineral resources estimated at a gold price of $1,700 per ounce.
[15] Open pit mineral resources are reported within optimized pit shells at a cut-off grade of 0.55 g/t Au.
[16] Underground mineral resources are reported within underground reporting shapes at cut-off grades of 2.3 g/t Au for the LP zone, 2.5 g/t Au for the Limb zone, and 2.4 g/t for the Hinge zone. An incremental cut-off grade of 1.7 g/t Au was used at the LP zone for areas that do not require additional development.
[17] Mineral resources that are not mineral reserves do not have demonstrated economic viability.
[18] Numbers may not add due to rounding.

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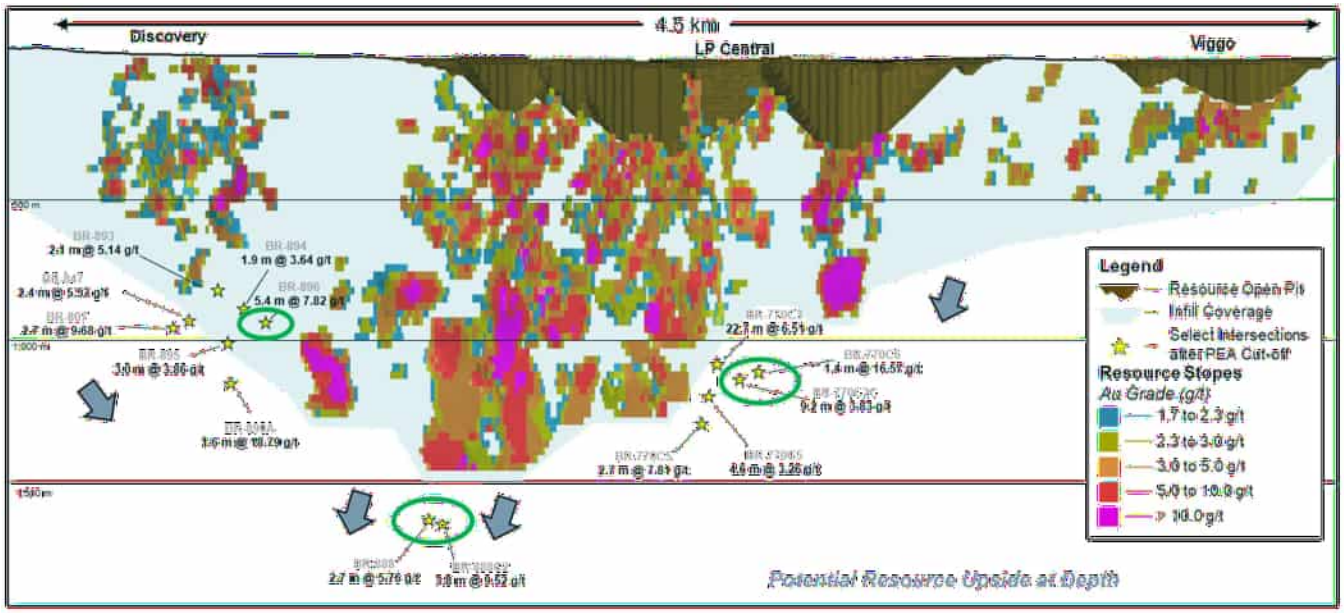
Figure 5: Resource Growth - continuing to see high-grade intercepts outside of the PEA inventory



The PEA represents a point in time estimate and is only a window into the long-term potential of the asset given the indications of continued mineralization at depth. As a result, the Company is focused on progressing the AEX to begin drilling underground to continue unlocking the full potential of the asset.

In 2024, the Company will continue to focus drilling to link zones at depth at LP and further directional work at Hinge and Limb. Exploration will also focus resources on brownfield exploration work on the newly expanded ~120 square kilometre land package to look for additional open pit and underground opportunities.

Great Bear Technical Presentation details

In connection with this news release, Kinross will hold a conference call and audio webcast on Tuesday, September 10, 2024, at 9:00 a.m. EDT, followed by a question-and-answer session. To access the call, please dial:

To access the call:

Webcast Link: https://meetings.lumiconnect.com/400-478-546-594

Canada & US toll-free: 1-866-613-0812
Outside of Canada & US: 647-694-2812

Replay (available 30 days after the call):

Canada & US toll-free: 1 (877) 454-9859
Outside of Canada & US: (647) 483-1416
Passcode: 4887947

You may also access the conference call on a listen-only basis via webcast at our website www.kinross.com. The audio webcast will be archived on www.kinross.com.

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About Kinross Gold Corporation

Kinross is a Canadian-based global senior gold mining company with operations and projects in the United States, Brazil, Mauritania, Chile and Canada. Our focus is on delivering value based on the core principles of responsible mining, operational excellence, disciplined growth, and balance sheet strength. Kinross maintains listings on the Toronto Stock Exchange (symbol: K) and the New York Stock Exchange (symbol: KGC).

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APPENDIX A

Non-GAAP financial measures

The Company has included certain non-GAAP financial measures in this document. These financial measures are not defined under IFRS and should not be considered in isolation. The Company believes that these financial measures, together with financial measures determined in accordance with IFRS, provide investors with an improved ability to evaluate the underlying performance of the Company. The inclusion of these financial measures is meant to provide additional information and should not be used as a substitute for performance measures prepared in accordance with IFRS. These financial measures are not necessarily standard and therefore may not be comparable to other issuers.

All-in sustaining cost

All in sustaining cost is a non-GAAP financial measure calculated based on guidance published by the World Gold Council ("WGC"). The WGC is a market development organization for the gold industry and is an association whose membership comprises leading gold mining companies including Kinross. Although the WGC is not a mining industry regulatory organization, it worked closely with its member companies to develop these metrics. Adoption of the all-in sustaining cost metric is voluntary and not necessarily standard, and therefore, this measure presented by the Company may not be comparable to similar measures presented by other issuers. The Company believes that the all-in sustaining cost measure complements existing measures and ratios reported by Kinross.

All-in sustaining cost includes both operating and capital costs required to sustain gold production on an ongoing basis. Sustaining operating costs represent expenditures expected to be incurred at Great Bear that are considered necessary to maintain production. Sustaining capital represents expected capital expenditures comprising mine development costs, including capitalized waste, and ongoing replacement of mine equipment and other capital facilities, and does not include expected capital expenditures for major growth projects or enhancement capital for significant infrastructure improvements.

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APPENDIX B

Proposed Site Layout

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APPENDIX C

Cautionary statement on forward-looking information

All statements, other than statements of historical fact, contained or incorporated by reference in this news release including, but not limited to, any information as to the future financial or operating performance of Kinross, constitute "forward-looking information" or "forward-looking statements" within the meaning of certain securities laws, including the provisions of the Securities Act (Ontario) and the provisions for "safe harbor" under the United States Private Securities Litigation Reform Act of 1995 and are based on expectations, estimates and projections as of the date of this news release. Forward-looking statements contained in this news release include, without limitation, statements with respect to: the calculation of mineral resources at the project and the possibility of eventual economic extraction of minerals from the project; the identification of future mineral resources at the project; the Company's ability to convert existing mineral resources into categories of mineral resources or mineral reserves of increased geological confidence; the projected yearly gold production profile from both open pit and underground operations, all-in sustaining costs, mill throughput and average grades; future plans for exploration drilling; the projected economics of the project, including total gold sales, margins, taxes, average annual production, the net present value of the project, the internal rate of return on the project, project payback period, average yearly free cash flow, life of mine unit costs, projected mine life, the total initial capital and sustaining capital required; the project design, including the location of the tailings management facility, process plant, infrastructure area, stockpile areas, the anticipated advanced exploration site and the proposed open pit and underground mine plans; the project development timeline to production including the Company's work relating to its Impact Statement and permitting future phases of the project and development and construction of and production at the project, including the possibility of constructing either or both of an open pit and underground mines; the timing of and future prospects for exploration and any expansion of the project, including upside associated with the project's land package and via exploration at depth beneath the proposed underground mine; the potential for expanding the initial mineral resource and the potential for identifying additional mineralization in areas of intercepts and conceptual areas for extension and expansion; potential recovery rates or processing techniques; and the Company's plans to construct an exploration decline. The words "believe", "conceptual", "expect", "future", "plan", "potential", "progress", "prospective", "target", "view" and "upside" or variations of or similar such words and phrases or statements that certain actions, events or results "may", "could", "will" or "would" occur, and similar expressions identify forward-looking statements. Forward-looking statements are necessarily based upon a number of estimates and assumptions that, while considered reasonable by Kinross as of the date of such statements, are inherently subject to significant business, economic and competitive uncertainties and contingencies. The estimates, models and assumptions of Kinross referenced, contained or incorporated by reference in this news release, which may prove to be incorrect, include, but are not limited to, the various assumptions set forth herein and in our Annual Information Form dated March 27, 2024 and our full-year 2023 Management's Discussion and Analysis as well as: (1) there being no significant disruptions affecting the activities of the Company whether due to extreme weather events and other or related natural disasters, labour disruptions, supply disruptions, power disruptions, damage to equipment or otherwise; (2) permitting and development of the project being consistent with the Company's expectations; (3) political and legal developments in Ontario and Canada being consistent with its current expectations; (4) the accuracy of the current mineral resource estimates of the Company (including but not limited to ore tonnage and ore grade estimates); (5) certain price assumptions for gold and silver and foreign exchange rates; (6) Kinross' future relationship with the Wabauskang and Lac Seul First Nations and other Indigenous groups being consistent with the Company's expectations; and (7) inflation and prices for diesel, natural gas, fuel oil, electricity and other key supplies being approximately consistent with anticipated levels. Known and unknown factors could cause actual results to differ materially from those projected in the forward-looking statements. There can be no assurance that forward-looking statements will prove to be accurate, as actual results and future events could differ materially from those anticipated in such statements. Forward-looking statements are provided for the purpose of providing information about management's expectations and plans relating to the future. All of the forward-looking statements made in this news release are qualified by these cautionary statements and those made in our other filings with the securities regulators of Canada and the United States including, but not limited to, the cautionary statements made in the "Risk Factors" section of our Annual Information Form dated March 27, 2024, and the "Risk Analysis" section of our full year 2023 Management's Discussion & Analysis. These factors are not intended to represent a complete list of the factors that could affect Kinross. Kinross disclaims any intention or obligation to update or revise any forward-looking statements or to explain any material difference between subsequent actual events and such forward looking statements, except to the extent required by applicable law.

Certain forward-looking statements in this press release may also constitute a "financial outlook" within the meaning of applicable securities laws. A financial outlook involves statements about the Company's prospective financial performance, financial position or cash flows and is based on and subject to the assumptions about future economic conditions and courses of action and the risk factors described above in respect of forward-looking information generally, as well as any other specific assumptions and risk factors in relation to such financial outlook noted in this press release. Such assumptions are based on management's assessment of the relevant information currently available, and any financial outlook included in this press release is provided for the purpose of helping viewers understand the Company's current expectations and plans for the future. Viewers are cautioned that reliance on any financial outlook may not be appropriate for other purposes or in other circumstances and that the risk factors described above, or other factors may cause actual results to differ materially from any financial outlook. The actual results of the Company's operations will likely vary from the amounts set forth in any financial outlook and such variances may be material.

Other information

Where we say "we", "us", "our", the "Company", or "Kinross" in this news release, we mean Kinross Gold Corporation and/or one or more or all of its subsidiaries, as may be applicable.
The technical information about the Company's mineral properties contained in this news release has been prepared under the supervision of Mr. Nicos Pfeiffer who is a "qualified person" within the meaning of National Instrument 43-101.

Source: Kinross Gold Corporation

MINESITE DRAINAGE ASSESSMENT GROUP

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CANADA

BY EMAIL

January 31, 2025
FILE: 5025.01

Grassy Narrows First Nation
c/o Cavalluzzo
474 Bathurst Street, Suite 300,
Toronto, Ontario M5T 2S6
Attn: Grassy Narrows Lands Protection Team

Dear Grassy Narrows Lands Protection Team,

RE: Great Bear Mining Project - Preliminary Technical Review of the Mercury Study Plan dated December 2024

Introduction

Thank you for forwarding the Great Bear Project Mercury Study Plan by WSP Canada Inc., dated December 2024. This Study Plan is a response to the Tailored Impact Statement Guidelines (TISG) from the Impact Assessment Agency of Canada. The TISG requires a detailed investigation of mercury and methylmercury. This investigation includes interactions with sulphate some of which will be generated by proposed future mine wastes at the Great Bear Project at all relevant pH levels.

Grassy Narrows First Nation already has expertise on mercury and methylmercury. Therefore, my technical review here focuses on the portions of Section 3.4 (Methods for Forecasting Future Conditions) involving modelling within my areas of expertise. Section 3.4 begins:

> "The following sections outline the key data inputs and modeling approaches proposed to predict future conditions and potential changes from baseline levels, resulting from the Project's potential contributions to methylmercury production. Sulphate, mercury, and methylmercury concentrations in both mine site drainage and the receiving environment will be influenced by factors such as the geochemistry of ore and mine rock, the quantities and management of stockpiled materials, and the characteristics of the receiving waters."

The proposed models in Section 3.4 involve geochemistry including Metal Leaching and Acid Rock Drainage (ML-ARD or geochemical source terms), groundwater flow, and water quality as discussed in the following subsections of the Mercury Study Plan.

3.4.1 Geochemical Characterization
3.4.2 Groundwater Modelling
3.4.3 Mercury and Methylmercury Water Quality Modelling

As explained below, the proposed methods and models in these subsections of Section 3.4 are incorrect, misleading, and/or unacceptably ambiguous for assessing and predicting mercury and

sulphate on, beneath, and around the Great Bear Project. I expect the general effect of the proposed methods and models for the Mercury Study Plan will be to underestimate the leaching and transport of mercury, sulphate, and other metals and elements at the Great Bear Project.

Geochemical Characterization

Subsection 3.4.1 explains the methods that will be used to predict the aqueous concentrations and solid-phase levels for dozens of potential contaminants at the Great Bear Project, including sulphate, ML-ARD, and water quality at near-neutral pH.

This Study Plan states,

> "The sampling approach and testing methods for the geochemical investigations comply with ... guidance found within the Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND, 2009), which represents best practice and industry standard approaches and methodologies for ML/ARD sampling and characterization in Canada."

Kinross committed to the same approach and testing for Advanced Exploration at the Great Bear Project years ago, but fails to follow guidance in this federal Prediction Manual of best practice and industry standards[1]. Where Kinross did follow some guidance and detected potential for significant water-quality degradation and ML-ARD, Kinross decided this serious potential was not relevant to its Great Bear site. Where Kinross admitted to not following the guidance and using a non-recommended procedure that was cheaper, Kinross' rationale was that the non-recommended procedure was mentioned in the federal Prediction Manual as not recommended and thus Kinross was indeed following the federal Prediction Manual.

Kinross has committed to conducting many of the tests for geochemical characterization in this Subsection 3.4.1 as it did for Advanced Exploration at the Great Bear Project. However, as of early 2025, Kinross has not released most of the results for any geochemical testing.

Section 3.4.1 continues Kinross usage of the wrong analytical methods as it did for Advanced Exploration[1]. For example, Section 3.4.1 lists:

> "Solid phase elemental content analysis by aqua regia digestion and inductively coupled plasma-mass spectrometry scan"

However, Kinross fails to explain to non-technical readers that this will underestimate the amount of mercury in Great Bear mined materials including the walls of underground workings and pits, waste rock, overburden, soil, and tailings.

[1] MDAG. 2024. Review of Kinross Gold Responses to Grassy Narrows First Nation Concerns for Advanced Exploration, Concerning Metal Leaching, Acid Rock Drainage (ML-ARD), On-Site Contamination of Water, Fugitive Dust, and Hydrogeology in the ECA, PTTW, and Closure Plan Responses. Report for Grassy Narrows Lands Protection Team, dated September 5, 2024. 48 p.

This is because "aqua regia digestion" dissolves and analyzes only part of the mercury and many other elements in Great Bear mine materials, leaving behind an undetected and unknown amount of additional mercury and other elements. This is not appropriate under conditions and pathways such as fugitive dust to the environment, local-scale acidic conditions, animal inhalation, and comparisons to crustal abundances, which require "total digestion" of all mercury in a sample rather than only part of the mercury from partial "aqua regia digestion". Thus, based on the listing of methods in Section 3.4.1 for mercury, sulphate, and other elements, it is easy to overlook or miss the facts that these proposed methods are not appropriate, reliable, and safe for the Mercury Study.

Therefore, Grassy Narrows First Nation should understand that this Mercury Study Plan contains a program for Geochemical Characterization that matches that for Advanced Exploration, but Kinross has not been able to fulfill this program for Exploration to date after about two years of trying. Also, this geochemical characterization will use invalid and/or ambiguous methods that will underestimate the severity of mercury and sulphate issues at the Great Bear Project. As a result, I expect that Kinross will underestimate the important geochemical input that is critical for a reliable outcome from the proposed Mercury Study. If Kinross corrects the geochemical methods in the Mercury Study Plan to those appropriate to the Great Bear Project, then Advanced Exploration should be stopped because it is already based on invalid and/or ambiguous methods.

Groundwater Modelling

In Subsection 3.4.2, the Mercury Study Plan contains a description of the groundwater modelling that will be used to predict the flow of groundwater and likely the additional mercury loadings to the water-quality model discussed below. Similar to the Geochemical Characterization above, the procedure proposed for groundwater modelling is about the same as used for Advanced Exploration that is seriously flawed[1].

There are many errors in Kinross' modelling of groundwater flow at the Great Bear Project. Many reflect technical details that require relatively long explanations[1]. For example, groundwater modelling at the Great Bear Project apparently shows a high mound of free-standing groundwater above the land surface near Dixie Creek. This artificial and obviously wrongly modelling incorrectly restricts groundwater with mercury, sulphate, and other elements from travelling off the Great Bear site and into the surrounding environment around Dixie Creek.

Perhaps the easiest error to understand with Kinross' groundwater modelling, for both Advanced Exploration and the Mercury Study Plan, is the difference between "transient" and "steady state" groundwater modelling. Similar to surface water and many other environmental processes like temperature and rainfall, subsurface groundwater flow can shift and change daily, seasonally, yearly, over decades, and even longer due to climate change. Thus, the earth's environment is inherently "transient" through time, which can be important for defining flows and loadings of mercury, sulphate, and other elements.

Kinross does not model groundwater at the Great Bear Project using naturally transient conditions. Instead, Kinross only models groundwater at Great Bear with "steady state" conditions, where groundwater flows and loadings are constant all the time, every day, every season, every year, every decade, etc. For Advanced Exploration, at what point in the future was groundwater modelled? No one can say, but the obvious assumption is that it represents conditions a long time into the future. No one can say because Kinross continues to refuse transient modelling.

Groundwater modellers for Great Bear have stated that transient modelling is not needed despite having no transient data, no transient measurements, and no transient modelling[1]. I suspect that Kinross is strongly opposing transient groundwater modelling because it requires additional site measurements and parameters apparently not measured at the Great Bear Project.

Transient groundwater modelling at the Great Bear Project is seriously needed to understand better the impacts and effects on (1) groundwater inflows around the mine and (2) groundwater movement throughout all hydrogeologic layers and surrounding environment, as time passes. Kinross has pointed out that the effects of drought and climate change cannot be estimated, which is because only steady-state modelling was conducted.

Because steady-state modelling of some distant future but unknown time was modelled for Advanced Exploration, this is obviously the modelling that would also apply to proposed mining in the Mercury Study Plan. However, the steady-state modelling for Advanced Exploration was likely wrong but Kinross has not released the additional information from its steady-state model to confirm this.

During proposed exploration and later mining, groundwater will be drawn from all depths into the underground mine at least 500 meters (0.5 km) deep vertically. However, Kinross will release only the drawdown map for the uppermost 36 m of overburden, and not the remaining ~500 m vertical thickness of rock. This incorrectly implies (1) drawdown happens instantaneously for long lateral distances throughout the Great Bear site and (2) transient conditions are minor because they will only be up to 36m vertically.

In situations where groundwater levels will fluctuate more than 500 meters vertically, non-steady "transient" modelling is certainly needed. In fact, groundwater levels, forced by Kinross pumping, varying by roughly 500 m vertically (varying by roughly 0.5 kilometers below the land surface) at the Great Bear Project is one of the best examples of where transient groundwater modelling is critical for reliable and realistic flow directions and associated loadings of mercury, sulphate, and other elements. The proposed open pits at Great Bear will also lead to significant transient groundwater flows and geochemical loadings like mercury and sulphate closer to the land surface but are ignored by Kinross.

Additionally, Kinross misleads by indicating shallow contaminated groundwater will not escape to the environment but would be drawn into the pumped-down underground mine[1]. This is false at early times and only becomes reasonable after unknown longer times as steady-state conditions are approached. The lack of transient modelling prevents anyone from proving how long it will take to

reach steady-state conditions and prevent contaminated groundwater from escaping.

Based on this error alone of steady-state groundwater modelling, Section 3.4.2 of the Mercury Study Plan is remarkable in that it simply states,

> "These numerical groundwater flow models [of FEFLOW 7.2] consider three dimensional steady-state flow conditions and implement an equivalent porous media approach which is deemed sufficient for characterizing the overall groundwater flow regime at the scale of this analysis."

This is wrong, because FEFLOW 7.2 can also simulate transient conditions. Kinross is misleading readers here by not revealing the full capability of this groundwater model including transient modelling needed for the Mercury Study and for general impacts of the Project. In any case, it is clear that steady-state, always-the-same-and-not-varying groundwater modelling, for conditions at some distant but unknown time, will be used to unreliably simulate the critical groundwater pathways and loadings for mercury and sulphate at the Great Bear Project.

Furthermore, the second part of the quotation above on "equivalent porous media" deceptively hides another important flaw. Groundwater moving through irregular and scattered cracks (fractures) in Great Bear rock will be instead incorrectly modelled as smoothed layers like sand and gravel. Kinross has cryptically "deemed sufficient" this unrealistic modelling based on no data and no evidence that groundwater flow through fractured rock at Great Bear is like groundwater flow through sand, gravel, silt, etc. Without proof otherwise, the porous-media modelling planned for the Mercury Study is not "sufficient" and is plain wrong and misleading.

Therefore, Grassy Narrows First Nation should understand that this Mercury Study Plan contains a program for Groundwater Modelling that matches that for Advanced Exploration. The current groundwater modelling is unreliable and likely wrong in light of many incorrect and unjustified assumptions made by Kinross. The Mercury Study Plan shows these errors will be continued, including the false assumption that groundwater flow will be steady state during mining, being the same every day, every season, every year, every decade, etc. As a result, I expect that Kinross will underestimate the important groundwater flow leaving its Great Bear site. Along with problems with the proposed Geochemical Characterization discussed above, this will underestimate the loadings of mercury, sulphate, and other elements leaving the Great Bear site. This will preclude a reliable outcome from the proposed Mercury Study. If Kinross corrects the proposed groundwater modelling in the Mercury Study Plan, then Advanced Exploration should be stopped because it is already based on the misleading and wrong modelling.

Water-Quality Modelling

Section 3.4.3 on water-quality modelling explains that the model called GoldSim will be used for water-flow and water-quality modelling at the Great Bear Project. Here are some statements from Section 3.4.3 about the GoldSim model.

- GoldSim will "stimulate [sic] the volume and flow of water, and the concentrations and transport of chemical species, over the life of the Project".

- "The GoldSim model domain includes waterbodies potentially impacted by the Project within the PA, LSA and RSA."

It is not clear from these statements that GoldSim is not like models such as groundwater (see above) that simulate the movement and chemistry of waters (1) across a site-wide grid of mathematical elements or (2) along a grid of mathematical elements along lake or a creek like Dixie Creek where groundwater can alternately enter and exit the surface waterbodies over short distances.

Instead, GoldSim uses user-defined "compartments" or "conceptual boxes" such as one for the western portion of Dixie Creek near the Great Bear site and another for the eastern portion near the site. The human modellers then conceptually connect these two boxes and any other selected boxes in the GoldSim model to create "nodes". Then the modellers choose the inputs, outputs, and internal conditions and processes that they think apply to each box and node. This should include variable and transient conditions that exist at the Great Bear site over days, seasons, years, and decades, but we already know from the proposed groundwater modelling that transient conditions for at least one important pathway for mercury and sulphate will be ignored and thus will not reliable (see above).

Now it is clearer what Kinross means by saying,

> "Sulphate, mercury and methylmercury predictions will be generated for waterbodies represented by model nodes shown in Figure 3-2."

Thus, predictions for mercury and sulphate will be generated only at "nodes" that do not literally simulate waterbodies in their environmental complexity, but simply represent the "boxes" and "nodes" and internal conditions that Kinross chooses to assume, estimate, and simulate.

Figure 3-2 in the Mercury Study Plan shows that the Chukuni River will be modelled only at two nodes: CHK-1 immediately above the property boundary and CHK-2 immediately below the boundary. Therefore, everything above the property boundary in the Chukuni River will be simulated as a single "node" or "box" for which the modellers will define all the upstream physical, geochemical, and water-quality properties, likely with many simplifications and/or assumptions. Then the physical and chemical contributions from Dixie Creek Node DIX-5 will be "mixed" with Node CHK-1 to obtain predicted flows and concentrations at Node CHK-2, subject to currently unstated simplifications and/or assumptions possibly like adsorption on river-bed sediments or biological processes to remove additional mercury and sulphate from the water at CHK-2. Because of this "node" approach, important details like an initial dilution zone (a mixing zone) in the Chukuni River between Nodes CHK-1 and CHK-2 cannot be simulated in sufficient detail. This gives you some idea how the GoldSim model will "simulate" water flow and water quality at, beneath, and around the Great Bear site.

The GoldSim model for the Great Bear Project can be easily manipulated by the modellers but this is hidden from external inspection by Grassy Narrows First Nation. For example, the modellers can apply a condition where aqueous concentrations of mercury, sulphate, and other elements are allowed to decrease but are not allowed to increase as water "flows" through the boxes and nodes. Section 3.4.3 promises to "[p]rovide a clear description and rationale for model input parameters and assumptions". This is appropriate and important but in my experience I have never seen this

provided in sufficient detail for any GoldSim model.

Therefore, to understand how the GoldSim water-quality model for the Great Bear Project has been designed and manipulated through all of its boxes and nodes, and thus whether its results and predictions are reasonable, a relatively large amount of information on the GoldSim model will be needed from Kinross. I have not seen this provided in detail before, but it will be required for the Great Bear Mercury Study.

Conclusion

As explained above, the proposed methods and models in the subsections of Section 3.4 of the Mercury Study Plan are incorrect, misleading, and/or unacceptably ambiguous for assessing and predicting mercury and sulphate on, beneath, and around the Great Bear Project. I expect the general effect of the proposed methods and models for the Mercury Study Plan will be to underestimate the leaching and transport of mercury, sulphate, and other metals and elements at the Great Bear Project.

Sincerely,

Kevin A. Morin, Ph.D., P.Geo., L.Hydrogeo.
President

January 27, 2025

To: J. Esmonde, Cavalluzzo LLP
From: Dr. Brian Branfireun, London, Ontario.

Re: Preliminary review of the Great Bear Project Mercury Plan, December 2024

1 Introduction

I have been asked to provide a preliminary review the Great Bear Project Mercury Study Plan (WSP, December 2024), and provide an Expert Opinion concerning the adequacy of the plan to protect receiving waters and biota from the direct and indirect effects of the proposed project. As there is little new information provided in this document, a substantial amount of this memo is derived from prior opinions and memos of mine that have reviewed other submissions from the Proponent. These are listed in materials referred.

2 Qualifications

I received my PhD in Geography from McGill University, Montreal, Canada in 1999 with a specialization in hydrology, mercury biogeochemistry, and wetland science. I was subsequently employed as a Professor at the University of Toronto Mississauga campus in Mississauga Ontario, Canada for 10 years, establishing an internationally recognized research program on hydrology and mercury in the environment. In 2010, I was recruited by the University of Western Ontario to the position of Professor and Canada Research Chair in Environment and Sustainability. I am considered an internationally recognized expert in the field of watershed biogeochemistry and the environmental cycling of mercury.

I have authored or co-authored over 100 peer-reviewed scientific papers and book chapters, and have made, or contributed to significant discoveries concerning the role of wetlands on the production and export of methylmercury (e.g. Branfireun et al., 1996; 1998; 1999; 2001; 2005; McCarter et al., 2017). I have been involved in high-impact state-of-the-science publications that have provided significant direction to the mercury research community (Harris et al., 2007; Munthe et al., 2007; Branfireun et al., 2020; Blanchfield et al., 2021). In addition to environmental biogeochemistry, research in my group has broadened to include the impacts of mercury on biota, including migratory birds (e.g. Ma et al., 2018a,b).

3 Summary of Opinions Concerning the Great Bear Project Mercury Study Plan

The Great Bear Project Mercury Study Plan provides a more comprehensive background discussion (Section 1.2) of mercury biogeochemistry than any previous document that I have reviewed from the project Proponent. In Prior submissions, the direct and indirect effects on mercury biogeochemistry of the proposed project have been dismissed, downplayed or ignored, so an increased acknowledgment of the link between sulphate loading from the proposed project from the Proponent is welcome. The presentation of the basics of mercury biogeochemistry is significantly more scientifically correct than the erroneous and misleading prior submissions from the Proponent indicating to me that there is effort being invested to coming up to speed about the current state-of-the-science mercury methylation, which I consider to be a central issue related to the proposed project. Indeed the Proponent acquiesces to the indisputable link between sulphate and mercury methylation, in contrast with the attempts to sew doubt found in prior submissions (Kinross Response to ANA Memo concerning

Great Bear Project AEX ECA Application, August 1, 2024), and goes so far as to acknowledge that arguments to apply site specific knowledge to setting mercury thresholds are valid. Despite this effort, there has surprisingly been no change in the interpretation of baseline data nor the proposed plan for effects monitoring for mercury or methylmercury – I find the same errors in a more attractive wrapper. The facts related to the inadequacy of the background data, sampling frequency, analytical methods, and misrepresentation of the receiving water body receiving effluent (Chukuni River) remain in this document, and evidence-based corrections in prior submissions by ANA have not been acknowledged or addressed, although many are now hidden by vague and over-generalized language. The only salient new information in the Mercury Study Plan is the Proponent's suggested application of a model (GoldSim) to predict changes in mercury and methylmercury as a result of the project. This model is a wholly inappropriate framework for this purpose and cannot provide the information that the Proponent suggests. As such, none of what is presented in this plan addresses the TISG requirement:

"Of particular note, the potential for project contributions to methylmercury production in downstream watersheds requires a detailed and robust analysis. The proponent must submit a study plan to the Agency with sufficient time to facilitate a review by experts and interested parties and to inform the studies undertaken. This includes establishing baseline methodology and effects assessment methodology related to methylmercury as outlined in section 8.6 Groundwater and Surface Water and 8.8 Fish and Fish Habitat."

This requirement is not met because none of the inadequacies of background data or future monitoring that have been previously identified have been addressed let alone acknowledged, and important information from prior documents was omitted which would permit a complete review by experts and interested parties who do not have full knowledge of what has been proposed in prior submissions from the Proponent. As many of these issues have been addressed in prior submissions from ANA, my opinions regarding the Great Bear Project Mercury Study Plan are reiterations of prior concerns with the exception of the discussion of the inappropriateness of GoldSim, which was informed by written and oral testimony that I presented for another case (and was supported by the US Environmental Protection Agency and Army Corps of Engineers).

It is my opinion that:

1) The selective reliance on achieving on and off site water quality that complies with water quality guidelines (CCME) inadequate and inappropriate when considering mercury and methylmercury in water, and methylmercury uptake by biota.

2) The background data collected as part of the baseline studies for this project are largely erroneous or their interpretation is flawed, rendering them neither comprehensive nor sufficient to detect whether the project will have measurable impacts on fish mercury levels in the future.

3) The assimilative capacity of the receiving waters (Chukuni River) as a mitigation strategy for excess sulphate loading is not supported by available data. As this is the only measure that has been proposed to address the indirect downstream effect of sulphate-related methylmercury production, there is no evidence that other adverse downstream effects can be avoided.

4) The model that the Proponent indicates will be used to predict changes in mercury and methylmercury concentrations in downstream watersheds and assess the potential impact on mercury levels in fish (including assessment bioaccumulation / bio-magnification pathways) can technically deliver none of these outcomes.

4 Opinion 1: The selective reliance on achieving on and off site water quality that complies with water quality guidelines (CCME) in inadequate and inappropriate when considering mercury and methylmercury in water, and methylmercury uptake by biota.

Section 2.2.1 of the Great Bear Project Mercury Plan States the following:

> Existing baseline mercury and methylmercury concentrations in surface water and groundwater are compared against applicable guidelines for the protection of aquatic life as well as health-based drinking water quality guidelines, including the:
>
> −CCME guideline for total mercury for the protection of aquatic life (26 ng/L)
> −CCME guideline for methylmercury for the protection of aquatic life **(0.04 ng/L (sic)**
> −Canadian drinking water quality for mercury (1,000 ng/L)
> −United States Environmental Protection Agency (US EPA 1997) criterion of 0.05 ng/L for filtered methylmercury in water for the protection of fish-eating wildlife species

Disregarding the fact that the authors of the report surprisingly misstate the CCME guideline for methylmercury (it is 4 ng/L not 0.04, although 0.04 would be more scientifically justifiable), the statement that the data from the proposed project will be "compared against" any criteria is meaningless, because one may compare an apple to an orange; no intent, threshold, nor trigger value is indicated or even implied by this language. Despite quoting the more reasonable US EPA criterion of 0.05 ng/L methylmercury for the protection of fish-eating wildlife, prior documents submitted for this project indicate clearly that the Proponent intends (and has been approved by the Ontario MECP) to apply the CCME guideline the project from a compliance standpoint, so the reader should presume that the CCME values are the regulatory thresholds being applied by this Mercury Plan, rather than merely comparisons. As I have stated in prior opinions, there is no other way to characterize the CCME guideline values for mercury and methylmercury as anything but useless for the protection of fish consumers, and even if discharges or indirect effects were a fraction of these guideline limits there would be significant potential for downstream impairments of aquatic resources. For example, the CCME Criterion for (Total) mercury is 26 ng/L, which is a value (developed from a 1991 protocol) for the **direct** protection of aquatic life. Despite being profoundly outdated, the CCME document provides valuable commentary that is all too frequently ignored when setting regulatory criteria based on this single value, including "*The protocol **does not** address exposure through **food or bioaccumulation** to higher trophic levels*", and "*if the ultimate management objective for mercury is to protect high trophic level aquatic life and/or those wildlife that prey on aquatic life, **more stringent site-specific application** of these water quality guidelines may be necessary*" (CCME, 2003, p.2; **emphasis mine**).

Although the Province of Ontario is silent on the issue of any other water quality guidelines for mercury, other jurisdictions have been more engaged with revising their mercury and

methylmercury based on best available science at the time. British Columbia explicitly acknowledges the limitations of the CCMEs guidelines, stating "It should be noted that the CCME (2000) in developing guidelines for fresh and marine waters did not consider bioaccumulation effects per se, but based their guidelines on **chronic toxicity**. They caution that the guidelines that they have developed 'may not protect wildlife that consume aquatic life'." (British Columbia Ministry of Environment and Lands, 2001; emphasis mine). We may reasonably extend the statement about consumers of aquatic life to humans. Despite the document being nearly as old as the original CCME guidance, BC takes the interesting approach of defining the water quality guideline to protect wildlife for total mercury by scaling it as a function of the percentage of total mercury that is methylmercury, acknowledging that methylmercury is the only form of mercury that bioaccumulates and biomagnifies in wildlife. Their Table 5 indicates that only in environments where methylmercury is largely not being formed would the CCME guideline of 26 ng/L for total mercury be remotely reasonable for fish consumers to be protected. In environments where methylmercury makes up an increasing fraction of total mercury, the allowable amount of total mercury decreases proportionally with the %methylmercury in the system. At 8% of total mercury as methylmercury, the guideline for total mercury is 1.25 ng/L. Even at 8% methylmercury the BC guideline total mercury value is below the detection limit of the technique that the Proponent declares adequate for the purposes of monitoring (DL of ~ 5 ng/L). The Proponent states in this document (as I provided to them in prior submissions) that that % methylmercury in surface waters of the proposed project can exceed 14% (using their own sparse data), translating to a guideline concentration of a mere 0.72 ng/L for the protection of wildlife consuming aquatic life. Despite the BC document being nearly 25 years old, the rationale for their mercury criteria is logical, and recognize the fact that even low levels of mercury in the environment can bioaccumulate and biomagnify to hazardous levels for fish consumers if the landscape has high methylmercury production potential. It is clear that current conditions in surface waters in the project area already exceed this criteria, meaning that **any** cumulative effect would be in exceedance of BC criteria for mercury in freshwater.

I find it impossible to accept any generalized guideline for mercury or methylmercury in aquatic environments, and instead advise site specific assessment for appropriate threshold levels (which the CCME also explicitly does in their 2003 document, but never seems to be considered). An acceptance of this project mercury plan adhering to the CCME guidance for mercury and methylmercury threshold concentrations for direct and indirect effects is effectively a license to impair downstream resources given the low concentrations of mercury identified by the Proponent through limited baseline sampling. Site specific criterion for mercury and methylmercury must be required here, and derived from **appropriate** baseline data – scant little of which currently exist (see Opinion 2).

5 Opinion 2: The background data collected as part of the baseline studies for this project are largely erroneous or their interpretation is flawed, rendering them neither comprehensive nor sufficient to detect whether the project will have measurable impacts on fish mercury levels in the future.

In the context of the protection of fish consumers, nearly all of the background data for total mercury are useless and stated incorrectly. All of the "data" that are reported in Table 2.10 of "Attachment 4 - Surface and Groundwater Technical Supporting Document" (March 2024) for total mercury are not data at all, but the reporting detection limits of the contract laboratory.

The background mercury data in water (with the exception of the handful of appropriate trace mercury and methylmercury analyses that were conducted by Flett Research) **is incorrect**. The data provided for mercury **are not data** – they are detection limits of the inappropriate technique used to do element scans by inductively coupled plasma – mass spectrometry (ICP-MS). ICP-MS in a standard configuration cannot generate data for mercury with appropriate detection limits (despite the Proponent's assertion to the contrary in the Mercury Plan). Moreover, the Proponent treats these detection limit placeholders as data – **these are not data.** If the contract laboratory reported these values as data, then they are not operating in compliance with ISO 17025 protocols. If the Proponent substituted detection limits for samples reported to be below the detection limit by the contract lab, then this is not correct procedure and should be stated as such. In both cases, a serious lack of oversight and understanding of analytical results is clear as **these are not data**. There is also insufficient data for methylmercury in surface water as this critical parameter was only measured sparsely as part of the baseline monitoring program. As a result, there is virtually no background data for mercury in surface waters for the project area, nor is there sufficient monitoring in the proposed plan because the appropriate trace mercury and methylmercury monitoring is only proposed at select locations and at a frequency that is insufficient to detect change over time, and with highly inappropriate threshold levels that are orders of magnitude above the levels at which adverse effects will occur.

Further investigation into the baseline monitoring data provided in Attachment 4 of the AEX-ECA application which contains all of the background data cited by the Proponent in the Mercury Plan also reveals that the **concentrations reported for sulphate were also erroneous** up until May of 2023 when the Proponent either changed analytical methods or laboratories, or incorrect instrument operation was corrected. From 2021-06-03 to 2023-03-30, we find data that are reported with no precision (i.e. no decimal place) and spuriously range from values of 1 to 11. I know of no analytical technique that would report concentrations like this (we see similarly erroneous data for parameters such as Chloride, TSS, TDS). The clearest evidence to me that this data is no better than random is the value of 7 mg/l on 2022-12-15, followed by a value of 1 mg/L four days later on 2022-12-19. Given that there was no appreciable change in river flow over this time, **these data are erroneous and cannot be used**. There is similar randomness in other parameters. The fact that the average concentrations that are reported directly in the Appendix are substantially different for the three stations on the Chukuni River should have been the first indication that there was a data quality problem.

Notably, the data quality changes substantially in May 2023, with two decimal place precision and a much more realistic range of concentrations (4.18 – 6.30 mg/L). Other parameters also show this step change in data quality. There was obviously a change in technique or in the contract laboratory being used that was not documented, which is contrary to best practices at the very least.

Other variables reported are also suspect up until this date as many of the physical parameters (e.g. TDS, TSS) and nutrient data ($N0_2$), contain inexplicable values, change in quality, or are dropped completely (e.g. NO_3-$N0_4$-T). The failure to note and censor these erroneous data is inexplicable – to use them to calculate descriptive statistics is inexcusable. For these variables (including sulphate) there are only 8-9 usable data points for all of the stations reported (including the Chukuni River).

The Mercury Plan makes reference to comprehensive background data about mercury and sulphate that will inform modelling efforts and trigger undefined actions should they change. One cannot numerically model concentrations of "below the detection limit". The reality is that the background data is neither "comprehensive" nor "sufficient" by any reasonable definition, and the approval of a Mercury Plan such as this is license to both proceed blind with respect to the site specific mercury conditions, as well as condone the continued use of an inappropriate analytical approach (despite the Proponent's statement to the contrary) that will reliably generate non-data that cannot capture trends in mercury concentrations across most of the sampling sites in the project area.

6 **Opinion 3: The assimilative capacity of the receiving waters (Chukuni River) as a mitigation strategy for excess sulphate loading is not supported by available data. As this is the only measure that has been proposed to address the indirect downstream effect of sulphate-related methylmercury production, there is no evidence that other adverse downstream effects can be avoided.**

Similar to the comparison to various mercury guidelines discussed above, the Proponent outlines in the Mercury Plan a range of sulphate mitigation measures that are being "considered" to address the issue of sulphate loading to sites of mercury methylation (Section 3.3). The primary mitigation measure outlined is to not discharge sulphate directly into sites with high methylation potential (e.g. wetlands). I am not sure that this constitutes a mitigation measure because of the obvious environmental consequence of doing so. Other measures being "considered" include various tailings management strategies and management of sulphate-bearing runoff. In the middle of the list is the **only** option that has been discussed and justified by the Proponent in all prior submissions:

"Discharging treated effluent to a large receiving watercourse (Chukuni River) that has a high oxygenation level and high assimilative capacity."

This 'mitigation strategy' has been commented on by myself and other experts in prior submissions, however this single sentence contains so much misleading information that it is worth breaking down here, making reference to the much more detailed discussion found in prior expert submissions.

1) **Treated effluent:** Indeed the Proponent has outlined strategies for treating effluent to be discharged to the Chukuni River, however none of the treatment technologies proposed target sulphate at all. Sulphate production from overburden and waste rock could be substantially greater than the Proponent states. Given that groundwater contributes nearly 80% of the total water outflows, 25% of groundwater samples (75^{th} percentile) from many locations in the project area had sulphate concentrations well in excess of 10 mg/L (Appendix B, Table 3 AEX-ECA Application), and the water treatment technology outlined by the Proponent has no capacity to remove sulphate, it would seem that the Proponent's 'expected' case of 10 mg/L sulphate is not just unlikely, but nearly impossible to achieve without even considering the potential for additional sulphate sources due to operations. Indeed without any additional treatment the Proponents 'extreme' case is likely a gross underestimate. With only gypsum saturation ultimately controlling sulphate solubility, sulphate concentrations in the range of 1000-1500 mg/L may be expected and are in fact, typical of many mine sites with oxidizing sulphide minerals like pyrite.

2) **Large watercourse:** This is of course a relative statement however a 20-year median annual discharge of 26.5 m^3/s is objectively a substantial flow. However as I have outlined in prior memos (Branfireun Review of Kinross Response to ANA Memo concerning Great Bear Project AEX ECA Application, August 1, 2024; October 7, 2024), median or mean statistics do not tell the whole story about assimilative capacity, despite the Proponent utilizing the simple numerical average of the entire daily discharge record (which upward biases the value) for all of their dilution scenarios presented in prior submissions to justify assimilative capacity. In the context of dilution of an environmentally relevant chemical, it is more relevant and protective to explore the lower ranges of flow, since it is at these levels that the river has less assimilative capacity and adverse effects are more likely. The 20-year average 25th percentile value is 14.2 m^3/s, meaning that for a full quarter of the year (which would include the relevant summer low flows when biogeochemical activity including methylation would be the highest), flows in the river are equal to or less than this value. The 20-year average minimum flows are only 5.7 m^3/s; more than 5 times lower than the discharge value that the Proponent used to calculate dilution. I argue that this is a more appropriate 'extreme' case discharge value to use, however it is notable that **the record contains a period of zero flow conditions in 2011 – a condition under which effluent discharge would make up 100% of river flow and would be completely undiluted (i.e. the river has zero assimilative capacity)**. 2023 was among the lowest flow years in the last 20, and the central tendency of the river discharge over that period is toward lower, and less variable flow. If the 2023 flow statistics (median, 25th percentile, and minimum flows of 13.5, 6.6 and 3.1 m^3/s are reflective of future drier conditions driven by climate change, then the use of a single value of average flow that is 10x greater than this low flow condition to calculate effluent dilution and demonstrate assimilative capacity is clearly not protective by any definition.

3) **High oxygenation level:** The Proponent has frequently made the argument that oxygenated waters in the receiving reach of the Chukuni River preclude negative effects of sulphate addition because sulphate reduction would not occur. This statement is misleading, as I could visit the most methylmercury contaminated lake in Ontario (Clay Lake) in August, measure surface water oxygen levels and declare it oxygenated. This would be ignoring the anoxic bottom waters and sediments where very high levels of methylmercury are formed. Of course, rivers do not stratify but it is well documented that they can have anaerobic sediments, biofilms and hyporheic zones where sulphate reduction and methylation can occur (despite having a well-mixed water column above). The biogeochemical status of the immediate receiving river reach is actually not the biggest issue here, it is the methylation potential of downstream waters where this well-oxygenated river will deliver sulphate that may be many times in excess of background levels.

Pakwash Lake is the first lake downstream of the proposed effluent discharge, and already has **five** fish species that have restricted consumption advisories due to mercury contamination (https://www.ontario.ca/page/fish-consumption-report?id=50459330) indicating that any further loading of methylmercury, or enhancement of the methylating process either in the lake or upstream would amplify an existing environmental degradation.

Whether the fish species with tissue mercury exceedances in Pakwash Lake immediately downstream of the proposed operation derive their methylmercury from Chukuni riverbank wetlands, river littoral sediments, biofilms or periphyton, anoxic profundal lake sediments, or anoxic hypolimnetic waters during stratification is actually irrelevant – methylmercury is produced in the aquatic environment because it is found in fish in downstream receiving waters

and it is dependent on the activity of sulphate-reducing bacteria, which are dependent on available sulphate. To have that many species with mercury consumption advisories confirms that this is a mercury sensitive environment with high mercury methylation potential.

4) **High assimilative capacity:** The argument was been made that additional sulphate might not enhance methylation in the receiving reach because it is oxygenated, but the Proponent has further argued that the proposed operation will not measurably increase sulphate in the Chukuni River and downstream receiving waters because of the dilution of the operation's effluent by the large flows of the Chakuni River (where dilution is used synonymously with assimilative capacity). All of the above points outline how the Proponent has arrived at the conclusion of high assimilative capacity through the application of erroneous/incorrect data, inappropriate analyses of river flows, and untested estimates of sulphate loading from project effluent, none of which is bounded by uncertainty. I have numerically laid out the potentially dire sulphate concentrations that may arise as a result of low flows combined with higher than stated effluent sulphate concentrations/volumes, should the reader choose to explore this more fully (Branfireun Review of Kinross Response to ANA Memo concerning Great Bear Project AEX ECA Application, August 1, 2024; October 7, 2024).

7 Opinion 4: The model that the proponent indicates will be used to predict changes in mercury and methylmercury concentrations in downstream watersheds and assess the potential impact on mercury levels in fish (including assessment of bioaccumulation / bio-magnification pathways) cannot technically deliver any of these outcomes.

In the Great Bear Project Mercury Plan Section 3.4.3, the Proponent states that the GoldSim software modelling package will be used to "stimulate ***(sic)*** the volume and flow of water, and the concentrations and transport of chemical species, over the life of the Project." Without substantiation, they go on to state that "GoldSim has been extensively and successfully applied to simulate complex water resource management, mining operation, contaminant transport, and waste management projects and represents a robust industry-standard modelling software." Although I do not disagree that GoldSim has been widely applied to various industry problems I cannot speak to its success. I can say that it does not appear to ever have been applied to an environmental mercury speciation scenario. There is a clear reason for this – GoldSim is fundamentally (even with its CT submodel) a non-reactive mass-balance model that cannot incorporate mechanistic sorption/desorption reactions along flowpaths, the biomethylation process, nor the complex interaction between mercury and sulphate. As such, the model proposed can never be successfully applied in the manner that is proposed. A mass balance model *cannot* by definition incorporate mechanistically the input and removal processes for mercury, and *cannot* address the biogeochemical aspects of mercury methylation across the landscape which are at the root of the potential impacts associated with the Great Bear proposal. The reason why mass balance models are used for solutes (and can work for solutes that are conservative in water) is because they are simple to apply quickly and require little parameterization (i.e. are inexpensive to implement). Indeed they can have value to evaluate simple "what if" scenarios. However, being cheaper and easier to use is not sufficient justification for taking a naïve approach to evaluating possible environmental risks in a region of extreme mercury sensitivity, when much more defensible approaches exist, including models for watershed-steam mercury dynamics. On page 17 of the Mercury Plan, the authors state that GoldSim is used because it provides "a clear description and rationale for model input parameters and assumptions." I have seen this language used in other cases that I have opined about, with the implication being that GoldSim is somehow MORE clear in its description and

rationale of input parameters and assumptions than other models (i.e. superior). This seems to be popular but baseless justification, as it implies that it is somehow more transparent than other model frameworks.

The statement that the mass balance models like GoldSim are transparent with respect to data inputs is true, in that it is true that *any* model is transparent with respect to data inputs because one must know what the data inputs are in order to run the model (a non sequitur). What is also true of any model is the adage of "garbage in, garbage out." The definition of input parameters and stated variables is always required in any model, as is the establishment of boundary conditions and mechanisms that reflect the best available science. In the case of the Great Bear Project, we have a virtual absence of useable data for baseline water quality (see above), which means that we are at a loss for values for the very input parameters that are required.

The Great Bear Project Mercury Plan reaches even farther by stating that "Results of GoldSim modelling for surface water and sediment quality, described above, will be used to forecast and assess potential effects on fish mercury concentrations in downstream watersheds. Both small and large-bodied fish will be considered in this assessment." My understanding of GoldSim is that it uses the sediment compartment to model water chemistry, not the other way around, so to suggest that GoldSim can be used predictably for the sediment compartment is unrealistic beyond simple mass transfer, despite the importance of the sediment compartment for net methylation. More problematic is the leap of faith between whatever output is provided by GoldSim and a prediction of methylmercury concentrations in biota. There is no evidence of any such effort being successfully reported in the public domain; if the Proponent has advanced the science in this area then I would welcome an opportunity to review their efforts in this regard as it would mark a major breakthrough in modelling mercury biogeochemistry and biotic uptake. I suspect that this is not the case, since the means by which this is to be accomplished is apparently "changes in fish body burden mercury concentrations is considered to be the forecasted methylmercury concentration in the water column, as determined by the water quality model." I am not sure who "considered" this relationship, however it was not someone with a modest scientific understanding of the controls on fish tissue MeHg concentrations – such a simplistic forecasting relationship does not exist, and this is in addition to the fact that GoldSim cannot predict methylmercury concentrations in the first place.

8 Other Errors, Omissions and Concluding Remarks

There are other problematic statements throughout the Mercury Plan that are used to downplay the potential impacts of the project do not align with scientific facts. The statement "For example, SRB-induced mercury methylation could occur in areas of organic soils peripheral to the rock stockpiles; however, methylmercury production beneath rock stockpiles can be limited by low temperatures at the base of the stockpiles which will inhibit SRB activity." is patently false given that the SRB can be quite active at temperatures just above freezing (e.g. Fortin et al., 2000).

We have all kinds of details on sample handling and Quality Assurance/Quality Control procedures in Section 2.2.1 that convey attention to detail and rigour, however a statement about sampling frequency is carefully worded so that the inadequacy of the water quality sampling is not apparent.

Baseline surface water quality sampling generally occurs monthly to characterize seasonal variability in water quality, providing flow is present and that the monitoring site can be safely accessed. (GBP Mercury Plan, p.5)

This statement fails to identify which solutes will be measured from this 'generally' monthly sampling, however in prior documents, the Proponent has clearly indicated that low detection level mercury and methylmercury sampling will only be done at only **half of the sampling sites**, and are only to be taken **quarterly (4 times per year)**. This low frequency of sampling of the only mercury data of utility is insufficient to statistically detect change until that change is so substantial that its effects would be irreversible. Since all of the other mercury sampling will be subject to an inappropriate analytical technique that will mostly return non-detects, the proposed monitoring programs are effectively designed to avoid change detection and I expanded on this in a prior memo (Branfireun to Esmonde, on Advanced Exploration Program (AEX) Environmental Compliance Approval - Industrial Sewage Works (ECA – ISW) July 5, 2024).

Here, we see the assembly of a house of cards by the Proponent. We have a water quality model that is not capable of predicting mercury biogeochemical processes, and that is dependent on background data and proposed monitoring that is insufficient. The outcome will be the inevitable future conclusion by the Proponent that the combination has led to an inability to adequately predict changes in methylmercury concentrations in fish because of 'uncertainties' in GoldSim output, and 'unforeseen complexities' in coupling abiotic and biotic compartments. The reality is that these uncertainties and complexities are completely foreseeable as outlined here. The consideration of the December 2024 Mercury Plan as anything other than deficient will excuse the Proponent's future failure to predict the impact of the proposed development from a mercury perspective because of the appearance of due diligence at this stage of the process. I conclude that the TISG's requirement that the Proponent provide *a detailed and robust analysis on the potential for project contributions to methylmercury production in downstream watersheds* has not been met based on the information provided in their Mercury Plan.

9 Materials Referred

Branfireun, B.A. Expert Opinion Memo to J. Esmonde, Cavalluzzo LLP concerning Great Bear Project AEX-ECA proposal. July 5, 2024

Branfireun, B.A. Review of Kinross Response to ANA Memo concerning Great Bear Project AEX ECA Application, August 1, 2024; October 7, 2024

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Canadian Council of Ministers of the Environment. 2003. Canadian water quality guidelines for the protection of aquatic life: Inorganic mercury and methylmercury. In: Canadian environmental quality guidelines, 1999. Canadian Council of Ministers of the Environment, Winnipeg.

(mercury-inorganic-mercury-and-methylmercury-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf)

Fortin, D, Goulet, R, Roy, M (2000). Seasonal cycling of Fe and S in a constructed wetland: The role of sulfate-reducing bacteria. GEOMICROBIOLOGY JOURNAL, 17(3), 221-235

Water Quality

Ambient Water Quality Guidelines for Mercury

Overview Report — First Update

Prepared pursuant to Section 2(e) of the
Environment Management Act, 1981

Original signed by Margaret Eckenfelder
Assistant Deputy Minister
Environment and Lands HQ Division
February, 2001

Summary

This report is one in a series that establishes ambient water quality guidelines for British Columbia. The guidelines are safe conditions or levels of contaminants, applicable province-wide, which are set to protect various water uses.

This report updates the 1989 BC Environment guidelines for total mercury (THg) by providing revised water quality guidelines to protect aquatic life from chronic effects of mercury. This was deemed to be necessary since the Canadian Council of Ministers of the Environment (CCME) have recently developed guidelines for mercury in the water column to protect aquatic life and in the flesh of aquatic life to protect wildlife. The report also outlines water quality guidelines to protect avian wildlife feeding on aquatic organisms. The updated guidelines are consistent with the CCME tissue residue guideline to protect wildlife from methyl mercury (MeHg) in their diet. The guidelines for livestock, irrigation and recreation, are unchanged from in the 1989 report. The guidelines are summarized in Table 1, Table 2, and Table 3.

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Table 1: Summary of Water Quality Guidelines for Mercury

Water Use	30-d av. Conc.* (µg/L THg)	Maximum Conc. (µg/L THg)
Source Drinking Water	See Source Drinking Water Quality Guidelines: https://www2.gov.bc.ca/assets/download/1F11ABD2CBD24EB09A70B89AB50CE6B0	
Wildlife and Aquatic Life (Freshwater Estuarine and Marine)+ When MeHg = 0.5% of THg When MeHg = 1.0% of THg When MeHg = 8.0% of THg	 0.02 0.01 0.00125	None proposed
Irrigation Water Supplies	None proposed	2.0
Livestock Water	None proposed	3.0

* The 30-day average is based on five weekly samples taken in a period of 30 days.
+ If natural levels exceed the guidelines for aquatic life, then any increase allowed above the natural levels should be based on site-specific data.

Table 2: Tissue Residue Guidelines to Protect Wildlife from Mercury Toxicity

The concentration of methyl Hg in fish or shellfish consumed by wildlife should not exceed 0.033 µg/g wet weight.

Preface

THE MINISTRY OF ENVIRONMENT, LANDS AND PARKS (now called Ministry of Water, Land and Air Protection) develops province-wide ambient water quality guidelines for variables that are important in the surface waters of British Columbia. This work has the following goals:

1. to provide guidelines for the evaluation of data on water, sediment, and biota

The definition of a guideline is:

A maximum and/or a minimum value for a physical, chemical or biological characteristic of water, sediment or biota, which should not be exceeded to prevent specified detrimental effects from occurring to a water use, including aquatic life, under specified environmental conditions.

The guidelines are province-wide in application, are use-specific, and are developed for some or all of the following specific water uses:

- Raw drinking and public water supply
- Aquatic life
- Wildlife
- Agriculture (livestock watering and irrigation)
- Recreation and aesthetics

The guidelines are set after considering the scientific literature, guidelines from other jurisdictions, and general conditions in British Columbia. The scientific literature gives information on the effects of toxicants on various life forms. This information is not always conclusive because it is usually based on laboratory work which, at best, only approximates actual field conditions. To compensate for this uncertainty, guidelines have built-in safety factors which are conservative but reflect natural background conditions in the province.

Guidelines are subject to review and revision as new information becomes available, or as other circumstances dictate.

The guidelines apply to the ambient raw water source before it is diverted or treated for domestic use.

The Ministry of Health regulates the quality of water for domestic use after it is treated and delivered by a water purveyor.

Guidelines relating to public health at bathing beaches are the same as those used by the Ministry of Health which regulates the recreation and aesthetic use.

Introduction

Mercury is a non-essential element for plants and animals. However, metallic mercury is widely used in industry for the manufacture of chemicals, electrical equipment, power generation, dental amalgams and metallurgical gold. The mercurial compounds have found applications in paints, drywall compounds, scientific supplies, pharmaceuticals, fungicides and bactricides.

Mercury is found naturally in the earth crust, rocks, minerals, and coal and base metal deposits. Areas of high mercury content associated with zones of instability and volcanic and thermal activity have been found over the globe.

Many natural and anthropogenic sources contribute to environmental mercury loading. In the environment, mercury can exist in both organic and inorganic forms. Methyl mercury (MeHg), the most toxic form of mercury, tends to bioaccumulate and biomagnify in the aquatic food chain. Piscivorous mammals, fish and birds accumulate most of their body burden through diet.

Mercury is known to damage renal, nervous, reproductive, and developmental systems. The chemical form of mercury and route of entry are important determinants of its toxicity. Ingestion of inorganic mercury is primarily responsible for erosion of intestinal tracts and kidney damage in both animals and humans. Methyl mercury and short-chain organic mercurials destroy neuronal cells in areas of central nervous systems concerned with sensory and co-ordination functions.

In British Columbia, economic grade deposits of mercury are commonly associated with sedimentary rocks such as limestone and sandstone of the Palaezoic to Recent age. The province's richest mercury deposits are in the Pinchi Lake fault zone which extends from Fort St. James northwest to the Omineca River. Other major areas of mercury mineralization in British Columbia include Kamloops Lake, Bridge River, and Yalakom River.

The concentration of mercury in natural waters is generally low. However, elevated concentrations of mercury have been reported in British Columbia in areas contaminated by the industrial activity (e.g., Squamish) and where extensive mercury mineralization has occurred.

Historical mercury concentrations should be viewed with caution. Results from cleaner laboratory analytical methods with lower detection limits show that background mercury concentrations are lower than previously thought. Older high values may be the artifacts of high detection limits and artificial contamination during measurement.

Recommended Guidelines

Table 1 summarizes all guideline values including those that have been updated. This was deemed to be necessary since the Canadian Council of Ministers of the Environment (CCME) have recently developed guidelines for mercury in the water column to protect aquatic life and in the flesh of aquatic life to protect wildlife. There is obviously a need to reconcile all these guideline values in one document for the benefit of resource managers.

1. SOURCE DRINKING WATER

See the Source Drinking Water Quality Guidelines: Guideline Summary Document

https://www2.gov.bc.ca/assets/download/1F11ABD2CBD24EB09A70B89AB50CE6B0

2. AQUATIC LIFE (FRESHWATER, ESTUARINE AND MARINE)

These guidelines replace the 1989 BC Environment guidelines for fresh, marine and estuarine waters.

(a) The 30-day average guidelines for marine, estuarine and fresh waters are the same, due to the facts that:

- the bioaccumulation potential of mercury in marine and freshwater food chain is similar; and
- both are based on the 1999 CCME recommended tissue residue guideline to protect the most sensitive consumers of aquatic life (e.g., avian species).

The average concentration of total mercury in water as measured over a 30-day period (based on five weekly samples) should not exceed 0.02 ug/L when the methyl mercury (MeHg) constitutes less than or equal to 0.5% of the total mercury concentration. When the proportion of MeHg is greater than 0.5%, the guideline should be adjusted as indicated in the Table 3 below. The rationale for the graduated guideline is the fact that MeHg concentrations may vary in the environment. For example if the percent of MeHg is 11% the guideline would be calculated by the following equation:

0.1ng MeHg/L (WQGwl *see below in rationale section*) ÷ 0.11 (i.e. the % MeHg)
= 0.9 (guideline ng/L total Hg)

Table 3: The Total Hg Guideline as a Function of the Percentage of Methyl Mercury

% MeHg (of total Hg)	Guideline (ng/L total Hg)
0.5	20.0 ng/L
1.0	10.0 ng/L
2.5	4.0 ng/L
5.0	2.0 ng/L

These levels will protect freshwater aquatic life from chronic effects of mercury. They will also prevent undesirable accumulation of mercury from water to the food chain that may harm the most sensitive consumers (e.g., avian species) of aquatic life.

Rationale:

The following assumptions were made to update the 30-day average guideline to protect from mercury bioaccumulation in fish to a level that may harm wildlife consuming the mercury-contaminated fish:

All mercury in fish tissue is in the methylated form. This conclusion is consistent with observations made by researchers in the literature.

The MeHg bioaccumulation factor at a higher trophic level (level 3 or fish consumed by avian species) is 320,000 on wet-weight (BAF_{3ww}) basis or 1,600,000 on dry-weight (BAF_{3dw}) basis. This BAF is consistent with the US EPA recommended value and values observed in Squamish, British Columbia.

Based on recommended level of methyl mercury at 33 µg/kg wet-weight (diet) and the methyl mercury BAF_{3ww} of 320,000, the acceptable concentration in water for the protection of wildlife consuming fish can be estimated as follows:

$$WQGwl = (33\ \mu g\ MeHg\ kg^{-1} \times 1000\ mg/\mu g) / 320{,}000 = 0.1\ ng\ MeHg/L$$

(where WQGwl is the water quality guideline to protect wildlife)

Table 5 below expresses WQGwl in terms of the comparable THg levels for various percentages of MeHg as a function of THg.

Table 5. WQGwl In Terms of the Comparable THg Levels for Various Percentages of MeHg as a Function of THg

% MeHg (of total Hg)	WQGwl (ng/L total Hg)
0.5	20.0 ng/L
1.0	10.0 ng/L
2.5	4.0 ng/L
8.0	1.25 ng/L

This analysis suggests that the 1989 BC Environment's 30-day average guideline of 0.02 mg/L (or 20 ng/L) total mercury is valid as long as MeHg is less than or equal to 0.5% of the total mercury concentration. Appropriate water quality guidelines for MeHg concentrations other than those specified in the above table can be determined using a linear relationship between WQGwl and MeHg (%).

It should be noted that the CCME (2000) in developing guidelines for fresh and marine waters did not consider bioaccumulation effects per se, but based their guidelines on chronic toxicity. They caution that the guidelines that they have developed 'may not protect wildlife that consume aquatic life'. As well, they considered marine and fresh waters separately, even though there is no reason to suspect that the chemistry of each affects mercury or its bioaccumulation in fish and avian wildlife and do not provide a guideline for MeHg in marine water.

(b) The 1989 BC Environment guidelines for a maximum mercury concentration in either fresh or marine waters has been deleted due to the bioaccumulative nature of mercury which is the most important consideration in developing guidelines. Direct toxic effects that a maximum concentration is meant to protect against are seldom encountered and will be accounted for in bioaccumulation in most cases.

3. WILDLIFE

The 30-day average concentration of total mercury in water to protect wildlife should not exceed levels shown in Section 2 above. These guidelines are based on the tissue residue guideline recommended by the CCME (2000), and will protect the most sensitive avian life feeding on aquatic organisms that may accumulate undesirable levels of mercury in their tissues. This guideline replaces the 1989 BC Environment guideline of 3.0 mg THg/L that had been based on livestock sensitivity to mercury since there were insufficient data on mercury toxicity to avian wildlife. The CCME (2000) did not recommend mercury guidelines for wildlife.

Additionally, the methyl mercury concentration should not exceed 0.033 µg/g wet weight in the diet of wildlife. This guideline is consistent with the CCME (2000) tissue guidelines to protect avian wildlife feeding on fish and shellfish containing mercury.

4. LIVESTOCK WATER SUPPLY

The concentration of total mercury in livestock water supply should not exceed 3.0 µg/L at any time. This is consistent with the 1989 BC Environment and the CCME (1999) guidelines.

5. IRRIGATION

The maximum concentration of total mercury in irrigation water should not exceed 2.0 µg/L. This is consistent with the 1989 BC Environment guideline. The CCME (1999) did not recommend mercury guidelines for water used for irrigation.

Application of the Guidelines

1. FORMS OF MERCURY

Toxicity of mercury has been expressed in terms of both total and methyl forms of mercury. However, total mercury is recommended for setting water quality objectives for a given waterbody. The advantages of expressing toxicity on the basis of total mercury concentrations are:

i. all the mercury that may potentially be toxic is included in the measurement; if the total mercury concentration in water is within the guideline limits, then it is safe to conclude that no mercury pollution exists;
ii. for comparison purposes, there is a considerable amount of historical information available for total mercury; and
iii. total mercury measurements are routine and relatively inexpensive.

Mercury in aquatic organisms (e.g., fish) is predominantly in the methyl form and should also be measured when investigating mercury contamination problems in aquatic systems. The CCME recommended tissue residue guideline (0.033 micrograms MeHg/g wet weight-diet) should apply to protect wildlife consumers of fish.

The main disadvantage of using total mercury to assess water quality is that a large fraction of mercury may become biologically unavailable by forming complexes with the organic and suspended solids fractions of water. Nevertheless, given favourable environmental conditions, mercury complexed in such a manner will be released into the environment in readily available forms, becoming part of the food chain.

2. ASSESSMENT OF EXISTING WATER QUALITY

The guidelines recommended in this document are primarily based on laboratory bioassays that usually are performed with soluble forms of mercury under controlled conditions. Aquatic organisms in a natural environment, however, obtain their mercury burden from both water and food. Mercury from sediments

could become available to the organisms under certain environmental conditions. Thus measuring total mercury in water alone cannot be taken as a true measure of a mercury problem in a given waterbody.

Other assessment techniques include measurements of mercury in fish, and long-term bioassays with resident species using local water. The guidelines for mercury in fish can be used for to assess existing water quality. Long-term bioassays are complex and costly, and should be used for waterbodies with high fisheries values that are threatened by a controllable source.

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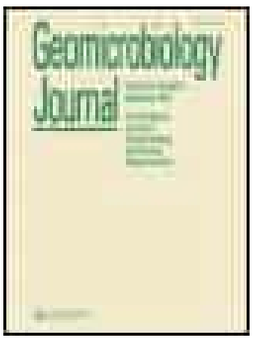

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Seasonal Cycling of Fe and S in a Constructed Wetland: The Role of Sulfate-Reducing Bacteria

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The role of sulfate-reducing bacteria (SRB) in the cycling of Fe and S was studied in a young constructed wetland located in Kanata, Ontario, Canada. The wetland is a surface-flow system composed of three consecutive cells. Sediments and water samples were collected over the course of 1 year within each cell. Sediments were analyzed for the presence of SRB (using a lactate-rich medium), whereas surface and porewaters were analyzed for their concentrations of dissolved Fe and sulfate and for pH, E_h*, and dissolved organic carbon. Lactate-using SRB were present at all three sites within the wetland, and the populations were largest (*10^{10} *colony-forming units per gram of sediment) during the cold winter months, where the temperature of the water was ~1° C. The presence of high-SRB populations also corresponded to highly anoxic conditions within the sediments and to a decrease of sulfate concentrations, suggesting that cold temperature did not affect the activity of SRB. Our results indicate that Fe and S cycling in the young constructed wetland was active throughout the year, especially in the cold winter months, where large SRB populations were encountered. This suggests that Fe removal in wetlands can be effective in temperate climates, even though the temperature of the water decreases drastically during the winter.*

Keywords constructed wetland, iron cycling, sulfate-reducing bacteria, sulfur cycling

Biogeochemical reactions responsible for metal removal in constructed wetlands include adsorption onto reactive mineral and organic surfaces and precipitation as insoluble metal

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oxides and sulfides (Tarutis and Unz 1996). Of all these processes, microbial sulfate reduction and the subsequent precipitation of metal sulfides have been identified as important reactions in metal removal in wetlands (Machemer and Wildeman 1992; Feng and Hsieh 1998; Webb et al. 1998). In fact, in many low-temperature sedimentary environments, microbial sulfate reduction is the sole mechanism responsible for the formation of iron monosulfides and pyrite (Berner 1984). Recent work has shown that such iron sulfide minerals play an important role in trace metal adsorption in anoxic sediments (Huerta-Diaz et al. 1998).

Microbial sulfate reduction depends on various physicochemical factors, including the supply of sulfates, the amount and type of organic electron donors, pH, and temperature (Berner 1984). In freshwater environments, such as wetlands, sulfate reduction rates are generally limited by the amount of sulfate, because the average SO_4 concentrations are ~50 to 450 μM (Feng and Hsieh 1998). In constructed wetlands, however, sulfate concentrations can be greater because of wastewater loading and anthropogenic activities. A second important factor influencing sulfate reduction in natural aqueous environments is temperature. Temperature effects on the growth of and reduction rates by sulfate-reducing bacteria (SRB) have been studied in sediments in cold climates, such as the Arctic and Antarctic (Isaksen and Jorgensen 1996; Sageman et al. 1998). The latter showed that SRB from Arctic sediments grew well at very low temperatures, but the sulfate reduction rates were greatest at much higher temperatures. The same studies concluded that sulfate reduction rates were more dependent on substrate supply than on temperature.

There is much concern about metal retention by constructed wetlands in northern climates (Maehlum et al. 1995; Reddy and Burgoon 1996). As surface water temperature decreases, microbial sulfate reduction rates are believed to decrease, perhaps leading to a decrease in metal retention. Data on the effect of temperature on SRB growth and sulfate reduction rates in wetlands are, however, limited. Batal (1989) hypothesized that SRB increase their numbers in cold water because the decrease in their metabolic rate provides more substrate for growth of other SRB. Therefore, metal retention, especially Fe, during the winter should be sustained because the increasing number of SRB should maintain the sulfate reduction rates.

The present study was initiated to examine the impact of seasonal variations of SRB populations on the cycling of Fe and SO_4 in the sediments of a young constructed wetland built to treat municipal and agricultural runoff. Seasonal variations in SRB numbers were expected to affect the removal of soluble Fe from the water.

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Materials and Methods

Site Description

The Monahan wetland, located in the city of Kanata, Ontario, Canada, is a surface-flow system that was built in 1995 to control the quantity and quality of storm water runoff. The wetland is referred to as a young wetland because it has yet to accumulate a substantial amount of organic matter in its sediments. In young wetlands, the retention of metals depends more on adsorption onto organic matter than on microbial sulfate reduction observed in older wetlands (Machemer and Wildeman 1992). The Monahan wetland was designed to keep water velocities <0.5 m/s and to hold 35,000 m^3 of water. The mean water depth is 1.5 m and the total drainage basin area of the wetland is ~637 ha. The wetland itself has three consecutive cells, which were lined initially with a thick layer of clay to prevent water infiltration into the underlying aquifer. No organic substrate was added on the clay liner. The Monahan wetland is mainly colonized by cattails (*Typha latifolia*) (Table 1). Phosphorus loading to the Monahan wetland is relatively high (0.17 mg/L), which results in an intense

TABLE 1 Characteristics of the sampling sites

	Site 1	Site 2	Site 3
Location	Cell near inflow	Middle cell	Cell near outflow
Depth (m)	0.5	0.5	0.5
Vegetation	*Typha latifolia*	*Typha latifolia*	*Typha latifolia*
OM[a] (%)	8.15 (0.50[b])	12.67 (0.12)	12.13 (0.42)

[a]Organic matter content in the surface sediments (0–2 cm), as determined by loss on ignition.
[b]The standard deviation ($n = 3$) is given in parentheses.

colonization of the littoral zones by cattails. As a result, ~44,000 kg of organic matter accumulate, mainly as peat, at the bottom of the wetland each year.

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Sampling

Sediments and porewater samples were taken in each cell (at locations called sites 1, 2, and 3) of the wetland (Table 1). Sediments were collected in October and December 1997 and in April and August 1998. One sediment core was taken at each sampling date and site with a 10-cm-diameter plexiglass tube and was sectioned on site into 1-cm intervals. To avoid contamination, samples used for bacterial enumeration were taken in the middle of the core and stored in sterile glass vials. To minimize air contact, the vials were completely filled with sediments and stored on ice until their return to the laboratory. Most probable number (MPN) enumeration was carried out within 24 h of sampling. In situ measurements of pH and redox were also performed on the same sediment cores, using a portable pH meter. The pH electrode was calibrated on site with pH standards (at pH 4 and 7). The redox electrode was also calibrated on site with the ZoBell's solution (Nordstrom 1977). A second set of samples was taken in October 1997 for analysis of geochemical fractions. The sediments were placed in acid-washed bottles and kept at 4°C until being freeze-dried. Fresh surface sediments (from 0–2 cm deep) were also analyzed for organic matter content, as determined by loss on ignition.

Porewater samples (peepers) were collected in December 1997 and in April and August 1998 with plexiglass peepers. One peeper was installed per site and sampling date. Porewater peepers were filled with degassed ultrapure water and closed with a 0.2-μm pore-size filtering membrane (HT-Tufryn; Gelman Scientific). Peepers were inserted vertically into the sediments (not more than 0.5 m from the sediment cores) and left in place for 2 weeks (Carignan 1984). The peepers allowed for the collection of interstitial and surface waters at 1-cm-intervals along a 35-cm profile. Water samples were retrieved with 5-ml plastic syringes and transferred into preacidified plastic bottles (10 μl of conc. HCl for 4 ml of sample). Water sample collection was completed within 1 h of the retrieval of the peepers. The temperature of the overlying waters was also monitored on a monthly basis over the course of the sampling period. Surface water samples were collected every 3 days from April 1997 to October 1997 at site 1 (inflow) and site 3 (outflow). Samples were filtered (with 0.45-μm pore-size filter) and acidified after collection and analyzed for dissolved organic carbon (DOC) by using a DC-190 (Hewlett Packard) TOC analyzer.

MPN Counts of SRB

Numbers of viable SRB were estimated with MPN dilutions in liquid medium (American Public Health Association, 1965) within 24 h of sampling. A modified version of Postgate's

growth medium B (Postgate 1984; 10 g/L Bacto-Tryptone [Difco], 5.9 ml 60% Na-lactate, 2 g/L $MgSO_4 \cdot 7H_2O$, 0.5 g/L Fe $SO_4 \cdot 7H_2O$, and 0.5 g/L Na_2SO_3) was used along with a reducing agent supplement (RAS; 7.5 g/L ascorbic acid and 7.5 ml/L thioglycollic acid). All solutions were adjusted to pH 7.50 with 2 M NaOH. Dilution series (1:10) were carried out in culture tubes, starting with ~1 g of wet sample in 9 ml of reduced water (100 ml/L RAS and 2.1 g/L NaCl adjusted to pH 7.50 with 2 M NaOH). Between each dilution, the tubes were vortex-mixed for 1 min to thoroughly disperse the bacteria and sediments. Five tubes containing 9 ml of growth medium and 1 ml of RAS were then individually inoculated with 1 ml from each dilution set. Sealed tubes were left in the dark at room temperature until black Fe-sulfide precipitates started to form (~1–2 weeks). Note that the medium used might have preferentially selected lactate-utilizing SRB over nonlactate users.

Sequential Chemical Extraction

Sediments were subjected to a sequential chemical extraction to separate them into three iron-rich fractions: Fe-reactive, including oxides, carbonates, monosulfides, and hydrous aluminosilicates; Fe-silicates; and Fe-pyrite (Huerta-Diaz et al. 1993). Freeze-dried sediments (0.25 g) were first digested with 1 M HCl (10 ml) for 16 h. Iron concentration in the HCl fraction is referred to as Fe-reactive. The solid residue was then placed in 10 M HF (30 ml) for 16 h to extract Fe from silicate minerals, and finally any remaining residue was transferred to concentrated HNO_3 (10 ml) for 2 h to assess the pyrite fraction. All extractions were run on duplicate samples.

Iron and Sulfate Analysis

Sulfate concentrations in the porewater samples were analyzed by ion chromatography (Dionex DX-100) with a detection limit of 20 μM. Iron concentrations were measured by graphite furnace atomic absorption spectroscopy (Varian Spectra AA-250 plus), with a detection limit of 0.09 μM. Blanks and certified standards (SCP Science Canada) were used to ascertain the accuracy of the porewater Fe and SO_4 measurements. The iron content of each extraction fraction was analyzed by flame atomic absorption (Varian AA-1475) with use of appropriate standards and matrices; the detection limit of that method for Fe was 1.7 μM.

Statistical Analyses

Statistical analyses were performed with Systat 7.0 for Windows 95. Spatial and temporal differences in DOC content in surface water were tested by using a two-way parametric analysis of variances (ANOVA). Assumptions of the parametric ANOVA were tested with Wilkes–Shapiro test for normality of residuals, with Levene's test for homoscedasticity and with autocorrelation plots for independence among residuals.

Results

SRB Populations

Temperatures of surface water dropped near the freezing point in the winter, and a thin layer of ice (5–15 cm) developed over most of the wetland (Figure 1). Nevertheless, SRB were observed at all three sampling sites during each of the sampling periods (Figure 2), being recovered from the first 10 cm of sediment (organic and inorganic sedimentary material and clays from the liner material put at the bottom of the wetland during its construction). SRB

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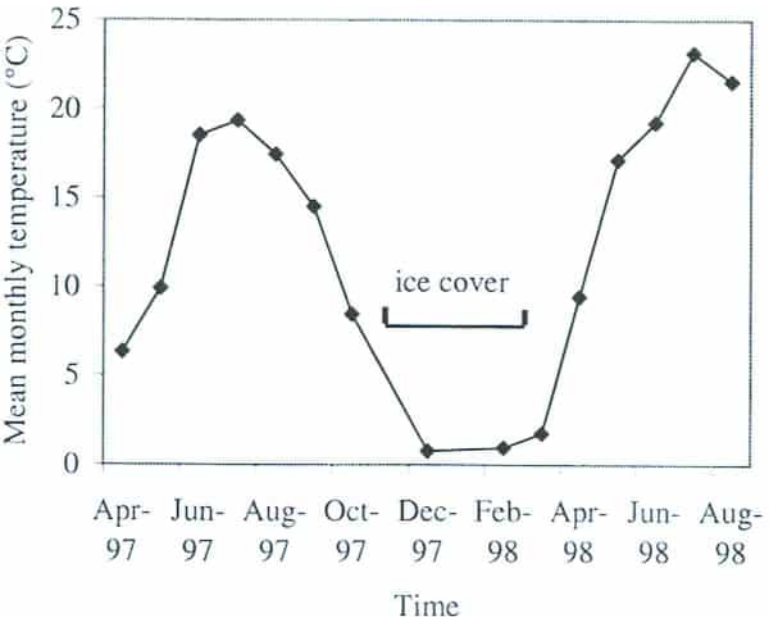

FIGURE 1 Average monthly temperature (°C) of the surface waters in the constructed wetland for the period April 1997 to August 1998.

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populations varied with depth at all sites but appeared to fluctuate most as a function of the season, especially near the sediment–water interface. In fact, the largest SRB populations were encountered at site 1 during the winter sampling in December. The smallest SRB populations were seen in the upper layer of sediments at sites 1 and 2 in April.

Surface and Porewater Chemistry

The pH of interstitial waters was between 7.00 and 8.50 (Figure 3) and remained fairly stable with respect to both depth and sampling time. A slight pH increase was observed near the sediment–water interface at site 1 in August, at site 2 in October and April, and at site 3 at all sampling dates. On the other hand, redox conditions varied greatly with depth and sampling time (Figure 3). Although anoxic conditions prevailed in the sediment deeper than 1–2 cm, slightly oxic conditions were encountered near the sediment–water interface at site 1 in April and August, whereas the sediments were anoxic in October. At site 2, suboxic conditions prevailed near the surface in October and April, whereas the surface sediments were slightly anoxic in August. At site 3, conditions were suboxic to oxic near the surface in October and April, whereas the sediments were completely anoxic in August. Samples were not analyzed for pH and E_h in December.

One set of data for iron and sulfate is missing for site 3 in December, because the peeper could not be recovered from under the ice. At all sites and sampling times, Fe was not detected in the overlying waters, except at sites 1 and 2 in December, which had low concentrations of Fe (Figure 4). For all sites, Fe concentrations increased drastically near or at the sediment–water interface, especially at site 1 in April, at site 2 in December, and at site 3 in April (Figure 4). In addition, large fluctuations were observed within the sediments, especially in the deeper portion of the profiles, where sedimentary particles were mixed with clays. Sulfate concentrations showed a very different trend: Concentrations were greatest in the overlying waters and decreased sharply in the sediments (Figure 5). Sulfate

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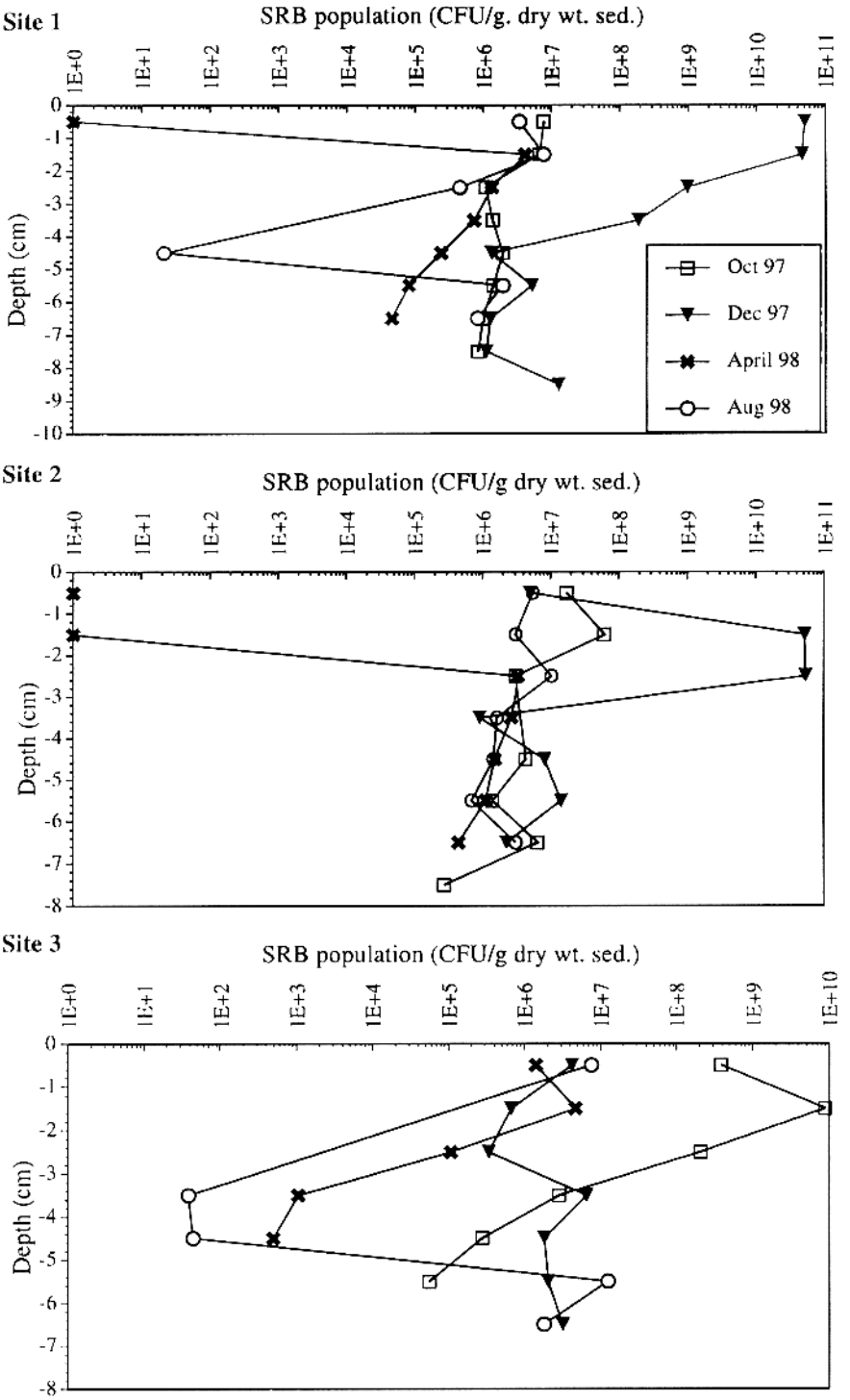

FIGURE 2 Seasonal variations of SRB populations (colony-forming units [CFU]/g dry wt. sediment) in the sediments of the littoral zone near the water inflow (site 1), in the middle cell (site 2), and near the water outflow (site 3). Notice the increase of SRB populations in December in the upper portion of the sediments at sites 1 and 2, and their absence in April.

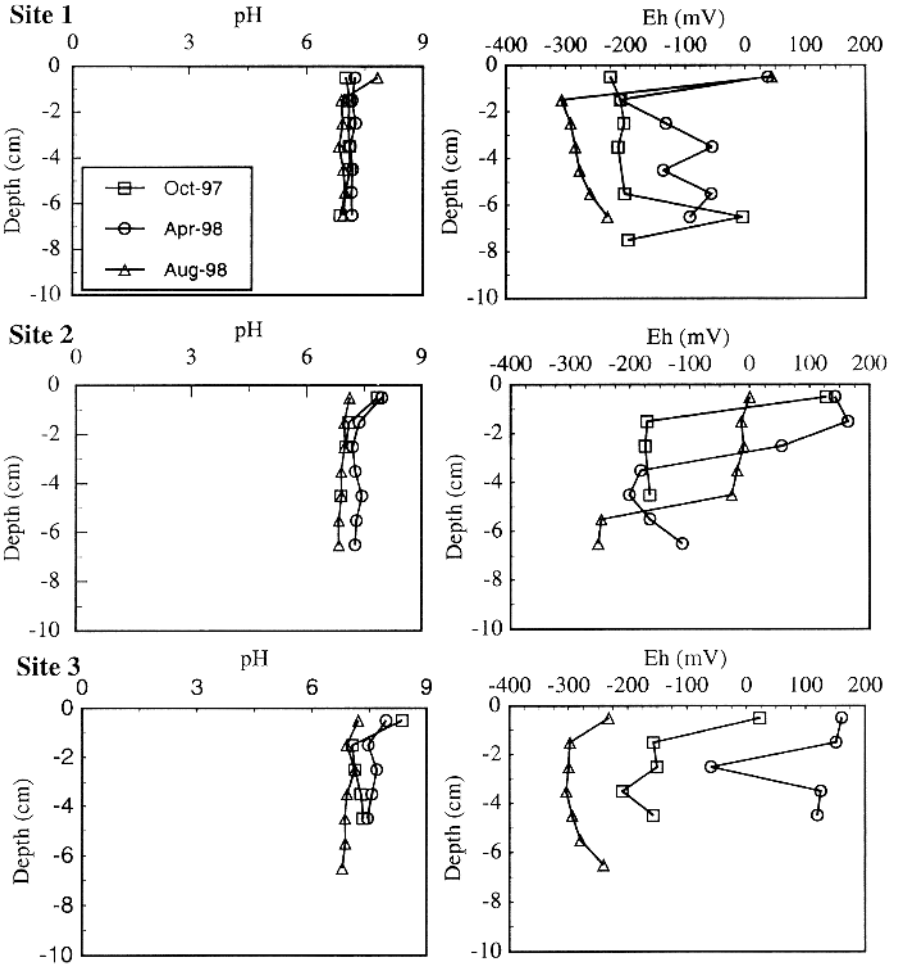

FIGURE 3 In situ pH and E_h profiles as a function of sampling dates in the sediments of the littoral zone near the water inflow (site 1), in the middle cell (site 2), and near the water outflow (site 3). Depth 0 cm corresponds to the sediment–water interface.

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concentrations never exceeded 300 μmol/L below the sediment–water interface and did not vary much as a function of time. On the other hand, seasonal variations were observed in the overlying waters at all sites (Figure 5). The largest SO_4 concentrations were encountered in December at sites 1 and 2, were less in April, and reached a minimum in August.

DOC concentrations in the surface waters varied on temporal and spatial scales (Table 2). DOC concentrations ranged from 5.96 to 12.04 mg/L and differed significantly between seasons (Table 3). Throughout the year, basis, DOC concentrations at the inlet were significantly lower than at the outlet. The same difference in DOC concentrations between the inlet and outlet also occurred at each sampling date. DOC concentrations were particularly high in June 97, reaching 9.50 and 12.04 mg/L at the inlet and outlet, respectively.

Sediment Chemistry

The organic matter content of the surface sediments varied slightly between the three sampling sites (Table 1), with slightly higher values at sites 2 (middle cell) and 3 (outflow) than at

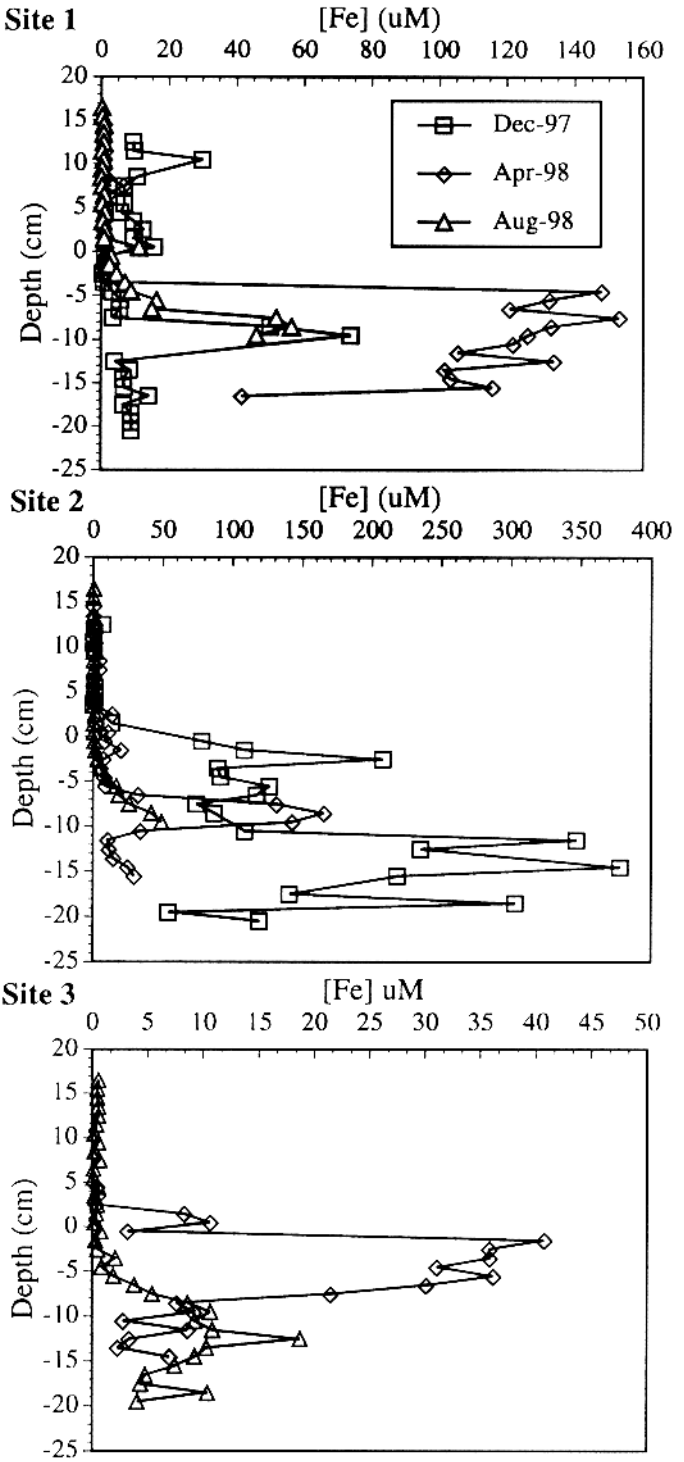

FIGURE 4 Fe concentration profiles in the overlying waters and in the porewaters for three sampling dates at site 1 (near the water inflow), site 2 (the middle cell), and site 3 (the outflow basin). Note the presence of dissolved Fe in the overlying waters at sites 1 and 2 in December.

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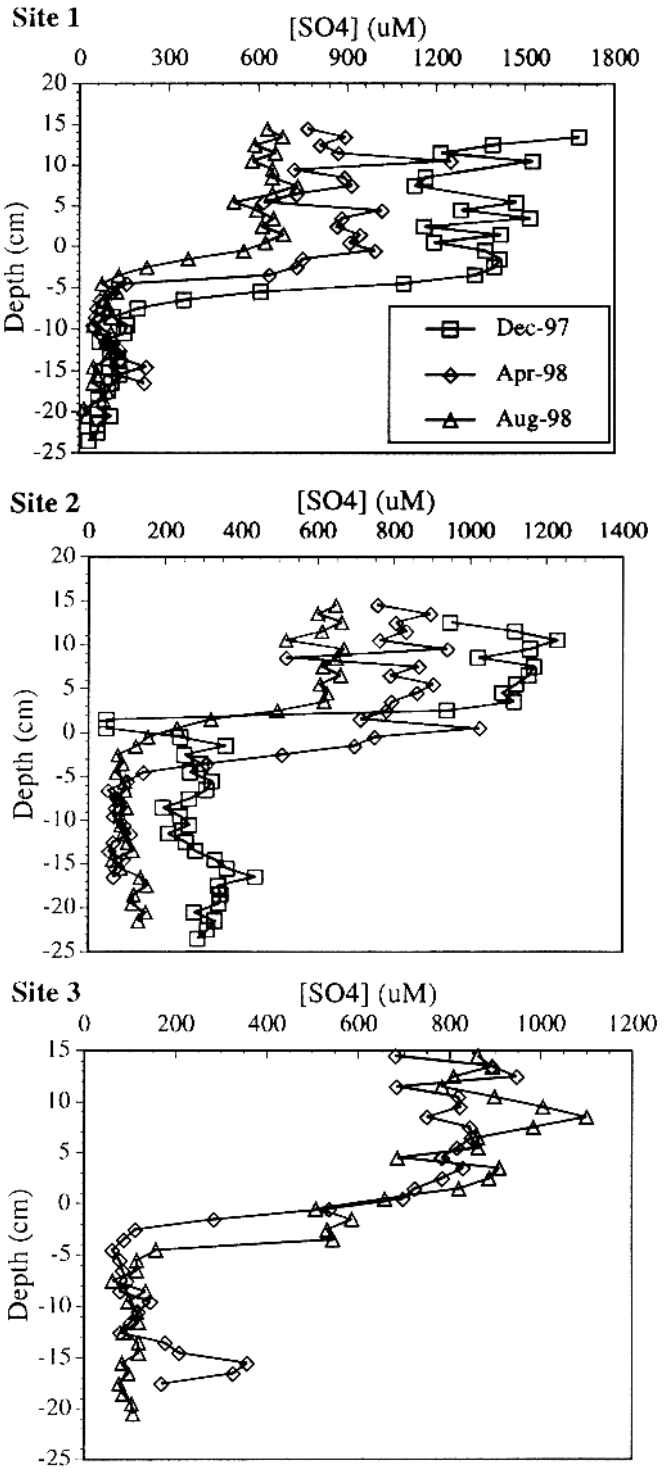

FIGURE 5 SO_4 concentration profiles in the overlying waters and in the porewaters for three sampling dates near the water inflow (site 1), in the middle cell (site 2), and at the outflow (site 3). Note the large concentrations of sulfate in December for sites 1 and 2.

TABLE 2 Average monthly concentrations[a] of dissolved organic carbon (DOC) in the surface waters of the wetland at sites 1 and 3

	DOC (mg/L)	
Sampling date	Site 1	Site 3
April 97	8.01 (1.26)[b]	8.74 (1.94)
June 97	9.50 (3.98)	12.04 (3.69)
August 97	5.96 (2.93)	8.20 (2.28)
October 97	7.26 (1.80)	8.63 (3.14)

[a]Samples were taken every 3 days during the course of each month.

[b]The standard deviation (n = 9–10) is given in parentheses.

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site 1 (inflow). The reactive iron fraction showed a slight increase near the sediment–water interface at all three sites, whereas the silicate fraction fluctuated with depth (Figure 6). Fe concentrations associated with the pyrite fraction were less than those observed in the Fe-reactive and silicate fractions. In fact, no Fe was detected in the pyrite fraction at site 3.

Discussion

Fe and S Cycling and Redox Fluctuations

The cycling of iron and sulfur in wetlands and other aquatic environments is affected by redox reactions, which are triggered by the mineralization of organic matter (Stumm and Sulzberger 1992). In fact, the rapid consumption of oxygen during the degradation of organic matter and the subsequent use of alternate electron acceptors can move the oxic/anoxic barrier toward the sediment–water interface and create anoxic conditions in the surficial sediments (Froelich et al. 1979). Such redox fluctuations were observed in the sediments of the Monahan wetland throughout the year, especially in the top 2 cm of the sediments (Figure 3), in which completely anoxic conditions were encountered in October at site 1 and in August at site 3. Redox measurements were not made in December, but the presence of reducing conditions in the surface sediments and in the overlying waters of sites 1 and 2 was inferred by the presence of soluble Fe above the sediment–water interface (Figure 4). Under reducing conditions, Fe-rich minerals such as Fe-oxides undergo reductive dissolution,

TABLE 3 Results of the two-way ANOVA test comparing DOC concentrations (n = 138) between the inlet (site 1) and outlet (site 3) and the four sampling dates

	Two-way ANOVA test		
Factor	Degrees of freedom	F-statistic	P
Sampling dates	3	17.48	0.000
Sites	1	4.43	0.037
Sampling dates sites[a]	3	1.10	0.354

[a]The interaction term compares the differences between sites within each sampling date.

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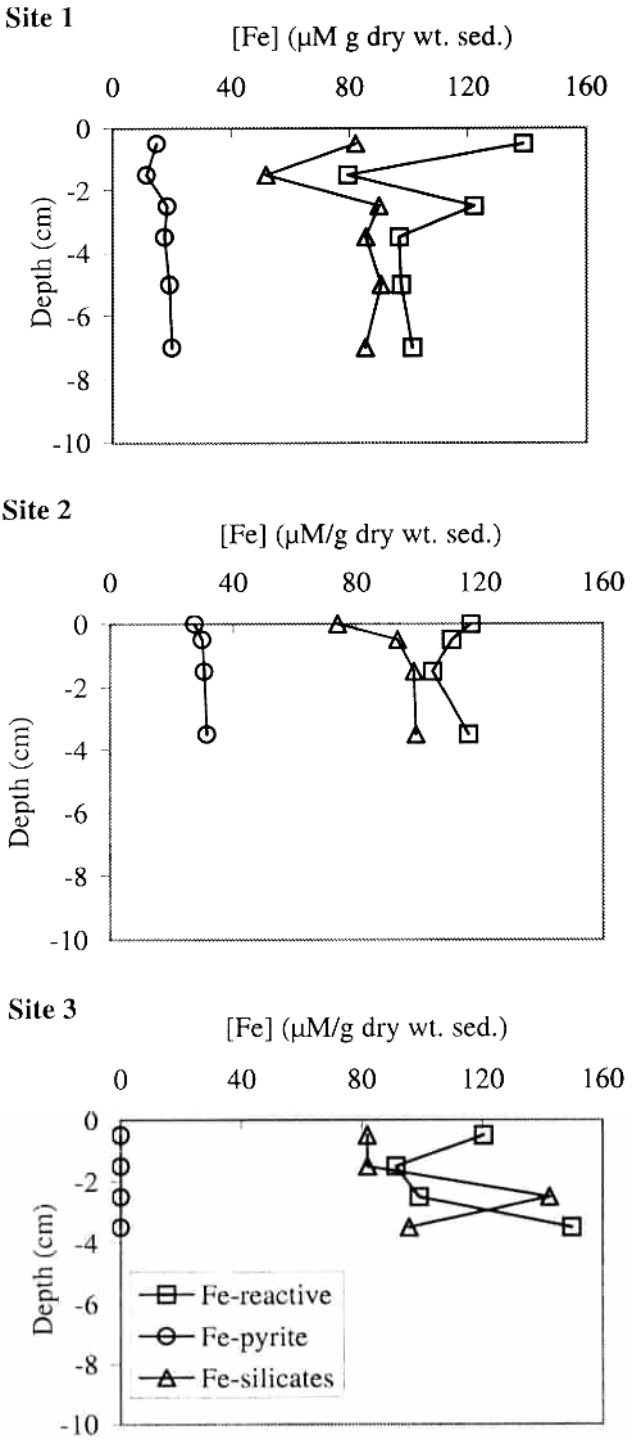

FIGURE 6 Profiles of Fe-rich fractions in the sediments of sites 1, 2, and 3 in October 1997 as determined by sequential chemical extraction. Fe-reactive was extracted with HCl, Fe-silicate with HF, and Fe-pyrite with HNO_3. Notice the absence of Fe-pyrite in the sediments of site 3.

which allows Fe(II) to either diffuse upward into the overlying waters or downward into the sediments (Stumm and Sulzberger 1992). The presence of an ice cover over most of the wetland during the winter months might have also contributed to the presence of anoxic conditions by limiting oxygen diffusion into the water. Redox fluctuations, however, were not constant within the wetland. For example, site 3 (outflow) often behaved differently from site 1 (inflow), and surface sediments near the inflow tended to be less oxic overall than the sediments at sites 2 and 3, even though they contained less organic material in the sediments and in the water at site 1 (Tables 1 and 2). These cell differences were probably caused by various degrees of oxygen consumption and differences in microbial activity throughout the year.

Sulfate concentration profiles in the Monahan wetland indicate that sulfate was reduced near the sediment–water interface (Figure 5), as indicated by the sharp decrease of concentrations in the sediments. Sulfate reduction was observed over the course of the year and did not appear to be limited to warmer months. In fact, sulfate concentrations within the sediments remained constant, whereas concentrations in the overlying waters increased during the winter months—probably because of the use of de-icing agents containing sulfate salts or sulfate impurities on the surrounding roads (Shanley 1994).

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Microbial Sulfate Reduction

The decrease of sulfate concentrations showed a positive correlation with the presence of SRB in the sediments (Figures 2 and 5). SRB were indeed recovered throughout the year and did not appear to be greatly affected by the presence of suboxic conditions in the surface sediments or by the temperature. SRB were generally present in the surface sediments where oxic conditions prevailed, except at sites 1 and 2 in April 1998, where they were absent (Figure 2). This suggests that SRB were either oxygen-tolerant or living in anoxic microenvironments within the oxic sediments. Oxygen usually inhibits microbial sulfate reduction (Widdel 1988), but sulfate reducers have been isolated from oxic to suboxic environments (Canfield and DesMarais 1991; Sass et al. 1997). Visual observation of the wetland surface sediments revealed the presence of small black patches rich in Fe-sulfides within the oxic sediments, indicating the presence of microenvironments. On the other hand, the absence of SRB in the surface sediments at sites 1 and 2 in April and their presence at site 3 suggest possible changes in population dynamics.

Our results also indicate that SRB thrived during the colder months. In fact, the largest populations were encountered in December, when the temperature of the water was ~1°C (Figure 2). The largest SRB populations also corresponded to the largest decline of sulfate concentrations (Figure 5), suggesting an apparent increase in sulfate reduction during the colder months. Our results are surprising, because sulfate reduction rates in natural aquatic environments usually decrease during colder months (Abdollahi and Nedwell 1979; Moeslund et al. 1994; Holmer and Kristensen 1996). However, recent work by Sageman et al. (1998) and Isaksen and Jorgensen (1996) showed that optimum growth temperature for SRB isolated from cold environments was often higher than the in situ temperature, but the sulfate reduction rates were comparable with those measured in sediments of temperate climates. Numerous studies have also suggested that cold temperature might not inhibit bacterial life but might diminish the affinity of the bacteria for substrates (Wiebe et al. 1992; Nedwell and Rutter 1994; Isaksen and Jorgensen 1996; Sageman et al. 1998). It is difficult to conclude from our results that substrate affinity was a key factor in SRB growth at cold temperature, because we did not identify the various types of SRB and organic substrates in the water. In fact, it is possible that the growth medium used for the enumeration (MPN) preferentially selected lactate-utilizing SRB, which might not be representative of the whole SRB population in the wetland. Regarding substrate availability,

our limited number of DOC values (Table 2) suggest that the pool of organic substrates varied throughout the year from one site to the other, being generally lower in the winter because of low primary productivity (Mann and Wetzel 1995). Our results indicate that to compensate for the low organic content of the sediments and the potential lower affinity for the substrates, SRB increased in number during the colder months, which had the effect of maintaining the sulfate reduction rates throughout the year. Clearly more work is needed on the characterization and availability of potential organic donors to assess the role of substrate affinity.

SRB and Fe-Rich Mineral Formation

The dynamics of SRB populations and their effect on sulfur and iron cycling affected the mineralogy of the wetland sediments. The constructed wetland was 2 years old at the time of sampling and originally contained clay material at the bottom. Results from the chemical extraction (Figure 6) indicated that the surface sediments were enriched in reactive Fe, indicating that Fe was bound to carbonates, oxides, monosulfides, and hydrous aluminosilicates (Huerta-Diaz et al. 1993). In most natural aquatic environments, the enrichment of Fe-reactive compounds corresponds to the formation of diagenetic Fe-oxides and Fe-monosulfides (FeS). Diagenetic Fe-oxides usually form when soluble Fe(II) from anoxic sediments diffuses upward toward the oxic–anoxic interface and is oxidized to Fe(III) (Fortin et al. 1993), whereas Fe-monosulfides precipitate as a result of sulfide production during microbial sulfate reduction (Berner 1984). Seasonal variations in Fe and S cycling are therefore responsible for the enrichment in reactive Fe in the constructed wetland. On the other hand, the Fe-silicate fraction showed no distinctive patterns but simply reflected the existence of the clay material emplaced during construction of the wetland and its redistribution through bioturbation. In fact, visual observation of the sediment cores indicated that the clay material in the deeper portion of the core was often mixed with black precipitates, probably Fe-sulfides. Our results also showed that pyrite (FeS_2) formed within the wetland, but only at sites 1 and 2. Pyrite formation is not a direct by-product of microbial sulfate reduction; its formation in aquatic environments is often attributed to the reaction of Fe-monosulfides with dissolved sulfides (Berner 1984; Schoonen and Barnes 1991; Donald and Southam 1999). Our results indicate that the formation of pyrite might have been inhibited in the outflow basin (site 3), perhaps because of a low production of sulfides. However, SRB populations in October were at their greatest, which suggests a large supply of dissolved sulfides (Figure 2). Clearly, the presence of SRB alone cannot explain the absence of pyrite at site 3; the solubility of pyrite is also a function of physicochemical factors, such as the presence of sulfide-complexing agents and the concentration on Fe (Howarth et al. 1983; Howarth and Merkel 1984). In fact, our results indicate that the concentrations of dissolved Fe in the anoxic sediments of site 3 were 3 to 8 times lower than the ones at sites 1 and 2, respectively (Figure 4).

In conclusion, Fe and S cycling in the young Monahan constructed wetland was active throughout the year, especially in the cold winter months, where large SRB populations were encountered. This suggests that metal removal in young wetlands, especially Fe, is effective in temperate climates, even when the temperature of the waters decreases drastically in the winter.

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January 31, 2025

BY EMAIL

Attention: Aaron MacDonell
Director of Environmental Services
Kinross Gold Corp.

Dear Aaron MacDonell,

RE: Great Bear Project Mercury Study Plan

On behalf of Asubpeeschoseewagong Anishinabek ("ANA" or "Grassy Narrows"), we write in response to the Mercury Study Plan (the "Study Plan") prepared by WSP Canada Inc. on behalf of Great Bear Resources, as per the requirement in the Tailored Impact Statement Guidelines ("TISG") issued by the Impact Assessment Agency of Canada (the "Agency" or "IAAC") for the Great Bear Gold Project (the "Project") on August 1, 2024.

The TISG requires the proponent to "submit a study plan to the Agency with sufficient time to facilitate a review by experts and interested parties and to inform the studies undertaken." With respect to the study plan, the IAAC notes in the TISG that "the potential for project contributions to methylmercury production in downstream watersheds requires a detailed and robust analysis" that includes "establishing baseline methodology and effects assessment methodology related to methylmercury." (emphasis added)

Our experts have previously raised significant concerns with respect to the quality and quantity of baseline data and monitoring completed to date, and the monitoring planned, with respect to the Great Bear Gold Project. These concerns remain. The Study Plan does not provide us with adequate assurance that this preliminary work will be accurately and adequately completed before the proponent moves forward with the necessary studies and engages in risky Advanced Exploration ("AEX") construction and mining activities. Any studies completed based on erroneous and unreliable data will not provide Grassy Narrows with the necessary information we need to properly assess the potential impacts of the Project on our inherent, Aboriginal, and Treaty rights, nor will it provide the External Technical Reviewers ("ETR") with the technically rigorous and accurate information that they need to assess the impacts of mercury and methylation during the Impact Assessment process.

Our experts are also concerned with the effects assessment methodology proposed, including the use of inadequate baseline data, unclear monitoring, flawed ML-ARD work, and unsuitable modelling software.

The proposed software has technical limitations that will prevent it from being successfully applied in the manner proposed to address the biogeochemical aspects of mercury methylation across the landscape and methylmercury uptake by biota. The Study Plan indicates that the software will not be modeled downstream of the Project site and important details, such as a

mixing zone in between “nodes”, cannot be simulated in sufficient detail. As well, the model does not intend to assess cumulative impacts and methylation potential at the discharge point, downstream and throughout the broader river system.

The Study Plan thus presents a model that is unable to predict mercury biogeochemical processes, and which is dependent on background data and proposed monitoring that is insufficient. As we address below, any study based on this Plan is bound to fail and will be inadequate for its intended purposes as outlined in the TISG.

Request for extension to provide comments

The IAAC directed the proponent to submit a study plan with “sufficient time to facilitate a review by experts and interested parties.” (emphasis added) A few weeks is not enough time for Grassy Narrows to complete the necessary review, particularly because a significant portion of the review period extended over the Christmas holidays. The holidays are one of the only times when Grassy Narrows people are usually able to lower the level of stress and anxiety that the mercury crisis and industrial threats have brought to the community. Establishing short comment periods for critical plans related to toxic threats over the holidays exacerbates the stress and anxiety which have fueled a well-documented mental health and suicide crisis in Grassy Narrows. This is a concern that Grassy Narrows has explained repeatedly to Kinross and to the IAAC. The fact that this grave concern is being ignored is emblematic of the unilateral, coercive, reckless, and disrespectful nature of this Project and this process to date. The timeline provided by Great Bear is insufficient to review the proposed Study Plan, to engage with our experts and our community in a fulsome manner, to carry out our governance process, and to develop a fulsome response.

While you insist that you will not pause your work on the Impact Assessment as you must adhere to the Impact Assessment timelines, the IAAC continues to tell us that this is not the case. The IAAC informs us that the proponent can agree to a pause in the Impact Assessment process at any time. As well, the IAAC has assured us that there is no deadline by which the proponent is required to submit the Study Plan. In fact, IAAC agreed that it would be proper for the ETR to have the opportunity to review the Study Plan and provide input prior to proceeded with the studies. The ETR Terms of Reference have yet to be set, the selection process has yet to be finalized, and its membership has yet to be selected. It is premature to close the comment period on the Study Plan.

It is in everyone’s interest for Grassy Narrows and our external experts to have enough time to review the Study Plan prior to proceeding with the study/studies to ensure that the studies are “detailed and robust”, the ETR has the information they need to adequately assess methylation-related issues, and the Impact Assessment is completed in a technically rigorous manner. If the study proceeds without sufficient time for effective peer review, or with a flawed methodology, then its results will not be reliable. It is not prudent nor rational to proceed with the Study Plan in these circumstances. We reiterate our request for an extension to provide fulsome comments.

Preliminary comments

We have been unable to complete a fulsome review of this critical document which will inform the proponent’s analysis of methylmercury, a key concern identified by Grassy Narrows during the Planning Phase of the federal Impact Assessment and throughout other regulatory review processes. However, as you insist that you will move forward with the studies without us, we are submitting our preliminary comments.

We have also enclosed two initial reports from our experts who have completed a preliminary technical review of the Study Plan to date: (1) Preliminary Report by Dr. Brian Branfireun, and (2) Preliminary Report by Dr. Kevin Morin. Note that Dr. Branfireun is an internationally recognized expert in the field of watershed biogeochemistry and the environmental cycling of mercury, including methylation, and his insights with respect to the methodologies proposed are particularly valuable.

Grassy Narrows' previous submissions should also be meaningfully integrated into a revised Study Plan, including our initial March 2024 submissions and subsequent submissions from Grassy Narrows and our experts in response to the PTTW, ECA for ISW, and Closure Plan applications. These submissions include important content that relates to the Study Plan, including information about Grassy Narrows' concerns and priorities; the sufficiency of generic guidelines for the protection of aquatic wildlife; deficiencies in the components of the planned study, including with respect to baseline data, monitoring plans, ML-ARD, groundwater modelling, and mitigation plans, among other things; and deficiencies in the review process to date.

1. **The proponent's reliance on achieving on/off site water quality that complies with PWQO and CCME water quality guidelines is inadequate and inappropriate when considering mercury and methylmercury in water, and methylmercury uptake by biota.**

The Plan states that to date, water quality monitoring shows that mercury and methylmercury concentrations in water are below Canadian Council of Ministers of the Environment ("CCME") water quality guidelines for the protection of aquatic life. It is clear that the proponent intends to apply CCME guidelines to the Project as "comparisons", but also as regulatory thresholds from a compliance standpoint.

Dr. Branfireun continues to opine that CCME guidelines for mercury and methylmercury are "useless for the protection of fish consumers, and even if discharges or indirect effects were a fraction of these guideline limits there would be significant potential for downstream impairments of aquatic resources." The CCME guidelines for total mercury and methylmercury for the protection of aquatic life are significantly above background levels. For example, the CCME guideline for total mercury in surface water is roughly 10-20-fold higher than uncontaminated baseline levels of mercury in the English River watershed. Previous submissions by Dr. Branfireun are clear that any increase in mercury above baseline in water would be expected to be reflected in walleye.

The CCME document itself provides that it "does not address exposure through food or bioaccumulation to higher trophic levels" and that "if the ultimate management objective for mercury is to protect high trophic level aquatic life and/or those wildlife that prey on aquatic life, more stringent site-specific application of these water quality guidelines may be necessary." Stringent site-specific guidelines are necessary in the circumstances. These site-specific guidelines must take into account the specific ecosystem, watershed, bioaccumulation, subsistence human consumers of high trophic level fish and wildlife, cumulative impacts, and the ongoing mercury crisis in Grassy Narrows. Grassy Narrows has raised this issue consistently since its first submission on the Great Bear Gold Project, and we have yet to see it reflected in the project plans including this Mercury Study Plan. The information that Grassy Narrows and its experts have provided about mercury and methylation continues to be ignored.

It is unclear what guideline levels, if any, are being proposed for sulphate, and for other parameters that impact methylation including DOC, temperature, light penetration, and pH, among others. However, the sulphate guideline levels for the receiving environment proposed in the ECA application were found by Dr. Branfireun to be entirely inappropriate for the purpose of preventing methylation impacts. If Kinross is planning to use those same levels here, then the results of this study will be erroneous.

The Study Plan must establish site specific criterion for mercury, methylmercury, sulphate, and other parameters that impact methylation, based on appropriate baseline data, and the site-specific factors noted above, not based on generic national standards that have not been designed for bioaccumulation nor for subsistence fish eaters and/or previously exposed populations. Methodology that relies on "useless" comparators and guidelines will not lead to an analysis that is "detailed and robust."

2. **The background data collected as part of the baseline studies for this Project are largely erroneous or their interpretation is flawed, which makes them insufficient to detect whether the project will have a measurable impact on fish mercury levels in the future.**

Grassy Narrows continues to raise concerns with respect to the background data collected by the proponent as part of their baseline studies. The proponent has not corrected many of the baseline study problems identified by Grassy Narrows' experts. Serious data quality problems remain and any methodology that proposes modelling based on such erroneous data will lead to study results that are inaccurate and ineffective, rendering the entire study useless, and posing serious risks to Grassy Narrows.

Dr. Branfireun continues to opine that "in the context of the protection of fish consumers, nearly all of the background data for total mercury are useless and stated incorrectly." The background mercury data in water is incorrect. The data provided for mercury are not data but are instead detection limits of the contract laboratory. The detection limits for methylmercury are higher than background levels in the English River. Concentrations reported for sulphate have also been erroneous up until May 2023 when the proponent appears to have changed analytical methods or laboratories which was not documented, contrary to best practices.

The baseline studies and proposed methodology with respect to biota are similarly inadequate. The proponent has not collected consistent species to allow for comparison between years, assessed both high trophic sport fish and low trophic indicator species, nor identified the frequency and duration of any studies.

The Study Plan relies on background data about mercury and sulphate that will inform modelling efforts and trigger undefined actions should they change. Dr. Branfireun opines that the proponent proposes to use an "inappropriate analytical approach" that will "reliably generate non-data that will not capture trends in mercury concentrations across most of the sampling sites in the project area."

The baseline studies have a number of other key deficiencies including:

1) The baseline studies are being conducted after activities that can impact methylation (such as road and machine track construction, forest clearing, drilling, soil impacts, and other industrial activities) have already occurred. This makes it impossible for most sampling sites to establish a baseline that is free of project impacts or those from other

projects.

2) Further activities that can impact methylation are planned to be carried out over the study period including extensive Advanced Exploration activity that includes activities normally considered to be mine construction. This will further interfere with the ability to establish a proper baseline.

3) There are no baseline sites in the Chukuni River that are upstream of the potential impacts of other mine sites including the Red Lake Mine and the Madsen Mine. Therefore, the baseline will likely reflect contaminated conditions which will obscure impacts from this project.

4) There are no baseline sites downstream of Pakwash Lake even though dissolved methylmercury and sulphate can travel long distances downstream and have impacts large distances from the discharge point.

5) The Plan is lacking detail so the precise sampling purpose, locations, protocols, and durations cannot be evaluated.

Grassy Narrows has repeatedly expressed a lack of trust that a profit motivated gold mining company, nor its partners, can be relied upon to establish a credible baseline. The highly critical expert reviews of the baseline work to date and the monitoring plans further substantiate Grassy Narrows' concerns. Grassy Narrows has repeatedly requested that the Crown or the proponent support Grassy Narrows to carry out a credible baseline study. However, neither the Crown nor Kinross have supported this work to date. The result is that the baseline work and plans to date are fundamentally flawed and incapable of effectively supporting risk assessment and mitigation.

Well-designed baseline studies are required to be carried out over a number of years in order to establish a baseline with a reasonable level of confidence in the range of natural variation in the baseline. Without this, it will be impossible to know whether changes seen during monitoring are due to the project or due to natural variation.

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Another key input into the Study Plan is the prediction of which substances will be generated by the overburden, ore, and tailings from the project and their concentrations (ML-ARD). Previous submissions by Source Environmental note that the project has yet to complete a credible contaminants of concern assessment.

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As well, the proponent plans to use incorrect analytical methods in the proposed studies which are flawed and "will underestimate the amount of mercury in Great Bear mined materials including the walls of underground workings and pits, waste rock, overburden, soil, and tailings." Dr. Morin opines that the proposed methods are "not appropriate, reliable, and safe for the Mercury Study." He adds that the proposed groundwater modelling is similarly unreliable. Dr.

Morin concludes that he expects that the proponent will underestimate the important geochemical input and groundwater flow leaving its Gear Bear site which is “critical for a reliable outcome from the proposed Mercury Study.”

The proponent should not proceed with the Study Plan until there is high quality ML-ARD data and baseline data over multiple years for the model, and a credible monitoring plan in place. This must also be completed before the proponent proceeds with further activities that could cause potential impacts, including impacts to baseline data, for example, AEX construction, road and trail building, etc.

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The proponent continues to present a mitigation strategy that involves “discharging treated effluent to a large receiving watercourse (Chukuni River) that has a high oxygenation level and high assimilative capacity.” Our experts have commented on this “strategy” in previous submissions, explaining that this presents an erroneous understanding of methylation in aquatic environments. Dr. Branfireun responds in detail in his enclosed report. Dr. Branfireun concludes that:

- The strategies for treating effluent to be discharged to the Chukuni River do not target sulphate, and sulphate production from overburden and waste rock are likely to be greater than the proponent states.

- The proponent’s assessment of the watercourse’s assimilative capacity is inadequate as the proponent uses the average of entire daily discharge records for all of their dilution scenarios. There are potentially dire sulphate concentrations/volumes that could arise as a result of low flows combined with higher than stated effluent sulphate concentrations/volumes.

- The proponent relies on the high oxygenation level of the Chukuni River and does not consider the methylation potential of downstream waters, nor riparian areas and porewater, where this well-oxygenated river will deliver sulphate that may be many times in excess of background levels, in particular, to downstream mercury-sensitive lakes with high mercury methylation potential.

As with other components of this project, the cumulative impacts of this project in the context of other past, present, and planned projects does not appear to have been considered. There are at least five other gold mining projects proposed or operating in this watershed, as well as a pulp mill, sawmill, dams, diversions, clearcut logging, and municipal waste.

As well, the other mitigation measures described in the Study Plan are generally vague, unclear, and incomplete, and the list of potential effects is similarly incomplete and does not include potential effects from road and trail construction, site clearing, soil impacts, and water/dewatering, for example. There is insufficient information available for Grassy Narrows to adequately assess the proposed mitigation measures, and the information provided to date does not satisfy our experts that the proposed measures are effective and safe.

5. **The proposed model that the proponent plans to use to predict changes in sulphate, mercury and methylmercury concentrations in downstream watersheds and assess the potential impact on mercury levels in fish cannot technically**

deliver on those outcomes.

The Study Plan states that the proponent will rely on the GoldSim software modelling package to "simulate the volume and flow of water, and the concentrations and transport of chemical species, over the life of the Project." Our experts raise significant concerns with the GoldSim software, including its inability to be applied to an environmental mercury speciation scenario, and opine that additional information on the model is required before it can be assessed as an adequate model for the methylation studies.

Dr. Morin explains that mercury and sulphate predictions will only be generated at "nodes", the areas where the user-defined "conceptual boxes" connect. This means that the predictions will not simulate waterbodies in their environmental complexity, but simply represent the internal conditions that the proponent "chooses to assume, estimate, and simulate." It is particularly concerning that the Chukuni River will only be modeled at two "nodes", immediately above and below the property boundary. There are no "nodes" in Pakwash Lake nor further downstream where there are concerns of mercury methylation. There are also no nodes at a baseline site that is upstream from the impact of other local mines and therefore reflects uncontaminated conditions. Dr. Morin explains that "because of this "node" approach, important details like an initial dilution zone (a mixing zone) in the Chukuni River between Nodes CHK-1 and CHK-2 cannot be simulated in sufficient detail."

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The Study Plan, and its model, also appear to ignore a number of parameters beyond THg, meHg, and sulphate which can impact methylation dynamics including DOC, light penetration, temperature, pH, and other parameters.

We are not satisfied that the GoldSim software proposed is appropriate or technically able to apply to the circumstances and produce a useful prediction. We are concerned that the technical limitations of the software, as well as the manner in which the proponent intends to use the software, will not produce reliable, accurate, or useful predictions. Our concerns are heightened given the ongoing data quality problems in relation to the Great Bear Project – flawed data will lead to flawed results, regardless of the software chosen.

<u>Conclusion</u>

Dr. Branfireun concludes in his report:

> "We have a water quality model that is not capable of predicting mercury biogeochemical processes, that is dependent on background data and proposed monitoring that is insufficient. The outcome will be the inevitable future conclusion by the Proponent that the combination has led to an inability to adequately predict changes in methylmercury concentrations in fish because of 'uncertainties' in GoldSim output, and "unforeseen

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In light of our experts' opinions, we are concerned with this Study Plan and require additional time to complete a fulsome review and engage with our experts in a more in depth manner, and to engage with our other experts and our community.

We reiterate our request for a 90-day extension to provide comments. It is not prudent nor rational to proceed with a Mercury Study which is built on erroneous, incomplete, and inaccurate data and which uses flawed methodology that is unable to adequately address the biogeochemical aspects of mercury methylation across the landscape as required.

We expect that the proponent will not move forward with this Study Plan, the proposed studies, or any additional work on the site that may cause adverse effects prior to receiving and meaningfully integrating our comments.

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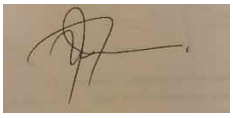

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January 31, 2025

BY EMAIL

Attention: Aaron MacDonell
Director of Environmental Services
Kinross Gold Corp.

Dear Aaron MacDonell,

RE: Great Bear Project Mercury Study Plan

On behalf of Asubpeeschoseewagong Anishinabek ("ANA" or "Grassy Narrows"), we write in response to the Mercury Study Plan (the "Study Plan") prepared by WSP Canada Inc. on behalf of Great Bear Resources, as per the requirement in the Tailored Impact Statement Guidelines ("TISG") issued by the Impact Assessment Agency of Canada (the "Agency" or "IAAC") for the Great Bear Gold Project (the "Project") on August 1, 2024.

The TISG requires the proponent to "submit a study plan to the Agency with sufficient time to facilitate a review by experts and interested parties and to inform the studies undertaken." With respect to the study plan, the IAAC notes in the TISG that "the potential for project contributions to methylmercury production in downstream watersheds requires a detailed and robust analysis" that includes "establishing baseline methodology and effects assessment methodology related to methylmercury." (emphasis added)

Our experts have previously raised significant concerns with respect to the quality and quantity of baseline data and monitoring completed to date, and the monitoring planned, with respect to the Great Bear Gold Project. These concerns remain. The Study Plan does not provide us with adequate assurance that this preliminary work will be accurately and adequately completed before the proponent moves forward with the necessary studies and engages in risky Advanced Exploration ("AEX") construction and mining activities. Any studies completed based on erroneous and unreliable data will not provide Grassy Narrows with the necessary information we need to properly assess the potential impacts of the Project on our inherent, Aboriginal, and Treaty rights, nor will it provide the External Technical Reviewers ("ETR") with the technically rigorous and accurate information that they need to assess the impacts of mercury and methylation during the Impact Assessment process.

Our experts are also concerned with the effects assessment methodology proposed, including the use of inadequate baseline data, unclear monitoring, flawed ML-ARD work, and unsuitable modelling software.

The proposed software has technical limitations that will prevent it from being successfully applied in the manner proposed to address the biogeochemical aspects of mercury methylation across the landscape and methylmercury uptake by biota. The Study Plan indicates that the software will not be modeled downstream of the Project site and important details, such as a

mixing zone in between “nodes”, cannot be simulated in sufficient detail. As well, the model does not intend to assess cumulative impacts and methylation potential at the discharge point, downstream and throughout the broader river system.

The Study Plan thus presents a model that is unable to predict mercury biogeochemical processes, and which is dependent on background data and proposed monitoring that is insufficient. As we address below, any study based on this Plan is bound to fail and will be inadequate for its intended purposes as outlined in the TISG.

Request for extension to provide comments

The IAAC directed the proponent to submit a study plan with “sufficient time to facilitate a review by experts and interested parties.” (emphasis added) A few weeks is not enough time for Grassy Narrows to complete the necessary review, particularly because a significant portion of the review period extended over the Christmas holidays. The holidays are one of the only times when Grassy Narrows people are usually able to lower the level of stress and anxiety that the mercury crisis and industrial threats have brought to the community. Establishing short comment periods for critical plans related to toxic threats over the holidays exacerbates the stress and anxiety which have fueled a well-documented mental health and suicide crisis in Grassy Narrows. This is a concern that Grassy Narrows has explained repeatedly to Kinross and to the IAAC. The fact that this grave concern is being ignored is emblematic of the unilateral, coercive, reckless, and disrespectful nature of this Project and this process to date. The timeline provided by Great Bear is insufficient to review the proposed Study Plan, to engage with our experts and our community in a fulsome manner, to carry out our governance process, and to develop a fulsome response.

While you insist that you will not pause your work on the Impact Assessment as you must adhere to the Impact Assessment timelines, the IAAC continues to tell us that this is not the case. The IAAC informs us that the proponent can agree to a pause in the Impact Assessment process at any time. As well, the IAAC has assured us that there is no deadline by which the proponent is required to submit the Study Plan. In fact, IAAC agreed that it would be proper for the ETR to have the opportunity to review the Study Plan and provide input prior to proceeded with the studies. The ETR Terms of Reference have yet to be set, the selection process has yet to be finalized, and its membership has yet to be selected. It is premature to close the comment period on the Study Plan.

It is in everyone’s interest for Grassy Narrows and our external experts to have enough time to review the Study Plan prior to proceeding with the study/studies to ensure that the studies are “detailed and robust”, the ETR has the information they need to adequately assess methylation-related issues, and the Impact Assessment is completed in a technically rigorous manner. If the study proceeds without sufficient time for effective peer review, or with a flawed methodology, then its results will not be reliable. It is not prudent nor rational to proceed with the Study Plan in these circumstances. We reiterate our request for an extension to provide fulsome comments.

Preliminary comments

We have been unable to complete a fulsome review of this critical document which will inform the proponent’s analysis of methylmercury, a key concern identified by Grassy Narrows during the Planning Phase of the federal Impact Assessment and throughout other regulatory review processes. However, as you insist that you will move forward with the studies without us, we are submitting our preliminary comments.

We have also enclosed two initial reports from our experts who have completed a preliminary technical review of the Study Plan to date: (1) Preliminary Report by Dr. Brian Branfireun, and (2) Preliminary Report by Dr. Kevin Morin. Note that Dr. Branfireun is an internationally recognized expert in the field of watershed biogeochemistry and the environmental cycling of mercury, including methylation, and his insights with respect to the methodologies proposed are particularly valuable.

Grassy Narrows' previous submissions should also be meaningfully integrated into a revised Study Plan, including our initial March 2024 submissions and subsequent submissions from Grassy Narrows and our experts in response to the PTTW, ECA for ISW, and Closure Plan applications. These submissions include important content that relates to the Study Plan, including information about Grassy Narrows' concerns and priorities; the sufficiency of generic guidelines for the protection of aquatic wildlife; deficiencies in the components of the planned study, including with respect to baseline data, monitoring plans, ML-ARD, groundwater modelling, and mitigation plans, among other things; and deficiencies in the review process to date.

1. **The proponent's reliance on achieving on/off site water quality that complies with PWQO and CCME water quality guidelines is inadequate and inappropriate when considering mercury and methylmercury in water, and methylmercury uptake by biota.**

The Plan states that to date, water quality monitoring shows that mercury and methylmercury concentrations in water are below Canadian Council of Ministers of the Environment ("CCME") water quality guidelines for the protection of aquatic life. It is clear that the proponent intends to apply CCME guidelines to the Project as "comparisons", but also as regulatory thresholds from a compliance standpoint.

Dr. Branfireun continues to opine that CCME guidelines for mercury and methylmercury are "useless for the protection of fish consumers, and even if discharges or indirect effects were a fraction of these guideline limits there would be significant potential for downstream impairments of aquatic resources." The CCME guidelines for total mercury and methylmercury for the protection of aquatic life are significantly above background levels. For example, the CCME guideline for total mercury in surface water is roughly 10-20-fold higher than uncontaminated baseline levels of mercury in the English River watershed. Previous submissions by Dr. Branfireun are clear that any increase in mercury above baseline in water would be expected to be reflected in walleye.

The CCME document itself provides that it "does not address exposure through food or bioaccumulation to higher trophic levels" and that "if the ultimate management objective for mercury is to protect high trophic level aquatic life and/or those wildlife that prey on aquatic life, more stringent site-specific application of these water quality guidelines may be necessary." Stringent site-specific guidelines are necessary in the circumstances. These site-specific guidelines must take into account the specific ecosystem, watershed, bioaccumulation, subsistence human consumers of high trophic level fish and wildlife, cumulative impacts, and the ongoing mercury crisis in Grassy Narrows. Grassy Narrows has raised this issue consistently since its first submission on the Great Bear Gold Project, and we have yet to see it reflected in the project plans including this Mercury Study Plan. The information that Grassy Narrows and its experts have provided about mercury and methylation continues to be ignored.

It is unclear what guideline levels, if any, are being proposed for sulphate, and for other parameters that impact methylation including DOC, temperature, light penetration, and pH, among others. However, the sulphate guideline levels for the receiving environment proposed in the ECA application were found by Dr. Branfireun to be entirely inappropriate for the purpose of preventing methylation impacts. If Kinross is planning to use those same levels here, then the results of this study will be erroneous.

The Study Plan must establish site specific criterion for mercury, methylmercury, sulphate, and other parameters that impact methylation, based on appropriate baseline data, and the site-specific factors noted above, not based on generic national standards that have not been designed for bioaccumulation nor for subsistence fish eaters and/or previously exposed populations. Methodology that relies on "useless" comparators and guidelines will not lead to an analysis that is "detailed and robust."

2. **The background data collected as part of the baseline studies for this Project are largely erroneous or their interpretation is flawed, which makes them insufficient to detect whether the project will have a measurable impact on fish mercury levels in the future.**

Grassy Narrows continues to raise concerns with respect to the background data collected by the proponent as part of their baseline studies. The proponent has not corrected many of the baseline study problems identified by Grassy Narrows' experts. Serious data quality problems remain and any methodology that proposes modelling based on such erroneous data will lead to study results that are inaccurate and ineffective, rendering the entire study useless, and posing serious risks to Grassy Narrows.

Dr. Branfireun continues to opine that "in the context of the protection of fish consumers, nearly all of the background data for total mercury are useless and stated incorrectly." The background mercury data in water is incorrect. The data provided for mercury are not data but are instead detection limits of the contract laboratory. The detection limits for methylmercury are higher than background levels in the English River. Concentrations reported for sulphate have also been erroneous up until May 2023 when the proponent appears to have changed analytical methods or laboratories which was not documented, contrary to best practices.

The baseline studies and proposed methodology with respect to biota are similarly inadequate. The proponent has not collected consistent species to allow for comparison between years, assessed both high trophic sport fish and low trophic indicator species, nor identified the frequency and duration of any studies.

The Study Plan relies on background data about mercury and sulphate that will inform modelling efforts and trigger undefined actions should they change. Dr. Branfireun opines that the proponent proposes to use an "inappropriate analytical approach" that will "reliably generate non-data that will not capture trends in mercury concentrations across most of the sampling sites in the project area."

The baseline studies have a number of other key deficiencies including:

1) The baseline studies are being conducted after activities that can impact methylation (such as road and machine track construction, forest clearing, drilling, soil impacts, and other industrial activities) have already occurred. This makes it impossible for most sampling sites to establish a baseline that is free of project impacts or those from other

projects.

2) Further activities that can impact methylation are planned to be carried out over the study period including extensive Advanced Exploration activity that includes activities normally considered to be mine construction. This will further interfere with the ability to establish a proper baseline.

3) There are no baseline sites in the Chukuni River that are upstream of the potential impacts of other mine sites including the Red Lake Mine and the Madsen Mine. Therefore, the baseline will likely reflect contaminated conditions which will obscure impacts from this project.

4) There are no baseline sites downstream of Pakwash Lake even though dissolved methylmercury and sulphate can travel long distances downstream and have impacts large distances from the discharge point.

5) The Plan is lacking detail so the precise sampling purpose, locations, protocols, and durations cannot be evaluated.

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<u>Conclusion</u>

Dr. Branfireun concludes in his report:

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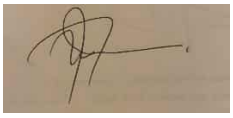

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BUILDING A LEGACY IN RED LAKE, ONTARIO

GREAT BEAR PROJECT

Proposed Open Pit and Underground Gold Mine

Fisheries Habitat Offsetting and Compensation Measures Request for Feedback

KINROSS

Current Status of Federal Approval

- Great Bear received our Tailored Impact Statement Guidelines on August 1, 2024, these guidelines provide the roadmap for the Impact Statement.
- The purpose of the Impact Statement is to identify and assess impacts of the project and the measures proposed to mitigate those effects.
- In this phase the Impact Statement will be drafted, with engagement and consultation on key elements like alternatives, design, closure, and fish compensation. This work is framed around Valued Components and Pathways.

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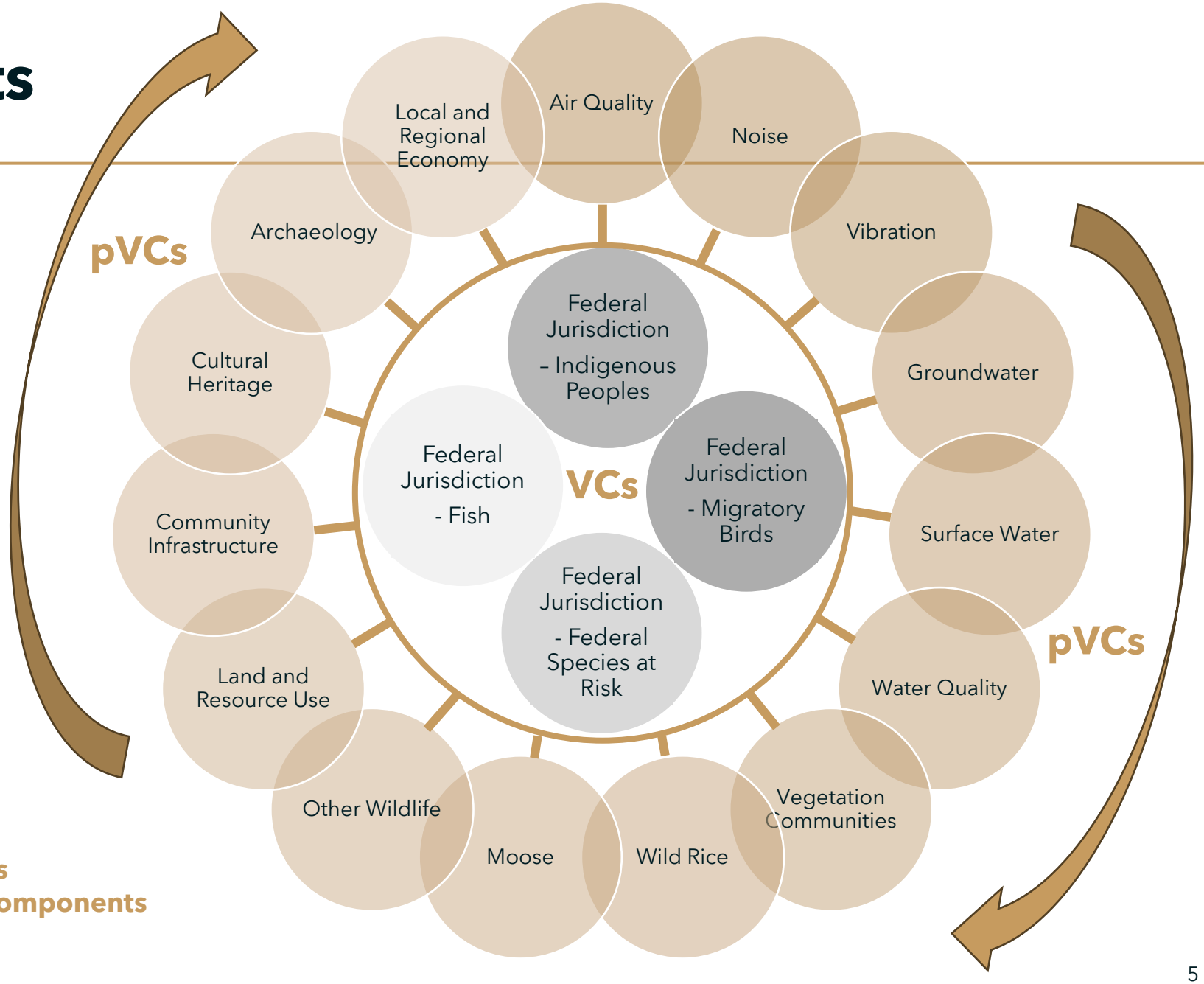
Valued Components

- **Valued Components** frame the assessment of the Project's potential impacts on both the biophysical and human environment with special attention given to aspects under Federal jurisdiction.
- **Pathway Valued Components** encompass a wide range of considerations, including terrestrial and aquatic ecology, water resources, vegetation, the physical environment, human well-being, community development, and Indigenous peoples.
- The Impact Assessment takes into consideration these pathways individually assessing while considering the implementation of avoidance and mitigation measures to reduce or eliminate any potential effects.



VCs: Valued Components
pVCs: Pathway Valued Components

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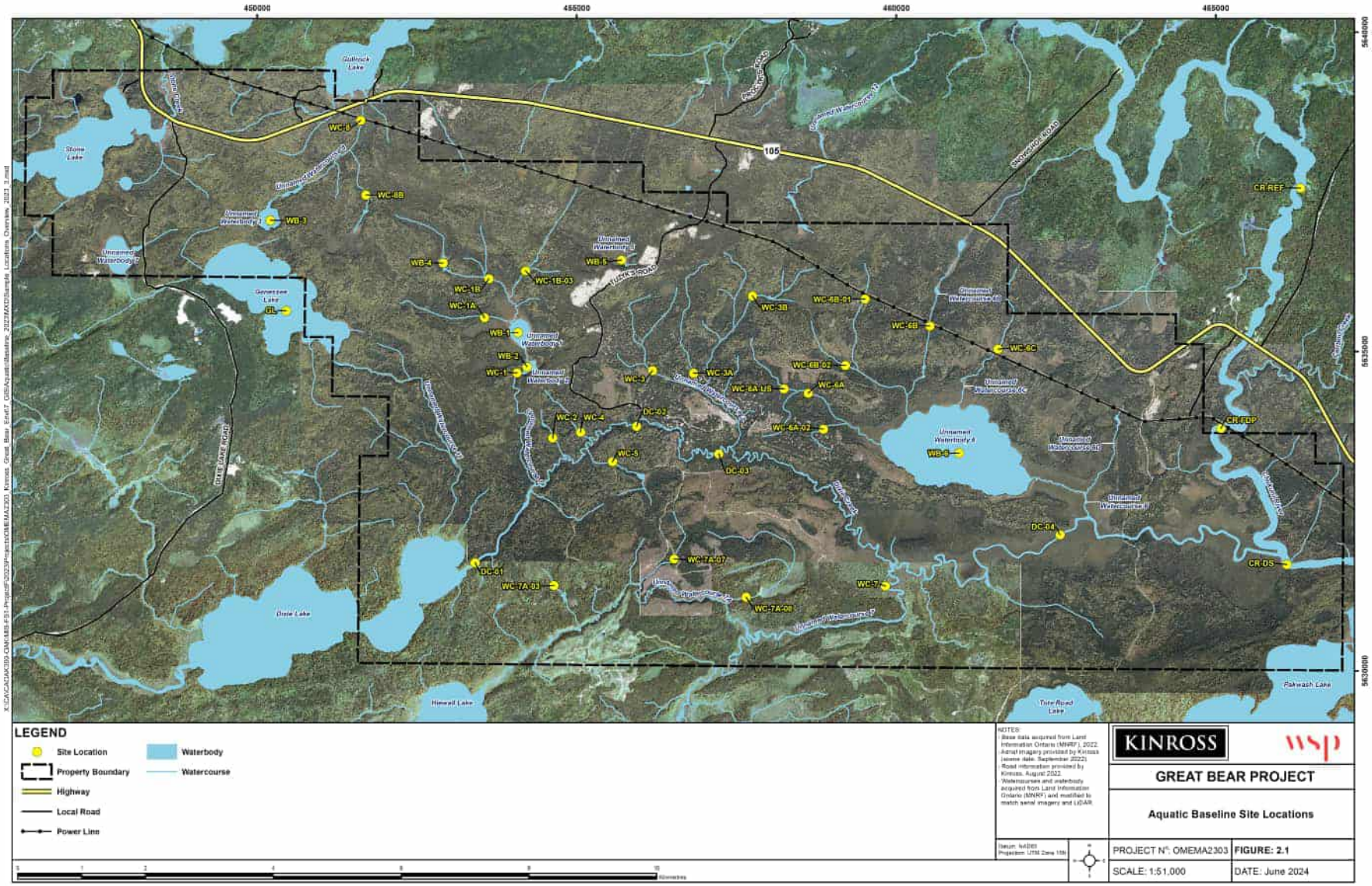
Fisheries Baseline

Field Studies Overview

(2022–2023):

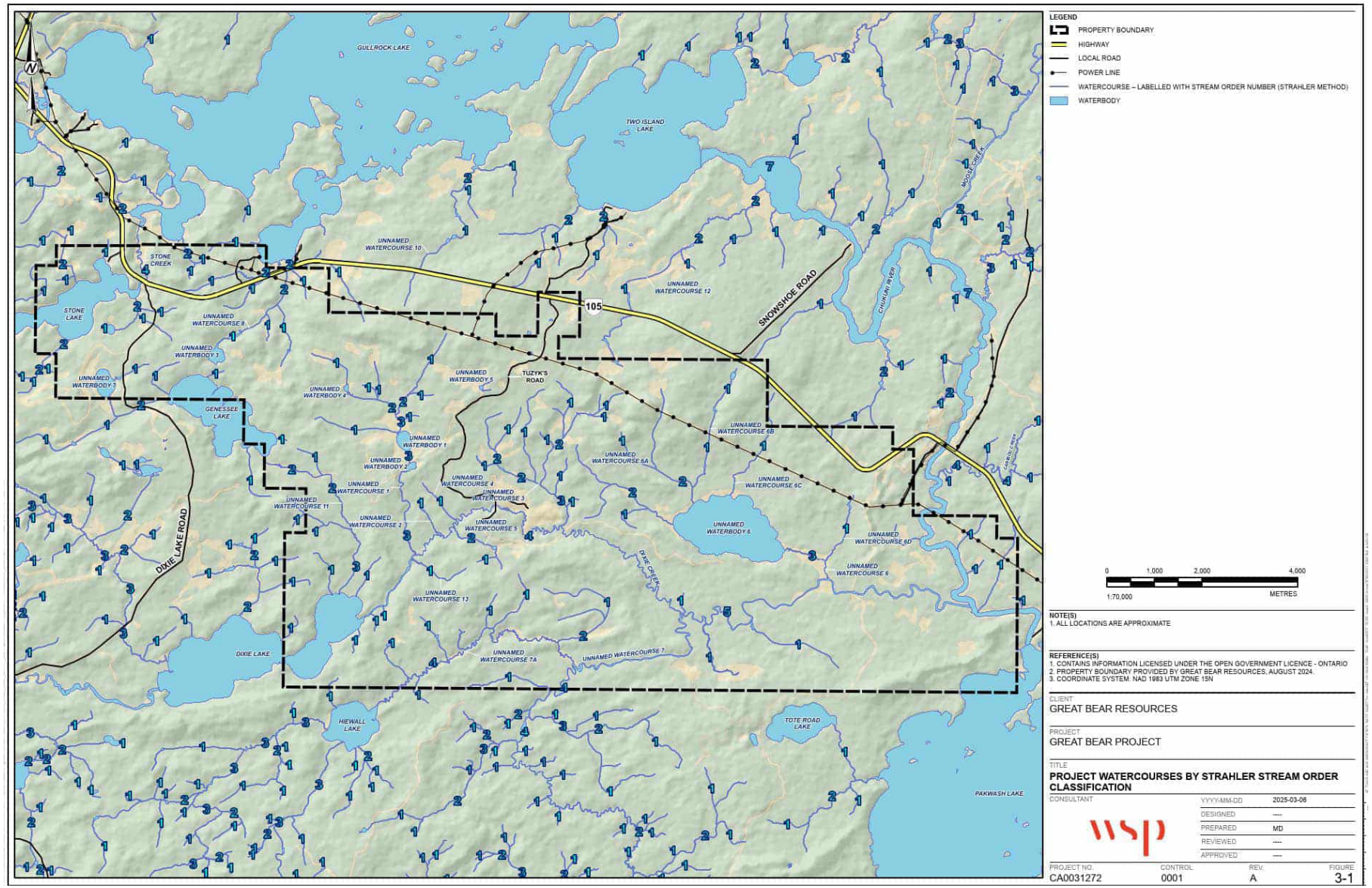
- Great Bear has completed extensive baseline studies on Fish and Fish Habitat in the project area.
- Sampled within and beyond the proposed project footprint to establish baseline conditions.
- Conducted habitat assessments at key locations during 2023.
- Integrated eDNA sampling in 2023 to enhance traditional fish community methods (minnow traps, electrofishing).



Stream Orders

Stream order is a numbering system that tells us how big the creek or river is by adding up the number of creeks that have joined together.

- We have used stream order to show aquatic baseline information in the following pages
- Small numbers such as 1 and 2 mean that the creek is small; sometimes there is no water or fish present.
- Larger numbers such as 5, 6 and 7 mean that numerous small creeks have joined together to make a large creek or river.
- Most of the creeks in the Project area are small, with stream orders of 3 or less. Dixie Creek is a bit larger with stream orders of 4 and 5



Project Area Fish Community Structure

Forage and Baitfish

- Blackchin Shiner
- Blacknose Shiner
- Bluntnose Minnow
- Brook Stickleback
- Central Mudminnow
- Common Shiner
- Emerald Shiner
- Fathead Minnow
- Finescale Dace
- Golden Shiner
- Iowa Darter
- Johnny Darter
- Lake Chub
- Mimic Shiner
- Northern Pearl Dace
- Northern Redbelly Dace
- Rainbow Smelt
- Silver Redhorse
- Shorthead Redhorse
- Slimy Sculpin
- Spottail Shiner
- Trout Perch
- White Sucker

Intermediate Sportfish

- Burbot
- Cisco
- Rock Bass
- Yellow Perch
- Mooneye

Top Trophic Level Sportfish

- Walleye
- Lake Whitefish
- Northern Pike
- Small Mouth Bass
- Muskellunge
- Lake Sturgeon
- Lake Trout

INLAND PONDS AND CREEKS → INTERMEDIATE CREEKS AND LAKES (Dixie Creek/ Waterbody 6) → LARGER RIVERS AND LAKES (Chukuni River / Pakwash Lake

Project Area Fish Community Structure by Stream Order (stream size)

Inland Ponds and Creeks

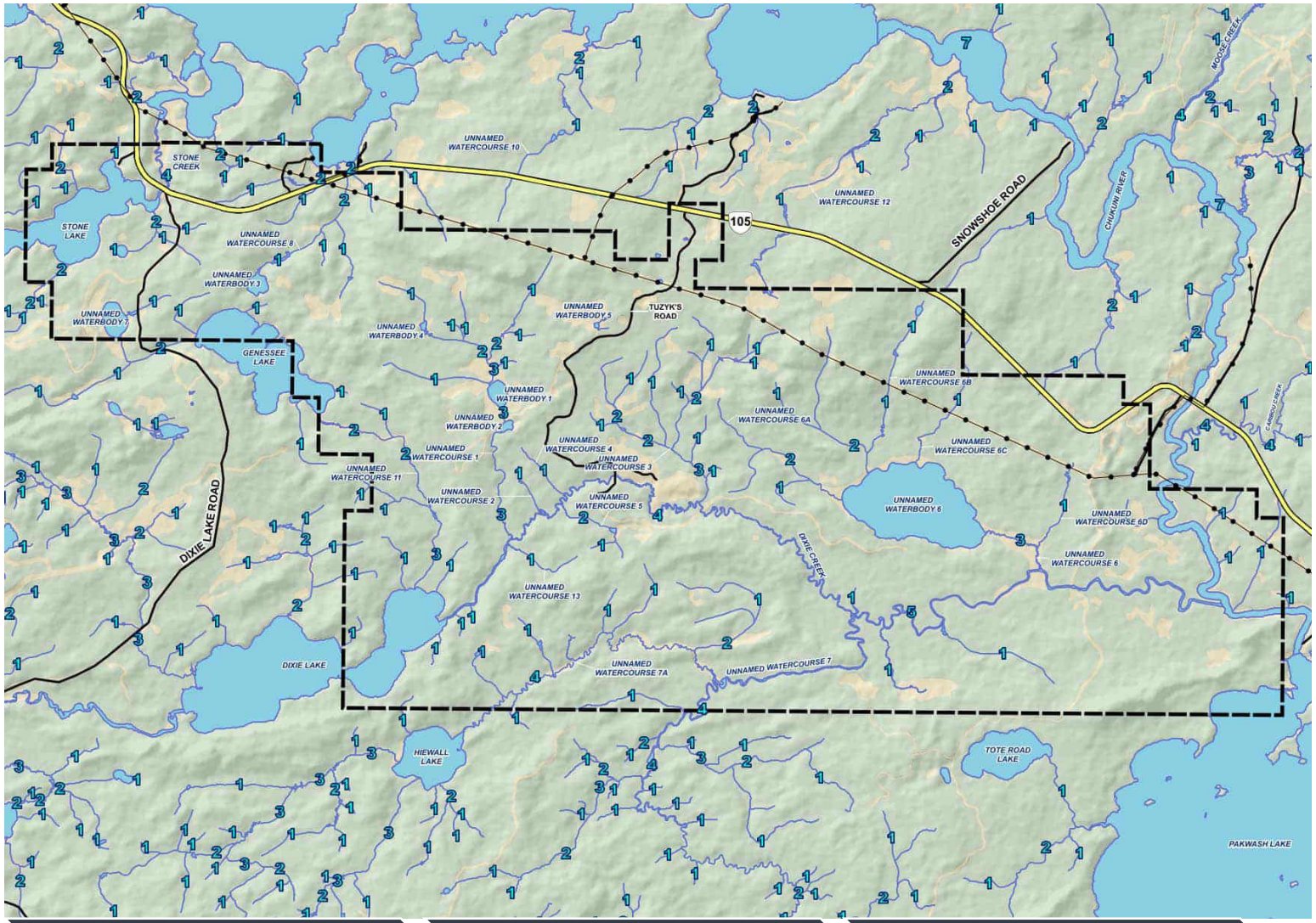
Stream orders 1-2	No fish to small bodied fish present , (i.e., minnows, mudminnow, stickleback)

Intermediate creeks and lakes

Stream orders 3-4	Small bodied and some larger fish (i.e, mooneye, suckers, northern pike, yellow perch, rock bass, burbot)

Larger Rivers and Lakes

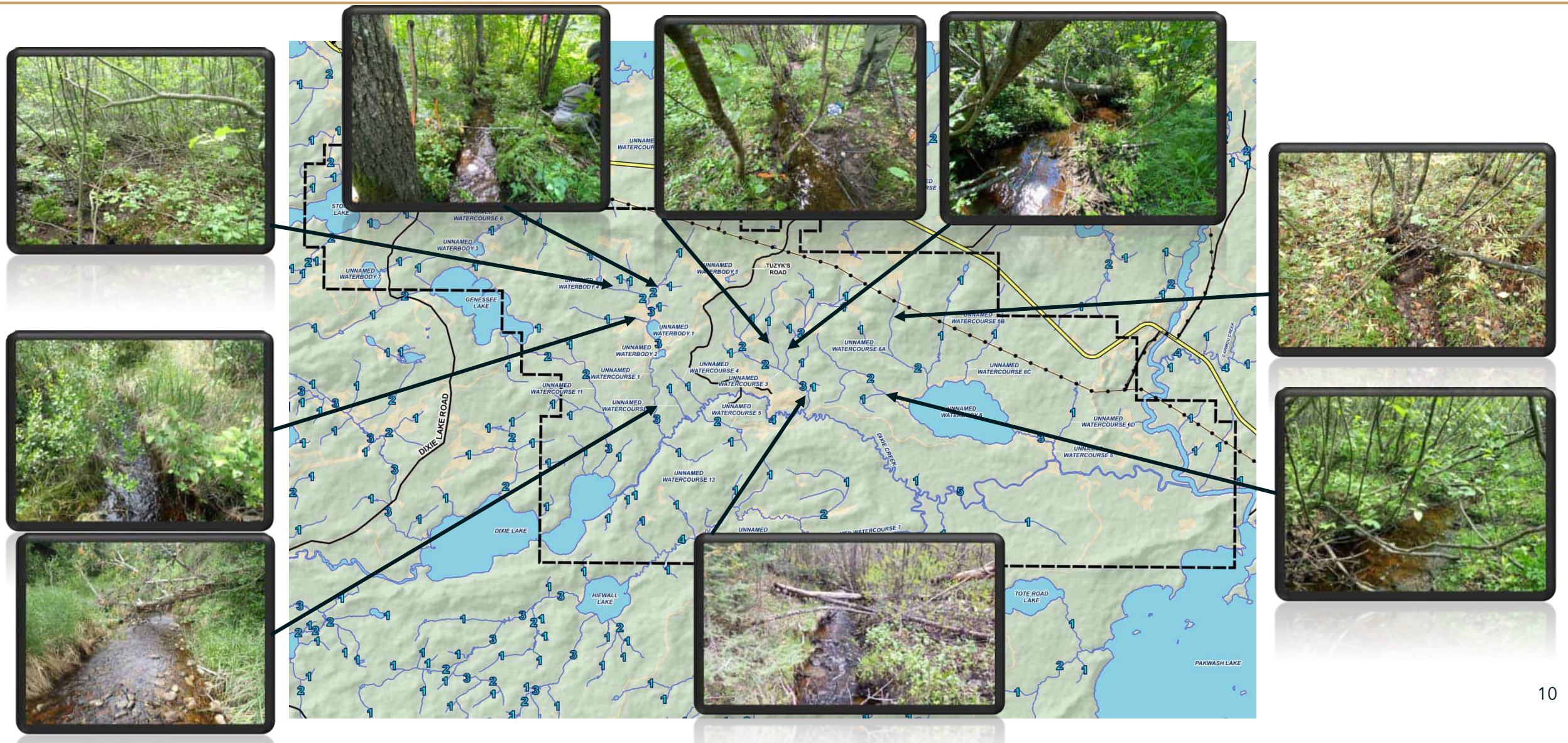
Stream orders 5 and larger, large lakes such as Dixie, Genessee, Pakwash, Gullrock)	Diverse fish communities including small bodied fish and large cool water and cold water sportfish (walleye, northern pike lake whitefish)



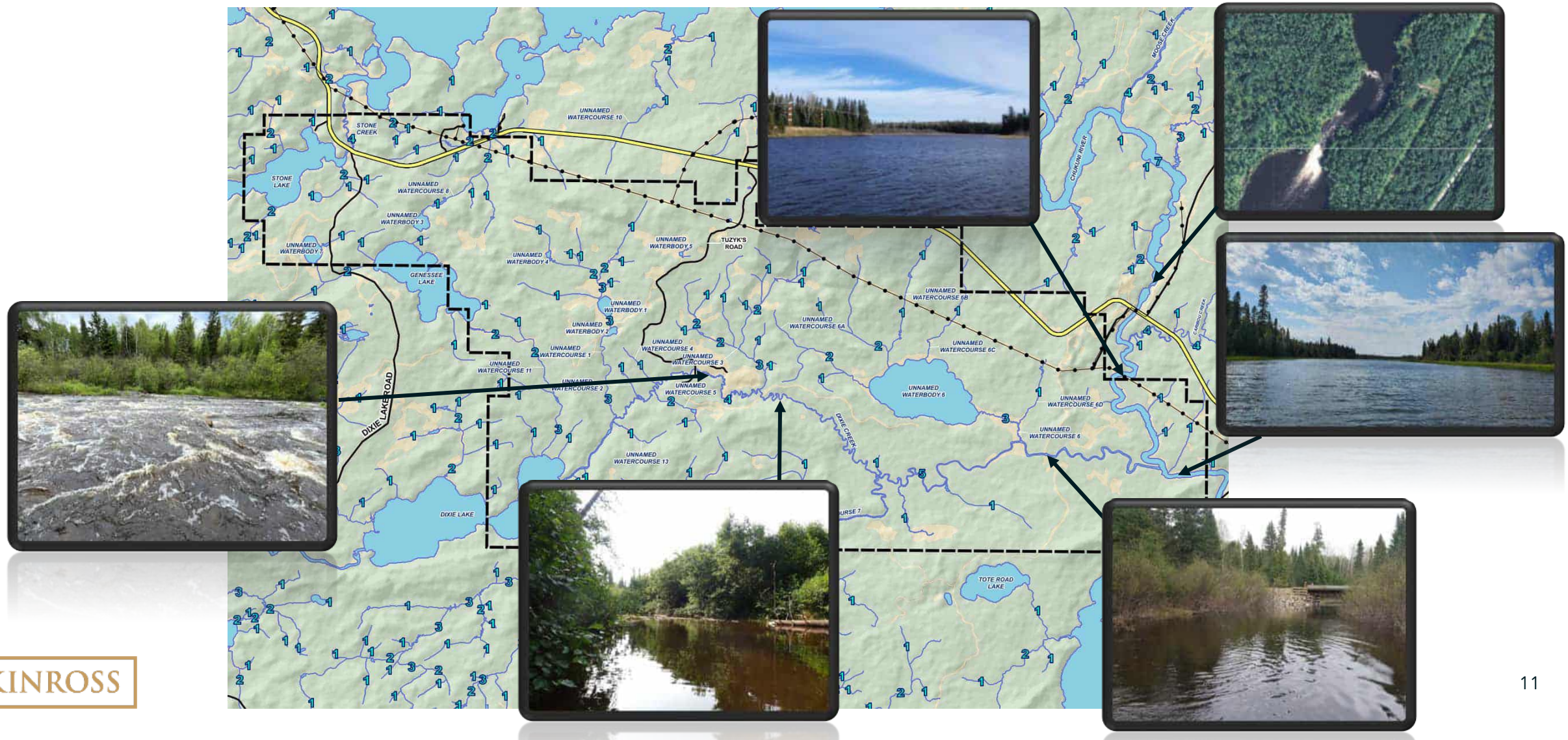
LEGEND
- PROPERTY BOUNDARY
- HIGHWAY
- LOCAL ROAD
- POWER LINE
- WATERCOURSE – LABELLED WITH STREAM ORDER NUMBER (STRAHLER METHOD)
- WATERBODY

INLAND PONDS AND CREEKS → INTERMEDIATE CREEKS AND LAKES (Upper Dixie Creek/ Waterbody 6) → LARGER RIVERS AND LAKES (lower Dixie Creek, Chukuni River / Pakwash Lake

Aquatic Habitat – Small Creeks (stream Order 1-3)



Aquatic Habitat – Larger Creeks and Rivers



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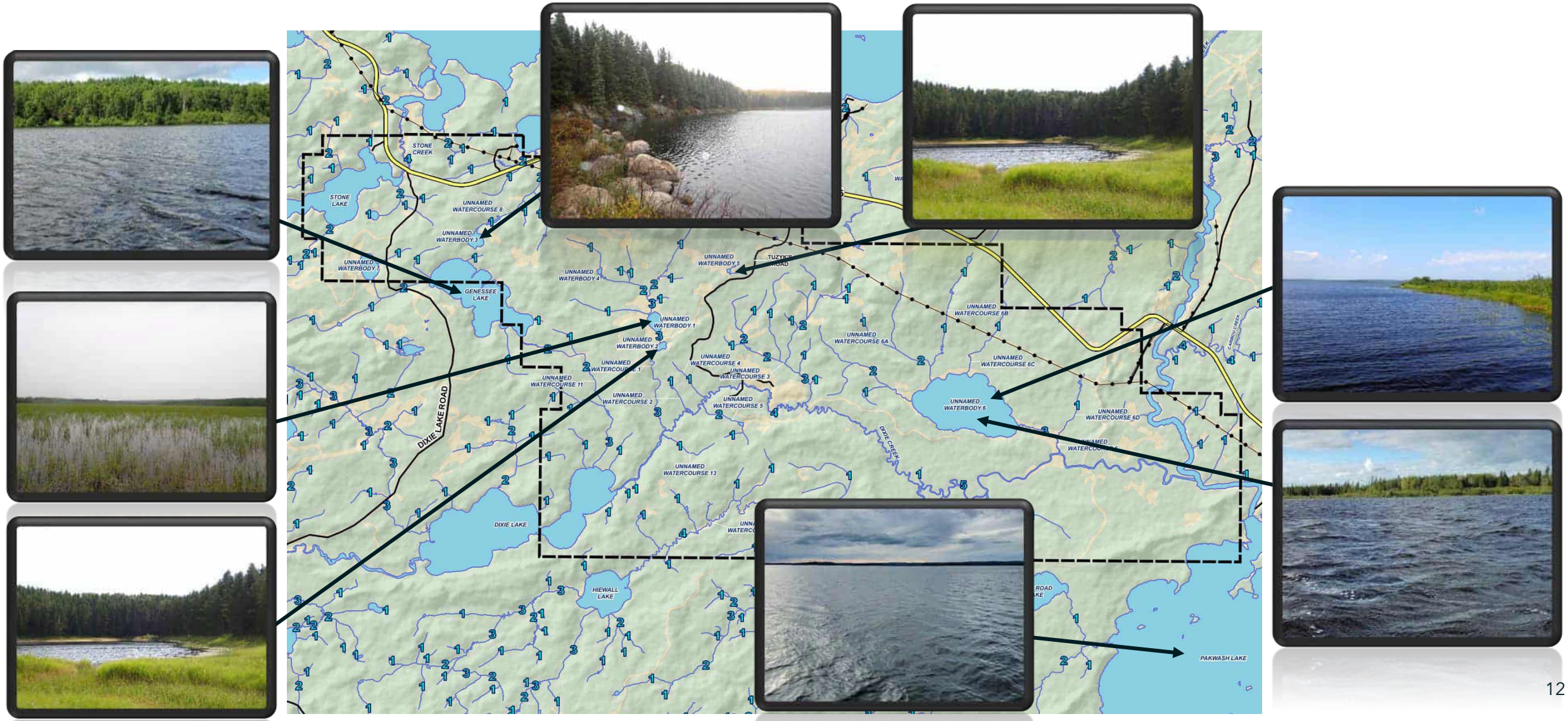
Aquatic Habitat – Ponds / Lakes



Fish Habitat Impacts and Offsetting

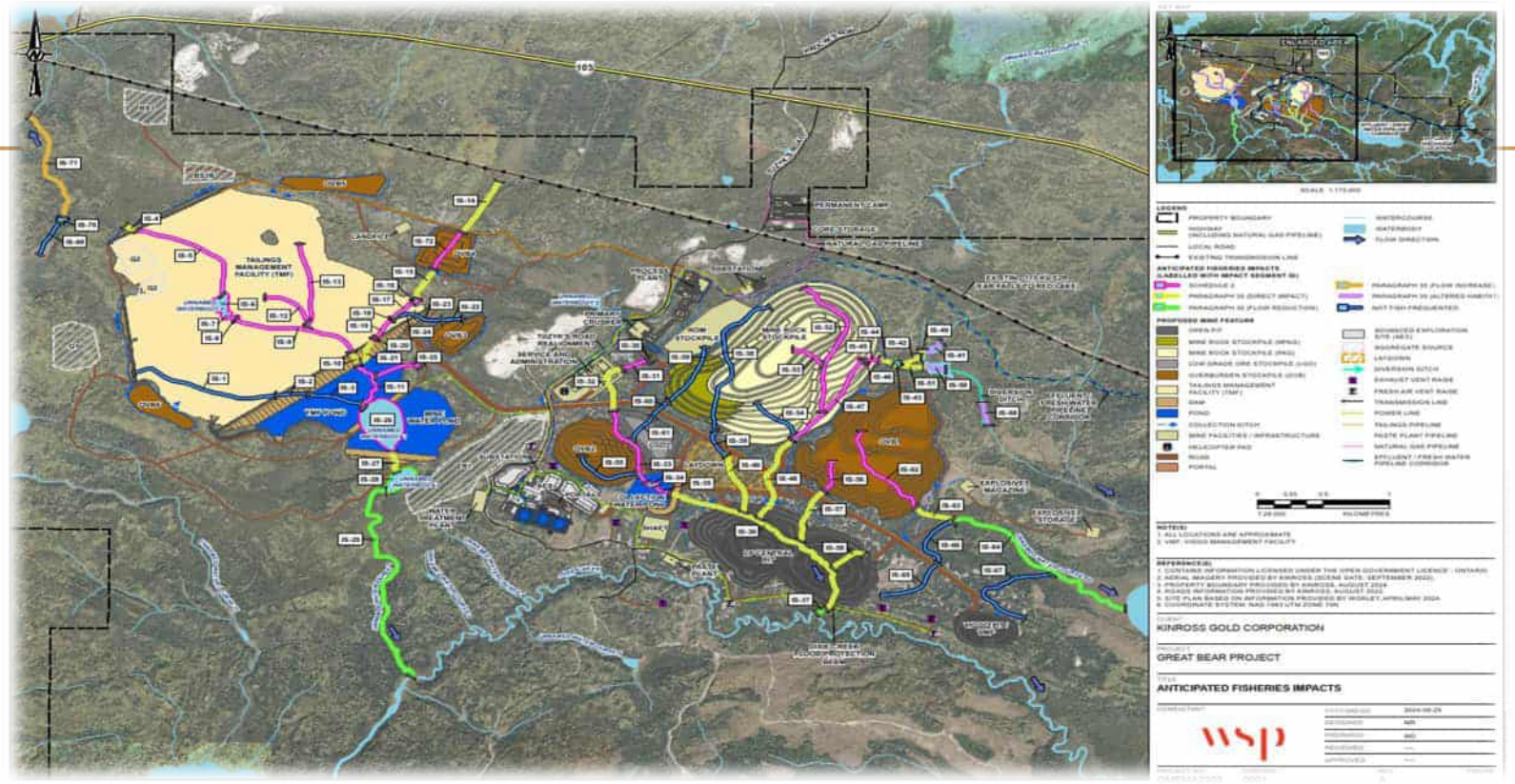
The project will result in some impacts to fish and fish habitat.

We propose to develop offsetting measures (replacing or improving fish habitat) to counterbalance the impacts.

The next 2 pages show the impacts to fish habitat that will occur from the project, and the types of fish habitat offsetting that can be considered.

Preliminary Impacts

- The proposed project is expected to impact approx. 20 ha of fish habitat.
- To offset these impacts, Kinross Great Bear must create new or enhance existing fish habitat.
- The following slides are created to provide examples of potential offsetting measures.
- **We are looking to the community for feedback and suggestions.**



Effect Type	Predicted Schedule 2 and HADD Area (m^2)	Predicted Schedule 2 and HADD Area (ha)
Schedule 2 Total	141,199	14.12
Section 35 Total	56,647	5.66
Not Fish Frequented *	15,882	1.59
Combined Schedule 2 and Section 35 Total	**197,846**	**19.78**

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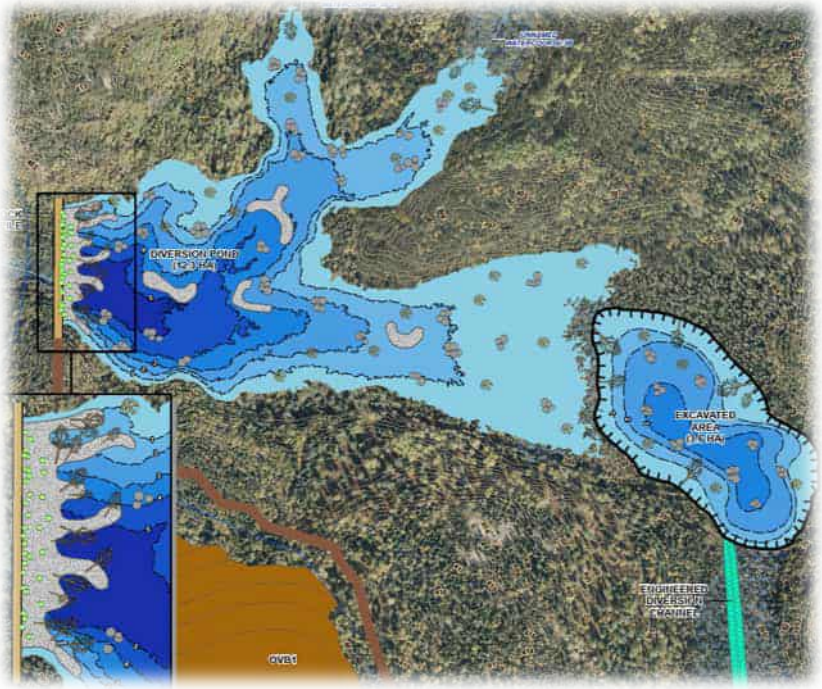
Types of Offsets and Compensation

Measures to offset may be grouped into four general categories	
Habitat Restoration and Enhancement	▪ Add habitat features (boulder clusters, tree piles, spawning stone) ▪ Stabilize stream banks ▪ Remove barriers to fish migration created by people
Habitat Creation	▪ Create new habitat inland or expand existing aquatic habitat
Chemical or Biological Manipulations	▪ Includes chemical treatment for water quality issues and stocking programs, constructed wetlands or control of invasive species
Complementary Measures	▪ Actions like data collection and scientific research related to maintaining or enhancing the conservation and protection of fish and fish habitat. Only considered where there are limited opportunities for on-the-ground measures to offset fish and fish habitat residual effects and can only represent 10% of total offset amount.

Examples

The following examples, specific to the Great Bear Project area, have been developed by WSP for your consideration.

Candidate Offset Measures – New Ponds



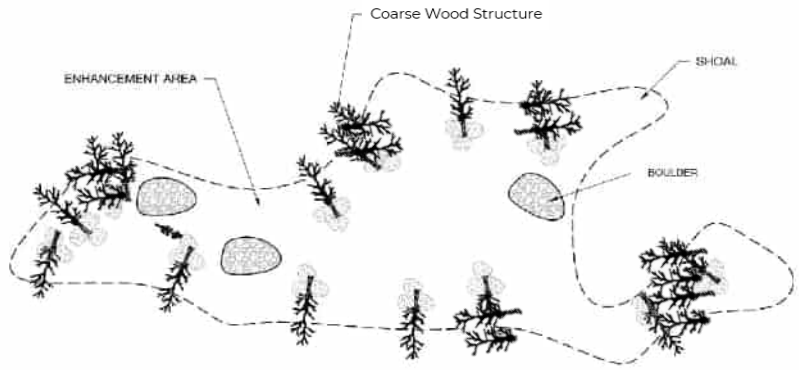
Replace the small lakes and ponds most effected by the project in the same general area of the Project,

The diversion Pond will pass clean water around the site and make a new pond.

More ponds can be excavated beside Dixie Creek.

Use Rocks and trees to provide natural cover for fish

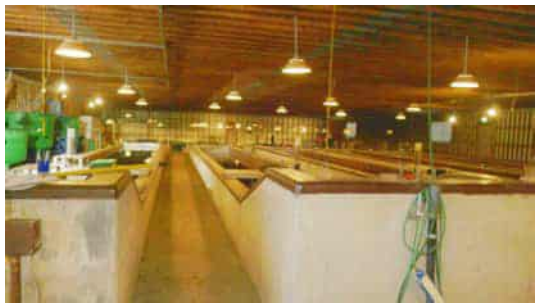
Rock Piles and shoals

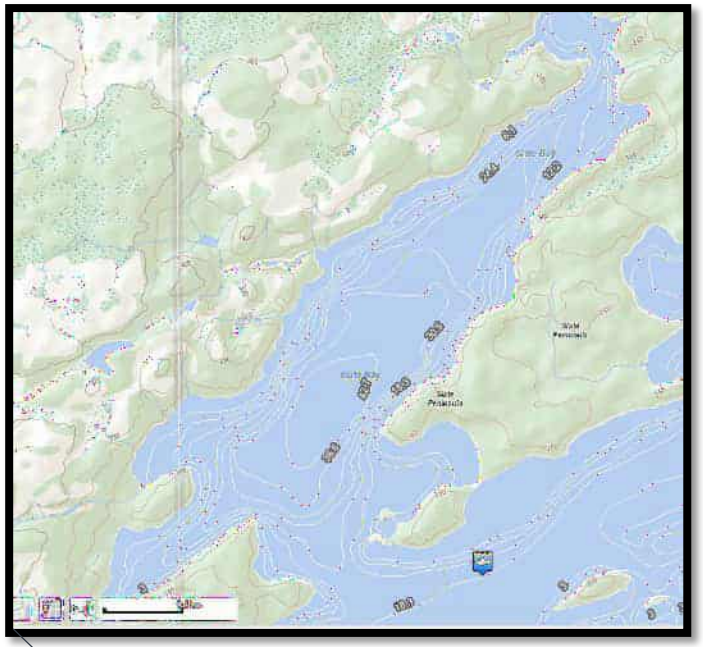


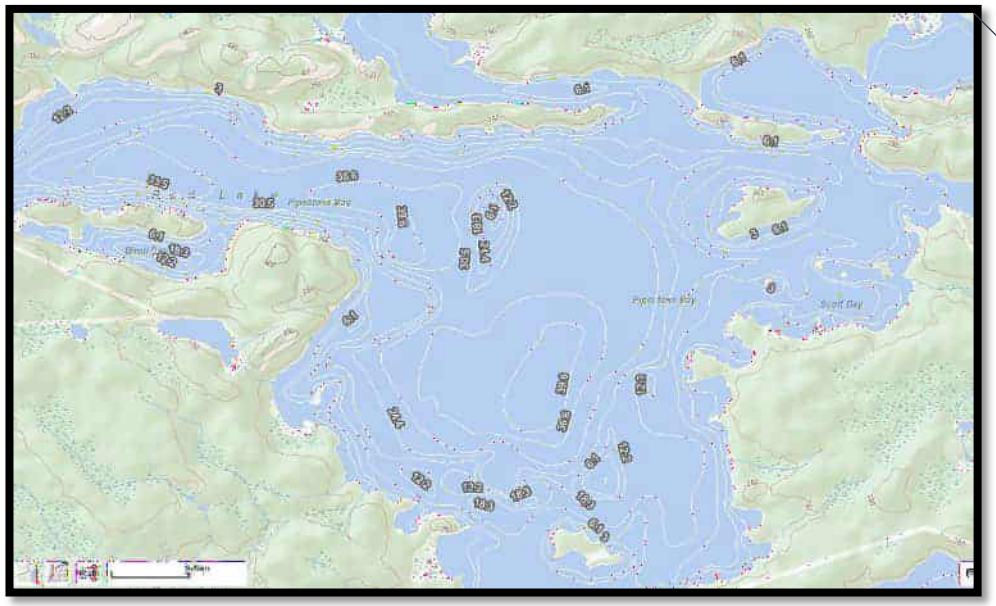
Red Lake Enhancements – Restore Lake Trout Fishery

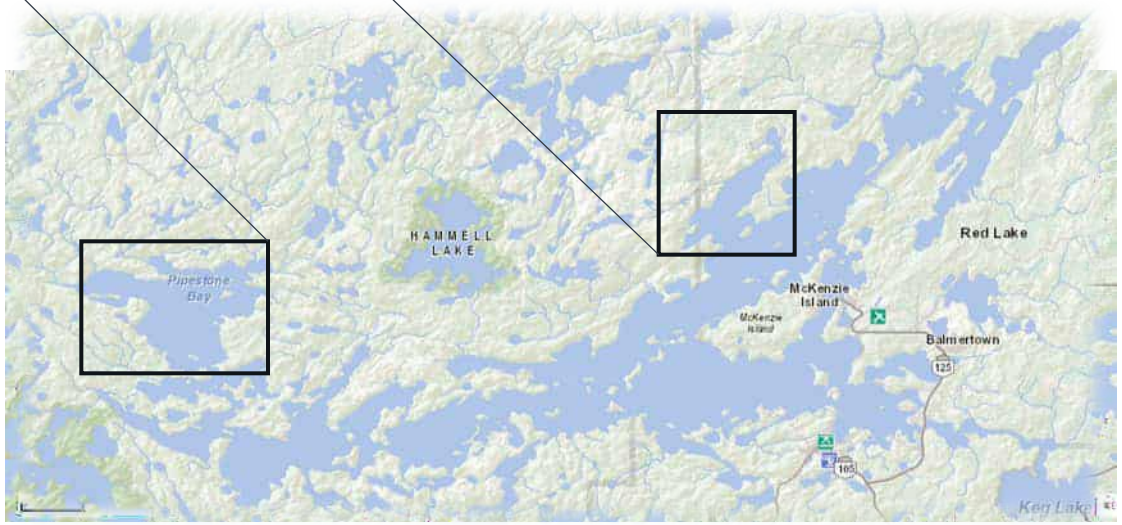
Potential Measure Highlights

- Enhance important life history habitats in Slate Bay
- Seed natural or constructed spawning shoals with fertilized eggs from native Lake Trout.
- Support hatchery efforts by MNR. Look at potential to help develop a hatchery that is local to Red Lake to address stock availability bottleneck.





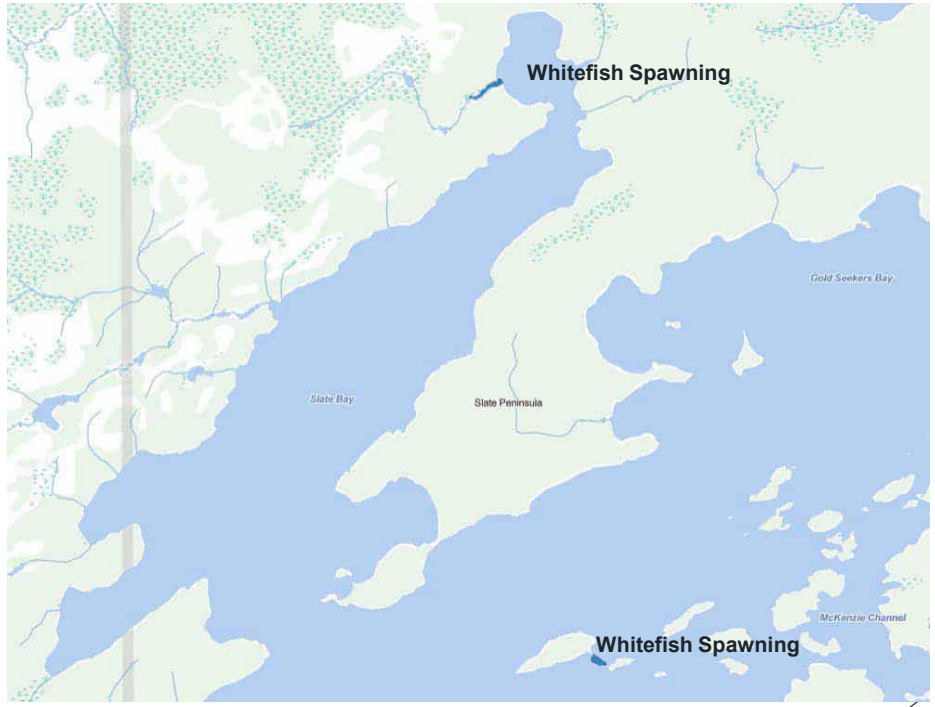


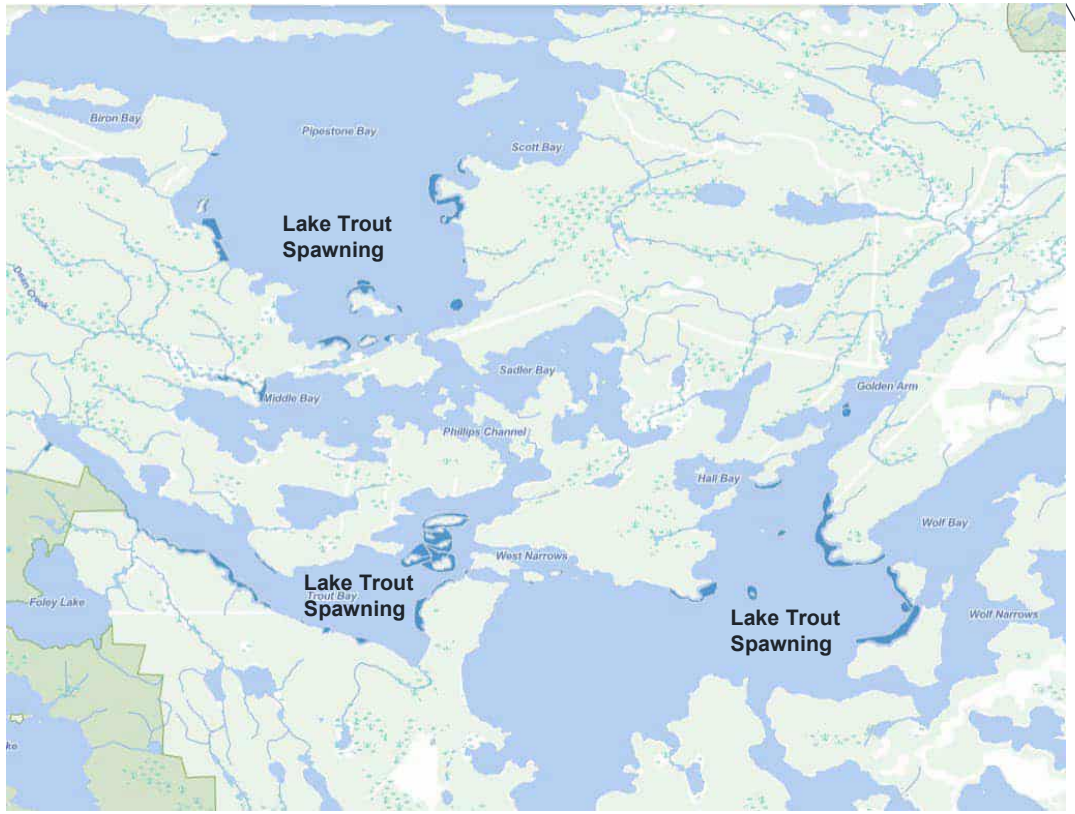


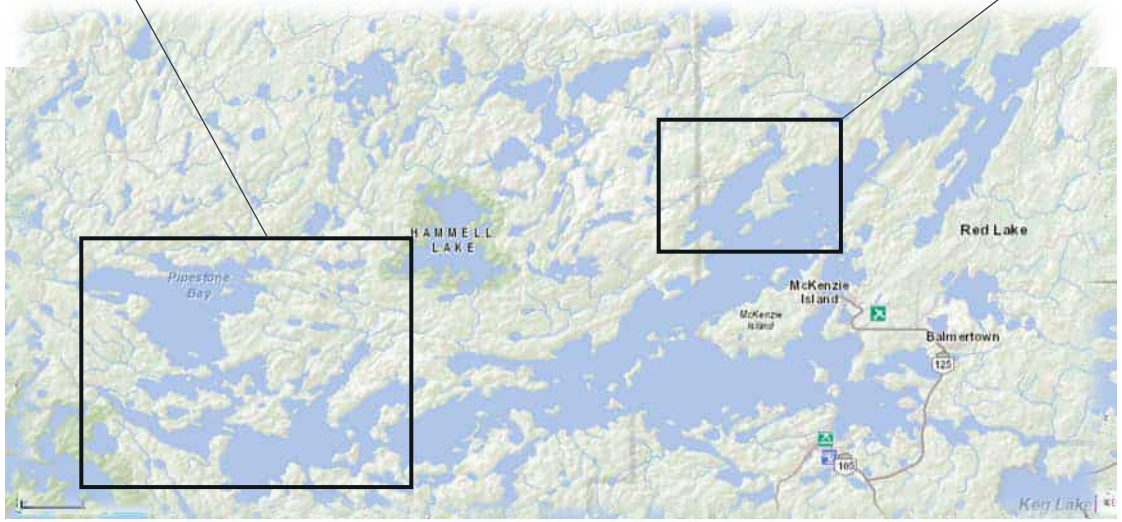
Red Lake Enhancements – Restore Lake Trout Fishery

Potential Measure Highlights

- Historic (known) spawning areas are concentrated near Pipestone Bay to Wolf Bay.
- Water depths to and within Slate Bay are good for supporting Lake Trout.







Other Examples

The following examples have been developed by WSP for your consideration. These are not specific to the Project area but are similar projects in other parts of Ontario.

Are there locations in and around your community that could benefit from a similar initiative?

Examples of Restoration and Enhancement

Culvert and Fish Barrier Replacement with Bridge and Spawning Area

Examples of Restoration and Enhancement

Constructed Riffles - Spawning Substrate

- Can be built to improve habitat complexity between natural waterbodies or constructed as part of new habitat creation (spawning, forage and passage habitat)

Examples of Restoration and Enhancement

Lake Trout and Walleye Spawning Shoal Enhancement

Examples of Restoration and Enhancement

Realigned Creek – Enhanced Features

Natural limitations are opportunities for enhancement:

- What are natural limitations? Enhancements maximize the benefits from a measure.
- Determine success criteria at the start - are you making habitat (m^2) or fish (number of fish) **or both**?

Creek Replacement with enhanced habitat increased total habitat area

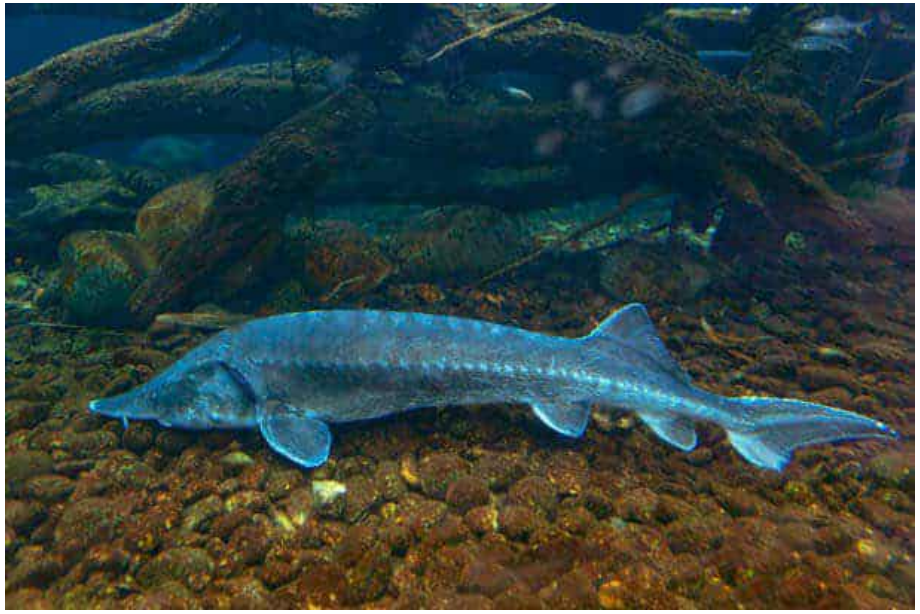
Enhancement resulted in greater than 100% increase in trout

Examples of Complimentary Measures

Research and Development - data collection and scientific research related to maintaining or enhancing the conservation and protection of fish and fish habitat.

eDNA - although becoming more common in surveys to assess species presence, environmental DNA (metabarcoding and PCR) sampling can be an important research tool for species distribution and Species at Risk investigations.

Science Gaps - collecting data on a species or habitat where a science gap exists.



Examples of Habitat Creation

Low berm impoundment

- ✓ **Provides complex wetland and fish habitat (ecosystem approach)**
- ✓ **Makes use of existing topography**

Low Berm Structure at Construction

Examples of Habitat Creation

Pond / Lake Excavation – Within low lying areas to match natural landscape

Basin Extension to Existing Lake

Other Habitat Considerations (Ecosystem Approach)

Tree Snags and Cavity Trees

Rock Piles

Brush Piles

Turtle Nesting Structures

Engineering, Social and Ecology Goals need to Match

Consider the function and uses of the measures into the engineering:

- Beaver are expected to colonize diversions channels
- People may have access and a desire to harvest fish
- Consider long-term risk and management.

How do we compile a list of Candidate Offset Measures?

1) **Talking with First Nation Communities, Local Natural Resource User Groups (e.g., fish and game clubs, Outfitters), Provincial Regulators (e.g., MNR) and Others.**

   - Create a list of measures, as much detail as able
   - Are there any baseline data collected?
     - ✓ Add to the decision matrix…

2) **Candidate Measures are Assessed Using a Matrix**

   - ✓ Relevance of measures to project development
   - ✓ Alignment with First Nations and stakeholder interests
   - ✓ Simplicity of construction and monitoring
   - ✓ Compatible with surrounding land use
   - ✓ Constructability and land tenure
   - ✓ Cost Implications

Candidate Measures are ranked using a (1) to (6) scale, with the cumulative score providing a list of highest to lowest rankings.

KINROSS Great Bear

Contact Info

807.631.6769

greatbearinfo@kinross.com

mpensation Measures

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Asubpeeschoseewagong
Netum Anishinabek
GRASSY NARROWS, ONTARIO P0X 1B0 • PHONE: (807) 925-2201 • FAX: (807) 925-2649

April 28 2025

BY EMAIL

Attention: Aaron MacDonnell
Director, Environmental Services
Kinross Gold Corp.

Dear Aaron MacDonnell,

RE: Grassy Narrows' Collective Rights

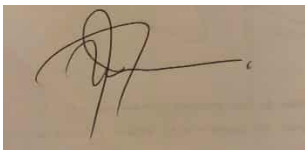
On behalf of Asubpeeschoseewagong Anishinabek ("ANA" or "Grassy Narrows"), we write in relation to your Company's engagement with our community.

We have recently been made aware that representatives from your Company have been approaching individual Grassy Narrows members and trapline holders with respect to your proposed Great Bear Gold Project.

As you know, Grassy Narrows Chief and Council have provided the Land Protection Team with a mandate to engage with your Company with respect to this Project on behalf of Grassy Narrows First Nation. Aboriginal and Treaty rights are communal rights and the duty to consult in regard to these rights is owed to the community as a whole.

We expect that you will respect Chief and Council's direction and continue to engage with the Land Protection Team with respect to Grassy Narrows' inherent, Aboriginal, and Treaty rights.

Miigwetch,



Joseph Fobister
Lead Negotiator, Grassy Narrows Lands Protection Team

Cc:

ANA Lands Protection Team
Mike Fobister, Lands Team Supervisor (mike.fobister@googlemail.com)
David Sone, ANA Advisor (david.sone@gmail.com)
Jackie Esmonde, ANA Legal Counsel (jesmonde@cavalluzzo.com)
Sydney Lang, ANA Legal Counsel (slang@cavalluzzo.com)
Dan Mossip-Balkwill, ANA Advisor (dan.mossip.balkwill@gmail.com)

Annelies Cooper, ANA Advisor (annelies.cooper@gmail.com)

Kinross/Great Bear
Luke Crosby, Legal Counsel (luke.crosby@kinross.com)
David Bursey (burseyd@bennettjones.com)

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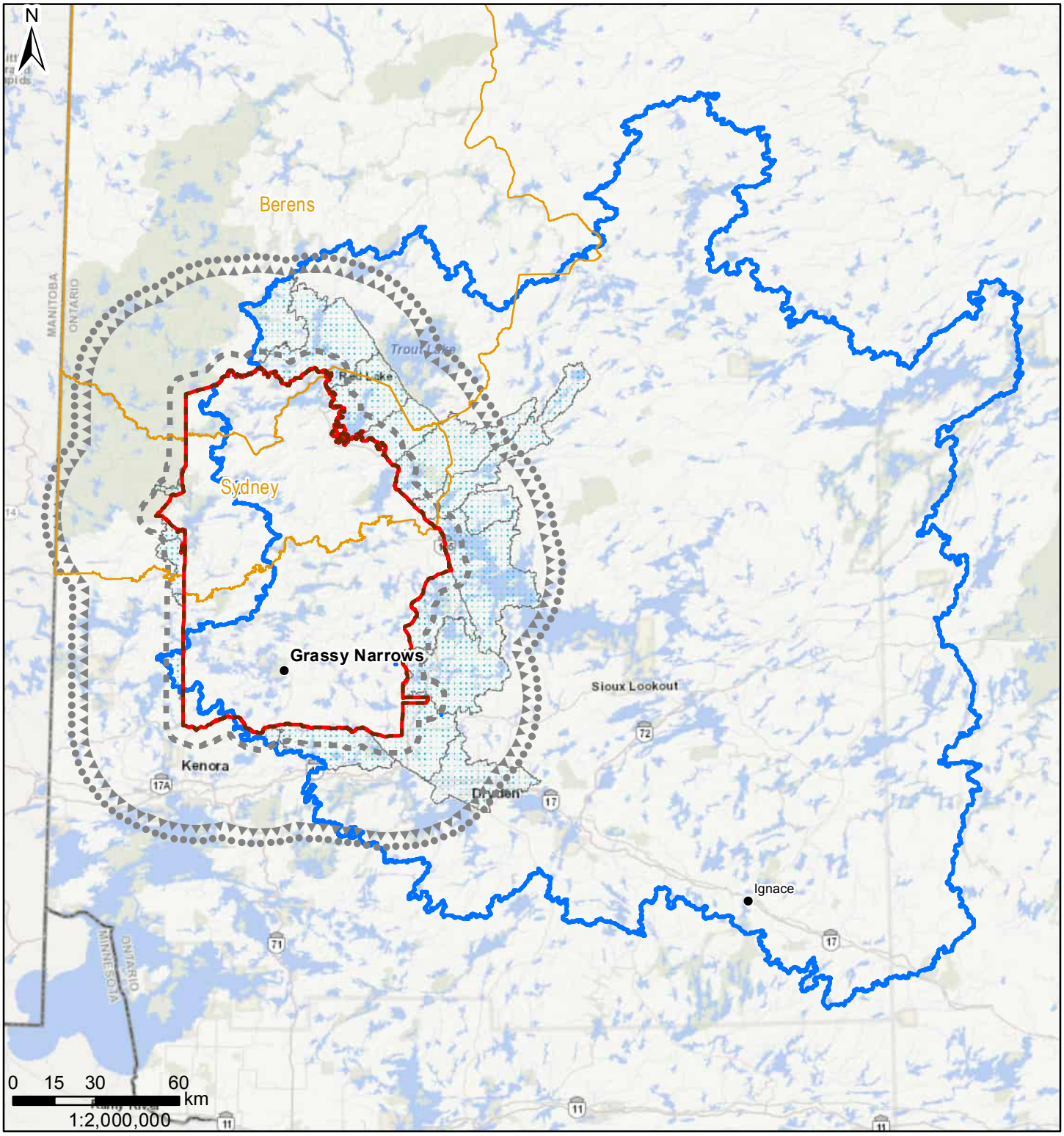
Asubpeeschoseewagong (Grassy Narrows) Interim Core Area of Interest for Mining



- Interim Core Area of Interest for Mining
- Moose Home Range (6km)
- Wolverine Home Range Area (36km)
- Walleye Migration Area (40km)
- Caribou Range Boundaries
- Nearby Quaternary Watersheds That Flow Into The Core
- English River Watershed at Separation Narrows

N.B. This is an interim product created under duress arising from the escalation of imposed mining activity by the Crown and industry and for the sole purpose of identifying an interim area for negotiations on mining related activity. It is not a complete representation of Grassy Narrows' area of interest. Due to unique circumstances and capacity constraints Grassy Narrows has not completed comprehensive studies required to fully determine its area of interest including, but not limited to, land use and occupancy, ethnohistory, archeaology, biology, and hydrology. For example, rights and interests associated with air quality, migratory birds, travel routes, marten, lake sturgeon, wolves, eastern cougar, landscape intactness, climate resilience, biodiversity, genetic diversity, and many other factors are not reflected here. Also, linear boundaries are an imposed non-Indigenous concept that does not accord with the nature of Grassy Narrows' relationship with the land which includes extensive interconnectedness, reciprocity, travel, sharing, and trade. This map does not limit any claims by Grassy Narrows people to assert their rights and interests throughout their territory and to protect themselves from harm to their health, rights, way of life, livelihood, society, and environment. Grassy Narrows people have Treaty rights, and practice them, throughout the Treaty 3 area. Grassy Narrows people also have inalienable inherent rights given by the Creator, some of which are affirmed in international law and instruments. The Grassy Narrows people are the true experts about their land, rights, and interests.

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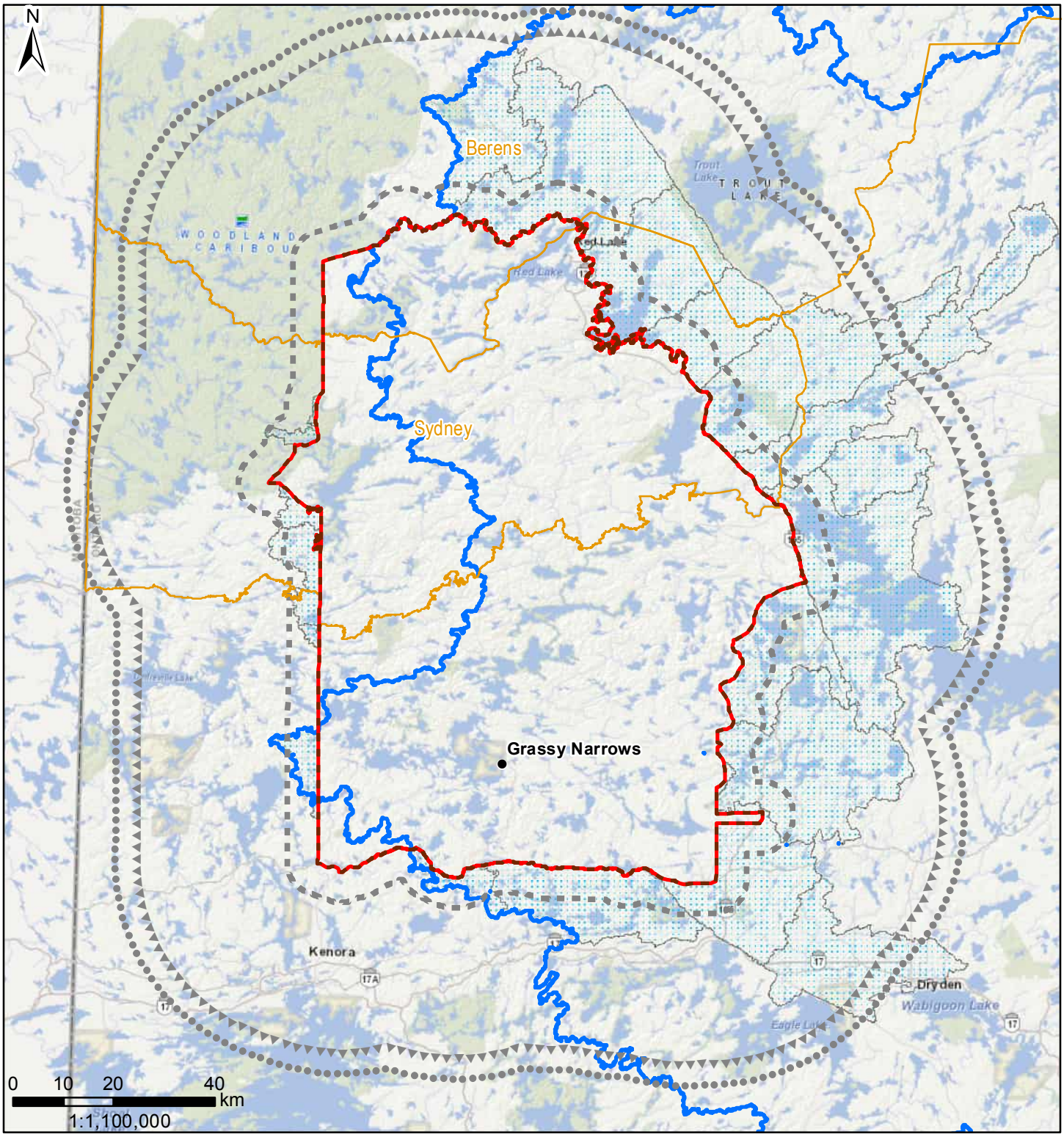
Asubpeeschoseewagong (Grassy Narrows) Interim Core Area of Interest for Mining



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Asubpeeschoseewagong
Netum Anishinabek
GRASSY NARROWS, ONTARIO P0X 1B0 • PHONE: (807) 925-2201 • FAX: (807) 925-2649

April 10, 2025

Great Bear Resources Ltd.
25 York Street, 17th Floor
Toronto, ON. M5J 2V5

SENT VIA EMAIL: bruno.almeida@kinross.com; Crystal.McCullough@Kinross.com

Dear Bruno Almeida;

NOTICE

On behalf of Asubpeeschoseewagong Anishinabek ("ANA" or "Grassy Narrows First Nation" or "Grassy Narrows"), we write to inform you that you hold claims, leases, or other mining tenures within the Grassy Narrows Interim Core Area of Interest for Mining ("Core Area").

Area Subject to Grassy Narrows Interests

We are concerned that you and your associates at your company, Great Bear Resources Ltd. have staked or acquired claims, or tenures derived from them, within the Interim Core Area of Interest for Mining, and on our Territory. We are further concerned that you have made no attempt to contact our First Nation to inform us about your plans and intentions, staking activities, and any early exploration activities that you have carried out, and to hear what we have to say.

We have attached a map of our Core Area at two different scales. Please note that this interim map is not comprehensive and is subject to change.

Grassy Narrows has a longstanding connection to the claimed area dating back to the time of the Treaty and before. Our ancestors have practiced, and we currently continue to practice our Anishinaabe way of life; a way of life that relies on a healthy environment and is central to our identity, health, wellness, and livelihood. This area is part of the whole that forms the sacred landscape which gives us life and which we are in relationship within every aspect of our lives, hearts, spirits, and dreams.

Our community members exercise our Treaty rights in the claimed area through activities such as hunting, travel, camping, fishing, gathering medicines, and teaching their children the Anishinaabe way of life. Our community members boat, canoe, portage, and camp in the vicinity of the claimed area, and in the process, they hunt, fish, gather plants, and drink the water.

Your company's mining claims or tenure also fall within the range of wildlife such as moose, wolverine, and caribou that may travel within our Indigenous Protected and Conserved Area ("IPCA"). In addition, walleye within the area of your mining claims or tenure may also migrate to the IPCA. These are indicator species for a wide range of terrestrial and water-based creatures

that we use which spend part of their lives within the claimed area and would be impacted by mining activities. Birds that we use would also spend part of their lives within the claimed area.

We are on a healing journey, trying to recover from the extreme damage that colonization and attempted forced assimilation have done to our people, including through the imposition of Crown policy and regulatory schemes related to residential schools, dams, relocation, mercury contamination, child apprehension, industrial logging, and mining. Our environment, culture, society, economy, and health have been harmed. We need to allow the land to heal because healthy land will help to heal our people. This is what reconciliation means to Grassy Narrows. We have called on Ontario and on companies to stop pushing mining activity and industrial logging on us. We call on you and your associates at your company to let us protect our land so that we can heal our people.

We strongly urge you to reconsider your plans in our Core Area and to seize this opportunity to set a course for a future that is free of conflict over mining.

Area Subject to Cumulative Effects

For many generations the Crown has imposed harmful law and policy on us, including through the Indian Act, the banning of our ceremonies, residential schools, relocation, the 60s scoop, and the ongoing removal of our children from our community. These policies have caused grave harm to our people and impaired the exercise of our rights. They have undermined our strong society and way of life and have left us more vulnerable to the impacts of industry.

At the same time, Grassy Narrows people and our Territory have been subjected to a long series of industrial attacks which have been imposed on us against our will. These include the damming of our river, mercury pollution, industrial logging, and mining activity. Each of these industrial attacks have had grave impacts on their own which have been well documented. In addition, each of these industrial attacks has compounded the existing harm that remains from previous attacks, creating unbearable cumulative impacts, thereby prolonging and exacerbating our inter-generational crisis.

These extreme and compounding industrial impacts have been carried out by industry, and allowed by the Crown, without any serious consideration of their cumulative effects on Grassy Narrows and the exercise of Grassy Narrows' rights. We have raised clear concerns, since the 1970s at least, that our environment, rights, way of life, and our health were at or beyond the breaking point due to the impacts of industry on the resources on which we have heavily relied for our wellbeing, livelihood, and the viability of our community. We have repeatedly requested environmental assessments. To this day, with respect to our Territory, industry and the Crown have failed to conduct a collaborative Land use Plan; failed to complete a source water protection plan; failed to carry out an environmental assessment; and failed to undertake an assessment of cumulative effects.

Our river that gives us life remains poisoned.

Our walleye are unsafe to eat.

Our sturgeon are rare.

Our moose are scarce.

Our caribou are nearly extirpated.

Our pine marten habitat is depleted.

Our medicines are tainted.

Our sacred landscape is desecrated and scarred.

Our way of life is diminished.

Our people suffer from poverty, food insecurity, disease, and premature death.

Our Treaty rights are impaired, our health has been harmed, and we have been discriminated against.

The crisis that was created by mercury, damming, and relocation, and which has been exacerbated by industrial logging and mining activity, continues.

And yet your company has staked or acquired mining claims or tenure on our Territory. This risks taking us farther past the point of “reasonable,” “justifiable” impacts on Grassy Narrows’ rights, health, and way of life.

We are long past the time when the industry and the Crown should have listened to Grassy Narrows when we said enough is enough. We are decades past the time when industry and the Crown should have realized that the harm to Grassy Narrows was too much, and the Treaty promises were being dishonourably compromised by imposed industry allowed by the Crown. The Crown and industry can no longer impose further impacts on our land and our people when the cumulative impacts from past development mean that any further imposed industry will unjustifiably infringe our Treaty rights, harm our health, and discriminate against us.

We ask your company to open your heart and to respect Grassy Narrows.

Area Subject to Treaty Land Entitlement Claim

We would like to ensure that you are aware that Grassy Narrows has an active Treaty Land Entitlement (“TLE”) claim that has been accepted by the Crown and is under negotiation for resolution. Part of the resolution of the claim will include an addition to Grassy Narrows' reserve lands, and compensation for lost use. Grassy Narrows is currently engaged in a process to select its additional reserve lands. All of Grassy Narrows Territory is currently potential reserve lands additions under consideration.

The Crown has asserted that lands which have encumbrances, such as mining claims, will be more challenging to designate as additional reserve lands. This means that your mining claims and tenures adversely impact our ability to select reserve land additions and are an impediment to the successful resolution of our TLE claim.

Further, lands which have been impacted by mining exploration such as cutting lines, pitting, trenching, stripping, and drilling, decline in ecological health, experience a degradation of their intactness, and therefore become less suitable as additional reserve lands. Over the last few decades, vast parts of our Territory have been encumbered and degraded through industrial actions imposed on Grassy Narrows. This has severely restricted the available suitable

additional reserve lands.

Grassy Narrows has been clear that there should be no new encumbrances on our Territory, and no new degradation to our Territory, as this would unfairly further reduce the available suitable additional reserve lands (in addition to other impacts outlined elsewhere). This would impair the ability to correct the injustice that was done to us by having been denied a fairly sized reserve for over a century.

Area Subject to Litigation

Grassy Narrows has commenced two legal proceedings addressing Crown failures that have the potential to impact your company's mining interests in Grassy Narrows' Core Area.

First, on June 4, 2024, Grassy Narrows served Ontario and Canada with notice of our intention to sue for breach of Treaty obligations, fiduciary duties, and obligations arising from the Honour of the Crown by failing to protect Grassy Narrows Treaty rights, including from:

- The effects of mercury and other pollutants discharged by the pulp and paper mill in Dryden, Ontario, into the English and Wabigoon River System; and

- The cumulative impacts of industry and land use including mining activity.

Paragraph 95 of the Statement of Claim addresses the issue of the Crown's continued authorization of industrial activities that increase the mercury load, net methylation, bioavailability and biomagnification in the ecosystem.

Paragraph 102 outlines the cumulative impacts of industry and land use that have interfered with Grassy Narrows' Treaty rights, including contaminating air, land and water in and around the Area, degrading the land important to hunting, trapping, fishing and gathering, impacting wildlife habitat and populations, and interfering with the spiritual and cultural integrity of the Area and Grassy Narrows' relationship to it, among other things. Paragraph 103 addresses the harms caused by these cumulative impacts of industry and land use.

Your mining claims and other tenures continue the unlawful and harmful Crown conduct that is the subject of the lawsuit.

Secondly, on July 12, 2024, Grassy Narrows served a Notice of Application on Ontario asserting that the Mining Act regime violates section 35 of the *Constitution Act, 1982* by failing to consult, accommodate or obtain consent prior to registering mining claims within the Interim Core Area of Interest for Mining.

Grassy Narrows is seeking a declaration that mining claims registered pursuant to this unconstitutional regime and further mining tenures derived from those leases are invalid, which would include any claims, leases, and patents registered by your company in the Area. Ontario did not consult, accommodate nor obtain consent from Grassy Narrows prior to registering your company's mining claims, and the leases, patents and other mining tenures derived from them.

As relief, Grassy Narrows is seeking a declaration that "existing mining claims, including mining activities such assessment work and exploration activities, and third-party mining interests granted under the Mining Claim Grant Regime within the Area are not consistent with section 35 of the *Constitution Act, 1982* and UNDRIP and are of no force or effect."

If Grassy Narrows is successful in either or both of these legal proceedings, your company's mining claims and other tenures would potentially be impacted and could be invalidated.

Area Subject to Unmet Legal Duties

In 1978, Ontario and Canada signed a Memorandum of Understanding ("1978 MOU") with Grassy Narrows in which the Crown committed to resolve in good faith the impacts of mercury on the environment that Grassy Narrows people heavily relied upon for the viability of our community, and the related health, social, economic, cultural, and environmental impacts on the people of Grassy Narrows. It was agreed that the issues would be resolved through a combination of financial compensation and land, or control over land, and furthermore in a manner that would enhance Grassy Narrows' self-determination, self-sufficiency, and control over local affairs wherever possible.

Although some agreements were reached, there remain outstanding obligations on the Crown, including with respect to increasing Grassy Narrows control and self-determination over Grassy Narrows lands. From the outset of our discussions under the 1978 MOU, Grassy Narrows was clear that in order to recover from the impacts of mercury and other harms, we need Crown recognition of Grassy Narrows' ownership, control, and protection of our Territory which will allow Grassy Narrows to make decisions with respect to our Territory that support our way of life and our livelihood. In the 1970s, 1980s, and 1990s Ontario committed to negotiate increased Grassy Narrows control over our lands, in addition to providing meaningful compensation for our people. However, those negotiations and obligations remain unresolved.

The Crown and Grassy Narrows have a fiduciary relationship, and our Treaty rights attract fiduciary obligations. When the Crown seized functional management and control of our lands and water, including through use of force, in the time since the Crown and Grassy Narrows entered into a Treaty relationship, the Crown assumed a duty to Grassy Narrows when exercising that imposed control over our Indigenous interests including our pre-existing legal interests in exercising our fishing, hunting and trapping rights and other traditional practices, including our medicine gathering and wild-rice picking. Grassy Narrows has been at the mercy of the exercise of Ontario's imposed fiduciary decision-making over our Territory as Ontario unilaterally authorized industrial activity, and otherwise has made decisions that affect the land, water and other natural resources of our Territory which we rely on to exercise our rights, practice our way of life, and maintain our health.

Under imposed Crown management and discretionary control, the health of our Territory and our people have seriously declined, our way of life has been degraded, and the exercise of our Treaty rights has been impaired.

In the 1980s, and since, we called for a moratorium on industrial activity in our Territory until our negotiations with Ontario were concluded.

However, rather than honour this moratorium, the Treaty promises, and the 1978 MOU obligations, Ontario abandoned the negotiations in the mid-1990s and exercised its imposed control in a way that unleashed industry on our Territory to our detriment.

The Crown's dishonourable conduct and abandonment of its fiduciary obligations continue. And now instead of helping to set us on a path back to health, prosperity, and wellness, as promised, the Ministry has granted thousands of mining claims and approved numerous exploration

permits on our Territory. This conduct will compound the harms imposed on our people by further compromising our health and degrading our Territory and impairing and unreasonably limiting the exercise of our rights.

The failure of the Crown to uphold its honour and its fiduciary duty to us has the potential to impact the legitimacy of your claims and your ability to carry out mining exploration activity on them.

Grassy Narrows calls on your company to respect Grassy Narrows' law and rights

We call on Great Bear Resources Ltd. to respect Grassy Narrows' law and our inherent, Aboriginal, and Treaty rights, and to commit to comply with Grassy Narrows' rights and laws.

We call on your company to halt all staking and mineral exploration and mining related activities within the Interim Core Area of Interest for Mining and to confirm this halt in writing with us.

We call on your company to commit to gain our free, prior and informed consent before staking any claims, applying for any tenures, and carrying out any activities within the Interim Core Area of Interest for Mining.

We further call on your company to engage with us, and to gain our free, prior, and informed consent, for activities that are outside of our Core Area, but which may have upstream or downstream, downwind, migratory, or other off-site impacts on our Core Area and our people.

Request to meet to identify and resolve any conflicting third-party interests

If you insist on continuing to hold interests in and operate these claims or other mining tenures in our Core Area of Interest for Mining and that may impact our IPCA, despite the information shared with you in this correspondence – that such activity would be in violation of our ANA law, and our rights and interests and in an area with excessive existing cumulative impacts, that conflicts with our TLE process, and is subject to litigation – then we raise the following additional considerations which form a barrier to us meaningfully understanding your interest in our Core Area and engaging with you about these claims:

1) **Insufficient information:** You have yet to provide ANA with any information related to your past and planned activities with these claims. We have enclosed a list of questions at Appendix A for your company to complete with respect to your activities in our Core Area. Please provide detailed responses to allow ANA to better understand your activities and to prepare to evaluate them.

2) **Capacity funding:** The process of evaluating your activities and engaging with your company comes at an expense to ANA. We must hire staff, engage our community, and obtain professional support from experts, lawyers, and advisors to engage with you in a meaningful way. Our First Nation is even more impoverished than our First Nation peers due to the ongoing impacts of mercury poisoning. We lack the funds required to engage in an informed way. Please commit to funding ANA's reasonable costs of engaging with your company.

3) **Mercury Crisis:** Our territory has already experienced a great deal of harm from industrial activities including mercury, damming, and industrial logging. The cumulative effects of these industrial impacts have already passed the point of an unreasonable,

unjustifiable impact on the exercise of our Treaty rights, and on our health and wellbeing. As a result, our community suffers from unusually high rates of conditions including poverty, food insecurity, disease, neurological conditions, conditions affecting learning, and premature death. We cannot tolerate any further imposed impacts to our environment, our rights, our health, and our wellbeing. As well, the social conditions created by mercury poisoning and the cumulative impacts of industry place us in an ongoing crisis which make us unable to meaningfully engage on mining exploration. We require that the Crown resolve our ongoing crisis caused by mercury contamination and cumulative impacts before we can meaningfully engage about mining.

4) **Fundamental matters must be addressed:** For decades Grassy Narrows has been raising important matters with the Crown including mercury justice, self-determination, unmet obligations, Treaty rights, cumulative impacts, withdrawals, free entry, land use designations, and land protection. Grassy Narrows has invited Ontario to a table to find honourable resolutions to these matters. For years, Ontario has refused to even come to the table. Ontario continues to refuse to come to the table on the fundamental issues that require negotiation. The issues with these many mining claims and other tenures flow from larger upstream strategic issues which continue to fester because Ontario refuses to engage on them, but rather seeks to impose their unilateral will on Grassy Narrows. As the decades pass, it is Grassy Narrows people and our environment who suffer as a result. Ontario must deal honourably with Grassy Narrows by resolving in good faith these long-standing matters.

Grassy Narrows requests that you and your associates at your company meet with the Grassy Narrows Lands Protection Team, once the above barriers have been addressed, to identify and discuss any third-party interests you and your associates at your company may have in the Interim Core Area of Interest for Mining that conflict with Grassy Narrows' rights and interests.

In preparation for a meeting and to ensure it is constructive amongst the parties, Grassy Narrows requests that you and your associates at your company respond to this letter in writing to:

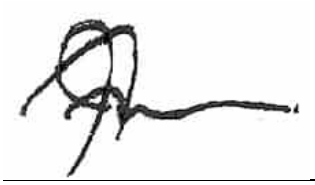
- Confirm your company's attendance at the corporate stakeholder meeting;
- Specify your company's representatives, and their positions, who will attend the meeting;
- Commit to respect the ANA Law and confirm your agreement not to pursue any mining-related activities within the Interim Core Area of Interest for Mining without ANA's free, prior, and informed consent;
- Commit that your company will work with Grassy Narrows in good faith to resolve any potentially conflicting third-party interests in the Interim Core Area of Interest for Mining;
- Specify with particulars any third-party interests you believe exist in the area proposed as the Interim Core Area of Interest for Mining with relation to your company's staked claims or tenures and any concerns which may need to be resolved, and your suggested resolution; and
- Respond to the questions that are listed in Appendix A.

Please respond within 90 days and address all correspondence to Joseph Fobister, Lead Negotiator for the Grassy Narrows Lands Protection Team. While copying ANA's Lands Protection Team, Mike Fobister, David Sone, Jackie Esmonde, Sydney Lang, Dan Mossip-Balkwill, and Annelies Cooper.

We look forward to meeting with you and your associates at your company.

Awsa,

Asubpeeschoseewagong Anishinabek (Grassy Narrows First Nation)



Joseph Fobister, Lead Negotiator for the Grassy Narrows Lands Protection Team.

Cc:

ANA Lands Protection Team
Joseph Fobister, Lead Negotiator (jbfobister@gmail.com)
Mike Fobister, Lands Team Supervisor (mike.fobister@googlemail.com)
David Sone, ANA Advisor (david.sone@gmail.com)
Jackie Esmonde, ANA Legal Counsel (jesmonde@cavalluzzo.com)
Sydney Lang, ANA Legal Counsel (slang@cavalluzzo.com)
Dan Mossip-Balkwill, ANA Advisor (dan.mossip.balkwill@gmail.com)
Annelies Cooper, ANA Advisor (annelies.cooper@gmail.com)

MINES
Susanna Laaksonen-Craig, Deputy Minister (deputy.mines@ontario.ca)
Stephen A. Miller, Mineral Exploration & Development Consultant (stephen.a.miller@ontario.ca)
Patrick Barnes, Consultation and Aboriginal Treaty Rights Advisor (patrick.m.barnes@ontario.ca)
Neal Bennett, Acting Regional Manager, Thunder Bay Office (neal.bennett@ontario.ca)
Teri McDonald, Director, Indigenous Consultation & Partnerships Branch (teri.mcdonald@ontario.ca)
Trina Rawn, Director, Mineral Development Branch (Trina.Rawn@ontario.ca)

MNRF
Drew Vanderduim, Deputy Minister (deputy.mnrf@ontario.ca)
Brian Kilgour, District Manager, Kenora (brian.kilgour@ontario.ca)
Krista Prosser, Resource Liaison Specialist, Kenora (krista.prosser@ontario.ca)
Myles Perchuk, District Manager, Red Lake (myles.perchuk@ontario.ca)
Alissa Van Wynen, District Resource Liaison Specialist, Red Lake (alissa.vanwynen@ontario.ca)

MECP
Serge Imbrogno, Deputy Minister (serge.imbrogno@ontario.ca)
Lisa Trevisan, Assistant Deputy Minister (lisa.trevisan@ontario.ca)
Ann Darby, Senior Program Support Coordinator, Permissions and Program Services Unit

(ann.darby@ontario.ca)

IAO
Shawn Batise, Deputy Minister (shawn.batise@ontario.ca)
Michael Reid, Assistant Deputy Minister (michael.reid@ontario.ca)
Candice Telfer, Acting Assistant Deputy Minister (candice.telfer@ontario.ca)

APPENDIX A

INFORMATION REQUESTS

ANA has become aware that you and your associates at your company hold claims or other mining tenures and may be planning to carry out staking, exploration or mining related work in our area ("mining related activity"). Please provide the following information and answer the following questions in detail in order to allow ANA to understand and assess your activities.

1. Detail when and how your company, and any predecessors on these claims or tenures, have contacted Grassy Narrows and/or MINES with regards to any claim staking and exploration or mining related activity within our Interim Core Area and provide copies of all correspondence to date. Please also provide copies of any previous correspondence between your company, and its predecessors, and Grassy Narrows.

2. Please provide copies of any correspondence between your company and MINES about these claims or mining tenures.

3. Did MINES inform your company that these claims were on Grassy Narrows Territory and within the Grassy Narrows Interim Core Area?

4. Did MINES inform your company that Grassy Narrows has rights and interests in this Area and is concerned about claim staking, mining exploration, and mining activity in this Area?

5. If your claims or tenures were previously held by anybody else, please detail your and your company's relationship with any individuals or companies who previously owned these claims.

6. Do you or your company have an exploration plan or other mining related plans for these claims or tenures, and if so, please provide a copy.

7. Have you or your company or any predecessors, carried out any early exploration activity which does not require notice to MINES or MNRF? If so, please provide detailed information about this work?

8. Does your company have any existing plans, or plans under development, for mining related activity of any kind in, or near, our Interim Core Area, or which could impact the Interim Core Area? If so, please provide complete details. If not, will you commit to sharing with us any such plans, the moment they come under development, should such an instance arise?

9. Specify which mineral resource(s) is/are being explored or developed.

10. Specify the size of the workforce carrying out mining related activities. Provide small/medium scale maps (aerial photography or satellite imagery if possible) of the locality/region that is the subject of the claim staking and any planned mining related activity.

11. Provide a more detailed large-scale map showing location (at high resolution) identifying

where specific mineral exploration activity is to occur. This would identify which mineral claim and where within the mineral claim the planned worksite will be, or has been, and any relevant geographic features. Buffers should be built around the worksite locations to reflect post-permitting 'adjustment' of actual drill hole or access route.

12. Provide any surface geology or other thematic mapping that might suggest landforms important for wildlife distribution, Traditional Land Use, etc. (i.e. eskers, end moraines, outwash channels, glacial lake beds, rivers, lakes, streams, wetlands, portages, etc.).

13. Specify location and provide a detailed summary of any prior mining related activity in the proposed program area, including prior staking, permits and leases, and maps showing their locations.

14. If remediation from past activities is required, how will you remediate the site(s)? If remediation from past activities is not required, please provide documentation supporting this.

15. What is the nature of the proposed activity (e.g. early-stage prospecting, magnetic surveys, geotech auger sampling, shovel testing, diamond drilling, reciprocal drilling with water, bulk sampling, blasting of bedrock, trenching, etc.)? What is the anticipated physical impact of the activity? When will the activity take place? Where will the specific activity take place?

16. Detail the planned access to the proposed program and its location in relation to trails and winter roads in the area. Have or will any new access routes such as trails be created? What alternative access options have been identified, how were they assessed and why was the preferred option chosen?

17. How and when will the worksite be accessed? (e.g. chopper access, winter road logistics, walking rigs on trails prepared by bulldozer, etc.)

18. Has or will a camp site be constructed? Where? Please detail relevant logistics regarding the base camp and waste disposal.

19. Have or will camp materials be removed after the work? In detail, how will garbage, brush, sewage and overburden be dealt with? What kinds of fuel will be used, and how and where will the fuel be stored? How will the fuel be transferred, and what is the contingency plan in the event of a spill? Following the mining related activity, how will the site be cleaned up, reclaimed, or remediated?

20. Please detail the fuel dump management plan. Where are dumps to be located and what are the protocols for removal of barrels or containing spills? Detail whether stream crossings or travel close to lake shores will occur? In addition, detail overlay of proposed activity with hydrological features to understand proximity to lakes, wetlands, and river systems and identify which fish species use those water bodies, and whether any spawning areas or other special habitat areas exist in the area.

21. Detail strategies for protection from spills, ground disturbance, and enhanced erosion from preparing approaches.

22. Will the past or future work, including access, disturb soils in such a way that will

increase the release of mercury from those soils, or increase the net methylation of mercury within those soils? What assessment has been done and what evidence supports your position? What monitoring will be done to confirm this?

23. Specify the nature of site preparation for drilling or other activities (i.e. drill dropped in by chopper onto a log pad, or drill pad cleared and levelled by bulldozer).

24. Provide an overlay of the proposed activity with range maps of moose, wolverine, and caribou.

25. Provide an overlay of proposed activity with land classification details, with a special focus on the sub-range habitat features for moose, wolverine, and caribou (e.g. wintering areas, nursery areas and travel corridors, calving areas, denning areas).

26. Detail the source of all water to be used in the exploration program and their geographic locations. If drilling requires water, where will the water be drawn from; how will it be transported (pump and hose through bush, or hauled in water tanker behind vehicle and drawn along prepared trails); how much will be used, and how will waste water be disposed of?

27. Will the past or future work disturb waterways in such a way that will increase the release of mercury from those waterways, or increase the net methylation of mercury within those waterways or other impacts? What assessment has been done and what evidence supports your position? What monitoring will be done to confirm this?

28. Will any drilling fluids be used? If so, which? What are the procedures that will be used to ensure their safety including storage, use, recovery, removal, and spills?

29. Will any toxic substances be used in the work on present on site? If so, which? What are the procedures that will be used to ensure their safety including storage, use, recovery, removal, and spills?

30. What other authorizations (e.g. fisheries, permit to take water, other permits) are required for this project?

31. How will the mining-related activities change the water, air or land? What impacts will each of these changes have on land, water, fish, and wildlife?

32. Have or will your mining-related activities create any off-site impacts that will impact the Interim Core Area such as downstream or downwind impacts, impacts to migratory wildlife and fish, edge effects, etc.?

33. What will the cumulative impacts of your current and planned activities be and how does this contribute to the overall cumulative impacts of industry on Grassy Narrows Interim Core Area?

34. What First Nations Territories are included in the area of your mining-related activities?

35. What communication have you or your company had with MINES about Aboriginal and Treaty rights in relation to your mining-related? Please provide copies.

36. Has MINES delegated to you or your company any of the procedural (or other) aspects of the Crown's legal duty under Canadian law for consultation and meaningful accommodation with First Nations? If so, which? Please provide all relevant documentation.

37. What is your company's opinion on what ANA's inherent, Aboriginal and Treaty rights are on the area of your mining-related activities?

38. What is your company's opinion on what your responsibilities are with respect to ANA's inherent, Aboriginal, and Treaty rights in the area of your mining-related activities?

39. Does your company commit to abiding by the United Nations Declaration on the Rights of Indigenous Peoples?

40. Does your company commit to not carry out staking, mining exploration, and other mining related activities in the Interim Core Area of Interest for Mining unless ANA has given its free, prior, and informed consent?

41. Will your company fund ANA's reasonable costs of engaging with your company including the costs of ANA staff, community engagement, experts, legal counsel, and advisors?

42. Will your company fund ANA to commission an independent archaeological assessment of your activity areas including drill sites, access routes, camps, waste sites, etc.?

43. Does your company have a policy and an enforcement plan to prevent gender-based violence by your employees and contractors?

44. What is the total area (in ha) of your company's combined claims and leases in the Interim Core Area?

45. What is the total dollar value of the work that you and/or your company has, or any predecessors have, done on claims and leases in the Interim Core Area to date?

46. What is your and/or your company's appraisal of the market value of your combined claims and leases in the Interim Core Area?

47. Does your company commit to respecting the ANA Land Declaration and other ANA laws?

48. Do you and/or your company believe that you have any interests in the Interim Core Area? Please specify.

49. Do you and/or your company believe that any of your asserted interests may conflict with the Interim Core Area? Please specify how and provide reasons. Please also outline your company's proposed resolution.

50. Do you or your company have any other concerns which may need to be resolved with ANA? Please outline your suggested resolutions in detail.

51. Do you and/or your company commit to working with ANA in good faith to resolve any

potentially conflicting interests which you and/or your company believes you have in the Interim Core Area?

52. Will you and/or your company write a letter expressing support for ANA's Interim Core Area?

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Netum Anishinabek
GRASSY NARROWS, ONTARIO P0X 1B0 • PHONE: (807) 925-2201 • FAX: (807) 925-2649

May 22, 2025

BY EMAIL

Attention: Aaron MacDonell (aaron.macdonell@kinross.com)
Kinross Gold Corp.

Dear Aaron MacDonell,

RE: Great Bear Gold Project – IA Process

I am writing on behalf of the Grassy Narrows First Nation's Land Protection Team with respect to the Impact Assessment for the Great Bear Gold Project.

Over the past few months, you have asked us to comment on and respond to your proposals in relation to various aspects of the Impact Statement that you are preparing. You have consistently requested that we provide comments within a short two-week time period and have denied our requests for additional time to respond.

Your timelines do not work for us.

We have informed you on multiple occassions that your timelines are insufficient and that we need more time to review your proposals, to assess their impacts, to engage with our community and our experts, to carry out our governance process, and to develop a response. Some of your questions require extensive research, archival work, and studies to answer. This kind of work typically takes years to complete. A few weeks is insufficient time in the best of circumstances.

As you know, our Territory has already experienced a great deal of harm from industrial activities. As a result, our community suffers from unusually high rates of conditions including poverty, food insecurity, disease, neurological conditions, conditions affecting learning, youth suicide, and premature death. The health and social conditions created by mercury poisoning and the cumulative impacts of industry place us in an ongoing crisis which is a barrier to our ability to meaningfully engage within your timelines.

We also need sufficient time to complete our own studies, including a land use and occupancy study, ethnohistorical report, baseline water and wildlife studies, social and economic impact studies, cumulative impacts assessments, and an ANA Indigenous Environmental Assessment, among other things. We have informed you of this requirement from the outset, and yet you have only recently provided capacity support, and only for a subset of these needs. We have begun work on that subset, but as noted

before, this work takes time.

Simply put, we need more time.

Grassy Narrows needs to be included in this process, but we need to be included in a good way.

For example, on March 3, 2025, you informed us that you had hired consultants to collect community-specific information from on-reserve service providers in Grassy Narrows. You gave us until March 21, 2025, only 14 business days, to provide you with this information. If we did not respond to you by March 10, 2025, you said that you would instruct your consultants to reach out to key service providers in Grassy Narrows on March 11, 2025 without us. You planned to move forward in this manner without our participation and/or consent to do so. We asked for more time and that you pause this work in the meantime. In response, you denied our request for more time and instead responded that the Impact Statement will proceed without this information.

The process that you proposed to collect data on the effects of the Project on on-reserve services was not a meaningful process and did not provide us with sufficient time to consider your proposal, let alone complete the work that you requested. The Impact Statement must include this information and we need to be included in this process. Grassy Narrows needs 180 days to prepare a submission with respect to the effects of the Project on the social conditions of Grassy Narrows, particularly with respect to on-reserve services. Grassy Narrows also needs 180 days to review the memo that you prepared with respect to the secondary sources of traditional knowledge and the sources therein. We also need substantial additional time to complete our preliminary Landuse and Occupancy study.

We have yet to receive any funding to complete baseline studies on water, fish, and wildlife. You have asked us to rely on baseline work done by others. But when our experts reviewed that work they found fundamental flaws, including the use of invalid lab methods, misleading reporting of data, insufficient duration of studies, and an absence of key parameters. Our experts concluded that your existing baseline data is inadequate, so we cannot rely on it.

On December 19, 2024, you shared with us a Mercury Study Plan with a short window for comments. As you know, mercury is a primary concern for us, and this Study Plan purports to be capable of determining whether your mine will have impacts on mercury and methylation. Our experts provided preliminary comments in which they identified fundamental flaws in your Mercury Study Plan. However, we have yet to hear any response from you. We have yet to receive an updated Mercury Study Plan that seeks to correct the fundamental flaws for our review. We also know that the IAAC plans to establish an independent Expert Technical Review group on methylation, but this group has yet to be established and so has not been able to review your Mercury Study Plan which is highly relevant to their mandate. We have yet to hear anything about how you propose to proceed.

We strongly urge you not to proceed with the fundamentally flawed Mercury Study Plan until:

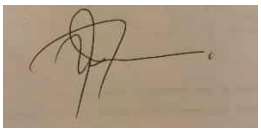
a. You have corrected all of the flaws identified in our preliminary comments and our experts have verified this;
b. We have had time to complete a comprehensive review of the revised Study Plan and to identify any further concerns;
c. The IAAC Expert Technical Review group has reviewed the Study Plan and found it to be valid; and
d. We have given our consent for the Study Plan.

Your approach to engagement with respect to Phase 2 of the Impact Assessment process has been rushed, has not respected the context that we are working from and our repeated requests for more time, and has not been consistent with the spirit of reconciliation, the duty to consult, the standard of free, prior and informed consent, nor the *United Nations Declaration on the Rights of Indigenous People.*

We again call on Kinross to pause the process, and to provide us with sufficient time to meaningully engage and participate in the Impact Assessment process and to respect that we are a mercury poisoned community that is actively dealing with the mercury crisis and the cumulative impacts of industrial activities.

Please confirm in writing that you will respect our need for additional time to meaningfully engage and participate in all stages of the Impact Assessment process.

Miigwetch,



Joseph B. Fobister
Lead Negotiator, Grassy Narrows Lands Protection Team

C.C.

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Asubpeeschoseewagong
Netum Anishinabek
GRASSY NARROWS, ONTARIO P0X 1B0 • PHONE: (807) 925-2201 • FAX: (807) 925-2649

May 29, 2025

BY EMAIL

Attention: Aaron MacDonnell, Director, Environmental Services
Kinross Gold Corp. / Great Bear Resources Ltd
25 York Street, Unit 1700
Toronto, Ontario M5J 2V5

Dear Aaron MacDonell,

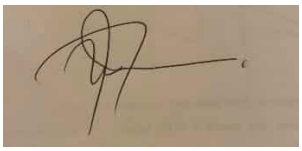
RE: Great Bear Gold Project – Update on Preliminary Land Use and Occupancy Study

I am writing to provide an update on the Preliminary Land Use and Occupancy Study. I have enclosed an update letter from Professor Anna Willow, the consultant anthropologist we have engaged to support Grassy Narrows in conducting this study.

As she notes in her letter, the community is working diligently on the study. Completing a full Land Use and Occupancy Study typically takes three to ten years to complete. In light of the unreasonable timelines imposed by the Impact Assessment process, the team is working to prepare a preliminary report. However, this is expected to require a further six to eight months.

It is important that the information in the pending Preliminary Report, and in future reports, inform decision making on this project so that Grassy Narrows' landuse can be taken into account. We urge you to ensure that the timelines and next steps for the Impact Assessment build in time for consideration of land use information. We urge you not to proceed with any work that could impact Grassy Narrows' landuse, including early and advanced exploration activities.

Miigwetch,



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May 29, 2025

To Whom It May Concern:

I am a consultant hired by Asubpeeschoseewagong Anishinabek (Grassy Narrows First Nation) to assist with their ongoing documentation of land use in the Grassy Narrows' Interim Core Area of Interest for Mining, particularly in the portions of the territory potentially impacted by the proposed Kinross Great Bear Mine. In particular, I am working with Grassy Narrows to prepare a Preliminary Land Use and Occupancy Study for the Great Bear Project.

In addition to my work with Asubpeeschoseewagong Anishinabek, I am a full Professor in the Ohio State University's Department of Anthropology with extensive expertise and publications in the areas of cultural and environmental anthropology, especially concerning Anishinabe land use and environmental relationships.

I am writing to report that the Asubpeeschoseewagong Anishinabek community is working diligently on the important process of land use documentation. Completing a full Land Use and Occupancy Study within a First Nations community typically takes between three and ten years. Knowing that the timeline imposed in this case is much shorter, we are doing all we can to collect and analyze data as expediently as possible to prepare a Preliminary Report. However, this report will likely take a further 6-8 months to prepare.

From the data already gathered, we can confidently report that the Grassy Narrows Interim Core Area of Interest for Mining in general, and the vicinity of the proposed Great Bear Mine in particular, was used by Asubpeeschoseewagong Anishinabek families in the past and continues to be used by members of the community for traditional subsistence and cultural practices (i.e., hunting, fishing, trapping, gathering, and travel) today. We have also documented community members' extensive concerns about potential water contamination as a result of proposed mining activity in that area.

More information will be provided as soon as it is available.

Cordially,

Anna J. Willow
Professor, Ohio State University
willow.1@osu.edu

January 27, 2025

To: J. Esmonde, Cavalluzzo LLP
From: Dr. Brian Branfireun, London, Ontario.

Re: Preliminary review of the Great Bear Project Mercury Plan, December 2024

1 Introduction

I have been asked to provide a preliminary review the Great Bear Project Mercury Study Plan (WSP, December 2024), and provide an Expert Opinion concerning the adequacy of the plan to protect receiving waters and biota from the direct and indirect effects of the proposed project. As there is little new information provided in this document, a substantial amount of this memo is derived from prior opinions and memos of mine that have reviewed other submissions from the Proponent. These are listed in materials referred.

2 Qualifications

I received my PhD in Geography from McGill University, Montreal, Canada in 1999 with a specialization in hydrology, mercury biogeochemistry, and wetland science. I was subsequently employed as a Professor at the University of Toronto Mississauga campus in Mississauga Ontario, Canada for 10 years, establishing an internationally recognized research program on hydrology and mercury in the environment. In 2010, I was recruited by the University of Western Ontario to the position of Professor and Canada Research Chair in Environment and Sustainability. I am considered an internationally recognized expert in the field of watershed biogeochemistry and the environmental cycling of mercury.

I have authored or co-authored over 100 peer-reviewed scientific papers and book chapters, and have made, or contributed to significant discoveries concerning the role of wetlands on the production and export of methylmercury (e.g. Branfireun et al., 1996; 1998; 1999; 2001; 2005; McCarter et al., 2017). I have been involved in high-impact state-of-the-science publications that have provided significant direction to the mercury research community (Harris et al., 2007; Munthe et al., 2007; Branfireun et al., 2020; Blanchfield et al., 2021). In addition to environmental biogeochemistry, research in my group has broadened to include the impacts of mercury on biota, including migratory birds (e.g. Ma et al., 2018a,b).

3 Summary of Opinions Concerning the Great Bear Project Mercury Study Plan

The Great Bear Project Mercury Study Plan provides a more comprehensive background discussion (Section 1.2) of mercury biogeochemistry than any previous document that I have reviewed from the project Proponent. In Prior submissions, the direct and indirect effects on mercury biogeochemistry of the proposed project have been dismissed, downplayed or ignored, so an increased acknowledgment of the link between sulphate loading from the proposed project from the Proponent is welcome. The presentation of the basics of mercury biogeochemistry is significantly more scientifically correct than the erroneous and misleading prior submissions from the Proponent indicating to me that there is effort being invested to coming up to speed about the current state-of-the-science mercury methylation, which I consider to be a central issue related to the proposed project. Indeed the Proponent acquiesces to the indisputable link between sulphate and mercury methylation, in contrast with the attempts to sew doubt found in prior submissions (Kinross Response to ANA Memo concerning

Great Bear Project AEX ECA Application, August 1, 2024), and goes so far as to acknowledge that arguments to apply site specific knowledge to setting mercury thresholds are valid. Despite this effort, there has surprisingly been no change in the interpretation of baseline data nor the proposed plan for effects monitoring for mercury or methylmercury – I find the same errors in a more attractive wrapper. The facts related to the inadequacy of the background data, sampling frequency, analytical methods, and misrepresentation of the receiving water body receiving effluent (Chukuni River) remain in this document, and evidence-based corrections in prior submissions by ANA have not been acknowledged or addressed, although many are now hidden by vague and over-generalized language. The only salient new information in the Mercury Study Plan is the Proponent's suggested application of a model (GoldSim) to predict changes in mercury and methylmercury as a result of the project. This model is a wholly inappropriate framework for this purpose and cannot provide the information that the Proponent suggests. As such, none of what is presented in this plan addresses the TISG requirement:

"Of particular note, the potential for project contributions to methylmercury production in downstream watersheds requires a detailed and robust analysis. The proponent must submit a study plan to the Agency with sufficient time to facilitate a review by experts and interested parties and to inform the studies undertaken. This includes establishing baseline methodology and effects assessment methodology related to methylmercury as outlined in section 8.6 Groundwater and Surface Water and 8.8 Fish and Fish Habitat."

This requirement is not met because none of the inadequacies of background data or future monitoring that have been previously identified have been addressed let alone acknowledged, and important information from prior documents was omitted which would permit a complete review by experts and interested parties who do not have full knowledge of what has been proposed in prior submissions from the Proponent. As many of these issues have been addressed in prior submissions from ANA, my opinions regarding the Great Bear Project Mercury Study Plan are reiterations of prior concerns with the exception of the discussion of the inappropriateness of GoldSim, which was informed by written and oral testimony that I presented for another case (and was supported by the US Environmental Protection Agency and Army Corps of Engineers).

It is my opinion that:

1) The selective reliance on achieving on and off site water quality that complies with water quality guidelines (CCME) inadequate and inappropriate when considering mercury and methylmercury in water, and methylmercury uptake by biota.

2) The background data collected as part of the baseline studies for this project are largely erroneous or their interpretation is flawed, rendering them neither comprehensive nor sufficient to detect whether the project will have measurable impacts on fish mercury levels in the future.

3) The assimilative capacity of the receiving waters (Chukuni River) as a mitigation strategy for excess sulphate loading is not supported by available data. As this is the only measure that has been proposed to address the indirect downstream effect of sulphate-related methylmercury production, there is no evidence that other adverse downstream effects can be avoided.

4) The model that the Proponent indicates will be used to predict changes in mercury and methylmercury concentrations in downstream watersheds and assess the potential impact on mercury levels in fish (including assessment bioaccumulation / bio-magnification pathways) can technically deliver none of these outcomes.

4 Opinion 1: The selective reliance on achieving on and off site water quality that complies with water quality guidelines (CCME) in inadequate and inappropriate when considering mercury and methylmercury in water, and methylmercury uptake by biota.

Section 2.2.1 of the Great Bear Project Mercury Plan States the following:

> Existing baseline mercury and methylmercury concentrations in surface water and groundwater are compared against applicable guidelines for the protection of aquatic life as well as health-based drinking water quality guidelines, including the:
>
> −CCME guideline for total mercury for the protection of aquatic life (26 ng/L)
> −CCME guideline for methylmercury for the protection of aquatic life **(0.04 ng/L (sic)**
> −Canadian drinking water quality for mercury (1,000 ng/L)
> −United States Environmental Protection Agency (US EPA 1997) criterion of 0.05 ng/L for filtered methylmercury in water for the protection of fish-eating wildlife species

Disregarding the fact that the authors of the report surprisingly misstate the CCME guideline for methylmercury (it is 4 ng/L not 0.04, although 0.04 would be more scientifically justifiable), the statement that the data from the proposed project will be "compared against" any criteria is meaningless, because one may compare an apple to an orange; no intent, threshold, nor trigger value is indicated or even implied by this language. Despite quoting the more reasonable US EPA criterion of 0.05 ng/L methylmercury for the protection of fish-eating wildlife, prior documents submitted for this project indicate clearly that the Proponent intends (and has been approved by the Ontario MECP) to apply the CCME guideline the project from a compliance standpoint, so the reader should presume that the CCME values are the regulatory thresholds being applied by this Mercury Plan, rather than merely comparisons. As I have stated in prior opinions, there is no other way to characterize the CCME guideline values for mercury and methylmercury as anything but useless for the protection of fish consumers, and even if discharges or indirect effects were a fraction of these guideline limits there would be significant potential for downstream impairments of aquatic resources. For example, the CCME Criterion for (Total) mercury is 26 ng/L, which is a value (developed from a 1991 protocol) for the **direct** protection of aquatic life. Despite being profoundly outdated, the CCME document provides valuable commentary that is all too frequently ignored when setting regulatory criteria based on this single value, including "*The protocol **does not** address exposure through **food or bioaccumulation** to higher trophic levels*", and "*if the ultimate management objective for mercury is to protect high trophic level aquatic life and/or those wildlife that prey on aquatic life, **more stringent site-specific application** of these water quality guidelines may be necessary*" (CCME, 2003, p.2; **emphasis mine**).

Although the Province of Ontario is silent on the issue of any other water quality guidelines for mercury, other jurisdictions have been more engaged with revising their mercury and

methylmercury based on best available science at the time. British Columbia explicitly acknowledges the limitations of the CCMEs guidelines, stating "It should be noted that the CCME (2000) in developing guidelines for fresh and marine waters did not consider bioaccumulation effects per se, but based their guidelines on **chronic toxicity**. They caution that the guidelines that they have developed 'may not protect wildlife that consume aquatic life'." (British Columbia Ministry of Environment and Lands, 2001; emphasis mine). We may reasonably extend the statement about consumers of aquatic life to humans. Despite the document being nearly as old as the original CCME guidance, BC takes the interesting approach of defining the water quality guideline to protect wildlife for total mercury by scaling it as a function of the percentage of total mercury that is methylmercury, acknowledging that methylmercury is the only form of mercury that bioaccumulates and biomagnifies in wildlife. Their Table 5 indicates that only in environments where methylmercury is largely not being formed would the CCME guideline of 26 ng/L for total mercury be remotely reasonable for fish consumers to be protected. In environments where methylmercury makes up an increasing fraction of total mercury, the allowable amount of total mercury decreases proportionally with the %methylmercury in the system. At 8% of total mercury as methylmercury, the guideline for total mercury is 1.25 ng/L. Even at 8% methylmercury the BC guideline total mercury value is below the detection limit of the technique that the Proponent declares adequate for the purposes of monitoring (DL of ~ 5 ng/L). The Proponent states in this document (as I provided to them in prior submissions) that that % methylmercury in surface waters of the proposed project can exceed 14% (using their own sparse data), translating to a guideline concentration of a mere 0.72 ng/L for the protection of wildlife consuming aquatic life. Despite the BC document being nearly 25 years old, the rationale for their mercury criteria is logical, and recognize the fact that even low levels of mercury in the environment can bioaccumulate and biomagnify to hazardous levels for fish consumers if the landscape has high methylmercury production potential. It is clear that current conditions in surface waters in the project area already exceed this criteria, meaning that **any** cumulative effect would be in exceedance of BC criteria for mercury in freshwater.

I find it impossible to accept any generalized guideline for mercury or methylmercury in aquatic environments, and instead advise site specific assessment for appropriate threshold levels (which the CCME also explicitly does in their 2003 document, but never seems to be considered). An acceptance of this project mercury plan adhering to the CCME guidance for mercury and methylmercury threshold concentrations for direct and indirect effects is effectively a license to impair downstream resources given the low concentrations of mercury identified by the Proponent through limited baseline sampling. Site specific criterion for mercury and methylmercury must be required here, and derived from **appropriate** baseline data – scant little of which currently exist (see Opinion 2).

5 Opinion 2: The background data collected as part of the baseline studies for this project are largely erroneous or their interpretation is flawed, rendering them neither comprehensive nor sufficient to detect whether the project will have measurable impacts on fish mercury levels in the future.

In the context of the protection of fish consumers, nearly all of the background data for total mercury are useless and stated incorrectly. All of the "data" that are reported in Table 2.10 of "Attachment 4 - Surface and Groundwater Technical Supporting Document" (March 2024) for total mercury are not data at all, but the reporting detection limits of the contract laboratory.

The background mercury data in water (with the exception of the handful of appropriate trace mercury and methylmercury analyses that were conducted by Flett Research) **is incorrect**. The data provided for mercury **are not data** – they are detection limits of the inappropriate technique used to do element scans by inductively coupled plasma – mass spectrometry (ICP-MS). ICP-MS in a standard configuration cannot generate data for mercury with appropriate detection limits (despite the Proponent's assertion to the contrary in the Mercury Plan). Moreover, the Proponent treats these detection limit placeholders as data – **these are not data.** If the contract laboratory reported these values as data, then they are not operating in compliance with ISO 17025 protocols. If the Proponent substituted detection limits for samples reported to be below the detection limit by the contract lab, then this is not correct procedure and should be stated as such. In both cases, a serious lack of oversight and understanding of analytical results is clear as **these are not data**. There is also insufficient data for methylmercury in surface water as this critical parameter was only measured sparsely as part of the baseline monitoring program. As a result, there is virtually no background data for mercury in surface waters for the project area, nor is there sufficient monitoring in the proposed plan because the appropriate trace mercury and methylmercury monitoring is only proposed at select locations and at a frequency that is insufficient to detect change over time, and with highly inappropriate threshold levels that are orders of magnitude above the levels at which adverse effects will occur.

Further investigation into the baseline monitoring data provided in Attachment 4 of the AEX-ECA application which contains all of the background data cited by the Proponent in the Mercury Plan also reveals that the **concentrations reported for sulphate were also erroneous** up until May of 2023 when the Proponent either changed analytical methods or laboratories, or incorrect instrument operation was corrected. From 2021-06-03 to 2023-03-30, we find data that are reported with no precision (i.e. no decimal place) and spuriously range from values of 1 to 11. I know of no analytical technique that would report concentrations like this (we see similarly erroneous data for parameters such as Chloride, TSS, TDS). The clearest evidence to me that this data is no better than random is the value of 7 mg/l on 2022-12-15, followed by a value of 1 mg/L four days later on 2022-12-19. Given that there was no appreciable change in river flow over this time, **these data are erroneous and cannot be used**. There is similar randomness in other parameters. The fact that the average concentrations that are reported directly in the Appendix are substantially different for the three stations on the Chukuni River should have been the first indication that there was a data quality problem.

Notably, the data quality changes substantially in May 2023, with two decimal place precision and a much more realistic range of concentrations (4.18 – 6.30 mg/L). Other parameters also show this step change in data quality. There was obviously a change in technique or in the contract laboratory being used that was not documented, which is contrary to best practices at the very least.

Other variables reported are also suspect up until this date as many of the physical parameters (e.g. TDS, TSS) and nutrient data ($N0_2$), contain inexplicable values, change in quality, or are dropped completely (e.g. NO_3-$N0_4$-T). The failure to note and censor these erroneous data is inexplicable – to use them to calculate descriptive statistics is inexcusable. For these variables (including sulphate) there are only 8-9 usable data points for all of the stations reported (including the Chukuni River).

The Mercury Plan makes reference to comprehensive background data about mercury and sulphate that will inform modelling efforts and trigger undefined actions should they change. One cannot numerically model concentrations of "below the detection limit". The reality is that the background data is neither "comprehensive" nor "sufficient" by any reasonable definition, and the approval of a Mercury Plan such as this is license to both proceed blind with respect to the site specific mercury conditions, as well as condone the continued use of an inappropriate analytical approach (despite the Proponent's statement to the contrary) that will reliably generate non-data that cannot capture trends in mercury concentrations across most of the sampling sites in the project area.

6 **Opinion 3: The assimilative capacity of the receiving waters (Chukuni River) as a mitigation strategy for excess sulphate loading is not supported by available data. As this is the only measure that has been proposed to address the indirect downstream effect of sulphate-related methylmercury production, there is no evidence that other adverse downstream effects can be avoided.**

Similar to the comparison to various mercury guidelines discussed above, the Proponent outlines in the Mercury Plan a range of sulphate mitigation measures that are being "considered" to address the issue of sulphate loading to sites of mercury methylation (Section 3.3). The primary mitigation measure outlined is to not discharge sulphate directly into sites with high methylation potential (e.g. wetlands). I am not sure that this constitutes a mitigation measure because of the obvious environmental consequence of doing so. Other measures being "considered" include various tailings management strategies and management of sulphate-bearing runoff. In the middle of the list is the **only** option that has been discussed and justified by the Proponent in all prior submissions:

"Discharging treated effluent to a large receiving watercourse (Chukuni River) that has a high oxygenation level and high assimilative capacity."

This 'mitigation strategy' has been commented on by myself and other experts in prior submissions, however this single sentence contains so much misleading information that it is worth breaking down here, making reference to the much more detailed discussion found in prior expert submissions.

1) **Treated effluent:** Indeed the Proponent has outlined strategies for treating effluent to be discharged to the Chukuni River, however none of the treatment technologies proposed target sulphate at all. Sulphate production from overburden and waste rock could be substantially greater than the Proponent states. Given that groundwater contributes nearly 80% of the total water outflows, 25% of groundwater samples (75^{th} percentile) from many locations in the project area had sulphate concentrations well in excess of 10 mg/L (Appendix B, Table 3 AEX-ECA Application), and the water treatment technology outlined by the Proponent has no capacity to remove sulphate, it would seem that the Proponent's 'expected' case of 10 mg/L sulphate is not just unlikely, but nearly impossible to achieve without even considering the potential for additional sulphate sources due to operations. Indeed without any additional treatment the Proponents 'extreme' case is likely a gross underestimate. With only gypsum saturation ultimately controlling sulphate solubility, sulphate concentrations in the range of 1000-1500 mg/L may be expected and are in fact, typical of many mine sites with oxidizing sulphide minerals like pyrite.

2) **Large watercourse:** This is of course a relative statement however a 20-year median annual discharge of 26.5 m^3/s is objectively a substantial flow. However as I have outlined in prior memos (Branfireun Review of Kinross Response to ANA Memo concerning Great Bear Project AEX ECA Application, August 1, 2024; October 7, 2024), median or mean statistics do not tell the whole story about assimilative capacity, despite the Proponent utilizing the simple numerical average of the entire daily discharge record (which upward biases the value) for all of their dilution scenarios presented in prior submissions to justify assimilative capacity. In the context of dilution of an environmentally relevant chemical, it is more relevant and protective to explore the lower ranges of flow, since it is at these levels that the river has less assimilative capacity and adverse effects are more likely. The 20-year average 25th percentile value is 14.2 m^3/s, meaning that for a full quarter of the year (which would include the relevant summer low flows when biogeochemical activity including methylation would be the highest), flows in the river are equal to or less than this value. The 20-year average minimum flows are only 5.7 m^3/s; more than 5 times lower than the discharge value that the Proponent used to calculate dilution. I argue that this is a more appropriate 'extreme' case discharge value to use, however it is notable that **the record contains a period of zero flow conditions in 2011 – a condition under which effluent discharge would make up 100% of river flow and would be completely undiluted (i.e. the river has zero assimilative capacity)**. 2023 was among the lowest flow years in the last 20, and the central tendency of the river discharge over that period is toward lower, and less variable flow. If the 2023 flow statistics (median, 25th percentile, and minimum flows of 13.5, 6.6 and 3.1 m^3/s are reflective of future drier conditions driven by climate change, then the use of a single value of average flow that is 10x greater than this low flow condition to calculate effluent dilution and demonstrate assimilative capacity is clearly not protective by any definition.

3) **High oxygenation level:** The Proponent has frequently made the argument that oxygenated waters in the receiving reach of the Chukuni River preclude negative effects of sulphate addition because sulphate reduction would not occur. This statement is misleading, as I could visit the most methylmercury contaminated lake in Ontario (Clay Lake) in August, measure surface water oxygen levels and declare it oxygenated. This would be ignoring the anoxic bottom waters and sediments where very high levels of methylmercury are formed. Of course, rivers do not stratify but it is well documented that they can have anaerobic sediments, biofilms and hyporheic zones where sulphate reduction and methylation can occur (despite having a well-mixed water column above). The biogeochemical status of the immediate receiving river reach is actually not the biggest issue here, it is the methylation potential of downstream waters where this well-oxygenated river will deliver sulphate that may be many times in excess of background levels.

Pakwash Lake is the first lake downstream of the proposed effluent discharge, and already has **five** fish species that have restricted consumption advisories due to mercury contamination (https://www.ontario.ca/page/fish-consumption-report?id=50459330) indicating that any further loading of methylmercury, or enhancement of the methylating process either in the lake or upstream would amplify an existing environmental degradation.

Whether the fish species with tissue mercury exceedances in Pakwash Lake immediately downstream of the proposed operation derive their methylmercury from Chukuni riverbank wetlands, river littoral sediments, biofilms or periphyton, anoxic profundal lake sediments, or anoxic hypolimnetic waters during stratification is actually irrelevant – methylmercury is produced in the aquatic environment because it is found in fish in downstream receiving waters

and it is dependent on the activity of sulphate-reducing bacteria, which are dependent on available sulphate. To have that many species with mercury consumption advisories confirms that this is a mercury sensitive environment with high mercury methylation potential.

4) **High assimilative capacity:** The argument was been made that additional sulphate might not enhance methylation in the receiving reach because it is oxygenated, but the Proponent has further argued that the proposed operation will not measurably increase sulphate in the Chukuni River and downstream receiving waters because of the dilution of the operation's effluent by the large flows of the Chakuni River (where dilution is used synonymously with assimilative capacity). All of the above points outline how the Proponent has arrived at the conclusion of high assimilative capacity through the application of erroneous/incorrect data, inappropriate analyses of river flows, and untested estimates of sulphate loading from project effluent, none of which is bounded by uncertainty. I have numerically laid out the potentially dire sulphate concentrations that may arise as a result of low flows combined with higher than stated effluent sulphate concentrations/volumes, should the reader choose to explore this more fully (Branfireun Review of Kinross Response to ANA Memo concerning Great Bear Project AEX ECA Application, August 1, 2024; October 7, 2024).

7 Opinion 4: The model that the proponent indicates will be used to predict changes in mercury and methylmercury concentrations in downstream watersheds and assess the potential impact on mercury levels in fish (including assessment of bioaccumulation / bio-magnification pathways) cannot technically deliver any of these outcomes.

In the Great Bear Project Mercury Plan Section 3.4.3, the Proponent states that the GoldSim software modelling package will be used to "stimulate ***(sic)*** the volume and flow of water, and the concentrations and transport of chemical species, over the life of the Project." Without substantiation, they go on to state that "GoldSim has been extensively and successfully applied to simulate complex water resource management, mining operation, contaminant transport, and waste management projects and represents a robust industry-standard modelling software." Although I do not disagree that GoldSim has been widely applied to various industry problems I cannot speak to its success. I can say that it does not appear to ever have been applied to an environmental mercury speciation scenario. There is a clear reason for this – GoldSim is fundamentally (even with its CT submodel) a non-reactive mass-balance model that cannot incorporate mechanistic sorption/desorption reactions along flowpaths, the biomethylation process, nor the complex interaction between mercury and sulphate. As such, the model proposed can never be successfully applied in the manner that is proposed. A mass balance model *cannot* by definition incorporate mechanistically the input and removal processes for mercury, and *cannot* address the biogeochemical aspects of mercury methylation across the landscape which are at the root of the potential impacts associated with the Great Bear proposal. The reason why mass balance models are used for solutes (and can work for solutes that are conservative in water) is because they are simple to apply quickly and require little parameterization (i.e. are inexpensive to implement). Indeed they can have value to evaluate simple "what if" scenarios. However, being cheaper and easier to use is not sufficient justification for taking a naïve approach to evaluating possible environmental risks in a region of extreme mercury sensitivity, when much more defensible approaches exist, including models for watershed-steam mercury dynamics. On page 17 of the Mercury Plan, the authors state that GoldSim is used because it provides "a clear description and rationale for model input parameters and assumptions." I have seen this language used in other cases that I have opined about, with the implication being that GoldSim is somehow MORE clear in its description and

rationale of input parameters and assumptions than other models (i.e. superior). This seems to be popular but baseless justification, as it implies that it is somehow more transparent than other model frameworks.

The statement that the mass balance models like GoldSim are transparent with respect to data inputs is true, in that it is true that *any* model is transparent with respect to data inputs because one must know what the data inputs are in order to run the model (a non sequitur). What is also true of any model is the adage of "garbage in, garbage out." The definition of input parameters and stated variables is always required in any model, as is the establishment of boundary conditions and mechanisms that reflect the best available science. In the case of the Great Bear Project, we have a virtual absence of useable data for baseline water quality (see above), which means that we are at a loss for values for the very input parameters that are required.

The Great Bear Project Mercury Plan reaches even farther by stating that "Results of GoldSim modelling for surface water and sediment quality, described above, will be used to forecast and assess potential effects on fish mercury concentrations in downstream watersheds. Both small and large-bodied fish will be considered in this assessment." My understanding of GoldSim is that it uses the sediment compartment to model water chemistry, not the other way around, so to suggest that GoldSim can be used predictably for the sediment compartment is unrealistic beyond simple mass transfer, despite the importance of the sediment compartment for net methylation. More problematic is the leap of faith between whatever output is provided by GoldSim and a prediction of methylmercury concentrations in biota. There is no evidence of any such effort being successfully reported in the public domain; if the Proponent has advanced the science in this area then I would welcome an opportunity to review their efforts in this regard as it would mark a major breakthrough in modelling mercury biogeochemistry and biotic uptake. I suspect that this is not the case, since the means by which this is to be accomplished is apparently "changes in fish body burden mercury concentrations is considered to be the forecasted methylmercury concentration in the water column, as determined by the water quality model." I am not sure who "considered" this relationship, however it was not someone with a modest scientific understanding of the controls on fish tissue MeHg concentrations – such a simplistic forecasting relationship does not exist, and this is in addition to the fact that GoldSim cannot predict methylmercury concentrations in the first place.

8 Other Errors, Omissions and Concluding Remarks

There are other problematic statements throughout the Mercury Plan that are used to downplay the potential impacts of the project do not align with scientific facts. The statement "For example, SRB-induced mercury methylation could occur in areas of organic soils peripheral to the rock stockpiles; however, methylmercury production beneath rock stockpiles can be limited by low temperatures at the base of the stockpiles which will inhibit SRB activity." is patently false given that the SRB can be quite active at temperatures just above freezing (e.g. Fortin et al., 2000).

We have all kinds of details on sample handling and Quality Assurance/Quality Control procedures in Section 2.2.1 that convey attention to detail and rigour, however a statement about sampling frequency is carefully worded so that the inadequacy of the water quality sampling is not apparent.

Baseline surface water quality sampling generally occurs monthly to characterize seasonal variability in water quality, providing flow is present and that the monitoring site can be safely accessed. (GBP Mercury Plan, p.5)

This statement fails to identify which solutes will be measured from this 'generally' monthly sampling, however in prior documents, the Proponent has clearly indicated that low detection level mercury and methylmercury sampling will only be done at only **half of the sampling sites**, and are only to be taken **quarterly (4 times per year)**. This low frequency of sampling of the only mercury data of utility is insufficient to statistically detect change until that change is so substantial that its effects would be irreversible. Since all of the other mercury sampling will be subject to an inappropriate analytical technique that will mostly return non-detects, the proposed monitoring programs are effectively designed to avoid change detection and I expanded on this in a prior memo (Branfireun to Esmonde, on Advanced Exploration Program (AEX) Environmental Compliance Approval - Industrial Sewage Works (ECA – ISW) July 5, 2024).

Here, we see the assembly of a house of cards by the Proponent. We have a water quality model that is not capable of predicting mercury biogeochemical processes, and that is dependent on background data and proposed monitoring that is insufficient. The outcome will be the inevitable future conclusion by the Proponent that the combination has led to an inability to adequately predict changes in methylmercury concentrations in fish because of 'uncertainties' in GoldSim output, and 'unforeseen complexities' in coupling abiotic and biotic compartments. The reality is that these uncertainties and complexities are completely foreseeable as outlined here. The consideration of the December 2024 Mercury Plan as anything other than deficient will excuse the Proponent's future failure to predict the impact of the proposed development from a mercury perspective because of the appearance of due diligence at this stage of the process. I conclude that the TISG's requirement that the Proponent provide *a detailed and robust analysis on the potential for project contributions to methylmercury production in downstream watersheds* has not been met based on the information provided in their Mercury Plan.

9 Materials Referred

Branfireun, B.A. Expert Opinion Memo to J. Esmonde, Cavalluzzo LLP concerning Great Bear Project AEX-ECA proposal. July 5, 2024

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Canadian Council of Ministers of the Environment. 2003. Canadian water quality guidelines for the protection of aquatic life: Inorganic mercury and methylmercury. In: Canadian environmental quality guidelines, 1999. Canadian Council of Ministers of the Environment, Winnipeg.

(mercury-inorganic-mercury-and-methylmercury-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf)

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Water Quality

Ambient Water Quality Guidelines for Mercury

Overview Report — First Update

Prepared pursuant to Section 2(e) of the
Environment Management Act, 1981

Original signed by Margaret Eckenfelder
Assistant Deputy Minister
Environment and Lands HQ Division
February, 2001

Summary

This report is one in a series that establishes ambient water quality guidelines for British Columbia. The guidelines are safe conditions or levels of contaminants, applicable province-wide, which are set to protect various water uses.

This report updates the 1989 BC Environment guidelines for total mercury (THg) by providing revised water quality guidelines to protect aquatic life from chronic effects of mercury. This was deemed to be necessary since the Canadian Council of Ministers of the Environment (CCME) have recently developed guidelines for mercury in the water column to protect aquatic life and in the flesh of aquatic life to protect wildlife. The report also outlines water quality guidelines to protect avian wildlife feeding on aquatic organisms. The updated guidelines are consistent with the CCME tissue residue guideline to protect wildlife from methyl mercury (MeHg) in their diet. The guidelines for livestock, irrigation and recreation, are unchanged from in the 1989 report. The guidelines are summarized in Table 1, Table 2, and Table 3.

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Table 1: Summary of Water Quality Guidelines for Mercury

Water Use	30-d av. Conc.* (µg/L THg)	Maximum Conc. (µg/L THg)
Source Drinking Water	See Source Drinking Water Quality Guidelines: https://www2.gov.bc.ca/assets/download/1F11ABD2CBD24EB09A70B89AB50CE6B0	
Wildlife and Aquatic Life (Freshwater Estuarine and Marine)+ When MeHg = 0.5% of THg When MeHg = 1.0% of THg When MeHg = 8.0% of THg	 0.02 0.01 0.00125	None proposed
Irrigation Water Supplies	None proposed	2.0
Livestock Water	None proposed	3.0

* The 30-day average is based on five weekly samples taken in a period of 30 days.
+ If natural levels exceed the guidelines for aquatic life, then any increase allowed above the natural levels should be based on site-specific data.

Table 2: Tissue Residue Guidelines to Protect Wildlife from Mercury Toxicity

The concentration of methyl Hg in fish or shellfish consumed by wildlife should not exceed 0.033 µg/g wet weight.

Preface

THE MINISTRY OF ENVIRONMENT, LANDS AND PARKS (now called Ministry of Water, Land and Air Protection) develops province-wide ambient water quality guidelines for variables that are important in the surface waters of British Columbia. This work has the following goals:

1. to provide guidelines for the evaluation of data on water, sediment, and biota

The definition of a guideline is:

A maximum and/or a minimum value for a physical, chemical or biological characteristic of water, sediment or biota, which should not be exceeded to prevent specified detrimental effects from occurring to a water use, including aquatic life, under specified environmental conditions.

The guidelines are province-wide in application, are use-specific, and are developed for some or all of the following specific water uses:

- Raw drinking and public water supply
- Aquatic life
- Wildlife
- Agriculture (livestock watering and irrigation)
- Recreation and aesthetics

The guidelines are set after considering the scientific literature, guidelines from other jurisdictions, and general conditions in British Columbia. The scientific literature gives information on the effects of toxicants on various life forms. This information is not always conclusive because it is usually based on laboratory work which, at best, only approximates actual field conditions. To compensate for this uncertainty, guidelines have built-in safety factors which are conservative but reflect natural background conditions in the province.

Guidelines are subject to review and revision as new information becomes available, or as other circumstances dictate.

The guidelines apply to the ambient raw water source before it is diverted or treated for domestic use.

The Ministry of Health regulates the quality of water for domestic use after it is treated and delivered by a water purveyor.

Guidelines relating to public health at bathing beaches are the same as those used by the Ministry of Health which regulates the recreation and aesthetic use.

Introduction

Mercury is a non-essential element for plants and animals. However, metallic mercury is widely used in industry for the manufacture of chemicals, electrical equipment, power generation, dental amalgams and metallurgical gold. The mercurial compounds have found applications in paints, drywall compounds, scientific supplies, pharmaceuticals, fungicides and bactricides.

Mercury is found naturally in the earth crust, rocks, minerals, and coal and base metal deposits. Areas of high mercury content associated with zones of instability and volcanic and thermal activity have been found over the globe.

Many natural and anthropogenic sources contribute to environmental mercury loading. In the environment, mercury can exist in both organic and inorganic forms. Methyl mercury (MeHg), the most toxic form of mercury, tends to bioaccumulate and biomagnify in the aquatic food chain. Piscivorous mammals, fish and birds accumulate most of their body burden through diet.

Mercury is known to damage renal, nervous, reproductive, and developmental systems. The chemical form of mercury and route of entry are important determinants of its toxicity. Ingestion of inorganic mercury is primarily responsible for erosion of intestinal tracts and kidney damage in both animals and humans. Methyl mercury and short-chain organic mercurials destroy neuronal cells in areas of central nervous systems concerned with sensory and co-ordination functions.

In British Columbia, economic grade deposits of mercury are commonly associated with sedimentary rocks such as limestone and sandstone of the Palaezoic to Recent age. The province's richest mercury deposits are in the Pinchi Lake fault zone which extends from Fort St. James northwest to the Omineca River. Other major areas of mercury mineralization in British Columbia include Kamloops Lake, Bridge River, and Yalakom River.

The concentration of mercury in natural waters is generally low. However, elevated concentrations of mercury have been reported in British Columbia in areas contaminated by the industrial activity (e.g., Squamish) and where extensive mercury mineralization has occurred.

Historical mercury concentrations should be viewed with caution. Results from cleaner laboratory analytical methods with lower detection limits show that background mercury concentrations are lower than previously thought. Older high values may be the artifacts of high detection limits and artificial contamination during measurement.

Recommended Guidelines

Table 1 summarizes all guideline values including those that have been updated. This was deemed to be necessary since the Canadian Council of Ministers of the Environment (CCME) have recently developed guidelines for mercury in the water column to protect aquatic life and in the flesh of aquatic life to protect wildlife. There is obviously a need to reconcile all these guideline values in one document for the benefit of resource managers.

1. SOURCE DRINKING WATER

See the Source Drinking Water Quality Guidelines: Guideline Summary Document

https://www2.gov.bc.ca/assets/download/1F11ABD2CBD24EB09A70B89AB50CE6B0

2. AQUATIC LIFE (FRESHWATER, ESTUARINE AND MARINE)

These guidelines replace the 1989 BC Environment guidelines for fresh, marine and estuarine waters.

(a) The 30-day average guidelines for marine, estuarine and fresh waters are the same, due to the facts that:

- the bioaccumulation potential of mercury in marine and freshwater food chain is similar; and
- both are based on the 1999 CCME recommended tissue residue guideline to protect the most sensitive consumers of aquatic life (e.g., avian species).

The average concentration of total mercury in water as measured over a 30-day period (based on five weekly samples) should not exceed 0.02 ug/L when the methyl mercury (MeHg) constitutes less than or equal to 0.5% of the total mercury concentration. When the proportion of MeHg is greater than 0.5%, the guideline should be adjusted as indicated in the Table 3 below. The rationale for the graduated guideline is the fact that MeHg concentrations may vary in the environment. For example if the percent of MeHg is 11% the guideline would be calculated by the following equation:

0.1ng MeHg/L (WQGwl *see below in rationale section*) ÷ 0.11 (i.e. the % MeHg)
= 0.9 (guideline ng/L total Hg)

Table 3: The Total Hg Guideline as a Function of the Percentage of Methyl Mercury

% MeHg (of total Hg)	Guideline (ng/L total Hg)
0.5	20.0 ng/L
1.0	10.0 ng/L
2.5	4.0 ng/L
5.0	2.0 ng/L

These levels will protect freshwater aquatic life from chronic effects of mercury. They will also prevent undesirable accumulation of mercury from water to the food chain that may harm the most sensitive consumers (e.g., avian species) of aquatic life.

Rationale:

The following assumptions were made to update the 30-day average guideline to protect from mercury bioaccumulation in fish to a level that may harm wildlife consuming the mercury-contaminated fish:

All mercury in fish tissue is in the methylated form. This conclusion is consistent with observations made by researchers in the literature.

The MeHg bioaccumulation factor at a higher trophic level (level 3 or fish consumed by avian species) is 320,000 on wet-weight (BAF_{3ww}) basis or 1,600,000 on dry-weight (BAF_{3dw}) basis. This BAF is consistent with the US EPA recommended value and values observed in Squamish, British Columbia.

Based on recommended level of methyl mercury at 33 µg/kg wet-weight (diet) and the methyl mercury BAF_{3ww} of 320,000, the acceptable concentration in water for the protection of wildlife consuming fish can be estimated as follows:

$$WQGwl = (33\ \mu g\ MeHg\ kg^{-1} \times 1000\ mg/\mu g) / 320{,}000 = 0.1\ ng\ MeHg/L$$

(where WQGwl is the water quality guideline to protect wildlife)

Table 5 below expresses WQGwl in terms of the comparable THg levels for various percentages of MeHg as a function of THg.

Table 5. WQGwl In Terms of the Comparable THg Levels for Various Percentages of MeHg as a Function of THg

% MeHg (of total Hg)	WQGwl (ng/L total Hg)
0.5	20.0 ng/L
1.0	10.0 ng/L
2.5	4.0 ng/L
8.0	1.25 ng/L

This analysis suggests that the 1989 BC Environment's 30-day average guideline of 0.02 mg/L (or 20 ng/L) total mercury is valid as long as MeHg is less than or equal to 0.5% of the total mercury concentration. Appropriate water quality guidelines for MeHg concentrations other than those specified in the above table can be determined using a linear relationship between WQGwl and MeHg (%).

It should be noted that the CCME (2000) in developing guidelines for fresh and marine waters did not consider bioaccumulation effects per se, but based their guidelines on chronic toxicity. They caution that the guidelines that they have developed 'may not protect wildlife that consume aquatic life'. As well, they considered marine and fresh waters separately, even though there is no reason to suspect that the chemistry of each affects mercury or its bioaccumulation in fish and avian wildlife and do not provide a guideline for MeHg in marine water.

(b) The 1989 BC Environment guidelines for a maximum mercury concentration in either fresh or marine waters has been deleted due to the bioaccumulative nature of mercury which is the most important consideration in developing guidelines. Direct toxic effects that a maximum concentration is meant to protect against are seldom encountered and will be accounted for in bioaccumulation in most cases.

3. WILDLIFE

The 30-day average concentration of total mercury in water to protect wildlife should not exceed levels shown in Section 2 above. These guidelines are based on the tissue residue guideline recommended by the CCME (2000), and will protect the most sensitive avian life feeding on aquatic organisms that may accumulate undesirable levels of mercury in their tissues. This guideline replaces the 1989 BC Environment guideline of 3.0 mg THg/L that had been based on livestock sensitivity to mercury since there were insufficient data on mercury toxicity to avian wildlife. The CCME (2000) did not recommend mercury guidelines for wildlife.

Additionally, the methyl mercury concentration should not exceed 0.033 µg/g wet weight in the diet of wildlife. This guideline is consistent with the CCME (2000) tissue guidelines to protect avian wildlife feeding on fish and shellfish containing mercury.

4. LIVESTOCK WATER SUPPLY

The concentration of total mercury in livestock water supply should not exceed 3.0 µg/L at any time. This is consistent with the 1989 BC Environment and the CCME (1999) guidelines.

5. IRRIGATION

The maximum concentration of total mercury in irrigation water should not exceed 2.0 µg/L. This is consistent with the 1989 BC Environment guideline. The CCME (1999) did not recommend mercury guidelines for water used for irrigation.

Application of the Guidelines

1. FORMS OF MERCURY

Toxicity of mercury has been expressed in terms of both total and methyl forms of mercury. However, total mercury is recommended for setting water quality objectives for a given waterbody. The advantages of expressing toxicity on the basis of total mercury concentrations are:

i. all the mercury that may potentially be toxic is included in the measurement; if the total mercury concentration in water is within the guideline limits, then it is safe to conclude that no mercury pollution exists;
ii. for comparison purposes, there is a considerable amount of historical information available for total mercury; and
iii. total mercury measurements are routine and relatively inexpensive.

Mercury in aquatic organisms (e.g., fish) is predominantly in the methyl form and should also be measured when investigating mercury contamination problems in aquatic systems. The CCME recommended tissue residue guideline (0.033 micrograms MeHg/g wet weight-diet) should apply to protect wildlife consumers of fish.

The main disadvantage of using total mercury to assess water quality is that a large fraction of mercury may become biologically unavailable by forming complexes with the organic and suspended solids fractions of water. Nevertheless, given favourable environmental conditions, mercury complexed in such a manner will be released into the environment in readily available forms, becoming part of the food chain.

2. ASSESSMENT OF EXISTING WATER QUALITY

The guidelines recommended in this document are primarily based on laboratory bioassays that usually are performed with soluble forms of mercury under controlled conditions. Aquatic organisms in a natural environment, however, obtain their mercury burden from both water and food. Mercury from sediments

could become available to the organisms under certain environmental conditions. Thus measuring total mercury in water alone cannot be taken as a true measure of a mercury problem in a given waterbody.

Other assessment techniques include measurements of mercury in fish, and long-term bioassays with resident species using local water. The guidelines for mercury in fish can be used for to assess existing water quality. Long-term bioassays are complex and costly, and should be used for waterbodies with high fisheries values that are threatened by a controllable source.

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Seasonal Cycling of Fe and S in a Constructed Wetland: The Role of Sulfate-Reducing Bacteria

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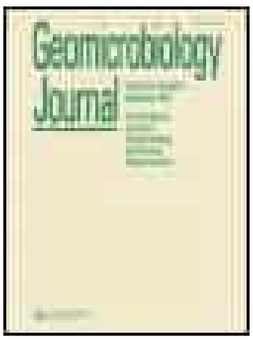

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Seasonal Cycling of Fe and S in a Constructed Wetland: The Role of Sulfate-Reducing Bacteria

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Seasonal Cycling of Fe and S in a Constructed Wetland: The Role of Sulfate-Reducing Bacteria

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The role of sulfate-reducing bacteria (SRB) in the cycling of Fe and S was studied in a young constructed wetland located in Kanata, Ontario, Canada. The wetland is a surface-flow system composed of three consecutive cells. Sediments and water samples were collected over the course of 1 year within each cell. Sediments were analyzed for the presence of SRB (using a lactate-rich medium), whereas surface and porewaters were analyzed for their concentrations of dissolved Fe and sulfate and for pH, E_h*, and dissolved organic carbon. Lactate-using SRB were present at all three sites within the wetland, and the populations were largest (*10^{10} *colony-forming units per gram of sediment) during the cold winter months, where the temperature of the water was ~1° C. The presence of high-SRB populations also corresponded to highly anoxic conditions within the sediments and to a decrease of sulfate concentrations, suggesting that cold temperature did not affect the activity of SRB. Our results indicate that Fe and S cycling in the young constructed wetland was active throughout the year, especially in the cold winter months, where large SRB populations were encountered. This suggests that Fe removal in wetlands can be effective in temperate climates, even though the temperature of the water decreases drastically during the winter.*

Keywords constructed wetland, iron cycling, sulfate-reducing bacteria, sulfur cycling

Biogeochemical reactions responsible for metal removal in constructed wetlands include adsorption onto reactive mineral and organic surfaces and precipitation as insoluble metal

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We thank the city of Kanata, Ontario, Canada, for allowing us to sample the wetland. The project was supported by the University of Ottawa Research Fund and the Interfaculty Collaborative Research Fund. We also thank F.R. Pick and two anonymous reviewers for their constructive comments and suggestions.

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oxides and sulfides (Tarutis and Unz 1996). Of all these processes, microbial sulfate reduction and the subsequent precipitation of metal sulfides have been identified as important reactions in metal removal in wetlands (Machemer and Wildeman 1992; Feng and Hsieh 1998; Webb et al. 1998). In fact, in many low-temperature sedimentary environments, microbial sulfate reduction is the sole mechanism responsible for the formation of iron monosulfides and pyrite (Berner 1984). Recent work has shown that such iron sulfide minerals play an important role in trace metal adsorption in anoxic sediments (Huerta-Diaz et al. 1998).

Microbial sulfate reduction depends on various physicochemical factors, including the supply of sulfates, the amount and type of organic electron donors, pH, and temperature (Berner 1984). In freshwater environments, such as wetlands, sulfate reduction rates are generally limited by the amount of sulfate, because the average SO_4 concentrations are ~50 to 450 μM (Feng and Hsieh 1998). In constructed wetlands, however, sulfate concentrations can be greater because of wastewater loading and anthropogenic activities. A second important factor influencing sulfate reduction in natural aqueous environments is temperature. Temperature effects on the growth of and reduction rates by sulfate-reducing bacteria (SRB) have been studied in sediments in cold climates, such as the Arctic and Antarctic (Isaksen and Jorgensen 1996; Sageman et al. 1998). The latter showed that SRB from Arctic sediments grew well at very low temperatures, but the sulfate reduction rates were greatest at much higher temperatures. The same studies concluded that sulfate reduction rates were more dependent on substrate supply than on temperature.

There is much concern about metal retention by constructed wetlands in northern climates (Maehlum et al. 1995; Reddy and Burgoon 1996). As surface water temperature decreases, microbial sulfate reduction rates are believed to decrease, perhaps leading to a decrease in metal retention. Data on the effect of temperature on SRB growth and sulfate reduction rates in wetlands are, however, limited. Batal (1989) hypothesized that SRB increase their numbers in cold water because the decrease in their metabolic rate provides more substrate for growth of other SRB. Therefore, metal retention, especially Fe, during the winter should be sustained because the increasing number of SRB should maintain the sulfate reduction rates.

The present study was initiated to examine the impact of seasonal variations of SRB populations on the cycling of Fe and SO_4 in the sediments of a young constructed wetland built to treat municipal and agricultural runoff. Seasonal variations in SRB numbers were expected to affect the removal of soluble Fe from the water.

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Materials and Methods

Site Description

The Monahan wetland, located in the city of Kanata, Ontario, Canada, is a surface-flow system that was built in 1995 to control the quantity and quality of storm water runoff. The wetland is referred to as a young wetland because it has yet to accumulate a substantial amount of organic matter in its sediments. In young wetlands, the retention of metals depends more on adsorption onto organic matter than on microbial sulfate reduction observed in older wetlands (Machemer and Wildeman 1992). The Monahan wetland was designed to keep water velocities <0.5 m/s and to hold 35,000 m^3 of water. The mean water depth is 1.5 m and the total drainage basin area of the wetland is ~637 ha. The wetland itself has three consecutive cells, which were lined initially with a thick layer of clay to prevent water infiltration into the underlying aquifer. No organic substrate was added on the clay liner. The Monahan wetland is mainly colonized by cattails (*Typha latifolia*) (Table 1). Phosphorus loading to the Monahan wetland is relatively high (0.17 mg/L), which results in an intense

TABLE 1 Characteristics of the sampling sites

	Site 1	Site 2	Site 3
Location	Cell near inflow	Middle cell	Cell near outflow
Depth (m)	0.5	0.5	0.5
Vegetation	*Typha latifolia*	*Typha latifolia*	*Typha latifolia*
OM[a] (%)	8.15 (0.50[b])	12.67 (0.12)	12.13 (0.42)

[a]Organic matter content in the surface sediments (0–2 cm), as determined by loss on ignition.
[b]The standard deviation ($n = 3$) is given in parentheses.

colonization of the littoral zones by cattails. As a result, ~44,000 kg of organic matter accumulate, mainly as peat, at the bottom of the wetland each year.

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Sampling

Sediments and porewater samples were taken in each cell (at locations called sites 1, 2, and 3) of the wetland (Table 1). Sediments were collected in October and December 1997 and in April and August 1998. One sediment core was taken at each sampling date and site with a 10-cm-diameter plexiglass tube and was sectioned on site into 1-cm intervals. To avoid contamination, samples used for bacterial enumeration were taken in the middle of the core and stored in sterile glass vials. To minimize air contact, the vials were completely filled with sediments and stored on ice until their return to the laboratory. Most probable number (MPN) enumeration was carried out within 24 h of sampling. In situ measurements of pH and redox were also performed on the same sediment cores, using a portable pH meter. The pH electrode was calibrated on site with pH standards (at pH 4 and 7). The redox electrode was also calibrated on site with the ZoBell's solution (Nordstrom 1977). A second set of samples was taken in October 1997 for analysis of geochemical fractions. The sediments were placed in acid-washed bottles and kept at 4°C until being freeze-dried. Fresh surface sediments (from 0–2 cm deep) were also analyzed for organic matter content, as determined by loss on ignition.

Porewater samples (peepers) were collected in December 1997 and in April and August 1998 with plexiglass peepers. One peeper was installed per site and sampling date. Porewater peepers were filled with degassed ultrapure water and closed with a 0.2-μm pore-size filtering membrane (HT-Tufryn; Gelman Scientific). Peepers were inserted vertically into the sediments (not more than 0.5 m from the sediment cores) and left in place for 2 weeks (Carignan 1984). The peepers allowed for the collection of interstitial and surface waters at 1-cm-intervals along a 35-cm profile. Water samples were retrieved with 5-ml plastic syringes and transferred into preacidified plastic bottles (10 μl of conc. HCl for 4 ml of sample). Water sample collection was completed within 1 h of the retrieval of the peepers. The temperature of the overlying waters was also monitored on a monthly basis over the course of the sampling period. Surface water samples were collected every 3 days from April 1997 to October 1997 at site 1 (inflow) and site 3 (outflow). Samples were filtered (with 0.45-μm pore-size filter) and acidified after collection and analyzed for dissolved organic carbon (DOC) by using a DC-190 (Hewlett Packard) TOC analyzer.

MPN Counts of SRB

Numbers of viable SRB were estimated with MPN dilutions in liquid medium (American Public Health Association, 1965) within 24 h of sampling. A modified version of Postgate's

growth medium B (Postgate 1984; 10 g/L Bacto-Tryptone [Difco], 5.9 ml 60% Na-lactate, 2 g/L $MgSO_4 \cdot 7H_2O$, 0.5 g/L Fe $SO_4 \cdot 7H_2O$, and 0.5 g/L Na_2SO_3) was used along with a reducing agent supplement (RAS; 7.5 g/L ascorbic acid and 7.5 ml/L thioglycollic acid). All solutions were adjusted to pH 7.50 with 2 M NaOH. Dilution series (1:10) were carried out in culture tubes, starting with ~1 g of wet sample in 9 ml of reduced water (100 ml/L RAS and 2.1 g/L NaCl adjusted to pH 7.50 with 2 M NaOH). Between each dilution, the tubes were vortex-mixed for 1 min to thoroughly disperse the bacteria and sediments. Five tubes containing 9 ml of growth medium and 1 ml of RAS were then individually inoculated with 1 ml from each dilution set. Sealed tubes were left in the dark at room temperature until black Fe-sulfide precipitates started to form (~1–2 weeks). Note that the medium used might have preferentially selected lactate-utilizing SRB over nonlactate users.

Sequential Chemical Extraction

Sediments were subjected to a sequential chemical extraction to separate them into three iron-rich fractions: Fe-reactive, including oxides, carbonates, monosulfides, and hydrous aluminosilicates; Fe-silicates; and Fe-pyrite (Huerta-Diaz et al. 1993). Freeze-dried sediments (0.25 g) were first digested with 1 M HCl (10 ml) for 16 h. Iron concentration in the HCl fraction is referred to as Fe-reactive. The solid residue was then placed in 10 M HF (30 ml) for 16 h to extract Fe from silicate minerals, and finally any remaining residue was transferred to concentrated HNO_3 (10 ml) for 2 h to assess the pyrite fraction. All extractions were run on duplicate samples.

Iron and Sulfate Analysis

Sulfate concentrations in the porewater samples were analyzed by ion chromatography (Dionex DX-100) with a detection limit of 20 μM. Iron concentrations were measured by graphite furnace atomic absorption spectroscopy (Varian Spectra AA-250 plus), with a detection limit of 0.09 μM. Blanks and certified standards (SCP Science Canada) were used to ascertain the accuracy of the porewater Fe and SO_4 measurements. The iron content of each extraction fraction was analyzed by flame atomic absorption (Varian AA-1475) with use of appropriate standards and matrices; the detection limit of that method for Fe was 1.7 μM.

Statistical Analyses

Statistical analyses were performed with Systat 7.0 for Windows 95. Spatial and temporal differences in DOC content in surface water were tested by using a two-way parametric analysis of variances (ANOVA). Assumptions of the parametric ANOVA were tested with Wilkes–Shapiro test for normality of residuals, with Levene's test for homoscedasticity and with autocorrelation plots for independence among residuals.

Results

SRB Populations

Temperatures of surface water dropped near the freezing point in the winter, and a thin layer of ice (5–15 cm) developed over most of the wetland (Figure 1). Nevertheless, SRB were observed at all three sampling sites during each of the sampling periods (Figure 2), being recovered from the first 10 cm of sediment (organic and inorganic sedimentary material and clays from the liner material put at the bottom of the wetland during its construction). SRB

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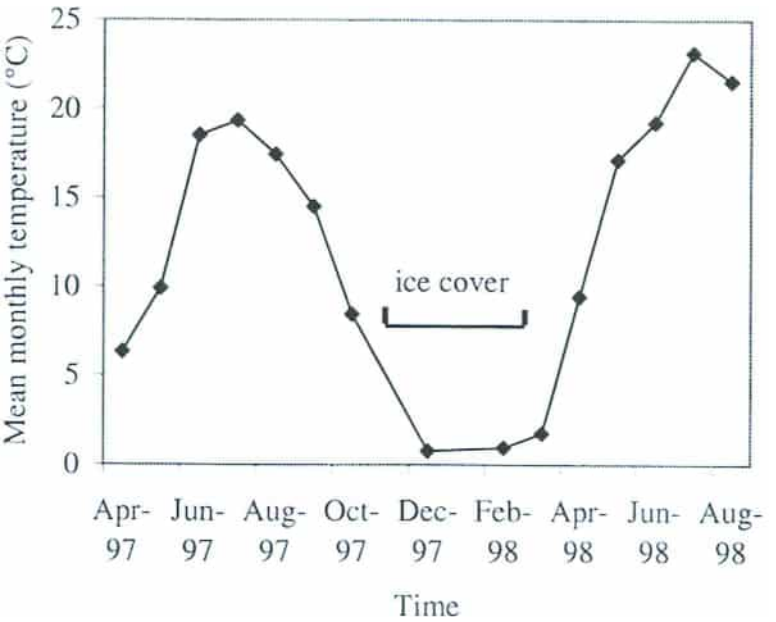

FIGURE 1 Average monthly temperature (°C) of the surface waters in the constructed wetland for the period April 1997 to August 1998.

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populations varied with depth at all sites but appeared to fluctuate most as a function of the season, especially near the sediment–water interface. In fact, the largest SRB populations were encountered at site 1 during the winter sampling in December. The smallest SRB populations were seen in the upper layer of sediments at sites 1 and 2 in April.

Surface and Porewater Chemistry

The pH of interstitial waters was between 7.00 and 8.50 (Figure 3) and remained fairly stable with respect to both depth and sampling time. A slight pH increase was observed near the sediment–water interface at site 1 in August, at site 2 in October and April, and at site 3 at all sampling dates. On the other hand, redox conditions varied greatly with depth and sampling time (Figure 3). Although anoxic conditions prevailed in the sediment deeper than 1–2 cm, slightly oxic conditions were encountered near the sediment–water interface at site 1 in April and August, whereas the sediments were anoxic in October. At site 2, suboxic conditions prevailed near the surface in October and April, whereas the surface sediments were slightly anoxic in August. At site 3, conditions were suboxic to oxic near the surface in October and April, whereas the sediments were completely anoxic in August. Samples were not analyzed for pH and E_h in December.

One set of data for iron and sulfate is missing for site 3 in December, because the peeper could not be recovered from under the ice. At all sites and sampling times, Fe was not detected in the overlying waters, except at sites 1 and 2 in December, which had low concentrations of Fe (Figure 4). For all sites, Fe concentrations increased drastically near or at the sediment–water interface, especially at site 1 in April, at site 2 in December, and at site 3 in April (Figure 4). In addition, large fluctuations were observed within the sediments, especially in the deeper portion of the profiles, where sedimentary particles were mixed with clays. Sulfate concentrations showed a very different trend: Concentrations were greatest in the overlying waters and decreased sharply in the sediments (Figure 5). Sulfate

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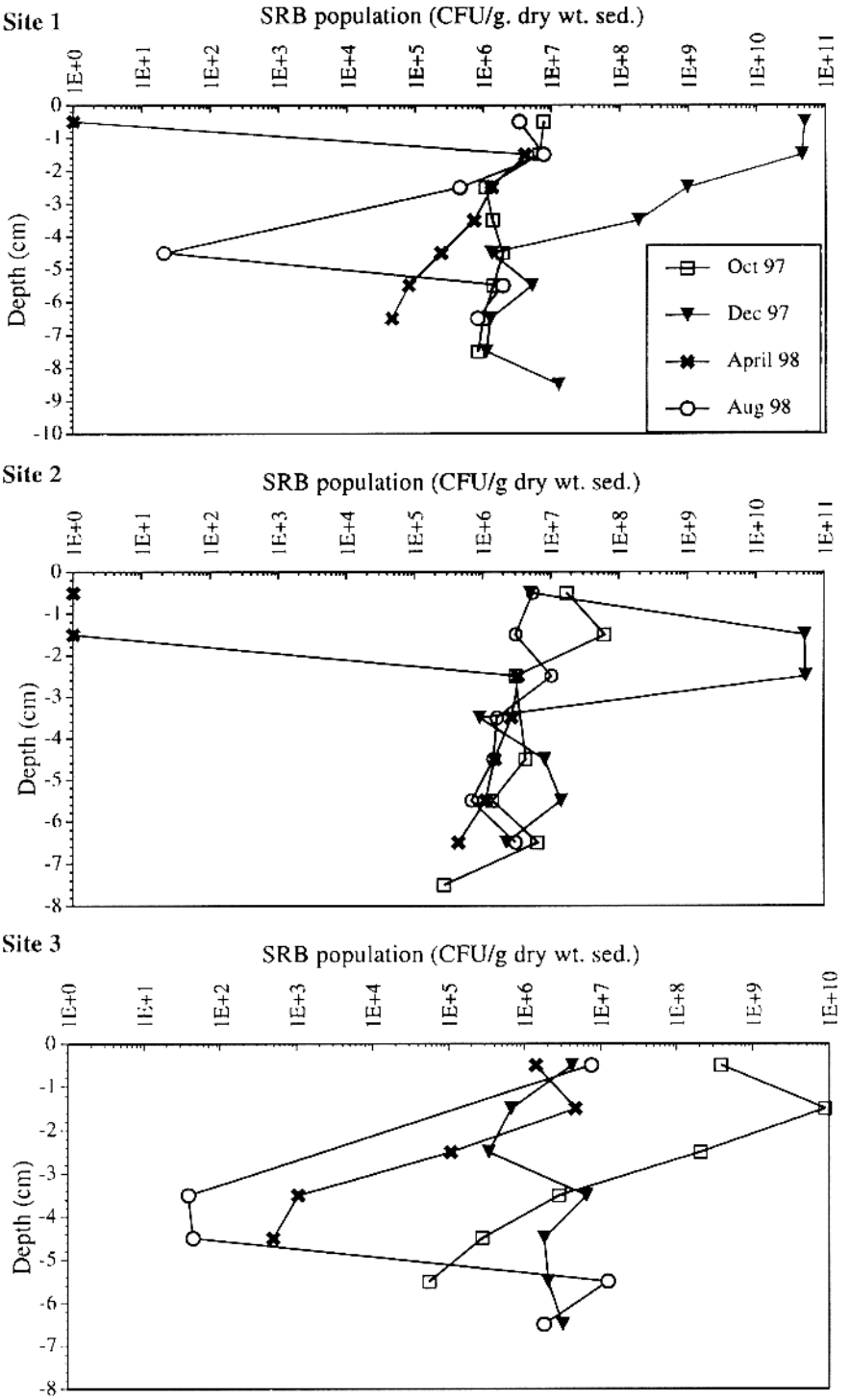

FIGURE 2 Seasonal variations of SRB populations (colony-forming units [CFU]/g dry wt. sediment) in the sediments of the littoral zone near the water inflow (site 1), in the middle cell (site 2), and near the water outflow (site 3). Notice the increase of SRB populations in December in the upper portion of the sediments at sites 1 and 2, and their absence in April.

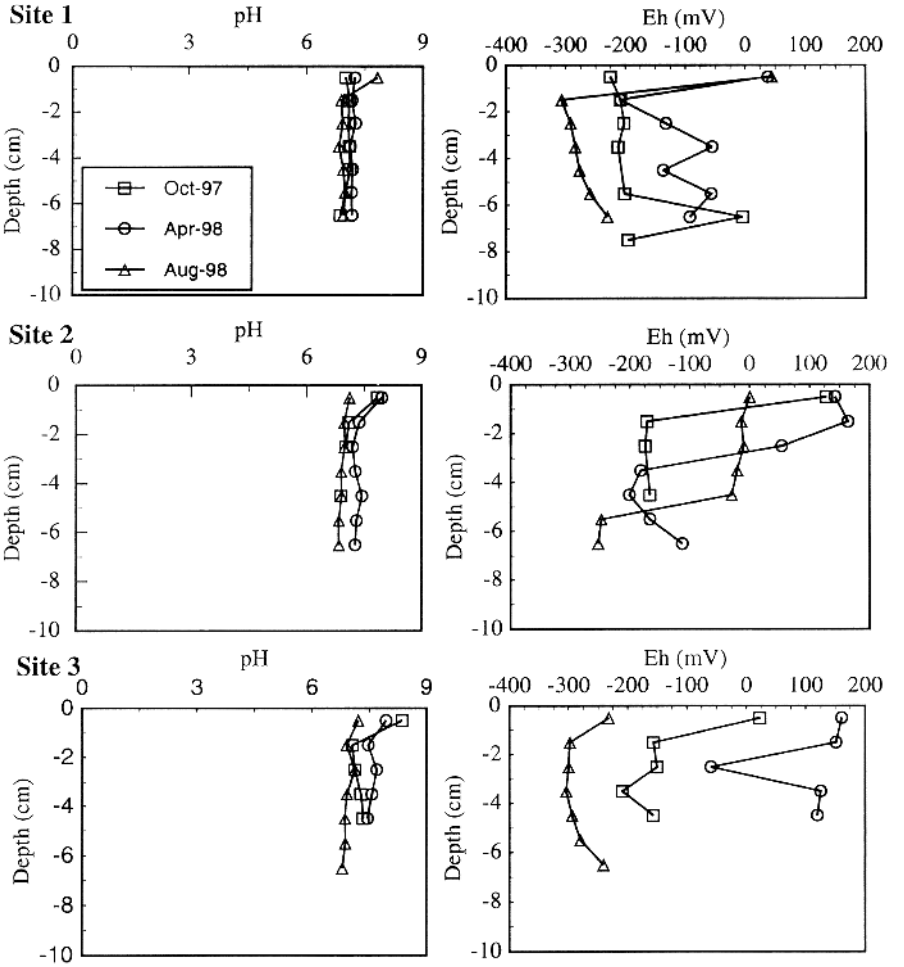

FIGURE 3 In situ pH and E_h profiles as a function of sampling dates in the sediments of the littoral zone near the water inflow (site 1), in the middle cell (site 2), and near the water outflow (site 3). Depth 0 cm corresponds to the sediment–water interface.

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concentrations never exceeded 300 μmol/L below the sediment–water interface and did not vary much as a function of time. On the other hand, seasonal variations were observed in the overlying waters at all sites (Figure 5). The largest SO_4 concentrations were encountered in December at sites 1 and 2, were less in April, and reached a minimum in August.

DOC concentrations in the surface waters varied on temporal and spatial scales (Table 2). DOC concentrations ranged from 5.96 to 12.04 mg/L and differed significantly between seasons (Table 3). Throughout the year, basis, DOC concentrations at the inlet were significantly lower than at the outlet. The same difference in DOC concentrations between the inlet and outlet also occurred at each sampling date. DOC concentrations were particularly high in June 97, reaching 9.50 and 12.04 mg/L at the inlet and outlet, respectively.

Sediment Chemistry

The organic matter content of the surface sediments varied slightly between the three sampling sites (Table 1), with slightly higher values at sites 2 (middle cell) and 3 (outflow) than at

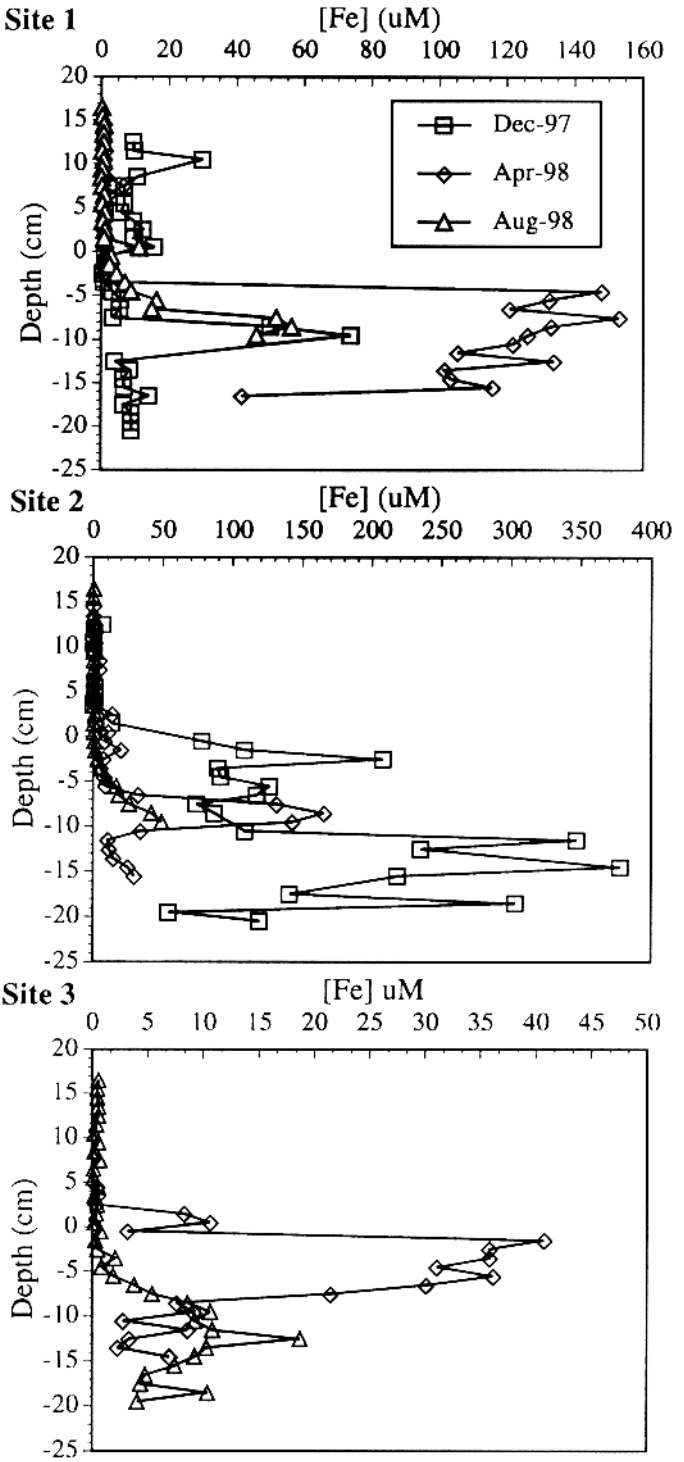

FIGURE 4 Fe concentration profiles in the overlying waters and in the porewaters for three sampling dates at site 1 (near the water inflow), site 2 (the middle cell), and site 3 (the outflow basin). Note the presence of dissolved Fe in the overlying waters at sites 1 and 2 in December.

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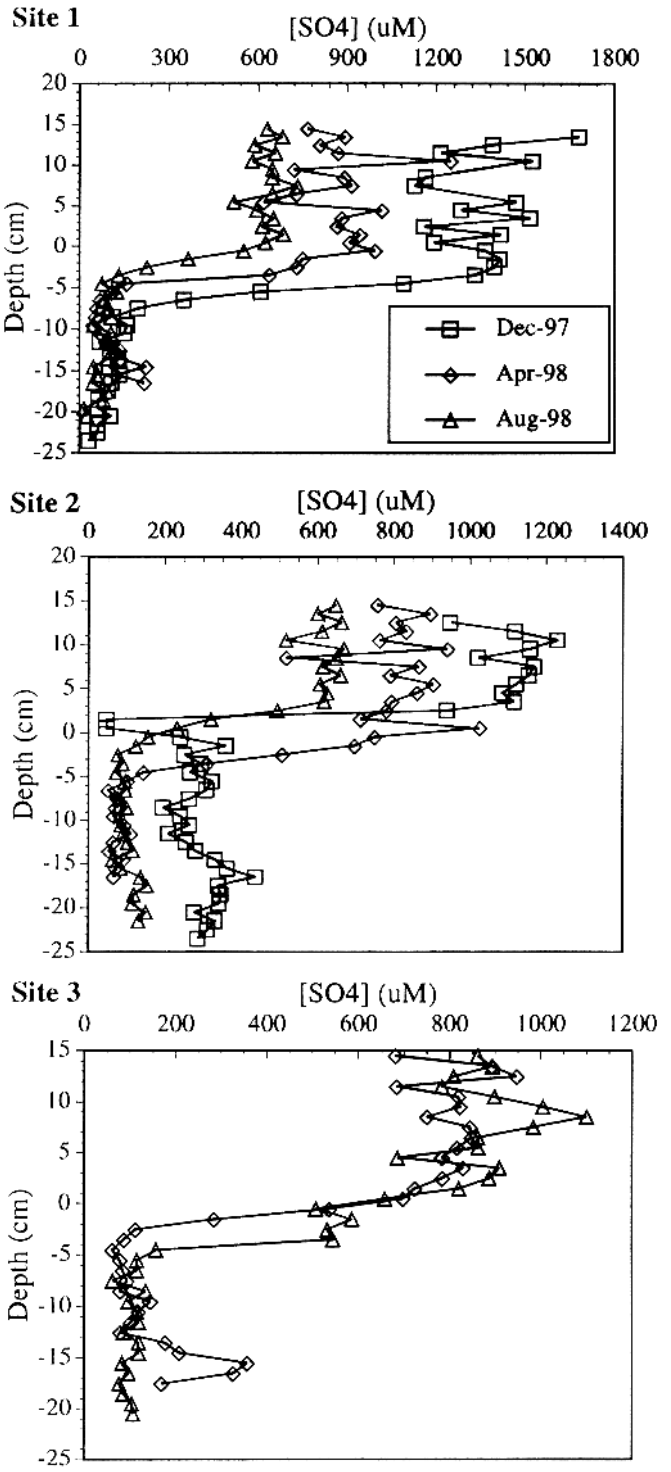

FIGURE 5 SO_4 concentration profiles in the overlying waters and in the porewaters for three sampling dates near the water inflow (site 1), in the middle cell (site 2), and at the outflow (site 3). Note the large concentrations of sulfate in December for sites 1 and 2.

TABLE 2 Average monthly concentrations[a] of dissolved organic carbon (DOC) in the surface waters of the wetland at sites 1 and 3

	DOC (mg/L)	
Sampling date	Site 1	Site 3
April 97	8.01 (1.26)[b]	8.74 (1.94)
June 97	9.50 (3.98)	12.04 (3.69)
August 97	5.96 (2.93)	8.20 (2.28)
October 97	7.26 (1.80)	8.63 (3.14)

[a]Samples were taken every 3 days during the course of each month.

[b]The standard deviation (n = 9–10) is given in parentheses.

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site 1 (inflow). The reactive iron fraction showed a slight increase near the sediment–water interface at all three sites, whereas the silicate fraction fluctuated with depth (Figure 6). Fe concentrations associated with the pyrite fraction were less than those observed in the Fe-reactive and silicate fractions. In fact, no Fe was detected in the pyrite fraction at site 3.

Discussion

Fe and S Cycling and Redox Fluctuations

The cycling of iron and sulfur in wetlands and other aquatic environments is affected by redox reactions, which are triggered by the mineralization of organic matter (Stumm and Sulzberger 1992). In fact, the rapid consumption of oxygen during the degradation of organic matter and the subsequent use of alternate electron acceptors can move the oxic/anoxic barrier toward the sediment–water interface and create anoxic conditions in the surficial sediments (Froelich et al. 1979). Such redox fluctuations were observed in the sediments of the Monahan wetland throughout the year, especially in the top 2 cm of the sediments (Figure 3), in which completely anoxic conditions were encountered in October at site 1 and in August at site 3. Redox measurements were not made in December, but the presence of reducing conditions in the surface sediments and in the overlying waters of sites 1 and 2 was inferred by the presence of soluble Fe above the sediment–water interface (Figure 4). Under reducing conditions, Fe-rich minerals such as Fe-oxides undergo reductive dissolution,

TABLE 3 Results of the two-way ANOVA test comparing DOC concentrations (n = 138) between the inlet (site 1) and outlet (site 3) and the four sampling dates

	Two-way ANOVA test		
Factor	Degrees of freedom	F-statistic	P
Sampling dates	3	17.48	0.000
Sites	1	4.43	0.037
Sampling dates sites[a]	3	1.10	0.354

[a]The interaction term compares the differences between sites within each sampling date.

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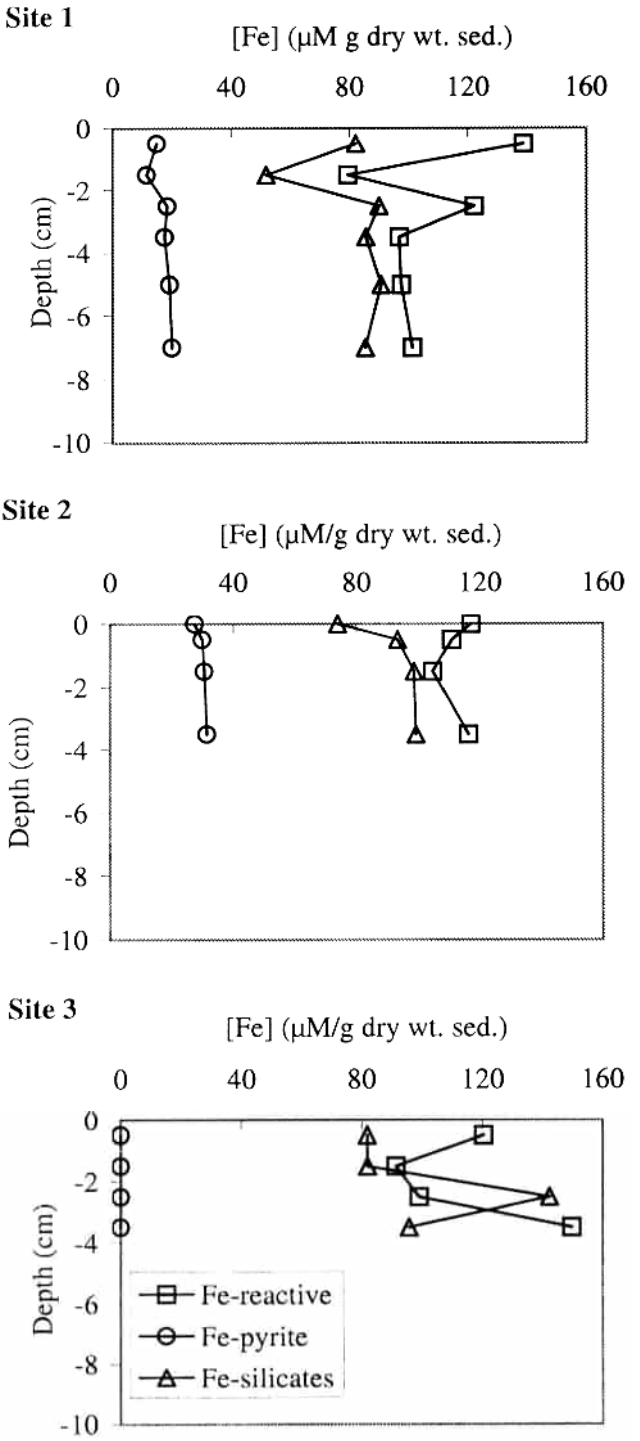

FIGURE 6 Profiles of Fe-rich fractions in the sediments of sites 1, 2, and 3 in October 1997 as determined by sequential chemical extraction. Fe-reactive was extracted with HCl, Fe-silicate with HF, and Fe-pyrite with HNO_3. Notice the absence of Fe-pyrite in the sediments of site 3.

which allows Fe(II) to either diffuse upward into the overlying waters or downward into the sediments (Stumm and Sulzberger 1992). The presence of an ice cover over most of the wetland during the winter months might have also contributed to the presence of anoxic conditions by limiting oxygen diffusion into the water. Redox fluctuations, however, were not constant within the wetland. For example, site 3 (outflow) often behaved differently from site 1 (inflow), and surface sediments near the inflow tended to be less oxic overall than the sediments at sites 2 and 3, even though they contained less organic material in the sediments and in the water at site 1 (Tables 1 and 2). These cell differences were probably caused by various degrees of oxygen consumption and differences in microbial activity throughout the year.

Sulfate concentration profiles in the Monahan wetland indicate that sulfate was reduced near the sediment–water interface (Figure 5), as indicated by the sharp decrease of concentrations in the sediments. Sulfate reduction was observed over the course of the year and did not appear to be limited to warmer months. In fact, sulfate concentrations within the sediments remained constant, whereas concentrations in the overlying waters increased during the winter months—probably because of the use of de-icing agents containing sulfate salts or sulfate impurities on the surrounding roads (Shanley 1994).

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Microbial Sulfate Reduction

The decrease of sulfate concentrations showed a positive correlation with the presence of SRB in the sediments (Figures 2 and 5). SRB were indeed recovered throughout the year and did not appear to be greatly affected by the presence of suboxic conditions in the surface sediments or by the temperature. SRB were generally present in the surface sediments where oxic conditions prevailed, except at sites 1 and 2 in April 1998, where they were absent (Figure 2). This suggests that SRB were either oxygen-tolerant or living in anoxic microenvironments within the oxic sediments. Oxygen usually inhibits microbial sulfate reduction (Widdel 1988), but sulfate reducers have been isolated from oxic to suboxic environments (Canfield and DesMarais 1991; Sass et al. 1997). Visual observation of the wetland surface sediments revealed the presence of small black patches rich in Fe-sulfides within the oxic sediments, indicating the presence of microenvironments. On the other hand, the absence of SRB in the surface sediments at sites 1 and 2 in April and their presence at site 3 suggest possible changes in population dynamics.

Our results also indicate that SRB thrived during the colder months. In fact, the largest populations were encountered in December, when the temperature of the water was ~1°C (Figure 2). The largest SRB populations also corresponded to the largest decline of sulfate concentrations (Figure 5), suggesting an apparent increase in sulfate reduction during the colder months. Our results are surprising, because sulfate reduction rates in natural aquatic environments usually decrease during colder months (Abdollahi and Nedwell 1979; Moeslund et al. 1994; Holmer and Kristensen 1996). However, recent work by Sageman et al. (1998) and Isaksen and Jorgensen (1996) showed that optimum growth temperature for SRB isolated from cold environments was often higher than the in situ temperature, but the sulfate reduction rates were comparable with those measured in sediments of temperate climates. Numerous studies have also suggested that cold temperature might not inhibit bacterial life but might diminish the affinity of the bacteria for substrates (Wiebe et al. 1992; Nedwell and Rutter 1994; Isaksen and Jorgensen 1996; Sageman et al. 1998). It is difficult to conclude from our results that substrate affinity was a key factor in SRB growth at cold temperature, because we did not identify the various types of SRB and organic substrates in the water. In fact, it is possible that the growth medium used for the enumeration (MPN) preferentially selected lactate-utilizing SRB, which might not be representative of the whole SRB population in the wetland. Regarding substrate availability,

our limited number of DOC values (Table 2) suggest that the pool of organic substrates varied throughout the year from one site to the other, being generally lower in the winter because of low primary productivity (Mann and Wetzel 1995). Our results indicate that to compensate for the low organic content of the sediments and the potential lower affinity for the substrates, SRB increased in number during the colder months, which had the effect of maintaining the sulfate reduction rates throughout the year. Clearly more work is needed on the characterization and availability of potential organic donors to assess the role of substrate affinity.

SRB and Fe-Rich Mineral Formation

The dynamics of SRB populations and their effect on sulfur and iron cycling affected the mineralogy of the wetland sediments. The constructed wetland was 2 years old at the time of sampling and originally contained clay material at the bottom. Results from the chemical extraction (Figure 6) indicated that the surface sediments were enriched in reactive Fe, indicating that Fe was bound to carbonates, oxides, monosulfides, and hydrous aluminosilicates (Huerta-Diaz et al. 1993). In most natural aquatic environments, the enrichment of Fe-reactive compounds corresponds to the formation of diagenetic Fe-oxides and Fe-monosulfides (FeS). Diagenetic Fe-oxides usually form when soluble Fe(II) from anoxic sediments diffuses upward toward the oxic–anoxic interface and is oxidized to Fe(III) (Fortin et al. 1993), whereas Fe-monosulfides precipitate as a result of sulfide production during microbial sulfate reduction (Berner 1984). Seasonal variations in Fe and S cycling are therefore responsible for the enrichment in reactive Fe in the constructed wetland. On the other hand, the Fe-silicate fraction showed no distinctive patterns but simply reflected the existence of the clay material emplaced during construction of the wetland and its redistribution through bioturbation. In fact, visual observation of the sediment cores indicated that the clay material in the deeper portion of the core was often mixed with black precipitates, probably Fe-sulfides. Our results also showed that pyrite (FeS_2) formed within the wetland, but only at sites 1 and 2. Pyrite formation is not a direct by-product of microbial sulfate reduction; its formation in aquatic environments is often attributed to the reaction of Fe-monosulfides with dissolved sulfides (Berner 1984; Schoonen and Barnes 1991; Donald and Southam 1999). Our results indicate that the formation of pyrite might have been inhibited in the outflow basin (site 3), perhaps because of a low production of sulfides. However, SRB populations in October were at their greatest, which suggests a large supply of dissolved sulfides (Figure 2). Clearly, the presence of SRB alone cannot explain the absence of pyrite at site 3; the solubility of pyrite is also a function of physicochemical factors, such as the presence of sulfide-complexing agents and the concentration on Fe (Howarth et al. 1983; Howarth and Merkel 1984). In fact, our results indicate that the concentrations of dissolved Fe in the anoxic sediments of site 3 were 3 to 8 times lower than the ones at sites 1 and 2, respectively (Figure 4).

In conclusion, Fe and S cycling in the young Monahan constructed wetland was active throughout the year, especially in the cold winter months, where large SRB populations were encountered. This suggests that metal removal in young wetlands, especially Fe, is effective in temperate climates, even when the temperature of the waters decreases drastically in the winter.

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January 31, 2025

BY EMAIL

Attention: Aaron MacDonell
Director of Environmental Services
Kinross Gold Corp.

Dear Aaron MacDonell,

RE: Great Bear Project Mercury Study Plan

On behalf of Asubpeeschoseewagong Anishinabek ("ANA" or "Grassy Narrows"), we write in response to the Mercury Study Plan (the "Study Plan") prepared by WSP Canada Inc. on behalf of Great Bear Resources, as per the requirement in the Tailored Impact Statement Guidelines ("TISG") issued by the Impact Assessment Agency of Canada (the "Agency" or "IAAC") for the Great Bear Gold Project (the "Project") on August 1, 2024.

The TISG requires the proponent to "submit a study plan to the Agency with sufficient time to facilitate a review by experts and interested parties and to inform the studies undertaken." With respect to the study plan, the IAAC notes in the TISG that "the potential for project contributions to methylmercury production in downstream watersheds requires a detailed and robust analysis" that includes "establishing baseline methodology and effects assessment methodology related to methylmercury." (emphasis added)

Our experts have previously raised significant concerns with respect to the quality and quantity of baseline data and monitoring completed to date, and the monitoring planned, with respect to the Great Bear Gold Project. These concerns remain. The Study Plan does not provide us with adequate assurance that this preliminary work will be accurately and adequately completed before the proponent moves forward with the necessary studies and engages in risky Advanced Exploration ("AEX") construction and mining activities. Any studies completed based on erroneous and unreliable data will not provide Grassy Narrows with the necessary information we need to properly assess the potential impacts of the Project on our inherent, Aboriginal, and Treaty rights, nor will it provide the External Technical Reviewers ("ETR") with the technically rigorous and accurate information that they need to assess the impacts of mercury and methylation during the Impact Assessment process.

Our experts are also concerned with the effects assessment methodology proposed, including the use of inadequate baseline data, unclear monitoring, flawed ML-ARD work, and unsuitable modelling software.

The proposed software has technical limitations that will prevent it from being successfully applied in the manner proposed to address the biogeochemical aspects of mercury methylation across the landscape and methylmercury uptake by biota. The Study Plan indicates that the software will not be modeled downstream of the Project site and important details, such as a

mixing zone in between “nodes”, cannot be simulated in sufficient detail. As well, the model does not intend to assess cumulative impacts and methylation potential at the discharge point, downstream and throughout the broader river system.

The Study Plan thus presents a model that is unable to predict mercury biogeochemical processes, and which is dependent on background data and proposed monitoring that is insufficient. As we address below, any study based on this Plan is bound to fail and will be inadequate for its intended purposes as outlined in the TISG.

Request for extension to provide comments

The IAAC directed the proponent to submit a study plan with “sufficient time to facilitate a review by experts and interested parties.” (emphasis added) A few weeks is not enough time for Grassy Narrows to complete the necessary review, particularly because a significant portion of the review period extended over the Christmas holidays. The holidays are one of the only times when Grassy Narrows people are usually able to lower the level of stress and anxiety that the mercury crisis and industrial threats have brought to the community. Establishing short comment periods for critical plans related to toxic threats over the holidays exacerbates the stress and anxiety which have fueled a well-documented mental health and suicide crisis in Grassy Narrows. This is a concern that Grassy Narrows has explained repeatedly to Kinross and to the IAAC. The fact that this grave concern is being ignored is emblematic of the unilateral, coercive, reckless, and disrespectful nature of this Project and this process to date. The timeline provided by Great Bear is insufficient to review the proposed Study Plan, to engage with our experts and our community in a fulsome manner, to carry out our governance process, and to develop a fulsome response.

While you insist that you will not pause your work on the Impact Assessment as you must adhere to the Impact Assessment timelines, the IAAC continues to tell us that this is not the case. The IAAC informs us that the proponent can agree to a pause in the Impact Assessment process at any time. As well, the IAAC has assured us that there is no deadline by which the proponent is required to submit the Study Plan. In fact, IAAC agreed that it would be proper for the ETR to have the opportunity to review the Study Plan and provide input prior to proceeded with the studies. The ETR Terms of Reference have yet to be set, the selection process has yet to be finalized, and its membership has yet to be selected. It is premature to close the comment period on the Study Plan.

It is in everyone’s interest for Grassy Narrows and our external experts to have enough time to review the Study Plan prior to proceeding with the study/studies to ensure that the studies are “detailed and robust”, the ETR has the information they need to adequately assess methylation-related issues, and the Impact Assessment is completed in a technically rigorous manner. If the study proceeds without sufficient time for effective peer review, or with a flawed methodology, then its results will not be reliable. It is not prudent nor rational to proceed with the Study Plan in these circumstances. We reiterate our request for an extension to provide fulsome comments.

Preliminary comments

We have been unable to complete a fulsome review of this critical document which will inform the proponent’s analysis of methylmercury, a key concern identified by Grassy Narrows during the Planning Phase of the federal Impact Assessment and throughout other regulatory review processes. However, as you insist that you will move forward with the studies without us, we are submitting our preliminary comments.

We have also enclosed two initial reports from our experts who have completed a preliminary technical review of the Study Plan to date: (1) Preliminary Report by Dr. Brian Branfireun, and (2) Preliminary Report by Dr. Kevin Morin. Note that Dr. Branfireun is an internationally recognized expert in the field of watershed biogeochemistry and the environmental cycling of mercury, including methylation, and his insights with respect to the methodologies proposed are particularly valuable.

Grassy Narrows' previous submissions should also be meaningfully integrated into a revised Study Plan, including our initial March 2024 submissions and subsequent submissions from Grassy Narrows and our experts in response to the PTTW, ECA for ISW, and Closure Plan applications. These submissions include important content that relates to the Study Plan, including information about Grassy Narrows' concerns and priorities; the sufficiency of generic guidelines for the protection of aquatic wildlife; deficiencies in the components of the planned study, including with respect to baseline data, monitoring plans, ML-ARD, groundwater modelling, and mitigation plans, among other things; and deficiencies in the review process to date.

1. **The proponent's reliance on achieving on/off site water quality that complies with PWQO and CCME water quality guidelines is inadequate and inappropriate when considering mercury and methylmercury in water, and methylmercury uptake by biota.**

The Plan states that to date, water quality monitoring shows that mercury and methylmercury concentrations in water are below Canadian Council of Ministers of the Environment ("CCME") water quality guidelines for the protection of aquatic life. It is clear that the proponent intends to apply CCME guidelines to the Project as "comparisons", but also as regulatory thresholds from a compliance standpoint.

Dr. Branfireun continues to opine that CCME guidelines for mercury and methylmercury are "useless for the protection of fish consumers, and even if discharges or indirect effects were a fraction of these guideline limits there would be significant potential for downstream impairments of aquatic resources." The CCME guidelines for total mercury and methylmercury for the protection of aquatic life are significantly above background levels. For example, the CCME guideline for total mercury in surface water is roughly 10-20-fold higher than uncontaminated baseline levels of mercury in the English River watershed. Previous submissions by Dr. Branfireun are clear that any increase in mercury above baseline in water would be expected to be reflected in walleye.

The CCME document itself provides that it "does not address exposure through food or bioaccumulation to higher trophic levels" and that "if the ultimate management objective for mercury is to protect high trophic level aquatic life and/or those wildlife that prey on aquatic life, more stringent site-specific application of these water quality guidelines may be necessary." Stringent site-specific guidelines are necessary in the circumstances. These site-specific guidelines must take into account the specific ecosystem, watershed, bioaccumulation, subsistence human consumers of high trophic level fish and wildlife, cumulative impacts, and the ongoing mercury crisis in Grassy Narrows. Grassy Narrows has raised this issue consistently since its first submission on the Great Bear Gold Project, and we have yet to see it reflected in the project plans including this Mercury Study Plan. The information that Grassy Narrows and its experts have provided about mercury and methylation continues to be ignored.

It is unclear what guideline levels, if any, are being proposed for sulphate, and for other parameters that impact methylation including DOC, temperature, light penetration, and pH, among others. However, the sulphate guideline levels for the receiving environment proposed in the ECA application were found by Dr. Branfireun to be entirely inappropriate for the purpose of preventing methylation impacts. If Kinross is planning to use those same levels here, then the results of this study will be erroneous.

The Study Plan must establish site specific criterion for mercury, methylmercury, sulphate, and other parameters that impact methylation, based on appropriate baseline data, and the site-specific factors noted above, not based on generic national standards that have not been designed for bioaccumulation nor for subsistence fish eaters and/or previously exposed populations. Methodology that relies on "useless" comparators and guidelines will not lead to an analysis that is "detailed and robust."

2. **The background data collected as part of the baseline studies for this Project are largely erroneous or their interpretation is flawed, which makes them insufficient to detect whether the project will have a measurable impact on fish mercury levels in the future.**

Grassy Narrows continues to raise concerns with respect to the background data collected by the proponent as part of their baseline studies. The proponent has not corrected many of the baseline study problems identified by Grassy Narrows' experts. Serious data quality problems remain and any methodology that proposes modelling based on such erroneous data will lead to study results that are inaccurate and ineffective, rendering the entire study useless, and posing serious risks to Grassy Narrows.

Dr. Branfireun continues to opine that "in the context of the protection of fish consumers, nearly all of the background data for total mercury are useless and stated incorrectly." The background mercury data in water is incorrect. The data provided for mercury are not data but are instead detection limits of the contract laboratory. The detection limits for methylmercury are higher than background levels in the English River. Concentrations reported for sulphate have also been erroneous up until May 2023 when the proponent appears to have changed analytical methods or laboratories which was not documented, contrary to best practices.

The baseline studies and proposed methodology with respect to biota are similarly inadequate. The proponent has not collected consistent species to allow for comparison between years, assessed both high trophic sport fish and low trophic indicator species, nor identified the frequency and duration of any studies.

The Study Plan relies on background data about mercury and sulphate that will inform modelling efforts and trigger undefined actions should they change. Dr. Branfireun opines that the proponent proposes to use an "inappropriate analytical approach" that will "reliably generate non-data that will not capture trends in mercury concentrations across most of the sampling sites in the project area."

The baseline studies have a number of other key deficiencies including:

1) The baseline studies are being conducted after activities that can impact methylation (such as road and machine track construction, forest clearing, drilling, soil impacts, and other industrial activities) have already occurred. This makes it impossible for most sampling sites to establish a baseline that is free of project impacts or those from other

projects.

2) Further activities that can impact methylation are planned to be carried out over the study period including extensive Advanced Exploration activity that includes activities normally considered to be mine construction. This will further interfere with the ability to establish a proper baseline.

3) There are no baseline sites in the Chukuni River that are upstream of the potential impacts of other mine sites including the Red Lake Mine and the Madsen Mine. Therefore, the baseline will likely reflect contaminated conditions which will obscure impacts from this project.

4) There are no baseline sites downstream of Pakwash Lake even though dissolved methylmercury and sulphate can travel long distances downstream and have impacts large distances from the discharge point.

5) The Plan is lacking detail so the precise sampling purpose, locations, protocols, and durations cannot be evaluated.

Grassy Narrows has repeatedly expressed a lack of trust that a profit motivated gold mining company, nor its partners, can be relied upon to establish a credible baseline. The highly critical expert reviews of the baseline work to date and the monitoring plans further substantiate Grassy Narrows' concerns. Grassy Narrows has repeatedly requested that the Crown or the proponent support Grassy Narrows to carry out a credible baseline study. However, neither the Crown nor Kinross have supported this work to date. The result is that the baseline work and plans to date are fundamentally flawed and incapable of effectively supporting risk assessment and mitigation.

Well-designed baseline studies are required to be carried out over a number of years in order to establish a baseline with a reasonable level of confidence in the range of natural variation in the baseline. Without this, it will be impossible to know whether changes seen during monitoring are due to the project or due to natural variation.

3. **Metal Leaching and Acid Rock Drainage prediction methods are improper.**

Another key input into the Study Plan is the prediction of which substances will be generated by the overburden, ore, and tailings from the project and their concentrations (ML-ARD). Previous submissions by Source Environmental note that the project has yet to complete a credible contaminants of concern assessment.

Dr. Morin similarly explains that the proponent continues to use the same ML-ARD approach and testing as Advanced Exploration and fails to follow guidance in the federal Prediction Manual of best practice and industry standards which are required under Ontario regulations. Where the proponent has committed to conducting certain tests, such as the tests for geochemical characterization, the proponent has not released most of its results.

As well, the proponent plans to use incorrect analytical methods in the proposed studies which are flawed and "will underestimate the amount of mercury in Great Bear mined materials including the walls of underground workings and pits, waste rock, overburden, soil, and tailings." Dr. Morin opines that the proposed methods are "not appropriate, reliable, and safe for the Mercury Study." He adds that the proposed groundwater modelling is similarly unreliable. Dr.

Morin concludes that he expects that the proponent will underestimate the important geochemical input and groundwater flow leaving its Gear Bear site which is “critical for a reliable outcome from the proposed Mercury Study.”

The proponent should not proceed with the Study Plan until there is high quality ML-ARD data and baseline data over multiple years for the model, and a credible monitoring plan in place. This must also be completed before the proponent proceeds with further activities that could cause potential impacts, including impacts to baseline data, for example, AEX construction, road and trail building, etc.

4. **The assimilative capacity of the receiving waters as a mitigation strategy for excess sulphate loading is not supported by the available data.**

The proponent continues to present a mitigation strategy that involves “discharging treated effluent to a large receiving watercourse (Chukuni River) that has a high oxygenation level and high assimilative capacity.” Our experts have commented on this “strategy” in previous submissions, explaining that this presents an erroneous understanding of methylation in aquatic environments. Dr. Branfireun responds in detail in his enclosed report. Dr. Branfireun concludes that:

- The strategies for treating effluent to be discharged to the Chukuni River do not target sulphate, and sulphate production from overburden and waste rock are likely to be greater than the proponent states.

- The proponent’s assessment of the watercourse’s assimilative capacity is inadequate as the proponent uses the average of entire daily discharge records for all of their dilution scenarios. There are potentially dire sulphate concentrations/volumes that could arise as a result of low flows combined with higher than stated effluent sulphate concentrations/volumes.

- The proponent relies on the high oxygenation level of the Chukuni River and does not consider the methylation potential of downstream waters, nor riparian areas and porewater, where this well-oxygenated river will deliver sulphate that may be many times in excess of background levels, in particular, to downstream mercury-sensitive lakes with high mercury methylation potential.

As with other components of this project, the cumulative impacts of this project in the context of other past, present, and planned projects does not appear to have been considered. There are at least five other gold mining projects proposed or operating in this watershed, as well as a pulp mill, sawmill, dams, diversions, clearcut logging, and municipal waste.

As well, the other mitigation measures described in the Study Plan are generally vague, unclear, and incomplete, and the list of potential effects is similarly incomplete and does not include potential effects from road and trail construction, site clearing, soil impacts, and water/dewatering, for example. There is insufficient information available for Grassy Narrows to adequately assess the proposed mitigation measures, and the information provided to date does not satisfy our experts that the proposed measures are effective and safe.

5. **The proposed model that the proponent plans to use to predict changes in sulphate, mercury and methylmercury concentrations in downstream watersheds and assess the potential impact on mercury levels in fish cannot technically**

deliver on those outcomes.

The Study Plan states that the proponent will rely on the GoldSim software modelling package to "simulate the volume and flow of water, and the concentrations and transport of chemical species, over the life of the Project." Our experts raise significant concerns with the GoldSim software, including its inability to be applied to an environmental mercury speciation scenario, and opine that additional information on the model is required before it can be assessed as an adequate model for the methylation studies.

Dr. Morin explains that mercury and sulphate predictions will only be generated at "nodes", the areas where the user-defined "conceptual boxes" connect. This means that the predictions will not simulate waterbodies in their environmental complexity, but simply represent the internal conditions that the proponent "chooses to assume, estimate, and simulate." It is particularly concerning that the Chukuni River will only be modeled at two "nodes", immediately above and below the property boundary. There are no "nodes" in Pakwash Lake nor further downstream where there are concerns of mercury methylation. There are also no nodes at a baseline site that is upstream from the impact of other local mines and therefore reflects uncontaminated conditions. Dr. Morin explains that "because of this "node" approach, important details like an initial dilution zone (a mixing zone) in the Chukuni River between Nodes CHK-1 and CHK-2 cannot be simulated in sufficient detail."

Dr. Branfireun explains that GoldSim "does not appear to ever have been applied to an environmental mercury speciation scenario" and attributes this to the software's model which "cannot incorporate mechanistic sorption/desorption reactions along flow paths, the biomethylation process, nor the complex interaction between mercury and sulphate." Dr. Branfireun concludes that, as a result, "the model proposed can never be successfully applied in the manner that is proposed. […] A mass balance model *cannot* by definition incorporate mechanistically the input and removal processes for mercury, and *cannot* address the biogeochemical aspects of mercury methylation across the landscape which are at the root of the potential impacts associated with the Great Bear proposal."

The Study Plan, and its model, also appear to ignore a number of parameters beyond THg, meHg, and sulphate which can impact methylation dynamics including DOC, light penetration, temperature, pH, and other parameters.

We are not satisfied that the GoldSim software proposed is appropriate or technically able to apply to the circumstances and produce a useful prediction. We are concerned that the technical limitations of the software, as well as the manner in which the proponent intends to use the software, will not produce reliable, accurate, or useful predictions. Our concerns are heightened given the ongoing data quality problems in relation to the Great Bear Project – flawed data will lead to flawed results, regardless of the software chosen.

<u>Conclusion</u>

Dr. Branfireun concludes in his report:

> "We have a water quality model that is not capable of predicting mercury biogeochemical processes, that is dependent on background data and proposed monitoring that is insufficient. The outcome will be the inevitable future conclusion by the Proponent that the combination has led to an inability to adequately predict changes in methylmercury concentrations in fish because of 'uncertainties' in GoldSim output, and "unforeseen

> complexities" in coupling abiotic and biotic compartments. The reality is that these uncertainties and complexities are completely foreseeable as outlined here. […] I conclude that the TISG's requirement that the Proponent provide *a detailed and robust analysis on the potential for project contributions to methylmercury production in downstream watersheds* has not been met based on the information provided in the Mercury Plan."

In light of our experts' opinions, we are concerned with this Study Plan and require additional time to complete a fulsome review and engage with our experts in a more in depth manner, and to engage with our other experts and our community.

We reiterate our request for a 90-day extension to provide comments. It is not prudent nor rational to proceed with a Mercury Study which is built on erroneous, incomplete, and inaccurate data and which uses flawed methodology that is unable to adequately address the biogeochemical aspects of mercury methylation across the landscape as required.

We expect that the proponent will not move forward with this Study Plan, the proposed studies, or any additional work on the site that may cause adverse effects prior to receiving and meaningfully integrating our comments.

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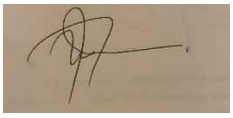

Joseph Fobister
Lead Negotiator, Grassy Narrows Lands Protection Team

Cc:

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BY EMAIL

January 31, 2025
FILE: 5025.01

Grassy Narrows First Nation
c/o Cavalluzzo
474 Bathurst Street, Suite 300,
Toronto, Ontario M5T 2S6
Attn: Grassy Narrows Lands Protection Team

Dear Grassy Narrows Lands Protection Team,

RE: Great Bear Mining Project - Preliminary Technical Review of the Mercury Study Plan dated December 2024

Introduction

Thank you for forwarding the Great Bear Project Mercury Study Plan by WSP Canada Inc., dated December 2024. This Study Plan is a response to the Tailored Impact Statement Guidelines (TISG) from the Impact Assessment Agency of Canada. The TISG requires a detailed investigation of mercury and methylmercury. This investigation includes interactions with sulphate some of which will be generated by proposed future mine wastes at the Great Bear Project at all relevant pH levels.

Grassy Narrows First Nation already has expertise on mercury and methylmercury. Therefore, my technical review here focuses on the portions of Section 3.4 (Methods for Forecasting Future Conditions) involving modelling within my areas of expertise. Section 3.4 begins:

> "The following sections outline the key data inputs and modeling approaches proposed to predict future conditions and potential changes from baseline levels, resulting from the Project's potential contributions to methylmercury production. Sulphate, mercury, and methylmercury concentrations in both mine site drainage and the receiving environment will be influenced by factors such as the geochemistry of ore and mine rock, the quantities and management of stockpiled materials, and the characteristics of the receiving waters."

The proposed models in Section 3.4 involve geochemistry including Metal Leaching and Acid Rock Drainage (ML-ARD or geochemical source terms), groundwater flow, and water quality as discussed in the following subsections of the Mercury Study Plan.

3.4.1 Geochemical Characterization
3.4.2 Groundwater Modelling
3.4.3 Mercury and Methylmercury Water Quality Modelling

As explained below, the proposed methods and models in these subsections of Section 3.4 are incorrect, misleading, and/or unacceptably ambiguous for assessing and predicting mercury and

sulphate on, beneath, and around the Great Bear Project. I expect the general effect of the proposed methods and models for the Mercury Study Plan will be to underestimate the leaching and transport of mercury, sulphate, and other metals and elements at the Great Bear Project.

Geochemical Characterization

Subsection 3.4.1 explains the methods that will be used to predict the aqueous concentrations and solid-phase levels for dozens of potential contaminants at the Great Bear Project, including sulphate, ML-ARD, and water quality at near-neutral pH.

This Study Plan states,

> "The sampling approach and testing methods for the geochemical investigations comply with ... guidance found within the Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND, 2009), which represents best practice and industry standard approaches and methodologies for ML/ARD sampling and characterization in Canada."

Kinross committed to the same approach and testing for Advanced Exploration at the Great Bear Project years ago, but fails to follow guidance in this federal Prediction Manual of best practice and industry standards[1]. Where Kinross did follow some guidance and detected potential for significant water-quality degradation and ML-ARD, Kinross decided this serious potential was not relevant to its Great Bear site. Where Kinross admitted to not following the guidance and using a non-recommended procedure that was cheaper, Kinross' rationale was that the non-recommended procedure was mentioned in the federal Prediction Manual as not recommended and thus Kinross was indeed following the federal Prediction Manual.

Kinross has committed to conducting many of the tests for geochemical characterization in this Subsection 3.4.1 as it did for Advanced Exploration at the Great Bear Project. However, as of early 2025, Kinross has not released most of the results for any geochemical testing.

Section 3.4.1 continues Kinross usage of the wrong analytical methods as it did for Advanced Exploration[1]. For example, Section 3.4.1 lists:

> "Solid phase elemental content analysis by aqua regia digestion and inductively coupled plasma-mass spectrometry scan"

However, Kinross fails to explain to non-technical readers that this will underestimate the amount of mercury in Great Bear mined materials including the walls of underground workings and pits, waste rock, overburden, soil, and tailings.

[1] MDAG. 2024. Review of Kinross Gold Responses to Grassy Narrows First Nation Concerns for Advanced Exploration, Concerning Metal Leaching, Acid Rock Drainage (ML-ARD), On-Site Contamination of Water, Fugitive Dust, and Hydrogeology in the ECA, PTTW, and Closure Plan Responses. Report for Grassy Narrows Lands Protection Team, dated September 5, 2024. 48 p.

This is because "aqua regia digestion" dissolves and analyzes only part of the mercury and many other elements in Great Bear mine materials, leaving behind an undetected and unknown amount of additional mercury and other elements. This is not appropriate under conditions and pathways such as fugitive dust to the environment, local-scale acidic conditions, animal inhalation, and comparisons to crustal abundances, which require "total digestion" of all mercury in a sample rather than only part of the mercury from partial "aqua regia digestion". Thus, based on the listing of methods in Section 3.4.1 for mercury, sulphate, and other elements, it is easy to overlook or miss the facts that these proposed methods are not appropriate, reliable, and safe for the Mercury Study.

Therefore, Grassy Narrows First Nation should understand that this Mercury Study Plan contains a program for Geochemical Characterization that matches that for Advanced Exploration, but Kinross has not been able to fulfill this program for Exploration to date after about two years of trying. Also, this geochemical characterization will use invalid and/or ambiguous methods that will underestimate the severity of mercury and sulphate issues at the Great Bear Project. As a result, I expect that Kinross will underestimate the important geochemical input that is critical for a reliable outcome from the proposed Mercury Study. If Kinross corrects the geochemical methods in the Mercury Study Plan to those appropriate to the Great Bear Project, then Advanced Exploration should be stopped because it is already based on invalid and/or ambiguous methods.

Groundwater Modelling

In Subsection 3.4.2, the Mercury Study Plan contains a description of the groundwater modelling that will be used to predict the flow of groundwater and likely the additional mercury loadings to the water-quality model discussed below. Similar to the Geochemical Characterization above, the procedure proposed for groundwater modelling is about the same as used for Advanced Exploration that is seriously flawed[1].

There are many errors in Kinross' modelling of groundwater flow at the Great Bear Project. Many reflect technical details that require relatively long explanations[1]. For example, groundwater modelling at the Great Bear Project apparently shows a high mound of free-standing groundwater above the land surface near Dixie Creek. This artificial and obviously wrongly modelling incorrectly restricts groundwater with mercury, sulphate, and other elements from travelling off the Great Bear site and into the surrounding environment around Dixie Creek.

Perhaps the easiest error to understand with Kinross' groundwater modelling, for both Advanced Exploration and the Mercury Study Plan, is the difference between "transient" and "steady state" groundwater modelling. Similar to surface water and many other environmental processes like temperature and rainfall, subsurface groundwater flow can shift and change daily, seasonally, yearly, over decades, and even longer due to climate change. Thus, the earth's environment is inherently "transient" through time, which can be important for defining flows and loadings of mercury, sulphate, and other elements.

Kinross does not model groundwater at the Great Bear Project using naturally transient conditions. Instead, Kinross only models groundwater at Great Bear with "steady state" conditions, where groundwater flows and loadings are constant all the time, every day, every season, every year, every decade, etc. For Advanced Exploration, at what point in the future was groundwater modelled? No one can say, but the obvious assumption is that it represents conditions a long time into the future. No one can say because Kinross continues to refuse transient modelling.

Groundwater modellers for Great Bear have stated that transient modelling is not needed despite having no transient data, no transient measurements, and no transient modelling[1]. I suspect that Kinross is strongly opposing transient groundwater modelling because it requires additional site measurements and parameters apparently not measured at the Great Bear Project.

Transient groundwater modelling at the Great Bear Project is seriously needed to understand better the impacts and effects on (1) groundwater inflows around the mine and (2) groundwater movement throughout all hydrogeologic layers and surrounding environment, as time passes. Kinross has pointed out that the effects of drought and climate change cannot be estimated, which is because only steady-state modelling was conducted.

Because steady-state modelling of some distant future but unknown time was modelled for Advanced Exploration, this is obviously the modelling that would also apply to proposed mining in the Mercury Study Plan. However, the steady-state modelling for Advanced Exploration was likely wrong but Kinross has not released the additional information from its steady-state model to confirm this.

During proposed exploration and later mining, groundwater will be drawn from all depths into the underground mine at least 500 meters (0.5 km) deep vertically. However, Kinross will release only the drawdown map for the uppermost 36 m of overburden, and not the remaining ~500 m vertical thickness of rock. This incorrectly implies (1) drawdown happens instantaneously for long lateral distances throughout the Great Bear site and (2) transient conditions are minor because they will only be up to 36m vertically.

In situations where groundwater levels will fluctuate more than 500 meters vertically, non-steady "transient" modelling is certainly needed. In fact, groundwater levels, forced by Kinross pumping, varying by roughly 500 m vertically (varying by roughly 0.5 kilometers below the land surface) at the Great Bear Project is one of the best examples of where transient groundwater modelling is critical for reliable and realistic flow directions and associated loadings of mercury, sulphate, and other elements. The proposed open pits at Great Bear will also lead to significant transient groundwater flows and geochemical loadings like mercury and sulphate closer to the land surface but are ignored by Kinross.

Additionally, Kinross misleads by indicating shallow contaminated groundwater will not escape to the environment but would be drawn into the pumped-down underground mine[1]. This is false at early times and only becomes reasonable after unknown longer times as steady-state conditions are approached. The lack of transient modelling prevents anyone from proving how long it will take to

reach steady-state conditions and prevent contaminated groundwater from escaping.

Based on this error alone of steady-state groundwater modelling, Section 3.4.2 of the Mercury Study Plan is remarkable in that it simply states,

> "These numerical groundwater flow models [of FEFLOW 7.2] consider three dimensional steady-state flow conditions and implement an equivalent porous media approach which is deemed sufficient for characterizing the overall groundwater flow regime at the scale of this analysis."

This is wrong, because FEFLOW 7.2 can also simulate transient conditions. Kinross is misleading readers here by not revealing the full capability of this groundwater model including transient modelling needed for the Mercury Study and for general impacts of the Project. In any case, it is clear that steady-state, always-the-same-and-not-varying groundwater modelling, for conditions at some distant but unknown time, will be used to unreliably simulate the critical groundwater pathways and loadings for mercury and sulphate at the Great Bear Project.

Furthermore, the second part of the quotation above on "equivalent porous media" deceptively hides another important flaw. Groundwater moving through irregular and scattered cracks (fractures) in Great Bear rock will be instead incorrectly modelled as smoothed layers like sand and gravel. Kinross has cryptically "deemed sufficient" this unrealistic modelling based on no data and no evidence that groundwater flow through fractured rock at Great Bear is like groundwater flow through sand, gravel, silt, etc. Without proof otherwise, the porous-media modelling planned for the Mercury Study is not "sufficient" and is plain wrong and misleading.

Therefore, Grassy Narrows First Nation should understand that this Mercury Study Plan contains a program for Groundwater Modelling that matches that for Advanced Exploration. The current groundwater modelling is unreliable and likely wrong in light of many incorrect and unjustified assumptions made by Kinross. The Mercury Study Plan shows these errors will be continued, including the false assumption that groundwater flow will be steady state during mining, being the same every day, every season, every year, every decade, etc. As a result, I expect that Kinross will underestimate the important groundwater flow leaving its Great Bear site. Along with problems with the proposed Geochemical Characterization discussed above, this will underestimate the loadings of mercury, sulphate, and other elements leaving the Great Bear site. This will preclude a reliable outcome from the proposed Mercury Study. If Kinross corrects the proposed groundwater modelling in the Mercury Study Plan, then Advanced Exploration should be stopped because it is already based on the misleading and wrong modelling.

Water-Quality Modelling

Section 3.4.3 on water-quality modelling explains that the model called GoldSim will be used for water-flow and water-quality modelling at the Great Bear Project. Here are some statements from Section 3.4.3 about the GoldSim model.

- GoldSim will "stimulate [sic] the volume and flow of water, and the concentrations and transport of chemical species, over the life of the Project".

- "The GoldSim model domain includes waterbodies potentially impacted by the Project within the PA, LSA and RSA."

It is not clear from these statements that GoldSim is not like models such as groundwater (see above) that simulate the movement and chemistry of waters (1) across a site-wide grid of mathematical elements or (2) along a grid of mathematical elements along lake or a creek like Dixie Creek where groundwater can alternately enter and exit the surface waterbodies over short distances.

Instead, GoldSim uses user-defined "compartments" or "conceptual boxes" such as one for the western portion of Dixie Creek near the Great Bear site and another for the eastern portion near the site. The human modellers then conceptually connect these two boxes and any other selected boxes in the GoldSim model to create "nodes". Then the modellers choose the inputs, outputs, and internal conditions and processes that they think apply to each box and node. This should include variable and transient conditions that exist at the Great Bear site over days, seasons, years, and decades, but we already know from the proposed groundwater modelling that transient conditions for at least one important pathway for mercury and sulphate will be ignored and thus will not reliable (see above).

Now it is clearer what Kinross means by saying,

> "Sulphate, mercury and methylmercury predictions will be generated for waterbodies represented by model nodes shown in Figure 3-2."

Thus, predictions for mercury and sulphate will be generated only at "nodes" that do not literally simulate waterbodies in their environmental complexity, but simply represent the "boxes" and "nodes" and internal conditions that Kinross chooses to assume, estimate, and simulate.

Figure 3-2 in the Mercury Study Plan shows that the Chukuni River will be modelled only at two nodes: CHK-1 immediately above the property boundary and CHK-2 immediately below the boundary. Therefore, everything above the property boundary in the Chukuni River will be simulated as a single "node" or "box" for which the modellers will define all the upstream physical, geochemical, and water-quality properties, likely with many simplifications and/or assumptions. Then the physical and chemical contributions from Dixie Creek Node DIX-5 will be "mixed" with Node CHK-1 to obtain predicted flows and concentrations at Node CHK-2, subject to currently unstated simplifications and/or assumptions possibly like adsorption on river-bed sediments or biological processes to remove additional mercury and sulphate from the water at CHK-2. Because of this "node" approach, important details like an initial dilution zone (a mixing zone) in the Chukuni River between Nodes CHK-1 and CHK-2 cannot be simulated in sufficient detail. This gives you some idea how the GoldSim model will "simulate" water flow and water quality at, beneath, and around the Great Bear site.

The GoldSim model for the Great Bear Project can be easily manipulated by the modellers but this is hidden from external inspection by Grassy Narrows First Nation. For example, the modellers can apply a condition where aqueous concentrations of mercury, sulphate, and other elements are allowed to decrease but are not allowed to increase as water "flows" through the boxes and nodes. Section 3.4.3 promises to "[p]rovide a clear description and rationale for model input parameters and assumptions". This is appropriate and important but in my experience I have never seen this

provided in sufficient detail for any GoldSim model.

Therefore, to understand how the GoldSim water-quality model for the Great Bear Project has been designed and manipulated through all of its boxes and nodes, and thus whether its results and predictions are reasonable, a relatively large amount of information on the GoldSim model will be needed from Kinross. I have not seen this provided in detail before, but it will be required for the Great Bear Mercury Study.

Conclusion

As explained above, the proposed methods and models in the subsections of Section 3.4 of the Mercury Study Plan are incorrect, misleading, and/or unacceptably ambiguous for assessing and predicting mercury and sulphate on, beneath, and around the Great Bear Project. I expect the general effect of the proposed methods and models for the Mercury Study Plan will be to underestimate the leaching and transport of mercury, sulphate, and other metals and elements at the Great Bear Project.

Sincerely,

Kevin A. Morin, Ph.D., P.Geo., L.Hydrogeo.
President

Technical Memo

To: **Joseph B. Fobister, Lead Negotiator (Grassy Narrows Land Protection Team), David Sone (ANA Advisor), Jackie Esmonde (Legal Counsel) and Sydney Lang (Legal Counsel) of the ANA Advisory Team**

From: **Rina Freed (Ph.D., P.Eng.), Georgina Farah, B.Sc.**

Date: **April 29th 2025**

Subject: **Review of the Great Bear Resources Mercury Study Plan**

Source has been retained by Asubpeeschoseewagong Anishinabek (ANA) Land Protection Team to provide comments on the proposed Great Bear Project. This technical review provided to ANA is in relation to a Mercury Study Plan, a requirement of the Tailored Impact Statement Guidelines issued for the project in August 2024.

The objectives of the Mercury Study Plan are to outline baseline methodology and to identify project contributions to mercury / methylmercury generation in downstream waterbodies. Industrial mercury pollution originated from the Dryden Paper Mill in the 1960s and 1970s, causing mercury contamination in the English-Wabigoon River and mercury related conditions in Grassy Narrows people. As a result, ANA community members are especially concerned with mercury pollution. Formation of methylmercury is of considerable concern within the watersheds surrounding the proposed Great Bear Project which contain mercury from geological sources, atmospheric deposition from distant industrial sources, and potentially local industrial sources such as hydro damming and clearcut logging. Methylmercury is a species of mercury that bioaccumulates and biomagnifies in consumers, causing accumulation in the food chain.

The following comments are not exhaustive and are limited to areas within the expertise of the authors, and should be read in conjunction with reviews by other experts and by ANA.

Alignment with Tailored Impact Statement Guidelines (TISG)

1. **Lack of Maps for Proposed Study Areas:**

   Section 7.3.1 of the Great Bear Project TISG states the impact statement for each valued component (VC) identified must describe the spatial boundaries of said VC and a rationale for the boundaries. These spatial boundaries must be shown on maps in each impact statement.

The Mercury Study Plan does not include maps for the PA (Project Area), LSA (Local Study Area) and RSA (Regional Study Area) identified for the VC methylmercury, which makes it hard for reviewers to understand where the boundaries lie and the reasoning behind them. These maps should be included in the Mercury Study Plan.

2. Regional Study Area for Cumulative Effects

An identified VC in the TISG is the health of Indigenous Peoples in relation to potential changes in the surrounding watershed. This includes downstream water quality from effluent discharge and past industrial activity.

More explanation is required in the Study Plan to explain how cumulative effects are addressed. For example, the Regional Study Area (RSA) described in the Mercury Study Plan may be too narrow for a cumulative effects assessment, as it does not include areas of significant historic mercury contamination such as the English-Wabigoon River system which are downstream of the proposed industrial effluent discharge point. To ensure a comprehensive assessment of cumulative effects for this identified VC, the RSA should be expanded to include areas of historic mercury contamination that have impacted ANA.

Baseline Methodology

3. Inclusion of the Exploration Phase in the Study Plan

The Study Plan should include the proposed underground exploration phase as well as the Life of Mine project described in the Project Description (January 2024). Please indicate if the exploration project phase is included in the study plan. This phase has the potential to generate methylmercury, as noted in previous submissions, and should be included in the study. This should include both early exploration activities, and the “Advance Exploration” program, which includes construction of key components of the mine.

4. Documentation of Missed Sampling Events

Establishing a sufficient baseline dataset is critical for conducting an effects assessment. In section 2.2 Summary of Analytical Methodology, water quality will be sampled monthly providing flow is present and the site can be safely accessed. To ensure a complete dataset, the proponent should ensure any missed sampling events are recorded with a rationale and attempts to re-sample the location(s) should be made within the monthly sampling period.

In order to establish a reliable baseline dataset, sampling should be carried out over three years, and should include monthly sampling, as well as 5 samples in 30 days during periods of low and high flows.

Also, in order to establish a valid baseline, the proponent should ensure that appropriate baseline monitoring sites are established which:

a. Do not reflect regional sources of contamination (eg. upstream mines),
b. Do not reflect contamination from earlier stages of this project,
c. Reference stations that will not be impacted by later stages of this project,
d. Will continue to be monitored throughout the project.

The proponent should also ensure that the correct sampling and lab methodology are used to ensure that all contaminant levels above baseline are detected reliably.

5. Inclusion of Mercury, Methylmercury and Sulphate Loadings

Loadings may be a useful measurement of mercury, methylmercury and sulphate and provide an indication of the total mass of these parameters anticipated in the project waterbodies. The study plan should include a requirement to develop monthly predictions of loadings for mercury, methylmercury and sulphate (and other substances affecting methylation) that may enter the project area waterbodies, including the Chukuni River.

6. Baseline Sampling Locations

Methylmercury concentrations observed in monitoring data in the project area ranged from 1.98% to 14.35% (of total mercury) reflecting that there are certain project areas that generate more methylmercury than others. The Study Plan should provide a rationale of how both surface water and groundwater sampling locations in the Study Plan have been chosen in relation to expected direct and indirect effects and discuss the potential influence of project waters on wetted areas. Given that methylmercury is primarily generated under anoxic conditions, which can vary across the project site, the Study Plan should provide a rationale as to how the baseline sampling locations are sufficient to capture the range in methylmercury. Currently, the Mercury Study Plan does not include a sufficient level of detail for each proposed monitoring site to assess whether the purpose or rationale of the location fulfills the intent of the baseline program. The program should ensure that each downstream sampling point is sufficient to establish a robust baseline against which any changes in downstream water quality related to mercury and methylation can be measured.

7. Unnamed Waterbodies #1 and #2

According to Section 2.2.1 Water Quality, seasonal baseline surface water quality sampling for temperature, pH and dissolved oxygen occurs in Pakwash Lake, Genesee Lake and Unnamed Waterbody #6. The Study Plan should include a rationale as to why there is no planned physicochemical property sampling proposed for Unnamed Waterbodies #1 and #2.

Additionally, the Study Plan should list which waterbodies are included in the multi-season fish habitat assessments.

8. Additional Data Request- Water Quality

Baseline water quality reporting should include the 95th percentile, minimum and maximum values for all waterbodies sampled, as well as an assessment of seasonal variation. Figures should be provided showing seasonal variation for the range in mercury, methylmercury and sulphate baseline data. Baseline data should cover 3 years and include monthly sampling, as well as 5 samples in 30 days during periods of low and high flows.

9. Mercury and Methylmercury in Temporary Closure

Spatial and temporal boundaries for the effects assessment are discussed by phase of mine life. However, there is no discussion of a Care and Maintenance phase, which commonly occurs in mining, according to economic conditions. Mines often plan for operations and closure phases but lack rigorous assessment of temporary closures and their implications for the receiving environment. The effects assessment cannot be considered complete without an assessment of a temporary closure scenario. The proponent should consider a 'worst case scenario' during operations, where the mine is forced to temporarily shut down. Implications for water management, water treatment and potential for adverse effects related to mercury, methylmercury and sulphate in a care and maintenance scenario should be assessed in the Study Plan.

10. Traditional Food Harvesting Considerations

While the sampling locations proposed as part of the Mercury Study Plan attempt to assess the impact of effluent release on water quality as it flows through the waterbodies surrounding the mine site, there is no discussion in the Mercury Study Plan regarding how it will assess potential impacts on human health or how the movement of fish and other species that are consumed will be considered. For example, Great Bear should assess, as part of the Mercury Study Plan, how far key fish species for Indigenous consumption, including walleye, migrate to and from the project site, its receiving waters, and downstream water bodies that are potentially impacted. How does the study plan presented account for movement of species that will ultimately be consumed potentially outside of the study area? The study plan also does not apply consumption guidelines that are designed for Indigenous subsistence consumers of fish, nor does it consider the pre-existing mercury exposure that Grassy Narrows people have experienced. The study plan does not appear to take into account the unique mercury risks associated with Grassy Narrows people who consume fish as part of their way of life and who have previously experienced high levels of mercury exposure.

Effects Assessment Methodology

11. Lack of Data Provided on Geochemical Characterization to Date

Section 8.3.1. of the TISG provided for the Great Bear Project states that the associated Impact Statement should describe the representativeness of samples collected for acid rock drainage and metal leaching. Despite the Mercury Study Plan stating that baseline geochemical data has been collected since 2022, the plan does not indicate the location of samples or the results of testing thus far. The existing data for baseline geochemical analysis that will be included in the water quality model (GoldSim) for methylmercury should be provided. Significant deficiencies in the ML-ARD data and study plan have been identified by Source and by other reviewers in previous submissions. These deficiencies should be corrected, and the associated studies completed and reviewed, before the geochemical data is used as an input in the effects assessment.

12. Quality Assurance for Geochemical Samples

The methodology for geochemical characterization described in Section 3.4.1 of the Mercury Study Plan does not include quality assurance / quality control procedures, including but not limited to laboratory certificates of analysis as requested in Section 8.3.1 of the TISG. What are the procedures to follow for quality assurance / quality control for samples taken for geochemical characterization?

13. Inclusion of Worst Case Scenario in Water Quality Modelling

Section 8.3.2 of the TISG states the Impact Statement for the Biophysical Environment must provide base case (i.e. most likely, mean, median) and worst case (e.g. 75^{th}-90^{th} percentile) scenarios, plus any applicable sensitivity scenarios. However, the Mercury Study Plan indicates the GoldSim model used for Mercury and Methylmercury Water Quality Modelling (Section 3.4.3) will only identify and describe the base case (expected case) plus sensitivity scenarios. This is not considered appropriate as the worst case scenario should also be included in future modelling for mercury and methylmercury concentrations. Considering the legacy of mercury contamination in the surrounding region, it is critical that the ‘worst case’ is considered and modelled, not just the expected scenario.

Conclusion

Thank you for the opportunity to provide a review of the drafted Mercury Study Plan for the Great Bear Project. If you have any questions, please contact the undersigned.

Yours truly,

Source Environmental Associates Inc.

per:

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Draft Mercury Study Plan

Great Bear Resources Ltd.'s Response to January 31, 2025 Letter from Asubeechoseewagong Netum Anishinabek

#	Comments	Great Bear Resources Response
A. The proponent's reliance on achieving on/off site water quality that complies with PWQO and CCME water quality guidelines is inadequate and inappropriate when considering mercury and methylmercury in water, and methylmercury uptake by biota		
A1	The Plan states that to date, water quality monitoring shows that mercury and methylmercury concentrations in water are below Canadian Council of Ministers of the Environment ("CCME") water quality guidelines for the protection of aquatic life. It is clear that the proponent intends to apply CCME guidelines to the Project as "comparisons", but also as regulatory thresholds from a compliance standpoint.	Water quality modeling will use the both baseline water quality data and a suite of available guidelines for mercury and methylmercury, as proposed in the Mercury Study Plan to assess results of the modelling. This includes the existing CCME guideline (4 ng/L) as a benchmark for comparisons. This is an industry-standard approach based on available guidance documents. Additionally, biomagnification and food web modeling will be incorporated into the Mercury Study Plan to provide a complementary line of assessment beyond what water quality guideline comparisons alone may be able to capture. This approach will account for potential mercury and methylmercury bioaccumulation through the food web, including in fish consumed by both humans and wildlife (e.g., forage and sport fish). Regardless of the water quality guidelines applied, the Human Health and Ecological Risk Assessment (HHERA) will assess human health risks from predicted changes to mercury and methylmercury concentrations based on measured and predicted changes in water and fish concentrations and consumption for members of the local communities.
A2	Dr. Branfireun continues to opine that CCME guidelines for mercury and methylmercury are "useless for the protection of fish consumers, and even if discharges or indirect effects were a fraction of these guideline limits there would be significant potential for downstream impairments of aquatic resources." The CCME guidelines for total mercury and methylmercury for the protection of aquatic life are significantly above background levels. For example, the CCME guideline for total	Water quality modeling will use the both baseline water quality data and a suite of available guidelines for mercury and methylmercury, as proposed in the Mercury Study Plan to assess results of the modelling. This includes the existing CCME guideline (4 ng/L) as a benchmark for comparisons. This is an industry-standard approach based on available guidance documents. Additionally, biomagnification and food web modeling will be incorporated into the Mercury Study Plan to provide a complementary line of assessment beyond what water quality guideline comparisons alone may be able to capture. This approach will account for potential mercury and methylmercury bioaccumulation

#	Comments	Great Bear Resources Response
	mercury in surface water is roughly 10-20-fold higher than uncontaminated baseline levels of mercury in the English River watershed. Previous submissions by Dr. Branfireun are clear that any increase in mercury above baseline in water would be expected to be reflected in walleye.	through the food web, including in fish consumed by both humans and wildlife (e.g., forage and sport fish). Regardless of the water quality guidelines applied, the HHERA will assess human health risks from predicted changes to mercury and methylmercury concentrations based on measured and predicted changes in water and fish concentrations and appropriate consumption rates for members of the local communities.
A3	The CCME document itself provides that it "does not address exposure through food or bioaccumulation to higher trophic levels" and that "if the ultimate management objective for mercury is to protect high trophic level aquatic life and/or those wildlife that prey on aquatic life, more stringent site-specific application of these water quality guidelines may be necessary." Stringent site-specific guidelines are necessary in the circumstances. These site-specific guidelines must take into account the specific ecosystem, watershed, bioaccumulation, subsistence human consumers of high trophic level fish and wildlife, cumulative impacts, and the ongoing mercury crisis in Grassy Narrows. Grassy Narrows has raised this issue consistently since its first submission on the Great Bear Gold Project, and we have yet to see it reflected in the project plans including this Mercury Study Plan. The information that Grassy Narrows and its experts have provided about mercury and methylation continues to be ignored.	Regardless of the water quality guidelines applied for comparison purposes, the HHERA will assess human health risks from predicted changes to mercury and methylmercury concentrations based on measured and predicted changes in water and fish and appropriate consumption rates for members of the local communities. Fish concentrations will be predicted based on a food web model that considers the potential for bioaccumulation. The aquatic food web modelling will be based on empirical baseline data that has measured the mercury and methylmercury concentrations in herbivorous, insectivorous, and piscivorous fish and the supporting food web as well (i.e., invertebrates, zooplankton and periphyton). In addition, the empirical data includes measurements of mercury and routine parameters in sediment, porewater and surface water. Mathematical relationships will be constructed between the food web items to calculate concentration changes in the food web associated with concentration changes predicted in sediment/water quality modelling.
A4	It is unclear what guideline levels, if any, are being proposed for sulphate, and for other parameters that impact methylation including DOC, temperature, light penetration, and pH, among others. However, the sulphate guideline levels for the receiving environment proposed in the ECA application were found by Dr. Branfireun to be entirely inappropriate for the	A key objective of the Mercury Study Plan is to assess how potential changes in sulfate concentrations may influence methylmercury production in the receiving environment. This includes evaluating the relationships between sulfate, and other water quality parameters within the context of methylmercury production. Rather than only relying on predefined sulfate thresholds, or data from dissimilarly impacted environments, the study has been designed to collect and use site-specific data — an approach which aligns with best practice and available regulatory guidance.

#	Comments	Great Bear Resources Response
	purpose of preventing methylation impacts. If Kinross is planning to use those same levels here, then the results of this study will be erroneous.	Regarding the sulfate levels referenced in the ECA application for the advance exploration program, the Mercury Study Plan is not simply adopting those values. Instead, a process-based approach is proposed to evaluate sulfate's role in the production of methylmercury and the potential for bioaccumulation.
A5	The Study Plan must establish site specific criterion for mercury, methylmercury, sulphate, and other parameters that impact methylation, based on appropriate baseline data, and the site-specific factors noted above, not based on generic national standards that have not been designed for bioaccumulation nor for subsistence fish eaters and/or previously exposed populations. Methodology that relies on "useless" comparators and guidelines will not lead to an analysis that is "detailed and robust."	Please see responses to comments A1 and A2, above. Dismissing the study's validity based on an assumption about guideline application misrepresents its intent and proposed methodology. Regardless of the water quality guidelines applied for comparison purposes in the Impact Statement, the HHERA will assess human health risks from predicted changes to mercury and methylmercury concentrations based on measured and predicted changes in water and fish and appropriate consumption rates for members of the local communities. Fish concentrations will be predicted based on a food web model that takes into account the potential for bioaccumulation. The aquatic food web modelling will be based on empirical baseline data that has measured the mercury and methylmercury concentrations in herbivorous, insectivorous, and piscivorous fish and the supporting food web as well (i.e., invertebrates, zooplankton and periphyton). In addition, the empirical data includes measurements of mercury and routine parameters in sediment, porewater and surface water. Appropriate mathematical relationships will be constructed between the food web items to calculate concentration changes in the food web associated with concentration changes predicted in sediment/water quality modelling.
B.	**The background data collected as part of the baseline studies for this Project are largely erroneous or their interpretation is flawed, which makes them insufficient to detect whether the project will have a measurable impact on fish mercury levels in the future.**	
B1	Grassy Narrows continues to raise concerns with respect to the background data collected by the proponent as part of their baseline studies. The proponent has not corrected many of the baseline study problems identified by Grassy Narrows' experts. Serious data quality problems remain and any methodology that proposes modelling based on such erroneous data will lead to study results that are inaccurate and ineffective, rendering the	Baseline conditions refers to pre-project, existing environmental conditions, consistent with industry-standard effects assessment methodologies and the Tailored Impact Statement Guidelines for the Project. Baseline sampling programs were initiated in 2019 (noting that the construction of Project has not as been initiated as the Project has not been approved yet), and have been designed to be extensive and appropriate to inform the effects assessment. The repeated claim that background data collected as part of ongoing baseline studies are "useless" is unfounded and inaccurate. They have been designed to be extensive and appropriate to inform the effects assessment, and encompass a comprehensive

#	Comments	Great Bear Resources Response
	entire study useless, and posing serious risks to Grassy Narrows.	network of sites strategically selected to capture and characterize spatial and temporal variations. The site-specific data is analyzed at third-party accredited laboratories - an approach which aligns with best practice and available regulatory guidance. The specific concerns raised by Grassy Narrows have most recently been addressed in the October 25, 2024 memorandum "*Response to ANA Letter Concerning Great Bear Project AEX ECA ISW Application and Expected Impacts to the Chukuni River*". Key points are as follows: *"The water quality laboratory analyses have been conducted using industry-approved methods at accredited laboratories (Canadian Association for Laboratory Accreditation). It is important to clarify that while ICP-MS has been used for total metal scans, it has not been employed for mercury quantification since 2021 such that detection limits of ongoing analyses are much lower. Starting in 2022, sulphate and mercury monitoring on the Chukuni River has included the following analyses:* • *Methylmercury by Distillation, Aqueous Ethylation, Purge and Trap, and Cold Vapor Atomic Florescence Spectroscopy (CVAFS) at specialized laboratories[a] with reported detection limits of approximately 0.0035 ng/L* • *Ultra-low mercury by Oxidation, Purge, and Trap, and CVAFS at specialized laboratories with reported detection limits of approximately 0.04 ng/L* • *Standard mercury by Cold Vapor Atomic Absorption Spectroscopy (CVASS) with reported detection limits of approximately 5 ng/L* • *Sulphate (method E235.S04) with reported detection limits of approximately 0.3 mg/L* *The analytical methods used and the reported detection limits (DL) are sufficiently sensitive to characterize the existing water quality of the Chukuni River. Dr. Branfireun correctly noted that analytical results below the reported DL were retained in the water quality database and included in the statistical summaries presented in the Application. This approach is consistent with established*

[a] Ultra low (ultra trace) analyses are offered by a limited number of specialized laboratories in Canada that use specialized analytical techniques and laboratory measures to avoid potential for cross contamination. Baseline ultra data for the AEX Program has been completed at Flett Research Ltd.

#	Comments	Great Bear Resources Response
		guidance on environmental data handling (Environment and Climate Change Canada, 2014; Environmental Protection Agency, 1990), reflects industry standards and regulator expectations, and is appropriate to support baseline database creation. *For sulphate concentrations, it is noted by Dr. Branfireun that there is variation in reported water quality data over the period of record, such that sulphate data is not useful. Water quality in natural systems is inherently dynamic and can fluctuate even over short periods due to a range of environmental factors, such as precipitation, runoff, temperature changes, and natural heterogeneity in ice cover. The variation identified by Dr. Branfireun of 7 mg/L sulphate on 2022-December-15 and 1 mg/L sulphate on 2022-December-19, as being erroneous, is consistent with expected natural variability and does not undermine the reliability of the overall dataset, which includes hundreds of data points. Such fluctuations are typical in natural aquatic environments.*
B2	Dr. Branfireun continues to opine that "in the context of the protection of fish consumers, nearly all of the background data for total mercury are useless and stated incorrectly." The background mercury data in water is incorrect. The data provided for mercury are not data but are instead detection limits of the contract laboratory. The detection limits for methylmercury are higher than background levels in the English River. Concentrations reported for sulphate have also been erroneous up until May 2023 when the proponent appears to have changed analytical methods or laboratories which was not documented, contrary to best practices.	Baseline conditions refers to pre-project, existing environmental conditions, consistent with industry-standard effects assessment methodologies and the Tailored Impact Statement Guidelines for the Project. Baseline sampling programs were initiated in 2019 (noting that the construction of Project has not as been initiated as the Project has not been approved yet), and have been designed to be extensive and appropriate to inform the effects assessment. The repeated claim that background data collected as part of ongoing baseline studies are "useless" is unfounded and inaccurate. They have been designed to be extensive and appropriate to inform the effects assessment, and encompass a comprehensive network of sites strategically selected to capture and characterize spatial and temporal variations. The site-specific data is analyzed at third-party accredited laboratories - an approach which aligns with best practice and available regulatory guidance. The specific concerns raised by Grassy Narrows have most recently been addressed in the October 25, 2024 memorandum "*Response to ANA Letter Concerning Great Bear Project AEX ECA ISW Application and Expected Impacts to the Chukuni River*". Key points are as follows: *"The water quality laboratory analyses have been conducted using industry-approved methods at accredited laboratories (Canadian Association for Laboratory Accreditation). It is important to clarify*

#	Comments	Great Bear Resources Response
		that while ICP-MS has been used for total metal scans, it has not been employed for mercury quantification since 2021 such that detection limits of ongoing analyses are much lower. Starting in 2022, sulphate and mercury monitoring on the Chukuni River has included the following analyses: • *Methylmercury by Distillation, Aqueous Ethylation, Purge and Trap, and Cold Vapor Atomic Florescence Spectroscopy (CVAFS) at specialized laboratories[b] with reported detection limits of approximately 0.0035 ng/L* • *Ultra-low mercury by Oxidation, Purge, and Trap, and CVAFS at specialized laboratories with reported detection limits of approximately 0.04 ng/L* • *Standard mercury by Cold Vapor Atomic Absorption Spectroscopy (CVASS) with reported detection limits of approximately 5 ng/L* • *Sulphate (method E235.S04) with reported detection limits of approximately 0.3 mg/L* *The analytical methods used and the reported detection limits (DL) are sufficiently sensitive to characterize the existing water quality of the Chukuni River. Dr. Branfireun correctly noted that analytical results below the reported DL were retained in the water quality database and included in the statistical summaries presented in the Application. This approach is consistent with established guidance on environmental data handling (Environment and Climate Change Canada, 2014; Environmental Protection Agency, 1990), reflects industry standards and regulator expectations, and is appropriate to support baseline database creation.* *For sulphate concentrations, it is noted by Dr. Branfireun that there is variation in reported water quality data over the period of record, such that sulphate data is not useful. Water quality in natural systems is inherently dynamic and can fluctuate even over short periods due to a range of environmental factors, such as precipitation, runoff, temperature changes, and natural heterogeneity in ice cover. The variation identified by Dr. Branfireun of 7 mg/L sulphate on 2022-December-15 and 1 mg/L sulphate on 2022-December-19, as being erroneous, is consistent with expected natural*

[b] Ultra low (ultra trace) analyses are offered by a limited number of specialized laboratories in Canada that use specialized analytical techniques and laboratory measures to avoid potential for cross contamination. Baseline ultra data for the AEX Program has been completed at Flett Research Ltd.

#	Comments	Great Bear Resources Response
		variability and does not undermine the reliability of the overall dataset, which includes hundreds of datapoints. Such fluctuations are typical in natural aquatic environments.
B3	The baseline studies and proposed methodology with respect to biota are similarly inadequate. The proponent has not collected consistent species to allow for comparison between years, assessed both high trophic sport fish and low trophic indicator species, nor identified the frequency and duration of any studies.	Baseline mercury data from over 320 fish samples has been collected from the Project waterbodies representing high trophic sport fish (Walleye and Northern Pike) and insectivorous fish such as sucker and minnow species as shown in the table below. The intent was to document baseline contaminants in fish across the project area representative of multiple types of habitats. This results in a variety of species sampled depending on what is present in those habitats. Consistent species were used when available, however, species presence varied by location as is normal in the natural environment where conditions are not rigid unlike a laboratory. Detailed methodology of the fish tissue collections will be included in baseline documentation appended to the Impact Statement. With respect to the Mercury Study Plan, exposure and reference stations will be used and species-specific fish collection made with appropriate numbers of samples to allow for statistical comparisons. In additional to fish, other components of the food web have been sampled as per the table below.

Web Component / Trophic Level	Species	Location	Number of Samples
Carnivore (Piscivore) Fish	Northern Pike Walleye Yellow Perch	Dixie Creek Chukuni River Genessee Lake Unnamed Waterbodies	175
Omnivorous Fish	Lake Whitefish	Chukuni River	2
Insectivorous Fish	Silver Redhorse White Sucker Brook Stickleback Central Mudminnow Finescale Dace Iowa Darter Lake Chub Northern Redbelly Dace Spottail Shiner Yellow Perch	Dixie Creek Chukuni River Genessee Lake Unnamed Waterbodies Unnamed Watercourses	145
Invertebrates	Aeshnidae (Dragonfly nymph) Belostomatidae (Giant Water Beetle)	Dixie Creek Chukuni River Pakwash Lake	60
Zooplankton	Composite Samples	Dixie Creek Chukuni River Pakwash Lake Genessee Lake	13
Periphyton	Composite Samples	Dixie Creek Chukuni River	30
Sediment	N/A	Dixie Creek Chukuni River Pakwash Lake Genessee Lake Unnamed Waterbodies Unnamed Watercourses	57
Wetland Plugs	N/A	Dixie Creek Chukuni River Pakwash Lake	8
Porewater	N/A	Dixie Creek Chukuni River Pakwash Lake	64
Surface Water	N/A	Dixie Creek Chukuni River Pakwash Lake	9

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B4	The Study Plan relies on background data about mercury and sulphate that will inform modelling efforts and trigger undefined actions should they change. Dr. Branfireun opines that the proponent proposes to use an "inappropriate analytical approach" that will "reliably generate non-data that will not capture trends in mercury concentrations across most of the sampling sites in the project area."	The aquatic food web modelling will be based on empirical baseline data that has measured the mercury and methylmercury concentrations in herbivorous, insectivorous, and piscivorous fish and the supporting food web as well (i.e., invertebrates, zooplankton and periphyton). In addition, the empirical data includes measurements of mercury and routine parameters in sediment, porewater and surface water. Appropriate mathematical relationships will be constructed between the food web items to calculate concentration changes in the food web associated with concentration changes predicted in sediment/water quality modelling.
C. The baseline studies have a number of other key deficiencies including:		
C1	The baseline studies are being conducted after activities that can impact methylation (such as road and machine track construction, forest clearing, drilling, soil impacts, and other industrial activities) have already occurred. This makes it impossible for most sampling sites to establish a baseline that is free of project impacts or those from other projects.	Baseline conditions refers to pre-project, existing environmental conditions, consistent with industry-standard effects assessment methodologies and the Tailored Impact Statement Guidelines for the Project. Baseline sampling programs were initiated in 2019 - noting that the construction of Project has not as been initiated as the Project has not been approved yet. Accordingly, this statement is incorrect. The project baseline studies include reference stations located away from potential future project influence as appropriate, including upstream stations for water-related studies.
C2	Further activities that can impact methylation are planned to be carried out over the study period including extensive Advanced Exploration activity that includes activities normally considered to be mine construction. This will further interfere with the ability to establish a proper baseline.	As noted above, baseline conditions refers to pre-project, existing environmental conditions, consistent with industry-standard effects assessment methodologies and the Tailored Impact Statement Guidelines for the Project. Baseline sampling programs were initiated in 2019 - noting that the construction of Project has not as been initiated as the Project has not been approved yet. Accordingly, this statement is incorrect. Utilizing an abundance of caution, Great Bear Resources will be using baseline data for the Impact Statement reflecting the monitoring prior to receiving Advanced Exploration permits.

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C3	There are no baseline sites in the Chukuni River that are upstream of the potential impacts of other mine sites including the Red Lake Mine and the Madsen Mine. Therefore, the baseline will likely reflect contaminated conditions which will obscure impacts from this project	Baseline conditions refers to pre-project, existing environmental conditions, consistent with industry-standard effects assessment methodologies and the Tailored Impact Statement Guidelines for the Project. Baseline sampling programs were initiated in 2019 - noting that the construction of Project has not as been initiated as the Project has not been approved yet. Accordingly, this statement is incorrect. The baseline conditions at the Project site do reflect the historic and ongoing industrial and residential developments in the upstream watershed. These developments are unrelated to the Project and reflect existing conditions.
C4	There are no baseline sites downstream of Pakwash Lake even though dissolved methylmercury and sulphate can travel long distances downstream and have impacts large distances from the discharge point.	The baseline program supporting the effects assessment currently extends downstream to the outlet of Pakwash Lake, over 20 km from the proposed discharge location and is sufficient to support the effects assessment. Project discharge is estimated to contribute less than 1% of total flows. If necessary, study area boundaries will be reassessed following modeling to ensure they adequately capture and evaluate potential Project effects.
C5	The Plan is lacking detail so the precise sampling purpose, locations, protocols, and durations cannot be evaluated.	Sampling locations and stations, frequency of sampling, and identification of analytical methodology is presented in Section 2 of the Mercury Study Plan, including maps (Figures 2.2 though Figures 2-5). Baseline reports were provided to ANA in April 2025.
C6	Grassy Narrows has repeatedly expressed a lack of trust that a profit motivated gold mining company, nor its partners, can be relied upon to establish a credible baseline. The highly critical expert reviews of the baseline work to date and the monitoring plans further substantiate Grassy Narrows' concerns. Grassy Narrows has repeatedly requested that the Crown or the proponent support Grassy Narrows to carry out a credible baseline study. However, neither the Crown nor Kinross have supported this work to date. The result is that the baseline work and plans to date are fundamentally flawed and incapable of effectively supporting risk assessment and mitigation.	On October 3, 2024, Great Bear Resources and Asubeechoseewagong Netum Anishinabek (ANA) entered into an Interim Funding Agreement establishing a financial commitment of $722,650.00 to support ANA's meaningful engagement in the review of the Great Bear Project. Of this amount, $300,000.00 was specifically allocated to support ANA's technical review of documentation related to the Impact Assessment and associated supporting materials. Great Bear provided detailed work plans to Grassy Narrows and the Ministry in June 2023, followed by comprehensive Baseline Reports in April 2024. These submissions were developed to align with provincial and federal regulatory requirements, and were informed by multi-season field programs, input from regulatory agencies, and available Indigenous Knowledge where shared. The work was completed using standard scientific methods and is consistent with industry best practices and

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		applicable guidance documents. The methodologies, data, and results remain open to review, discussion, and refinement where warranted. Baseline conditions refers to pre-project, existing environmental conditions, consistent with industry-standard effects assessment methodologies and the Tailored Impact Statement Guidelines for the Project. Baseline sampling programs were initiated in 2019 (noting that the construction of Project has not as been initiated as the Project has not been approved yet), and have been designed to be extensive and appropriate to inform the effects assessment. The repeated claim that background data collected as part of ongoing baseline studies are not credible and fundamentally flawed, is unfounded and inaccurate. They have been designed to be extensive and appropriate to inform the effects assessment, and encompass a comprehensive network of sites strategically selected to capture and characterize spatial and temporal variations. The site-specific data is analyzed at third-party accredited laboratories - an approach which aligns with best practice and available regulatory guidance. The 2024 baseline workplans were submitted to ANA in June 2023. To date, we have not received any comments or direction in response. Despite our repeated efforts to advance the work, we have yet to receive any guidance on what ANA is specifically looking for to consider their concerns satisfied.
C7	Well-designed baseline studies are required to be carried out over a number of years in order to establish a baseline with a reasonable level of confidence in the range of natural variation in the baseline. Without this, it will be impossible to know whether changes seen during monitoring are due to the project or due to natural variation	Thank you for confirming our approach to a well-design baseline study is appropriate. Baseline studies were initiated in 2019, and detailed aquatic baseline investigations were conducted over a three year period, from 2022 to 2024 at locations within the proposed Project footprint, as well as peripheral locations beyond the Project to characterize baseline conditions throughout the area. Sampling stations were generally consistent between years with minor adjustments to reflect the needs of the ongoing program and site conditions.
D. Metal Leaching and Acid Rock Drainage prediction methods are improper.		

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D1	Another key input into the Study Plan is the prediction of which substances will be generated by the overburden, ore, and tailings from the project and their concentrations (ML-ARD). Previous submissions by Source Environmental note that the project has yet to complete a credible contaminants of concern assessment.	ANA has previously made numerous false claims that geochemical and other studies being conducted for the Project are not credible. Great Bear Resources has previously addressed these comments. As previously indicated, baseline geochemical characterization programs have been conducted and are continuing for the Project, following industry standard methods, under the direction of experienced professional geoscientists. This includes the assessment of ML/ARD potential for mine rock, ore, tailings, and overburden, per the approaches and methods in MEND (2009). The results of these studies will be used to assess potential environmental effects of the Project and ensure that they are appropriately mitigated and managed.
D2	Dr. Morin similarly explains that the proponent continues to use the same ML-ARD approach and testing as Advanced Exploration and fails to follow guidance in the federal Prediction Manual of best practice and industry standards which are required under Ontario regulations. Where the proponent has committed to conducting certain tests, such as the tests for geochemical characterization, the proponent has not released most of its results	ANA's claim that methods in MEND (2009) are not being followed is false and has been responded to numerous times by Great Bear Resources. Geochemical information has been shared with ANA as far back as 2023 and most recently with the updated filed Closure Plan in November 2024 including static testing results for hundreds of samples including mine rock and overburden and kinetic testing results for mine rock and overburden.
D3	As well, the proponent plans to use incorrect analytical methods in the proposed studies which are flawed and "will underestimate the amount of mercury in Great Bear mined materials including the walls of underground workings and pits, waste rock, overburden, soil, and tailings." Dr. Morin opines that the proposed methods are "not appropriate, reliable, and safe for the Mercury Study." He adds that the proposed groundwater modelling is similarly unreliable. Dr. Morin concludes that he expects that the proponent will underestimate the important geochemical input and groundwater flow leaving its Gear Bear site which is "critical for a reliable outcome from the proposed Mercury Study."	As outlined in Comment M3 of this document, ANA indicates that mercury should be measured by a "total digestion" method. ANA also indicates that "Kinross fails to explain to non-technical readers that this will underestimate the amount of mercury in Great Bear mined materials including the walls of underground workings and pits, waste rock, overburden, soil, and tailings". ANA is indicating that a method known to underestimate solid phase mercury concentrations should be utilized for the Project. Total digestion methods involve the use of several strong acids and high temperature heating of a sample to completely dissolve the material. Due to the chemical properties of mercury, it can be volatilized under these conditions, which can result in erroneously low mercury concentrations being reported for a given sample. As such, analytical laboratories do not recommend the use of this procedure for solid phase mercury analysis.

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		The Project has utilized the aqua regia digest method to measure mercury. Mercury is not volatilized by this method and can thus be accurately measured. Please see responses N1 to N5 for a discussion of groundwater modelling.
D4	The proponent should not proceed with the Study Plan until there is high quality ML-ARD data and baseline data over multiple years for the model, and a credible monitoring plan in place. This must also be completed before the proponent proceeds with further activities that could cause potential impacts, including impacts to baseline data, for example, AEX construction, road and trail building, etc.	Baseline geochemical data for the Project has been collected since 2022. Ongoing geochemical characterization programs and water quality modelling is following industry standard approaches for mining projects in Ontario. Models will be verified and validated through continuing laboratory and field programs as well as on-site monitoring.
E. The assimilative capacity of the receiving waters as a mitigation strategy for excess sulphate loading is not supported by the available data.		
E1	The proponent continues to present a mitigation strategy that involves "discharging treated effluent to a large receiving watercourse (Chukuni River) that has a high oxygenation level and high assimilative capacity." Our experts have commented on this "strategy" in previous submissions, explaining that this presents an erroneous understanding of methylation in aquatic environments. Dr. Branfireun responds in detail in his enclosed report. Dr. Branfireun concludes that: The strategies for treating effluent to be discharged to the Chukuni River do not target sulphate, and sulphate production from overburden and waste rock are likely to be greater than the proponent states. The proponent's assessment of the watercourse's assimilative capacity is inadequate as the proponent uses the average of	Much of the content of this comment is specific to the ECA ISW application for the Advanced Exploration Program and its supporting technical studies. They are not applicable and do not accurately reflect the content, intent, or proposed methodology of the Mercury Study Plan or the effects assessment regulatory process for a proposed mining Project in Ontario. The effects assessment for the proposed Project is underway, and mitigation and treatment strategies will be informed based on outcomes of baseline studies and predictive modeling, as is standard practice and supports the development of appropriately targeted and effective mitigation measures. Final effluent criteria will be informed by the content and conclusions of the effects assessment, but are established through the provincial permitting process subsequent to the effects assessment, as is the regulatory environment in Ontario. The assertion that sulphate treatment is not being considered is incorrect. Great Bear is actively evaluating water treatment options, including strategies to manage sulphate concentration, in alignment with regulatory requirements, best practices and feedback received from communities.

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	entire daily discharge records for all of their dilution scenarios. There are potentially dire sulphate concentrations/volumes that could arise as a result of low flows combined with higher than stated effluent sulphate concentrations/volumes. The proponent relies on the high oxygenation level of the Chukuni River and does not consider the methylation potential of downstream waters, nor riparian areas and porewater, where this well-oxygenated river will deliver sulphate that may be many times in excess of background levels, in particular, to downstream mercury-sensitive lakes with high mercury methylation potential. As with other components of this project, the cumulative impacts of this project in the context of other past, present, and planned projects does not appear to have been considered. There are at least five other gold mining projects proposed or operating in this watershed, as well as a pulp mill, sawmill, dams, diversions, clearcut logging, and municipal waste. As well, the other mitigation measures described in the Study Plan are generally vague, unclear, and incomplete, and the list of potential effects is similarly incomplete and does not include potential effects from road and trail construction, site clearing, soil impacts, and water/dewatering, for example. There is insufficient information available for Grassy Narrows to adequately assess the proposed mitigation measures, and the information provided to date does not satisfy our experts that the proposed measures are effective and safe.	The Mercury Study Plan is not a stand alone Impact Statement. The claim that mitigation measures are vague and incomplete misrepresents the scope of the Mercury Study Plan and the level of detail already provided. The study plan outlines mitigation strategies that are available, being considered, and will be refined as supporting studies are progressed. Cumulative effects will be assessed in the Impact Statement consistent with the Tailored Impact Statement Guidelines and other guidance provided by the Impact Assessment Agency of Canada.

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F. The proposed model that the proponent plans to use to predict changes in sulphate, mercury and methylmercury concentrations in downstream watersheds and assess the potential impact on mercury levels in fish cannot technically deliver on those outcomes.		
F1	The Study Plan states that the proponent will rely on the GoldSim software modelling package to "simulate the volume and flow of water, and the concentrations and transport of chemical species, over the life of the Project." Our experts raise significant concerns with the GoldSim software, including its inability to be applied to an environmental mercury speciation scenario, and opine that additional information on the model is required before it can be assessed as an adequate model for the methylation studies.	GoldSim is a widely recognized tool for developing water quality models. GoldSim's application in simulating water volume, flow, and chemical species transport is well-established in environmental modeling, and is the industry standard for mining projects. However, it is important to clarify that while GoldSim is a valuable modeling tool for surface water, the accuracy and reliability of the model in predicting mercury and methylmercury concentrations will be driven primarily by data inputs and assumptions, rather than the specific software employed. In this regard, the surface water model developed to support the effects assessment and Mercury Study Plan will use site-specific empirical data and include clear identification of the interconnections between mercury, sulphate, and other relevant factors, underpinning the model. These interconnections will be grounded in findings from site-specific baseline studies, site-specific geochemical programs, analogue site data, and peer-reviewed scientific literature. The overall approach to the GoldSim model will thus reflect a strong empirical foundation and a comprehensive understanding of the relevant environmental processes. The findings of the surface water model will support subsequent bioaccumulation and aquatic food-web modelling
F2	Dr. Morin explains that mercury and sulphate predictions will only be generated at "nodes", the areas where the user-defined "conceptual boxes" connect. This means that the predictions will not simulate waterbodies in their environmental complexity, but simply represent the internal conditions that the proponent "chooses to assume, estimate, and simulate." It is particularly concerning that the Chukuni River will only be modeled at two "nodes", immediately above and below the	The node-based structure is an industry-standard method for predicting water quality changes across a study area and is commonly used in support effects assessment and approvals process of proposed mining project in Ontario. This approach provides a structured framework for evaluating potential water quality changes at key locations while maintaining a defensible balance between complexity and practicality. To clarify, the assessment for water quality will not be limited to node-based predictions alone. Hydrodynamic mixing modeling will be conducted to evaluate dilution and dispersion processes

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	property boundary. There are no "nodes" in Pakwash Lake nor further downstream where there are concerns of mercury methylation. There are also no nodes at a baseline site that is upstream from the impact of other local mines and therefore reflects uncontaminated conditions. Dr. Morin explains that "because of this "node" approach, important details like an initial dilution zone (a mixing zone) in the Chukuni River between Nodes CHK-1 and CHK-2 cannot be simulated in sufficient detail."	downstream of discharge within the Chukuni River, including the initial mixing zone. Additionally, food-web and bioaccumulation modeling will support the assessment of mercury, methylation and potential bioaccumulation processes. These analyses will provide a more comprehensive understanding of potential Project effects, beyond the individual assessment locations identified in the receiving environment (aka, nodes). Regarding currently proposed spatial coverage, the modeling framework is designed to be adaptive. The initial proposed placement of nodes was selected based on anticipated pathways of interaction between the Project and area watercourses. Additional locations can be incorporated. Water quality predictions will be generated for five areas of the Chukuni River: upstream and downstream of Project discharge, at the end of the mixing zone, downstream of the confluence of Dixie Creek and upstream of the confluence with Pakwash Lake. Modelling of Pakwash Lake will include downstream of the confluence of the Chukuni River, downstream of influences of inflows from inflows from Trout lake River, and at the Pakwash Lake outlet.
F3	Dr. Branfireun explains that GoldSim "does not appear to ever have been applied to an environmental mercury speciation scenario" and attributes this to the software's model which "cannot incorporate mechanistic sorption/desorption reactions along flow paths, the biomethylation process, nor the complex interaction between mercury and sulphate." Dr. Branfireun concludes that, as a result, "the model proposed can never be successfully applied in the manner that is proposed. […] A mass balance model *cannot* by definition incorporate mechanistically the input and removal processes for mercury, and *cannot* address the biogeochemical aspects of mercury methylation across the landscape which are at the root of the potential impacts associated with the Great Bear proposal."	GoldSim is a widely recognized tool for developing water quality models. GoldSim's application in simulating water volume, flow, and chemical species transport is well-established in environmental modeling, and is the industry standard for mining projects. However, it is important clarify that the stimulated processes and reactions represented in the model are user defined, rather than being defined by the specific software employed. In this regard, as appropriate, the GoldSim model can include data inputs regarding mercury speciation and user-defined calculations and assumptions regarding sorption/desorption reactions along flow paths etc. The surface water model developed to support the effects assessment and Mercury Study Plan will use site-specific empirical data and include clear identification of the interconnections between mercury, sulphate, and other relevant factors, underpinning the model. These interconnections will be grounded in findings from site-specific baseline studies, site-specific geochemical programs, analogue site data, and peer-reviewed scientific literature. The overall approach to the GoldSim model will thus reflect a strong empirical foundation and a comprehensive understanding of the relevant

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		environmental processes. The findings of the surface water model will support subsequent bioaccumulation and aquatic food-web modelling.
F4	The Study Plan, and its model, also appear to ignore a number of parameters beyond THg, meHg, and sulphate which can impact methylation dynamics including DOC, light penetration, temperature, pH, and other parameters.	These parameters will be considered in the Mercury Study Plan.
F5	We are not satisfied that the GoldSim software proposed is appropriate or technically able to apply to the circumstances and produce a useful prediction. We are concerned that the technical limitations of the software, as well as the manner in which the proponent intends to use the software, will not produce reliable, accurate, or useful predictions. Our concerns are heightened given the ongoing data quality problems in relation to the Great Bear Project – flawed data will lead to flawed results, regardless of the software chosen.	Please see responses above regarding proposed modelling approach, noting that ANA have not suggested an alternative software that they believe is appropriate or technically appropriate for discussion. The overall approach to the GoldSim and bioaccumulation model is comprehensive and sufficient to support the effects assessment. The aquatic food web modelling will be based on empirical baseline data that has measured the mercury and methylmercury concentrations in herbivorous, insectivorous, and piscivorous fish and the supporting food web as well (i.e., invertebrates, zooplankton and periphyton). In addition, the empirical data includes measurements of mercury and routine parameters in sediment, porewater and surface water. Appropriate mathematical relationships will be constructed between the food web items to calculate concentration changes in the food web associated with concentration changes predicted in sediment/water quality modelling.
G. Conclusions		
G1	Dr. Branfireun concludes in his report: "We have a water quality model that is not capable of predicting mercury biogeochemical processes, that is dependent on background data and proposed monitoring that is insufficient. The outcome will be the inevitable future conclusion by the Proponent that	We strongly disagree with Dr. Branfireun's statement, and assert that as it misrepresents both the modeling approach and the broader effects assessment approach being taken for the Project, using industry-standard approaches, consistent with guidance provided by the Impact Assessment Agency of Canada. The proposed water quality modeling framework meets regulatory requirements and aligns with industry best practices for assessing potential Project-related effects. Contrary to the assertion that the

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	the combination has led to an inability to adequately predict changes in methylmercury concentrations in fish because of 'uncertainties' in GoldSim output, and "unforeseen complexities" in coupling abiotic and biotic compartments. The reality is that these uncertainties and complexities are completely foreseeable as outlined here. […] I conclude that the TISG's requirement that the Proponent provide a detailed and robust analysis on the potential for project contributions to methylmercury production in downstream watersheds has not been met based on the information provided in the Mercury Plan."	model is incapable of predicting mercury biogeochemical processes, the Mercury Study Plan proposes to incorporate multiple lines of evidence, including food-web modeling, to assess methylmercury production and bioaccumulation. The integration of hydrodynamic mixing modeling further strengthens the assessment by addressing spatial and temporal variability in the receiving environment. As presented in Great Bear Responses to comments above, the claim that background data and proposed monitoring are insufficient is unfounded. Baseline studies are comprehensive and have been designed to characterize existing conditions comprehensively, including key drivers of mercury methylation. The suggestion that uncertainties will inevitably prevent an adequate assessment is speculative and incorrect. While all environmental models have inherent uncertainties, the proposed approach employs standard methodologies, supported by site-specific data, used in regulatory approvals across the mining sector. These methodologies are well-established for evaluating potential project effects. The effects assessment and supporting modelling studies have been designed to be rigorous, transparent, and to provide meaningful predictions that support regulatory decision-making for a Project at this stage in the approvals process. We disagree with Dr. Branfireun's biased and unfounded claim that the proposed approach will not provide a detailed and robust analysis. Assertions to the contrary disregard the structured and methodical approach being undertaken to assess potential effects comprehensively. Dr. Branfireun asserts that the Mercury Study Plan lacks sufficient detail regarding the potential for project contributions to methylmercury production. However, no specific advice or technical guidance has been provided to clarify what would constitute an adequate level of analysis. We are fully open to considering input into the plan, but general criticisms without actionable suggestions do not help advance the discussion. We encourage the provision of clear, solution-oriented feedback so that we can meaningfully address any outstanding concerns.

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G2	In light of our experts' opinions, we are concerned with this Study Plan and require additional time to complete a fulsome review and engage with our experts in a more in depth manner, and to engage with our other experts and our community. We reiterate our request for a 90-day extension to provide comments. It is not prudent nor rational to proceed with a Mercury Study which is built on erroneous, incomplete, and inaccurate data and which uses flawed methodology that is unable to adequately address the biogeochemical aspects of mercury methylation across the landscape as required. We expect that the proponent will not move forward with this Study Plan, the proposed studies, or any additional work on the site that may cause adverse effects prior to receiving and meaningfully integrating our comments.	Great Bear Resources, remains committed to respectful, transparent, and inclusive engagement with Indigenous Nations, the public, and regulators throughout the development of the Great Bear Project.

- MEND 2009. Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials. MEND Report 1.20.1. December 2009.

#	Comments	Great Bear Resources Response
H. Opinion 1: **The selective reliance on achieving on and off site water quality that complies with water quality guidelines (CCME) in inadequate and inappropriate when considering mercury and methylmercury in water, and methylmercury uptake by biota.**		
H1	Disregarding the fact that the authors of the report surprisingly misstate the CCME guideline for methylmercury (it is 4 ng/L not 0.04, although 0.04 would be more scientifically justifiable), the statement that the data from the proposed project will be "compared against" any criteria is meaningless, because one may compare an apple to an orange; no intent, threshold, nor trigger value is indicated or even implied by this language. Despite quoting the more reasonable US EPA criterion of 0.05 ng/L methylmercury for the protection of fish-eating wildlife, prior documents submitted for this project indicate clearly that the Proponent intends (and has been approved by the Ontario MECP) to apply the CCME guideline the project from a compliance standpoint, so the reader should presume that the CCME values are the regulatory thresholds being applied by this Mercury Plan, rather than merely comparisons. As I have stated in prior opinions, there is no other way to characterize the CCME guideline values for mercury and methylmercury as anything but useless for the protection of fish consumers, and even if discharges or indirect effects were a fraction of these guideline limits there would be significant potential for downstream impairments of aquatic resources. For	Regardless of the water quality guidelines applied for comparison purposes, the HHERA will assess human health risks from predicted changes to mercury and methylmercury concentrations based on measured and predicted changes in water and fish and consumption rates for members of the local communities. Fish concentrations will be predicted based on a food web model that takes into account the potential for bioaccumulation. The aquatic food web modelling will be based on empirical baseline data that has measured the mercury and methylmercury concentrations in herbivorous, insectivorous, and piscivorous fish and the supporting food web as well (i.e., invertebrates, zooplankton and periphyton). In addition, the empirical data includes measurements of mercury and routine parameters in sediment, porewater and surface water. Appropriate mathematical relationships will be constructed between the food web items to calculate concentration changes in the food web associated with concentration changes predicted in sediment/water quality modelling.

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	example, the CCME Criterion for (Total) mercury is 26 ng/L, which is a value (developed from a 1991 protocol) for the **direct** protection of aquatic life. Despite being profoundly outdated, the CCME document provides valuable commentary that is all too frequently ignored when setting regulatory criteria based on this single value, including "*The protocol **does not** address exposure through **food or bioaccumulation** to higher trophic levels*", and "*if the ultimate management objective for mercury is to protect high trophic level aquatic life and/or those wildlife that prey on aquatic life, **more stringent site-specific application** of these water quality guidelines may be necessary*" (CCME, 2003, p.2; **emphasis mine**).	
H2	Although the Province of Ontario is silent on the issue of any other water quality guidelines for mercury, other jurisdictions have been more engaged with revising their mercury and methylmercury based on best available science at the time. British Columbia explicitly acknowledges the limitations of the CCMEs guidelines, stating "It should be noted that the CCME (2000) in developing guidelines for fresh and marine waters did not consider bioaccumulation effects per se, but based their guidelines on **chronic toxicity**. They caution that the guidelines that they have developed 'may not protect wildlife that consume aquatic life'." (British Columbia Ministry of Environment and Lands, 2001; emphasis mine). We may reasonably extend the statement about consumers of aquatic life to humans. Despite the document being nearly as old as the original CCME guidance, BC takes	As stated above, to support the overall Project, the Mercury Study Plan will incorporate multiple lines of evidence, including food-web modeling, to assess methylmercury production and bioaccumulation. As stated above, regardless of the water quality guidelines applied for comparison purposes, the HHERA will assess human health risks from predicted changes to mercury and methylmercury concentrations based on measured and predicted changes in water and fish and appropriate consumption rates for members of the local communities. Fish concentrations will be predicted based on a food web model that takes into account the potential for bioaccumulation. The aquatic food web modelling will be based on empirical baseline data that has measured the mercury and methylmercury concentrations in herbivorous, insectivorous, and piscivorous fish and the supporting food web as well (i.e., invertebrates, zooplankton and periphyton). In addition, the empirical data includes measurements of mercury and routine parameters in sediment, porewater and surface water. Appropriate mathematical relationships will be constructed between the food web items to calculate concentration changes in the food web associated with concentration changes predicted in sediment/water quality modelling. The same food web model will be used to predict mercury and methylmercury concentrations in smaller fish that would be consumed by piscivores.

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	the interesting approach of defining the water quality guideline to protect wildlife for total mercury by scaling it as a function of the percentage of total mercury that is methylmercury, acknowledging that methylmercury is the only form of mercury that bioaccumulates and biomagnifies in wildlife. Their Table 5 indicates that only in environments where methylmercury is largely not being formed would the CCME guideline of 26 ng/L for total mercury be remotely reasonable for fish consumers to be protected. In environments where methylmercury makes up an increasing fraction of total mercury, the allowable amount of total mercury decreases proportionally with the %methylmercury in the system. At 8% of total mercury as methylmercury, the guideline for total mercury is 1.25 ng/L. Even at 8% methylmercury the BC guideline total mercury value is below the detection limit of the technique that the Proponent declares adequate for the purposes of monitoring (DL of ~ 5 ng/L). The Proponent states in this document (as I provided to them in prior submissions) that that % methylmercury in surface waters of the proposed project can exceed 14% (using their own sparse data), translating to a guideline concentration of a mere 0.72 ng/L for the protection of wildlife consuming aquatic life. Despite the BC document being nearly 25 years old, the rationale for their mercury criteria is logical, and recognize the fact that even low levels of mercury in the environment can bioaccumulate and biomagnify to hazardous levels for fish consumers if the landscape has high methylmercury production potential. It is clear that current conditions in surface waters in the project area already exceed this criteria, meaning that **any** cumulative effect would be in exceedance of BC criteria for mercury in freshwater.	

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H3	I find it impossible to accept any generalized guideline for mercury or methylmercury in aquatic environments, and instead advise site specific assessment for appropriate threshold levels (which the CCME also explicitly does in their 2003 document, but never seems to be considered). An acceptance of this project mercury plan adhering to the CCME guidance for mercury and methylmercury threshold concentrations for direct and indirect effects is effectively a license to impair downstream resources given the low concentrations of mercury identified by the Proponent through limited baseline sampling. Site specific criterion for mercury and methylmercury must be required here, and derived from **appropriate** baseline data – scant little of which currently exist (see Opinion 2).	Regulation of mining projects is purposefully guided by federal and provincial, law and regulatory guidance that have stood the test of time, and reflect and balance the technical knowledge of many qualified professionals. Regardless of the water quality guidelines applied for comparison purposes, the HHERA will assess human health risks from predicted changes to mercury and methylmercury concentrations based on measured and predicted changes in water and fish and appropriate consumption rates for members of the local communities. Fish concentrations will be predicted based on a food web model that takes into account the potential for bioaccumulation. The aquatic food web modelling will be based on empirical baseline data that has measured the mercury and methylmercury concentrations in herbivorous, insectivorous, and piscivorous fish and the supporting food web as well (i.e., invertebrates, zooplankton and periphyton). In addition, the empirical data includes measurements of mercury and routine parameters in sediment, porewater and surface water. Appropriate mathematical relationships will be constructed between the food web items to calculate concentration changes in the food web associated with concentration changes predicted in sediment/water quality modelling.
I. Opinion 2: **The background data collected as part of the baseline studies for this project are largely erroneous or their interpretation is flawed, rendering them neither comprehensive nor sufficient to detect whether the project will have measurable impacts on fish mercury levels in the future.**		
I1	In the context of the protection of fish consumers, nearly all of the background data for total mercury are useless and stated incorrectly. All of the "data" that are reported in Table 2.10 of "Attachment 4 - Surface and Groundwater Technical Supporting Document" (March 2024) for total mercury are not data at all, but the reporting detection limits of the contract laboratory The background mercury data in water (with the exception of the handful of appropriate trace mercury and methylmercury analyses that were conducted by Flett Research) **is incorrect**. The data provided for mercury **are not data** – they are detection limits of the inappropriate technique used to do	Much of the content of this comment is specific to the ECA ISW application for the Advanced Exploration Program and its supporting technical studies. They are not applicable and do not accurately reflect the content, intent, or proposed methodology of the Mercury Study Plan or the effects assessment regulatory process for a proposed mining Project in Ontario. These concerns were previously raised by Grassy Narrows in October 2024, and have most recently been addressed in the October 25, 2024 memorandum "*Response to ANA Letter Concerning Great Bear Project AEX ECA ISW Application and Expected Impacts to the Chukuni River*". Key points are as follows:

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	element scans by inductively coupled plasma – mass spectrometry (ICP- MS). ICP-MS in a standard configuration cannot generate data for mercury with appropriate detection limits (despite the Proponent's assertion to the contrary in the Mercury Plan). Moreover, the Proponent treats these detection limit placeholders as data – **these are not data.** If the contract laboratory reported these values as data, then they are not operating in compliance with ISO 17025 protocols. If the Proponent substituted detection limits for samples reported to be below the detection limit by the contract lab, then this is not correct procedure and should be stated as such. In both cases, a serious lack of oversight and understanding of analytical results is clear as **these are not data**. There is also insufficient data for methylmercury in surface water as this critical parameter was only measured sparsely as part of the baseline monitoring program. As a result, there is virtually no background data for mercury in surface waters for the project area, nor is there sufficient monitoring in the proposed plan because the appropriate trace mercury and methylmercury monitoring is only proposed at select locations and at a frequency that is insufficient to detect change over time, and with highly inappropriate threshold levels that are orders of magnitude above the levels at which adverse effects will occur.	*"The water quality laboratory analyses have been conducted using industry-approved methods at accredited laboratories (Canadian Association for Laboratory Accreditation). It is important to clarify that while ICP-MS has been used for total metal scans, it has not been employed for mercury quantification since 2021 such that detection limits of ongoing analyses are much lower. Starting in 2022, sulphate and mercury monitoring on the Chukuni River has included the following analyses:* • *Methylmercury by Distillation, Aqueous Ethylation, Purge and Trap, and Cold Vapor Atomic Florescence Spectroscopy (CVAFS) at specialized laboratories[c] with reported detection limits of approximately 0.0035 ng/L* • *Ultra-low mercury by Oxidation, Purge, and Trap, and CVAFS at specialized laboratories with reported detection limits of approximately 0.04 ng/L* • *Standard mercury by Cold Vapor Atomic Absorption Spectroscopy (CVASS) with reported detection limits of approximately 5 ng/L* • *Sulphate (method E235.S04) with reported detection limits of approximately 0.3 mg/L* *The analytical methods used and the reported detection limits (DL) are sufficiently sensitive to characterize the existing water quality of the Chukuni River. Dr. Branfireun correctly noted that analytical results below the reported DL were retained in the water quality database and included in the statistical summaries presented in the Application. This approach is consistent with established guidance on environmental data handling (Environment and Climate Change Canada, 2014; Environmental Protection Agency, 1990), reflects industry standards and regulator expectations, and is appropriate to support baseline database creation.* *For sulphate concentrations, it is noted by Dr. Branfireun that there is variation in reported water quality data over the period of record, such that sulphate data is not useful. Water quality in natural systems is inherently dynamic and can fluctuate even over short periods due to a range of*

[c] Ultra low (ultra trace) analyses are offered by a limited number of specialized laboratories in Canada that use specialized analytical techniques and laboratory measures to avoid potential for cross contamination. Baseline ultra data for the AEX Program has been completed at Flett Research Ltd.

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		environmental factors, such as precipitation, runoff, temperature changes, and natural heterogeneity in ice cover. The variation identified by Dr. Branfireun of 7 mg/L sulphate on 2022-December-15 and 1 mg/L sulphate on 2022-December-19, as being erroneous, is consistent with expected natural variability and does not undermine the reliability of the overall dataset, which includes hundreds of data points. Such fluctuations are typical in natural aquatic environments. The claim that virtually no background data is unfounded and inaccurate. Data collection has been designed to be extensive and appropriate to inform the effects assessment, and encompass a comprehensive network of sites strategically selected to capture and characterize spatial and temporal variations.
I2	Further investigation into the baseline monitoring data provided in Attachment 4 of the AEX- ECA application which contains all of the background data cited by the Proponent in the Mercury Plan also reveals that the **concentrations reported for sulphate were also erroneous** up until May of 2023 when the Proponent either changed analytical methods or laboratories, or incorrect instrument operation was corrected. From 2021-06-03 to 2023-03-30, we find data that are reported with no precision (i.e. no decimal place) and spuriously range from values of 1 to 11. I know of no analytical technique that would report concentrations like this (we see similarly erroneous data for parameters such as Chloride, TSS, TDS). The clearest evidence to me that this data is no better than random is the value of 7 mg/l on 2022-12-15, followed by a value of 1 mg/L four days later on 2022-12-19. Given that there was no appreciable change in river flow over this time, **these data are erroneous and cannot be used**. There is similar randomness in other parameters. The fact that the average concentrations that are reported directly in the Appendix are	Much of the content of this comment is specific to the ECA ISW application for the Advanced Exploration Program, and its supporting technical studies. So being, the comment does not accurately reflect the content, intent, or proposed methodology of the Mercury Study Plan or the effects assessment regulatory process for a proposed mining Project in Ontario. These specific concerns were raised by Grassy Narrows in 2024, and have most recently been addressed in the October 25, 2024 memorandum "*Response to ANA Letter Concerning Great Bear Project AEX ECA ISW Application and Expected Impacts to the Chukuni River*". Key points are as follows: *"The water quality laboratory analyses have been conducted using industry-approved methods at accredited laboratories (Canadian Association for Laboratory Accreditation). It is important to clarify that while ICP-MS has been used for total metal scans, it has not been employed for mercury quantification since 2021 such that detection limits of ongoing analyses are much lower. Starting in 2022, sulphate and mercury monitoring on the Chukuni River has included the following analyses:*

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	substantially different for the three stations on the Chukuni River should have been the first indication that there was a data quality problem.	• *Methylmercury by Distillation, Aqueous Ethylation, Purge and Trap, and Cold Vapor Atomic Florescence Spectroscopy (CVAFS) at specialized laboratories[d] with reported detection limits of approximately 0.0035 ng/L* • *Ultra-low mercury by Oxidation, Purge, and Trap, and CVAFS at specialized laboratories with reported detection limits of approximately 0.04 ng/L* • *Standard mercury by Cold Vapor Atomic Absorption Spectroscopy (CVASS) with reported detection limits of approximately 5 ng/L* • *Sulphate (method E235.S04) with reported detection limits of approximately 0.3 mg/L* *The analytical methods used and the reported detection limits (DL) are sufficiently sensitive to characterize the existing water quality of the Chukuni River. Dr. Branfireun correctly noted that analytical results below the reported DL were retained in the water quality database and included in the statistical summaries presented in the Application. This approach is consistent with established guidance on environmental data handling (Environment and Climate Change Canada, 2014; Environmental Protection Agency, 1990), reflects industry standards and regulator expectations, and is appropriate to support baseline database creation.* *For sulphate concentrations, it is noted by Dr. Branfireun that there is variation in reported water quality data over the period of record, such that sulphate data is not useful. Water quality in natural systems is inherently dynamic and can fluctuate even over short periods due to a range of environmental factors, such as precipitation, runoff, temperature changes, and natural heterogeneity in ice cover. The variation identified by Dr. Branfireun of 7 mg/L sulphate on 2022-December-15 and 1 mg/L sulphate on 2022-December-19, as being erroneous, is consistent with expected natural variability and does not undermine the reliability of the overall dataset, which includes*

[d] Ultra low (ultra trace) analyses are offered by a limited number of specialized laboratories in Canada that use specialized analytical techniques and laboratory measures to avoid potential for cross contamination. Baseline ultra data for the AEX Program has been completed at Flett Research Ltd.

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I3	Notably, the data quality changes substantially in May 2023, with two decimal place precision and a much more realistic range of concentrations (4.18 – 6.30 mg/L). Other parameters also show this step change in data quality. There was obviously a change in technique or in the contract laboratory being used that was not documented, which is contrary to best practices at the very least. Other variables reported are also suspect up until this date as many of the physical parameters (e.g. TDS, TSS) and nutrient data ($N0_2$), contain inexplicable values, change in quality, or are dropped completely (e.g. NO_3-$N0_4$-T). The failure to note and censor these erroneous data is inexplicable – to use them to calculate descriptive statistics is inexcusable. For these variables (including sulphate) there are only 8-9 usable data points for all of the stations reported (including the Chukuni River). The Mercury Plan makes reference to comprehensive background data about mercury and sulphate that will inform modelling efforts and trigger undefined actions should they change. One cannot numerically model concentrations of "below the detection limit". The reality is that the background data is neither "comprehensive" nor "sufficient" by any reasonable definition, and the approval of a Mercury Plan such as this is license to both proceed blind with respect to the site specific mercury conditions, as well as condone the continued	The analytical methods used and the reported detection limits (DL) are sufficiently sensitive to characterize the existing water quality of the Chukuni River. Analytical results below the reported DL were retained in the water quality database and included in the statistical summaries presented in the Application consistent with established guidance on environmental data handling (Environment and Climate Change Canada, 2014; Environmental Protection Agency, 1990). This approach reflects industry standards and regulator expectations, and is appropriate to support baseline database creation. These specific concerns were raised by Grassy Narrows in 2024, and have most recently been addressed in the October 25, 2024 memorandum "*Response to ANA Letter Concerning Great Bear Project AEX ECA ISW Application and Expected Impacts to the Chukuni River*". Key points are as follows: *"The water quality laboratory analyses have been conducted using industry-approved methods at accredited laboratories (Canadian Association for Laboratory Accreditation). It is important to clarify that while ICP-MS has been used for total metal scans, it has not been employed for mercury quantification since 2021 such that detection limits of ongoing analyses are much lower. Starting in 2022, sulphate and mercury monitoring on the Chukuni River has included the following analyses:* • *Methylmercury by Distillation, Aqueous Ethylation, Purge and Trap, and Cold Vapor Atomic Florescence Spectroscopy (CVAFS) at specialized laboratories[e] with reported detection limits of approximately 0.0035 ng/L* • *Ultra-low mercury by Oxidation, Purge, and Trap, and CVAFS at specialized laboratories with reported detection limits of approximately 0.04 ng/L* • *Standard mercury by Cold Vapor Atomic Absorption Spectroscopy (CVASS) with reported detection limits of approximately 5 ng/L*

[e] Ultra low (ultra trace) analyses are offered by a limited number of specialized laboratories in Canada that use specialized analytical techniques and laboratory measures to avoid potential for cross contamination. Baseline ultra data for the AEX Program has been completed at Flett Research Ltd.

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	use of an inappropriate analytical approach (despite the Proponent's statement to the contrary) that will reliably generate non-data that cannot capture trends in mercury concentrations across most of the sampling sites in the project area.	• *Sulphate (method E235.S04) with reported detection limits of approximately 0.3 mg/L* *The analytical methods used and the reported detection limits (DL) are sufficiently sensitive to characterize the existing water quality of the Chukuni River. Dr. Branfireun correctly noted that analytical results below the reported DL were retained in the water quality database and included in the statistical summaries presented in the Application. This approach is consistent with established guidance on environmental data handling (Environment and Climate Change Canada, 2014; Environmental Protection Agency, 1990), reflects industry standards and regulator expectations, and is appropriate to support baseline database creation.* *For sulphate concentrations, it is noted by Dr. Branfireun that there is variation in reported water quality data over the period of record, such that sulphate data is not useful. Water quality in natural systems is inherently dynamic and can fluctuate even over short periods due to a range of environmental factors, such as precipitation, runoff, temperature changes, and natural heterogeneity in ice cover. The variation identified by Dr. Branfireun of 7 mg/L sulphate on 2022-December-15 and 1 mg/L sulphate on 2022-December-19, as being erroneous, is consistent with expected natural variability and does not undermine the reliability of the overall dataset, which includes*
J. Opinion 3: **The assimilative capacity of the receiving waters (Chukuni River) as a mitigation strategy for excess sulphate loading is not supported by available data. As this is the only measure that has been proposed to address the indirect downstream effect of sulphate-related methylmercury production, there is no evidence that other adverse downstream effects can be avoided.**		
J1	**Treated effluent:** Indeed the Proponent has outlined strategies for treating effluent to be discharged to the Chukuni River, however none of the treatment technologies proposed target sulphate at all. Sulphate production from overburden and waste rock could be substantially greater than the Proponent states. Given that groundwater contributes nearly 80% of the total water outflows, 25% of groundwater samples (75th percentile) from many locations in the project area had	The mercury study plan was prepared for the Project, yet this comment like many others, appears to pertain to the AEX Program. The reviewer appears to be confusing water quality estimates prepared for the AEX with water quality estimates currently in preparation for the overall Project. Regarding the AEX water quality estimates: • Geochemical testing indicates that overburden is non-potentially acid generating (NPAG) (average NPR = 34) with very low concentrations of sulphur. Of the 116 overburden samples tested,

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	sulphate concentrations well in excess of 10 mg/L (Appendix B, Table 3 AEX- ECA Application), and the water treatment technology outlined by the Proponent has no capacity to remove sulphate, it would seem that the Proponent's 'expected' case of 10 mg/L sulphate is not just unlikely, but nearly impossible to achieve without even considering the potential for additional sulphate sources due to operations. Indeed without any additional treatment the Proponents 'extreme' case is likely a gross underestimate. With only gypsum saturation ultimately controlling sulphate solubility, sulphate concentrations in the range of 1000-1500 mg/L may be expected and are in fact, typical of many mine sites with oxidizing sulphide minerals like pyrite.	approximately half of the samples had below detection limit sulphur concentrations (<0.005% or 0.01%). When detectable, sulphur concentrations ranged from 0.006% to 0.11%. High concentrations of sulphate from overburden, as claimed by ANA, are not supported by the geochemical test results. • The bulk of the rock generated as part of the AEX is expected to be NPAG and comprise the basalt lithology. Samples of basalt generally have a low sulphur content with a median sulphur content of 0.2%. Sulphate release from the rock was accounted for in water quality estimates for the AEX utilizing industry standard data (e.g., humidity cell tests) for drill core samples representing the rock to be excavated as part of the AEX Program. • The claim that sulphate concentrations in groundwater are well in excess of 10 mg/L is false. The median and average sulphate concentrations in monitoring wells is 4.9 mg/L and 8.5 mg/L, respectively. Approximately 75 percent of the samples have sulphate concentrations ≤10 mg/L. The 95th percentile sulphate concentration is 22 mg/L. This includes data for 74 wells comprising 241 datapoints. Monitoring wells proximal to the AEX portal area have even lower range of sulphate concentrations; the 95th percentile sulphate concentration in those wells is 13 mg/L. Water quality estimates for the overall Project for mine operations and closure are underway. Sulphate is a model parameter and the results of these estimates will be used to identify strategies to manage sulphate in the effluent discharge, if required.
J2	**Large watercourse:** This is of course a relative statement however a 20-year median annual discharge of 26.5 m^3/s is objectively a substantial flow. However as I have outlined in prior memos (Branfireun Review of Kinross Response to ANA Memo concerning Great Bear Project AEX ECA Application, August 1, 2024; October 7, 2024), median or mean statistics do not tell the whole story about assimilative capacity, despite the Proponent utilizing the simple numerical average of the entire daily discharge record (which upward biases the value)	The mercury study plan was prepared for the Project, yet this comment like many others, appears to pertain to the AEX Program. The reviewer appears to be confusing water balance estimates prepared for the AEX Program with water balances currently in preparation for the overall Project. Data inputs, assumptions and results of the water balance modelling to support the overall Project, including discharge volume relative to receiving environment flows, will be provided in the effects assessment. Water balance modelling will include evaluation of extreme wet and extreme dry periods as well as climate change scenarios, in addition to average conditions, as to elevate lower ranges of flow.

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	for all of their dilution scenarios presented in prior submissions to justify assimilative capacity. In the context of dilution of an environmentally relevant chemical, it is more relevant and protective to explore the lower ranges of flow, since it is at these levels that the river has less assimilative capacity and adverse effects are more likely. The 20-year average 25th percentile value is 14.2 m^3/s, meaning that for a full quarter of the year (which would include the relevant summer low flows when biogeochemical activity including methylation would be the highest), flows in the river are equal to or less than this value. The 20-year average minimum flows are only 5.7 m^3/s; more than 5 times lower than the discharge value that the Proponent used to calculate dilution. I argue that this is a more appropriate 'extreme' case discharge value to use, however it is notable that **the record contains a period of zero flow conditions in 2011 – a condition under which effluent discharge would make up 100% of river flow and would be completely undiluted (i.e. the river has zero assimilative capacity)**. 2023 was among the lowest flow years in the last 20, and the central tendency of the river discharge over that period is toward lower, and less variable flow. If the 2023 flow statistics (median, 25th percentile, and minimum flows of 13.5, 6.6 and 3.1 m^3/s are reflective of future drier conditions driven by climate change, then the use of a single value of average flow that is 10x greater than this low flow condition to calculate effluent dilution and demonstrate assimilative capacity is clearly not protective by any definition.	This comment regarding the AEX Program, and concerns raised regarding hydrological data handling was previously addressed in the following memorandum "*October 2024. Discharge to the Chukuni River, Great Bear AEX ECA ISW Application*". Key points of discussion in this regard were as follows: "The Chukuni River is a regulated system, with flow controlled by the Snowshoe Rapids Dam. Water levels and flow releases at the dam are managed by the Ministry of Natural Resources (MNR).To support calculation of flow statistics in the Application, data available from the 63-year record (not the last 20 years) were used from Water Survey of Canada (WSC) flow gauge located on the Chukuni River near Ear Falls Station (gauge ID 05QC001). As noted in the ECA ISW Application for AEX, the period of record for this gauge includes various types of development in upstream watershed, as well as construction and modification of the Snowshoe Rapids Dam and its operating rules. The period of record was screened to remove low flow periods influenced by significant construction activities at the dam, based on WSC records and MNR documentation, including the period of zero flows in 2011, when the control structure was being repaired to support accurate forecasting of future conditions.

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J3	**High oxygenation level:** The Proponent has frequently made the argument that oxygenated waters in the receiving reach of the Chukuni River preclude negative effects of sulphate addition because sulphate reduction would not occur. This statement is misleading, as I could visit the most methylmercury contaminated lake in Ontario (Clay Lake) in August, measure surface water oxygen levels and declare it oxygenated. This would be ignoring the anoxic bottom waters and sediments where very high levels of methylmercury are formed. Of course, rivers do not stratify but it is well documented that they can have anaerobic sediments, biofilms and hyporheic zones where sulphate reduction and methylation can occur (despite having a well-mixed water column above). The biogeochemical status of the immediate receiving river reach is actually not the biggest issue here, it is the methylation potential of downstream waters where this well-oxygenated river will deliver sulphate that may be many times in excess of background levels. Pakwash Lake is the first lake downstream of the proposed effluent discharge, and already has **five** fish species that have restricted consumption advisories due to mercury contamination (https://www.ontario.ca/page/fish-consumption-report?id=50459330) indicating that any further loading of methylmercury, or enhancement of the methylating process either in the lake or upstream would amplify an existing environmental degradation. Whether the fish species with tissue mercury exceedances in Pakwash Lake immediately downstream of the proposed operation derive their methylmercury from Chukuni riverbank	The Mercury Study Plan was developed for the overall Project; the reviewer appears to be referencing technical supporting studies for the Advanced Exploration Program which is not appropriate. So being, the comment does not accurately reflect the content, intent, or proposed methodology of the Mercury Study Plan or the effects assessment regulatory process for a proposed mining Project in Ontario. The Chukuni River is a high-flow, turbulent watercourse with oxygen saturation throughout the water column. Comparing this dynamic environment to the stratified basin of Clay Lake, where hypolimnetic oxygen levels are low such that methylation processes are more likely supported, is misleading. To support the overall Project, the Mercury Study Plan will incorporate multiple lines of evidence, including food-web modeling, to assess methylmercury production and bioaccumulation, including downstream in Pakwash Lake where deep-basin conditions may support presence of anoxic bottom waters and sediments. The integration of hydrodynamic mixing modeling further strengthens the assessment by addressing spatial and temporal variability in the receiving environment. The proposed water quality modeling framework meets regulatory requirements and aligns with industry best practices for assessing potential Project-related effects. Regardless of the water quality guidelines applied for comparison purposes, the HHERA will assess human health risks from predicted changes to mercury and methylmercury concentrations based on measured and predicted changes in water and fish and appropriate consumption rates for members of the local communities. Fish concentrations will be predicted based on a food web model that takes into account the potential for bioaccumulation. The aquatic food web modelling will be based on empirical baseline data that has measured the mercury and methylmercury concentrations in herbivorous, insectivorous, and piscivorous fish and the supporting food web as well (i.e., invertebrates, zooplankton and periphyton). In addition, the empirical data includes measurements of mercury and routine parameters in sediment, porewater and surface water. Appropriate mathematical relationships will be constructed between the food web items to calculate concentration changes in the food web associated with concentration changes predicted in sediment/water quality modelling.

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	wetlands, river littoral sediments, biofilms or periphyton, anoxic profundal lake sediments, or anoxic hypolimnetic waters during stratification is actually irrelevant – methylmercury is produced in the aquatic environment because it is found in fish in downstream receiving waters and it is dependent on the activity of sulphate-reducing bacteria, which are dependent on available sulphate. To have that many species with mercury consumption advisories confirms that this is a mercury sensitive environment with high mercury methylation potential.	
K. Opinion 4: **The model that the proponent indicates will be used to predict changes in mercury and methylmercury concentrations in downstream watersheds and assess the potential impact on mercury levels in fish (including assessment of bioaccumulation / bio- magnification pathways) cannot technically deliver any of these outcomes.**		
K1	In the Great Bear Project Mercury Plan Section 3.4.3, the Proponent states that the GoldSim software modelling package will be used to "stimulate ***(sic)*** the volume and flow of water, and the concentrations and transport of chemical species, over the life of the Project." Without substantiation, they go on to state that "GoldSim has been extensively and successfully applied to simulate complex water resource management, mining operation, contaminant transport, and waste management projects and represents a robust industry-standard modelling software." Although I do not disagree that GoldSim has been widely applied to various industry problems I cannot speak to its success. I can say that it does not appear to ever have been applied to an environmental mercury speciation scenario. There is a clear reason for this – GoldSim is fundamentally (even with its CT submodel) a non-reactive mass-balance	Please see response to question F1, F2 and F3.

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	model that cannot incorporate mechanistic sorption/desorption reactions along flowpaths, the biomethylation process, nor the complex interaction between mercury and sulphate. As such, the model proposed can never be successfully applied in the manner that is proposed. A mass balance model *cannot* by definition incorporate mechanistically the input and removal processes for mercury, and *cannot* address the biogeochemical aspects of mercury methylation across the landscape which are at the root of the potential impacts associated with the Great Bear proposal. The reason why mass balance models are used for solutes (and can work for solutes that are conservative in water) is because they are simple to apply quickly and require little parameterization (i.e. are inexpensive to implement). Indeed they can have value to evaluate simple "what if" scenarios. However, being cheaper and easier to use is not sufficient justification for taking a naïve approach to evaluating possible environmental risks in a region of extreme mercury sensitivity, when much more defensible approaches exist, including models for watershed-steam mercury dynamics. On page 17 of the Mercury Plan, the authors state that GoldSim is used because it provides "a clear description and rationale for model input parameters and assumptions." I have seen this language used in other cases that I have opined about, with the implication being that GoldSim is somehow MORE clear in its description and rationale of input parameters and assumptions than other models (i.e. superior). This seems to be popular but baseless justification, as it implies that it is somehow more transparent than other model frameworks.	

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	The statement that the mass balance models like GoldSim are transparent with respect to data inputs is true, in that it is true that *any* model is transparent with respect to data inputs because one must know what the data inputs are in order to run the model (a non sequitur). What is also true of any model is the adage of "garbage in, garbage out." The definition of input parameters and stated variables is always required in any model, as is the establishment of boundary conditions and mechanisms that reflect the best available science. In the case of the Great Bear Project, we have a virtual absence of useable data for baseline water quality (see above), which means that we are at a loss for values for the very input parameters that are required.	
K2	The Great Bear Project Mercury Plan reaches even farther by stating that "Results of GoldSim modelling for surface water and sediment quality, described above, will be used to forecast and assess potential effects on fish mercury concentrations in downstream watersheds. Both small and large-bodied fish will be considered in this assessment." My understanding of GoldSim is that it uses the sediment compartment to model water chemistry, not the other way around, so to suggest that GoldSim can be used predictably for the sediment compartment is unrealistic beyond simple mass transfer, despite the importance of the sediment compartment for net methylation. More problematic is the leap of faith between whatever output is provided by GoldSim and a prediction of methylmercury concentrations in biota. There is no evidence of any such effort being successfully reported in the public domain; if the Proponent has advanced the science in this area then I would welcome an opportunity to review their efforts in this regard	Goldsim model results for water quality will be used as inputs to food-web and bioaccumulation modelling. Please also see response to comments F1, F2 and F3. As described previously, the HHERA will assess human health risks from predicted changes to mercury and methylmercury concentrations based on measured and predicted changes in water and fish and appropriate consumption rates for members of the local communities. Fish concentrations will be will account the potential for bioaccumulation and biomagnification of methylmercury, based on empirical baseline data that has measured the mercury and methylmercury concentrations in herbivorous, insectivorous, and piscivorous fish and the supporting food web as well (i.e., invertebrates, zooplankton and periphyton). In addition, the empirical data includes measurements of mercury and routine parameters in sediment, porewater and surface water. Appropriate mathematical relationships will be constructed between the food web items to calculate concentration changes in the food web associated with concentration changes predicted in sediment/water quality modelling.

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	as it would mark a major breakthrough in modelling mercury biogeochemistry and biotic uptake. I suspect that this is not the case, since the means by which this is to be accomplished is apparently "changes in fish body burden mercury concentrations is considered to be the forecasted methylmercury concentration in the water column, as determined by the water quality model." I am not sure who "considered" this relationship, however it was not someone with a modest scientific understanding of the controls on fish tissue MeHg concentrations – such a simplistic forecasting relationship does not exist, and this is in addition to the fact that GoldSim cannot predict methylmercury concentrations in the first place.	
L. Other Errors, Omissions and Concluding Remarks		
L1	There are other problematic statements throughout the Mercury Plan that are used to downplay the potential impacts of the project do not align with scientific facts. The statement "For example, SRB-induced mercury methylation could occur in areas of organic soils peripheral to the rock stockpiles; however, methylmercury production beneath rock stockpiles can be limited by low temperatures at the base of the stockpiles which will inhibit SRB activity." is patently false given that the SRB can be quite active at temperatures just above freezing (e.g. Fortin et al., 2000).	As indicated, inhibition or lowering of sulphate reducing bacteria activity at lower temperatures is well documented in the scientific literature. • Hao, O.K. 2003. Sulphate Reducing Bacteria. Handbook of Water and Wastewater Microbiology. Pp. 459 -469. • Wright, D.R. and R. D. Hamilton. 1982. Release of methyl mercury from sediments: Effects of mercury concentration, low temperature, and nutrient addition. Can. J. Fish. Aquat. Sci. 39:1459-1466. • Wright, D.R. and R. D. Hamilton. 1990. Environmental Toxicology and Chemistry, Vol 9, pp 853-869, 1990 Printed In the USA Pergamon Press plc • Sulaiman Al-Zuhair , Muftah H El-Naas, Huda Al-Hassani / 2008. Environmental Factors Affecting the Formation of Methylmercury in low pH lakes. J Biochem Tech (2008) 1(2):39-44

#	Comments	Great Bear Resources Response
L2	We have all kinds of details on sample handling and Quality Assurance/Quality Control procedures in Section 2.2.1 that convey attention to detail and rigour, however a statement about sampling frequency is carefully worded so that the inadequacy of the water quality sampling is not apparent. *Baseline surface water quality sampling generally occurs monthly to characterize seasonal variability in water quality, providing flow is present and that the monitoring site can be safely accessed. (GBP Mercury Plan, p.5)* This statement fails to identify which solutes will be measured from this 'generally' monthly sampling, however in prior documents, the Proponent has clearly indicated that low detection level mercury and methylmercury sampling will only be done at only **half of the sampling sites**, and are only to be taken **quarterly (4 times per year)**. This low frequency of sampling of the only mercury data of utility is insufficient to statistically detect change until that change is so substantial that its effects would be irreversible. Since all of the other mercury sampling will be subject to an inappropriate analytical technique that will mostly return non-detects, the proposed monitoring programs are effectively designed to avoid change detection and I expanded on this in a prior memo (Branfireun to Esmonde, on Advanced Exploration Program (AEX) Environmental Compliance Approval - Industrial Sewage Works (ECA – ISW) July 5, 2024).	The statement is accurate and is not misleading. The ongoing sampling effort to support the effects assessment is monthly. Monthly sampling is conducted with flow is present, and site can be safely accessed. For most stations, this means data is collected 10 to 12 months out of the year. However, some small watercourses do not have flow in winter months (no flow, or frozen to bottom), such that samples cannot be collected. The final baseline report prepared to support the effects assessment will include the period of record (number of samples) for each station across the baseline data area. We disagree with the assertion that the proposed analytical methodology for water quality sampling for mercury is appropriate and will return mostly non-detect values. This specific concern was addressed most recently in Great Bear's October 2024 memorandum "*Response to ANA Letter Concerning Great Bear Project AEX ECA ISW Application and Expected Impacts to the Chukuni River*". Key points are as follows: *"The water quality laboratory analyses have been conducted using industry-approved methods at accredited laboratories (Canadian Association for Laboratory Accreditation). It is important to clarify that while ICP-MS has been used for total metal scans, it has not been employed for mercury quantification since 2021 such that detection limits of ongoing analyses are much lower. Starting in 2022, sulphate and mercury monitoring on the Chukuni River has included the following analyses:* • *Methylmercury by Distillation, Aqueous Ethylation, Purge and Trap, and Cold Vapor Atomic Florescence Spectroscopy (CVAFS) at specialized laboratories[f] with reported detection limits of approximately 0.0035 ng/L* • *Ultra-low mercury by Oxidation, Purge, and Trap, and CVAFS at specialized laboratories with reported detection limits of approximately 0.04 ng/L* • *Standard mercury by Cold Vapor Atomic Absorption Spectroscopy (CVASS) with reported detection limits of approximately 5 ng/L*

[f] Ultra low (ultra trace) analyses are offered by a limited number of specialized laboratories in Canada that use specialized analytical techniques and laboratory measures to avoid potential for cross contamination. Baseline ultra data for the AEX Program has been completed at Flett Research Ltd.

#	Comments	Great Bear Resources Response
		• *Sulphate (method E235.S04) with reported detection limits of approximately 0.3 mg/L* In response to Dr. Branfireun's inquiries about the adequacy monitoring the AEX monitoring Program, Great Bear Resources submitted the following response dated July 7, 2024: *The aquatics and surface monitoring programs for AEX Program have been developed in collaboration with the Ministry of the Environment, Conservation and Parks, and align with regulatory standards and expectations in Ontario. These programs are designed to proactively address / confirm potential effects and protect the receiving water throughout the AEX Program. The frequency and methodology of the aquatics sampling are in line with available regulatory guidance, including the Federal Metal and Dimond Mining Effluent Regulations (MDMER), and, together with the surface water quality program, are sufficient to detect changes, triggering management actions, before they reach a level that could cause adverse effects. With sufficient monitoring and ad-adaptive management programs in place, Kinross* [Great Bear Resources] *is confident in its ability to safe-guard surface waters and mitigate potential impacts.*
L3	Here, we see the assembly of a house of cards by the Proponent. We have a water quality model that is not capable of predicting mercury biogeochemical processes, and that is dependent on background data and proposed monitoring that is insufficient. The outcome will be the inevitable future conclusion by the Proponent that the combination has led to an inability to adequately predict changes in methylmercury concentrations in fish because of 'uncertainties' in GoldSim output, and 'unforeseen complexities' in coupling abiotic and biotic compartments. The reality is that these uncertainties and complexities are completely foreseeable as outlined here. The consideration of the December 2024 Mercury Plan as anything other than deficient will excuse the Proponent's future failure to predict the impact of the proposed development from a	We strongly disagree with Dr. Branfireun's biased characterization of the modeling approach, and assert this comment misrepresents the baseline dataset, modelling methodology, and rigor of the effects assessment as a regulatory process. The assertion that the water quality model is incapable of assessing mercury biogeochemical processes is incorrect. The assessment follows industry-standard practices and regulatory requirements, integrating multiple lines of evidence, including food-web modeling, to evaluate methylmercury production and bioaccumulation. Please also see responses to Comments F1, F2 and F3. The claim that the assessment relies on insufficient background data and monitoring is also incorrect. Extensive baseline studies have been conducted to characterize existing, pre-Project conditions, including key factors influencing mercury methylation. These studies provide site-specific empirical data and a defensible foundation for predictive modeling for a Project at this stage in development.

#	Comments	Great Bear Resources Response
	mercury perspective because of the appearance of due diligence at this stage of the process. I conclude that the TISG's requirement that the Proponent provide *a detailed and robust analysis on the potential for project contributions to methylmercury production in down- stream watersheds* has not been met based on the information provided in their Mercury Plan.	The suggestion that the assessment will inevitably fail due to 'uncertainties' or 'unforeseen complexities' is speculative and unfounded. While all environmental models have inherent uncertainties, the approach used here applies well-established methodologies to account for and manage these uncertainties effectively. The claim that the Mercury Plan does not meet the TISG's requirements is demonstrably false. The Plan provides a detailed and robust analysis of potential project contributions to methylmercury production, aligning with both anticipated regulatory expectations and established scientific principles. Assertions to the contrary disregard the structured, evidence-based approach being undertaken to assess the potential for Project effects and mitigate effects, and clearly show an anti-Project bias.

#	Comments	Great Bear Resources Response
M. Geochemical Characterization		
M1	Subsection 3.4.1 explains the methods that will be used to predict the aqueous concentrations and solid-phase levels for dozens of potential contaminants at the Great Bear Project, including sulphate, ML-ARD, and water quality at near-neutral pH. This Study Plan states, "The sampling approach and testing methods for the geochemical investigations comply with ... guidance found within the Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND, 2009), which represents best practice and industry standard approaches and methodologies for ML/ARD sampling and characterization in Canada." Kinross committed to the same approach and testing for Advanced Exploration at the Great Bear Project years ago, but fails to follow guidance in this federal Prediction Manual of best practice and industry standards[g]. Where Kinross did follow some guidance and detected potential for significant water-	ANA's claim that methods in MEND (2009) are not being followed is false and has been responded to numerous times by Great Bear Resources. This comment is simply a repetition of an earlier comment from ANA regarding the analysis of neutralization potential content, which is not relevant to the analytical determination of mercury. Neutralization potential represents the capacity of a sample to buffer acidity. Neutralization potential originates from minerals such as carbonates or other silicates present in the sample. Several types of neutralization potential can be measured, including the carbonate neutralization potential (CarbNP, represented by fast reacting carbonates like calcite and dolomite) as well as a bulk neutralization potential (NP, represented by carbonates as well as some silicate minerals). In the absence of non-net neutralizing carbonates (which mineralogical testing indicates are not present in the Project materials), carbonate NP represents the most conservative indicator of a sample's neutralization potential. Use of carbonate NP assumes that only carbonate minerals are available for neutralization and does not rely on silicate minerals that may be present in a sample but can be slower to react and therefore not provide effective buffering capacity. As outlined in previous responses, the ARD potential for project materials was determined based on the NPR of the samples, calculated as CarbNP / MPA. This conservatively assumes that only carbonate minerals will provide neutralization potential, and that all of the sulphur present in the rock will

[g] MDAG. 2024. Review of Kinross Gold Responses to Grassy Narrows First Nation Concerns for Advanced Exploration, Concerning Metal Leaching, Acid Rock Drainage (ML-ARD), On-Site Contamination of Water, Fugitive Dust, and Hydrogeology in the ECA, PTTW, and Closure Plan Responses. Report for Grassy Narrows Lands Protection Team, dated September 5, 2024. 48 p.

#	Comments	Great Bear Resources Response
	quality degradation and ML-ARD, Kinross decided this serious potential was not relevant to its Great Bear site. Where Kinross admitted to not following the guidance and using a non-recommended procedure that was cheaper, Kinross' rationale was that the non-recommended procedure was mentioned in the federal Prediction Manual as not recommended and thus Kinross was indeed following the federal Prediction Manual.	generate acidity. CarbNP was based on total inorganic carbon, determined by HCl-Leco analysis, which is one of the approaches recommended by the MEND (2009) to determine carbonate NP. ANA is indicating that the Project should utilize bulk NP. This would potentially underestimate the ARD potential of the samples and would not be conservative.
M2	Kinross has committed to conducting many of the tests for geochemical characterization in this Subsection 3.4.1 as it did for Advanced Exploration at the Great Bear Project. However, as of early 2025, Kinross has not released most of the results for any geochemical testing.	Baseline geochemical programs are ongoing and additional results will be shared as part of the Impact Statement.
M3	Section 3.4.1 continues Kinross usage of the wrong analytical methods as it did for Advanced Exploration1. For example, Section 3.4.1 lists: "Solid phase elemental content analysis by aqua regia digestion and inductively coupled plasma-mass spectrometry scan" However, Kinross fails to explain to non-technical readers that this will underestimate the amount of mercury in Great Bear mined materials including the walls of underground workings and pits, waste rock, overburden, soil, and tailings. This is because is because "aqua regia digestion" dissolves and analyzes only part of the mercury and many other elements in Great Bear mine materials, leaving behind an undetected and unknown amount of additional mercury and other elements. This is not appropriate under conditions and pathways such as fugitive dust to the environment, local-scale acidic conditions, animal inhalation, and comparisons to crustal abundances,	Total digestion methods involve the use of several strong acids and high temperature heating of a sample to completely dissolve the material. Due to the chemical properties of mercury, it can be volatilized under these conditions, which can result in erroneously low mercury concentrations being reported for a given sample. As such, analytical laboratories do not recommend the use of this procedure for solid phase mercury analysis. The Project has utilized the aqua regia digest method to measure mercury. Mercury is not volatilized by this method and can thus be accurately measured. ANA is indicating that a method known to underestimate solid phase mercury concentrations should be utilized for the Project.

#	Comments	Great Bear Resources Response
	which require "total digestion" of all mercury in a sample rather than only part of the mercury from partial "aqua regia digestion". Thus, based on the listing of methods in Section 3.4.1 for mercury, sulphate, and other elements, it is easy to overlook or miss the facts that these proposed methods are not appropriate, reliable, and safe for the Mercury Study. Therefore, Grassy Narrows First Nation should understand that this Mercury Study Plan contains a program for Geochemical Characterization that matches that for Advanced Exploration, but Kinross has not been able to fulfill this program for Exploration to date after about two years of trying. Also, this geochemical characterization will use invalid and/or ambiguous methods that will underestimate the severity of mercury and sulphate issues at the Great Bear Project. As a result, I expect that Kinross will underestimate the important geochemical input that is critical for a reliable outcome from the proposed Mercury Study. If Kinross corrects the geochemical methods in the Mercury Study Plan to those appropriate to the Great Bear Project, then Advanced Exploration should be stopped because it is already based on invalid and/or ambiguous methods.	

N. Groundwater Modelling

General Note from Great Bear Resources

A groundwater model was not provided with the Mercury Study Plan, and we are assuming that the reviewer comments are drawn from their review of a model developed to assess dewatering impacts for the AEX Program. The Mercury Study Plan simply includes a generic description of a groundwater model. Nevertheless, we will attempt to address some of the reviewer's concerns based on their review of the AEX ramp model, recognizing that a modified version of this model will form part of the Impact Statement work. The reviewer has generally elected to provide vague and high-level commentary on groundwater modelling.

#	Comments	Great Bear Resources Response
N1	There are many errors in Kinross' modelling of groundwater flow at the Great Bear Project. Many reflect technical details that require relatively long explanations1. For example, groundwater modelling at the Great Bear Project apparently shows a high mound of free-standing groundwater above the land surface near Dixie Creek. This artificial and obviously wrongly modelling incorrectly restricts groundwater with mercury, sulphate, and other elements from travelling off the Great Bear site and into the surrounding environment around Dixie Creek.	The reviewer provides essentially three examples of where they believe the model is in error, 1) concerning artesian conditions, which is addressed below, 2) concerning the use of transient modelling, which is addressed in the responses to comments N2 to N5, and 3) a final concern about the use of an equivalent porous media approach. With respect to the presence of artesian conditions, a map of simulated groundwater levels has been provided in Figure 9.8 of the groundwater modelling report submitted in support of the PTTW application at the start of 2025. The reviewer's comments lack sufficient detail to identify the area of groundwater mounding above ground surface along Dixie Creek that they are referring to, however the comment provides an opportunity to correct a false impression that the reviewer appears to hold. Groundwater levels above ground surface are relatively common in low lying areas, and frequently manifest in the form of flowing (artesian) wells. Such flowing conditions are observed at the site near Dixie Creek in a number of exploration drillholes, therefore the model is not wrong and is consistent with site observations. Artesian conditions do require restrictions in groundwater flow to create pressure gradients, usually due to the presence of an aquitard between the creek and the well / aquifer. The aquitards present in the area of Dixie Creek include layers of low permeability overburden sediments and tight bedrock, which have been encountered during drilling at the site. We agree with the reviewer that the presence of aquitards would restrict interaction between Dixie Creek and groundwater, but as there is ample physical evidence to support their presence, their inclusion in the model is not an error.
N2	Perhaps the easiest error to understand with Kinross' groundwater modelling, for both Advanced Exploration and the Mercury Study Plan, is the difference between "transient" and "steady state" groundwater modelling. Similar to surface water and many other environmental processes like temperature and rainfall, subsurface groundwater flow can shift and change daily, seasonally, yearly, over decades, and even longer due to climate change. Thus, the earth's environment is inherently	We agree with the reviewer that it is easy to see that Earth systems vary through time (i.e., or transient in the words of the reviewer) and we agree that these variations in the environment are relevant for defining flows and loadings, which is why there is an entire separate report designed to characterize the surface water flow systems. However, in comparison to flows in creeks which can change from almost no flow to flood conditions in the spring, groundwater flow and loadings through the tight bedrock into which the AEX ramp will be constructed will be relatively unaffected by daily or seasonal variations at surface and thus are relatively intransient in the context of the examples that the reviewer has provided.

#	Comments	Great Bear Resources Response
	"transient" through time, which can be important for defining flows and loadings of mercury, sulphate, and other elements. Kinross does not model groundwater at the Great Bear Project using naturally transient conditions. Instead, Kinross only models groundwater at Great Bear with "steady state" conditions, where groundwater flows and loadings are constant all the time, every day, every season, every year, every decade, etc. For Advanced Exploration, at what point in the future was groundwater modelled? No one can say, but the obvious assumption is that it represents conditions a long time into the future. No one can say because Kinross continues to refuse transient modelling. Groundwater modellers for Great Bear have stated that transient modelling is not needed despite having no transient data, no transient measurements, and no transient modelling1. I suspect that Kinross is strongly opposing transient groundwater modelling because it requires additional site measurements and parameters apparently not measured at the Great Bear Project. Transient groundwater modelling at the Great Bear Project is seriously needed to understand better the impacts and effects on (1) groundwater inflows around the mine and (2) groundwater movement throughout all hydrogeologic layers and surrounding environment, as time passes. Kinross has pointed out that the effects of drought and climate change cannot be estimated, which is because only steady-state modelling was conducted.	The reviewer's inaccurate statement that no transient data, in the sense the reviewer uses the term transient, has been acquired at site is false, and the reviewer incorrectly insinuates that Great Bear Resources has not elected to acquire any temporal data. Such data, including groundwater and surface water level measurements, surface flows, weather data, etc., has been reported to date and continues to be collected. With respect to the AEX Program (an underground ramp only without open pits), Great Bear Resources has previously shared with the commentator that assessing changes in groundwater inflow to the ramp is not relevant where such changes are overwhelmed by the much greater changes due to the project over the long term. The philosophy taken is that by assessing the maximum extent of the mine, rather than the smaller inflows at immediate steps along the way, Great Bear Resources is being conservative with respect to impacts to surface water features. In terms of an adequacy of data to complete transient modelling, WSP has worked on almost every mine site in northern Ontario and has access to parameters from other analog sites. The reviewer is likely aware that there is a much smaller range of storage related parameter values that have a large impact transient inflows and still be realistic, compared to non-storage related parameters (i.e., hydraulic conductivity). This is particularly true for simulating a ramp that develops gradually. Given that groundwater inflows to underground workings in northern Ontario simply don't change much from day to day and the slow rate of ramp progression, the use of parameters from analog sites would be sufficient for assessing transient inflows and consistent with expectations of the environmental assessment process. The final part of this comment, the reviewer states that Great Bear Resources has not released the additional information from its steady state model. Great Bear Resources is engaging in good faith with stakeholders and has responded to comments. To date, the requests for transient modelling from the reviewer have concerned the groundwater model developed for the assessment of stream impacts, however, Great Bear Resources is not ruling out the use transient modelling in the future.

#	Comments	Great Bear Resources Response
	Because steady-state modelling of some distant future but unknown time was modelled for Advanced Exploration, this is obviously the modelling that would also apply to proposed mining in the Mercury Study Plan. However, the steady-state modelling for Advanced Exploration was likely wrong but Kinross has not released the additional information from its steady-state model to confirm this.	
N3	During proposed exploration and later mining, groundwater will be drawn from all depths into the underground mine at least 500 meters (0.5 km) deep vertically. However, Kinross will release only the drawdown map for the uppermost 36 m of overburden, and not the remaining ~500 m vertical thickness of rock. This incorrectly implies (1) drawdown happens instantaneously for long lateral distances throughout the Great Bear site and (2) transient conditions are minor because they will only be up to 36m vertically. In situations where groundwater levels will fluctuate more than 500 meters vertically, non-steady "transient" modelling is certainly needed. In fact, groundwater levels, forced by Kinross pumping, varying by roughly 500 m vertically (varying by roughly 0.5 kilometers below the land surface) at the Great Bear Project is one of the best examples of where transient groundwater modelling is critical for reliable and realistic flow directions and associated loadings of mercury, sulphate, and other elements. The proposed open pits at Great Bear will also lead to significant transient groundwater flows and geochemical loadings like mercury and sulphate closer to the land surface but are ignored by Kinross.	In response to similar comments to this comment, drawdown cones at different depths in the bedrock system have been provided with the updated PTTW application. The reviewer states that by originally including only these figures Great Bear Resources implies 1) drawdown happens instantaneously over long distances and 2) transient conditions are minor. The reviewer is reminded that the report repeatedly indicates that the ramp will take five years to construct, which is hardly instantaneous. Furthermore, as previously communicated with the reviewer, the ramp will only advance a few meters per day, meaning groundwater inflows and associated loadings to the ramp will not grossly vary from day to day, simply because the ramp does not change much from day to day. It is likely also worth noting that the conclusion that such figures imply instantaneous appearance of maximum drawdown is an atypical comment from a hydrogeological reviewer. The reviewer then repeats that transient modelling is needed to properly simulate mercury and other loadings, similar to previous comments, but this time introduces the open pits. Seasonal pumping rates from the open pits can be expected to be many, many times greater than to the ramp or underground, in large part due to direct precipitation and snowmelt on exposed surfaces, which are highly seasonal. These are likely to be substantially greater than the seasonal variations in loadings from the groundwater system, particularly after the groundwater previously held in storage near the open pits will have been depleted by dewatering from the previously constructed underground. For these reasons, transient groundwater modelling may also be of little value to the predictions of loadings from the open pits.

#	Comments	Great Bear Resources Response
N4	Additionally, Kinross misleads by indicating shallow contaminated groundwater will not escape to the environment but would be drawn into the pumped-down underground mine1. This is false at early times and only becomes reasonable after unknown longer times as steady-state conditions are approached. The lack of transient modelling prevents anyone from proving how long it will take to reach steady-state conditions and prevent contaminated groundwater from escaping. Based on this error alone of steady-state groundwater modelling, Section 3.4.2 of the Mercury Study Plan is remarkable in that it simply states, "These numerical groundwater flow models [of FEFLOW 7.2] consider three dimensional steady-state flow conditions and implement an equivalent porous media approach which is deemed sufficient for characterizing the overall groundwater flow regime at the scale of this analysis." This is wrong, because FEFLOW 7.2 can also simulate transient conditions. Kinross is misleading readers here by not revealing the full capability of this groundwater model including transient modelling needed for the Mercury Study and for general impacts of the Project. In any case, it is clear that steady-state, always-the-same-and-not-varying groundwater modelling, for conditions at some distant but unknown time, will be used to unreliably simulate the critical groundwater pathways and loadings for mercury and sulphate at the Great Bear Project.	The capture of shallow groundwater by the AEX Program is not one of the proposed methods to mitigate the risk of groundwater contamination proposed to the MECP in the ECA application for the early stages of development, and it is false to suggest that Great Bear Resources is being misleading to the reader to think that Great Bear Resources is reliant on this as part of the groundwater cone as a containment control strategy. Great Bear Resources has repeatedly indicated that contact water during the AEX Program will be contained within lined facilities and seepage collection systems have been proposed as a backup. If Great Bear Resources was attempting to "mislead" stakeholders into thinking that the drawdown cone of the ramp could be counted on for containment, why would they build a lined facility? It is not clear how the reviewer is contributing to a genuine dialogue through such statements or how the use of lined facilities at the early stages of ramp development is indication of an error of the steady state model. At no time did Great Bear Resources state the FELOW 7.2 could not be used for transient modelling, and again the reviewer is wrong to state Great Bear Resources is "misleading" readers by disingenuously attributing such inferences to them. Furthermore, information on FEFLOW capabilities are widely available online and would be certainly known to the experts employed by various stakeholders, and it would be rash to think if such a brazen lie was attempted that it would not be quoted by one of the reviewers. The remainder of the comment about the criticality of the groundwater pathways is essentially a repeat of the previous comment and is addressed above.

#	Comments	Great Bear Resources Response
N5	Furthermore, the second part of the quotation above on "equivalent porous media" deceptively hides another important flaw. Groundwater moving through irregular and scattered cracks (fractures) in Great Bear rock will be instead incorrectly modelled as smoothed layers like sand and gravel. Kinross has cryptically "deemed sufficient" this unrealistic modelling based on no data and no evidence that groundwater flow through fractured rock at Great Bear is like groundwater flow through sand, gravel, silt, etc. Without proof otherwise, the porous-media modelling planned for the Mercury Study is not "sufficient" and is plain wrong and misleading. Therefore, Grassy Narrows First Nation should understand that this Mercury Study Plan contains a program for Groundwater Modelling that matches that for Advanced Exploration. The current groundwater modelling is unreliable and likely wrong in light of many incorrect and unjustified assumptions made by Kinross. The Mercury Study Plan shows these errors will be continued, including the false assumption that groundwater flow will be steady state during mining, being the same every day, every season, every year, every decade, etc. As a result, I expect that Kinross will underestimate the important groundwater flow leaving its Great Bear site. Along with problems with the proposed Geochemical Characterization discussed above, this will underestimate the loadings of mercury, sulphate, and other elements leaving the Great Bear site. This will preclude a reliable outcome from the proposed Mercury Study. If Kinross corrects the proposed groundwater modelling in the Mercury Study Plan, then Advanced	The reviewer here is critical of the equivalent porous media (EPM) approach, suggesting an EPM model is "unrealistic", but yet does not preface their opinion with the fact that this approach is widely used to assess groundwater related impacts at almost all mining projects across the province (in some cases, only simplified analytical equations are used) and widely used in academia and accepted by Federal regulators for the simulation of mine workings. This suggests a lack familiarity of the reviewer with groundwater modelling best practices and industry standards, particularly in the context of mine development assessments such as this one. The presence of bedrock fractures and their effect on groundwater flows is well understood and accounted for by Great Bear Resources in its approach. The entire point of EPM is that it equates groundwater flow rates to the discrete media, which is what is relevant in the determination of loading rates and surface water interactions. This comment also seems to contradict the reviewer's own promotion of FEFLOW transient modelling capabilities previously, which up to this point appear to have been the reviewer's main concern. Given that EPM models have been deemed sufficient for the evaluation of groundwater impacts in recent assessments, it is not "misleading" on the part of Great Bear Resources to expect to use a commonly accepted approach. The lack of objections to the EPM approach from all other groundwater reviewers of the project also suggests that the reviewer appears to be isolated in their opinion. The commentator goes on to make several incorrect statements in the last paragraph. He states that Great Bear Resources has falsely assumed that groundwater flow will be "steady state during mining", when Great Bear Resources repeatedly gives a multi-year time frame for mine development. Great Bear Resources does contend that the steady state model will overestimate the size of the drawdown cone in the short term and therefore will be conservative with respect to both stream impacts and groundwater drawdowns, which is different from assuming the instantaneous creation of steady state conditions attributed by the reviewer to Great Bear Resources. The reviewer also "expect(s) that Kinross will underestimate the important groundwater flow leaving its Great Bear site", which will "underestimate the loadings", but does not provide any evidence or detail to support this statement or indicate if the underestimation they expect will be material. This suggests that the reviewer does not have a detailed understanding of the physical process that are key to the interactions of the proposed AEX development with the local groundwater flow system. Otherwise,

#	Comments	Great Bear Resources Response
	Exploration should be stopped because it is already based on the misleading and wrong modelling.	the reviewer would have clearly laid out cause and effect, rather than relying on vague, high-level arguments. Given that groundwater represents only a minor quantity of the total water balance at an operating mine, that loadings to the environment will also impacted by treatment and desulfurization in the mine processes, this statement seems premature, and is not in line with other mining operations in the province.
O. Water Quality Modelling		
O1	Section 3.4.3 on water-quality modelling explains that the model called GoldSim will be used for water-flow and water-quality modelling at the Great Bear Project. Here are some statements from Section 3.4.3 about the GoldSim model. – GoldSim will "stimulate [sic] the volume and flow of water, and the concentrations and transport of chemical species, over the life of the Project". – "The GoldSim model domain includes waterbodies potentially impacted by the Project within the PA, LSA and RSA." It is not clear from these statements that GoldSim is not like models such as groundwater (see above) that simulate the movement and chemistry of waters (1) across a site-wide grid of mathematical elements or (2) along a grid of mathematical elements along lake or a creek like Dixie Creek where groundwater can alternately enter and exit the surface waterbodies over short distances. Instead, GoldSim uses user-defined "compartments" or "conceptual boxes" such as one for the western portion of Dixie	Please see response to comments F1, F2 and F3.

#	Comments	Great Bear Resources Response
	Creek near the Great Bear site and another for the eastern portion near the site. The human modellers then conceptually connect these two boxes and any other selected boxes in the GoldSim model to create "nodes". Then the modellers choose the inputs, outputs, and internal conditions and processes that they think apply to each box and node. This should include variable and transient conditions that exist at the Great Bear site over days, seasons, years, and decades, but we already know from the proposed groundwater modelling that transient conditions for at least one important pathway for mercury and sulphate will be ignored and thus will not reliable (see above). Now it is clearer what Kinross means by saying, "Sulphate, mercury and methylmercury predictions will be generated for waterbodies represented by model nodes shown in Figure 3-2." Thus, predictions for mercury and sulphate will be generated only at "nodes" that do not literally simulate waterbodies in their environmental complexity, but simply represent the "boxes" and "nodes" and internal conditions that Kinross chooses to assume, estimate, and simulate.	
O2	Figure 3-2 in the Mercury Study Plan shows that the Chukuni River will be modelled only at two nodes: CHK-1 immediately above the property boundary and CHK-2 immediately below the boundary. Therefore, everything above the property boundary in the Chukuni River will be simulated as a single "node" or "box" for which the modellers will define all the upstream physical, geochemical, and water-quality properties, likely with many simplifications and/or assumptions. Then the	Please see responses to comments F1, F2 and F3.

#	Comments	Great Bear Resources Response
	physical and chemical contributions from Dixie Creek Node DIX-5 will be "mixed" with Node CHK-1 to obtain predicted flows and concentrations at Node CHK-2, subject to currently unstated simplifications and/or assumptions possibly like adsorption on river-bed sediments or biological processes to remove additional mercury and sulphate from the water at CHK-2. Because of this "node" approach, important details like an initial dilution zone (a mixing zone) in the Chukuni River between Nodes CHK-1 and CHK-2 cannot be simulated in sufficient detail. This gives you some idea how the GoldSim model will "simulate" water flow and water quality at, beneath, and around the Great Bear site.	
O3	The GoldSim model for the Great Bear Project can be easily manipulated by the modellers but this is hidden from external inspection by Grassy Narrows First Nation. For example, the modellers can apply a condition where aqueous concentrations of mercury, sulphate, and other elements are allowed to decrease but are not allowed to increase as water "flows" through the boxes and nodes. Section 3.4.3 promises to "[p]rovide a clear description and rationale for model input parameters and assumptions".This is appropriate and important but in my experience I have never seen this provided in sufficient detail for any GoldSim model. Therefore, to understand how the GoldSim water-quality model for the Great Bear Project has been designed and manipulated through all of its boxes and nodes, and thus whether its results and predictions are reasonable, a relatively large amount of information on the GoldSim model will be needed from	Data inputs, assumptions, and calculations will be explicitly documented in the model reporting for the GoldSim model. We agree with the reviewer, that the intended level of detail will exceed typical reporting standards for effects assessments, providing greater transparency.

#	Comments	Great Bear Resources Response
	Kinross. I have not seen this provided in detail before, but it will be required for the Great Bear Mercury Study.	

Advanced Exploration Project

Great Bear Resources Ltd.'s Response to Source Environmental Associates Inc. Technical Memorandum – Review of Great Bear Resources Mercury Study Plan, dated April 29, 2025

#	Comments & Rationale	Response
A.	**Alignment with Tailored Impact Statement Guidelines (TISG)**	
A.1	**Lack of Maps for Proposed Study Areas** Section 7.3.1 of the Great Bear Project TISG states the impact statement for each valued component (VC) identified must describe the spatial boundaries of said VC and a rationale for the boundaries. These spatial boundaries must be shown on maps in each impact statement. The Mercury Study Plan does not include maps for the PA (Project Area), LSA (Local Study Area) and RSA (Regional Study Area) identified for the VC methylmercury, which makes it hard for reviewers to understand where the boundaries lie and the reasoning behind them. These maps should be included in the Mercury Study Plan.	The Mercury Study Plan, although requested by the TISG, is not part of the Impact Statement and spatial boundaries related to the Impact Statement are not relevant to the Plan. Mapping will be provided in future documentation as appropriate.
A.2	**Regional Study Area for Cumulative Effects** An identified VC in the TISG is the health of Indigenous Peoples in relation to potential changes in the surrounding watershed. This includes downstream water quality from effluent discharge and past industrial activity. More explanation is required in the Study Plan to explain how cumulative effects are addressed. For example, the Regional Study Area (RSA) described in the Mercury Study Plan may be too narrow for a cumulative effects assessment, as it does not include areas of significant historic mercury contamination such as the English-Wabigoon River system which are downstream of the proposed industrial effluent discharge point. To ensure a comprehensive assessment of cumulative effects for this identified VC, the RSA should be expanded to include areas of historic mercury contamination that have impacted ANA.	Cumulative effects will be included in the Impact Statement consistent with the TISG and the Federal guidance, including the current guidance (*Operational Policy Statement: Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012*). Three spatial study areas have been defined for the Impact Statement as required. The Regional Study Area (RSA) for the Impact Statement encompasses the Project Area (PA) and Local Study Area (LSA). It is the maximum geographical extent or zone of influence assessed.

#	Comments & Rationale	Response
B.	**Baseline Methodology**	
B.1	**Inclusion of the Exploration Phase in the Study Plan** The Study Plan should include the proposed underground exploration phase as well as the Life of Mine project described in the Project Description (January 2024). Please indicate if the exploration project phase is included in the study plan. This phase has the potential to generate methylmercury, as noted in previous submissions, and should be included in the study. This should include both early exploration activities, and the "Advance Exploration" program, which includes construction of key components of the mine.	The Mercury Study Plan was a requirement of the TISGs, which are for the designated Great Bear Project only (i.e., proposed open pit and underground mine), and do not apply to exploration and advanced exploration.
B.2	**Documentation of Missed Sampling Events** Establishing a sufficient baseline dataset is critical for conducting an effects assessment. In section 2.2 Summary of Analytical Methodology, water quality will be sampled monthly providing flow is present and the site can be safely accessed. To ensure a complete dataset, the proponent should ensure any missed sampling events are recorded with a rationale and attempts to re-sample the location(s) should be made within the monthly sampling period. In order to establish a reliable baseline dataset, sampling should be carried out over three years, and should include monthly sampling, as well as 5 samples in 30 days during periods of low and high flows. Also, in order to establish a valid baseline, the proponent should ensure that appropriate baseline monitoring sites are established which: a. Do not reflect regional sources of contamination (e.g. upstream mines), b. Do not reflect contamination from earlier stages of this project,	The baseline sampling program has been developed in alignment with the applicable regulatory framework for proposed mining projects in Ontario. It includes long-term monthly sampling designed to capture natural variability and to characterize pre-development conditions, consistent with Ontario's regulatory environment and regulator expectations. The baseline sampling program incorporates reference stations that are not anticipated to be affected by Project development, and monitoring will continue throughout the life of the Project in accordance with applicable approvals.

#	Comments & Rationale	Response
	c. Reference stations that will not be impacted by later stages of this project, d. Will continue to be monitored throughout the project. The proponent should also ensure that the correct sampling and lab methodology are used to ensure that all contaminant levels above baseline are detected reliably.	
B.3	**Inclusion of Mercury, Methylmercury and Sulphate Loadings** Loadings may be a useful measurement of mercury, methylmercury and sulphate and provide an indication of the total mass of these parameters anticipated in the project waterbodies. The study plan should include a requirement to develop monthly predictions of loadings for mercury, methylmercury and sulphate (and other substances affecting methylation) that may enter the project area waterbodies, including the Chukuni River.	Final reporting will include loading estimates for sulphate, mercury and methylmercury, and other relevant parameters, as appropriate, for Project-area watercourse and waterbodies, including the Chukuni River where applicable.
B.4	**Baseline Sampling Locations** Methylmercury concentrations observed in monitoring data in the project area ranged from 1.98% to 14.35% (of total mercury) reflecting that there are certain project areas that generate more methylmercury than others. The Study Plan should provide a rationale of how both surface water and groundwater sampling locations in the Study Plan have been chosen in relation to expected direct and indirect effects and discuss the potential influence of project waters on wetted areas. Given that methylmercury is primarily generated under anoxic conditions, which can vary across the project site, the Study Plan should provide a rationale as to how the baseline sampling locations are sufficient to capture the range in methylmercury. Currently, the Mercury Study Plan does not include a sufficient level of detail for each proposed monitoring site to assess whether the purpose or rationale of the location fulfills the intent of the baseline program. The program should ensure that each downstream sampling point is sufficient to establish a robust baseline against which any changes in downstream water quality related to mercury and	Consistent with standard practice, baseline sampling locations have been selected to characterize pre-development conditions across areas that may be directly or indirectly affected by Project development. Site selection includes representative upstream, downstream and reference locations, as well as areas of potential interaction between project infrastructure and surface water or groundwater-surface water interactions. Locations have been chosen to capture spatial variability, account for natural influences (e.g., geology, anoxic environments, riverine systems), and provide sufficient coverage to support the effects assessment. The baseline program has been designed to establish a robust dataset that will enable assessment of any Project-related changes in downstream water quality related to mercury and methylation, as part of the final reporting under the Mercury Study Plan.

#	Comments & Rationale	Response
	methylation can be measured.	
B.5	**Unnamed Waterbodies #1 and #2** According to Section 2.2.1 Water Quality, seasonal baseline surface water quality sampling for temperature, pH and dissolved oxygen occurs in Pakwash Lake, Genesee Lake and Unnamed Waterbody #6. The Study Plan should include a rationale as to why there is no planned physicochemical property sampling proposed for Unnamed Waterbodies #1 and #2. Additionally, the Study Plan should list which waterbodies are included in the multi-season fish habitat assessments.	Physicochemical data (temperature, pH and oxygen) are monitored in Unnamed Waterbodies 1 and 2. Unnamed Waterbodies 1 and 2 are predicted to be impacted by the mine site development (displaced or considerably altered) and will be compensated for in their entirety within the final Fish Habitat Offset and Compensation Plan.
B.6	**Additional Data Request- Water Quality** Baseline water quality reporting should include the 95th percentile, minimum and maximum values for all waterbodies sampled, as well as an assessment of seasonal variation. Figures should be provided showing seasonal variation for the range in mercury, methylmercury and sulphate baseline data. Baseline data should cover 3 years and include monthly sampling, as well as 5 samples in 30 days during periods of low and high flows.	Baseline water quality reporting for mercury and methylmercury reporting will include 95th percentile, minimum and maximum values for all waterbodies sampled, as well as figures showing seasonal variation. The baseline sampling program has been developed in alignment with the applicable regulatory framework for proposed mining projects in Ontario and includes long-term monthly sampling designed to capture natural variability in pre-development conditions.
B.7	**Mercury and Methylmercury in Temporary Closure** Spatial and temporal boundaries for the effects assessment are discussed by phase of mine life. However, there is no discussion of a Care and Maintenance phase, which commonly occurs in mining, according to economic conditions. Mines often plan for operations and closure phases but lack rigorous assessment of temporary closures and their implications for the receiving environment. The effects assessment cannot be considered complete without an assessment of a temporary closure scenario. The proponent should consider a 'worst case scenario' during operations, where the mine is forced to temporarily shut down.	The Mercury Study Plan was a requirement of the TISGs which are for the designated Project (the proposed open pit and underground mine). The phases described in the Plan are consistent with the TISG and the Impact Statement in preparation. Closure of mines in Ontario is governed by the *Mining Act*. The Closure Plan required by the *Mining Act* will address temporary suspension, state of inactivity and final closure, including chemical monitoring.

#	Comments & Rationale	Response
	Implications for water management, water treatment and potential for adverse effects related to mercury, methylmercury and sulphate in a care and maintenance scenario should be assessed in the Study Plan.	
B.8	**Traditional Food Harvesting Considerations** While the sampling locations proposed as part of the Mercury Study Plan attempt to assess the impact of effluent release on water quality as it flows through the waterbodies surrounding the mine site, there is no discussion in the Mercury Study Plan regarding how it will assess potential impacts on human health or how the movement of fish and other species that are consumed will be considered. For example, Great Bear should assess, as part of the Mercury Study Plan, how far key fish species for Indigenous consumption, including walleye, migrate to and from the project site, its receiving waters, and downstream water bodies that are potentially impacted. How does the study plan presented account for movement of species that will ultimately be consumed potentially outside of the study area? The study plan also does not apply consumption guidelines that are designed for Indigenous subsistence consumers of fish, nor does it consider the pre-existing mercury exposure that Grassy Narrows people have experienced. The study plan does not appear to take into account the unique mercury risks associated with Grassy Narrows people who consume fish as part of their way of life and who have previously experienced high levels of mercury exposure.	Studies have shown that Walleye tend to show a high fidelity to their habitats. A study to track within-year and between-year movement of Walleyes in a chain of 10 interconnected lakes in Vilas County, Wisconsin showed that most (76%) of Walleye remained in the same lake within and between years (Weeks and Hansen 2009). Similar to the Great Brear Project RSA, a study of Walleye movement on the highly fragmented (due to dams) Ottawa River determined that Walleye movement was primarily upstream with limited downstream movement. As could be expected movement among impounded reaches was not detected other than a few instances where fish were entrained through the dams (Haxton et al. 2015). Based on the studies, it is likely that the Walleye population at the site is largely confined by the known barriers including the Snowshoe Rapids on the Chukuni River, and the Manitou Generating Station and Ear Falls Generating Station on the English River. The mercury study will assess potential increased risks to Indigenous consumers of fish harvested from the PA and downstream waterbodies due to existing conditions and the potential influence of the Project by: - Characterizing baseline concentrations of mercury and methyl mercury in fish (Walleye, Northern Pike and Whitefish) sampled during baseline studies around the Project (baseline fish quality) in comparison to baseline concentrations of mercury and methyl mercury in surface water from the same water bodies (baseline surface water quality). Site-specific bioaccumulation factors (BAFs) from surface water to fish will be calculated for mercury and methyl mercury from the baseline data. - Predicting the potential changes in mercury and methylmercury concentrations in surface water from the Project within the receiving environment (Chukuni River) and downstream waterbodies including the English River. - Predicting the potential changes in mercury and methylmercury concentrations in fish in the same water bodies based on the predicted changes in mercury and methyl mercury concentrations in surface water and the calculated BAFs from surface water to fish. - Predicting the potential increased risks to fish consumers from consumption of fish harvested from the PA and downstream waterbodies, calculated using fish consumption rates for average and subsistence consumers of fish reported in the *First Nations Food, Nutrition and Environment Study for Ontario, 2014* (Chan et al 2014). Consumption rates reported in this study are based on data provided by Indigenous communities in the Ecozone 1 (Boreal Shield Subarctic) region, including Grassy Narrows. - The movement of fish in the PA is largely restricted by infrastructure barriers (i.e., dams) and can be

#	Comments & Rationale	Response
		extensive for older or larger predatory fish (e.g., Walleye and Northern Pike) migrating from one waterbody to the next searching for food and mates. The mercury study will be used to inform health risks related to mercury exposure via fish consumption and can be used to estimate consumption guidelines, but this task is not the focus of the study as consumption guidelines are recommended by the Province and Health Canada guidance. Consumption guidelines depend on several assumptions that influence risks, such as the person and life stage, species and size of fish, mercury concentration, consumption rate and the toxicity reference value. The mercury study will primarily calculate risks based on measured baseline concentrations of mercury and projected changes in fish concentrations associated with the Project in comparison to the consumption rates reported in the Chan et al (2014) study for the region. The mercury study will not recommend fish consumption guidelines but the risk estimates provided can be used for information purposes related to fish advisories.
B.9	**Lack of Data Provided on Geochemical Characterization to Date** Section 8.3.1. of the TISG provided for the Great Bear Project states that the associated Impact Statement should describe the representativeness of samples collected for acid rock drainage and metal leaching. Despite the Mercury Study Plan stating that baseline geochemical data has been collected since 2022, the plan does not indicate the location of samples or the results of testing thus far. The existing data for baseline geochemical analysis that will be included in the water quality model (GoldSim) for methylmercury should be provided. Significant deficiencies in the ML-ARD data and study plan have been identified by Source and by other reviewers in previous submissions. These deficiencies should be corrected, and the associated studies completed and reviewed, before the geochemical data is used as an input in the effects assessment.	Geochemical baseline information will be provided in the Impact Statement, as outlined in the TISG. This will include the location of samples as specified in the TISG, along with the results of ML/ARD testing. Water quality estimates for site discharge or fugitive seepage to receivers are being prepared and represent some of the inputs for additional receiving environment modelling (i.e., for methylmercury). Reporting summarizing the mine site water quality modelling and supporting geochemical data will be provided as part of the Impact Statement. ANA has previously made numerous false claims that geochemical and other studies being conducted for the Project are not credible. Great Bear Resources has previously addressed these comments. As previously indicated, baseline geochemical characterization programs have been conducted and are continuing for the Project, following industry standard methods, under the direction of experienced professional geoscientists. This includes the assessment of ML/ARD potential for mine rock, ore, tailings, and overburden, per the approaches and methods in MEND (2009). The results of these studies will be used to assess potential environmental effects of the Project and ensure that they are appropriately mitigated and managed.
B.10	**Quality Assurance for Geochemical Samples** The methodology for geochemical characterization described in Section 3.4.1 of the Mercury Study Plan does not include quality assurance / quality control procedures, including but not limited to laboratory certificates of analysis as requested in Section 8.3.1 of the TISG. What are the procedures to follow for quality assurance / quality control for samples taken for geochemical characterization?	Geochemical baseline information will be provided in the Impact Statement, as outlined in the TISG. As specified in the TISG, laboratory certificates of analysis will be provided for all samples, along with information related to analytical methodology and other quality assurance / control measures.

#	Comments & Rationale	Response
B.11	**Inclusion of Worst Case Scenario in Water Quality Modelling** Section 8.3.2 of the TISG states the Impact Statement for the Biophysical Environment must provide base case (i.e. most likely, mean, median) and worst case (e.g. 75th-90th percentile) scenarios, plus any applicable sensitivity scenarios. However, the Mercury Study Plan indicates the GoldSim model used for Mercury and Methylmercury Water Quality Modelling (Section 3.4.3) will only identify and describe the base case (expected case) plus sensitivity scenarios. This is not considered appropriate as the worst case scenario should also be included in future modelling for mercury and methylmercury concentrations. Considering the legacy of mercury contamination in the surrounding region, it is critical that the 'worst case' is considered and modelled, not just the expected scenario.	The proposed water quality modelling approach, including the forecasting of mercury and methylmercury concentrations, follows standard industry practice by incorporating a range of sensitivity cases to account for variability and uncertainty in key inputs. An upper-case scenario will be identified based on the modelling results. This approach, applying the identification and discussion of an upper-case scenario, will be used consistently across model components, including methylmercury production, so that both expected and upper-bound outcomes are explicitly considered in the assessment.

References

- Haxton T., S. Nienhuis, K. Punt, and T. Baker. 2015. Assessing Walleye Movement among Reaches of a Large, Fragmented River, North American Journal of Fisheries Management, Volume 35, Issue 3, June 2015, Pages 537–550
- Laurie Chan, Olivier Receveur, Malek Batal, William David, Harold Schwartz, Amy Ing, Karen Fediuk, Andrew Black and Constantine Tikhonov. 2014. First Nations Food, Nutrition and Environment Study (FNFNES): Results from Ontario (2011/2012). Ottawa: University of Ottawa, 2014. Print
- Mine Environment Neutral Drainage (MEND). 2009. Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials. MEND Report 1.20.1. December 2009.
- Weeks, J. G., and M. J. Hansen. 2009. Walleye and muskellunge movement in the Manitowish chain of lakes, Vilas County, Wisconsin. North American Journal of Fisheries Management 29:791–804.

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Technical Memorandum

Date: 2025-10-01

To: Connor Devereaux and Aaron MacDonell (Kinross Gold)

From: Joel Harrison and David Leeder

Re: Estimation of [MeHg] from SO_4 loading – interim update

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1. Introduction

Sulphate-reducing bacteria (SRB) are known to participate in the mercury-methylation process in freshwater environments (Gilmour et al. 1992). The production of methyl-mercury (MeHg) can be limited by sulphate (SO_4) availability (Orem et al. 2020) and therefore added SO_4 can stimulate MeHg production under certain conditions (e.g., in anoxic environments where sufficient concentrations of organic carbon and inorganic mercury are present; e.g., Watras et al. 1995). There is therefore concern with SO_4 loading into freshwater ecosystems, especially where consumption of fish is significant, because MeHg bioaccumulates in fish tissue posing a risk to human health (Driscoll et al. 2013).

In this memorandum we present our approach for estimating the potential effect of SO_4 loading from the Great Bear project effluent to the Chukuni River on downstream MeHg concentrations. The quantification of SO_4 loading will be based on conventional mass-balance modelling. There is no standard approach for estimating changes in MeHg concentrations due to changes in SO_4 loading in freshwater environments – the conditions in each aquatic system vary and available information to define the SO_4 – MeHg relationship also vary. We derived an empirical SO_4-MeHg loading relationship using the available information from the freshwater environment downstream of the Chukini River, supplemented with information from several research studies completed in similar environments. Sensitivity analysis will be performed to assess the quantitative implications of the inherent uncertainty in model parameters. The approach will be updated with site-specific information collected from the modelled area, in late September, 2025.

The results of this modelling will provide input data for bioaccumulation and health-risk modelling to be completed by WSP Global Inc.

2. Overview of Approach

A mass-balance model will be used to estimate SO_4 loading (effluent and background) for the 23 waterbodies/watercourses between the Great Bear project effluent discharge location on the Chukuni River and Grassy Narrows Lake. MeHg concentrations will be estimated based on published relationships between changes in SO_4 loading and changes in pore-water MeHg concentrations. The current approach incorporates SO_4 influx rates to sediment and MeHg efflux rates to surface water, based on data from aquatic system downstream of the Chukuni River.

The fundamental assumption upon which this modelling exercise is predicated is that SO_4 availability limits MeHg production in the Chukuni–English River system, as opposed to limitation by organic carbon supply, inorganic mercury supply, or other potentially limiting factors. All other factors are conservatively assumed to be non-limiting, such that MeHg stimulation by SO_4 is unconstrained. A sensitivity analysis will be completed to assess the importance of changes in effluent loading and model coefficients/sub-models and inherent assumptions therein. The sub-models numerically predict the effects of the following primary factors that stimulate MeHg production and uptake in the aquatic environment (Table 1):

Table 1. Overview of model structure.

Sub-model	Relevance
Hydrology	Estimated flows (discharge rates) of each waterbody are used to calculate SO_4 and MeHg loading/fluxes and concentrations.
SO_4 Loading	The SO_4-MeHg sub-model (below) is based on the projected increase in SO_4 loading (due to project activities) relative to the pre-project (background) loading.
SO_4 Influx to Sediment	The flux of SO_4 to sediments is estimated based on the concentration gradient between the water column and sediment porewater.
SO_4 Loading vs. MeHg Production	The predicted change in pore-water MeHg due to project activities is based on SO_4 loading above the background load. The SO_4-MeHg relationship is based on empirical data from several published studies that are judged to be relevant to the project setting (Branfireun et al. 1999; Branfireun et al. 2001; Jeremiason et al. 2006; Mitchell et al. 2008; Branfireun 2024; hereafter, “the peatland studies”).
MeHg Efflux from Sediment	The flux of MeHg from sediments is estimated based on the concentration gradient between the sediment porewater and water column.
Temperature-dependence of SO_4-reduction	For sensitivity analysis, a lower MeHg yield was modelled based on a lower SO_4-reduction rate predicted to occur at the low temperatures likely associated with (deepwater) Hg-methylation zones in the study area on a full-year basis (vs. non-winter, near-surface data from the peatland studies).

3. Methods

3.1 Hydrology

The model area includes the waterbodies and watercourses (hereafter referred to collectively as waterbodies) downstream of the effluent-discharge location on the Chukuni River (upstream of Pakwash Lake) to the English River upstream of where it joins Little Fox Lake, north of Grassy Narrows Lake (Figure 1). Grassy Narrows Lake will not be included as one of the modelled waterbodies because it flows into (i.e. is upstream of) the terminal section of the English River within the modelled area (MNR 2025a; Figure 2).

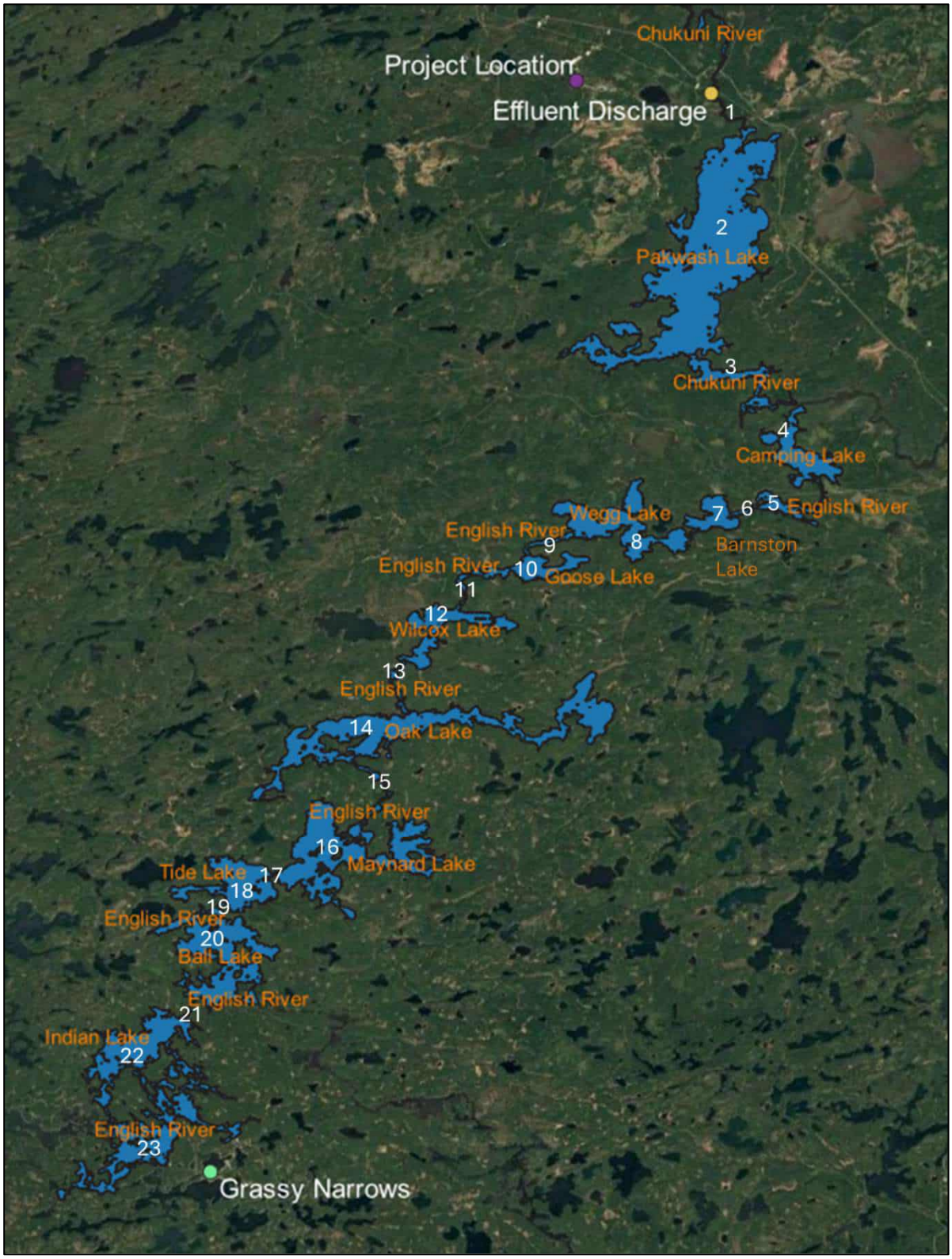

Figure 1. Waterbodies in area to be modelled.

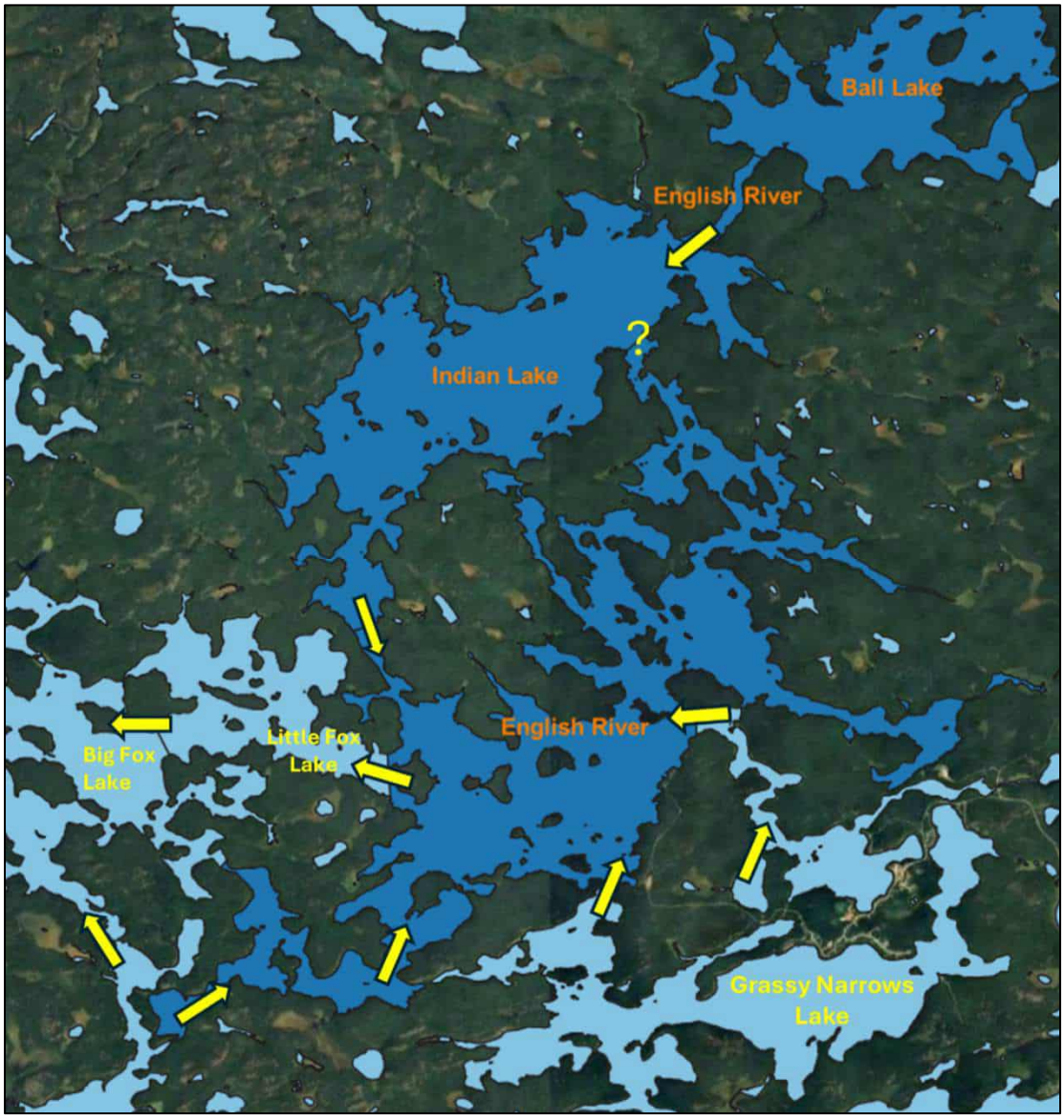

Figure 2. Flow directions in the most downstream area of the model region according to the Ontario Watershed Information Tool (MNR 2025a). The model waterbodies are depicted in dark blue.

The drainage area upstream of the outlet of each waterbody will be calculated using the Ontario Watershed Information Tool (OWIT; MNR 2025a). Annual average ambient flow rates ($Q\text{-}Bkg_{(i)}$) will be estimated for each waterbody based on areal prorating. The annual average flows for the Chukuni River and English River at Manitou Falls will be calculated based on long-term data from WSC (1994–2023) and LWCB (1991–2020), respectively. The flow-area ratio (runoff) at the Chukuni River gauge will be used to estimate flows upstream of the confluence with the English River; the English River at Manitou Falls flow-area ratio will be used to estimate flows downstream of the confluence. While seasonal variation in flow is expected to differ markedly between the two locations because of the dams on the English River, it is expected that the flows of the two watercourses show strong correlation on annual-average basis (i.e., among years). Annual flow rates were chosen for modelling MeHg stimulation by SO_4 in this case, because the purpose of predicting MeHg is to evaluate bioaccumulation change in fish over the course of years.

Table 2. Drainage areas (from OWIT) and flows for regional WSC gauges with the gauges to be used for prorating shown in boldface type.

WSC ID	Name	Watershed Area (km^2)	Avg. Flow (m^3/s)	Runoff (m/y)	Flow Data Included		
					From	To	Years
05QC006	GOLDEN CREEK NEAR RED LAKE	56	0.5	0.28	2009	2023	15
05QE012	LONG-LEGGED RIVER BELOW LONG-LEGGED LAKE	544	3.6	0.21	1994	2023	30
05QE009	STURGEON RIVER AT OUTLET OF SALVESEN LAKE	1,746	12.2	0.22	1994	2023	30
05QE008	CEDAR RIVER BELOW WABASKANG LAKE	1,623	12.7	0.25	1995	2024	30
04GA003	PASHKOKOGAN RIVER AT OUTLET OF PASHKOKOGAN LAKE	2,246	21.6	0.30	1968	2023	25
05QC007	TROUTLAKE RIVER BELOW WOMAN RIVER	2,290	15.8	0.22	2016	2023	8
05QA004	STURGEON RIVER AT MCDOUGALL MILLS	4,416	41.7	0.30	1994	2023	30
05QC001	**CHUKUNI RIVER NEAR EAR FALLS**	**4,333**	**32.1**	**0.23**	**1995**	**2024**	**30**
04GA002	CAT RIVER BELOW WESLEYAN LAKE	5,390	50.5	0.30	1995	2024	29
05RC001	BERENS RIVER ABOVE BERENS LAKE	5,709	49.0	0.27	1987	2024	30
05QA002	ENGLISH RIVER AT UMFREVILLE	6,127	60.7	0.31	1994	2023	30
05QE007	**ENGLISH RIVER AT MANITOU FALLS**	**48,649**	**397.2***	**0.26***	**1991**	**2020**	**30**
05QE005	ENGLISH RIVER AT CARIBOU FALLS	64,206	431.7	0.21	1965	1994	30

** English River at Manitou Falls flow data from LWCB; all other flow data from WSC.*

3.2 Sulphate Loading and Concentrations

3.2.1 Water-column Sulphate Concentrations

The final water-column SO_4 concentration of each waterbody (background + effluent), is calculated as the quotient of the total SO_4 load to that waterbody and the total flow through that water body as

$$[SO_4]_{(i)} = L\text{-}SO_{4(i)} \div Q_{(i)}$$

where

(i) is the waterbody (i.e., 1 of the 23 model compartments)
$[SO_4]_{(i)}$ is the water-column concentration of SO_4 in the i^{th} waterbody (mg/L)
$L\text{-}SO_{4(i)}$ is the total (project + background) loading of SO_4 to the i^{th} waterbody (g/d)
$Q_{(i)}$ is the total flow (discharge) through the i^{th} waterbody (m^3/d)

and

g/m^3 is equivalent to mg/L

3.2.2 Sulphate Loading to Waterbody #1

The total SO_4 load to the Chukuni River upstream of Pakwash Lake, the 1st waterbody in the sequence, is the sum of the background (upstream) SO_4 loading ($L\text{-}SO_4\text{-}Bkg_{(\#1)}$) and effluent loading ($L\text{-}SO_4\text{-}Eff$)

$$L\text{-}SO_{4(\#1)} = L\text{-}SO_4\text{-}Bkg_{(\#1)} + L\text{-}SO_4\text{-}Eff$$

where the background loading is the product of the background concentration ($[SO_4\text{-}Bkg]$) and flow ($Q\text{-}Bkg$)

$$L\text{-}SO_4\text{-}Bkg_{(\#1)} = [SO_4\text{-}Bkg] \times Q\text{-}Bkg$$

and the effluent loading is the product of the effluent concentration ($[SO_4\text{-}Eff]$) and flow ($Q\text{-}Eff$)

$$L\text{-}SO_4\text{-}Eff = [SO_4\text{-}Eff] \times Q\text{-}Eff$$

The background SO_4 concentration ($[SO_4\text{-}Bkg]$) used for modelling is 4.9 mg/L; this concentration is the average of available baseline data collected by WSP (Chukuni River and Pakwash Lake stations; *n* = 168; 2022–2025).

3.2.3 Sulphate Loading to Waterbodies #2–23

For Pakwash Lake and all downstream waterbodies, the SO_4 loading is calculated as the sum of background loading from the immediate watershed only ($L\text{-}SO_4\text{-}WS_{(i)}$) and the in-stream load exported from the upstream waterbody ($L\text{-}SO_4\text{-}out_{(i-1)}$) as

$$L\text{-}SO_{4(i)} = L\text{-}SO_4\text{-}WS_{(i)} + L\text{-}SO_4\text{-}out_{(i-1)}$$

The background watershed loading is the product of the background concentration and immediate-watershed inflow ($Q\text{-}WS_{(i)}$)

$$L\text{-}SO_4\text{-}WS_{(i)} = [SO_4\text{-}Bkg] \times Q\text{-}WS_{(i)}$$

where

$$Q\text{-}WS_{(i)} = Q_{(i)} - Q_{(i-1)}$$

and

$$Q_{(i)} = Q\text{-}Bkg_{(i)} + Q\text{-}Eff$$

The SO_4 exported via the outflow from each waterbody ($L\text{-}SO_4\text{-}out_{(i)}$) is the difference between the total load to that waterbody and the flux of SO_4 lost to the sediments ($F\text{-}SO_{4(i)}$)

$$L\text{-}SO_4\text{-}out_{(i)} = L\text{-}SO_{4(i)} - F\text{-}SO_{4(i)}$$

3.3 Sulphate Flux to Sediments

Fluxes were modelled based on Fick's 1st Law using equations found in Delongchamp et al. (2009). The areal flux ($g/m^2/d$) of SO_4 from the water column to sediment porewater in each waterbody was calculated as

$$F = -1 \times (\Phi \times D_W \div \theta^2) \times (\Delta C \div \Delta x)$$

where

Φ is sediment porosity
D_W is the diffusion coefficient of SO_4 in water
θ is the sediment tortuosity
ΔC is the change in SO_4 concentration between the water column and porewater
Δx is the change in depth within the surficial sediments (assumed to be 10 cm)

Following Delongchamp et al. (2009), tortuosity was estimated from porosity as

$$\theta = 1 - \ln(\Phi^2)$$

The background sediment porewater SO_4 concentration used was 0.2636 mg/L, the average of available data collected by WSP from the Chukuni River and Pakwash Lake (n = 14; Sep 2024; MDL = 0.3 mg/L; ½ MDL substituted for non-detects to calculate average).

The background SO_4 influx to sediment (F-SO_4-Bkg) was calculated based on the background water column SO_4 concentration of 4.9 mg/L. The total SO_4 influx to sediment in each waterbody (F-$SO_{4(i)}$) was calculated based on the total SO_4 concentration of each waterbody ([SO_4]$_{(i)}$); i.e., in the presence of effluent discharge.

3.4 Stimulation of Hg methylation by SRB

The change in sediment efflux of MeHg in each waterbody was estimated based on reports of empirical relationships between changes in SO_4 loading and porewater MeHg concentrations (Table 3). The available studies on this topic were not all included, as some did not express SO_4 loads relative to natural (background) loading (e.g., Harmon et al. 2004) and others reported SO_4 concentrations but not loading (e.g., Gilmour et al. 1992). When only considering the field (mesocosm) studies that did quantify increases in porewater MeHg as a function of augmented SO_4 loading (relative to natural loading), the data available to establish an empirical relationship are from varying temporal scales (days to years), various geographic locations, various depths in sediment, and were collected using variable methods. These studies are, however, to our knowledge the best available sources for establishing an empirical relationship between increased SO_4 loading and Hg methylation. The data considered most representative of the potential effect of SO_4 on MeHg were extracted from the text or figures of each paper. In extracting data from figures, data from multiple sediment depths and replicates were first averaged, and the highest MeHg concentrations in reported timeseries were then extracted, as per a conservative approach. The median ratio (increase in SO_4 load to increase in MeHg concentration) of the available (relevant) data was used to estimate the change in sediment MeHg efflux.

With the exception of Branfireun (2024), the available studies were conducted in peatlands not lakes. We are not aware of any studies conducted in Canadian lakes, or in lakes of the northern United States (or other comparable areas), that have quantified the relationship between change in SO_4 loading and porewater MeHg concentration. The model does <u>not</u> assume that SO_4 or MeHg concentrations or Hg-methylation rates in the study area are comparable to those in peatlands; rather, the model assumes that the stoichiometry — i.e., the proportional change in MeHg in response to increased SO_4 — is comparable to that reported for peatlands, when changes are expressed relative to background levels.

3.5 Sediment MeHg Flux to Water Column

The change in the areal efflux (g/m^2/d) of MeHg from the sediment porewater to the water column in each waterbody (F-MeHg$_{(i)}$) was calculated based on the change in SO_4 influx (Section 3.3) and the empirical SO_4-MeHg relationship discussed above (Section 3.4) as

$$\text{F-MeHg}_{(i)} = \text{F-MeHg-Bkg} \times 0.65 \times \text{F-SO}_{4(i)} \div \text{F-SO}_4\text{-Bkg}$$

The background MeHg efflux rate (F-MeHg-Bkg; i.e., flux out of sediment) was estimated based on available monitoring data and Fick's Law, as described for SO_4 in Section 3.3.

Table 3. Studies of porewater-MeHg increases in response to augmented SO_4 loading.

Reference	Location	Date of experiments	*Duration	SO_4 loading (variable units)		MeHg concentration (ng/L)		SO_4 load (/ Bkg.)	[MeHg] (/ Bkg.)	Ratio	Avg. Ratio
				Bkg.	Experiment	Bkg.	Experiment				
Branfireun et al. 1999	small headwater peatland in Experimental Lakes Area, ON	Sep 1996	2 days	1.4 kg/ha	28 kg/ha	1.5	3.8	20.0	2.5	0.13	0.96
		Sep 1997	1 day		2.8 kg/ha	0.7	2.5	2.0	3.6	1.79	
Branfireun et al. 2001	low sedge peatland in northern Sweden	*"during the snow-free period"*	3 years	9 kg-S/ha/y	30 kg-S/ha/y	0.33	0.61	3.3	1.8	0.55	0.65
					60 kg-S/ha/y		1.62	6.7	4.9	0.74	
Jeremiason et al. 2006	Marcell Experimental Forest, MN	May 2002	2 weeks	8 kg/ha/y	32 kg/ha	0.52	1.63	4.0	3.1	0.78	0.78
Mitchell et al. 2008	Marcell Experimental Forest, MN	Jun 2005	2 days	6.2 kg/ha/y	24.8 kg/ha/y	0.26	1.18	4.0	4.5	1.13	0.71
					62 kg/ha/y	0.26	0.72	10.0	2.8	0.28	
**Branfireun 2024	Wabigoon River at Dryden Mill	Nov–Dec (year unspecified)	9–24 days	0.28 mg	1.4 mg	151	200	5	1.32	0.26	0.19
					4.2 mg		265	15	1.75	0.12	
					1.4 mg	187	236	5	1.26	0.25	
					4.2 mg		347	15	1.86	0.12	
										Median:	**0.65**

**Refers to time elapsed prior to the presented data, not necessarily the duration of the entire experiment.*
***Branfireun (2024) used bottle incubations and reported MeHg in supernatant water (deionized and mill effluent) from experimental samples; here it is assumed that the 2-mg/L SO_4 treatment from this study represents background (Bkg.) conditions (allowing relative changes to be quantified for the 10 mg/L and 30 mg/L treatments).*

3.6 Water-column MeHg Concentration

The increase in water-column MeHg concentration (i.e., additional to the background MeHg concentration) of each waterbody ($[MeHg\text{-}Inc]_{(i)}$) was calculated from total sediment efflux (areal efflux in $g/m^2/d$ × lake area in m^2 = g/d) and flow (m^3/d) as

$$[MeHg\text{-}Inc]_{(i)} = F\text{-}MeHg_{(i)} \div Q_{(i)}$$

with concentrations converted from g/m^3 to picograms per litre (pg/L).

Demethylation processes are not considered in the mass balance. This is precautious and reduces model uncertainty concerning demethylation process definition.

3.7 Sensitivity Analysis and Additional Scenarios

Additional effluent discharge scenarios will be evaluated and sensitivity analysis performed to assess the importance of coefficients and assumptions related to temperature, the background MeHg concentration in porewater, and other variables related to flux estimates. For the sensitivity analyses, the model will be run based on the base Operations effluent SO_4 loading scenario.

3.7.1 SO_4 Loading from Project

In addition to the base scenarios for AEX and Operations, two additional scenarios will be modelled: a SO_4 concentration (as annual average) at the approved effluent limit and an increased effluent flow of 25% above the average expected effluent flow for the Operations phase of the project.

3.7.2 Background Porewater MeHg Concentrations

In addition to the median background porewater MeHg value that will be modelled for the base scenario, low and high concentrations will be modelled based on the range of concentrations observed in Pakwash Lake and the Chukuni River in 2024 (WSP data), pending data from the lakes downstream of the Chukuni River (Hutchinson Environmental data) and the concentrations reported by the peatland studies that were used to derive the SO_4-MeHg relationship (i.e., 0.26–1.50 ng/L; Table 3).

3.7.3 Temperature

The effect of temperature on the relationship between SO_4 loading and MeHg generation will be accounted for by assuming a direct relationship between the SO_4-reduction rate and MeHg generation. The effect of temperature on the SO_4-reduction rate will be modelled based on data presented by Robador et al. (2016) for a hypothetical mixture of SO_4-reducing microorganisms with activation energy (Ea) of 70 kJ/mol (data for up to 100% of maximum reduction rate, from their Figure 1b; reproduced below as **Error! Reference source not found.**).

The temperature of porewater was reported by the authors in 2 of the 4 studies used to establish the SO_4-load-[MeHg] relationship (Figure 3). Jeremiason et al. (2006) reported a porewater temperature of 4.5°C associated with their May results. Mitchell et al. (2008) reported average porewater temperatures of 19.8°C

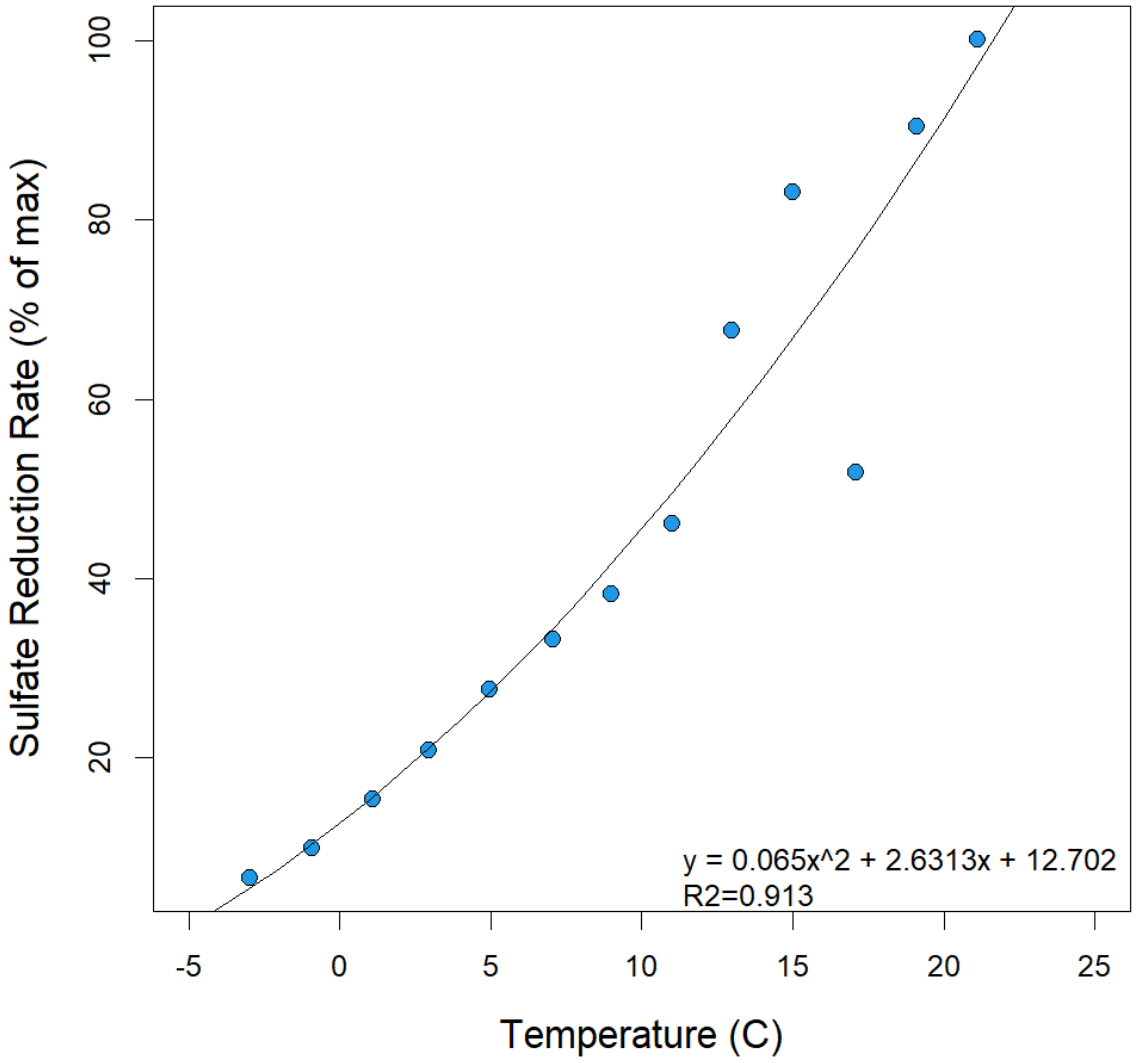

Figure 3. Temperature dependence of sulphate-reduction rate for a hypothetical mixture of SRB (data from Robador et al. 2016).

and 15.2°C at depths of 5 cm and 15 cm, respectively, and an average air temperature of 15°C. The average air temperature was comparable (14°C) during the Sep 1997 experiment of Branfireun et al. (1999), based on historical Environment Canada data for Rawson Lake (Climate ID 6036904). Branfireun et al. (2001) did not report temperatures or the dates of their experiments but noted that treatments were applied "during the snow-free period" and that MeHg samples were taken 5 weeks after the last SO_4 addition. Based on the available data, it is estimated that the average porewater temperature for the peatland/wetland studies was approximately 15°C.

For sensitivity analysis, an average annual temperature of 5°C will be assumed for the modelled area based on the reasoning that the primary zones of SO_4 reduction in the waterbodies will be relatively cool areas (e.g., anoxic environments such as hypolimnia, which typically range between 0°C and 10°C, depending on seasonality, water-column depth, mixing depth and related parameters such as transparency, fetch, etc.) and to provide a meaningful contrast with the estimated 15°C temperature of the peatland studies.

In order to estimate the extent to which using data from the studies performed in non-winter months may lead to overestimation of the annual average SO_4-reduction rates, the (relative) SO_4-reduction rates (SRR) will be calculated for temperatures of 15°C and 5°C (based on **Error! Reference source not found.**) and the expected increase in porewater-MeHg concentration (based on **Error! Reference source not found.**) scaled accordingly.

$$SRR_{temp} = 0.065 \times temp^2 + 2.6313 \times temp + 12.702$$

The temperature scaling factor will be applied to the SO_4-MeHg stoichiometric ratio of 0.65 (Table 3) to adjust estimates of change in MeHg efflux

$$F\text{-}MeHg_{(i)} = F\text{-}MeHg\text{-}Bkg \times 0.65 \times SRR_{5°C} \div SRR_{15°C} \times F\text{-}SO_{4(i)} \div F\text{-}SO_4\text{-}Bkg$$

4. Summary

The proposed approach to estimating the increase in water-column MeHg concentrations due to SO_4 loading from the Great Bear Project uses mass-balance modelling to estimate loading and concentrations, water-porewater concentration gradients to estimate vertical fluxes of SO_4 and MeHg, and empirical data from the scientific literature to estimate the relationship between changes in SO_4 loading and MeHg concentrations. The modelling assumes that steady-state, annual-average conditions apply.

The approach comprises the following steps:

1. Ambient flows will be estimated by areal prorating of flows from gauged watercourses.
2. SO_4 loadings and concentrations of each waterbody will be calculated based on annual-average flows and effluent and background SO_4 concentrations.
3. SO_4 influx to sediment porewater will be calculated based on Fick's 1st law of diffusion.
4. MeHg efflux from porewater will be modelled relative to background, based on the increase in porewater SO_4, as per the available studies conducted in peatlands.
5. The increase in water-column MeHg is calculated based on flow and the change in efflux from sediment.

Sensitivity analyses will be performed to assess the quantitative implications of uncertainty in model parameters.

JH/dil

5. References

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KINROSS

Advanced Exploration Project

Great Bear Resources Ltd.'s (GBR) Response to August 19th, 2025 Letter from MDAG and August 24th, 2025 Letter from Dr. Branfireun

Great Bear Project ECA and PTTW Applications, July 7 and July 24, 2025

#	Comments	Kinross Response
MDAG Letter Dated August 19th 2025		
1. And PTTW comment	*First, the artificial separation between PTTW requirements and ECA requirements heightens the risk that MECP will fail to consider significant issues with the PTTW application that will impact on the ECA. For example, the Great Bear groundwater water model on which the PTTW and ECA are based is critically important, but flawed and unreliable as my past comments have shown. This groundwater model predicts that miners would be working deep underground during Advanced Exploration at the same time that the underground workings would be filled with water to various levels all at the same time. If the Great Bear PTTW were to be approved, the ECA would not have to address this error that invalidates statements made in Kinross' ECA document because it was approved under the PTTW. This groundwater model is discussed further below under Kinross July 24 PTTW Comments.* *My comments have pointed out how the Kinross FeFlow model fails to simulate reality at Great Bear and thus is flawed and unreliable. In turn, Kinross does not respond to and correct its failures, but instead indicates I do not understand how to ignore these failures of its model and to pretend it is working correctly. As I have pointed out before, the Kinross FeFlow model predicts that miners would be working deep underground during Advanced Exploration at the same time that the underground workings would be filled with water to various levels all at the same time. That is what the model and the contours show, but this is impossible because the FeFlow model cannot simulate reality at the Great Bear Project.*	These two comments are being addressed together due to their similarity. The reviewer's initial comment suggesting that the separation of approvals between the PTTW and ECA is artificial is not an issue that can be addressed by Kinross and difficult to understand. The reviewer uses the word "artificial" to describe the use of different regulatory instruments to manage a water taking from a natural environment and the operation and maintenance of treatment facilities. The term artificial is ambiguous as it can mean either produced by human beings or insincere. It is not clear which meaning the reviewer is intending with their comment. The reviewer, although only recently registered as a professional in Ontario, is surely aware the MECP addresses the division with respect to environmental outcomes by assigning the same reviewers to both instruments. The example given by the reviewer in the first paragraph of their quoted comments is a repeat of a previous comment. The reviewer continues to suggest in this paragraph, which he expounds upon in subsequent text, that there are significant issues with the use of a groundwater model, FeFlow to simulate the movement of groundwater in the subsurface towards underground workings. It appears that the reviewer is suggesting that FeFlow, which is a widely used groundwater model for this application and used in hundreds if not thousands of peer reviewed articles to model groundwater, has a fundamental issue such that groundwater models are "flawed and unreliable". The mathematical boundary conditions used in the model were developed to specifically simulate the interface between the saturated rock interface with the underground workings, and do not, as the reviewer claims, "invalidate(s) statements" made by Great Bear Resources. There is no debate within the scientific community about the use of these boundary conditions for these applications. While the reviewer disagrees with this position, we have made every reasonable effort to respond to the concerns raised. We are unable to provide further clarification that would alter the reviewer's perspective and therefore consider our response complete. No

#	Comments	Kinross Response
		additional comment will be provided on this matter.
1.	*Second, Kinross has proposed issuing "updates" for expected contamination during Advanced Exploration including metal leaching and acid rock drainage (ML-ARD), and has issued one update in March 2025. These updates would replace a comprehensive, integrated report estimating future contamination. Kinross has provided these comprehensive, integrated reports for other aspects of the Great Bear Project like the groundwater model mentioned above, but not on environmental contamination and ML-ARD.* *Please note a fundamental concern at Great Bear and all other advanced-exploration projects is the amount and severity of the contamination that the operation would produce and release. There is no comprehensive assessment and estimation of this fundamental concern about future contamination at the Great Bear Project. Thus, there is no way to reliably assess what is needed for safe and proper environmental protection at Great Bear, although advanced exploration at Great Bear has already been designed in detail. This is an environmentally dangerous example of "putting the cart before the horse". It is a false belief that Kinross could later respond literally immediately before any significant environmental damage occurred.* *The 2009 federal ML-ARD Prediction Manual3, which must be complied with in Ontario under the Mine Rehabilitation Code for advanced exploration closure plans, points out that comprehensive and integrated information on future contamination is needed in advance. The reactive approach of "putting the cart before the horse" is rejected in this Manual. Under this Manual, no disturbance such as changing water levels and water flows should be allowed until the comprehensive and integrated information on expected contamination is submitted, reviewed, and approved. Again, Kinross is ignoring these recommendations that are based on standard procedures and best practices.* *The effect of this failure by Kinross can now be seen in Comment A.1 of the Kinross July 7 Comments. Part of this Comment says, "We believe the reviewer [Kevin Morin] has interpreted the numbers of PAG and NPAG humidity cells to represent the distribution of PAG and NPAG rock" in the March 2025 ML-ARD update. This highlights the failure of ML-ARD updates for the Great Bear Project.* *The March 2025 ML-ARD update does not state that the numbers of PAG humidity cells are not representative of PAG percentages at the site. If the numbers are not representative, then this should be stated in the March 2025 update but is not. Instead, the March 2025 update was issued out of context and with no parallel update on the percentages of PAG/NPAG rock. Thus, Kinross expects external people to know internal information that Kinross has not released and updated. In fact, Kinross has released little information on expected contamination and ML-ARD, and thus there is insufficient context for proper environmental protection and sufficient water treatment at the Great*	Great Bear has conducted a comprehensive ML/ARD characterization study for the Project following the guidance of the MEND 2009 manual, per the requirements of the Ontario Mining Act. Results and knowledge gained from these ongoing ML/ARD studies have been incorporated into the AEX Program design to ensure an environmentally acceptable project. This has included early identification of mine rock ML/ARD characteristics and optimization of the study designs to provide better resolution of those characteristics to improve the Project. The ML/ARD study has included releases of information when available, including kinetic testing data, to support regulatory review. The March 2025 Humidity Cell Tests Update document was produced to show the progress of the Project kinetic tests and provide information on key subjects such as metal release rates and lag time to net acid conditions for PAG materials. The intent of that document was clear, and no statements were made regarding volumes of PAG rock in the AEX Program. Our July 7 comment was to point out to the reviewer that the numbers of kinetic tests could not be directly extrapolated to the AEX program rock volume. Information on PAG and NPAG rock volumes and key rock types for the AEX had been previously provided to ANA in other reports. Great Bear Resources committed through the Closure Plan consultation to provide updated geochemical reports the Ministry of Energy and Mines (MEM). We provided the AEX Program ML/ARD assessment report (September 2025) to MEM and the MECP and the AEX Program Water Quality Estimate Update (August 2025) to the MECP The ML/ARD report is approximately 4,000 pages in length and contains a comprehensive compilation of extensive geochemical and mineralogical testing results and interpretations to support the AEX Program development. The water quality estimate utilizes kinetic testing results and site monitoring data, and follows industry standard practices to develop water quality estimates for the AEX Program. While the reviewer disagrees with this position, we have made every reasonable effort to respond to the concerns raised. We are unable to provide further clarification that would alter the reviewer's perspective and therefore consider our response complete. No additional comment will be provided on this matter.

#	Comments	Kinross Response
	Bear Project. This a failure by Kinross and its consultants to provide detailed and comprehensive information and context for its ML-ARD updates, as illustrated in Comment A.1. *Independent of the PAG/NPAG categories of rock, I reached a much more important conclusion based on the March 2025 ML-ARD update. The information in this update, when scaled up to the full site conditions at Great Bear, indicated water contamination and water-quality degradation during Advanced Exploration would likely be much worse than currently predicted and designed for. This much higher contamination could be to the point that the currently proposed water treatment would fail to properly treat it. Kinross did not contest or disagree with this in its Kinross July 7 Comments.* *Therefore, water quality during and after Advanced Exploration will be worse than currently predicted and designed for, and the currently proposed water treatment will likely be insufficient and thus release additional contamination.*	
2.	*Third, Comment A.6 in the Kinross July 7 Comments states in part, "sulphate concentrations will meet background levels at the end of the mixing zone." Other experts for Grassy Narrows First Nation are addressing the impacts and effects of sulphate. My point was that there would be various forms of toxicity within the mixing zone no matter how long it was, which Kinross again ignored by simply addressing the end of the mixing zone.* *It is easy to envision adverse environmental effects greater than what is currently predicted by Kinross. For example, the river sediments at the bottom near the contaminated-water discharge will be exposed to this contamination and will adsorb some of it through time. Thus, local sediment quality degrades. Occasionally, such as during high flows, this contaminated sediment will be flushed downstream into pristine areas where it can contaminate sediment and aquatic life in its new location. As another example, benthic organisms exposed to contamination in the mixing zone would eventually die and can be carried downstream into pristine areas, releasing contamination to the pristine areas.* *Therefore, the mixing zone in the Chukuni River for Great Bear's contaminated water can produce additional, long-term contamination farther downstream not evaluated by Kinross to date. Kinross July 7 response of "sulphate concentrations will meet background levels at the end of the mixing zone" does not recognize or address this downstream contamination.*	The technical basis for approval of the ECA ISW and anticipated conditions therein for the proposed AEX Program is sufficient and has occurred as per the appropriate regulatory regime in Ontario, as per our previous responses. While the reviewer disagrees with this position, we have made every reasonable effort to respond to the concerns raised. We are unable to provide further clarification that would alter the reviewer's perspective and therefore consider our response complete. No additional comment will be provided on this matter.
Dr. Brian Branfireun Letter Dated August 24th 2025		
Comment B.1	*In response to my concerns about baseline data deficiencies, inappropriate analytical approaches, and selective flow analyses to overstate the assimilative capacity of the Chukuni River, the Proponent simply indicates that these issues were 'addressed' in prior responses. In my opinion, this is not the case. As indicated above, prior responses from the Proponent have chosen to either simply 'disagree' with my identification of deficiencies in the permit application based on factual information presented in their own documents, or lean on purported compliance with MECP regulations. My opinion stands that there is virtually no usable background data on sulphate, mercury, and methylmercury for the project area. The response here that refers to prior insufficient responses only serves to bury the scientifically unsupportable justifications and explanations deeper in the record.*	The reviewer's assertion that there is "virtually no usable background data on sulphate, mercury, and methylmercury" is demonstrably false and mischaracterises both the scope and quality of the baseline dataset compiled for the Chukuni River and other local area waterbodies. For example, over three years of monthly sulphate monitoring data have been collected across three stations on the Chukuni River (CR-REF, CR-FDP, CR-DS), with 94% of observations above

#	Comments	Kinross Response
	In response to my determination that the project may result in significant increases in sulphate in the Chukuni River, the Proponent chose to inexplicably respond by stating that "We have demonstrated the differences between the conditions and factors measured in the Riverbank Study and the conditions in the aquatic system downstream of the project (English River system). It is not appropriate to apply the riverbank study to the methyl mercury patterns in the entire English Wabigoon system, let alone the system downstream of the Project." The Riverbank study has nothing to do with my calculations of what potential sulphate concentrations may be in the Chukuni River, so the intention of this response is unclear. If the intention is to imply that the receiving waterbody and those downstream cannot support mercury methylation, then this is factually untrue since MECP fish monitoring data indicate otherwise, with consumption advisories for methylmercury in fish in the public record that I have referred to previously. If the intention is to imply that sulphate reduction controls mercury methylation in the Wabigoon River (consistent with 30 years of scientific understanding) but that some other process other than sulphate-reduction controls methylation in the English River system, then I would be very curious to know what scientific breakthrough the Proponents have made in this regard. In my opinion they in no way "have demonstrated the differences between the conditions and factors" in prior documents, as indicated.	detection limits. Since 2022, detection limits have consistently ranged between 1 and 2 mg/L, and all 2021 observations—collected using a different analytical method—were also above detection limits. The reviewer's claim that the Proponent has relied on "selective flow analyses" to overstate assimilative capacity is similarly unfounded. The modelling approach explicitly evaluated the full range of permitted discharge conditions, including the highly conservative 7Q20 low-flow scenario as is required by MECP Policy B-1-5. The reviewer's claim that baseline sulphate concentrations will be exceeded beyond the mixing zone in the Chukuni River is demonstrably false and misrepresents both the regulatory framework underpinning the anticipated ECA ISW and Great Bear Resources' commitments to environmental protection. The proposed conditions of the ECA ISW include sulphate discharge limits specifically designed to meet background concentrations at the edge of a small mixing zone, in full alignment with Ontario's regulatory standards for environmental protection. Calculations were reviewed and confirmed as accurate by Senior Technical Staff at the MECP. Water quality modelling completed by Great Bear Resources, using the proposed effluent limits for sulphate, shows that baseline sulphate concentrations in the Chukuni River are maintained under all permitted discharge conditions, including the theoretical maximum discharge co-occurring with the low-flow 7Q20 event—a highly conservative and unlikely scenario explicitly evaluated in the assessment The reviewer has continued to dismiss empirical data, the technical realities of the AEX Program, and the regulatory standards that govern it. Great Bear Resources has responded comprehensively and transparently to all concerns raised. Reiterating unsupported claims does not constitute a valid scientific critique, and no additional comment will be provided on this matter.
Comment B.2	*In response to my calculations of potential river sulphate concentrations using the MECPs sulphate effluent limit explicitly stated in the ECAs Summary of ECA Conditions Under Consideration, the Proponents response is "We disagree that the proposed ECA will allow for a sulphate increase of 35% in the Chukuni River." As is often the case in the Proponents responses, this 'disagreement' is unsubstantiated. I used the numeric criteria exactly as stated in the ECA. The mathematics is quite simple – one typically does not "disagree" with the result of a numerical calculation without demonstrating an error. The ECA will most certainly allow an increase of this magnitude above natural background. There can also be no disagreement about what the definition of natural background concentration is, as it is the concentration of a constituent that would be found upstream of ANY pollution source. As I indicated in my prior memo, the Proponent themselves acknowledge substantial upstream contributions of sulphate from other operations – as such sulphate concentrations measured in the Chukuni River just upstream from the proposed project are several fold higher than natural background concentrations. The Proponents repeated attempt to paint the receiving water system as being not sensitive to additional sulphate loading leading to increased mercury methylation defies decades of scientific consensus and publically available data. The implication that the underlying mechanisms that contributed to the findings of the Riverbank sediment study were somehow unique and not applicable elsewhere is wholly unsupportable.*	The reviewer's claim that baseline sulphate concentrations will be exceeded beyond the mixing zone in the Chukuni River is demonstrably false and misrepresents both the regulatory framework underpinning the anticipated ECA ISW and Great Bear Resources' commitments to environmental protection. The proposed conditions of the ECA ISW include sulphate discharge limits specifically designed to meet background concentrations at the edge of a small mixing zone, in full alignment with Ontario's regulatory standards for environmental protection. Calculations were reviewed and confirmed as accurate by Senior Technical Staff at the MECP. Water quality modelling completed by Great Bear Resources, using the proposed effluent limits for sulphate, shows that baseline sulphate concentrations in the Chukuni River are maintained under all permitted discharge conditions, including the theoretical maximum discharge co-

#	Comments	Kinross Response
		occurring with the low-flow 7Q20 event—a highly conservative and unlikely scenario explicitly evaluated in the assessment. The technical basis for approval of the ECA ISW and anticipated conditions therein for the proposed AEX Program is sufficient and has occurred as per the appropriate regulatory regime in Ontario, as per our previous responses. While the reviewer disagrees with this position, we have made every reasonable effort to respond to the concerns raised. We are unable to provide further clarification that would alter the reviewer's perspective and therefore consider our response complete. No additional comment will be provided on this matter.
Comment 3	*In response to my assertion that the Conditions of the ECA are not protective with respect to sulphate and mercury methylation, the Proponent again chooses to disagree, stating that "subject to stringent conditions that include sulphate discharge limits designed to meet background concentrations at the end of the approved mixing zone. These limits were developed in accordance with Ontario's regulatory framework to ensure protection of the receiving environment.". I demonstrated quite plainly that the numerical effluent criteria in the Conditions under Consideration of the ECA would allow for exceedances of sulphate well above natural background, and that these exceedances could be quite substantial around certain flow thresholds.* *The Proponent then goes on to state that "In addition, a detailed monitoring and adaptive management program has been collaboratively developed with Wabauskang and Lac Seul First Nations, whose traditional territories include the project area. This program provides for proactive oversight and mitigation to address any unforeseen changes in water quality and reflects a shared commitment to environmental protection.". We are expected to take those statement at face value without any documentary evidence that I am aware of. It is inferred that this program concerns sulphate and changes to mercury methylation, however this is not stated explicitly.* *What is notable are the concerns that I raised in my July 7 memo that the Proponent chose* ***not*** *to respond to. There is no response to my concerns about the Proponents weak justification to the MECP to not treat effluent for sulphate, no response to my identification of Mr. MacDonnell's (Kinross) acknowledgement of upstream contributions of sulphate from other mines for decades (thus undermining the assertion that river sulphate concentrations immediately upstream of the proposed project are a representative natural background), and no response to Mr. MacDonnell's completely unsupportable statement that despite the decades of mine sulphate discharge "there is no evidence of any material change in mercury concentrations in fish tissue as a result.".* *My conclusions are unchanged. The revised PTTW and revised ECA make no movement toward protecting the downstream environment from enhanced mercury methylation and increased mercury concentrations in fish because they do not fundamentally address the source of sulphate nor effectively limit the release of sulphate to a receiving environment that is sensitive to mercury contamination.*	The reviewer's claim that baseline sulphate concentrations will be exceeded beyond the mixing zone in the Chukuni River is demonstrably false and misrepresents both the regulatory framework underpinning the anticipated ECA ISW and Great Bear Resources' commitments to environmental protection. The proposed conditions of the ECA ISW include sulphate discharge limits specifically designed to meet background concentrations at the edge of a small mixing zone, in full alignment with Ontario's regulatory standards for environmental protection. Calculations were reviewed and confirmed as accurate by Senior Technical Staff at the MECP. Modelling completed by Great Bear Resources, using the proposed effluent limits for sulphate, shows that baseline sulphate concentrations in the Chukuni River are maintained under all permitted discharge conditions, including the theoretical maximum discharge co-occurring with the low-flow 7Q20 event—a highly conservative and unlikely scenario explicitly evaluated in the assessment. The reviewer's dismissal of monitoring and adaptive management program is unfounded. This program, created in partnership with the MECP, explicitly includes provisions for monitoring sulphate and mercury methylation, with mechanisms for proactive mitigation should any adverse trends emerge. Assertions to the contrary are not supported by the evidence and do not reflect the regulatory environment or technical realities of the AEX Program. All data collected to date show that sulphate levels are low. The only known, potentially applicable, treatment technology to further reduce expected sulphate concentrations in contact water quality is Reverse Osmosis (RO). RO systems present significant operational challenges, particularly related to brine and waste management. Implementing a brine management system to address a risk that has not been demonstrated would introduce unnecessary environmental and operational burdens. Based on the feedwater quality to the AEX Effluent Treatment Plant (ETP), expected to contain low levels of sulphate, use of a sulphate removal system such as RO is not warranted during the AEX phase. Background concentrations of sulphate will be met in the Chukuni River with AEX effluent discharges as described

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		above. The reviewer has continued to dismiss empirical data, the technical realities of the AEX Program, and the regulatory standards that govern it. Great Bear Resources has responded comprehensively and transparently to all concerns raised. Reiterating unsupported claims does not constitute a valid scientific critique. The technical basis for approval of the ECA ISW and anticipated conditions therein for the proposed AEX Program is sufficient and has occurred as per the appropriate regulatory regime in Ontario, as per our previous responses. While the reviewer disagrees with this position, we have made every reasonable effort to respond to the concerns raised. We are unable to provide further clarification that would alter the reviewer's perspective and therefore consider our response complete. No additional comment will be provided on this matter.

KINROSS Great Bear

Great Bear Gold Project

August 30, 2025, Source Environmental Associate Inc. Evaluation of Great Bear Resources' Responses to Summary Comments on AEX ECA

Comment ID	July 7, 2025, Source Comments & Rationale	July 10, 2025, Great Bear Resource Response	Source Evaluation of Response	Great Bear Resources Response
C.1	The proponent should submit a finalized version of the water quality model report that incorporates all prior review comments. A revision history log should accompany the final document to clarify all changes made during the review process. The updated version should serve as the technical basis for approval assessments and ECA conditions.	Provided a response on June 18, 2025, to comments received by ANA on April 11, 2025. Also addressed by the GBR response letter sent February 5, 2025, regarding ANA letter dated September 6, 2024.	Source previously reviewed Great Bear's June 18, 2025, response, including Attachment 1 (Water Quality Model memo). Source's July 7, 2025, memorandum reflects the review conducted on the June 18 response and identifies that the draft WQM remains incomplete. The WQM report (included as Attachment 1), titled "Advanced Exploration Program (AEX) Water Quality Estimate Update, Great Bear – Draft" is dated February 1, 2024, despite the submission of follow-up materials and prior feedback from MECP, the Ontario Ministry of Energy and Mines (MINES), and ANA. The use of the same draft document after more than a year and multiple comment rounds indicates a lack of responsiveness to comments provided. Without receiving an updated version, reviewers cannot verify which data, assumptions, or scenarios have been updated in response to previous feedback. As such, this comment has not been addressed. It is noted that GBR response letter on February 5, 2025 (filename: 2025 02 06 Great Bear Response to ANA AEX_ECA_7 July 2024_Aug2024 4923-4663-7335 1) is merely a copy of August 1, 2024, Kinross response to Source's previous comments. Source has already provided responses to the August 1, 2024, Kinross Response. For ease of reference, Source's evaluation of Kinross' August 1, 2024, response is attached herein.	The technical basis for approval of the ECA ISW and anticipated conditions therein for the proposed Advanced Exploration Program (AEX) is sufficient and has occurred as per the appropriate regulatory regime in Ontario, as per our previous responses. Anticipated ECA ISW conditions include extensive follow-up monitoring, triggers for adaptive management, and contingency measures. Key technical supporting materials submitted, listed below for ease of reference (and within our previous responses) collectively demonstrate that the modelling framework has been updated since February 2024, including a recent update in August of 2025. An additional update to the water quality modelling at this stage—prior to the commencement of AEX Program activities—would not yield improvements to the engineering design of the proposed works, the conditions of the ECA ISW, or the level of protection afforded to the receiving environment beyond what has already been proposed. Great Bear Resources respectfully disagrees with the reviewer's characterisation; the apparent disagreement between Great Bear Resources and the consultants representing ANA does not equate to a lack of responsiveness by Great Bear Resources. As per our previous responses, Great Bear Resources has provided multiple rounds of updated technical materials that directly address reviewer comments and incorporate new data since the submission of the original draft application in 2022. These include: – WSP 2024. *Response to Dr. Branfireun Letter Concerning the Potential Effects of Proposed Discharge to the Chukuni River, Great Bear AEX ECA ISW Application*. October 2024. – Great Bear 2025. *ANA Comments: Review of the*

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				– *Great Bear Advanced Exploration Program – ECA ISW Application (September 5, 2024).* September 2024. – Great Bear 2025. *Great Bear Resources Ltd.'s (GBR) Response to August 19th, 2025 Letter from MDAG and August 24th, 2025 Letter from Dr. Branfireun.* August 2025. – WSP 2025. *Water Quality Estimate Update, Great Bear AEX Program.* August 2025. – Great Bear 2025. G*reat Bear Resources Ltd.'s (GBR) Response to Canadian Environmental Law Association Letter – Great Bear Resources Ltd. ("GBR", "Kinross", or "Kinross/GBR") Proposal for a Permit to Take Water ("PTTW") – ERO No. 025-0078, MECP Reference No. 0788-DCXP8C (Comment Period January 23 – February 22, 2025) – Supplementary Comments from Grassy Narrows First Nation* While the reviewer disagrees with this position, we have made every reasonable effort to respond to the concerns raised. We are unable to provide further clarification that would alter the reviewer's perspective and therefore consider our response complete. No additional comment will be provided on this matter.
C.2	The proponent should develop a consolidated water quality model that addresses all mine phases: construction, exploration, active closure, passive closure, and post-closure. The model should clearly define	Provided a response on June 18, 2025, to comments received by ANA on April 11, 2025. Also addressed by the GBR response letter sent February 5, 2025, regarding ANA letter dated September 6, 2024.	Similar to Comment 1, the June 18, 2025, response and Attachment 1 (WQM memo) have already been reviewed by Source as part of July 7, 2024, technical memorandum. The provided WQM does not meet the requirement for a consolidated model covering all mine phases and remains a draft document. The WQM memo provided appears to only address the exploration (operational) phase of the Great Bear AEX Program. It does not include predictions for the construction, active closure, passive closure, or post closure phases, each of which involves unique water quality risks and management requirements. While water quality estimates are included in Appendix M of the Great Bear AEX Program Closure Plan for some later phases	Please note, this is a 5-year advanced exploration program, it is not a mine, and is not subject to the *Federal Impact Assessment Act*. The technical basis for approval of the ECA ISW is sufficient and has occurred as per the appropriate regulatory regime in Ontario; please see response to Comment C.1. The technical supporting materials for the ECA ISW application are appropriately tailored to the specific activities to be authorised under that approval. Importantly closure-related activities are not the scope of an ECA ISW and are addressed under separate regulatory processes (in the Closure Plan approved by MINES), Please also refer as per our previous responses, including those distributed on June 18, 2025, to

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			(specifically passive- and post-closure), these are not integrated into the main modeling framework. A single, consolidated model report that addresses all project phases represents is requested. This comment therefore remains outstanding. The model should clearly define: • Phase-specific inputs (e.g., water sources, contaminant loading assumptions); • Evolving water management strategies (e.g., treatment system design changes, pond retention times); • Changes in drainage, hydrogeology, and contaminant transport pathways over time; and • Projected effluent quality under realistic operating and climate scenarios for each phase. All outputs should be used to inform long-term compliance planning, effluent limit setting, and monitoring program design. This full-phase modeling approach is necessary to ensure environmental protection throughout the life of the project. It is noted that GBR response letter on February 5, 2025 (filename: 2025 02 06 Great Bear Response to ANA AEX_ECA_7 July 2024_Aug2024 4923-4663-7335 1) is merely a copy of August 1, 2024, Kinross response to Source's previous comments. Source has already provided responses to the August 1, 2024, Kinross Response. For ease of reference, Source's evaluation of Kinross' August 1, 2024, response is attached herein.	comments received by ANA on April 11, 2025. Also addressed by the GBR response letter sent February 5, 2025, regarding ANA letter dated September 6, 2024. While the reviewer disagrees with this position, we have made every reasonable effort to respond to the concerns raised. We are unable to provide further clarification that would alter the reviewer's perspective and therefore consider our response complete. No additional comment will be provided on this matter.
C.3	In comparable jurisdictions such as British Columbia and Yukon, the proponents are typically required to provide underground specific source terms and node that significantly influences the water quality within the site. These model nodes are	We remind the reviewer the Project is located in Ontario. Our project is designed to comply with applicable law. Great Bear has previously provided a response to ANA regarding water	As outlined in Source's July 7, 2025, technical memorandum, this review comment was based on the evaluation of the Water Quality Model memo submitted as part of Great Bear's June 18, 2025, response. The issues raised remain unresolved because the information is fragmented across multiple submissions and has not been integrated into a consolidated Water Quality Model	Please see responses to C.1. and C.2.

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	expected to inform treatment system design and regulatory limits. Moreover, during closure or temporary shutdown, flooded workings may mobilize legacy oxidation products from PAG zones or wall rock. These conditions can result in contaminant pulses that require mitigation planning, contingency treatment, and monitoring frameworks.	quality of the underground mine water on August 1, 2024. Also addressed by the GBR response letter dated February 5, 2025, in response to ANA letter dated September 6, 2024. Regarding ANA's concerns about water quality predictions, (letter dated April 11, 2025), GBR responded to ANA on June 18, 2025.	report. Without a unified document, it is difficult to assess how underground-specific source terms, model nodes, and treatment system considerations are incorporated into the overall water balance and quality predictions. This comment therefore remains outstanding. The following request was previously made in July 7, 2025, technical memorandum: • The proponent should provide a comprehensive evaluation of expected underground mine water quality. This assessment should be based on: • Site-specific geochemical characterization of underground rock types, including PAG zones; • Consideration of mine development methods, blasting residues, oxygen ingress, and water-rock interaction under dewatered and reflooded conditions; and • Modeling of contaminant release during active pumping and during reflooding events (e.g., shutdown or post closure scenarios). The predictions should be specific to each mine phase and aligned with mine development timelines. The model should also assess the implications of this water quality on treatment performance. It is noted that GBR response letter on February 5, 2025 (filename: 2025 02 06 Great Bear Response to ANA AEX_ECA_7 July 2024_Aug2024 4923-4663-7335 1) is merely a copy of August 1, 2024, Kinross response to Source's previous comments. Source has already provided responses to the August 1, 2024, Kinross Response. For ease of reference, Source's evaluation of Kinross' August 1, 2024, response is attached herein.	
C.4	The WQM report does not account for nitrogen-based contaminants (ammonia, nitrite, and nitrate) that are commonly introduced into the mine area as residues from blasting	A response was provided to ANA on February 5, 2025, in response to concerns raised about nitrogen species in a letter from ANA dated September 6, 2024.	Similarly, the July 7, 2025, technical memorandum identified that nitrogen-based contaminants introduced by blasting agents have not been adequately accounted for in the draft Water Quality Model. Kinross' response provided in the February 5, 2025, submission only states	We believe the reviewer's summary of the response by Great Bear regarding this topic is innacurate. A response concerning identifying parameters of potential concern, as well as potential effects regarding potential nitrogen loadings was provided July 2025, February 2025 and

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	agents. This omission represents a notable gap given that blasting is a planned activity during underground development.		that effluent criteria have been developed in accordance with MECP Policy B-1-5, and for parameters including nitrate and nitrite would be subject to the Surface Water Monitoring Program. Source reiterates that this response does not address the comment that the WQM should account for all nitrogen-based contaminants including ammonia, nitrate, and nitrite that are commonly introduced from the blasting activities. A consolidated and updated Water Quality Model is required to demonstrate how nitrogen species will be predicted and managed within the overall water quality and balance framework. This comment remains unaddressed. Moreover, the model contains no discussion of the type of blasting materials, volumes used, leachability, or potential release pathways for nitrogen species in site runoff or seepage water. The proponent should revise the WQM report to include a quantitative assessment of nitrogen species, specifically ammonia, nitrate, and nitrite, resulting from blasting activities. This should include: • Identification of explosive types and compositions proposed for use. • Estimated volumes of explosives to be used during the AEX Program. • Leaching potential of nitrogen compounds based on site-specific or literature-derived data. • Modeling of nitrogen species release from the underground working, ore and mine rock stockpiles; and • Evaluation of nitrogen removal performance in the ETP under expected and conservative load conditions. If nitrogen species are found to present a risk to effluent quality or receiving waters, the proponent should identify appropriate mitigation measures such as explosive	September 2024. Specifically, from that response (brackets added for additional clarity): – "Effluent criteria (as per MECP Policy B-1-5) are j**ust one aspect** of the regulatory approach in the ECA ISW application. The Surface Water Monitoring Program includes threshold criteria (mg/L) that trigger adaptive management for all parameters with Water Quality Guidelines for the Protection of Aquatic Life (WQG PAL). The approach is to maintain WQG PAL, or background water quality, as applicable, in the receiving environment downstream of a short mixing zone throughout the AEX Program (as well as in Dixie Creek and other monitored waterbodies proximate to the AEX footprint as outlined in the Surface Water Monitoring Plan). Consequently, all water quality parameters with WQG PAL (this includes nitrogen species) are regulated in relation to effluent discharge (and AEX Program activities, like blasting) and no parameters are missing or omitted from regulation, contrary to the reviewer's suggestion. This comprehensive strategy indicates that all relevant parameters are considered in the ECA ISW and are carefully managed to protect surface water quality and aquatic ecosystem health throughout the AEX Program." While the reviewer disagrees with this position, we have made every reasonable effort to respond to the concerns raised. We are unable to provide further clarification that would alter the reviewer's perspective and therefore consider our response complete. No additional comment will be provided on this matter.

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			loading control, targeted capture systems, or ammonia/nitrite/nitrate-specific treatment technologies.	
C.5	The water quality model lacks a sensitivity analysis. The water quality model includes numerous assumptions related to hydrological inputs, geochemical conditions, and contaminant loadings that are inherently uncertain. While the proponent includes both expected and conservative geochemical source terms, there is no indication that variability in factors such as climate conditions, streamflow, groundwater inflows, or operational changes over time were tested to understand how the model would respond to these fluctuations. The proponent should complete and clearly document a sensitivity analysis as part of the water quality modeling. This analysis should explore how model outputs respond to a range of uncertain inputs, including wet and dry flow conditions, the upper and lower bounds of updated geochemical source terms, seasonal changes such as snowmelt pulses or late-summer low flows, and projected climate change impacts on site hydrology and contaminant transport.	The water quality model is appropriately conservative and consistent with standard industry practice for a project at the advanced exploration (AEX) stage. Great Bear has committed to updating the model every three years and will compare monitoring results against model predictions as part of regular compliance reporting. It is important to emphasize that any model refinements made prior to approval of the Environmental Compliance Approval for Industrial Sewage Works (ECA ISW) would not alter the mitigation measures, effluent limits, or follow-up monitoring programs already embedded in the AEX Program design. These components have been developed in coordination with the MECP using conservative assumptions to protect against the full range of potential conditions. As is best practice, multiple layers of mitigation and contingency have been incorporated to manage uncertainty, including: • Lined waste rock storage areas and lined contact water ponds to limit contaminant transport. • Flexible, modular water	As outlined in Source's July 7, 2025, technical memorandum, this review comment specifically requested a sensitivity analysis to evaluate how the water quality model responds to a range of uncertain inputs (e.g., wet and dry flow conditions, updated geochemical source terms, seasonal events like snowmelt or late-summer low flows, and projected climate change impacts). The proponent's response reiterates that the current model is "appropriately conservative" and consistent with industry practice but does not provide or commit to a sensitivity analysis. The "conservative case" used in the WQM memo, Advanced Exploration Program (AEX) Water Quality Estimate Update, Great Bear – Draft" is dated February 1, 2024, only accounts for purportedly conservative geochemical source term. While conservative inputs can offer some margin of safety, they do not replace the need to evaluate system behavior under multiple plausible scenarios. Sensitivity testing is a standard component of robust water quality modeling. Without it, the Proponent's claim that "these components have been developed in coordination with MECP using conservative assumptions to protect against the full range of potential conditions" cannot be substantiated. A conservative source term alone does not capture the combined variability of hydrologic, climatic, and operational factors that can significantly influence contaminant transport and water quality outcomes. Lastly, the response also cites a submission dated September 5, 2025; however, this date is not possible as it is in the future. It is likely referring to the September 5, 2024 submission. To allow proper review, please provide the referenced September 5, 2024 document for verification and context.	The technical basis for approval of the ECA ISW is sufficient and has occurred as per the appropriate regulatory regime in Ontario; please see response to Comment C.1 regarding water quality modelling and responses provided and geochemical characterisation, including the updated water quality from August 2025. Consistent with best practice, the AEX Program incorporates multiple layers of mitigation and contingency to manage any uncertainty and minimise potential interaction with the receiving environment. The planned measures exceed industry standards for a typical advanced exploration and include: – Full containment of all waste rock storage areas and collection ponds and use of engineered liners; – Classification of overburden piles as contact water sources, with all associated runoff directed to water treatment systems; – Deployment of flexible, modular water treatment systems designed to adapt to changes in influent chemistry; – Provision of dedicated contingency storage to accommodate variable flow volumes and unanticipated conditions. While the reviewer disagrees with this position, we have made every reasonable effort to respond to the concerns raised. We are unable to provide further clarification that would alter the reviewer's perspective and therefore consider our response complete. No additional comment will be provided on this matter.

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		treatment systems capable of adjusting to changes in influent chemistry. • Dedicated contingent storage to accommodate variable flow volumes or unexpected conditions. • Given the use of conservative inputs, proven • mitigation measures, and the commitment to regular model updates, the approach provides a robust and defensible foundation for permitting decisions. • Responses addressing concerns regarding effluent limit development were provided to ANA on August 1, 2024, and September 5, 2025.		
C.6	If PoPCs are not identified and screened, there is a high risk that key contaminants may be omitted from both the predictive model and subsequent ECA limits. This can lead to discharge of unregulated contaminants, underestimation of environmental risks, and inadequate design or monitoring of treatment systems. Recommendation: The proponent should provide an assessment of PoPCs based on the modeled predictions comparing with baseline water quality data and applicable regulatory guidelines and site-specific consideration. This process should	Responses addressing concerns regarding effluent limit development were provided to ANA on August 1, 2024, and September 5, 2025.	The issue of missing screening analysis for Parameters of Potential Concern (PoPCs) has been raised repeatedly, including in Source's July 7, 2024, and July 7, 2025, memoranda. The August 2024 response does not address the fundamental concern because: • No PoPC screening analysis or results have been provided, preventing verification of completeness. • Effluent criteria were derived from preliminary geochemical and baseline studies, which is not a substitute for a systematic PoPC assessment. • It remains unclear how geochemical test results, environmental baseline data, and site water quality model considerations were integrated into identifying PoPCs.	The technical basis for approval of the ECA ISW is sufficient and has occurred as per the appropriate regulatory regime in Ontario; please see response to Comment C.1 Great Bear has sufficiently addressed the fundamental concern regarding protection of the surface water environment during the AEX Program. For example, as per the response provided on August 1, the approach is to maintain WQG PAL (or background water quality, as applicable) in the receiving environment downstream of a short mixing zone as well as within Dixie Creek/surrounding waterbodies throughout the AEX Program. Consequently, all water quality parameters with WQG PAL are regulated in relation to the AEX Program vis a vis the proposed effluent criteria, planned rock management and water mitigation measures (e.g. liners, treatment) and trigger criteria/thresholds for adaptive

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	identify which parameters have the potential to exceed background concentrations, pose ecological or human health risks, or require active management through treatment or monitoring. The assessment should also provide justification for any constituents excluded from the model. This PoPCs assessment forms a basis		• The approach described relies heavily on the assimilative capacity of the Chukuni River rather than demonstrating how Best Achievable Technology would reduce effluent levels. • Potential contaminants of concern such as (nitrate, nitrite, aluminum, antimony, cadmium, chromium, cobalt, iron, mercury, selenium, silver, and chloride), as described in Comment 9 herein appear to be omitted from the proposed effluent discharge limits. Lastly, the response also cites a submission dated September 5, 2025; however, this date is not possible as it is in the future. It is likely referring to the September 5, 2024, submission. To allow proper review, please provide the referenced September 5, 2024, document for verification and context.	management as presented in the Surface Water Monitoring Program; no parameters are missing or omitted from regulation, contrary to the reviewer's suggestion. This comprehensive strategy indicates that all relevant parameters are considered in the ECA ISW and are carefully managed to protect surface water quality and aquatic ecosystem health throughout the AEX Program. While the reviewer disagrees with this position, we have made every reasonable effort to respond to the concerns raised. We are unable to provide further clarification that would alter the reviewer's perspective and therefore consider our response complete. No additional comment will be provided on this matter.
C.7	The final AEX ECA should revise the effluent discharge limits to consider the minimum protection levels proposed in Table 1. If any parameters remain unchanged from the original MECP or Proponent submission, MECP should provide a technical rationale for their exclusion or justification for the selected limit values. Revised effluent discharge limits should be circulated to ANA and other reviewers for review and comment prior to the issuance of any ECA decision.	Great Bear provided a response regarding effluent limits to ANA in a letter sent February 5, 2025, in response to ANA comments dated September 6, 2024.	It is noted that GBR response letter on February 5, 2025 (filename: 2025 02 06 Great Bear Response to ANA AEX_ECA_7 July 2024_Aug2024 4923-4663-7335 1) is merely a copy of August 1, 2024, Kinross response to Source's previous comments. Source has already provided responses to the August 1, 2024, Kinross Response. For ease of reference, Source's evaluation of Kinross' August 1, 2024, response is attached herein. For ease of reference, a summary of those deficiencies is provided here: • **Criteria largely unchanged:** With the exception of adding a sulfate criterion, the effluent limits under consideration remain essentially unchanged from earlier drafts, despite multiple review rounds. • **Reliance on dilution rather than treatment:** The proposed approach continues to allow discharge up to provincial receiving-environment water quality guidelines after dilution in the Chukuni River, rather than setting protective,	Please refer to response provided to C.1.

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			end-of-pipe treatment-based criteria. • **Key contaminants omitted:** Several PoPCs identified by Source remain absent from the proposed effluent criteria (e.g., nitrate, nitrite, aluminum, antimony, cadmium, chromium, cobalt, iron, mercury, selenium, silver, and chloride). In the absence of regulatory limits, these contaminants could be discharged without constraint, leading to serious ecological or human health impacts. • **Overly permissive limits:** For certain metals where limits are proposed, the thresholds are **orders of magnitude higher** than levels known to cause impacts and far above limits applied in other jurisdictions or projects. Such levels would not ensure protection of aquatic life or downstream users. • **Risk to environment and human health:** Taken together, these omissions and elevated criteria represent a risk of harm to aquatic ecosystems and to human consumers of fish. For these reasons, the February 5, 2025, GBR submission does not substantively address Source's recommendation that the final AEX ECA adopt the minimum protection levels recommended in Source's September 5, 2024, memorandum. Revised effluent discharge limits should be circulated to ANA and other reviewers for comment prior to ECA issuance.	
C.8	The minimum protection levels proposed in Table 1 should apply equally to discharges to ground. The parameter list for the low point drains should be expanded to include all PoPCs identified. Revised effluent discharge limits should be circulated to ANA and other reviewers for review and comment prior to the issuance of any ECA decision.	Responses addressing concerns regarding effluent limit development were provided to ANA on August 1, 2024, and September 5, 2025.	This review comment was first raised in Source's July 7, 2025, memorandum following our review of the "Summary of ISW ECA Conditions Under Consideration" document received in June 2025. The proponent's statement that responses were provided in 2024 does not address this new comment, as the issue had not been previously raised. Source's comment is further explained in Comment 8 of July 7, 2025, technical memorandum. Specifically, the	As per the most recent ECA ISW submission, there are planned discharges to ground under normal operating conditions. PWQO will apply to low point drains in the event pipeline maintenance is required.

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			comment requested that the minimum protection levels in Table 1 apply equally to discharges to ground, that the parameter list for the low point drains include all identified PoPCs, and that revised effluent discharge limits be circulated to ANA and reviewers for input prior to any ECA decision. These points remain outstanding and were not addressed in the cited earlier responses. Lastly, the response also cites a submission dated September 5, 2025; however, this date is not possible as it is in the future. It is likely referring to the September 5, 2024, submission. To allow proper review, please provide the referenced September 5, 2024, document for verification and context.	
C.9	Discharge limit proposed is 10 times higher than the acute BC WQG and PWQO, and 100 times higher than the background Chukuni River WQ. Source is concerned that the Proponent has proposed effluent limits based on achieving water quality guidelines for the protection of aquatic life (WQG PAL) after dilution in the Chukuni River, rather than at the end-ofpipe. As stated in our earlier memorandum, proponents do not have the inherent right to discharge pollutants up to receiving environment guideline thresholds, especially when better treatment is technically achievable. In addition, several PoPCs identified by Source were omitted from the Proponent's proposed effluent limits, and no rationale was provided for these exclusions. In the absence of a robust water quality model, effluent discharge limits should adopt a precautionary approach and minimize the risk of contaminant release to the receiving environment. To this end, it	We would like to remind the review the Project is located in Ontario, and the discharge limits were derived within the policies and framework of the Ministry of Environment and Parks in Ontario. Great Bear has previously provided responses regarding effluent limits to ANA on August 1, 2025, and February 5, 2025.	As stated, discharge limit proposed is 10 times higher than the acute BC WQG and Ontario Provincial Water Quality Objective (PWQO) and 100 times higher than the background Chukuni River water quality. Acute BC WQG is also provided, which is at the same concentration as Ontario's WQG, to illustrate that the proposed discharge limits substantially exceed both provincial and background water quality levels. The response cites a submission dated August 1, 2025; however, assuming this is intended to reference the August 1, 2024, submission, the response states that effluent criteria have been developed in accordance with MECP Policy B-1-5, and that the surface water monitoring program is placed as adaptive management. As stated in previous Source's responses (September 5, 2024), Source maintains that adaptive management is not a replacement for protective effluent criteria limits. Furthermore, MECP B-1-5 policy is clear that "A mixing zone is, under no circumstances, to be used as an alternative to reasonable and practical treatment." Standard treatment technology is available and implementable for the parameters listed in column 1. Effluent criteria limits should reflect the reasonable ability of treatment to remove parameters from effluent as well as site-specific considerations related to bioaccumulation, human exposure, cumulative impacts, and other	It appears the reviewer may be unfamiliar with the regulatory processes for approval of advanced exploration activities in Ontario. Effluent criteria for the AEX Program were developed based on the calculated assimilative capacity of the Chukuni River, assuming a conservative scenario in which maximum discharge volumes coincide with low-flow conditions (7Q20), in accordance with MECP Policy B-1-5. This approach ensures that water quality objectives for the protection of aquatic life (long-term exposure) are met downstream of a defined, small mixing zone. For parameters such as arsenic and sulphate, baseline concentrations were used as the applicable benchmarks. It is important to emphasise that the simultaneous occurrence of both maximum discharge volumes and 7Q20 low-flow conditions is highly unlikely. Under average or expected operating conditions—characterised by lower discharge volumes and higher ambient flows—receiving water quality is anticipated to be significantly better than the 7Q20 modelled scenario. This further reinforces the protective nature of the proposed effluent criteria. This rationale and supporting technical basis have been communicated to ANA on multiple occasions, including in our responses dated 1 August 2025 and 5 February 2025, where detailed explanations of the effluent limit derivation and underlying assumptions were provided.

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	is recommended that the following omitted PoPCs be included in the final effluent discharge limits: nitrate, nitrite, aluminum, antimony, cadmium, chromium, cobalt, iron, mercury, selenium, silver, and chloride.		ecological risks, rather than relying on the assimilative capacity of the receiving water body. The proposed discharge limits are far higher than levels treatment technology can reasonably treat and do not account for these site-specific risk pathways. As such, this comment has not been addressed. Lastly, the response also cites a submission dated September 5, 2025; however, this date is not possible as it is in the future. It is likely referring to the September 5, 2024, submission. To allow proper review, please provide the referenced September 5, 2024, document for verification and context.	While the reviewer disagrees with this position, we have made every reasonable effort to respond to the concerns raised. We are unable to provide further clarification that would alter the reviewer's perspective and therefore consider our response complete. No additional comment will be provided on this matter.
C.10	The water quality model does not appear to reflect the updated geochemical predictions based on recent MLARD testing. According to a review by Dr. Kevin Morin (Great Bear Mining Project – MDAG Review of New ECA-Related Documents for	These concerns were raised by ANA in letters dated July 7, 2024, and September 6, 2024. GBR addressed these concerns in our technical responses sent February 5th, 2025. ANA raised the same concern again	Comments in relation to the appropriateness of geochemical assessment is referred to Dr. Kevin Morin's follow-up responses. However, the latest WQM report, titled "Advanced Exploration Program (AEX) Water Quality Estimate Update, Great Bear – Draft" is still dated February 1,	Please refer to response to Comment C.1. The most recent water quality update occurred in August 2025.

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	Advanced Exploration, July 2025), the proportion of underground rock classified as potentially acid generating (PAG) may be as high as 70%, approximately double the value assumed in earlier assessments. This discrepancy raises concerns about the validity of the model's underlying assumptions and the absence of a sensitivity test to explore the implications of this updated geochemical context.	in a letter sent April 25, 2025, GBR subsequently provided a response in our June 12th, 2025, technical responses	2024. Source is not aware of any update to the water quality model since February 1, 2024, and it remains uncertain how these concerns have been addressed. As such, this comment has not been addressed.	
C.11	The water quality model lacks a sensitivity analysis. The water quality model includes numerous assumptions related to hydrological inputs, geochemical conditions, and contaminant loadings that are inherently uncertain. While the proponent includes both expected and conservative geochemical source terms, there is no indication that variability in factors such as climate conditions, streamflow, groundwater inflows, or operational changes over time were tested to understand how the model would respond to these fluctuations. Although the water balance model report considers wet and dry scenarios, those variations have not been carried through to the water quality predictions. In addition, there is no indication that the model incorporates confidence intervals or uncertainty bounds around its key assumptions, such as source term variability, treatment system performance, or climate inputs. The absence of an uncertainty assessment prevents reviewers from understanding the full range of	Please refer to responses in number 5 and number 10 above.	This comment has been marked as "closed" on the basis that it is being addressed in other responses (numbers 5 and 10). However, Great Bear Resources' approach (comment and response table) of copying excerpts from the July 7, 2025, technical memorandum and providing partial responses does not address the underlying concern.	Comment is closed

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	possible outcomes and limits confidence in the model's robustness.			
C.12	The proponent should re-evaluate the ETP design to confirm whether the proposed MBBR has sufficient capacity and the necessary treatment steps to effectively remove ammonia, nitrite, and nitrate to levels protective of the receiving environment. If nitrate is expected in the effluent, a denitrification stage should be added to the treatment train.	The ETP has been designed to achieve effluent limits that meet water quality guidelines for the protection of aquatic life in the receiving environment, under all receiver flow conditions, inclusive of the 7Q20 low flow condition, as per MECP policy requirements. A denitrification stage is not required to meet applicable water quality guidelines for nitrogen species in the receiving environment. As noted in Great Bear's letter to ANA dated February 5, 2025, responding to ANA comments received on September 6, 2024, a comprehensive follow-up monitoring and adaptive management framework is in place. This framework specifically addresses nitrogen species and includes: • Regular monitoring of effluent and receiving water concentrations; • Defined trigger thresholds for key parameters; and • Contingency measures to be implemented if observed concentrations approach or exceed trigger values. This approach reflects standard practice and provides the necessary flexibility and responsiveness to manage potential variability in	Based on the Kinross Great Bear – Veolia Process memo, the influent water is expected to contain 30–50 mg N/L of ammonia, which would be biologically oxidized to nitrate through the MBBR's nitrification process. However, without a denitrification step, this would likely result in high nitrate concentration in the treated water. Since there are currently no effluent limits proposed for nitrate, it is unclear how the ETP, as designed, would ensure compliance with Water Quality Guidelines (WQG) or effluent limits protective of aquatic life. As noted in previous Source's responses (September 5, 2024), Source maintains that adaptive management is not a replacement for protective effluent criteria limits. Effluent criteria limits should reflect the reasonable ability of treatment to remove parameters from effluent as well as site-specific considerations related to bioaccumulation, human exposure, cumulative impacts, and other ecological risks, rather than relying on the assimilative capacity of the receiving water body. The proposed discharge limits are far higher than levels treatment technology can reasonably treat to. As such, this comment has not been addressed. These recommendations remain still outstanding. **Recommendation:** The proponent should re-evaluate the ETP design to confirm whether the proposed MBBR has sufficient capacity and the necessary treatment steps to effectively remove ammonia, nitrite, and nitrate to levels protective of the receiving environment. If nitrate is expected in the effluent, a denitrification stage should be added to the treatment train. **Recommendation:** The system should be modeled and validated under reasonable and conservative nitrogen loading scenarios to ensure that treated effluent meets all	The technical basis for approval of the ECA ISW is sufficient and has occurred as per the appropriate regulatory regime in Ontario; please see response to Comment C.1. Also, as per our previous responses, the proposed effluent limits are both appropriate and protective of the receiving environment. The assertion that the absence of a denitrification step compromises compliance with water quality guidelines is not accurate and overlooks several key facts: – Effluent criteria were developed using conservative assumptions, including maximum discharge volumes coinciding with 7Q20 low-flow conditions, in accordance with MECP Policy B-1-5. These criteria ensure that downstream water quality objectives for aquatic life are met—even under worst-case scenarios. – Nitrate and nitrite are not expected to pose a risk to the receiving environment under the proposed mitigation and management options and treatment configuration. There is a proposed effluent limit for ammonia, and trigger measures for adaptive management (including addition of treatment trains or holding water etc.) for nitrate, nitrite and ammonia. – Agree, adaptive management is not a substitute for effluent limits—but a complement to them. The AEX Program includes robust mitigation and management measures, active water treatment, extensive follow-up monitoring, contingency storage, and modular treatment flexibility to respond to any deviations from expected performance. This approach is consistent with MECP's risk-based permitting framework and represents industry best practice. – The proposed effluent limits reflect both the reasonable capabilities of the treatment system and site-specific environmental conditions, as developed

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		nitrogen concentrations over time, without the need for additional treatment stages beyond what is currently proposed.	applicable discharge standards. In addition, the water quality model should be updated to reflect post-treatment concentrations of all nitrogen species, including nitrate, and assessed for compliance with downstream aquatic life guidelines. **Recommendation:** An effluent discharge limit should be established for nitrate to ensure treatment aligns with applicable provincial and federal water quality standards and to support the long-term effectiveness of the site's nitrogen management strategy.	by Hatch engineering. They are not technology-forcing, but rather grounded in what is achievable and protective, based on validated geochemical data, industry-standard treatment performance, extensive geochemical studies, and receiving water characteristics. While the reviewer disagrees with this position, we have made every reasonable effort to respond to the concerns raised. We are unable to provide further clarification that would alter the reviewer's perspective and therefore consider our response complete. No additional comment will be provided on this matter.
C.13	Source remains concerned about the uncertainties and limitations in the current water quality model. It is also important to note that the proposed ECA conditions also include effluent discharge limits for sulphate which are being reviewed by methylation experts for Grassy Narrows. The proposed effluent limits leave a narrow compliance margin, and if site conditions change or the influent sulphate concentrations increase beyond current estimates, the project may not be able to meet the proposed compliance requirements without additional treatment.	Please refer to response number 5.	Great Bear Resources' approach (comment and response table) of copying excerpts from the July 7, 2025 technical memorandum and providing partial responses does not address the underlying concern. This comment is regarding Sulphate Treatment (Comment 14 in the Source's technical memorandum dated July 7, 2025). Response number 5 does not address the concerns outlined herein. The proposed ETP does not include a treatment stage for sulphate. According to email correspondence from Kinross dated June 5, 2025, in response to the MECP's Sulphate Management Information Request, the company evaluated options such as Reverse Osmosis (RO) for sulphate removal. Kinross concluded that a dedicated sulphate removal system was not warranted due to the company's predicted concentrations of sulphate in the influent water and the expense. Source remains concerned about the uncertainties and limitations in the current water quality model. It is also important to note that the proposed ECA conditions also include effluent discharge limits for sulphate which are being reviewed by methylation experts for Grassy Narrows. The proposed effluent limits leave a narrow compliance margin, and if site conditions change or the influent sulphate concentrations increase beyond current estimates, the project may not be able to meet the proposed compliance requirements without additional	The technical basis for approval of the ECA ISW is sufficient and has occurred as per the appropriate regulatory regime in Ontario; please see response to Comment C.1 and Comment C.12. All data collected to date show that sulphate levels are extremely low. The only known, potentially applicable, treatment technology to further reduce sulphate is Reverse Osmosis (RO). RO systems present significant operational challenges, particularly related to brine and waste management. Implementing a brine management system to address a risk that has not been demonstrated would introduce unnecessary environmental and operational burdens. Based on the feedwater quality to the AEX Effluent Treatment Plant (ETP), expected to contain low levels of sulphate, use of a sulphate removal system such as RO is not warranted during the AEX phase. Background concentrations of sulphate will be met in the Chukuni River with AEX effluent discharge as per MECP Policy B-1-5. While the reviewer disagrees with this position, we have made every reasonable effort to respond to the concerns raised. We are unable to provide further clarification that would alter the reviewer's perspective and therefore consider our response complete. No additional comment will be provided on this matter.

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			treatment. Given the inherent variability of site conditions during construction, exploration, and closure phases, sulphate management strategies and relevant treatment technology should be evaluated further to support compliance. **Information Request:** The information package received includes a folder titled, "9. June 6 -2025 – Sulphate management," but this folder appears to be empty. Please provide the sulphate management document for review. **Recommendation:** Relevant available sulfate treatment technologies should be assessed for feasibility, effectiveness, and operational considerations. **Recommendation:** A sulphate removal system should be assessed and included as a potential contingency measure to support compliance. A sulphate management plan should include a clear and measurable trigger mechanism, based on influent and effluent sulphate monitoring results, which would initiate protective actions. ANA and their reviewers must be given an opportunity to review and comment on the finalized report before it is used to support regulatory decisions.	
C.14	The current water balance and water quality model (WBWQM) reports are based on a few years of baseline data collected before site groundwork began and are presented as a preliminary prediction. However, it remains unclear how the water balance and water quality model will be reconciled and updated over time to reflect actual site-specific monitoring data once construction and exploration activities begin. The model should not be static throughout the life of the project as this increases	Please refer to response number 5.	The proponent's response indicates that the water balance and water quality model (WBWQM) would be updated every three years and compared against monitoring results. However, the submitted WQM memo (Advanced Exploration Program (AEX) Water Quality Estimate Update, Great Bear – Draft, February 1, 2024) is based on a steady state model. This modeling approach does not account for temporal variability or transient changes in water chemistry and hydrology. Each project phase (construction, active closure, passive closure, and post-closure) introduces distinct water quality risks and management needs. A static model cannot capture the dynamic responses of groundwater and surface water systems to dewatering, changes in site	We acknowledge the reviewer's continued concerns regarding the modeling approach and update frequency for the Water Balance and Water Quality Model (WBWQM). As previously stated, the current steady-state model reflects a conservative approach appropriate. The model will be updated every three years and compared against monitoring results to support adaptive management and ensure alignment with site conditions. It is important to note that evaluation of closure-related water quality risks and management strategies was completed as part of the Closure Plan review. The Closure Plan for the Great Bear Project has been filed and approved, and includes consideration of water

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	the risk that predicted outcomes will become misaligned with the reality on the ground as site conditions evolve. Annual comparison between modeled and observed data is essential for keeping water management strategies responsive and effective. It is recommended that the WBWQM be updated on an annual basis to reflect changes in climatic conditions, operational flows, and site water storage volumes. These regular annual updates enable operators to make informed adjustments to pond management, flow controls, and overall system performance. Ongoing monitoring of pond levels and inflow/outflow dynamics not only supports operational efficiency but also enhances the early detection of deviations that could signal system vulnerabilities.		operations, climate variability, or evolving geochemical conditions. Without transient modeling, it is unclear how the proponent intends to reconcile monitoring results with predictive outputs or use those comparisons to adaptively manage water quality. The current approach risks misalignment between predicted and actual outcomes, potentially leading to ineffective or delayed mitigation measures. In addition, the proposed three-year update interval is not sufficient for a five-year permit term. A revision at the three-year mark occurs 60% of the way through the project, meaning that if the model is inaccurate, the proponent could operate under false or outdated predictions for the majority of the permit duration. At that point, the project may also be in a different phase (e.g., shifting from construction to operation, or into closure), such that monitoring data used for recalibration would not reflect the conditions of the upcoming two years. With no further model updates scheduled within the 5-year term, there is a significant risk that the model will not represent actual site conditions during later phases of work. **Recommendation:** The proponent should develop a transient water quality model capable of simulating time-varying conditions. This would allow for meaningful comparison to monitoring data. **Recommendation:** Updates should occur at minimum at each project phase change, to ensure monitoring data remain representative of actual conditions and predictive outputs remain reliable. This is necessary to ensure meaningful comparison with monitoring data, timely detection of deviations, and effective adaptive management.	quality conditions and mitigation measures across all closure phases While the reviewer disagrees with this position, we have made every reasonable effort to respond to the concerns raised. We are unable to provide further clarification that would alter the reviewer's perspective and therefore consider our response complete. No additional comment will be provided on this matter.
C.15	Surface Water Monitoring Plan – Recommendations **Recommendation:** The final Industrial Sewage Works ECA should	The final monitoring plans will be referenced in the conditions of approval and will therefore form part of the formal requirements of the final authorization. This will include the	The Proponent's response partially addressed the July 7, 2025, comment. The original comment also requested clarification on the locations of the surface water quality monitoring locations under the SWMP. Source assumed that the monitoring locations in the SWMP were the same	Coordinates, listed tables, and maps of proposed monitoring locations are provided in the monitoring plans submitted to support both the PTTW and ECA ISW applications, including the Surface Water Monitoring Plan.

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	include a complete list of surface and groundwater monitoring stations, including the locations listed in Table 1 of the AEX Surface Water Quality Workplan. Each station should also be associated with applicable regulatory thresholds (e.g., effluent limits, trigger criteria).	required surface water and groundwater monitoring locations, and corresponding UTMs.	as those listed in Table 1 of the AEX Surface Water Quality Workplan. This comment remains open pending review of the final draft ECA and attached SWMP. **Clarification:** Without coordinates or a spatial figure in the SWMP, it is difficult to assess whether the proposed water quality monitoring stations are appropriately located. Source requests confirmation from MECP/Kinross that the stations included in Table 1 of the 2023 Surface Water Quality Workplan correspond to those listed in the SWMP. **Recommendation:** Please revise the SWMP to include coordinates for the surface water quality monitoring stations. ANA and its technical reviewers need to review and provide comments prior to ECA decisions.	
C.16	Surface Water Monitoring Plan – Recommendations **Recommendation:** Trigger response plans are often broken down into several action levels, which escalate in severity from low to high risk. Table 4 provides an example structure for the Trigger Criteria that follows this standard approach. Source recommends that the MECP consider this approach for incorporation into the proposed ECA for review by ANA and others.	The proposed trigger response framework was developed in coordination with the MECP and is consistent with ECA ISW policy framework and associated guidance documents. There are no proposed changes to the wording of Trigger Criteria in this regard.	Source notes that the full comment, including Table 4, was not included in the Proponent's response to July 7, 2025, comments. Therefore, the response is missing key context and may be incomplete. The suggestions provided in Table 4 of Source's original memorandum expand upon the original proposed trigger response framework. Incorporating these recommendations would not undermine the guidance of the ECA ISW policy framework and associated guidance documents. It is important to emphasize that development of the Trigger Response Plan in coordination with MECP does not demonstrate, on its own, that the plan is sufficiently protective. Regulatory acceptance establishes a minimum compliance baseline, but it does not guarantee that the framework adequately addresses site-specific risks, ecological sensitivities, or cumulative effects. The fact that MECP was involved in its development should not preclude further improvement. Source offers these recommendations with the goal of ensuring that the TRP is as robust and protective as	see response to Comment C.1. While we acknowledge the recommendations provided, we remain confident in the structure and content of the Trigger Response Plan (TRP) is consistent with ECA ISW policy and framework and associated guidance documents. As stated in earlier responses there are no proposed changes to trigger criteria at this time by GBR. While the reviewer disagrees with this position, we have made every reasonable effort to respond to the concerns raised. We are unable to provide further clarification that would alter the reviewer's perspective and therefore consider our response complete. No additional comment will be provided on this matter.

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			possible, particularly given that adaptive management is central to the Proponent's overall mitigation strategy. A weak or incomplete TRP could undermine the effectiveness of adaptive management and increase the risk of delayed or insufficient responses to environmental stressors. **Recommendation:** Trigger response plans are often broken down into several action levels, which escalate in severity from low to high risk. Table 4 provides an example structure for the Trigger Criteria that follows this standard approach. Source recommends that GBR considers this approach for incorporation into the proposed ECA for review by ANA and others.	
C.17	Surface Water Monitoring Plan – Recommendations **Recommendation:** Trigger Criteria b should be revised to clarify which monitoring stations it applies to. Does it only apply at the end of the effluent mixing zone? Or at all impact monitoring stations?	Trigger criteria b applies to all off-site monitored surface water quality locations.	Thank you for the clarification. This comment remains open until the wording for Trigger Criteria b has been revised to clarify which monitoring stations it applies to. **Recommendation:** Trigger Criteria b should be revised to clarify that it applies to off-site surface water quality monitoring stations.	Trigger criteria identified in the Surface Water Monitoring Program for off-site monitoring locations apply to all off-site surface water monitoring locations, including Chukuni River (receiving environment) and other monitored watercourses (e.g. Dixie Creek).
C.18	Surface Water Monitoring Plan – Recommendations **Recommendation:** Trigger Criteria b references either the WQG PAL or "baseline equivalents". It is unclear which parameters will be compared against the WQG PAL, and which will be compared against "baseline equivalents".	Baseline equivalents are where baseline conditions are greater than WQG PAL, which will be documented in annual compliance reporting. There are no proposed changes to the wording of Trigger Criteria b in this regard.	The original comment has not been addressed. Wouldn't baseline period be over once construction on the Project begins? If so, the baseline conditions will not change over time with each annual report. At this time, the Proponent should have a sense of what parameters are naturally elevate above baseline concentrations. In addition, Source requested that the Trigger b concentration thresholds be defined for each parameter in the ECA. This recommendation was not addressed in the Proponent's response. **Information request:** Please confirm which parameters have baseline concentrations greater than WQG PAL, based on data gathered to date. **Recommendation:** The Trigger b concentration thresholds should be defined for each parameter in the ECA. This should include which thresholds are based on	The technical basis for approval of the ECA ISW is sufficient and will occur as per the appropriate regulatory regime in Ontario; please see response to Comment C.1 Baseline equivalents means concentration observed during baseline monitoring program, which yes, ends with the commencement of AEX Program discharges. This is to refer to existing concentrations greater than WQG PAL in baseline conditions, which are not an effect of the AEX Program (for example, arsenic in the Chukuni River). While the reviewer disagrees with this position, we have made every reasonable effort to respond to the concerns raised. We are unable to provide further clarification that would alter the reviewer's perspective and therefore consider our response complete. No additional comment will be provided on this matter.

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			WQG PAL, and which are based on baseline concentrations.	
C.19	Surface Water Monitoring Plan – Recommendations: The intent of Trigger Criteria c should be clarified. Revised trigger response plan should be circulated to ANA and other reviewers for review and comment prior to the issuance of any ECA decision.	More plainly, Trigger Criterion C means that if concentrations of parameters with Water Quality Guidelines for the Protection of Aquatic Life (WQG PAL) are consistently increasing in the receiving environment, an "investigation of cause" will be triggered—even if there is not yet a clear long-term trend indicating that the guideline will be exceeded. There are no proposed changes to the wording of Trigger Criteria c in this regard.	Thank you for the clarification. **Recommendation:** Source requests that Trigger c be updated to include the language in the Proponent's response.	Agree, the language will be included in the final ECA ISW approval, as requested.
C.20	**Recommendation:** To ensure a proactive approach, trigger a should be revised to detect concerning trends earlier. A lower threshold (such as 80%) is recommended to initiate root cause analysis and early stage mitigation. These revised trigger levels should be consulted on, subjected to technical review, and incorporated into the proposed ECA.	The current trigger structure, including Trigger A, was developed in alignment with the MECP policy and reflects a risk-based framework that is both technically defensible and appropriately protective. Trigger A is designed to detect exceedance risk based on modelled predictions and observed data and is supported by additional triggers that respond to increasing trends and parameter variability. No single trigger is intended to operate in isolation. Rather, the full suite of triggers works together to provide early warning, guide investigation, and implement mitigation if needed. This integrated approach, combined with regular monitoring and adaptive management, ensures that potential	The response to this comment is confusing. Source's original comment requested a lower threshold (e.g., 80%) for Trigger a. At this threshold, the Proponent would initiate a root cause analysis and identify early-stage mitigations. In response, the Proponent states that "A revision to Trigger A is not warranted, no changes to the trigger criteria have been made in this regard." However, the comment later commits to the 80% trigger threshold. This comment remains open pending review of a revised TRP **Recommendation:** Please revise the trigger response framework to incorporate the lower threshold (i.e., 80%) committed to in the round 1 response. These revised trigger levels should be consulted on, subjected to technical review, and incorporated into the proposed ECA.	The technical basis for approval of the ECA ISW is sufficient and has occurred as per the appropriate regulatory regime in Ontario; please see response to Comment C.1. To clarify, the trigger criteria in the surface water monitoring program document are currently as follows: – Three consecutive final effluent sampling results exceed 90% of the monthly average effluent limit for any parameter, including sulphate, with an associated increasing trend, based on application of the Mann – Kendall non-parametric test. – There is an observed statistical trend towards increasing parameter concentrations in the receiving environment, including sulphate, mercury and methylmercury, based on application of the Mann – Kendall non-parametric test, such that there is a likelihood of applicable Water Quality Guidelines for the Protection of Aquatic Life (WQG PAL), or baseline equivalents, being exceeded in the

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		risks are identified and addressed in a timely and effective manner. A revision to Trigger A is not warranted, no changes to the trigger criteria have been made in this regard. GBR will commit to the lower 80% trigger threshold.		receiving environment (beyond the mixing zone) should the trend continue. – Additionally, in the case of the British Columbia Protection of Aquatic Life guideline for total mercury, although the BC guideline is based on the average concentration of total mercury in water as measured over a 30-day period (based on five weekly samples); an adaptive management approach will be implemented where individual monthly results show exceedance of the guideline. In which case mercury and methylmercury sampling is to occur weekly. Should exceedances still be observed, BC's complete approach to monitoring will be followed.
C.21	**Recommendation:** Trigger Criteria b should be rewritten to ensure a proactive approach to protecting receiving environment water quality. Please see Table 4 for recommendations. These revisions should be adopted as enforceable conditions of the AEX ECA.	Revisions to Trigger Criterion B are not necessary. The existing language is consistent with MECP policy and supports a proactive, risk-based approach to protecting receiving water quality. No changes are proposed.	Please see Source's Evaluation of the response to Comment 16.	The technical basis for approval of the ECA ISW is sufficient and has occurred as per the appropriate regulatory regime in Ontario; please see response to Comment C.1
C.22	**Recommendation:** The proponent should reevaluate the ETP design to confirm whether the proposed MBBR has sufficient capacity and the necessary treatment steps to effectively remove ammonia, nitrite, and nitrate to levels protective of the receiving environment. If nitrate is expected in the effluent, a denitrification stage should be added to the treatment train.	A response was provided to ANA on February 5, 2025, addressing the concerns raised about nitrogen species in ANA's letter dated September 6, 2024. Please see response to comment 12.	Comment Closed. As suggested, Source's evaluation of response is provided in Comment 12.	
C.23	**Recommendation:** Relevant available sulfate treatment technologies should be assessed for feasibility, effectiveness, and operational considerations.	Please see response to comment 12.	The Proponent already copied and pasted this Source's comment in Comment 13. It appears redundant. Please see Comment 13 for Source's evaluation of response.	Acknowledged. Please see response to comment C. 13.

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	Recommendation: A sulphate removal system should be assessed and included as a potential contingency measure to support compliance. A sulphate management plan should include a clear and measurable trigger mechanism, based on influent and effluent sulphate monitoring results, which would initiate protective actions. ANA and their reviewers must be given an opportunity to review and comment on the finalized report before it is used to support regulatory decisions.			

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24 October 2025

Via email
Steven Carrasco
Ontario Ministry of Environment Conservation and Parks
40th St Clair Ave W, Foster Building 14th Floor
Toronto, Ontario M4V 1P5

Subject: Ministry of Environment, Conservation and Parks ("MECP") – Great Bear Resources Ltd. ("Great Bear") – Advanced Exploration (AEX) Program – Permit to Take Water ("PTTW") – Environmental Compliance Approval ("ECA") – ERO No. 025-0579

This letter accompanies our responses to comments sent on behalf of Asubpeeschoseewagong Anishinabek ("**ANA**") on the Great Bear Advanced Exploration (**AEX**) Program, which were submitted in the following documents:

a. Letter dated 19 August 2025 from MDAG;

b. Letter dated 24 August, 2025 from Brian Branfireun;

c. Technical Memorandum "Source Evaluation of Great Bear Resources' Responses to Summary Comments on AEX ECA" dated 30 August 2025; and

d. Technical Memorandum "Source Evaluation of Great Bear Resources' Response to Summary Comments on AEX PTTW" dated 13 September 2025.

These documents are entirely repetitive of comments to which Great Bear has already responded. As you will see, Great Bear refers MECP to its previous responses.

1. Indigenous Community interest in the AEX Activities and the Application

The Province included three communities on the consultation list for permits related to the Great Bear project: Lac Seul First Nation ("**LSFN**"), Waubuskang First Nation ("**WFN**") and ANA.

LSFN and WFN have filed letters of support for Great Bear's AEX permits, including the PTTW and ECA, and are further engaged in negotiations with Great Bear for an agreement that would establish the basis upon which the Project would proceed with their support. Conversely, ANA has been clear in its engagement with Great Bear, MINES, MECP and IAAC that it will oppose the Project regardless of the Project information, risk management measures, or Project accommodations that Great Bear offers.[1]

2. The repetitive nature of the comments

ANA's expert letters and technical memoranda raise no novel issues or concerns. Instead, they state that the responses that Great Bear has provided do not satisfy ANA. Providing the specific data and performing

[1] See page 3 of the ANA letter to IAAC and MINES on 6 March 2024.

the specific tests that ANA demands is not a reasonable approach and is not based on any credible scientific or legal foundation.

Great Bear has engaged with ANA extensively since 2022 including engagement with the many rounds of comments provided by ANA's experts.[2] These comments have become repetitive and, as a result, Great Bear has been obliged by MECP to respond comments that it has already responded to, in some cases many times. Great Bear already responded to all the issues raised by ANA in the latest round of comments so it is unproductive to provide future Great Bear response comments. The permit review record would be extended but not improved.

MECP should end this open-ended loop of repetitive comments. This approach is unnecessary and procedurally unfair to Great Bear. It also allows ANA to hijack the permitting process causing endless delay. Where there is a disagreement between ANA and Great Bear on the data provided or the testing and modeling performed, MECP must decide the issue based on the merit of the information on the record. That is MECP's role as decision-maker,

3. The Duty to Consult has been met

As stated in Great Bear's letter dated 15 August 2025, the Crown has met the Duty to Consult by the standards set out in the Ontario policy and applicable case law.[3] Moreover, MINES, MECP and Great Bear have engaged with ANA on the "higher/deeper" end of the "Consultation Spectrum".[4] ANA has had a reasonable opportunity to express their interests and to comment on all aspects of the requested permits. MECP must now make a decision on those permits.

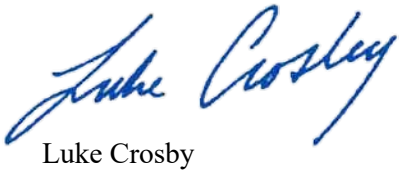
4. Concluding Comments

Great Bear has provided more than adequate information to support the issuance of the requested permits. This permit review has far exceeded all comparable permit reviews of this nature in time and volume of information requested. Accordingly, Great Bear does not intend to respond to future information requests related to the PTTW and ECA. MECP must conclude this review and issue its decision.

Thank you for your prompt attention to this urgent issue.

Sincerely,

GREAT BEAR RESOURCES LTD.



Luke Crosby

[2] See summary of Great Bear engagement with ANA attached to the Great Bear letter to MECP on 15 August 2025.
[3] See page 3 of the Great Bear letter to MECP on 15 August 2025
[4] See Consultation framework: implementing the duty to consult with Aboriginal communities on mineral exploration and mine production in Ontario | ontario.ca at "Consultation Spectrum"

KINROSS

Advanced Exploration Project

Great Bear Resources Ltd.'s (GBR) Response to September 13th, 2025 Letters from Source Environmental.

Source Evaluation of Great Bear Resources' Responses to Summary Comments on AEX ECA

Table 2: GBR Response to September 13th, 2025 Letter.

#	July 23, 2025, Source Comments & Rational	July 24th, 2025, Great Bear Resource Response	Sept 13th, 2025, Source Evaluation Response	GBR Response
C.1	*The proponent should submit an updated Water Quality Model (WQM) report that incorporates and addresses the outstanding technical issues raised in Source's memorandum titled "Review of Great Bear Advanced Exploration Program ECA ISW Application – Follow-Up Comments on Latest Technical Materials" dated July 7, 2025. ANA and their reviewers must be given an opportunity to review and comment on the updated report before it is used to support regulatory decisions.*	GBR has previously addressed this comment in its June 18, 2025, submission titled 'Great Bear Resources Ltd.'s Response to Source Environmental Associates Inc. Technical Memorandum – Review of Great Bear Advanced Exploration Program – Permit to Take Water Application for Dewatering (Updated), dated April 11, 20	Source previously reviewed Great Bear's June 18, 2025, response, including Attachment 1 (Water Quality Model memo). The Attachment 1 was considered a latest WQM memo by the Proponent. Source's July 7, 2025, memorandum, titled "Review of Great Bear Advanced Exploration Program ECA ISW Application – Follow-Up Comments on Latest Technical Materials" highlighted concerns that remains following the review of the latest WQM memo. Almost all comments concerning the WQM remain outstanding, as provided in the Source's follow-up evaluation of Kinross' response on the ECA, dated August 8, 2025. For context and tracking purposes with respect to the review of PTTW, the following background information was included in the July 7, 2025, Source's PTTW memo (C.1): The proponent's response to the previous review comment on the absence of a water quality model asserts that the PTTW Application focuses strictly on water quantity, and that matters related to water quality are instead addressed under the Environmental Compliance Approval (ECA) for Industrial Sewage Works (ISW). However, this division between water quantity and quality is problematic from a technical perspective. The PTTW Application proposes dewatering activities that will generate contact water requiring management and discharge to the environment. The projected water takings are based on predicted inflows to the underground workings and surface contact areas, which depend on both groundwater and surface water contributions. Moreover, changes to groundwater flow patterns, heads, and volumes can impact water quality throughout the site, including in areas that may not contribute flow directly to the underground workings. Altering groundwater gradients can mobilize contaminants or induce mixing between geochemically distinct water sources. These water quality effects may not be captured within the scope of the ECA, particularly if the affected groundwater is not collected and treated. As such, understanding the quality of these inflows is essential for evaluating the potential risks to receiving environments and determining appropriate mitigation strategies. Separating water quantity and water quality assessments into entirely distinct regulatory silos is therefore technically unsound. The groundwater system does not distinguish between these two elements. Contaminant loads and water volumes are inherently linked. For the purpose of environmental protection, it is critical that both aspects be evaluated together to identify how inflow water volumes and chemistry may interact and evolve, particularly in the early phases of dewatering and during periods of operational change.	We acknowledge the concerns raised in the July 7 and August 8, 2025 memoranda regarding the integration of water quantity and quality assessments. To clarify, the Water Quality Model (WQM) memo referenced in your July 7, 2025 comments was previously shared with ANA as Attachment 1 to our June 18, 2025 response. This memo represents the most current version of the WQM and was developed to support the Environmental Compliance Approval (ECA) for Industrial Sewage Works (ISW). We understand that some concerns remain regarding the scope and integration of water quality considerations within the Permit to Take Water (PTTW) application. While the PTTW application focuses on water quantity, we recognize the interconnected nature of groundwater flow and water quality. Accordingly, the Hydrogeological Monitoring Plan includes water quality triggers designed to identify and respond to potential changes in groundwater chemistry that may arise from dewatering activities. These triggers are intended to ensure that any water quality impacts are detected and addressed in a timely manner, supporting the overarching goal of environmental protection. We appreciate the importance of a holistic approach and remain committed to ensuring that both water quantity and quality considerations are appropriately addressed through the coordinated implementation of the PTTW and ECA frameworks.

#	July 23, 2025, Source Comments & Rational	July 24th, 2025, Great Bear Resource Response	Sept 13th, 2025, Source Evaluation Response	GBR Response
C.2	*The proponent should provide further detail on the implementation status of the grouting program, including the number and location of boreholes treated to date, plans and schedules for sealing remaining boreholes (both inside and outside the mine footprint), methods for verifying sealing effectiveness, and confirmation of how boreholes (both sealed and unsealed) are represented in the groundwater model.* *Further, the proponent should assess and disclose the potential hydrologic effects of both historical and planned exploration holes on model parameters, groundwater flow patterns, and water balance predictions. If necessary, sensitivity analyses should be conducted to evaluate the uncertainty introduced by these features. This information needs to be provided to validate that potential high-permeability pathways created by historical drilling activities have been adequately mitigated and incorporated into the site's hydrogeological model and water management strategy.*	GBR has previously addressed the grouting comment in its June 18, 2025, submission titled "Great Bear Resources Ltd.'s Response to Source Environmental Associates Inc. Technical Memorandum – Review of Great Bear Advanced Exploration Program – Permit to Take Water Application for Dewatering (Updated), dated April 11, 2025" and 'Great Bear Resources Ltd.'s (GBR) Response to Minesite Drainage Assessment Group Document – Great Bear Mining Project – Comments on the New 2025 PTTW Application, dated April 11, 2025'. The impact of the open exploration holes on the model results should be considered in relation to the area of their influence, their size, the size of the model and site stratigraphy. Most exploration holes are very small with a radius of less than 1", while the groundwater model domain is very large, covering 180 km2, (of which only a very small portion is influenced by open exploration holes). The area of influence of open exploration drillholes under drilling and testing conditions was 30m, it would be far less under typical, undisturbed gradient conditions. Furthermore, the open exploration holes are completed in bedrock, are capped to prevent artesian flow, and largely located in areas with thick clay cover, such that they have little influence of surface water flows. Almost none of the 109 points used for model calibration are located close to open exploration drillholes, and as such the drillholes will not have had a significant impact on the model calibration. They could have a significant impact under conditions of high gradients, such as near a dewatered underground facility, however, given they will be grouted in proximity to the ramp, the condition is not applicable and not simulated.	GBR acknowledged that open boreholes could have a significant impact under conditions of high gradients, such as near a dewatered underground facility. In its June 17, 2025 response, GBR indicated that it had initiated a grouting program in February 2024 to seal exploration boreholes, and that the program was ongoing as of that date. While GBR states that industry-standard grouting techniques are being used, it also concedes that any ungrouted boreholes intersected by underground workings could result in increased groundwater inflows until grouting is completed. Given that the proponent has drilled more than 2,500 exploration holes, it remains unclear which boreholes have been successfully grouted and which remain open. This represents a significant source of uncertainty for the hydrogeologic model and associated water management predictions. At the time of writing, no comprehensive accounting has been provided to demonstrate the status of borehole sealing across the project area. To reduce this uncertainty, the Proponent should provide a map and inventory that clearly identifies the location and grouting status (sealed versus unsealed) of all boreholes within the project boundary. Any ungrouted boreholes within the zone of influence described in the hydrogeological analysis of the PTTW Application have the potential to act as preferential flow pathways, thereby impacting model calibration, groundwater flow predictions, and ultimately the water quality prediction. Accordingly, the grouting program should also be clearly documented, summarized, and tracked for ANA's review prior to the regulatory decision on this PTTW Application. This document should also be used to reconcile with the water balance and water quality predictions of mine inflows. This comment remains unaddressed.	We acknowledge the reviewer's continued concern regarding the grouting of exploration boreholes and its potential influence on groundwater flow predictions. As previously communicated, Great Bear Resources Ltd. (GBR) addressed this comment in its June 18, 2025 submission titled "Great Bear Resources Ltd.'s Response to Source Environmental Associates Inc. Technical Memorandum – Review of Great Bear Advanced Exploration Program – Permit to Take Water Application for Dewatering (Updated), dated April 11, 2025" and in the response to the Minesite Drainage Assessment Group Document dated April 11, 2025. The potential impact of open exploration holes on the groundwater model has been carefully evaluated in relation to their physical characteristics, spatial distribution, and the overall model domain. Most boreholes are small in diameter, completed in bedrock, capped to prevent artesian flow, and located in areas with thick clay cover, limiting their influence on surface water and groundwater dynamics. Their area of influence under undisturbed gradient conditions is minimal, and they are not proximate to the majority of model calibration points. We also note that GBR is bound by the conditions and limitations of the Permit to Take Water (PTTW), which governs water takings and associated management practices. These regulatory constraints ensure that groundwater inflows and related risks are managed in accordance with provincial requirements. We remain confident that the work aligns with the permit application requirements for a Permit to Take Water (PTTW) and an Environmental Compliance Approval (ECA) in the province of Ontario. While the reviewer disagrees with this position, we have made every reasonable effort to respond to the concerns raised. We are unable to provide further clarification that would alter the reviewer's perspective and therefore consider our response complete. No additional comment will be provided on this matter.
C.3	*"Table 1-1 of the PTTW application (May 2025) lists the amount of water requested from each individual source, with a stated total of 2,555 m3/day. However, summing the individual daily water taking values results in a total of approximately 2,865 m3/day (or 1.05 Mm3/year) during the construction phase and 2,805 m3/day after the first year."*	Table 1-1 was copied from the groundwater modelling report that does not include 250 m3/day taken from Dixie Creek, which is a surface water source.	Please revise the Table to reflect a correct total amount of requested water taking.	We remain confident that the work aligns with the permit application requirements for a Permit to Take Water (PTTW) and an Environmental Compliance Approval (ECA) in the province of Ontario. While the reviewer disagrees with this position, we have made every reasonable effort to respond to the concerns raised. We are unable to provide further clarification that would alter the reviewer's perspective and therefore consider our response complete. No additional comment will be provided on this matter.
C.4	*"While the [GBR] response recognizes uncertainty in aquifer yield, it ultimately downplays the predicted 55% baseflow reduction without presenting concrete mitigation measures or a reasonable ecological justification. Several issues remain*	Because of the small quantity of groundwater involved, the hydrologic impact of the flow reduction in terms of hydrologic conditions, even if the percent change in the model simulated groundwater component, appears large. Unnamed Watercourse is a sizeable watercourse (9.4 km2), such that the equivalent water contribution of	While the proponent frames the predicted 55% reduction in baseflow as a small absolute volume and a contingency-only concern, this response does not address the fundamental operational and ecological risks identified in Source's original comment. Source requests for: • Trigger Criteria for Supplementation – In Comment C.5 below, GBR indicates that	We acknowledge the reviewer's continued concerns regarding the hydrologic impact to the Unnamed Watercourse and the proposed supplementation wells. These issues have been addressed in previous submissions, including our assessment of groundwater contributions, seasonal flow variability, and the

#	July 23, 2025, Source Comments & Rational	July 24th, 2025, Great Bear Resource Response	Sept 13th, 2025, Source Evaluation Response	GBR Response
	unresolved: *• Ecological Risk Mischaracterized: The assertion that Unnamed Watercourse 3 is often dry in winter does not address the potential impact of sustained flow reductions during other seasonal periods (e.g., spring and summer). A modeled 55% reduction in baseflow represents a substantial change in hydrologic regime, with potential consequences for aquatic habitat that extends beyond natural seasonal variability.* *• Lack of Proven Yield for Supplementation Wells: The response relies on bedrock permeability values from the groundwater model, which were not intended for production well design. No aquifer pump testing has been conducted to confirm that the wells can meet the required supplementation volumes.* *• Reliance on Undemonstrated Flexibility: The proponent's reliance on a "sufficiently flexible permit" to drill additional wells as needed transfers key risk management actions to a future stage, without assurance of feasibility of success. There is no backup plan for supplementation failure beyond proposing additional wells, despite the acknowledged low yield of the receiving aquifer. This reactive approach introduces the risk of prolonged periods during which supplementation is insufficient to protect the watercourse. A lag in expanding well capacity could lead to flow deficits during critical ecological windows. A proactive and tested contingency plan is needed to ensure timely and reliable delivery of supplemental flow.* *Potential Ecological Effects of Groundwater Supplementation: The use of groundwater to replace a larger portion of surface water flow (up to 55%) raises concerns about compatibility with the existing aquatic ecosystem. Groundwater may differ from surface water both in physical and chemical parameters. This potential has not been evaluated."*	groundwater to the watercourse decreases to as low as 0.1mm/year, which for context, is much smaller than the evaporation rate. This is a large part of the reason that there are periods of no flow or very little flow (<100 m3/day) are also observed during the summer and early fall conditions as well as the winter. This watercourse is a runoff dominated watercourse, and it is these factors that dominate the ecological characteristics of the feature. It is proposed to evaluate the potential flow reductions in relation to a reference watercourse, to help assess the impacts of seasonal weather variation, and largely eliminates the needs to predict unknown future climatic conditions. The proposal to use the supplementation wells should be viewed as a contingency. The 55% simulated loss is derived from a model being used to assess potential changes. Actual changes are likely to be much less and could fail to trigger the need for supplementation. The slow development of the ramp, over 5 years, also means that the drawdown cone can be assessed with time, and the need or supplementation re-assessed. The wells do not have to be available immediately. In terms of differing quality, the objective is to replace the loss of groundwater contributions from the till and shallow bedrock with water drawn from these horizons and hence providing an approximate like for like replacement.	the threshold for assessing flow reduction for this project based on local conditions is set at a 20% flow reduction relative to a reference watercourse. The PTTW must clearly define quantitative thresholds and method for initiating supplementation. • Timing of Supplementation Infrastructure – Supplementation wells must be installed, tested for sustainable yield, and proven operational prior to any construction activities that could reduce flows in Unnamed Watercourse 3. The proponent's reliance on "progressive development" and post-impact reassessment creates a risk of extended low-flow conditions before mitigation can be implemented. • Confirmation of Groundwater Quality – Once supplementation wells are installed, groundwater quality should be tested and compared against surface water at the receiving environment for assessing adequacy of the supplementation. • Contingency for Well Failure or Insufficient Yield – The plan must include specific contingencies for scenarios where wells do not meet target volumes or fail mechanically, ensuring that supplementation commitments can be met without delay during critical flow periods. These measures are necessary to ensure that supplementation is timely, effective, and capable of protecting ecological flow needs. Without them, the PTTW would permit a high risk of delayed or ineffective mitigation, leading to potentially significant and avoidable ecological impacts.	contingency nature of the supplementation strategy. As stated, the watercourse is runoff-dominated, and the modeled groundwater reduction,while expressed as a percentage, is minimal in absolute terms and unlikely to materially affect ecological conditions. The supplementation wells are proposed as a precautionary measure, with deployment contingent on observed conditions over time. We remain confident that the work aligns with the permit application requirements for a Permit to Take Water (PTTW) and an Environmental Compliance Approval (ECA) in the province of Ontario. While the reviewer disagrees with this position, we have made every reasonable effort to respond to the concerns raised. We are unable to provide further clarification that would alter the reviewer's perspective and therefore consider our response complete. No additional comment will be provided on this matter.
C.5	*The proponent should conduct aquifer pump testing to confirm the sustainable yield and operational feasibility of the proposed supplementation wells. They should also evaluate the ecological flow needs of Unnamed Watercourse 3 and justify the target supplementation volume relative to accepted environmental flow thresholds. Environmental flow guidance often recommends preserving 90% or more of natural flow to protect aquatic habitat (e.g., British Columbia Environmental flow needs policy), and this should be used as a benchmark in assessing the adequacy of mitigation and management strategy. A detailed and proactive contingency plan should be provided to address the risk of insufficient flow during well development or failure. Finally, the proponent should assess the*	Pumping tests to evaluate the yield will be completed once the wells are established. Note that the threshold for assessing flow reduction for this project based on local conditions is set at a 20% flow reduction relative to a reference watercourse.	The proponent has indicated that aquifer pumping tests to evaluate the yield of supplementation wells will be completed only after wells are established, and that the threshold for assessing flow reduction will be based on a 20% reduction relative to a "reference watercourse." However, it appears that the proponent has not identified which reference watercourse will be used, nor provided the criteria for its selection. Without a defined reference system and baseline dataset, the comment remains unaddressed. Prior to any dewatering, the Proponent should: • Identify the reference watercourse(s) and selection criteria. • If not already available, collect several years of baseline flow data (high, medium, and low flow years). • Justify the 20% threshold against accepted environmental flow standards A permit condition should require completion and submission of a reference watercourse study, including baseline monitoring results and ecological flow analysis,	We disagree pumping tests to evaluate the yield are required prior to establishing the wells. We remain confident that the work aligns with the permit application requirements for a Permit to Take Water (PTTW) and an Environmental Compliance Approval (ECA) in the province of Ontario. While the reviewer disagrees with this position, we have made every reasonable effort to respond to the concerns raised. We are unable to provide further clarification that would alter the reviewer's perspective and therefore consider our response complete. No additional comment will be provided on this matter.

#	July 23, 2025, Source Comments & Rational	July 24th, 2025, Great Bear Resource Response	Sept 13th, 2025, Source Evaluation Response	GBR Response
	potential ecological implications of replacing surface flow with groundwater. This information should be submitted to ANA and its technical reviewers for consideration prior to any decision on the PTTW application.		before work begins.	
C.6	*The proponent should conduct a sensitivity analysis on groundwater recharge rates under observed and plausible near-term drought and climate change scenarios, including multi-year precipitation deficits and higher evapotranspiration rates.*	This is assessed by comparing the water taking impacts, developed under typical, annual average conditions to very low flow conditions, which is conservative, as this considers stream flows under dry conditions to mine dewatering under wetter conditions. Using this conservative approach, the predicted flow reductions in Dixie Creek are below the threshold. Keep in mind that for operations, the flow reductions will be compared to a reference watershed, which will be experiencing the same seasonal conditions as Unnamed Watercourse 3. This eliminates the need to rely of highly theoretical calculations about possible future climate conditions.	GBR's response frames its approach as "conservative," comparing water taking impacts under typical annual conditions to low flow conditions, and asserts that this eliminates the need to evaluate future drought or climate change scenarios. However, reliance on a single "conservative" assumption does not address the underlying concern: if the model inputs carry large uncertainties, errors in those inputs may be compounded, and the predictions of flow reductions may not be protective. A sensitivity analysis is still needed to be conducted. This analysis should quantify the range of error in key parameters (e.g., recharge rates, aquifer storage, hydraulic conductivity) and test how these uncertainties influence predictions of flow reductions under both normal and stressed hydrologic conditions. Without such analysis, it cannot be demonstrated that the PTTW application adequately accounts for uncertainty or that the risk of underestimating flow reductions in Dixie Creek watershed is acceptably low. In addition, please refer to the comment C.5 for discussion on the reference watershed.	We acknowledge the reviewer's continued recommendation for a sensitivity analysis. As previously communicated, GBR has assessed water taking impacts by comparing typical annual conditions to very low flow scenarios which is a conservative approach that evaluates stream flows under dry conditions against mine dewatering during wetter periods. Predicted flow reductions in Dixie Creek remain below threshold values. For operations, flow reductions will be compared to a reference watershed experiencing the same seasonal conditions, eliminating the need for speculative modeling of future climate scenarios. We do not consider a sensitivity analysis necessary and maintain that our approach is protective and consistent with the requirements of the Permit to Take Water (PTTW). This comment has been addressed. We remain confident that the work aligns with the permit application requirements for a Permit to Take Water (PTTW) and an Environmental Compliance Approval (ECA) in the province of Ontario. While the reviewer disagrees with this position, we have made every reasonable effort to respond to the concerns raised. We are unable to provide further clarification that would alter the reviewer's perspective and therefore consider our response complete. No additional comment will be provided on this matter.
C.7	*The proponent should clarify the site-specific thresholds or indicators that would guide water taking decisions under low flow conditions. This should include operational protocols for modifying or reducing water takings in response to observed stress in the receiving environment. Providing this clarity would improve alignment with MECP's sustainable water use objectives.*	This has previously been assessed. Inflow into the underground is controlled by gradients and not by pumping. Adjustments in pumping from the underground only result in a change of water accumulating in the underground but do not measurably reduce flow reductions in creeks.	Comment closed.	
C.8	*The proponent should provide the transient model and associated outputs for review, including:* *• Drawdown and flow hydrographs over time* *• Simulated heads at key monitoring points and surface water features* *• Sensitivity analysis on recharge, pumping schedules, and aquifer storage* *• Calibration data, model input/output files, and documentation of model* *• Error analysis and confidence intervals for all inputs and outputs* *Given the coarseness of the model and the known*	GBR has previously addressed this comment in its June 18, 2025, submission titled 'Great Bear Resources Ltd.'s (GBR) Response to Minesite Drainage Assessment Group Document – Great Bear Mining Project – Comments on the New 2025 PTTW Application, dated April 11, 2025'. The steady state approach is accepted by groundwater professionals worldwide and is not a limitation. Additional transient work would result in smaller, but less conservative predicted changes in stream flow. However, given that, with the existing conservative approach, stream flow impacts are less than 20% of flows in Dixie Creek, there is no benefit in terms of mitigation measures to undertaking further transient modelling. Furthermore, the uncertainty introduced with the	The proponent continues to assert that steady-state modeling is "conservative" and sufficient for impact assessment. However, this claim does not address the primary concern raised in our original comment, that steady-state outputs cannot capture the timing, rate, and seasonal variability of groundwater responses to dewatering, which are critical for effective adaptive management. Uncertainty exists in both steady-state and transient models, and in modern groundwater modeling practice, transient calibration against monitoring data is a standard, accepted approach for increasing predictive confidence over time. In fact, the proponent's stated plan to "compare against a reference watercourse" would be more effective if supported by a transient framework capable of simulating seasonal variability and operational changes. Our position remains that the proponent should provide the transient modeling outputs referenced in their response, along with documentation of model assumptions, calibration, and sensitivity testing. This is necessary to: 1. Evaluate potential early-stage and seasonal impacts on surface water features.	We disagree with the reviewer's position that transient modelling should be undertaken, for reasons that have been clearly outlined in previous responses. We remain confident that the work aligns with the permit application requirements for a Permit to Take Water (PTTW) and an Environmental Compliance Approval (ECA) in the province of Ontario. While the reviewer disagrees with this position, we have made every reasonable effort to respond to the concerns raised. We are unable to provide further clarification that would alter the reviewer's perspective and therefore consider our response complete. No additional comment will be provided on this matter.

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	limitations of steady-state assumptions, this additional information is essential to ensure that the predicted impacts are appropriately captured and that planned mitigation measures are effective. Without this, there is a risk that hydrologic and ecologic impacts to receiving environments may exceed predictions, with potentially adverse effects on aquatic species and habitat.	addition of storage parameters, could reduce confidence in the results. The use of steady state model results applied to very low flow conditions is already sufficiently conservative and consistent with groundwater industry standards. Finally, in practice, during operation, flow reductions will be addressed by comparison to a reference watercourse, which is experiencing the same seasonal and climatic conditions as the nearby creeks.	2. Support Trigger Action Response planning for adaptive management. 3. Assess shutdown and restart scenarios for drought or operational contingencies.	
C.9	*N/A*	N/A	This comment from July 7, 2025 Source's technical memorandum was not responded: Water Taking during Construction Activities The scoped PTTW application previously included a construction-phase water taking volume of 953 m^3/day associated with dewatering the 4 Pond excavation. In the May 2025 version of the PTTW application, this specific activity and its associated volume are no longer explicitly identified in Table 1-1. It is understood that the updated application may rely on steady-state groundwater modeling to estimate a more "conservative" (i.e., higher) overall dewatering volume, which could implicitly include this component. However, given the distinct timing and operational nature of the 4 Pond excavation dewatering, it is not clear whether this activity has been excluded, reclassified under broader underground dewatering, or otherwise accounted for. Clear documentation is needed to confirm that peak construction-phase demands have been fully captured and appropriately represented in the requested water takings.	The most recent PTTW Application includes all the takings required for construction and operations of the GBR AEX project. We remain confident that the work aligns with the permit application requirements for a Permit to Take Water (PTTW) and an Environmental Compliance Approval (ECA) in the province of Ontario. While the reviewer disagrees with this position, we have made every reasonable effort to respond to the concerns raised. We are unable to provide further clarification that would alter the reviewer's perspective and therefore consider our response complete. No additional comment will be provided on this matter.

1. **Executive Summary**

Client Name:	Kinross Gold Corporation	Project No: Great Bear	
Project Name:	Great Bear Gold Project		
Meeting Type:	In-Person [ ]	Virtual [X]	Hybrid [ ]
Location:	Virtual		
Time:	14:00 – 15:00 EDT		
Date:	November 19, 2025		
Executive Summary:	Meeting between Grassy Narrows First Nation and Kinross. Dialogue on free, prior and informed consent. Technical discussion on sulphate discharge, water management and environmental commitments. Kinross provided an update on AEX activities in regard to permitting and water use compliance. Data sharing and next steps in consultation were also discussed.		
Key Actions:	- Share updated ML/ARD reports when available for main mine - Prepare written submission on fish consumption rates and risk assessment methodology - Schedule follow up meeting on agreement and potential future funding		

2. **Attendance**

ANA:

Joseph Fobister
David Sone
Dan Mossip-Balkwill
Jackie Esmonde
Sydney Lang

GBR:

Luke Crosby
Eric Lamontagne
Aaron MacDonnell
Connor Devereaux
Ashley Moncrief
David Bursey (Bennet Jones)

Notes:

ANA – Quick introduction of team members. No one new that Kinross has not met before from ANA side.

Kinross – Most of the same team. Ashley Moncrief is our Environmental Manager and Connor Devereaux is our Permitting manager. Eric Lamontagne is also supposed to join the call. Eric is our senior project leader and most senior technical person on the project.

Kinross – Eric confirmed he is present on teleconference

ANA – Introduction from Joseph Fobester the chief negotiator for my community. Want to talk about our land protection team and our mandate comes from the people of Grassy Narrows. It was developed to protect the people, the water, the land and environment in Grassy Narrow's territory. My people have suffered from relocation racism flooding residential schools and the contamination of our water our culture has been under constant attack our spirituality was nearly wiped out through colonization my people did not give up our inherent rights. We did not give up our right to govern ourselves, we did not give up our traditional territory, our right to traditional trapping or hunting. We did not agree to have our rivers and land contaminated or poisoned, my community wants to secure a healthy environment for our children and those yet to be born. We agreed to share our land on conditions that we would continue to live our way. We have enacted laws to protect our land that extended beyond our reserve boundary is our traditional territory, this is our hunting area, our medicine, our food that is a place where we go to heal our people. Section 35 of the Canadian constitution recognizes and affirms the original treaty rights of the Anishinaabe people of Canada. These rights are constitutionally protected the United Nations declaration on the rights of Indigenous People have recognized a right to self-determination and we can move freely and we can freely determine our political status and governance. Industry must obtain free power informed consent before implementing measures that may affect us particularly regarding land and resource development and we call on you to respect our laws and our rights.

Kinross - thank you for that introduction. We originally requested the meeting and thought it would be a good opportunity to speak as we haven't done so in this format in quite some time and I appreciate we had an agenda that was prepared by Grassy Narrows and we're ready to speak to it if you want to move to those items.

ANA – we can proceed to the agenda, the first item on the agenda is to start that conversation around the need for free prior and informed consent and that relationship with grassy narrows. There is a clear ongoing request for a relationship with Grassy Narrows that's grounded in free prior and informed consent.

Kinross - We appreciate this and we've had this conversation before and you know we are we are not going to give that consent right contractually that's not something we're going to do. The provincial crown and the federal crown don't recognize the free prior informed consent right, they have policies to pursue that and to engage to try to seek to achieve consent but it's not an absolute right

ANA - so you're saying you won't honor the law of Canada and the laws of grassy narrows

Kinross - the law of Canada does not recognize a right of free prior informed consent the federal and provincial policies are to seek consensus which is what Kinross has done

ANA – I think we're going to have a problem as stated in the opening statement that we demand that you respect the laws of the land and the laws of our community

Kinross - we understand the position of grassy narrows on this matter we have a different legal interpretation, and we've had this conversation going on three years now and neither side seems it has changed their view in terms of legal interpretation.

Kinross – Also putting aside the legal interpretation Kinross has provided all the information to grassy narrows on this same level as LSFN and WFN so we've provided all the information so the practical implication of that demonstrates respect that the companies afforded in this case and also funded Grassy Narrows efforts to review the information as well

ANA - we haven't really had a fair opportunity to engage in this process because the project start four years before we learned about this uh this project.

Kinross - we've had this conversation before we believe that we've engaged with grassy narrows very transparently early upon our acquisition of this project we've provided every piece of information that we've provided to the other communities that we're consulting. From the back and forth and the letters that we've seen and that you've written in our responses we believe that grassy narrows does have a very clear understanding of the project activities, the project itself and what we've been up to so we do disagree somewhat but we acknowledge that there was a period of time before we own this property but since we've owned it we've engaged consistently and transparently since 2022

ANA - it's hard to engage with the speed this is moving because we have a lot of problems in the community we're dealing with. The ability to engage in a meaningful way is an ongoing problem because of some things you know we can't control and focus on this project.

Kinross - we understand there are challenges and that we limited means for us to address those admittedly one of the ways that we have attempted to address that is through capacity funding for advisors and experts to allow for review of the materials. We have also reached out and made offers of potential opportunities for us to help in community. It's something we remain open to a discussion beyond capacity funding through the agreement

ANA - Grassy Narrows dealing with a mercury crisis and other situations and our water was already contaminated and we need to have meaningful engagement to understand what other potential contamination may come from your operations.

Kinross - no additional contamination caused by our project is contemplated but we want to help you understand that. We want you to understand our project and our activities and we hope you'll understand it the way we do but that hasn't been the case to date but we're certainly open and will continue to share information, provide capacity support to help to understand that information and we think we've demonstrated that commitment to date

ANA – we have presented our expert reports and they disagree with some of your reporting.

Kinross – we agree there is disagreement amongst our experts on some of this and want to continue the discussion

ANA - we need to understand what you're going to put in our water and this is good segway to talk about point three in the agenda in regards to sulphate discharges. From the communications we know that this is a contaminant of particular concern. We have seen in some of the documents filed through the federal impact assessment process that indicate intention to address sulfate. Could you explain to us what is your commitment around sulfate levels and guidelines

Kinross – One clarification for the main project and IAAC process is there have been no commitments on sulfate discharge levels. We have covered desulfurization methodologies that we have included in the design of the project but not specific sulphate levels in the discharge. Our team can explain further some of the methodologies and technologies we're contemplating for the main project

ANA – In regard to advanced exploration you have ECA permit and for main mine presumable there would be an ECA permit that may address sulphate levels. Is Kinross indicating there is a sulphate objective for AEX but not the main project. Can you expand on AEX

Kinross – for AEX, we have made a commitment to meet the background concentrations of sulfate within the mixing zone of the discharge. We're also attempting to understand the relationship between sulfate and mercury in the Chukuni river watershed. We are considering attempting to replicate the riverbank study that's often referenced that was done in the Wabigoon watershed. We would look at synthesizing our effluent from the main mine and potentially mimicking the study in the same laboratory conditions. We had reached out and we were asking for some of the QAQC data and methodologies of that study as it would help us understand how to properly mirror that study in our conditions. If that information is available to us it will help us understand for our work.

For the main project we are modeling the potential of our project would have any impact on methylmercury production in the system and we have made significant commitments from the outset. This includes desulfurization of the tailings product which will make our tailings essentially NPAG. We are also looking at membrane filtration which is often reverse osmosis treatment for the process water which is the highest concentration of sulfate from the site from current modelling. These are significant capital investments that we're making to reduce sulfate concentrations now. One item to note is you can't selectively treat for sulfate if you treat for sulfate you remove all and you basically make distilled water. The by product of this is brine from membrane filtration which needs to be managed as well. This includes storage on surface so we're looking at it very seriously as we know it's a concern for the community. Those are the steps we are taking for the main mine. Again, for AEX we will meet background concentrations within the mixing zone but this is not technically feasible for the main project.

ANA - when you say you can't commit you are you saying you can't commit right now because you need to do more studies or you'll never be able to commit for the main mine

Kinross - from a technological perspective it would not be achievable is our view at this time. We have requested for detailed data supports from the Branfireun study which we've received one response from Grassy Narrows saying that they will not provide this information. There is also an External Technical Review that has been established by the federal government that will be reviewing the information provided in the Impact Statement.

ANA – We are hoping to gain an understanding of the recommendations that come out of that process and modeling work for the main mine when you share it with us.

Kinross – To clarify we will meet background but for the main project the mixing zone will be a bit. The objective for the annual average concentration for sulfate is about 400mg/L that was used as modelling assumption. The team is telling me its around 300m where we would meet background for the main mine under current assumptions.

ANA – so that is for the main project and sulphate of 400 mg/L

Kinross – the modelling looks at life of mine and where the effluent concentration will be the highest. The majority as previously mentioned comes from the tailings facility itself and also the destruction of cyanide. We need to use sulfate to destruct cyanide and all of this process water will be treated with membrane filtration

ANA – for the Grassy Narrows team it would be good to get this all in writing that there is this commitment with respect to achieving background concentrations for AEX. For the AEX achieving background within 300 meters where should we look to see that all in writing

Kinross - if the government shared a draft permit with you or proposed conditions around the AEX it is in there. It was a commitment we made directly to the provincial government for AEX. We have a draft condition in the ECA

for AEX. For the main mine you'll see it in the documents we're going to be sending to Grassy Narrows before end of year which are the technical supporting documents for the impact statement.

ANA – we need to see a copy of that and given that it's grassy narrows people who are going to be eating the fish downstream of project and the population the concern applies to

Kinross - it is our understanding that the province has shared that information. We can say we are not resisting this condition and don't think we have something formal that we could show you a declaration of non-resistance but you know we've accepted the draft permit conditions.

ANA - I think you acknowledged and think we can all agree there's been many areas of disagreement but this may an area where something can be done Grassy Narrows in response to their concerns

ANA - it sounds like Kinross is trying to get grassy narrows a letter making this commitment

Kinross - we can discuss further but it's going to be in our permit and we've agreed to the draft condition so I don't know what a further commitment would mean

Kinross – Additional clarification when you characterize a lot of things where we disagree and say nothing we can do. Kinross is taking comments seriously and doing its best to deal with the disagreements about science but different points of view by experts is not something we can address.

ANA – we are not going to agree today on a summarizing statement about how things are going but we are hearing Kinross is committed to not increasing sulfate in the Chukuni River above background within a few meters of the discharge point for AEX and to not increase above background in the Chukuni river during the life of the mine after the mixing zone of a few hundred meters. Grassy Narrows expects anyone who makes a commitment would put it in writing and stand by it.

Kinross - we're making the commitment to the government and will be a permit condition. Respectfully the commitments being made to MECP and we're confirming that to you and providing additional information.

ANA – it a very important commitment to a key concern that Grassy Narrows has made and it would be an important part of building the relationship and the trust

Kinross - We're listening, we just want to make sure we have an accurate report of what is being discussed.

ANA – due to time we should move questions about the portal construction. We know from the media reports that there's been some steps taken towards construction of the portal. The portal construction was in the permit to take water that was the subject of the successful leave to appeal application and was later withdrawn. Some of the water takings were related to the construction of the portal. What work have you completed and what are you working on and does it involve the taking of water particularly taking of water more than 50,000 per liters per day

Kinross – we can assure you that everything that we've done to date has been reviewed and inspected and is within the parameters of the existing permits that we do have today. We have completed as much as we could do without moving water. There are ponds that we have stored water and have been working with MECP understanding snow conditions given that we don't have any authority to move water. Storing water on site isn't what we want to do responsibly we would like the permission to be able to move water so that we're not creating any additional risks but right now there is no movement of water on site over the 50 000 liters a day. We have dug out the storage ponds and storing water on site. We are also doing grading to ensure the water drains to the ponds as opposed to off site. General earthworks ongoing and utilities that would fall under the closure plan. Until we have the ECA and the PTTW it's just those activities of moving materials and grading and creating pads.

ANA - Have you completed the box cut and dug out the portal?

Kinross – Yes, we've created the box cut but not to the portal. Once we break collar to go underground is where we would need the ECA and the dewatering activities for pumping water out of the area. so the surface materials have happy route until you break collar to go underground has been removed for the box cut and then the collar so once we break to go underground is where we need the ECA for the dewatering activities

ANA – To follow up you are digging but not underground. You haven't been doing underground but have you got into bedrock?

Kinross – for the portal itself we aren't going at depth yet we've only exposed the bedrock

ANA – At the collar location you've removed all the overburden down to the bedrock in the box. What is happening with rain water or water that collects in the box cut

Kinross – water is collecting there right now. We have also shot created and bolted the sides for stability of the rock features but there is no work beyond that going in that area until we can move the water out

ANA - how deep is this area from ground level?

Kinross – do you have this figure off the top of my head but we can follow up

ANA - how is this different from what you proposed to do in the PTTW application

Kinross - we're not pumping water out of here above the 50,000 L/ day limit and we're not pumping water off-site

ANA - so are you not pumping water or you're not pumping water off-site

Kinross – Both, we're not allowed to mechanically pump water beyond the threshold that was previously mentioned. The only thing that we're allowed to do is under the 50 000 liters/ day which is tracked and it's for dust suppression mitigate other potential environmental impacts. Water used for dust suppression stays on site collects in the same ponds referenced earlier.

ANA – Can you send the information about the depth, the amount of water being taken or pumped within the site on daily basis.

Kinross - Water for dust suppression we have the data and will provide

ANA - Our experts that we've been working with need ML/ARD reports, data and to evaluate potential contaminants that could be generated by this project and that they can't assess what kind of treatment is needed for example or what the impacts would be on fish, people, environment without those studies being completed

Kinross - all of this data and reports are completed and it's with the MECP. They've asked to get this data and be the ones that that exchange it with Grassy Narrows. For the AEX that's the updated metal leaching and acid rock drainage assessment report but there's another more extensive report for the main mine that will shared in December with ANA for the Impact Statement.

ANA – Understand December okay thanks for drawing that distinction. We have been receiving some of the chapters that you've been submitting and some technical reports as part of IAAC process. So these reports will be shared in similar fashion.

Kinross - As it as it becomes available we will provide it to ANA prior to sending in the formal submissions to IAAC

ANA - We touched on it previously about Grassy Narrow's concerns and how the company is responding to what our experts are saying and how the company has responded to date. It certainly appears to the community that we have experts who are raising you know significant concerns and Kinross disagrees with what the experts are saying. It is helpful to hear today talking about sulfate and what the company is doing around that but we do note that from the community's perspective it hasn't felt like a good and meaningful process to date

Kinross - yes we acknowledge and as mentioned earlier we acknowledge our experts do disagree on some of technical aspects. We shared information and what we have done to address these and we've already spoken about one which is the advanced exploration permit having a sulfate discharge limit. We have exchanged a lot of letters back and fourth and are at a point there's a lot of disagreement between our experts on some things but I don't think it's fair to say that we have not thought about them or attempted to address any of them. We have certainly made in our view a lot of reasonable changes to our project to address these issues. Some of the items we do not agree with and cannot commit to. We recommend we continue this discussion once you have had a chance to review the addition information from MECP.

Kinross - the way it was presented, reasonable people can reasonably disagree and reasonable experts could reasonably disagree but beyond that Kinross for the AEX project is following leading industry practice, it's not just experts disagreeing, Kinross is listening and doing a lot of things that are far beyond what other comparable situations

Kinross – we will add that from our perspective it will be the most heavily regulated conditioned AEX project in the province. Kinross realizes water quality is an important issue for all the communities and particularly Grassy Narrows so we're looking at what can be done and the sulphate discharge is one example.

ANA – a lot can be said about it and the disagreement is on display now but we hope with the insertion of additional Ontario personnel into the process that might help some of the communication

Kinross – we have been in discussions with MECP to engage directly with Grassy Narrows. The other alternative is there's another call similar to this. It always helps to talk and understand the other side because maybe the disagreement isn't as big as the perception

ANA - on that topic is there anything else Kinross wanted to say since you called the meeting

Kinross - we wanted to check in as we haven't done a meeting like this in a while we do have some specific questions particularly us in terms of status of the TK work that's been ongoing there's a couple of requests to validate information and reports we wanted to ask about those directly because we haven't seen any updates or received responses to some of those we did want to ask again specifically to share the riverbank backup study information and we also wanted to give an opportunity to the community and the land protection team to ask us some of the questions we've been discussing and it appears kind of news to this team that we committed to a sulfate limit for AEX for example.

ANA - we can give you some quicker responses to the questions posed. If you are planning to replicate the professor Branfireun's method we think the most effective way to do that would not be to the see the QAQC on his data but rather to send him a copy of your work plan for the experiment and to invite him to review it and others. Our expectation is that you would be sharing this type of information. He would be the best place to review your methodology and to tell you whether you are effectively replicating his methodology. In regard to the plan to use Chan et al 2005 fish consumption rates for your risk assessment and asked grassy narrows to validate. At this time Grassy Narrows does not believe that's a valid method and we are preparing a written submission to you explaining the reasons for that. For the TK study we have previously communicated that the work on that is

ongoing but there is not current project like that and it will take years not months to complete. We will let you when there is information available to share

Kinross: do you intend to share that with us

ANA: there's nothing the community could share at this time as it is in the very preliminary stages and as we communicated at the beginning the land use and occupancy studies typically take three to five years. It will also be up to the community on what is shared with Kinross from this study.

Kinross: Follow up question about the human health risk assessment. You had mentioned that our methodology or assessment may not be correct but will your response include consumption rates that we should consider for Grassy Narrows? You have disagreed with the Chan et al secondary source that we utilized but it would be helpful if you can provide the appropriate fish consumption rates

ANA: We understand you are using that as an input for the risk assessment that we haven't seen yet. That is just one part of the bigger assessment that needs to occur.

Kinross: Correct that's one piece of the overall human health risk assessment. That document comes at the end as it takes into account results from numerous other studies in the Impact Statement.

ANA: We haven't seen the methodology yet but you did share how you plan to model mercury and again we think it's best to give input early and integrated early so that we don't get to the end with a product that you consider final and then we say well you follow the wrong methodology. If the methodology can be shared sooner than later for feedback.

Kinross – We don't see an issue with that as we follow the federal guidance and IAAC TISGs but we'll circle back on that one for sure

ANA - Grassy Narrows has been quite clear hat out of the box approaches for this unique situation may be required rather than most instances whether they're provincial or federal were not developed taking a community that's been poisoned by mercury downstream of the project into account. This is important in all aspects whether it's the fish consumption guidelines or human health risk assessment work

ANA: we're a little bit over time any additional follow up before we adjourn. I'm not sure if we got all of those questions so we can follow up with an email if that is okay. The other item to touch on quickly is the agreement and we were going to come back and talk about some other pieces of it and potentially future funding. Propose that we schedule another call with a smaller group for that discussion.

Kinross: We are available in December to facilitate a follow up meeting. Appreciate everyone taking the time and see value in these conversations, we don't always agree on everything but I do think there's value in hearing each other's sides, thank you

MEMO

To: Kinross, Ontario, Canada, ETR Panel

From: Grassy Narrows Land Protection Team

Date: November 28, 2025

RE: Preliminary comments on fish consumption and risk assessment

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1. Introduction

Great Bear Gold has asked for Grassy Narrows' comments on the use of fish consumption data from a 2005 report by Dr. Laurie Chan in the context of a risk assessment for the federal Impact Assessment.

A fulsome response will require Great Bear to share its proposed risk assessment methodology with Grassy Narrows, and will also require time for Grassy Narrows to obtain expert review. In addition, accurate figures for current fish consumption would require a robust current consumption survey in Grassy Narrows with a community validated methodology. However, on a preliminary basis, this submission outlines significant concerns with any reliance upon data that reflects consumption rates that are far below historical rates because of the decades-long mercury crisis. To the contrary, this Project should base its risk assessment on Grassy Narrows' Treaty-protected right to fish and its goals of remediating the river system to such a degree that this right can be fully exercised.

In addition, we outline the need to consider the unique risks to Grassy Narrows. Grassy Narrows members have already been exposed to high levels of mercury and expert evidence establishes that they cannot safely be exposed further.

We repeat our request that Great Bear share its proposed risk assessment methodology, guidelines and proposals for any other studies and assessments (including those with respect to methylation) in advance for Grassy Narrows' review. We reserve the right to make further comments after we have received details of the proposed risk assessment methodology and obtained expert advice.

2. Risk assessments and guidelines must be protective of the full scope of Grassy Narrows' Treaty protected right to fish

a) The Treaty Right to Fish

The right to fish and eat fish safely is an inherent right given to the people of Grassy Narrows by the Creator. The practice of fishing and consuming the fish is integral to Grassy Narrows' self-determination. These rights are recognized and protected internationally by the UN Declaration on the Rights of Indigenous Peoples, to which Canada is a signatory. Canada has committed to full implementation of the Declaration. The right to fish is also a Treaty right recognized and protected by section 35 of the constitution of the Crown.

Indeed, Treaty #3 Commissioner Simon Dawson reported to the Legislature that:

> "I am in a position to say that, as an inducement to the Indians to sign the Treaty, the commissioners pointed out to them that, along with the land reserves and money payments, they would forever have the use of their fisheries. This point was strongly insisted on and it had great weight with the Indians, who for some years previously had persistently refused to enter into any Treaty."

Indigenous fishing and fishing rights are different from the rights of the general population, and even different from other subsistence fishers. The US Environmental Protection Agency (EPA) developed a guide for subsistence fishing with the collaboration of representatives from Native American Tribes. It indicates:

> "EPA recognizes, however, that Native American subsistence fishers are a unique subsistence fisher population that needs to be considered separately. For Native American subsistence fishers, eating fish is not simply a dietary choice that can be completely eliminated if chemical contamination reaches unacceptable levels; rather eating fish is an integral part of their lifestyle and culture. This traditional lifestyle is a living religion that includes values about environmental responsibility and community health as taught by elders and tribal religious leaders. Therefore, methods for balancing benefits and risks from eating contaminated fish must be evaluated differently than for the general fisher population" (US Environmental Protection Agency, 2000, as quoted in Mergler, 2015, p. 23).

These observations apply equally to Grassy Narrows.

Caution must be taken in using data that does not reflect historical rights and current trends. Fish consumption is growing in Grassy Narrows. As part of the community's commitment to restore its cultural practices, younger people are learning to fish and eat what they catch. Fishing is becoming very popular. This has many benefits for Grassy Narrows' wellbeing, way of life, and nutrition. Regulatory decisions need to keep these young fishers safe while allowing them to practice their Anishinaabe way of life and support the safe revival of the fishery.

It is not acceptable, nor is it legal, to allow Grassy Narrows' fish to become, nor to remain, contaminated in a way that prevents the meaningful and safe exercise of their inherent, Aboriginal, and Treaty rights.

b) Grassy Narrows fish consumption and use prior to mercury

For countless generations, and immediately before mercury pollution came to light, fishing was a cornerstone of Grassy Narrows' sustenance, livelihood, and way of life. Grassy Narrows had

90-95% employment, mostly in the sport and commercial fishing industries (Usher, 1979, Vecsey, 1985).

Most Grassy Narrows people who worked in the fishing industry ate fish for lunch and then brought home fish for their family to eat at dinner.

In the 1960s the average Grassy Narrows person ate 200 lb of fish each year, with the vast majority of that fish being walleye (Usher, 1979).

c) Grassy Narrows' fish consumption reduced due to mercury

Grassy Narrows people have suffered from the mercury contamination of their fish, which they first learned about in 1970. Grassy Narrows' fish remain mercury contaminated, and mercury levels in walleye have not improved in a statistically significant way in the English River near Grassy Narrows since the early 1990s (Neff et al, 2012). As a result, the commercial fishery remains closed, and the Ontario Ministry of Environment Conservation and Parks continues to issue highly restrictive consumption advisories.

The mercury contamination of Grassy Narrows' fish has led to a dramatic reduction in the amount of fish that Grassy Narrows people eat, a dramatic decline in Grassy Narrows' sportfishing industry, and a cessation of the commercial fishing industry.

By 1978, Grassy Narrows fish consumption had declined by nearly 90%, and more recent consumption studies reflect a 95% decline in fish consumption compared to levels before 1970 (Chan, 2005; FNFNES, 2014).

Current fish consumption levels reflect the response of Grassy Narrows people to a high level of pollution, and a high level of impact on their health, wellbeing, rights, livelihood, environment, and way of life. They reflect an ongoing and devastating mercury crisis. Respect for Grassy Narrows' Treaty rights, in particular its right to fish, will require a reversal of this trend rather than a continuation or worsening of this state of affairs.

d) Remediation goals

Grassy Narrows has long demanded that the English River and its tributaries be returned to their uncontaminated state. In 2017 the Government of Ontario committed to partner with Grassy Narrows in the timely and comprehensive remediation of mercury and other contaminants in the English and Wabigoon Rivers.

Grassy Narrows' primary remediation objective is to:

1. Reduce mercury concentrations in fish traditionally consumed by Indigenous peoples on the river system to levels that are safe for subsistence consumption by present and future generations. Subsistence consumption includes not just the species and amounts of fish, but also the manners in which the fish were consumed and the locations in which they were fished before the river system's contamination by mercury.

   For Grassy Narrows this means reducing mercury concentrations in fish in the English River system to levels which are safe to consume 200 lbs of fish per person per year, with the large majority of that fish being walleye larger than 45cm. If that is not possible, then mercury concentrations should be reduced to pre-contamination background levels.

Additional remedial objectives support the primary objective and include:

2. Eliminate significant ongoing and potential future sources of mercury to the English-Wabigoon Rivers system from the Dryden Mill Site and vicinity, and other potential industrial sources.

3. Eliminate ongoing, and potential future, sources of mercury to the English-Wabigoon Rivers system from mill contaminated sediments (including banks, wetlands, floodplains, and wood wastes), with priority given to those contaminated sediments that contribute most to mercury levels in fish.

4. Reduce mercury uptake in the food chain by reducing mercury methylation and bioavailability.

5. Reduce mercury concentrations in sediment, water, and biota to levels that would be present if there were no discharges from the Dryden mill and other industrial sources.

6. If other contaminants associated with the mill pose a risk to human health and/or the environment, then reduce levels of those contaminants in fish and other biota with focus on fish that are consumed by Indigenous peoples.

There are further objectives with respect to employment and benefits for Grassy Narrows people, respect for Grassy Narrows' Indigenous knowledge, and respect for Treaty rights.

While the formal remediation objectives for the project have yet to be set by the Minister, there has been near consensus at the English and Wabigoon Rivers Remediation Panel on these, or similar, objectives.

All decisions with respect to pollution in the river system must be made in a way that supports the timely and comprehensive achievement of these remediation goals.

e) The Chan Report (2005) is not a valid basis for risk assessment

Great Bear proposes to use the Chan Report (2005) as a basis for estimating Grassy Narrows fish consumption. The Chan Report is flawed and should not be relied upon for risk assessment.

Chan's report merely corroborates the fact the Grassy Narrows people reduced their fish consumption by approximately 90% in response to the brutal impacts of a decades-long and ongoing mercury crisis. This standard, which reflects sustained attacks on Grassy Narrows ability to enjoy their Treaty right to fish, is not a benchmark to guide future industrial activities. To the contrary, it must be reversed. Any reasonable risk assessment should protect Grassy Narrows right to fish and therefore must be based on their 1960s fish consumption rate (200 lb of fish each year, mostly walleye). Anything less is inconsistent with Grassy Narrows' goal and Ontario's legal obligation to comprehensively remediate mercury in the English River system and support Grassy Narrows's ability to safely practice their right to fish.

However, even if the Chan Report's dramatically reduced fish consumption rates are used, such rates still result in mercury exposure levels in Grassy Narrows that, on average, exceed US EPA guideline levels, and often exceed Health Canada levels. For example, Dr. Mergler (2015) considered mercury exposure using Dr. Chan's data and found that in Grassy Narrows in 2003, the average mercury intake over the year was 0.2µg/kg body weight/day, with men having higher average intakes compared to women (0.3 µg/kg body weight/day vs. 0.1µg/kg body weight/day).

There is an important caveat to using this data. Average intake data included people who do not eat fish; if the analysis had included only fish-eaters, the average mercury intake would have been higher.

By season, the highest mercury intake was by men in summer and spring (3.7 µg/kg body weight/day). Approximately 25% had estimated intakes above the Canadian TDI and 41% were above the US-EPA RfD. The average mercury intake for Grassy Narrows women in 2003 was above the US-EPA RfD of 0.1 µg/kg body weight/day.

As Mergler shows, even at Chan's dramatically reduced fish consumption rates, mercury exposures in Grassy Narrows often exceeded established (not site-specific) guideline levels.

f) Probabilistic and seasonal approach to fish consumption estimates

A reliable risk assessment process must follow a rigorous probabilistic approach. Some shoddy risk assessments use only average exposure levels. This approach is especially problematic in Grassy Narrows where many people have been forced to dramatically reduce their fish consumption due to mercury. Reliance on averages obscures and masks the most serious risks facing those who continue to practice their right to fish.

It is critical to account for the full range of fish consumption rates and exposure levels within Grassy Narrows. For example, Chan calculated that the average yearly local fish consumption in Grassy Narrows in 2003 was 20g/day, but in older men (+61 years of age) consumption averaged 60g/day. A community average approach would fail to identify and address the three-fold higher exposure for male Elders and would likely fail to protect them.

Even in Chan's relatively small sample size, which made no effort to target heavy consumers of fish, there were individuals who experienced seasonal exposure 12x the mean. While Chan's mean 2003 hair mercury was 1.3 µg/g, the highest individual hair segment was 15.5 µg/g. In 2004, Harada reported that one person had a concentration of 25 µg/g (Mergler, 2015, p.52). Again, simply using the mean would not protect the individuals most in need of protection – those who continue to practice their right to fish regularly.

The pattern of fish consumption in Grassy Narrows includes periods of high fish use when out on the land at family cabins and landuse areas. Walleye make up approximately 90% of fish consumed and large fish are favoured for their high yield and ease of preparation. While 45 cm length-standardized walleye in a body of water may have 0.7 ppm (µg/g) mercury, larger walleye may have a 2 ppm or higher.

Importantly, the specific fetal impacts and impact upon pregnant persons must be taken into account. For example, a pregnant person who weighs 100 kg may eat 500g/day of flesh from a large walleye containing two ppm mercury each day for four days while at their family cabin. This would translate into exposure of 10 µg/kg/day, many times above both EPA and Health Canada guideline levels, for a period of time that is critical in the development of the fetus.

Again, simply using averages with respect to consumption and fish mercury would obscure and fail to protect against this important risk to the next generation.

> "There is now a very large number of studies on prenatal exposure to mercury and adverse health effects, most notably on children's neurodevelopment" (Mergler, 2015, p. 34). Furthermore, "A growing number of birth cohort studies show that the foetus is particularly sensitive to methylmercury neurotoxicity and even very low concentrations of exposure can affect future cognitive capacity and behaviour" (Mergler, 2015, p. 48).

Fetal and early childhood impacts can be severe and lifelong. Scientific evidence consistently shows that prenatal and early childhood exposure to mercury is linked to lasting reductions in children's cognitive abilities. These deficits persist into adolescence and adulthood, with higher prenatal mercury levels associated with increased rates of learning disabilities and long-term impairments in brain function and intelligence. While current reference doses are meant to protect fetuses and children, they may not be sufficiently protective because mercury concentrations in cord blood can exceed those in maternal blood (Mergler, 2015, pp. 14-15).

"A 22-year follow-up study of children of mothers with high mercury exposure shows that there are still deficits in major domains of brain function as well as general intelligence in relation to their cord blood mercury concentrations; the geometric mean of their current blood mercury concentrations was 2.53µg/L and hair mercury 0.68µg/g. The lowest reference dose for the protection of foetus and children is the US EPA reference dose (5.8 µg/L blood mercury; 1 µg/g hair mercury)" (Mergler, 2015, p. 14-15).

A risk assessment should account for heavy land users/fishers, higher mercury levels in large fish, the practice of eating large fish, the patterns of fish consumption, and the most at-risk segments of the Grassy Narrows population. It should use a methodology capable of protecting all Grassy Narrows people and should be robust at least at two standard deviations from the mean.

3. Guidelines for mercury consumption must be site-specific

a) Tailored Impact Statement Guidelines requires no increase in mercury methylation downstream of the Project

The starting point for Great Bear's risk assessment is the Impact Assessment Agency of Canada's (IAAC) Tailored Impact Statement Guidelines (TISG) (2024), which requires

Great Bear to demonstrate no increase in methylation of mercury in the waters downstream of the project. The TISG directs that the Impact Statement must:

> "describe the methods for **ensuring that the rate of methylation of mercury downstream of the Project does not increase as a result of the Project**, taking into account physicochemical parameters, biological parameters, and chemical constituents of surface water that can contribute to the methylation of mercury" (IAAC, 2024, p. 59, emphasis added).

IAAC also directs Great Bear to take into account existing mercury exposure in Grassy Narrows and to ensure no increase in methylmercury in the fish, including those fish consumed by people of Grassy Narrows. The TISG states:

> "Efforts should be made to ensure that existing methylmercury exposure in nearby human receptors are factored into the HHRA, particularly when assessing impacts on Grassy Narrows First Nation community members in the HHRA." (IAAC, 2024, p. 90).

> "The Impact Statement must describe the proposed mitigation and enhancement measures for any potential effects on the health of Indigenous Peoples. In particular, the Impact Statement must: …identify mitigation to **avoid human health effects caused by changes to the quality of country foods from potential changes in mercury methylation rates downstream of the project site**" (IAAC, 2024, p. 93, emphasis added).

No matter what guideline is chosen to assess risk of mercury exposure for fish consumption for the Great Bear project, the project cannot contribute to any increase to mercury methylation downstream.

b) No additional exposure is safe for Grassy Narrows

Grassy Narrows is unique due to their high past, and ongoing, exposure to mercury. Indeed, in a nationwide Health Canada mercury biomonitoring programme running from 1970-1992, among 71,842 measurements from 38, 571 individuals the highest mercury reading recorded was a man from Grassy Narrows who had 660 ppb mercury in his blood/hair samples (Philibert et al, 2020).

Given these unique circumstances, standard risk assessment procedures do not apply because they have been developed as guidance for lifetime safe fish consumption in the general population, which has not been exposed to high levels of mercury. Those guidelines are not

protective for a community like Grassy Narrows, which has already been exposed to “high concentrations of mercury in fish for many years and individuals and the community are suffering the effects” (Mergler, 2015, p.24).

According to Dr. Donna Mergler, professor emerita and renowned expert in mercury’s impact on human health, “When estimating the risk for mercury poisoning in Grassy Narrows, it is necessary to account [for] past exposures (including prenatal exposure), as well as present exposures" (Mergler, 2015 p.27).

Furthermore, “further exposure will build on the damage already present. The guidelines for mercury intake refer to ‘over a lifetime’. If exposures have been higher in the past than at present, the intake guidelines do not apply since over the lifespan, one’s intake will be higher than those recommended by the guidelines” (Mergler, 2015, p. 25).

Based on detailed review of decades of research on mercury in general and on the impact of mercury poisoning in Grassy Narrows, Dr. Mergler’s expert opinion is that “There is no question that the mercury already present in the Grassy Narrows area poses important risks to health and well-being to the community and that any further addition of mercury would increase that risk” (Mergler, 2015, p. 27).

After reviewing the extensive scientific literature on mercury and on Grassy Narrows, Mergler concludes that “Any increase of exposure to this already ‘sensitive’ community would further compound the harm to the health and well-being of the present and future generations” (Mergler, 2015, p. 53).

In summary, Grassy Narrows people are unique because of their past and ongoing mercury exposure. Many Grassy Narrows people have already exceeded the lifetime safe exposure to mercury amount and are experiencing intense impacts to their health and wellbeing as a result. Grassy Narrows requires that the mercury levels in their fish, and the consequent exposure to Grassy Narrows people be reduced. No increase to the levels of mercury in fish in the English River and its tributaries is safe for Grassy Narrows. Indeed, the levels of mercury in fish must decrease.

c) Existing guidelines do not apply

As noted above, Dr. Mergler’s expert opinion is that existing intake guidelines for mercury exposure “do not apply” for Grassy Narrows since community members have experienced high past exposure, which the guidelines do not account for. Grassy Narrows requires a more protective, site-specific methodology that prohibits any activity that does not contribute to the

return of mercury levels to their pre-contamination background level or support the achievement of the remediation objectives.

This protective, site-specific risk assessment methodology and guideline should be developed with Grassy Narrows and their experts and should obtain Grassy Narrows' consent.

d) Alternative guidelines

Should Great Bear refuse to develop protective site-specific guidelines, despite the overwhelming expert evidence about the unique circumstances for Grassy Narrows, the most protective guidelines available must be used a starting point and then adapted to reflect the unique situation in Grassy Narrows. As noted above, Dr. Mergler's expert opinion establishes that "a population that has already suffered effects from mercury contamination and other harmful risk factors for poor health may also be considered 'sensitive'" (Mergler, 2015, p.52). "Persons whose systems have already been altered by previous exposures are more sensitive than the general population" (Mergler, 2015, p.47). Therefore, unlike the general population, in Grassy Narrows all people must be considered 'sensitive' and child-bearers and children must be considered extra sensitive to mercury.

With respect to fish mercury concentrations, Health and Welfare Canada in 1979 recommended a limit of 0.2 ppm mercury in fish for consumption in Grassy Narrows. Nearly all 45 cm length-standardized walleye in the English River system exceed this threshold.

However, the USA EPA value for fish derived specifically for subsistence fishers is far more protective than Health and Welfare Canada's and is set at 0.049 ppm (Mergler, 2015 p.10).

There are now multiple mercury intake guidelines for the general population. As Dr. Mergler explains:

> "The guidelines were developed to recommend **tolerable daily intake (TDI) or weekly intake (TWI)** of mercury. The Canadian provisional tolerable daily intake for pregnant women, women of reproductive age and infants of 0.2µg/kg body weight/day is twice the US EPA of 0.1µg/kg body weight/day and slightly higher than the proposed revision of the FAO/WHO reference dose (0.19 µg/kg body weight/day) (see section 2). The US EPA reference dose is based on **cord blood concentrations**, while the JECDA and Canadian recommendations are based on **hair concentrations"** (Mergler, 2015, p.44).

The US-EPA uses the term Reference Dose (RfD), defined as "an estimate of a daily exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious effects during a lifetime" (Mergler, 2015, p. 21). Dr. Mergler notes that,

> "there is scientific evidence to support that the EPA RfD, based on cord blood, may be too high since cord blood contains 60-70% more mercury than maternal blood, and approximately 100% higher for the upper 5% and recent studies have observed neurotoxic effects in children at these levels of prenatal exposure" (Mergler, 2015 p.11).

Canada uses Toxicity Reference Values (TRVs) to derive Total Daily Intake, (TDI) defined as "the maximum amount of a chemical that can be ingested on a daily basis over a lifetime without increased risk of adverse health effects'" (Mergler, 2015, p.26).

Mergler notes that "The Canadian Total Daily Intake is based on maternal hair at birth and did not take into account placental bioconcentration and thus did not account for the fact that hair mercury concentrations decrease over pregnancy" (Mergler, 2015, p.23).

Peer reviewed scientific publications by Mergler and her team have found health impacts associated with mercury in Grassy Narrows at levels of exposure below the Health Canada guideline level (Mergler, 2025; Philibert et al, 2022, 2024a, 2024b).

Mergler comments that,

> "Given the information on estimated methylmercury intake from past and present exposures in Grassy Narrows, there are already effects on their health and well-being from mercury exposure and the EPA RfD would be more suitable for the Grassy Narrows population." (Mergler, 2015 p.22).

In summary, the US EPA guidelines for fish mercury and human mercury intake are the most protective existing guidelines and therefore the most relevant to Grassy Narrows. However, even the US EPA guideline is not sufficiently protective against fetal impacts and do not take into account high past exposure. Mergler concludes that "All of these reference doses are high for Grassy Narrows since the population has already been exposed to levels that are higher, and in many cases, considerably higher than these" (Mergler, 2015 p.44).

4. Conclusion

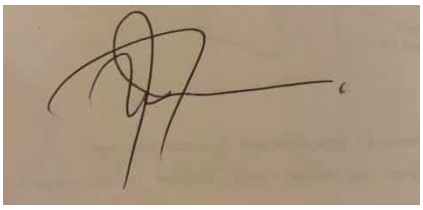
As Grassy Narrows has emphasized from its earliest engagement with Kinross, one-size-fits all approaches fail to protect Grassy Narrows because of its unique circumstances. Grassy

Narrows' mercury crisis, cumulative impacts, and site-specific considerations must be adressed to create tailored solutions that ensure that the impacts of the past are not repeated, prolonged, or compounded. This applies to the risk assessment.

The expert evidence shared here, supports the following conclusions:

1. Grassy Narrows people used to fish and eat fish extensively on the English River system before the mercury crisis, mostly large walleye (200 lb/person/year).
2. Grassy Narrows people have been forced to dramatically reduce their fish consumption due to mercury contamination.
3. All regulatory decisions about industrial activities impacting on Grassy Narrows must support the return of Grassy Narrows' fish to safe levels of mercury so that Grassy Narrows can restore and resume their pre-contamination fish consumption, livelihood, and way of life.
4. Grassy Narrows people have already exceeded their lifetime tolerable exposure to mercury and are experiencing intense impacts as a result.
5. No amount of further exposure or increased mercury levels in their environment or fish is safe for Grassy Narrows. Mercury levels must be reduced.
6. Existing mercury guidelines do not apply for Grassy Narrows, but if Kinross insists on using existing guidelines rather than site-specific ones, the US EPA guidelines are the more appropriate starting point.
7. The outcome of the risk assessment must result in measures that are protective of those who eat the most fish in Grassy Narrows, those at most risk, the practice of eating large fish, and the seasons / community events where they eat the most fish.

As Grassy Narrows has noted elsewhere, it is premature to assess risk for this project because the ML-ARD studies and reliable water quality models required to reliably quantify which contaminants will be generated by the project, and in what quantities, have yet to be completed or they have not been provided to Grassy Narrows. Without that information the effectiveness of the water treatment plant and other mitigation measures cannot be assessed, nor can the risks and impacts on the receiving and downstream environment and people.



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Joseph B. Fobister (Lead Negotiator – Grassy Narrows Land Protection Team)

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EXPERT REPORT

Grassy Narrows First Nation and Sherry Fobister, William Fobister, Senior, Simon Fobister and Chief Roger Fobister, Senior on their own behalf and on behalf of all other members of Grassy Narrows First Nation v. Minister of Natural Resources and Forestry (Ontario) and Minister of the Environment and Climate Change (Ontario), and the Attorney General of Ontario

Ontario Superior Court of Justice
(Divisional Court)

Prepared for
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GRASSY NARROWS
GENERAL MERCURY AND HEALTH FACTS

prepared by

Donna Mergler PhD
Professor Emerita
Université du Québec à Montréal

Date: November 6, 2015 _____
Donna Mergler

This is Exhibit A referred to in the affidavit of Donna Mergler
sworn before me this 6th day of November 2015

_____
Barbara Creary, lawyer, member of the Quebec Bar #183138-1

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Appendix A – Curriculum Vitae

INTRODUCTION

I am a professor emerita at the *Université du Québec à Montréal* (UQAM), where I was a professor in the Department of Biological Sciences from 1970 to 2006. I hold a doctorate in physiology from McGill University. I am a former chair of the department (1982-1984), head of the doctoral program in environmental sciences (1993) and chair of the UQAM Institute for Environmental Sciences (2001-2003). I founded the Center for Interdisciplinary Research on Well-being, Health, Environment and Society (CINBIOSE) in 1985, and was director at different periods until 2000. From 1998 to 2013, I was director of the CINBIOSE World Health Organization-Pan American Health Organization Collaborating Center for the Prevention of Work and Environment-related illnesses. I was co-coordinator of the Latin American Community of Practice in Ecosystem Approaches to Human Health (2005-2013). Since 2008, I head the pan-Canadian research team on Gender, Environment and Health. I have been a member of the Quebec Council for Science and Technology (1984-1989) and the Science Advisory Board of the International Joint Commission of the Great Lakes (2001-2011). My teaching, research and writing have focused on the early neurotoxic effects in humans of environmental pollutants generally, including mercury. In 2006, I chaired an international scientific group which wrote a consensus document on mercury and human health. I have authored over 150 peer-reviewed scientific articles, including 50 scientific papers on the subject of mercury exposure and effects in freshwater fish-eating populations. I have given keynote addresses on mercury and human health at major international conferences and numerous presentations on the subject at national and international meeting, including the Office of Science and Technology Policy of the United States' White House (1988). I have written reports on mercury and health as it relates to the members of Grassy Narrows First Nation. My curriculum vitae appears in Appendix A of this Expert Report.

I have been asked by Joseph F. Castrilli and Richard D. Lindgren of the Canadian Environmental Law Association on behalf of Grassy Narrows First Nation to prepare an expert report that responds to several questions. I am solely responsible for the preparation of this report.

QUESTIONS

1. For the documents referred to below, please indicate if the views expressed in those documents that relate to the subject matter of this expert report, and/or that are attributed to you, are accurate in every material respect? If not, please indicate in your expert report the corrections, if any, that should be made with respect thereto.

A. The Grassy Narrows-Earthroots request, dated January 2014, of the Ministry of the Environment for an individual environmental assessment (IEA) on the Whiskey Jack Forest Management Plan (2012-2022), and the supplementary submissions made to the Ministry dated May, July, September and November 2014 insofar as they relate to your area of expertise and the subject matter for your report.

B. Literature Review of the Mercury Disability Board, dated September 2010. This document (consisting of two reviews) is referred to in the September 2014 submission.

1.1 For the documents referred to below, please indicate your views on them to the extent they relate to the subject matter of your expert report and are within your area of expertise:

C. The article by Harada, et al. entitled "Mercury Poisoning in First Nations Groups in Ontario: 35 Years of Minamata Disease in Canada" (translated from the Japanese version published in the Journal of Minamata Studies in 2011).

D. The article by Takaoka, et al. entitled "Signs and Symptoms of methylmercury contamination in a First Nations community in Northwestern Ontario, Canada" published in the journal Science of the Total Environment in 2014.

2. Regarding the subject of mercury and human health:

a. Is mercury toxic to humans? If so, on the scale of toxic substances in the environment, where does mercury rank in terms of overall toxicity risk to humans?
b. If so, what are the clinical human health impacts of mercury?
c. Does exposure to mercury increase the risk of other health problems developing and, if so, identify those other health problems?

3. At what levels of exposure to mercury have adverse clinical health impacts on adults been documented in the scientific literature?

4. Does exposure to mercury affect the development of fetuses and children and, if so, what are the effects, and for what duration of time, if any, will those effects persist? At what exposure levels have these developmental effects been documented in the scientific literature?

5. Are there sub-clinical effects:

a. *In a community where mercury-related neurologic clinical disorders are present, could there be other persons with sub-clinical signs and symptoms?*
b. *What is the nature of these effects at each exposure level that have been documented in the scientific literature; and*
c. *Are developmental effects of mercury exposure affected by low socio-economic status based on such factors as education, income, etc.?*

6. *What are the sub-clinical population level effects, if any, of exposure to mercury? Compare these effects to individual clinical effects and to the mercury levels at which they are found? Comment on the nature and severity of the effect of these impacts at a community level?*

7. *Does mercury bio-concentrate across the placenta and, if so, what is the average concentration factor? What is the concentration factor at the 95th percentile?*

8. *Is there a delay in the manifestation of health effects following exposure to mercury? How do mercury impacts change with aging?*

9. *What evidence is there, if any, that mercury changes the rate or severity of degenerative neurological conditions such as Alzheimers, ALS, etc.?*

10. *What is the most important source of mercury in humans? How would you characterize the levels of mercury, if any, in piscivorous wildlife, such as ducks, loons, and otters? What effect, if any, do dental fillings have on human mercury body burden? How would you characterize the risk of methyl mercury exposure from eating wild fish alone compared to the total mercury risk in an Aboriginal population that also eats ducks, otters, store fish, and has dental fillings?*

11. *What is the Health Canada – World Health Organization recommended fish mercury content limit (measured in parts per million – ppm) for subsistence eaters? What is the mercury limit measured in ppm for legal possession of lake fish meant for sale in Ontario?*

12. *In general, what is a reference dose? Compare the Canadian reference dose for preventing fetal neurotoxicity and developmental impacts with the reference dose adopted by the Environmental Protection Agency in the United States ("USEPA")? What caveats, if any, come with using the USEPA reference dose? Which of the two reference doses, in your professional opinion, is more appropriate and safe to use (1) for the general population, and (2) at Grassy Narrows, and why?*

13. *How does the USEPA reference dose, if at all, account for bio-concentration across the placenta? If it does not account for bio-concentration, how would it need to be modified in order to do so? How does the Canadian reference dose, if at all, account for bio-concentration across the placenta?*

14. *What are the health benefits, if any, of eating fish? What are the health benefits, if any, of the practice of fishing?*

15. *If there are health benefits to eating fish what, in your professional opinion and in the scientific literature of which you are aware, should be done with respect to practices that lead to the bio-accumulation of mercury in fish? How would this principle apply at Grassy Narrows?*

16. *How would you characterize the appropriateness of the health guidance contained in the Ontario Guide for Sport Fish Eaters for indigenous communities who eat fish? Which reference dose is used in developing the Guide?*

17. *Compare with the general population, the level of sensitivity of those who already have experienced elevated mercury exposure, or show symptoms of mercury poisoning, upon further exposure? Comment on the appropriateness of intake guidelines designed for the general population when applied to people exhibiting symptoms consistent with mercury poisoning?*

Grassy Narrows

18. *For document B listed above, and if not already addressed in response to question 1, please indicate the following:*

    a. *What role, if any, did you play in the preparation of document B?*
    b. *Are the findings and conclusions contained in document B still valid today? If not, indicate what material changes have occurred since the release of document B that would cause the need for significant revisions in its findings and conclusions?*
    c. *What would be the revised findings and conclusions, if any?*

19. *If not otherwise answered in response to question 1, above, please indicate if the statements are accurate that are contained in the first six pages of the September 2014 supplementary submission listed in item A that are attributed to your document B report?*

20. *Are you aware of a more thorough long-term study than that of Dr. Harada and his colleagues from Japan (including Takaoka and Fujino, et al.), on the issue of mercury exposure and effects at Grassy Narrows?*

21. *What risks, if any, do current mercury levels in pike and walleye present to the people of Grassy Narrows who eat fish caught from local waters?*

22. What risk is there, if any, to the health of people at Grassy Narrows who eat fish caught from local waters if mercury levels were to increase? How low an increase in fish mercury level would pose a health risk, if any?

ORGANIZATION OF EXPERT REPORT

The Expert Report is organized into two parts. Part 1 provides short summary answers to the questions listed above.

Part 2 updates the review of the scientific literature presented in the document entitled *Literature Review: The Impact of Mercury on Human Health* prepared by Dr. H.M. Chan and myself for the Mercury Disability Board in 2009, and in 2010 with a review of Dr. Harada's studies (Document B). Taken together, these provide the greater context and scientific background for the summary answers provided in Part 1.

PART 1

SUMMARY ANSWERS TO QUESTIONS

Question 1:

1. For the documents referred to below, please indicate if the views expressed in those documents that relate to the subject matter of this expert report, and/or that are attributed to you, are accurate in every material respect? If not, please indicate in your expert report the corrections, if any, that should be made with respect thereto.

> ***A. The Grassy Narrows-Earthroots request, dated January 2014, of the Ministry of the Environment for an individual environmental assessment (IEA) on the Whiskey Jack Forest Management Plan (2012-2022), and the supplementary submissions made to the Ministry dated May, July, September and November 2014 insofar as they relate to your area of expertise and the subject matter for your report.***

Answer to Question 1A: The information contained in these documents as concerns my expertise on mercury exposure and human health are accurate, with the following details

- **[IEA request, supplemental information, September, 2014 p. 3]** I verified this information with a colleague at the Minamata Institute, Dr. Mineshi Sakamoto, who informed me that the diagnostic criteria for Minamata disease have not changed. These

are the same diagnostic criteria that Dr. Harada used in Grassy Narrows. In Japan, a Law Concerning Special Measures to Provide Relief to Minamata Disease Victims, passed in 2009 was enacted in April, 2010[1]. On May 1, 2010, then Prime Minister Hatoyama attended and gave prayers at the Memorial Service for the Victims of Minamata Disease and was the first prime minister to do so. On the same day, the acceptance of applications for relief started, and eligible persons began to receive a lump sum payment in October 2010. By 2012, there were 48,327 applications for lump-sum payment and 16,824 applications for Minamata Disease Victims' Passbook. It is noteworthy that as early as 1977, the Japanese Ministry of the Environment initiated dredging because " even though the discharge of the methylmercury compound was stopped, the residual presence of mercury in the substratum of nearby waters could still cause the contamination of water and marine lives, making it necessary to remove the contaminated base sediment.

- **[IEA request, supplemental information, September, 2014 p. 8]** The information written up in the Toronto Star (2003) was, in part, in error. I verified this information with Dr. Laurie Chan. While Dr, Chan did express his alarm at the high prevalence of persons still suffering from neurological symptoms after 30 years, he did not head a Health Canada financed study of neurological effects in Grassy Narrows. He did examine mercury in fish, fish consumption patterns and human exposure in Grassy Narrows[2].

- **[IEA request. Supplemental information, November, 2014]** While the psychological, social and economic impacts, cited in the Donnan 1986 report, are accurate, they do not do justice to the overall impact of mercury contamination and the ensuing reduced consumption of fish on the physical and mental health and well-being within the Grassy Narrow community.

- **[IEA request. Supplemental information, November, 2014; p. 13]** more precisely: the value for fish advisories at 0.049 µg/g is the EPA screening value for fish was derived specifically for subsistence fishers[3]. (see answer to Question 11)

- **[IEA request. Supplemental information, November, 2014; p. 13]** more precisely: as indicated in the text, the 0.2 µ/g wet weight was a recommendation made by the Medical Services Branch of Health and Welfare Canada for Grassy Narrows and White Dog in 1979.

- **[IEA request. Supplemental information, November, 2014; p. 15]** I would rephrase the term 'the scientific literature recommends' in the following terms: There is scientific

[1] Japan Ministry of the Environment (2013)

[2] Chan (2005)

[3] EPA Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories Volume 2 Risk Assessment and Fish Consumption Limits Third Edition, p. 1-6 (2000)

evidence to support that the EPA RfD, based on cord blood, may be too high since cord blood contains 60-70% more mercury than maternal blood, and approximately 100% higher for the upper 5% and recent studies have observed neurotoxic effects in children at these levels of prenatal exposure (see question 7 and Part 2; section 4).

B. Literature Review of the Mercury Disability Board, dated September 2010. This document (consisting of two reviews) is referred to in the September 2014 submission

Answer to Question 1B:

I was co-author of these reports and the information contained in these reports is still timely. Studies since that time further support and confirm the conclusions of these reports.

Question 1.1: For the documents referred to below, please indicate your views on them to the extent they relate to the subject matter of your expert report and are within your area of expertise:

C. The article by Harada, et al. entitled "Mercury Poisoning in First Nations Groups in Ontario: 35 Years of Minamata Disease in Canada" (translated from the Japanese version published in the Journal of Minamata Studies in 2011).

Answer to question 1.1 C.

In the article, Dr. Harada describes his experience over the past 35 years in the diagnosis of Minamata Disease in Grassy Narrows and White Dog. Dr. Harada was a clinical neurologist, with world-renowned expertise on Minamata Disease, who began examining patients with Minamata disease in 1961 and was the first to describe Foetal Minamata Disease from prenatal mercury exposure.

He relates in this article that since 1975 he has examined persons from Grassy Narrows and White Dog for signs and symptoms of Monamata Disease. Over the years, he has diagnosed many cases of Minamata Disease in these two communities. The studies up to 2004 are reviewed in our report to the Mecury Disability Board (see Document B).

In 2010, he lead a team, which included 5 neurologists/psychiatrists and internal medicine specialists in neurology. In Grassy Narrows, they examined 73 persons above the age of 20 years on the basis of the diagnostic criteria applied in Japan since 1975 for Minamata Disease. The team identified 30 persons with Minamata Disease and a further 12 persons with "suspected Miniamata Disease", within which there were 5 cases reminiscent of Minimata developmental disorders from fetal exposure. Dr. Harada notes in this report that "fetal influence remains to be

studied … there is no plan of investigation as of now."

The article reflects a great degree of thoughtfulness and care on the part of the physicians involved and, as Dr. Harada so aptly stated, ".. the undoubtable fact that Minamata Disease occurred in the corresponding districts in Canada, based on [their] long term investigation result."

D. The article by Takaoka, et al. entitled "Signs and Symptoms of methylmercury contamination in a First Nations community in Northwestern Ontario, Canada" published in the journal Science of the Total Environment in 2014.

Answer to question 1.1D.

In this article Takaoka and co-authors describe a comparison of signs and symptoms of 80 residents from Grassy Narrows above the age of 16 years with 88 mercury exposed Japanese residents and 164 Japanese non-exposed control residents. The group from Grassy Narrows was divided into 2 groups according to age: older from 45 years old to 76 years old and younger (less than 45 years of age). The age of the two Japanese groups were similar to the older Grassy Narrows group. Their findings were:

- Although the Japanese exposed group reported more subjective symptoms, the more specific mercury related complaints were similar for the Japanese exposed and the Grassy Narrows older group.

- Neurological findings and quantitative sensory measurements were similar in the Grassy Narrows Older and Japanese Exposed groups than in the Japanese Control group.

- The results for the younger Grassy Narrows group fell between those of the Grassy Narrow Older and Japanese Control groups.

- The authors mention the limitations of such a comparison due primarily to different living conditions and cultures, but emphasize the diagnostic validity of the examination.

- The authors conclude that the data collected from methylmercury-exposed indigenous residents of Grassy Narrows suggest that they were poisoned by methylmercury. The health abnormalities also appear to exist in a milder form in the younger generations from Grassy Narrows.

The findings of this study are consistent with the scientific literature on mercury poisoning. In the absence of an epidemiologic study on neurotoxic effects of mercury exposure in Grassy Narrows, the study presents an innovative way of examining similarities and differences in signs and symptoms in communities who have been exposed to mercury. Ideally, it would have been

useful to examine the signs and symptoms in Grassy Narrow residents with respect to past and present exposure and use a local reference group.

Question 2: Regarding the subject of mercury and human health:

a. Is mercury toxic to humans? If so, on the scale of toxic substances in the environment, where does mercury rank in terms of overall toxicity risk to humans?

Answer to Question 2a

Mercury is definitely toxic to humans. Every few years, the United States Agency for Toxic Substances establishes a Priority List of Hazardous Substances, which includes substances that have been determined to be of greatest public health concern to persons at or near National Priority List sites[1][2]. While this list considers aspects other than toxicity, it includes a measure of toxicity. The 2013, Registry[3] gives mercury the highest attributable toxicity points, at the same levels as arsenic and polychlorinated biphenyls (PCBs) and ranks mercury ranks third (after arsenic and lead) on the overall priority scoring list of 785 hazardous substances. It is noteworthy that mercury has held this ranking since 1991, when the first list was established.

b. If so, what are the clinical human health impacts of mercury?

The most severe clinical impacts of fetal and adult exposure to methyl mercury are the neurodegenerative diseases: Foetal Minamata Disease and Minamata Disease, respectively.

Clinical effects in adults : Gait disturbance, loss of balance, speech disturbance constriction of visual fields, sensory disturbances (numbness, loss of feeling or tingling in extremities and around the mouth), hearing disturbances, muscle weakness, muscle cramps

Clinical effects of in utero exposure : severe cerebral palsy-like symptoms, even when their mothers have mild or no manifestation of the poisoning: mental retardation, cerebellar ataxia (coordination and balance problems), primitive reflexes (present in infants, which should disappear in adulthood), dysarthria (muscle speech disorders), and hyperkinesia (uncontrolled muscular movements).

c. Does exposure to mercury increase the risk of other health problems developing and, if so, identify those other health problems?

[1] Agency for Toxic Substances Registry (http://www.atsdr.cdc.gov/spl/)
[2] It should be noted that this priority list is not a list of "most toxic" substances, but rather a prioritization of substances based on a combination of their frequency, toxicity, and potential for human exposure at NPL sites ((http://www.atsdr.cdc.gov/spl/))
[3] Agency for Toxic Substances Registry. Support Document to the 2013 list of hazardous substances that will be the subject of toxicological profiles.

Mercury has been shown to increase the risk for learning disabilities in children and, in adults, the risk for cardiovascular disorders, such as myocardial infarction and hypertension. There is some evidence of an association between mercury exposure and metabolic syndrome, diabetes and autoimmune disorders, but more studies are required to confirm or not these associations (see Part 2, section 1)

Question 3: At what levels of exposure to mercury have adverse clinical health impacts on adults been documented in the scientific literature? What are the reported adverse clinical health effects in adults at these levels?

Answer to Question 3:

For clinical neurological effects in adults, case reports of moderate to severe neurological symptoms in patients with blood mercury concentrations from 12 – 38 µg/L[1,2].

It should be noted that, for adults, it is difficult to establish a level of exposure since mercury-related subtle neurological alterations may have existed since conception and the biomarkers of mercury exposure (hair and blood) only represent recent exposure. Thus, adults who have been prenatally exposed to mercury, with continued exposure through childhood and early adulthood, may suffer clinical effects that are not related to their current mercury exposure, but to their past exposure. Furthermore, the large majority of studies on adults include persons who eat marine fish, which have considerably higher concentrations of beneficial nutrients such as omega-3 fatty acids and selenium, compared to freshwater fish.

Question 4: Does exposure to mercury effect the development of fetuses and children and, if so, what are the effects, and for what duration of time, if any, will those effects persist? At what exposure levels have these developmental effects been documented in the scientific literature?

Answer to Question 4:

There is a very substantial scientific literature showing prenatal and early childhood exposure to mercury is associated with a decrease in children's intellectual capacities. This has been confirmed in animal studies and in brain imaging and electrophysiological examinations (see Part 2; sections 5 and 6).

[1] Silbernagel et al. (2011)
[2] Groth (2008)

Follow-up studies of mercury-exposed children indicate that these deficits persist over time. For example, a study of Canadian Inuit children at 8 years of age, exposed prenatally to mercury, showed that 17.2% of the children whose cord blood mercury was above 7.5µg/L were below the clinical cut-off for learning disabilities compared to 4.3% for the others[1].

A 22-year follow-up study of children of mothers with high mercury exposure[2] shows that there are still deficits in major domains of brain function as well as general intelligence in relation to their cord blood mercury concentrations; the geometric mean of their current blood mercury concentrations was 2.53µg/L and hair mercury 0.68µg/g.

The lowest reference dose for the protection of foetus and children is the US EPA reference dose (5.8 µg/L blood mercury; 1 µg/g hair mercury), which includes a tenfold uncertainty factor[3]. However, since the mercury in the cord blood is higher than in mother's blood, it may be too high (see part 2, section 4).

Question 5: Are there sub-clinical effects:

a. *In a community where mercury-related neurologic clinical disorders are present, could there be other persons with sub-clinical signs and symptoms?*
b. *Nature of these effects at each exposure level that have been documented in the scientific literature; and*
c. *Developmental effects of mercury, if any, in children in families with low socio-economic status based on such factors as education, income, etc.?*

Answer to Question 5a:

Clinical manifestations of mercury poisoning constitute the tip of the iceberg with respect to the harmful health effects of mercury exposure. In a contaminated environment, for every person with clinical manifestations, there are many more with sub-clinical signs and symptoms and even more with symptoms of decreased well-being, which affect a person's physical, mental and social capacities.

Answer to Question 5b:

In adults, the tip of the iceberg is composed of people with the most severe classical symptoms of mercury poisoning (described in answer to question 2b), a higher number of mercury-exposed persons present signs and symptoms that are less severe, but debilitating, such as poorer cognition, motor deficits, vision problems and cataracts. Cognitive deficits have been

[1] Jacobson et al. (2005)
[2] Debes et al. (2015)
[3] Rice (2004)

observed in freshwater fish-eating communities with hair mercury concentrations that ranged from 0.56 to 13.6 µg/g, with half of the participants having levels below 6 µg/g.

For cardiovascular effects, an analysis of existing studies by an expert committee indicate a twofold increased risk for myocardial infarction at equivalent hair concentrations less than 1.66µg/L[1] (see Part 2, section 1)

In children, the most severe classical symptoms of mercury exposure in their development years is described in question 2b. Many more children are exposed to lesser concentrations.

There is consensus on the fact that mercury exposure is associated with delayed learning, shortened attention span, memory deficits, delayed language acquisition, poorer motor control or coordination (see part 2, sections 5 and 6)

Even at very low concentrations of prenatal and early childhood exposures (maternal mean hair mercury 0. 0.53 (range 0–2.3) µg/g)[2], some of these effects are present in the developing child and the frequency and severity of these problems increases with the exposure dose.

In the study of Inuit children mentioned above, mothers' hair mercury at birth ranged from 1.4µg/g – 15 µg/g.

Electrophysiological and neuro-imaging techniques have confirmed altered brain activity in children with prenatal exposure to mercury

Answer to Question 5c.

In addition to mercury exposure, children's development can be affected by other factors, such as poor nutrition and housing, pre-existing diseases and parents' unhealthy lifestyle, little access to health care, poor schooling, minimal parental stimulation (see Part 2, section 6).

Developmental mercury exposure can compound the effects of these conditions, resulting in, for example, a larger percentage of children with learning disabilities (see Part 2, Section 6, Figures 4,5 and 6)) .

Question 6: What are the sub-clinical population level effects, if any, of exposure to mercury? Comment on the nature and severity of the effect of these impacts at a community level? What are the levels of mercury exposure documented in the scientific literature at which these effects can occur?

[1] Guallar et al. (2002)
[2] Oken et al. (2008)

Answer to Question 6:

For adults, sub-clinical effects include poorer cognitive functions, poorer vision, poor motor function and earlier age-related cataracts. These affect people's capacity to earn their living and carry out daily activities (see part 2 section . Overall the community's capacity to develop is hindered. In some studies, cardiovascular and metabolic changes have been reported in relation to mercury exposure, but results are inconsistent and co-factors, such as nutritional status and lifestyle, may play a role (see Part 2, sections 1 and 2).

For children, even a small decrease in average cognitive function has striking repercussions for the community. For example, an average decrease of 5 IQ points, among exposed children means that, in this community, twice as many children have severe learning difficulties and half as many children are gifted (see Part 2, sections 5 and 6).

When other harmful factors (poor nutrition, lack of stimulation, poor education) are present, the effects of mercury may be greater (see Part 2, section 6). In a study of an Inuit community, an average loos of 4.8 IQ points resulted in over four times more children with learning disability[1]. (Part 2, section 6)

The loss of cognitive function has life-long effects for these children who do less well in school. Educational level is an important determinant of later-life earning capacity and health status.

Question 7: Does mercury bio-concentrate across the placenta and, if so, what is the average concentration factor? What is the concentration factor at the 95th percentile?

Answer to question 7:

Throughout pregnancy, the placenta concentrates methylmercury and blood mercury concentration in the umbilical cord, which nourishes the foetus, is higher than in the mother's blood.

At birth, the average cord mercury blood concentration is almost double that of the mother, while for one in twenty that concentration can be over three and a half times more.(see part 2, section 4)

[1] Jacobson (2015)

Question 8: Is there a delay in the manifestation of health effects following exposure to mercury? How do mercury impacts change with aging?

Answer to Question 8:

Minamata Disease is a progressive disorder and some infants, who had a normal appearance at birth, slowly developed the disease over time.[1]

Studies of persons from the Minamata region show that even those that do not have the diagnosed disease show more signs of aging compared to persons from other regions (see Part 2, section 7 and Figure 6)).

The aging brain is more sensitive to toxic assault and studies of aging fish-eaters exposed to mercury have shown mercury-related progressive visual disorders, even when exposure was reduced, and a higher prevalence of age-related cataracts.(see Part 2, section 7

Question 9: What evidence is there, if any, that mercury changes the rate or severity of degenerative neurological conditions such as Alzheimers, ALS, etc.?

Answer to Question 9:

To my knowledge, there is no evidence of a higher prevalence of Alzheimer's disease or amyotrophic lateral sclerosis (ALS). The features of fœtal Minamata Disease are similar to cerebral palsy. However, because of the pervasive neurologic effects of mercury exposure, there may be misdiagnoses.

Question 10: What is the most important source of mercury in humans? How would you characterize the levels of mercury, if any, in piscivorous wildlife, such as ducks, loons, and otters? What effect, if any, do dental fillings have on human mercury body burden? How would you characterize the risk of methyl mercury exposure from eating wild fish alone compared to the total mercury risk in an Aboriginal population that also eats ducks, otters, store fish, and has dental fillings?

Answer to Question 10:

The most important source of mercury exposure in humans is from the consumption of fish and fish-eating animals (see Part 2, section 8).

Mercury is accumulated and biomagnified through the food chain; the process is initiated through the action of bacteria that transform inorganic mercury, present in the water, to

[1] Maruyama et al, (2012)

methylmercury.

Larger fish eat many small fish, incorporating all of their mercury. Fowl and mammals that eat fish will likewise accumulate mercury in the same way.

At the top of the food chain are humans. The risk depends on the total amount of mercury from each of the foods.

The risk for mercury exposure in Aboriginal populations that eat fish and fish-eating animals has been shown to be considerably higher than in other populations

A study of adult dietary practices among 7 Eeyou Istchee (Cree) communities in the James Bay area showed that blood mercury concentrations 3 – 20 times higher than those reported in the Canadian Health Measures Survey (CHMS) [1], which did not include Aboriginal communities living on reserves. (see Part 2, section 9).

In the study of the Cree community mentioned above, the geometric mean for blood mercury of persons with the highest traditional food intake was 5.3µg/L, for those who consumed the least traditional food, it was 3µg/L,[2] while for the general adult Canadian population, it is approximately 0.8 µg/L[3].

A further source of methylmercury exposure may come from wild rice that grows in sediments that have been contaminated with mercury.

Mercury in dental amalgams is inorganic mercury and it can be measured in blood and urine, but not in hair. In the Canadian Health Measures Survey, blood mercury concentrations increased with the number of dental amalgams. The geometric mean for those with no mercury-based dental amalgams is 0.6 µg/L, while those who have over 26 amalgams, it is 1.24µg/L[4].

Question 11: What is the Health Canada – World Health Organization recommended fish mercury content limit (measured in parts per million – ppm) for subsistence eaters? What is the mercury limit measured in ppm for legal possession of lake fish meant for sale in Ontario?

Answer to Question 11:

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[1] Johnson-Down et al. (2015)
[2] Johnson-Down et al. (2012)
[3] Lye et al. (2013)
[4] Lye et al. (2013)

There are different types of recommended limits concerning fish consumption: (i) amount of mercury in the fish (expressed in mg/kg, µg/g or ppm); (ii) the amount of mercury considered safe to consume on a daily basis, considering persons' weight (µg/kg/day) over a lifetime; (iii) the average amount of fish that should be eaten (g/day or fish meals/month), based on a risk assessment of risks and benefits. Table 1 contains some of these recommendations from different agencies.

Table 1 Recommendations by different national and international agencies for limits for mercury on fish, mercury consumption and fish consumption

	Canada	Ontario	US-EPA	WHO/FAO
MERCURY IN FISH				
Commercial sale	0.5 ppm[a]			
Fishing for sale				
Recreational			0.4 ppm[c]	
Women of child-bearing age and children under 15		0.26 ppm[b] Do not eat: 0.52 ppm		
Others		0.61 ppm[b] Do not eat: 1.84 ppm		
Subsistence	0.2 ppm[h]		0.049 ppm[c]	
METHYL MERCURY IN THE PLATE				
Intake dose	0.2µg/kg body weight/day[d]		0.1µg/kg body weight/day[e]	0.23µg/kg body weight/day[f]
FISH CONSUMPTION				
General				
1-4 year old	10g/day[g]			
5-11 year old	14g/day[g]			
Adults	22g/day[g]			
Subsistence fishing				
1-4 year old	20g/day[g]			
5-11 year old	33g/day[g]			
Adults	40g/day[g]			

a. There are some exceptions to this for a few marine fish, with higher concentrations
b. These are the values used by the *Ontario Guide for Sport Fisher Eaters (2013-2014)* to provide information on fish consumption for anglers (and their families) who consume

moderate quantities of fish. The consumption advice is intended to protect individuals who follow the advice in the guide and consume no more than 8 meals per month of the fish they catch. Specific information is available for each lake.

c. Screening value from US Environmental Protection Agency *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories Volume 2 Risk Assessment and Fish Consumption Limits Third Edition (2000)*
d. Canadian Total Daily Intake Value Health Canada
e. EPA website ¨ http://www.epa.gov/iris/subst/0073.htm;
f. A recent review of these guidelines by the European Food Safety Authority (2012) proposed that it be reduced to 0.19µg/kg/body weight
g. Daily fish consumption recommended in the document *Human Health Risk Assessment of Mercury in Fish and Health Benefits of Fish Consumption.* Bureau of Chemical Safety Food Directorate Health Products and Food Branch, Health Canada (2007)
h. Health and Welfare Canada recommendation for Grassy Narrows and White Dog in 1979.

Question 12: In general, what is a reference dose? Compare the Canadian reference dose for preventing fetal neurotoxicity and developmental impacts with the reference dose adopted by the Environmental Protection Agency in the United States ("USEPA")? What caveats, if any, come with using the USEPA reference dose? Which of the two reference doses, in your professional opinion, is more appropriate and safe to use (1) for the general population, and (2) at Grassy Narrows, and why?

Answer to Question 12:

The US-EPA uses the term Reference Dose (RfD), defined as ''an estimate of a daily exposure to the human population (including sensitive subgroups) that is likely to be without appreciable risk of deleterious effects during a lifetime.''[1] Some scientists have raised the issue that this RfD may be too high because it is based on cord blood and does not take into account methylmercury accumulation in the placenta[2].

Canada uses Toxicity Reference Values (TRVs) to derive Total Daily Intake, (TDI) defined as "the maximum amount of a chemical that can be ingested on a daily basis over a lifetime without increased risk of adverse health effects.

As indicated in the table above, for methylmercury, the US-EPA RfD is 0.1µg/kg body weight/day, while the Canadian TDI is 0.2µg/kg body weight/day.

My opinion is that the US-EPA reference offers better protection against the harmful effects of exposure to methyl mercury to all populations. Mercury intake for most of the general Canadian

[1] cited in Rice (2004)
[2] Stern (2005)

population is well below this intake.

In 2003, Chan[1] calculated the intake of mercury in the Grassy Narrow community and estimated mercury intake from fish consumption using the actual values that were measured in fish species from the various lakes and the reported portion size per fish meal.

In Grassy Narrows, in 2003, the average mercury intake over the year was 0.2µg/kg body weight/day, with men having higher average intakes compared to women (0.3 µg/kg body weight/day vs 0.1µg/kg body weight/day). The average intakes included people who don't eat fish; if the analysis was only on fish-eaters, the average mercury intake would have been higher.

By season, the highest mercury intake was by men in summer and spring (3.7 µg/kg body weight/day). Approximately 25% had estimated intakes above the Canadian TDI and 41% were above the US-EPA RfD.

The average mercury intake for Grassy Narrows women in 2003 was above the US-EPA RfD of 0.1 µg/kg body weight/day. It should be noted that this includes all women who were surveyed, including those that don't eat fish.

Cord blood data from Grassy Narrows between 1978 and 1992 shows that they were much higher (see Part 2, section 14a and Figure 8). Today, these persons are between the ages of 23 and 37 years old.

Given the information on estimated methymercury intake from past and present exposures in Grassy Narrows, there are already effects on their health and well-being from mercury exposure and the EPA RfD would be more suitable for the Grassy Narrows population. However, this does not take into account the health, social and economic benefits of fishing and fish consumption.

Question 13: How does the USEPA reference dose, if at all, account for bio-concentration across the placenta? If it does not account for bio-concentration, how would it need to be modified in order to do so? How does the Canadian reference dose, if at all, account for bio-concentration across the placenta?

Answer to Question 13:

The US-EPA reference dose, which is based on cord blood, does not take into account bio-concentration across the placenta. It is based on a cord blood concentration of 58 µ/L and then uses a tenfold security factor to arrive at a cord blood concentration of 5.8µg/L from which mercury intake is derived as 0.1µg/kg body weight/day. Mahaffey, who was one of the

[1] Chan (2005)

committee members who set the EPA RfD suggests that it should be based on a value of 3.5 µg/L to take into account bioconcentration[1]. The relation between maternal mercury intake and cord blood is not necessarily linear[2] and what one can say at this point is that it would be lower than 0.1µg/kg body weight/day.

The Canadian Total Daily Intake is based on used maternal hair at birth[3] and did not take into account placental bioconcentration and thus did not account for the fact that hair mercury concentrations decrease over pregnancy (see Part 2; figure 2).

Question 14: What are the health benefits, if any, of eating fish? What are the health benefits, if any, of the practice of fishing?

Answer to Question 14:

Fish is a highly nutritious food, providing a wide variety of nutrients, including omega-3 fatty acids (see Part 2, section 11).

In utero and throughout lifespan, omega-3 fatty acids are likewise positive physical and mental health outcomes, including children's neurodevelopment,
vision, blood pressure, cardiac function, vascular reactivity and lipids.

Studies of children exposed to mercury through fish consumption show the negative effects of mercury exposure and the positive effects of omega-3 fatty acids on neurodevelopment. Studies of adults, as well, have shown the opposing effects of mercury and omega-3 fatty acids and visual function, as well as for the risk of myocardial infarction (Part 2, section 11, Figure 7)

The US-EPA advisory for subsistence fishing was developed in collaboration with representatives from Native American tribes. It indicates : "EPA recognizes, however, that Native American subsistence fishers are a unique subsistence fisher population that needs to be considered separately. For Native American subsistence fishers, eating fish is not simply a dietary choice that can be completely eliminated if chemical contamination reaches unacceptable levels; rather eating fish is an integral part of their lifestyle and culture. This traditional lifestyle is a living religion that includes values about environmental responsibility and community health as taught by elders and tribal religious leaders. Therefore, methods for balancing benefits and risks from eating contaminated fish must be evaluated differently than for the general fisher population"[4]."

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[1] Mahaffey (2009)
[2] Stern (2003)
[3] Legrand et al (2010)
[4] US Environmental Protection Agency *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories Volume 2 Risk Assessment and Fish Consumption Limits Third Edition (2000) p. 16*

Question 15: If there are health benefits to eating fish what, in your professional opinion and in the scientific literature of which you are aware, should be done with respect to practices that lead to the bio-accumulation of mercury in fish? How would this principle apply at Grassy Narrows?

Answer to Question 15:

In my professional opinion, based on the existing scientific literature, fish-eating practices should seek to maximize the nutritional benefits from fish consumption and minimize the toxic risk from mercury and other contaminants.

The Grassy Narrows community has been exposed to high concentrations mercury in fish for many years and individuals and the community are suffering the effects. **It would only add toxic insult to toxic injury to further expose this population to mercury**

While the community needs the nutrition from the fish, their intake of mercury needs to be minimal. To achieve this there needs to be a comprehensive plan:

- to reduce mercury at the source in the lake sediments;
- to never increase the mercury load in this environment;
- to eat more fish with little mercury;
- to initiate schooling and health programs to address the issue of mercury poisoning in this community.

Question 16: How would you characterize the appropriateness of the health guidance contained in the Ontario Guide for Sport Fish Eaters for indigenous communities who eat fish? Which reference dose is used in developing the Guide?

Answer to Question 16:

The Ontario Guide for Sport Fish Eaters is designed for "anglers (and their families) who consume moderate quantities of fish. The consumption advice is intended to protect individuals who follow the advice in the guide and consume no more than 8 meals per month of the fish they catch." The guide note that the advisory is based on the Canadian TDI. Their fish advisory recommends that "for women of child-bearing age and children under 15 years old, restrictions on consuming sport fish containing mercury begin at levels of 0.26 parts per million. Complete restriction (i.e., do not eat) is advised for levels above 0.52 parts per million. For the general population, consumption restrictions begin at levels above 0.61 parts per million. Complete restriction is advised for levels above 1.84 parts per million."[1]

[1] Ontario Ministry of the Environment. 2013-2014 Guide to Eating Ontario Sport Fish, p. 16,

The guide clearly indicates that it is not for heavy fish eaters. In Grassy Narrows, using the 2003 information on fish consumption from Chan, approximately 16% of persons eat more than 9 fish meals/month, and the average mercury content for several of the fish species in many of the lakes is above 0.52 ppm.

Question 17: Compare with the general population, the level of sensitivity of those who already have experienced elevated mercury exposure, or show symptoms of mercury poisoning, upon further exposure? Comment on the appropriateness of intake guidelines designed for the general population when applied to people exhibiting symptoms consistent with mercury poisoning?

Answer to Question 17:

There is ample evidence from animal and human studies that mercury modifies normal functioning of many systems, and in particular, the nervous system. While some of these changes result in symptoms and signs of damage, many remain undetectable because of the body's capacity to adapt. There is, however, a limit to this physiological adaptation and further exposure will build on the damage already present.

The guidelines for mercury intake refer to "over a lifetime". If exposures have been higher in the past than at present, the intake guidelines do not apply since over the lifespan, one's intake will be higher than those recommended by the guidelines.

Grassy Narrows

Question 18: For document B listed above, and if not already addressed in response to question 1, please indicate the following:

- ***a. What role, if any, did you play in the preparation of document B?***
- ***b. Are the findings and conclusions contained in document B still valid today? If not, indicate what material changes have occurred since the release of document B that would cause the need for significant revisions in its findings and conclusions?***
- ***c. What would be the revised findings and conclusions, if any?***

Answer to Question !8a:

I prepared document B in collaboration with Dr. Laurie Chan, Professor and holder of the Canada Research Chair in Toxicology and Environmental Health.

Answer to Question !8b:

The findings and conclusion of document B, which was submitted to the Mercury Disability Board in 2010, are still valid today. Since that time the science of mercury exposure and its effects on human health has continued to advance substantially and Part 2 of the present document updates the scientific evidence since that time. Studies published since 2010 on the effects of mercury on health and well-being, confirm the conclusions contained in Document B.

Answer to Question !8c:

The more recent studies indicate effects of mercury exposure are present at lower levels than previously thought and that they are long-lasting.

Question 19: If not otherwise answered in response to question 1, above, please indicate if the statements are accurate that are contained in the first six pages of the September 2014 supplementary submission listed in item A that are attributed to your document B report?

Answer to Question 19:

The statements are accurate and the scientific literature of the past 5 years provide strong confirmation. One further update : The law Concerning Special Measures to Provide Relief to Minamata Disease Victims, passed in 2009 was enacted in April, 2010 (see question 1 above).

Question 20: Are you aware of a more thorough long-term study than that of Dr. Harada and his colleagues from Japan (including Takaoka and Fujino, et al.), on the issue of mercury exposure and effects at Grassy Narrows?

Answer to Question 20:

Dr. Harada was a clinical neurologist, with world-renowned expertise on Minamata Disease, who began examining patients with Minamata Disease in 1961. He carried out a most thorough study of clinical manifestations of Minamata Disease in Grassy Narrows. No other group of scientists have carried extensive health studies with this community, although, as we indicated in the MDB report and Dr. Harada mentions in his 2011 report, there is a need for studies on the long-term effects of foetal exposure and the overall impact of mercury exposure on the physical and mental well-being of this community.

Question 21: What risks, if any, do current mercury levels in pike and walleye present to the people of Grassy Narrows who eat fish caught from local waters?

Answer to Question 21:

According to the 2005 report by Chan[1], the average mercury concentration in walleye in the lakes that are around Grassy Narrows (Ball Lake, Garden Lake and Indian Lake) are above almost all fish advisories guidelines for consumption. They are between twelve to twenty times higher than the US-EPA screening value for subsistence fish-eating. Northern Pike from these lakes, which are twelve to eighteen times higher than the screening value. Using the Ontario Fish advisories, all of the walleye and northern pike from these lakes are above the 'do not eat' concentration for women of child-bearing age and children (0.52 µg/g), while for the others, there would be restrictions for Ball and Indian Lake since the average mercury concentration in fish is above 0.62 µg/g).

Historical data from the English-Wabigoon River system from 1975 onwards show that there were much higher exposures in the past. While these high concentrations for walleye and northern pike declined rapidly from 1975 to 1985, the decline was much less and often stable until 2010[2].

When estimating the risk for mercury poisoning in Grassy Narrows, it is necessary to take into account past and present exposures, including prenatal exposure. Even without actual data, it is clear that the risk for mercury poisoning is very high for walleye and northern pike fish-eaters.

It should also be mentioned that particularly for *in utero* exposures, immediately after ingestion of the fish, there would be a very large peak of mercury exposure at a critical moments in fetal development. Prenatal effects may differ depending upon the moment of this peak exposure during foetal development.

Question 22: What risk is there, if any, to the health of people at Grassy Narrows who eat fish caught from local waters if mercury levels were to increase?

Answer to Question 22:

There is no question that the mercury already present in the Grassy Narrow area poses important risks to health and well-being to the community and that any further addition of mercury would increase that risk. It would, indeed be adding insult to injury. In my opinion, based on the scientific literature and Dr. Harada's work, it would be shameless, and I would call it irresponsible, to add more mercury to this mercury-laden environment. The health and well being of this community has already been harmed not only through mercury poisoning of those

[1] Chan (2005)
[2] Neff et al. (2012)

who continue to eat fish, but also and by depriving important nutrients to those who reduced their fish consumption because of the mercury.

PART 2

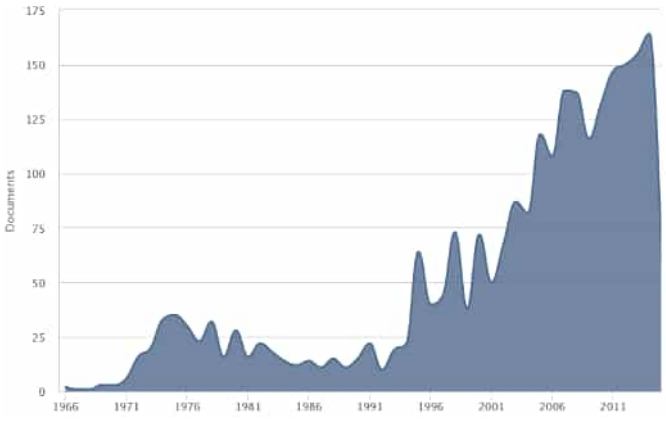
OVERVIEW

"At first, methyl mercury research was impaired by inappropriate attention to narrow case definitions and uncertain chemical speciation. It also ignored the link between ecotoxicity and human toxicity. As a result, serious delays affected the recognition of methyl mercury as a cause of serious human poisonings in Minamata, Japan. Developmental neurotoxicity was first reported in 1952, but despite accumulating evidence, the vulnerability of the developing nervous system was not taken into account in risk assessment internationally until approximately 50 years later. Imprecision in exposure assessment and other forms of uncertainty tended to cause an underestimation of methyl mercury toxicity and repeatedly led to calls for more research rather than prevention."

Grandjean et al, 2010

This review on general mercury and health facts sought to provide the most up-to-date information on mercury and human health, building on the information contained in the document entitled *Literature Review: The Impact of Mercury on Human Health* prepared by Dr. H.M. Chan and myself for the Mercury Disability Board in 2009, updated in 2010 with a review of Dr. Harada's studies. The two documents provide the scientific background for the answers to the questions above. Since 2010, over 800 articles have been published on methyl mercury and fish, with half in the medical domain. Figure 1 shows the evolution of articles on methyl mercury and fish since 1966. Approximately half of these are on health issues.

Figure 1 Evolution of scientific articles on methyl mercury and fish since 1966



The literature review, here, is not exhaustive and serves to respond to the questions that were posed. Relevant published scientific reviews and studies, since we wrote the report for the Mercury Disability Board in 2010 were identified, and where, possible, an emphasis placed on

those that examined methyl mercury exposure and health effects in Canadian First Nation and Inuit communities.

The studies of the past years, reviewed here, support the following conclusions:

- There is no doubt that at the levels of exposure experienced in Grassy Narrows, the community has suffered and continues to suffer from mercury poisoning, individually and collectively.
- The scientific literature continues to provide evidence for Dr. Masazumi Harada and colleagues' clinical findings, reviewed by Chan and Mergler for the MDB[1] on the similarities between the neurologic signs and symptoms of persons from Grassy Narrows and White Dog and Minimata Disease in Japan. Using the diagnostic criteria for Minamata Disease, in Harada's 2010 he diagnosed Minamata Disease in 30 people from Grassy Narrows and 12 persons with 'suspected MInimata Disease.' (see question 1 C).
- The reduction of consumption of local fish and wildlife resulting from mercury pollution of the area deprived the people of Grassy Narrows of healthful nutrients, which have been shown to be beneficial for a large number of physiological functions and to be preventive for many and diseases.
- It is surprising that although the Japanese neurologists have identified many cases of Minamata Disease in Grassy Narrows and many persons have illnesses that have been associated with mercury intoxication, there has never been a scientifically sound epidemiologic study of the impact of pre and post natal mercury exposure on the health and well-being of this community.
- Any increase of exposure to this already 'sensitive' community to mercury contamination from sources, such as mining, logging and reservoirs, would further compound the harm to the health and well-being of the present and future generations.

1. Mercury is highly toxic to human health. Impacts include foetal and child development, neurological disorders and cardiovascular changes.

The effects of mercury from fish consumption on the nervous system has been extensively studied since the Minamata disaster and there is consensus on mercury neurotoxicity and its harmful neurologic effects during foetal and child development and in adults. Epidemiologic studies of exposed populations show **increased risk for neurodevelopmental deficits, loss of cognitive and motor functions and visual deficits[2]. C**hanges in brain functioning in methyl mercury-exposed persons have been confirmed in electrophysiological[3] and brain imaging[4]

[1] Chan and Mergler (2010)
[2] Grandjean et al. (2010)
[3] Ethier et al, (2012)
[4] White et al. (2011)

studies. Experimental studies with mercury-exposed animals provide extensive information on the mechanisms that underlie mercury toxicity[1].

More recently, the possible effects of mercury on other health endpoints have been examined. In 2011, the Environmental Protection Agency of the United States convened a workshop of experts on methylmercury exposure and cardiovascular endpoints[2]. The authors concluded that there was strong evidence for the relation between biomarkers of mercury exposure, measures in toenails or hair and **myocardial infarction (MI). It is noteworthy that the range of the equivalent hair mercury exposure of the studies reviewed by this committee was from 0.34µg/g to 1.66µg/g[3].** Among the studies, upon which their conclusions were based, was an international study that showed a doubling of the risk for a first myocardial infarctus for men in the highest quintile of hair mercury.

In addition, several studies have shown associations between biomarkers of methyl mercury exposure and other **cardiovascular disorders,** including hypertension and changes in heart rate variability profiles[4]. In a study of Cree adults[5], the authors observed a positive association between altered heart rate variability parameters and blood mercury, after considering fish nutrients (omega-3 fatty acids and selenium) and other contaminants (lead and polychlorinated biphenyls) that are also present in the traditional diet of this population.

There is some evidence that mercury exposure increases the risk for **Type II diabetes**, but it is inconsistent. A recent 18-year follow-up study[6] of 3875 young United States' adults (20-32 years old), free of diabetes at the onset of the study, showed that those with the highest mercury exposure (equivalent of 1.2 – 1.5 µg/g hair mercury) had an elevated risk for diabetes compared to those with the lowest exposure, while another follow-up study of 2 cohorts did not show an association of incident cases of Type 2 diabetes and toenail mercury. concentrations[7]. An analysis of data from the Korean National Health and Nutrition Examination Survey showed and increased risk for **metabolic syndrome** in men with respect to blood mercury, but not in women[8].

A recent study used the data from the United States' National Health and Nutrition Evaluation on 1352 women of reproductive age women (16 – 49 years) to examine biomarkers of the immune system. Low levels of blood and hair mercury, generally considered safe, were

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[1] Fretham et al. (2012)
[2] Roman et al. (2011)
[3] Guallar et al, (2002)
[4] Houston (2011)
[5] Valera et al (2011)
[6] He et al (2013)
[7] Mozaffarian et al. (2013)
[8] Chung et al, (2014)

associated with subclinical **autoimmunity** among reproductive-age females.[1]. The authors put forward that methylmercury exposure may be relevant to future autoimmune disease risk.

2. Adults can be impacted at levels well below the old threshold level for risk of 50 µg/g in hair.

With the increasing information from research on risks of methyl mercury exposure and the evolution in our understanding of how subtle functional alterations in many individuals can translate into important risks for a community (see Part 2, section 5), regulatory agencies continue to revise recommended threshold levels for risk.

In Canada in the 1970's, the agency that later became the First Nation and Inuit Health Branch of Health Canada considered blood mercury levels below 20 µg/L (or 6 mg/kg in hair) as being "acceptable" and levels greater than 100 µg/L in blood (or 30 mg/kg in hair) as "at risk" based on the knowledge at that time and the unusually high mercury concentrations observed in Grassy Narrows and Whitedog[2]. Today, Health Canada provides different threshold levels for risk depending on age and sex. Legrand and co-authors[3] summarized existing Health Canada methyl mercury blood guidance values for the general population and expanded them to include a harmonized provisional interim blood guidance value. The threshold action levels for pregnant women, women from birth to 49 years and men less than 18 years was reduced but those for women above 50 years and men over 18 years, they are the same as in the 1970s. The table below is adapted from the table in the article by Legrand et al. in 2010 entitled:

Table 2 Overview of Health Canada Existing and Harmonized Blood Methylmercury Guidance Values

	Blood mercury threshold action levels			
	1	2	3	4
• pregnant women • women from birth to 49 years • men less than 18 years	less than 8 µg/L	8 – 40 µg/L	above 40 µg/L	
• women above 50 years • men above 18	less than 20 µg/L	20 -100 µg/L		
• women and men all ages				above 100µg/L

[1] Somers et al. (2015)
[2] Legrand et al. (2010)
[3] Legrand et al. (2010)

Action levels :

1. No follow-up required
2. Repeat blood/hair test in 6 months ; provide dietary advice
3. Repeat blood/hair test immediately ; schedule an appointment with a public health professional to review exposure history to identify sources of mercury exposure; provide dietary advice;
4. Repeat blood/hair test immediately ; schedule an appointment with a public health professional to review exposure history to identify sources of mercury exposure ; provide dietary advice ; refer study participant to a physician or medical toxicologist for assessment and follow-up in terms of checking basic neurological signs and symptoms and making a decision concerning appropriateness of any therapeutic intervention

Other regulatory agencies have one reference dose for all, based on the studies of prenatal exposure and effects. The US-EPA reference dose for oral exposure to methyl mercury is 0.1µg/kg body weight/day, which corresponds to mercury concentration of 5.8 µg/L (1 µg/g hair mercury)[1]. The Joint Expert Committee on Food Additives and Contaminants (JECFA) of the Food and Agriculture Organization (FAO) and the World Health Organization (WHO) proposed 1.6µ/kg body weight/ week (0.23µg/kg body weight/day)[2]. However, a recent review of the JEFCA guidelines by the European Food Safety Authority (EFSA)[3], published in 2012 and based on European data for fish consumption, proposed that the tolerable weekly intake be reduced to 1.3 µg/kg/week (0.19µg/kg body weight/day).

It is difficult to propose a threshold value for adults since few studies have focused on adult men and non-pregnant women since the developing foetus and child are more vulnerable to toxics and mercury is actively transported from the mother to the foetus. Moreover, the results on the studies on adults are inconsistent, probably due to the fact that the adults under study have different life histories (including prenatal exposure), life styles and nutrition (including difference in consumption of marine and fresh-water fish). The Health Canada guidelines in the Table above consider blood mercury of 20µg/L, which is approximately 10µg/g hair mercury.

A study of Taiwanese 240 adults (36 – 70 years old), who had lived in the region of a chloralkali plant that had been in operation between 1942 and 1985, was undertaken in 2005[4]. Mean total blood mercury was 17.3 ± 10.9 µg/L, with 90% methyl mercury. Comparison of those in the 75th percentile (greater or equal to 19.2µg/L; mean 27.1 ± 10.9) to the others (mean 11.6 ± 4.7 µg/L) showed higher abnormality rates for tests of remote memory, mental manipulation, orientation and verbal fluency, but not for tests covering recent memory, attention, abstract thinking, language and drawing. The authors indicate that they do not have information on historic

[1] http://www.epa.gov/iris/subst/0073.htm (referenced May 5, 2015)
[2] JECFA (2004)
[3] EFSA (2012)
[4] Chang et al. (2008)

exposures.

3. Fetuses and children can be impacted at far lower levels than adults.

There is now a very large number of studies on prenatal exposure to mercury and adverse health effects, most notably on children's neurodevelopment. In their review of the literature, EFSA[1] identified 34 articles of children's neurodevelopment in relation to prenatal exposure since 2003; the results of these studies motivate their recommendation to reduce the threshold for intake from 1.6µ/kg body weight/week to 1.3 µ/kg body weight/week, which would correspond to a decrease in blood mercury from 12 µg/L to 9.6 µg/L. As noted above, Health Canada considers a guidance level for blood mercury of 8 µg/L (hair mercury 2µg/g considering a ratio of 250:1) for pregnant women and women of reproductive age.

The lowest reference dose for the protection of foetus and children is the US EPA reference dose, which was based on three cohort studies of fish-eating populations[2]. It was derived by taking the lower limit of the benchmark dose[3] for cord blood and dividing it by an uncertainty factor of ten to account for variability in elimination half-life and pharmacodynamics variability[4]. It does not take into account bioaccumulation of mercury across the placenta (see section 4 below). Recent studies, however, suggest that measurable neurobehavourial effects may be present at cord blood concentrations near the US EPA reference dose.[5,6,7]

It is noteworthy that the birth cohort studies of mother-child pairs in the Seychelles[8] Islands continue to show little or no effects of mercury exposure despite concentrations similar and even higher than those which have demonstrated mercury-related effects on performance on neuropsychological tests and on electrophysiological and imaging. However, the authors of the Seychelles' studies note that the benchmark dose estimates that serve as the basis for regulatory decision-making have been largely comparable across the Seychelles, Faroese and New Zealand studies. Several hypotheses have been proposed to explain the differences between this fish-eating population and others, such as nutrients in the ocean fish in this area and possible genetic heritage factors. Indeed, in longitudinal analysis of young children's development, positive effects of omega-3 fatty acids were observed as well as small negative effects of prenatal mercury[9] and a study of school achievement showed a slight negative

[1] EFSA (2012)
[2] Rice (2004)
[3] The Benchmark Dose Level is the lower 95th percentile of the dose that corresponds to a specific change in an adverse response.
[4] Rice (2004)
[5] Bellinger (2013)
[6] Koren et al. (2010)
[7] Orenstein et al. (2014)
[8] van Wijngaarden et al. (2013)
[9] Stokes-Riner et al. (2011)

association with postnatal mercury in boys[1].

4. Mercury is bio-concentrated across the placenta.

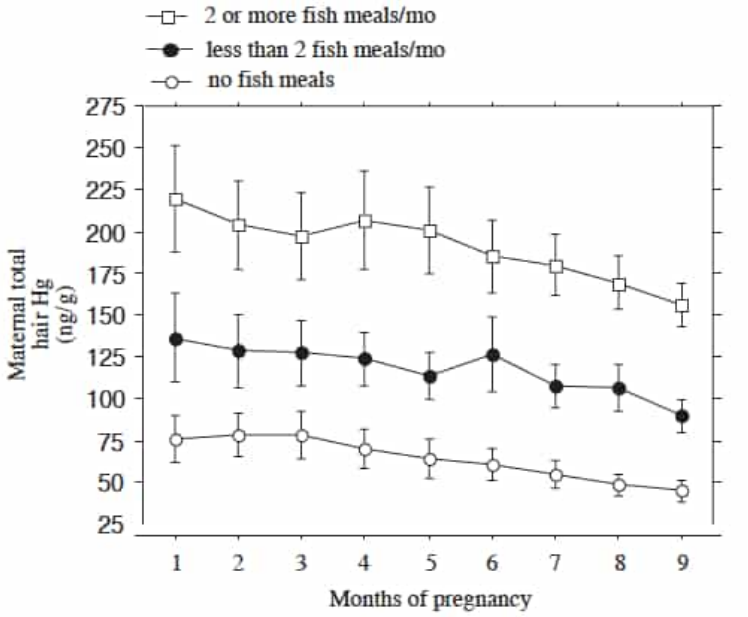
Throughout pregnancy, the placenta concentrates methylmercury and blood mercury concentration in the umbilical cord, which nourishes the foetus, is higher than in the mother's blood. A recent meta-analysis of cord to maternal blood ratios for methylmercury from 10 studies, using different modeling techniques, showed a mean cord to maternal blood ratio of 1.89 with the uppermost 95th percentile of 3.63.[2]. Thus, at birth, the average cord mercury blood concentration will be almost double that of the mother, while for one in twenty that concentration can be over three and a half times more.

Because methyl mercury is concentrated across the placenta, biomarkers of maternal methyl mercury decrease throughout pregnancy as the methyl mercury is taken up by the placenta. Figure 2 shows the decline in hair mercury concentrations during pregnancy for women with different frequencies of fish consumption[3].

For biomonitoring purposes, blood mercury concentrations are measured in women of child-bearing age and not in cord blood. In the study illustrated in the figure below mean maternal blood methyl mercury in the first trimester was 0.48 µg/L and at birth 0.26 µg/L. Mean cord blood concentrations (0.45 µg/L) were similar to mothers' blood methyl mercury concentrations in early pregnancy.

[1] Davidson et al. (2010)
[2] Ou et al. (2014)
[3] Morrissette et al (2004)

Figure 2. Decline in Hair Mercury Concentrations During Pregnancy for Women with Different Frequencies of Fish Consumption



from Morrissette et al. (2004)

5. Population level impacts can be found at much lower levels of exposure than clear individual impacts (eg. lower IQ). These can have major impacts at a community level.

The threshold concentrations of all of the above-mentioned agencies were based on neurobehavioral outcomes and not on illnesses. These statistically significant but individually subtle effects can greatly impact a community.

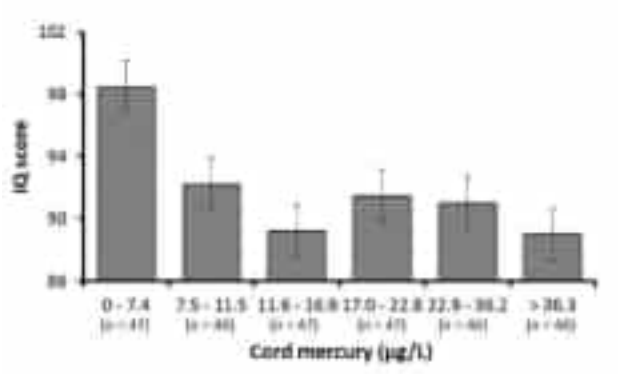
A recent video made by Dr. Bruce Lanphear of Simon Fraser University entitled 'Little Things Matter' (https://www.youtube.com/watch?v=E6KoMAbz1Bw) well describes the impact of very small quantities of toxic substances on children's neurodevelopment. Even **a small decrease in the learning capacity of children in a community has striking repercussions for the community**[1]. For example, an average decrease of 5 IQ points, among exposed children means that, in this community, twice as many children have severe learning difficulties and half as many children are gifted. The effects are amplified if the children have other problems, including poor nutrition, low intellectual stimulation or other toxicant exposures.

In a study of school-age Inuit children from 14 villages in Artic Quebec, children with **cord blood mercury equal to or greater than ≥ 7.5 µg/L were four times as likely to have an IQ score**

[1] Lanphear B. (2015)

below 80, the clinical cut-off for borderline intellectual disability[1], compared to those with lower cord mercury. It is noteworthy that since some of the IQ sub-tests are culturally sensitive, for this study, these tests were modified and validated for this population. The scores ranged from 61 – 125.

Figure 3. Test scores with respect to cord blood mercury in Inuit children 8-14 years old



from Jacobson et al, 2015

6. Developmental impacts of mercury have life-long impacts.

There is increasing evidence that prenatal exposure to mercury has lifelong effects. Subsequent to the Minamata disaster, many children born to asymptomatic mothers with high concentrations of methyl mercury during pregnancy, appeared normal at birth but developed a progressive neurological disorder called Minamata fetal disease[2]. At lower levels, prenatal exposure to methyl mercury is associated with a decrease in children's later cognitive functions, affecting their learning capacity and success in school and in later life.
Recent studies which have examined **long term effect of low-level prenatal exposure on brain activity,** using electrophysiological or neuro-imaging techniques, have confirmed altered brain activity in children with prenatal exposure to mercury[3,4,5,6]

In the United States, researchers have calculated that neurodevelopmental effects of methyl mercury in that country accounts for a loss of $8.7 billion dollars annually in earning capacity[1].

[1] Jacobson et al. (2015)
[2] Grandjean et al. (2010)
[3] White et al. (2011)
[4] Ethier et al. (2012)
[5] Yorifuji et al. (2013)
[6] Boucher et al. (2010)

The authors of the above-mentioned study of prenatal exposure and cognitive effects in Inuit children point out that intellectual disability on school-age IQ is a measure that is predictive of occupational success in adulthood.

In the above-mentioned study of Inuit children, the adjusted[1] mean IQ of the **lowest exposure group was 4.8 points (5%) higher than the others**. However comparing the percentage below 80, the clinical cut-off for borderline intellectual disability: **only 4.3% of the lowest exposure group** were in this category compared to **17.2% for the more exposed.**

In addition, some studies suggest that there may be associations between attention deficits and/or impulsive or hyperactive behaviour in relation to methyl mercury exposure. **The** birth cohort study of **8 – 14 year old Inuit children** shows that **problems of attention and teacher reported symptoms of attention deficits/hyperactive disorders (ADHD) were associated with higher prenatal mercury concentrations, but not current exposures**[2]. In a study in the United States of 8 year old children living near a contaminated site (superfund site), increased risk for inattention impulsive/hyperactive behaviour for boys, but not for girls, was associated with maternal hair mercury, measured close to child's birth, equal to or above 1µg/g.

Several authors have raised the issue of the combined effects of toxic exposures on children's development in communities with other risk factors, such as poor nutrition and housing, pre-existing diseases and parents' unhealthy lifestyle. Weiss and Bellinger[3] refer to the 'social ecology of children's vulnerability to environmental pollutants'. The impact of toxic exposures on children who are vulnerable because of other risk factors is greater on the community.

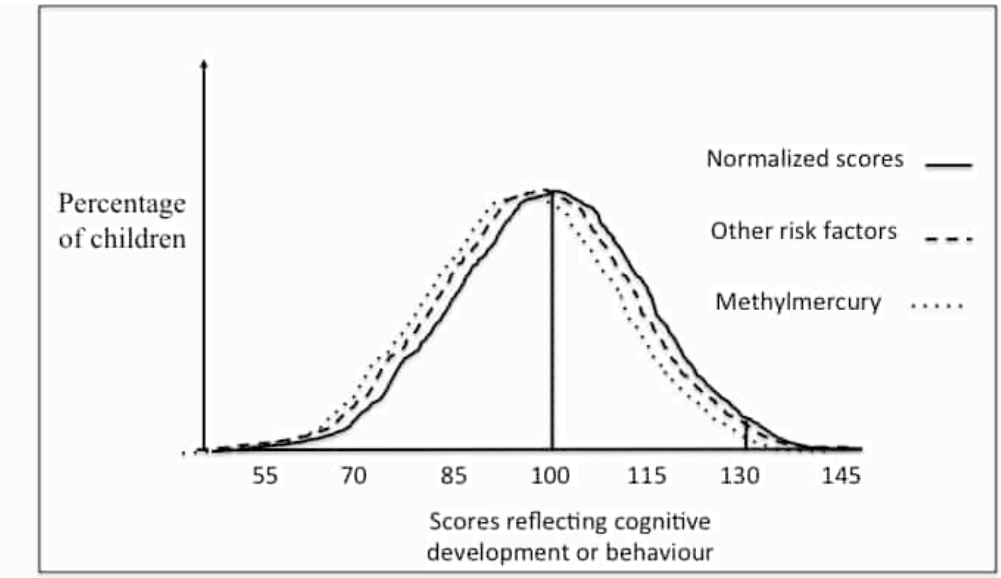
Figure 4 below shows how methyl mercury compounds the effects of other risk factors on intellectual capacities. Children's average cognitive capacities or behavior are influenced by factors such as poor nutrition and housing, pre-existing diseases and parents' unhealthy lifestyle, pushing the 'normal curve' towards the left, with more children suffering from learning difficulties. Methyl mercury exposure further pushes the curve towards the left.

[1] In this study, to assess the contribution of mercury, IQ scores were adjusted for cord lead, current PCB153, cord DHA, cord selenium, social environment

[2] Boucher et al. (2012)

[3] Weiss and Belanger (2006)

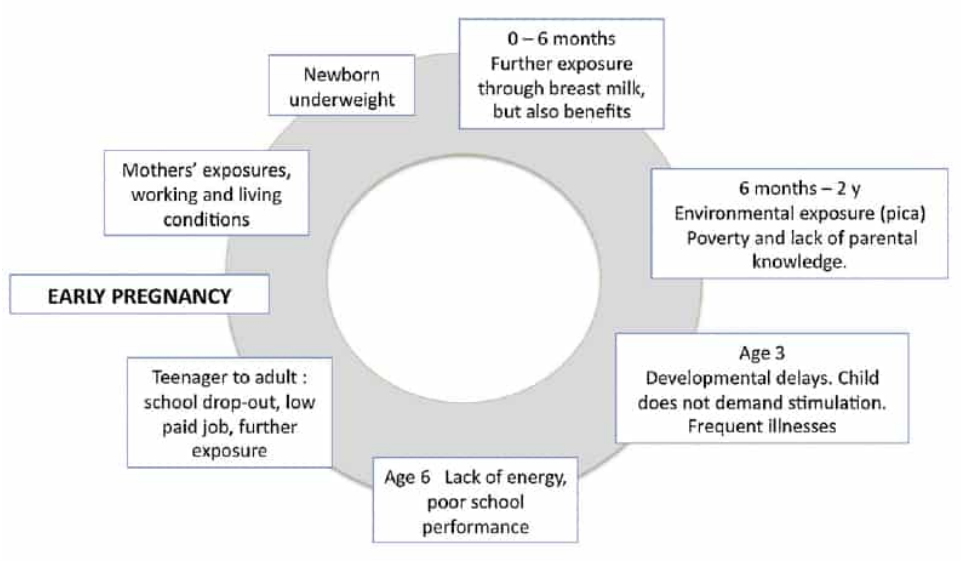
Figure 4 Estimated distribution of intellectual capacities with methyl mercury exposure combined with other factors. The normal curve moves towards the left, towards lower scores.



The impact of exposure may also be passed on from one generation to the next[1], not only through the fetal environment, but also through the care that parents who function less well because of their exposure are able to give to their children. It can become a vicious circle, as shown in Figure 5. The way in which boys and girls experience these effects may differ[2]. Boys and girls who drop out of school may occupy poorer jobs or no jobs and act out their dissatisfaction in different ways. For girls, early pregnancy may be a further consequence. Although associations between early pregnancy and school achievement, living conditions and income have been studied in aboriginal and non-aboriginal communities[3], the possible contribution of exposure to contaminants to these situations has not been examined.

[1] Mergler (2012)
[2] Mergler (2012)
[3] Garner et al. (2013)

Figure 5 Impact of Environmental Exposure from One Generation to the Next



From Mergler (2012)

7. The health impacts of mercury exposure in adults can take a long time to manifest and can be long lasting and degenerative.

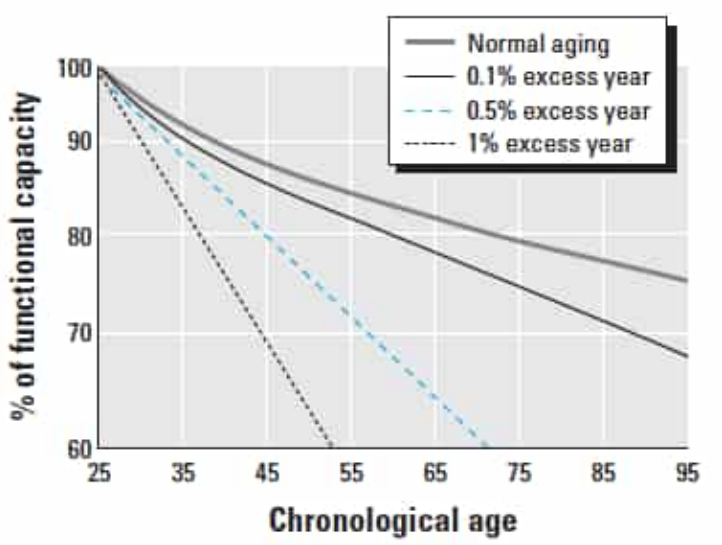
Adverse effects of methyl mercury exposure in adults can result from pre-natal and childhood exposure and/or exposure during adulthood. However, the harm may not be immediately evident. Even with high exposures during adulthood, such as those that occurred in Iraq and in Minamata, there was often a delay between exposure and mild to severe neurological effects exposure, varying from weeks to years[1]. A study in Japan[2] compared the subjective complaints and activities of daily living (ADL score) of a randomly chosen sample of 750 persons, classified into three groups with respect to estimated previous exposure to methyl mercury; all had lived in their current residence for over 40 years. While no difference was observed between exposure categories for the 40-49 year olds, as they got older there was a strong dose-effect relation, with those in the higher group showing the worst scores. Further data from Minamata and the surrounding areas suggest that, in later life, exposed persons display a higher prevalence of psychiatric problems[3], hypertension[4], lower urinary tract disorders[5].

[1] Weiss et al. (2002)
[2] Ushijima et al. (2012)
[3] Yorifuji et al. (2011)
[4] Yorifuji et al. (2009)
[5] Hara et al. (2013)

In adult subsistence fish-eaters of the Brazilian Amazon region, hair mercury concentrations have been associated with deficits in visual functions[1] and motor performance[2]. Age-related decrease in near visual acuity and the prevalence of age-related cataracts were higher among those with higher exposures to mercury[3,4] . In a follow-up study of persons in this region, who continued to eat the same amount of fish, but preferentially those with less mercury, the resulting decrease in hair mercury was associated with an improvement in motor functions, but visual functions continued to decrease in relation to their past exposure levels[5].

Studies of non-human primates dosed with methylmercury, the latency period increased as the dose decreased[6]. In Figure 6, taken from Weiss (2002), the impact of slight increases in loss of functional capacity with age is illustrated. Like with small decrements in IQ in children which have a large impact on society, small decrements in functional capacity with age likewise impact the aging process. Again with poor nutrition, living conditions and access to health facilities, the decrease in functional capacities is greater.

Figure 6 Impact of Slight Increases in Loss of Functional Capacity with Age



From Weiss (2002)

[1] Fillion et al. (2013)
[2] Fillion et al. (2011a)
[3] Fillion et al. (2011b)
[4] Lemire et al. (2010)
[5] Fillion et al. (2011a)
[6] Weiss (2002)

To better understand the mechanisms involved in adult exposure to methyl mercury, researchers have examined the brains of animals chronically exposed to methyl mercury over a period of time. These studies show extensive alterations in the cortical regions of the brain[1,2] Autopsies performed on the brains of children and adults from the Minamata disaster show different patterns of mercury related impairment, more diffuse in children and more concentrated in specific areas in adults[3].

Methyl mercury from fish consumption has also been associated with chronic conditions in adults although the contribution of previous prenatal and/or postnatal exposure vs. current exposure is difficult to determine. In the study cited above of a Taiwanese population living near a deserted chloralkali plant, there was no historical data and the researchers were unable to determine the contribution of past exposures to their neurologic deficits, which were associated with current exposure concentrations. In this same population, the authors found that current mercury blood concentrations were associated with increased risk of insulin resistance[4].

8. Fish is the most important source of mercury in humans. Other sources of mercury in humans include fish eating wildlife (ducks, otters, etc.), dental fillings, etc. Estimates of mercury impacts based on MeHg or fish alone may underestimate the total impact.

Humans are exposed to both inorganic mercury and organic mercury (usually in the form of methyl mercury). Exposure to inorganic mercury is usually through mercury vapours from occupational and industrial sources; mercury amalgams in dental fillings can also be a source of exposure to inorganic mercury. When inhaled or swallowed, this form of mercury passes passively into the blood and is excreted through the urine. Contrary to methyl mercury, it is not actively taken up by tissues, such as the brain or the placenta and the concentration in mother's blood is similar to that in cord blood[5].

Methyl mercury has been used in industrial processes; the methyl mercury poisoning disaster in Iraq in the early seventies was due to the methyl mercury containing fungicide that was consumed by humans[6]. However, outside of accidental exposures, human exposure to methyl mercury is very largely through fish consumption and to a lesser extent through consumption of fish-eating birds and mammals.

To estimate the total intake of methyl mercury, one needs to consider the entire diet, including

[1] Dasari et al. (2010)
[2] Kong et al. (2012)
[3] Eto et al. (2010)
[4] Chang et al . (2011)
[5] Morisette et al. (2004)
[6] Grandjean et al. (2010)

fish-eating birds and mammals. The Environment Canada website on mercury in the food chain, updated in 2013 well describes how mercury accumulates through the food chain (https://www.ec.gc.ca/mercure-mercury/default.asp?lang=En&n=D721AC1F-1).

Some salient points are made in this document :

- *Because mercury is a persistent substance, it can build up, or bioaccumulate, in living organisms, inflicting increasing levels of harm on higher order species such as predatory fish and fish eating birds and mammals through a process know as "biomagnification".*
- *In the environment, particularly lakes, waterways and wetlands, mercury can be converted to a highly toxic, organic compound called methylmercury through biogeochemical interactions.*
- *The most important pathway for mercury bioaccumulation is through the food chain. In the water, plants and small organisms like plankton take up mercury through passive surface absorption or through food intake. … Methyl mercury biomagnifies through the food chain as predators eat other organisms and absorb the contaminants that their food sources contained.*
- *Over time, an individual who consumes plants or prey contaminated with methyl mercury will acquire levels greater than in either its habitat or its food. As a result, top predators acquire greater body burdens of mercury than the fish they consume.*
- *In some cases, methylmercury levels in carnivorous fish, such as freshwater bass, walleye and pike … bioaccumulate up to a million times greater than in the surrounding water.*
- *Piscivorous (fish eating) predators such as loons, merganser ducks, osprey, eagles, herons, and kingfishers, generally have very high concentrations of mercury.*
- *In addition, mercury has been found in predatory mammals such as otters from south central Ontario.*

9. In 1979 the Health and Welfare Canada recommended a limit of 0.2 ppm in fish as a fish consumption limit for Grassy Narrows and White Dog. The limit for possession of fish for sale is 0.5 ppm wet weight.

In 1973, a Task Force on Organic Mercury in the Environment was established by the Minister of National Health and Welfare (currently Health Canada) "in order to respond to the problem of high and unusual mercury levels in relation to the health and well-being of residents of Grassy Narrows and Whitedog, Ontario"[1]. A biomonitoring program was initiated. In 1979, The Health and Welfare Canada recommended a limit of 0.2 ppm in fish for consumption in Grassy Narrows and Whitedog.

[1] cited in Legrand et al. (2010)

The Canadian limit of fish for commercial purposes of 0.5 ppm wet weight is based on the fact that in the general population, fish consumption is not very high. Data from the 2007-2009 Canadian Health Measures Survey (CHMS), which does not include people living on reserves or in remote regions, show that most Canadians eat (82.6%) eat less than three meals of fish and/or shellfish per week. Overall blood mercury levels are low, with median values at 0.81µg/L and the 95th percentile 4.70 µg/L. Blood mercury levels increase with fish consumption. Among pregnant women, 98% are below the Health Canada guideline for blood mercury (8µg/L).

In contrast, a study of diet among 7 Istchee (Cree) communities in the James Bay area showed that blood mercury concentrations 3 – 20 times higher than those reported in the CHMS; blood mercury increased with inland traditional food intake[1]. Another study of persons from the Wapekeka and Kasabonika communities[2] showed hair mercury concentrations 1.5 times higher in persons who ate more than 1 meal of wildlife/week (age adjusted hair mercury concentration (2.96 ± 0.3 µg/g)

10. The Canadian reference dose for preventing fetal neurotoxicity and developmental impacts is double that recommended by US EPA.

In section 2, the different guidelines for mercury exposures are presented. The guidelines were developed to recommend **tolerable daily intake (TDI) or weekly intake (TWI)** of mercury. The Canadian provisional tolerable daily intake for pregnant women, women of reproductive age and infants of 0.2µg/kg body weight/day is twice the US EPA of 0.1µg/kg body weight/day and slightly higher than the proposed revision of the FAO/WHO reference dose (0.19µg/kg body weight/day) (see section 2). The US EPA reference dose is based on **cord blood concentrations**, while the JECFA and Canadian recommendations are based on **hair concentrations**. The Canadian recommendation used a 5-fold uncertainty factor to account for inter-individual variability[3]. The studies that support this recommendation used maternal hair mercury concentrations at birth which are lower than those at the beginning of pregnancy due to placental accumulation (see figure 2 in section 4). All of these reference doses are high for Grassy Narrow since the population has already been exposed to levels that are higher, and in many cases, considerably higher than these.

11. Eating fish has a number of important health benefits. Serious efforts should be made to avoid practices which lead to bio-accumulation of mercury in fish so that the health benefits of fish can be enjoyed while minimizing health impacts from mercury.

Fish is a highly nutritious food, providing a wide variety of nutrients, including omega-3 fatty

[1] Johnson-Down et al. (2015)
[2] Seabert et al. (2014)
[3] Legrand et al. (2010)

acids. In a review of the cardio vascular benefits of omega-3 fatty acids, Mori[1] writes: "Many clinical and epidemiological studies have shown that the polyunsaturated n-3 fatty acids EPA and DHA from fish and fish oils, provide cardiovascular protection, particularly in the setting of secondary prevention. Omega-3 fatty acids beneficially influence a number of cardiometabolic risk factors including blood pressure, cardiac function, vascular reactivity and lipids, as well as having anti-platelet, anti-inflammatory and anti-oxidative actions". Omega-3 fatty acids are likewise positively associated with neuropsychological and neurophysiological outcomes throughout the lifespan.[2,3] Indeed, **today, most studies of mercury toxicity from consumption of fish and fish-eating animals take into account the positive effects of omega-3 fatty acids.**

An article describing a study of myocardial infarction in a Swedish and Finnish cohort well illustrates the benefits associated with omega-3 fatty acids and risks associated with methylmercury from fish consumption[4]. Their model of risk, presented in Figure 7, shows that at lower concentrations of methyl mercury, even a small increase in omega-3 fatty acids can have an important impact in reducing the risk of myocardial infarction, but at higher concentrations of methylmercury, the beneficial effects are counteracted.

[1] Mori (2014)
[2] Bernard et al (2013)
[3] Virtanen et al. (2013)
[4] Wennberg et al (2012)

Figure 7. Risk for Myocardial Infarction with respect to hair mercury concentrations and the percentage of omega -3 fatty acids (s-PUFA) in blood

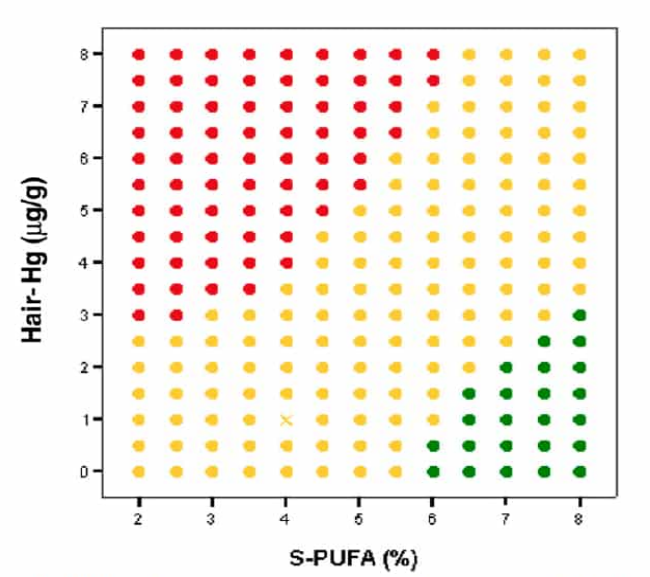


FIGURE 3. Associations of concentrations of long-chain n−3 S-PUFA and Hair-Hg with risk reduction (green circles; upper 95% CI limit for model-based RR <1.0) or increased risk of myocardial infarction (red circles; lower 95% CI limit RR >1.0), with the reference point (RR = 1.0; yellow X) set to S-PUFA = 4.0% and Hair-Hg = 1.0 µg/g; yellow circles denote no statistical evidence of an effect. Hair-Hg, amount of mercury in hair; S-PUFA, PUFAs in serum.

From Wennberg et al. (2012)

Like in many other birth cohort studies, the studies of Inuit children described above, which showed negative effects of prenatal mercury exposure on school-aged children's performance on neurobehavioural tests[1,2], likewise show positive effects of **cord blood DHA**; the benefits and risks are likewise reflected in electrophysiological measurements[3.]

In adult freshwater fish eaters from the Brazilian Amazon, although omega-3 fatty acid concentrations are low compared to consumers of marine fish and mammals, positive effects of omega-3 fatty acids have been observed with better visual functions[4]

The serum omega-3 fatty acids in First Nation inland communities increases with proportion of

[1] Boucher et al, (2011)
[2] Jacobson et al. (2015)
[3] Boucher et al (2011)
[4] Fillion et al, (2011)(2013)

traditional diet meals[1,2]

12. The Ontario Guide for Sport Fish Eaters is not appropriate for Indigenous communities who eat fish as part of their cultural practice. It assumes that fish are eaten relatively infrequently.

The Ontario Guide for Sport Fisher Eaters (2013-2014) indicates that "The advice in this guide is designed for anglers (and their families) who consume moderate quantities of fish. The consumption advice is intended to protect individuals who follow the advice in the guide and consume no more than 8 meals per month of the fish they catch. This maximum recommended consumption frequency was based on the results of surveys indicating that most anglers do not consume sport fish more frequently than 8 meals per month. However, many of these fish can be safely consumed more frequently. Anyone who consumes sport fish more frequently than 8 meals per month is advised to contact the Sport Fish Contaminant Monitoring Program (416-327-6816 or 1-800-820-2716, sportfish.moe@ontario.ca." [3]

The US-EPA developed a guide for subsistence fishing with the collaboration of representatives from Native American tribes. It indicates : "EPA recognizes, however, that Native American subsistence fishers are a unique subsistence fisher population that needs to be considered separately. For Native American subsistence fishers, eating fish is not simply a dietary choice that can be completely eliminated if chemical contamination reaches unacceptable levels; rather eating fish is an integral part of their lifestyle and culture. This traditional lifestyle is a living religion that includes values about environmental responsibility and community health as taught by elders and tribal religious leaders. Therefore, methods for balancing benefits and risks from eating contaminated fish must be evaluated differently than for the general fisher population"[4].

13. People who have already experienced elevated mercury exposure, or are showing symptoms of mercury poisoning, may be more sensitive to further exposure than the general population.

Both animal and human studies have shown long latency effects of methyl mercury exposure.[5] Adding further toxic exposure can add further harm to systems that have already been affected. A large number of human and animal studies have shown neuronal and metabolic changes in the absence of manifest signs and symptoms. Persons whose systems have already been altered by previous exposures are more sensitive than the general population.

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[1] Seabert et al (2014)
[2] Johnson-Down (2015)
[3] The Ontario Guide for Sport Fisher Eaters (2013-2014) p. 7
[4] US Environmental Protection Agency *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories Volume 2 Risk Assessment and Fish Consumption Limits Third Edition (2000) p. 16*
[5] Newland et al. (2015)

14. CONCLUSIONS WITH RESPECT TO GRASSY NARROWS

This updated analysis of the scientific literature provides substantial further support and confirm the Chan and Mergler conclusions in the report to the Mercury Disability Board (MDB) in 2009[1] **:**

14a There is no doubt that at the levels of exposure experienced in Grassy Narrows, many people have suffered and are suffering from mercury poisoning.

- Further scientific knowledge of the past 6 years inform us that damage occurs at concentrations much lower than those previously considered harmless, with important impacts not only for individuals but also on the entire community.
- A growing number of birth cohort studies show that the foetus is particularly sensitive to methyl mercury neurotoxicity and even very low concentrations of exposure can affect future cognitive capacity and behavior.
- In 1996, the Research and Development, Environmental Contaminants, Medical Services Branch of Health Canada presented a report on the mercury and child development research project for the Grassy Narrows Band Council[2]. Although the report has numerous methodological problems as regards data analyses[3] and data presentation is confusing, there is information on children's exposure :
    - For the 139 children included in the study, the authors report that between 1978 and 1990 average cord blood concentrations was 8.67 µg/L, with a maximum value of 78.5 and 10% above 20 µg/L.
    - One child born in 1979, who was not included in the study, had a cord blood mercury concentration above 120 µg/g, while another born in 1978 had over 80 µg/g.
    - Overall, there was an important decrease in cord blood mercury concentrations between 1978 and 1991, however, in 1992, there appears to be an increase .
    - The mean hair mercury concentration of the participants at the time of the study was 3.90 g/g with the maximum at 26 µg/g.
    - Figure 8, taken from this report, shows the cord mercury concentrations measured in Grassy Narrows over time.

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[1] Chan and Mergler (2009)

[2] Research and Development, Environmental Contaminants, Medical Services Branch of Health Canada (1996)

[3] The analyses that were carried out were insufficient to arrive at any conclusions and particularly the conclusion that there were no effects.

- **At these cord blood concentrations, there is consensus from the current scientific literature that there would be effects on children's neurodevelopment.**

Figure 8 Umbilical cord blood levels/year measured in Grassy Narrows

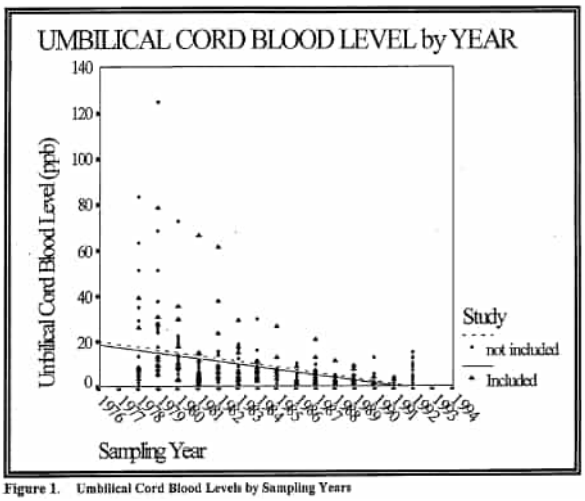

Figure 1. Umbilical Cord Blood Levels by Sampling Years

From the Mercury and Child Development Research Project, Grassy Narrows, Research and Development, Environment Contaminants, Medical Services Branch, Health Canada (1996)

- In a history of Minamata Disease published in 1995[1], Harada describes the diagnosis of the initial cases in 1956. He recounts that by 1960, "while the number of grave cases with acute Minamata Disease in the initial stage was decreasing, the numbers of chronic Minamata patients who manifested symptoms gradually over an extended period of time was on the increase."
- Recent studies from MInamata, supported by findings from animal research, show that methyl mercury accelerates the aging process.
- A large number of animal studies and several human electrophysiological and imaging studies are elucidating the mechanistic basis for mercury neurotoxicity.
- While the nervous system is the primary target organ for methyl mercury, studies indicate that the cardiovascular system and metabolic pathways may also be affected by methyl mercury.

[1] Harada (1995)

14 b. The scientific literature continues to support Dr. Masazumi Harada and colleagues' clinical findings, reviewed by Chan and Mergler for the MDB[1] on the similarities between the neurologic signs and symptoms of persons from Grassy Narrows and White Dog and Minimata Disease in Japan.

- In their early reports[2,3], Harada and colleagues had examined 89 persons from Grassy Narrows and Whitedog and indicated that no one presented all of the classical signs and symptoms of Minamata Disease, although many persons presented one or more classical signs of the disease. Although they did not carry out statistical analyses, they provide evidence of dose-effect relations.

- In 2002[4], the same neurologists examined 57 persons of whom 9 had been examined in 1975. The authors classified 11 of the 57 persons with Minimata Disease, 12 with Minamata Disease and other complications and 22 with "light Minamata Disease".

- None of the persons Harada found with levels over 50 in 1975 survived to be re-tested in 2002. Of the 9 who were re-examined none fell into the Minamata Disease category, but for 7 of the 9, symptoms and signs had worsened.

- In 2004, this team examined 187 persons, among whom they identified 60 of Minamata Disease and 54 cases of the disease with complications. Twenty seven had participated as well in 1975. In their review of Dr. Harada's follow-up studies (1975 - 2004)[5], the Chan and Mergler report point outs that **the most valuable information of this report was the evolution of neurologic signs and symptoms consistent with mercury poisoning in those that were tested in the two periods.**

- In 2011, Harada and his co-workers[6] wrote a review of the work that they had carried out in Grassy Narrows and White Dog since 1975, including a further study carried out in 2010. In 2010, they performed neurologic assessments of 73 persons from Grassy Narrows and 87 from White Dog over 20 years old. The report indicated that under the diagnostic criteria used in Minamata City, 33.7% of the group that they examined were diagnosed as Minamata Disease patients; and 25.0% as suspected Minamata Disease cases (see more details in answer to question 1.1 c) .

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[1] Chan and Mergler (2010)
[2] Harada et al. (1976)
[3] Harada et al. (1977)
[4] Harada et al. (2005)
[5] Harada et al. (unpublished report)
[6] Harada et al. (2011)

- Using the findings from the 2010 examinations, Takoaka and coworkers[1] compared the neurologic signs and symptoms of 80 volunteers aged 16 to 76 from Grassy Narrows and Japanese exposed and control groups. From the observed similarities, particularly between the Grassy Narrows older group and the Japanese exposed group, the authors conclude that "clinical signs and symptoms of the residents of Grassy Narrows are almost the same as those recorded for Minamata disease in Japan." (see more details in answer to question 1.1 d)
- It should be noted that Dr. Harada and his team sought to determine whether persons exposed to mercury in Grassy Narrows and White Dog presented a neurological clinical profile similar to Minamata Disease. While they identified cases and possible cases using the Minamata Disease criteria, they did not examine the possible contribution of mercury into other disorders or the impact of more subtle changes of nervous system functions, particularly during foetal exposure and childhood, which occur at lower concentrations of exposure. .
- Both Harada et al (2011) and Takaoka et al (2014) mention that the participants in their studies presented a high prevalence of several health disorders, including hypertension and diabetes among the participants, **but the possible contribution of mercury to these conditions has not been examined.**

14 c. Because of mercury contamination in the region, the people of Grassy Narrows were obliged to reduce their consumption of local fish and wildlife and were thus deprived of healthful nutrients, which have been shown to be beneficial for a large number of physiological functions and to be preventive for many and diseases.

- The historically high mercury concentrations in fish forced the community to greatly decrease their fish and wildlife consumption, depriving them of the nutritional and social benefits[2] of a traditional diet.
- In a 2003 study of 87 persons from Grassy Narrows[3], 61% reported that they currently fish in the surrounding area, 31% reported that they used to but no longer had fished in the area, and 8% reported they have never fished in the area. Of these participants, 9% reported eating more traditional food compared to 10 years ago, 55% reported eating about the same, and 36% reported eating less. Reasons provided for a decrease in the consumption of traditional foods included
    - changes in the family structure;
    - decreased hunting and fishing practices;
    - decreased availability;

[1] Takaoka et al. (2014)
[2] Wheatley and Wheatley (2000)
[3] Chan (2005)

  - concerns about the safety/contamination of the food;
  - the convenience of market foods.

- Although there has been marked decrease in mercury in fish in the English-Wabigoon River system,[1] recent concentrations of mercury in fish[2] and fish-eating wildlife[3] oblige the community to limit consumption of fish and wildlife.
- Kinghorn et al[4] analyzed fish mercury concentrations in 4 fish species from seven lakes in the Grassy Narrows territory and describe the relation between fish length with respect to mercury concentration. They note that the fish harvested from Grassy Narrows lakes show stronger associations between fish length and mercury compared to those from the Wabaseemong territory. The authors indicated that this may be because "these lakes are closest to the Dryden spill site. Higher levels of mercury in the sediment of these lakes may affect the rate of uptake of mercury in the fish that live predominantly within them."
- For a report in 2005, Chan calculated mercury intake and hair concentrations for 87 persons from Grassy Narrows and 55 from Wabaseemoong measured in 2003. In Grassy Narrows, the average yearly local fish consumption in Grassy Narrows was 20g/day, but in older men (+61 years of age) it averaged 60g/day. When all of the hair segments were analyzed, mean hair mercury was 1.3 µg/g with a maximum of 7.1 µg/g. The highest individual hair segment was 15.5 µg/g. Hair mercury increased with mercury intake from fish consumption. In 2004, Harada reported that one persons had a concentration of 25 µg/g and 2003, Chan reported that persons from the White Dog area had hair concentrations of 60µg/g.
- The 2012 report on fish Contaminant Monitoring near Grassy Narrows First Nation by the Environmental Monitoring and Reporting Branch Ontario Ministry of the Environment[5] shows elevated mercury in the 50 km area around Grassy Narrows in walleye and much lower concentrations in Whitefish. For walleye, with the exception of one site where the report indicates that fish can be eaten with restriction, all the other sites indicate DO NOT EAT. Whitefish present much lower concentrations, which may still pose a risk to subsistence eaters.
- The 2012 above-mentioned report presents separate values for sensitive populations, defined as women of child-bearing age and children under 15 years old, and for the general population. Given the recent information on mercury reviewed above, a population that has already suffered effects from mercury contamination and other harmful risk factors for poor health may also be considered 'sensitive'.

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[1] Neff et al. (2012)
[2] Kinghorn et al. (2007)
[3] Sellers et al. (2010)
[4] Kinghorn et al (2007)
[5] Ontario Ministry of the Environment (2012)

Grassy Narrows : a sensitive population

- Prior to the events and poisoning that occurred due to mercury contamination, the Grassy Narrows community had undergone important upheaval that negatively impacted their lives and lifestyle.[1,2,3] The toxic effects of mercury would compound the effects of these stresses on the nervous system and their health status.

- Because of the high prevalence of disease, coupled to mercury intoxication, in the communities of Grassy Narrows and White Dog, in the 2010 MDB report, Chan and Mergler point out " It is paramount that members of the two communities receive the necessary medical care and support. In contrast, residents in Minamata, Japan enjoy superb health care from neurologists and therapists even they had not officially been classified as victims of Minamata Disease".

- It is surprising that although the Japanese neurologists have identified many cases of Minamata Disease in Grassy Narrows and many persons have illness that have been associated with mercury intoxication, there has never been a scientifically sound epidemiologic study of the impact of pre and post natal mercury exposure on the health and well-being of this community.

- There are many sources of mercury contamination. The river and lake systems around Grassy Narrows have been polluted by industrial activities; hydro-electric reservoirs and logging can also contribute to the mercury burden in this ecosystem. Any increase of exposure to this already 'sensitive' community would further compound the harm to the health and well-being of the present and future generations.

1 Vecsey (1987)
2 Etken D. (2015)
3 Ilnyak (2014)

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APPENDIX A – CURRICULUM VITAE