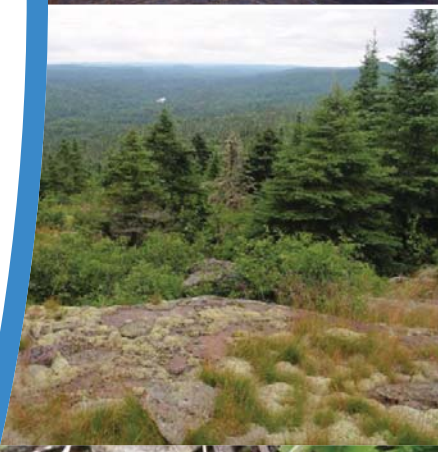
ENVIRONMENTAL ASSESSMENT FOR THE MARATHON PGM-Cu PROJECT AT MARATHON, ONTARIO



STILLWATER CANADA INC. MARATHON PGM-Cu PROJECT

SUPPORTING INFORMATION DOCUMENT No. 24 - MARATHON PGM-Cu PROJECT TERRESTRIAL BASELINE ENVIRONMENT PROGRAM

Prepared by:
Northern Bioscience
363 Van Horne Street
Thunder Bay, ON
P7A 3G3

Marathon PGM

Terrestrial Baseline Assessment 2009

November 2009

Prepared for:
Ecometrix
Incorporated

Prepared by:
Allan G. Harris
Dr. Robert F. Foster

NORTHERN BIOSCIENCE
ECOLOGICAL CONSULTING

Abstract

This report described a 2009 baseline environmental assessment for the Marathon PGM study area, 10 km north of Armstrong Ontario. It supplements the initial baseline assessment conducted in 2007 to 2008. Emphasis of the present study was on terrestrial habitat mapping, species at risk surveys, and caribou habitat assessment.

Terrestrial habitat is mostly (over 80%) birch forest on silty soils. Open rock barrens are common on hilltops. Jack pine and trembling aspen dominated forest are absent. Most of the forest is over 100 years old. Peatlands, cliffs, and other communities make up a small proportion of the study area.

Species at Risk (species listed under provincial or federal endangered species legislation) in the study area include three bird species. Canada warbler is a common nesting species in birch mixedwood forest. A single olive-sided flycatcher was observed and is a possible nesting species. A family group of rusty blackbirds at a wetland near the middle of the study area indicates that this species breeds here. Three other bird species at risk; peregrine falcon, common nighthawk and bald eagle; inhabit the surrounding area but were not observed in the study area. Peregrine falcon habitat in the study area is marginal (cliff faces less than 15 m high and less than 100 m long).

Five provincially rare plant species were observed in or adjacent to the study area: Appalachian firmoss, alpine woodsia, Braun's holly fern, alga pondweed, and shore plantain. These species are not listed under endangered species legislation but are considered to be rare in Ontario. Eleven regionally rare (i.e. rare in Thunder Bay District) were also discovered.

The study area itself lacks significant caribou winter or calving habitat, and there are no known records of caribou within about 20 km. However its position in the Lake Superior Coast Range means that the study area is considered to be caribou habitat. The area could function as a travel corridor connecting the Lake Superior coast with the Lake Superior Uplands and caribou ranges farther north.

Cover photo: Marathon PGM study area landscape.

Contents

Figures

Tables

Appendices

Introduction

Stillwater Canada Inc. (SCI) proposes to develop a platinum group metals (PGMs), copper (Cu) and possibly iron (Fe) open-pit mine and milling operation near Marathon, Ontario. A Notice of Commencement (NoC) of an environmental assessment (EA) in relation to the proposed Marathon PGM-Cu Project (the "Project") was filed by the Canadian Environmental Assessment Agency (CEA Agency) under Section 5 of the Canadian Environmental Assessment Act on April 29, 2010 (updated July 19, 2010).

The EA was referred to an independent Review Panel by the Federal Minister of the Environment on October 7, 2010. On March 23, 2011 SCI entered into a Voluntary Agreement (VA) with the Province of Ontario to have the Project subject to the Ontario Environmental Assessment Act (OEA Act). This agreement was the instrument that permitted the provincial government to issue a Harmonization Order (HO) under Section 18(2) of the Canada-Ontario Agreement on Environmental Assessment Cooperation to establish a Joint Review Panel for the Project between the Minister of the Environment, Canada and the Minister of the Environment, Ontario.

The HO was issued on March 25, 2011. The Terms of Reference (ToR) for the Project Environmental Impact Statement (EIS) and the agreement establishing the Joint Review Panel (JRP) were issued on August 8, 2011.

The following provides an overview of the proposed development including its location, surrounding land uses, the exploration history of the site and the primary conceptual features of the mining and milling facilities. The information provided below, in the Environmental Impact Statement Report and supporting technical studies is based on the conceptual mine design for the Project. The conceptual design provides planning level information for the environmental assessment process. Final detailed design will commence following EA approval in concordance with the concepts presented herein.

Project Location

The Project is located approximately 10 km north of the Town of Marathon, Ontario (Figure 1). The town, with a population of 3,353 (2011 Census), is situated adjacent to the Trans-Canada Highway 17 (Hwy 17) on the northeast shore of Lake Superior, about 300 km east and 400 km northwest (by highway) of Thunder Bay and Sault Ste. Marie, respectively.

The centre of the Project footprint sits at approximately 48° 47' N latitude and 86° 19' W longitude. The Project site is in an area characterized by relatively dense vegetation, comprised largely of a birch and, to a lesser extent, spruce-dominated mixed wood forest. The terrain is moderate to steep, with frequent bedrock outcrops and prominent east to west oriented valleys. The climate of this area is typical of northern areas within the Canadian Shield, with long winters and short, warm summers.

Figure 1. Location of the Proposed Marathon PGM-Cu Project Site near Marathon, Ontario.

Surrounding Land Uses

The Project site lies partially within the municipal boundaries of the Town of Marathon, as well as partially within the unorganized townships of Pic, O'Neil and McCoy. The primary zoning designation within the Project Site is 'rural'.

In the immediate vicinity of the Project there are several authorized aggregate sites, including SCI's licensed aggregate site located to the northeast of Hwy 17 along the existing site access road (Camp 19 Road).

The Marathon Municipal Airport (CYSP), which operates as a Registered Airport (Aerodrome class) under the Canadian Aviation Regulations (CARs; Subsection 302), is adjacent to, and south of the Project site. The airport occupies a land area of approximately 219 hectares and is accessed from Hwy 17.

Several First Nations and Métis peoples claim the Project site as falling within their traditional land use boundaries. Based on Aboriginal accounts, prior to the construction of the forestry road, the land and water uses associated with (or close to) the site would have typically been limited to the Pic River corridor, the Bamoos Lake-Hare Lake-Lake Superior corridor and the Lake Superior shoreline and near-shore area, rather than the interior of the Project site. Traditional land and water uses (or rights conferred by Treaty) that can be ascribed to the site could include:

- Hunting;
- Trapping;
- Fishing; and,
- Plant harvesting for food, cultural and medicinal uses.

Primary industries supporting the Town of Marathon, as well as the region, have historically been forestry, pulp and paper, mining and tourism. The Project site is located within the Big Pic Forest Management Area. The Big Pic Forest includes Crown land east and north of Lake Superior and is generally north, south and west of the community of Manitouwadge and includes the communities of Marathon, Caramat and Hillsport.

Until July 2010 the forest was managed under the authority of a Sustainable Forest License (SFL), which was held by Marathon Pulp Inc. This SFL was revoked, with the forest reverting to the Crown as a Crown Forest. Until recently, Marathon Pulp Inc. (MPI) operated a kraft pulp mill in Marathon on the shore of Peninsula Harbour. The mill announced its indefinite shut down (effective at the end of February 2009) on February 11, 2009, and as a result there has been a significant downturn in the local economy. A second mill operated in Terrace Bay was temporarily closed in December 2011.

The Hemlo Mining Camp is located 30 km to the southeast. There are currently two mines in production at the Camp (David Bell Mine, Williams Mine), which are estimated to be in operations until 2025.

Exploration History of the Site

Exploration for copper and nickel deposits on the Project site started in the 1920s and continued until the 1940s with the discovery of titaniferous magnetite and disseminated chalcopyrite occurrences. During the past four decades, the site has undergone several phases of exploration and economic evaluation, including geophysical surveys, prospecting, trenching, diamond drill programs, geological studies, resource estimates, metallurgical studies, mining studies, and economic analyses. These studies have successively enhanced the knowledge base of the deposit.

In 1963, Anaconda acquired the Marathon property and carried out systematic exploration work including diamond drilling of 36,531 m in 173 drill holes. This culminated in the discovery of a large copper-PGM deposit. Anaconda discontinued further work on the project in the early 1980s due to low metal prices at the time.

In 1985, Fleck purchased a 100% interest in the Marathon PGM-Cu Project with the objective of improving the project economics by focusing on the platinum group element (PGE) values of the deposit. The Fleck drilling totaled 3,615 m in 37 diamond drill holes. In 1986, H.A. Symons carried out a feasibility study for Fleck based on a 9,000 tonnes per day conventional flotation plant with marketing of copper concentrate and Kilborn Limited carried out a prefeasibility review for Fleck that included preliminary results from the Lakefield pilot plant tests (Kilborn Limited, 1987). The feasibility study indicated a low internal rate of return which was confirmed by Teck Corporation who concluded the project was uneconomic due to low metal prices at the time. On June 10, 1998, Fleck changed its name to PolyMet Mining Corp.

In 2000, Geomaque acquired certain rights to the Marathon PGM-Cu Project through an option agreement with Polymet. Geomaque and its consultants carried out a study of the economic potential of the Marathon PGM-Cu Project. The study included a review of the geology and drill hole database, interpretation of the mineralized zones, statistics and geostatistics, computerized block model, resource estimation, open pit design and optimization, metallurgy, process design, environmental aspects, capital and operating cost.
Marathon PGM Corp. acquired the Marathon PGM-Cu deposit from Polymet in December 2003. Marathon PGM Corp. funded programs of advanced exploration and diamond drilling on a continuous basis between June 2004 and 2009. Approximately 320 holes and 65,000 m were drilled from 2007 to 2009 to define and expand the resource and for condemnation holes outside of the pit area. A feasibility study was published in 2008 and updated in January 2010.

Stillwater Mining Company (SWC) and Marathon PGM entered into an agreement on September 7, 2010 pursuant to which SWC would acquire all of the outstanding shares of Marathon PGM. The acquisition agreement received ministerial approval under the Investment Canada Act on November 24, 2010 and the agreement closed on November 30, 2010. On December 31, 2010 Stillwater Mining Company formed a Canadian corporation, Stillwater Canada Inc. In March 2012, MC MINING LTD (MC) purchased 25% interest in Stillwater Canada Inc. who is the proponent of the Marathon PGM-Cu Project.

Project Overview

The Project is based on the development of an open pit mining and milling operation. The conceptual general layout of the components of the mine site, the transmission line corridor and access road is provided in Figure 3 below. One primary pit and a satellite pit complex to the south (currently envisaged to be comprised of four satellite pits) are proposed to be mined. Ore will be processed (crushed, ground, concentrated) at an on-site processing facility. Final concentrates containing copper and platinum group metals will be transported off-site via road and/or rail to a smelter and refinery for subsequent metal extraction and separation. The total mineral reserve (proven and probable) is estimated to be approximately 91.5 million tonnes. It is possible that an iron concentrate may also be produced, depending upon the results of further metallurgical testing and market conditions at that time.

During the operations phase of the Project, ore will be fed to the mill at an average rate of approximately 22,000 tonnes per day. The operating life of the mine is estimated to be approximately 11.5 years. The construction workforce will average approximately 400 people and will be required for between 18 and 24 months. During operations the work force will comprise an estimated 365 workers. The mine workforce will reside in local and surrounding communities, as well as in an Accommodations Complex that will be constructed in the Town of Marathon.

Approximately 288 million tonnes of mine rock[1] will be excavated. It is estimated that between eighty five to ninety percent of this material is non-acid generating (NAG) and will be permanently stored in a purposefully built Mine Rock Storage Area (MRSA) located east of the primary pit. The NAG or so-called Type 1 mine rock will also be used in the construction of access roads, dams and other site infrastructure as needed. Drainage from the MRSA will be collected, stored, treated and discharged as necessary to the Pic River. During mine operations, about 20 million tonnes of mine rock could have the potential to generate acid if left exposed for extended periods of time. This mine rock is referred to as Type 2 mine rock or potentially acid generating (PAG). The Type 2 mine rock will be managed on surface during mine operations in temporary stock piles with drainage directed into the open pits. This material will be relocated to the bottom of the primary and satellite pits and covered with water to prevent potential acid generation and covered with Type 1 materials.

Process solids[2] will be managed in the Process Solids Management Facility (PSMF), as well as in the satellite pit complex. The PSMF will be designed to hold approximately 61 million m^3 of material, and its creation will require the construction of dams. Two streams of process solids will be generated. An estimated 85 to 90% of the total amount of process solids produced will be non-acid generating, or so-called Type 1 process solids. The remaining ten to fifteen percent of the process solids could be potentially acid generating and referred to as Type 2 process solids. The Type 2 process solids will be stored below the water table in the PSMF or below

[1] Mine rock is rock that has been excavated from active mining areas but does not have sufficient ore grades to process for mineral extraction.
[2] Process solids are solids generated during the ore milling process following extraction of the ore (minerals) from the host material.

water in the pits to mitigate potential acid generation and covered with Type 1materials. Water collected within the PSMF, as well as water collected around the mine site other than from the MRSA will be managed in the PSMF for eventual reclamation in the milling process. Excess water not needed in the mill will be discharged, following treatment as is necessary, to Hare Lake.

Access to the Project site is currently provided by the Camp 19 Road, opposite Peninsula Road at Hwy 17. The existing road runs east towards the Pic River before turning north along the river to the Project site (approximately 8 km). The existing road will be upgraded and utilized from its junction with Hwy 17 for approximately 2.0 km. At this point a new road running north will be constructed to the future plant site. The primary rationale for developing the new road is to move traffic away from the Pic River. The new section of road will link two sections of forest access roads located on the site.

Power to the Project site will be provided via a new 115 kV transmission line that will be constructed from a junction point on the Terrace Bay-Manitouwadge transmission line (M2W Line) located to the northwest of the primary pit. The new transmission line will run approximately 4.1 km to a substation at the mill site. The width of the transmission corridor will be approximately 30 m.

Disturbed areas of the Project footprint will be reclaimed in a progressive manner during all Project phases. Natural drainage patterns will be restored as much as possible. The ultimate goal of mine decommissioning will be to reclaim land within the Project footprint to permit future use by resident biota and as determined through consultation with the public, Aboriginal peoples and government. A certified Closure Plan for the Project will be prepared as required by Ontario Regulation (O.Reg.) 240/00 as amended by O.Reg.194/06 “Mine Development and Closure under Part VII of the Mining Act” and “Mine Rehabilitation Code of Ontario”.
Maps showing the existing features and topography of the site, as well as the proposed conceptual development of the site are provided in Figure 2 and 3 below.

Scope of Work

Emphasis of the present study is on terrestrial habitat mapping, species at risk surveys, and caribou habitat assessment.

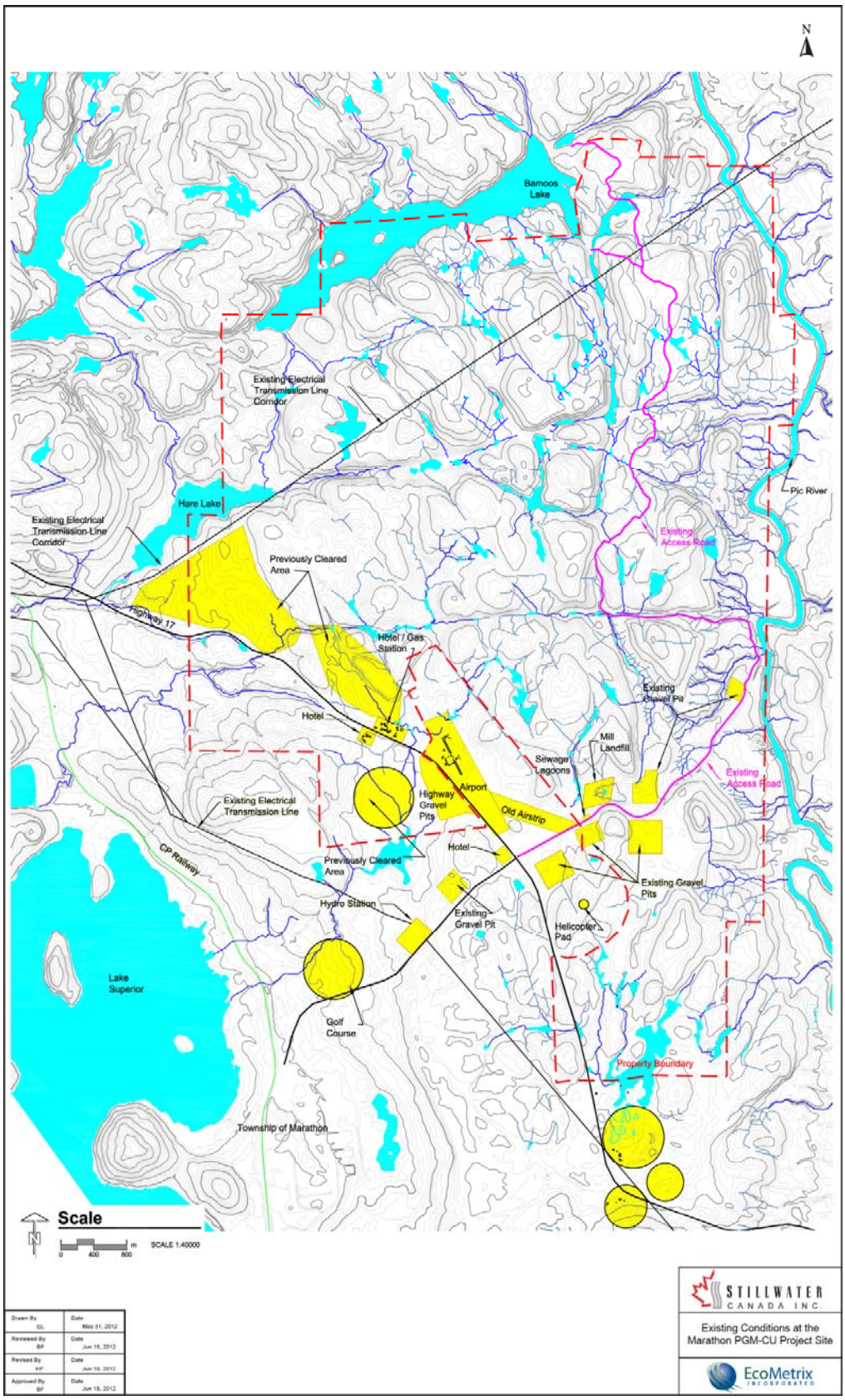


Figure 2. Existing Conditions at the Marathon PGM-Cu Project Site

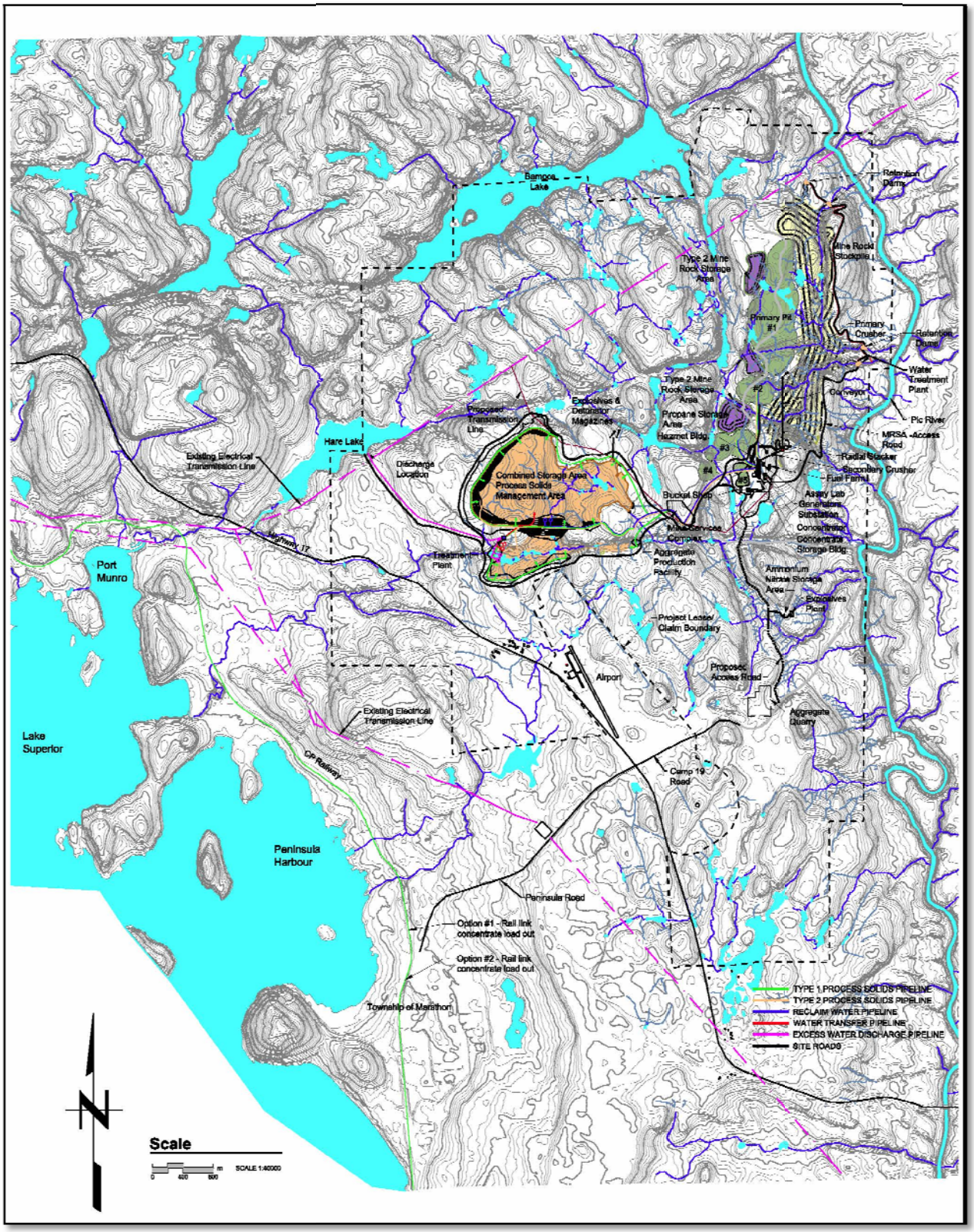


Figure 3. Marathon PGM-Cu Project Conceptual General Site Layout.

Methods

Terrestrial Habitat Mapping

Terrestrial habitat was mapped based on Forest Resource Inventory (FRI) data supplemented with fieldwork, air photograph interpretation, and Northern Ontario Engineering Geology Terrain Study Maps (NOEGTS). Fieldwork focused on visiting representative vegetation types and communities and compiling notes on soils and vegetation.

Species Surveys

Surveys for species at risk were conducted on 19 dates between March 20 and August 25 2009 (Table 1). Species identified as potentially occurring in the study area by Golder Associates Ltd. (2009) were targeted, particularly 10 species of vascular plants and two species of butterfly. Emphasis was placed on cliff and shoreline habitats and forest openings.

Additional searches were devoted to surveying for rare odonates (dragonflies and damselflies) and butterflies.

Table 1. Field survey dates, Marathon PGM study area 2009. Personnel are Robert Foster (RFF), Allan Harris (AGH) and Brian Ratcliff (BR).

Date	Personnel	Location
March 20	AGH, BR	Aerial survey
June 19 - 24	RFF, BR	Aerial survey, bird monitoring, species at risk surveys
July 14 - 18	RFF, AGH	Species at risk surveys, vegetation surveys
August 4 - 7	AGH, BR	Species at risk surveys, vegetation surveys
August 24 - 25	RFF, AGH	Species at risk surveys, vegetation surveys

Animal, plant, and plant community observations were recorded throughout the study area. Georeferenced (GPS) points were recorded throughout the study area (Figure 4).

Lists of vascular plants, birds, mammals, amphibians, butterflies, and odonates encountered during fieldwork are provides in Appendix 1 to Appendix 6. Scientific names of species mentioned in the text are provided in the appendices.

Bird Monitoring

Bird monitoring was conducted on June 19 and 20 2009 at 33 stations (Figure 4) following the Forest Bird Monitoring Program (FBMP) protocol. This consists of a transect of three 10-minute listening stations, 200 m apart. Breeding status was assigned consistent with the approach used by the Ontario Breeding Bird Atlas (Cadman et al. 2008).

Additional records were compiled from the Ontario Breeding Bird Atlas database (2 atlas squares overlapping the study area; 16EV50 and 16EV40;) (Ontario Breeding Bird Atlas 2009)

and a Breeding Bird Survey route (U.S. Department of the Interior 2009) at the south edge of the study area along Highway 17 (data available for 23 years between 1976 and 2004).

Aerial Surveys

A helicopter survey of the study area was conducted on March 20 2009 (11:00 - 12:15 EDT). Target species were woodland caribou and other ungulates, but all observed tracks were recorded. We also surveyed cliffs for potential peregrine falcon nesting habitat to be revisited during the nesting season. Observers were Al Harris and Brian Ratcliff. The survey was conducted with a Bell Long Ranger at a height of 150 to 200 m and ground speed of about 70 to 90 km / hour. Transect spacing was approximately 1 km (Figure 12). The survey route was recorded as a GPS track and waypoints were recorded for all track sightings. Weather conditions were calm and mostly clear. Temperature was -7 ^{o}C at 11:00. There was continuous snow cover in the forest of 50 to 70 cm. There had been no fresh snow for approximately one week prior to the survey.

An aerial survey for peregrine falcons was conducted on June 23 2009 using the same aircraft. Conditions were clear and calm. Observer was Rob Foster.

Caribou Habitat Assessment

Caribou habitat was assessed using Ontario's Landscape Tool (Elkie et al. 2009a, Elkie et al. 2009b). This model uses Forest Resource Inventory data to map caribou refuge habitat, winter habitat and habitat capability.

Anthropogenic disturbance was assessed and mapped on a 2 km X 2 km grid. Human disturbances in each grid square were identified using MNR GIS data, aerial photographs (2005 and 2008), topographic maps, and Google Earth. The following criteria were used to assign each grid square to a disturbance category:

Disturbance Category	Disturbance
High	• Highway 17 • Human habitation
Medium	• Utility corridor • Within 100 m of Highway 17 • Drivable unpaved road
Low	• No active roads • May include older cutovers and inactive roads

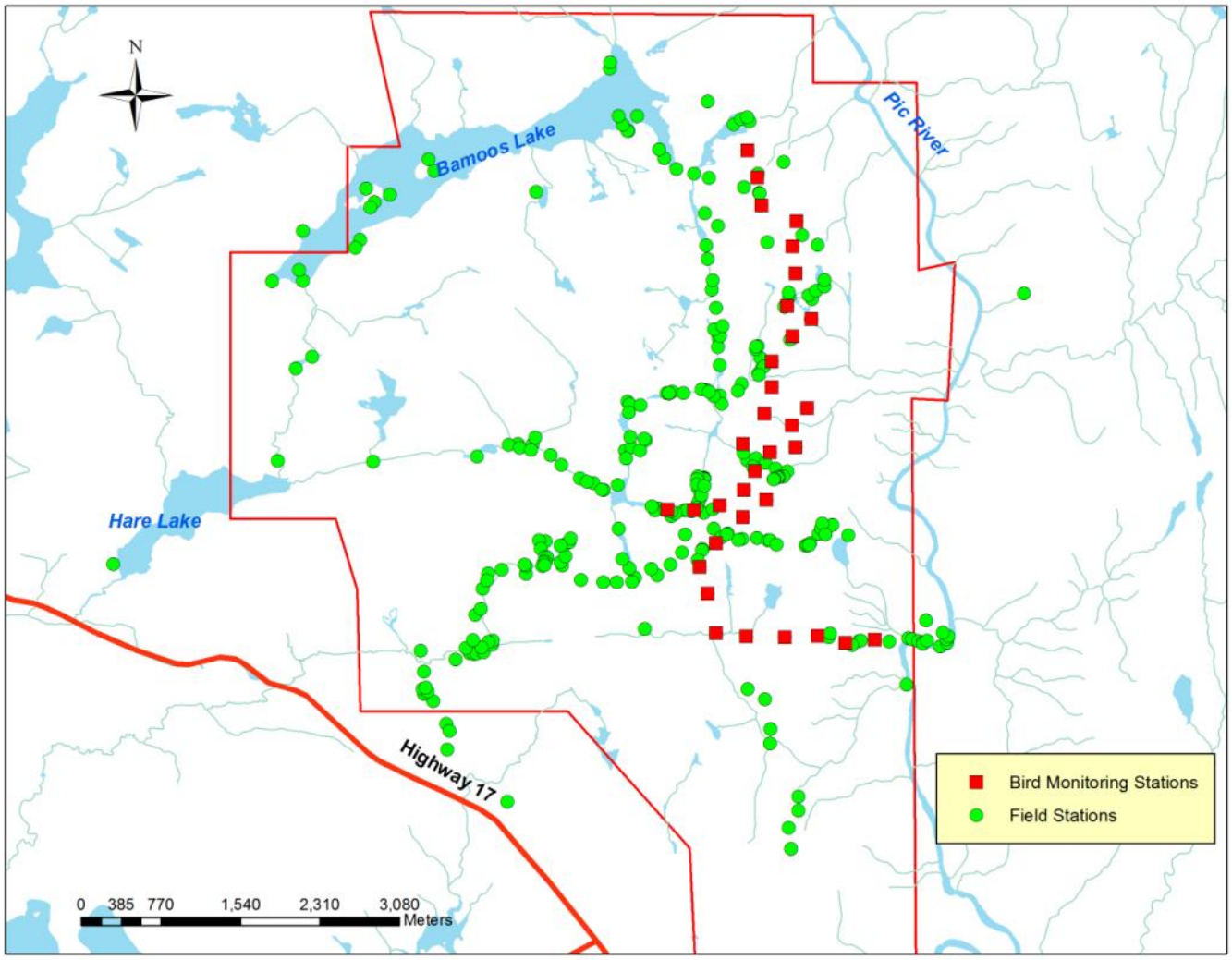


Figure 4. Field survey locations. Marathon PGM study area 2009.

Results and Discussion

Terrestrial Habitat

Table 2 is a summarizes habitats within the Marathon PGM study area. Two ecological land classifications (ELC) were used because the study area straddles the boundary between two OMNR ELC systems. Although the study area falls mainly within the range of the Northeastern Ontario classification system (Taylor et al. 2000), the Northwestern Ontario system (Racey et al. 1996) was applied to non-forested communities since an equivalent wetland ELC does not exist for northeastern Ontario. ELC site types and ecosites were not mapped in Forest Resource Inventory and areas presented in Table 2 were estimated based on fieldwork and aerial photos.

The study area consists of steep bedrock knob topography with prominent east-west oriented valleys (Figure 5, Figure 8). Silty glaciolacustrine deposits cover most of the study area (Figure 5). Deep, moist silty soils are found along the Pic River. Shallower silty soils are found on slopes and hilltops. Some smaller areas of sandy, ice-contact delta occur in the south end of the study area.

Birch-dominated mixedwood forest (NE 3a and NE 6a; Taylor et al. 2000) makes up about 70% of the study area (Figure 6, Figure 9). Balsam fir, black spruce and white spruce are the most common secondary tree species, usually with a rich understorey of mountain maple, beaked hazel, and other tall shrubs. White birch - black spruce stands on shallow (less than 30 cm) silty soils (NE 1) are common on slopes and tops of low hills. Some of the white spruce are large diameter, supercanopy trees, extending above the main birch canopy.

Upland black spruce dominated stands on silty soils (NE 5a, NE 9) occur in small patches. These stands almost always include balsam fir and white birch and a tall shrub understorey. Black spruce forest on peat (NE 11, NE 13, NE 14) are uncommon (total area about 17 ha) and is confined to a few small bedrock depressions filled with organic soils.

Stands dominated by jack pine and trembling aspen are absent although these species are generally common in northwestern Ontario.

Most of the forest is greater than 100 years old (Figure 7, Figure 10). A few pure white birch stands in the southern part of the study area along the Pic River are approximately 20 years of age and apparently originated from logging. There have been no recent forest fires in the study area. Much white birch forest is classified as "old growth" according to provincial standards (Uhlig et al. 2001). Onset of old growth in white birch stands is 90 to 110 years depending on site type.

Non-forested communities (other than rock barrens) cover less than 5 % of the study area and are discussed in Table 2.

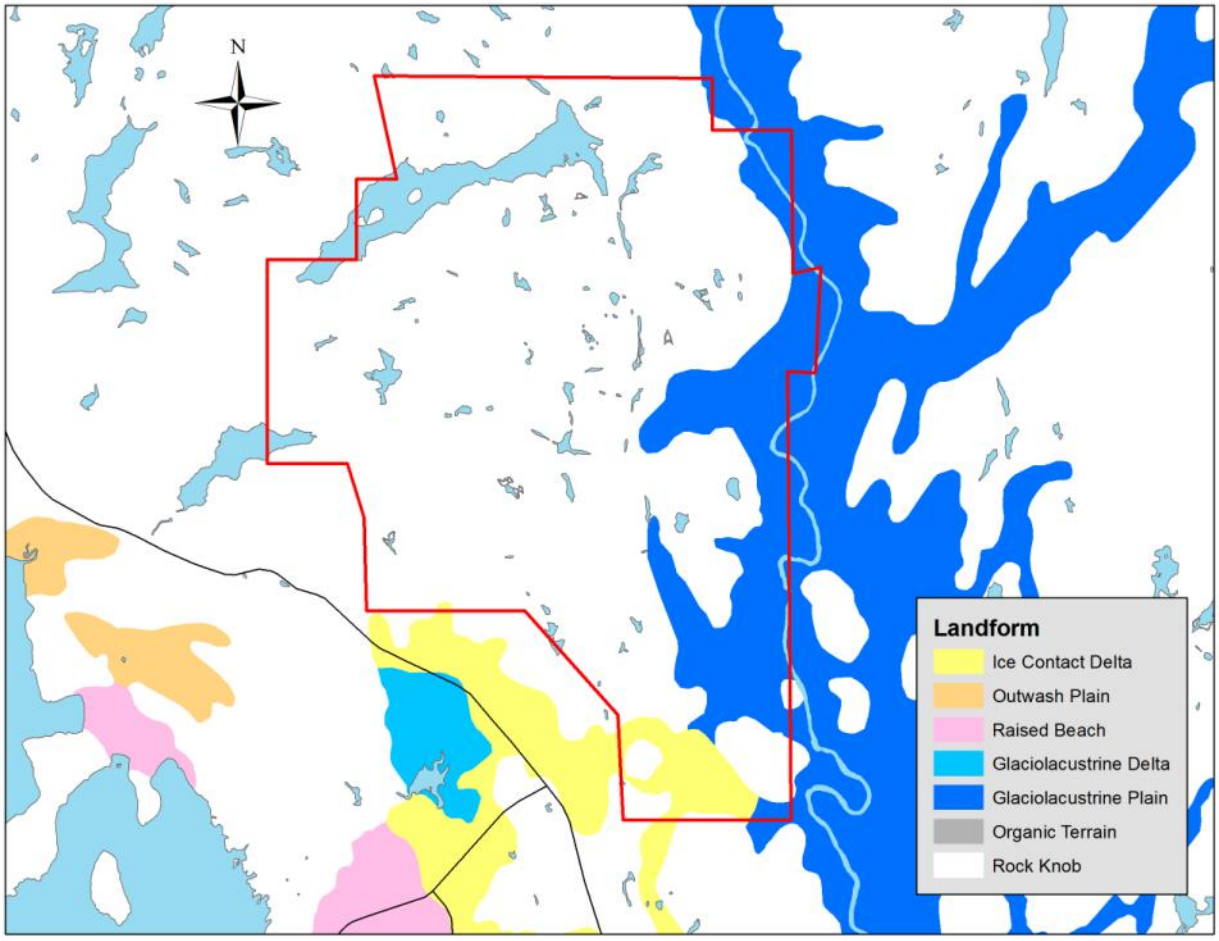


Figure 5. Landforms of the Marathon PGM study area (Northern Ontario Engineering Geology Terrain Study data).

Table 2. Ecological land classification for the Marathon PGM study area. Northeastern Ontario Forest Ecosystem classification sites types (NE) (Taylor et al. 2000) are provided for forested conditions. Northwestern Ontario Ecosites (NW) (Racey et al. 1996) are provided for non-forested conditions.

Site Type / Ecosite	Description	Notes
NE 1	Very Shallow Soil	Black spruce and white birch stands with less than 30 cm of soil. Common on valley slopes.
NE 3a NE 6a	Mixedwood-Medium Soil Mixedwood-Fine Soil	Birch dominated mixedwoods make up about 70% of the study area. Balsam fir, black spruce and white spruce are the common secondary tree species. Usually with a rich understorey of mountain maple, beaked hazel and other tall shrubs.
NE 5a NE 9	Black Spruce-Fine Soil Conifer-Moist Soil	Upland black spruce stands on silty soils. Almost always with balsam fir and white birch and a tall shrub understorey.
NE 7a	Hardwood-Fine Soil	Pure white birch stands mainly in the southern part of the study area along the Pic River. Total area 173 ha. Mostly young stands (approximately 20 years) apparently originated from logging.
NE 11 NE 13 NE 14	Black Spruce-Labrador Tea Conifer-Speckled Alder Black Spruce- Leatherleaf	Lowland black spruce stands on organic soils make up about 20 ha. In valley bottoms and bedrock depressions.
NW ES1	Beach / Bar	Very small sand beach present at the west end of Bamoos Lake
NW ES4 NW ES5	Cliff Talus or Steep Slope	Several small cliffs up to about 12 m high. Larger cliffs have a band of talus at the base.
NW ES7	Rock Barren	Several extensive areas of rock barren present totaling almost 53 ha. Vegetation is predominantly *Cladina* lichens, blueberries, and other low shrubs.
NW ES40 NW ES41	Treed Fen: Tamarack- Black Spruce / Sphagnum: Organic Soil Open Poor Fen: Ericaceous Shrub / Sedge / Sphagnum: Organic Soil	Peatland communities confined to small areas in bedrock basins, isolated from lakes and streams. Area is less than 2 ha
NW ES44	Thicket Swamp: Organic–Mineral Soil	Alder thickets on stream floodplains. Total area 32 ha.
NW ES45 NW ES46	Shore Fen: Organic Soil Meadow Marsh: Organic-Mineral Soil	Located on shores of lakes and streams. Vegetation consists of sedges, grasses and low shrubs. Total area is 42 ha
NW ES47 NW ES49	Sheltered Marsh: Emergent: Sedimentary Peat Substrate Open Water Marsh: Submergent / Floating-leaved: Sedimentary Peat Substrate	Small areas in sheltered bays on lakes.

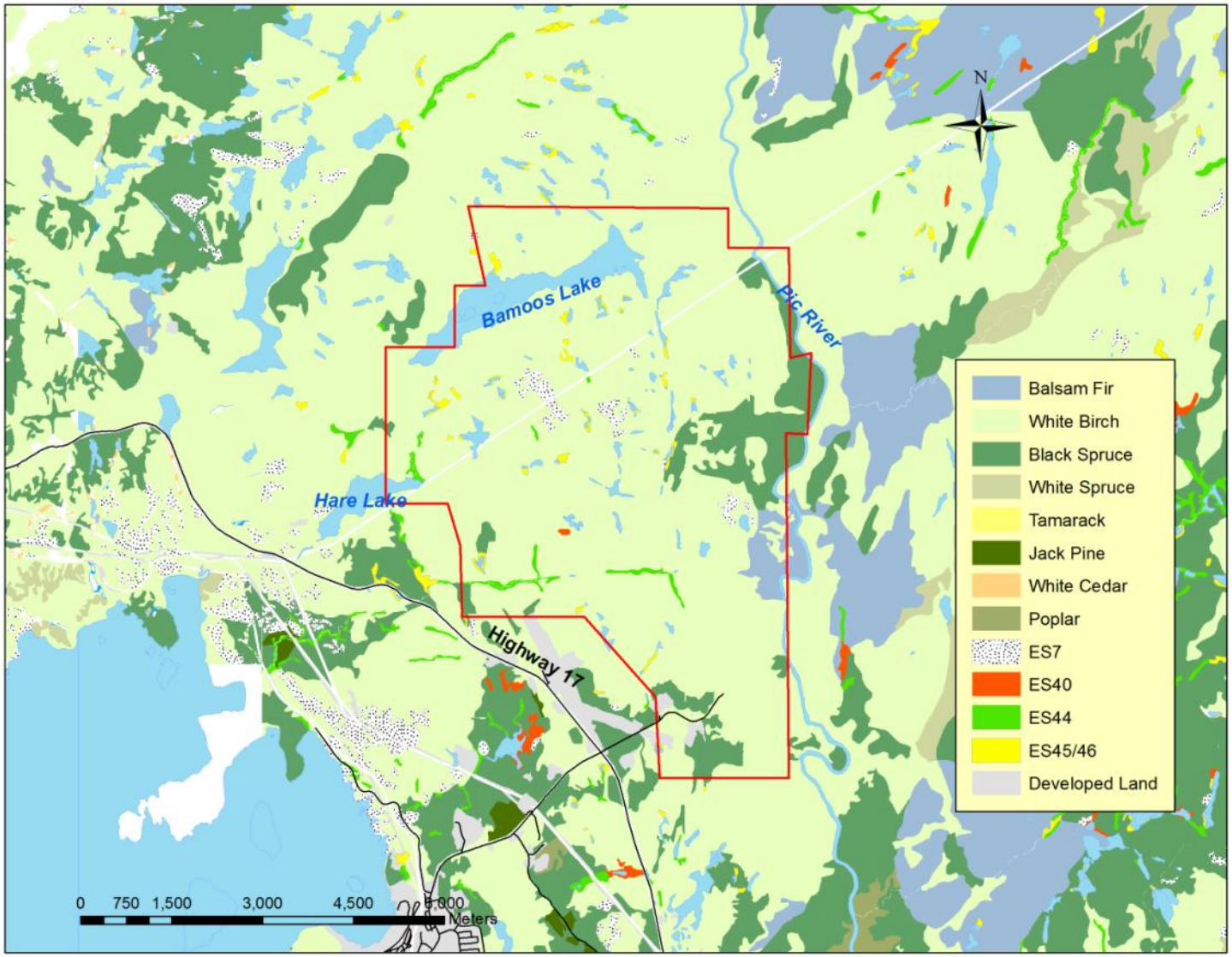


Figure 6. Vegetation map of the Marathon PGM study area showing dominant tree species (OMNR data) for forest communities and Northwestern Ontario ecosites for non-forested communities (refer to Table 2 for details).

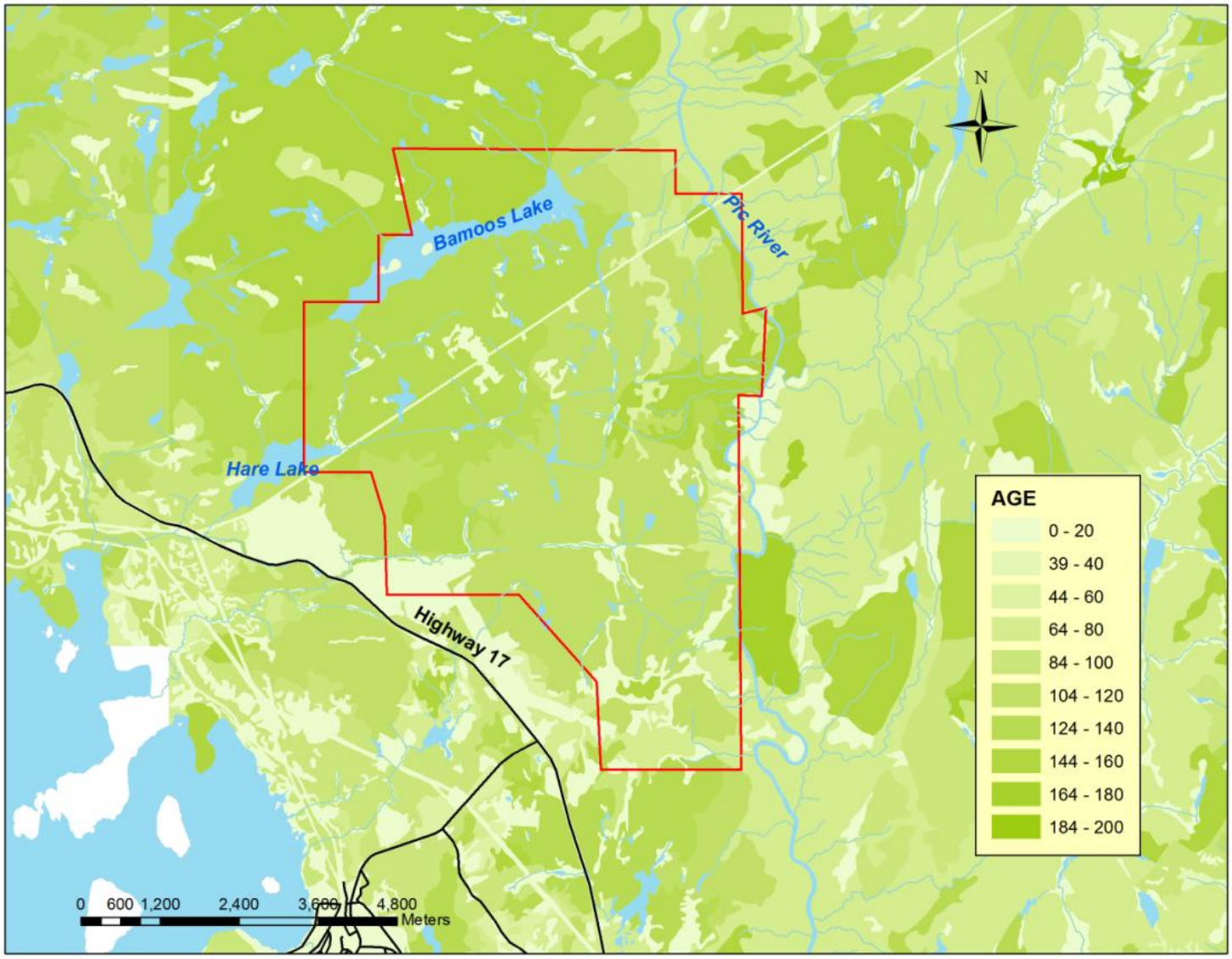


Figure 7. Forest age class (years) composition (OMNR data) in Marathon PGM study area.

Figure 8. Typical landscapes with white birch and balsam fir forest.

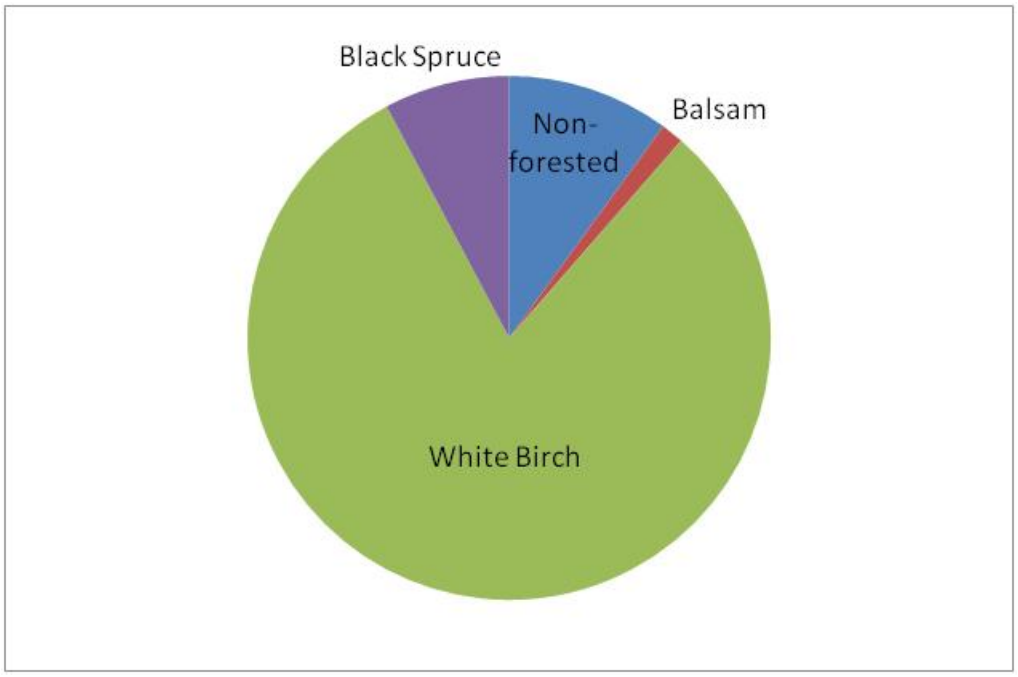


Figure 9. Forest composition (working groups) in the Marathon PGM study area (OMNR data).

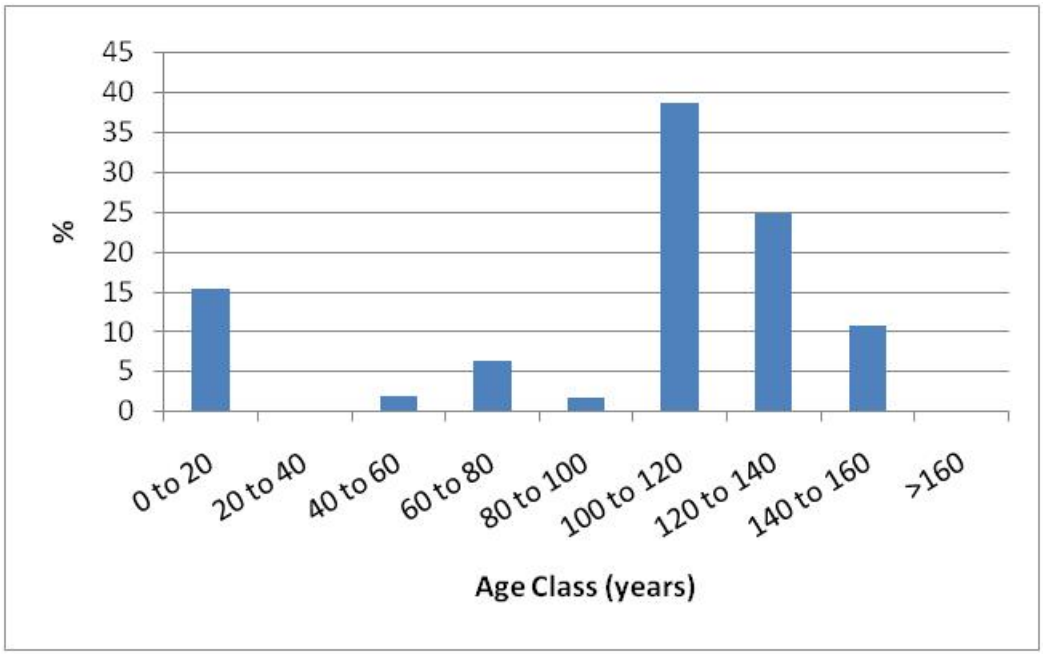


Figure 10. Forest age class (years) distribution in the Marathon PGM study area (OMNR data).

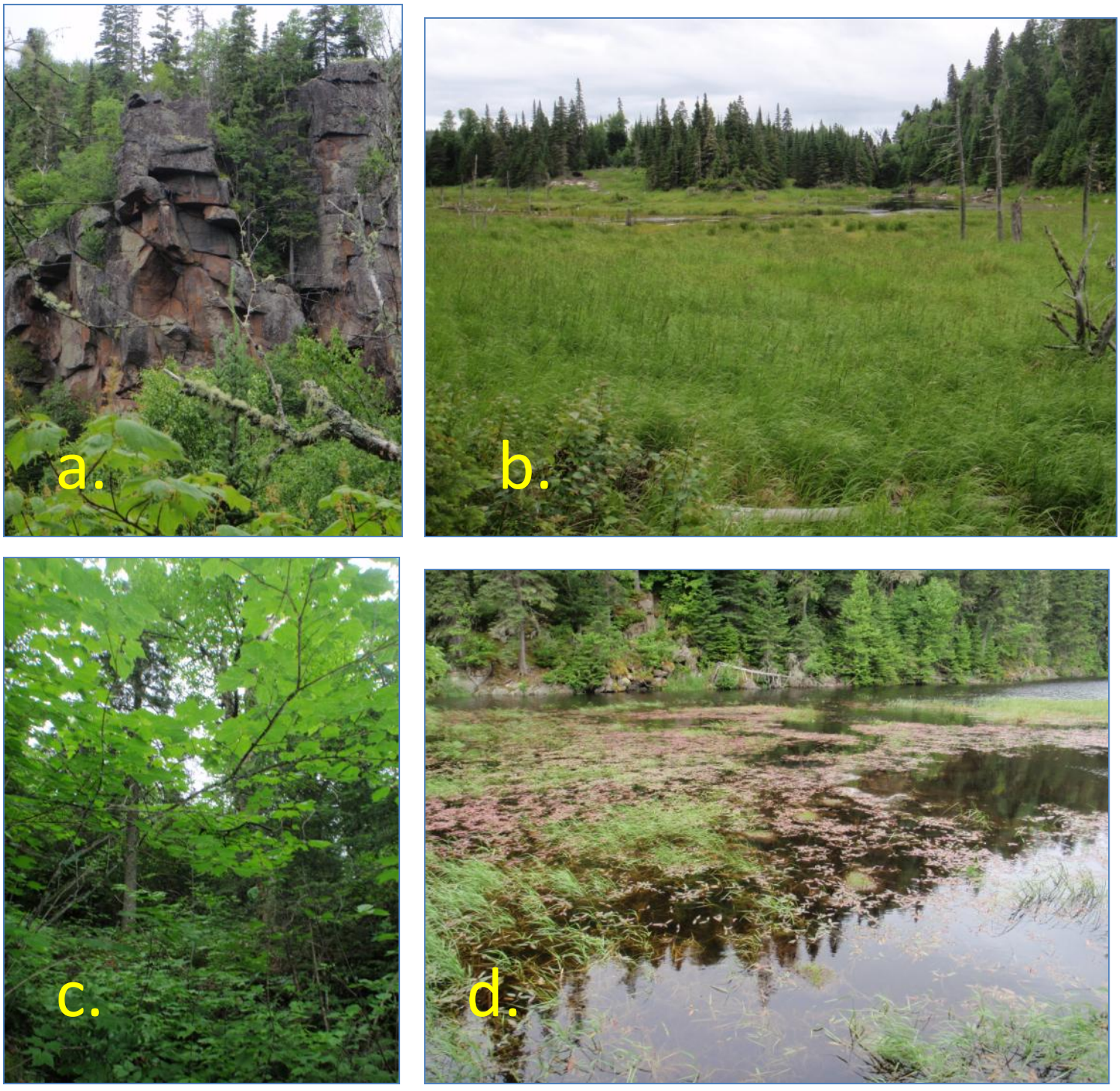


Figure 11. (a) Cliff (Ecosite 4), (b) meadow marsh (Ecosite 45), (c) white birch mixedwood forest (Site Type 3a), (d) sheltered marsh (Ecosite 47).

Vascular Plants

A total of 291 vascular plant species was observed in the study area (Appendix 1). Most species are typical boreal forest plants that are common throughout northwestern Ontario.

Several species of arctic-alpine disjunct plant species, including fragrant cliff fern, glaucous blue grass, alpine bistort, rock cranberry, northern woodsia, and smooth woodsia were discovered on cool, north-facing cliffs. These species are significant because they are geographically separated from their main ranges in arctic and alpine regions in northern and western Canada.

Thirty non-native plant species were discovered, mainly along roads and trails. Typical non-native species along the old logging road included clovers (*Trifolium* spp.), common dandelion, ox-eye daisy, and common plantain.

Rare plant species are discussed under *Species at Risk*.

Birds

A total of 64 bird species was observed in the study area in 2009, with an additional 58 species reported from the surrounding area during the Ontario Breeding Bird Atlas (2000 – 2005) or on the Breeding Bird Survey south of the study area (U.S. Department of the Interior 2009). Most of these species probably nest in the study area (Appendix 2). The species composition and density is typical of a mature mixedwood forest bird community, with a diversity of warblers, thrushes, sparrows, and vireos. White-throated sparrow, Black-throated green warbler, and winter wren are the most common species (Table 3). Forest Bird Monitoring data are in Appendix 9 and Appendix 10. Rare bird species are discussed under *Species at Risk*.

Table 3. The most common bird species recorded in Forest Bird Monitoring stations (totalling 90% of birds tallied) in the Marathon PGM study area, June-July, 2009.

Species	n
White-throated Sparrow	68
Black-throated Green Warbler	49
Winter Wren	42
Swainson's Thrush	34
American Redstart	28
Red-eyed Vireo	26
American Robin	22
Least Flycatcher	19
Mourning Warbler	16
Nashville Warbler	16
Magnolia Warbler	14
Ovenbird	12
Cedar Waxwing	8
Yellow-rumped Warbler	8

Mammals

A total of 11 mammal species (Appendix 3) was observed in the study area. No small mammal trapping was conducted, so this list should be considered incomplete. Typical boreal fauna such as black bear, moose, timber wolf, beaver, and red fox are present. Woodland caribou were not observed, but are discussed under *Species at Risk* below. No white-tailed deer sign was observed.

The March 2009 aerial survey results are summarized in Figure 12. Moose tracks were seen at five locations and unknown ungulate tracks were at six locations. The unknown ungulate tracks were probably those of moose, given the absence of definitive caribou sign such as cratering, slush pits, or groups of tracks from multiple animals. No animals were sighted. Moose sign was relatively scarce during the winter survey, perhaps due to the generally poor winter habitat (sparse mixedwood forest cover) (Figure 8). Additional species observed include red fox, river otter, timber wolf, and snowshoe hare.

Beaver lodges are present on many lakes and streams in the study area. Distribution of active lodges is shown in Figure 13. This distribution could serve as a baseline for future monitoring.

No moose were observed directly in 2009 during summer fieldwork, but tracks and droppings were commonly seen, particularly along trails, roads, and cut lines. Moose browse, particularly mountain maple, was relatively abundant in overmature mixedwoods where the overstorey was breaking apart and there was a dense shrub understorey. A Class 4 (very high potential; Ranta 1993) moose aquatic feeding area is present on a small stream about 600 m south of the west end of Bamoos Lake (OMNR data).

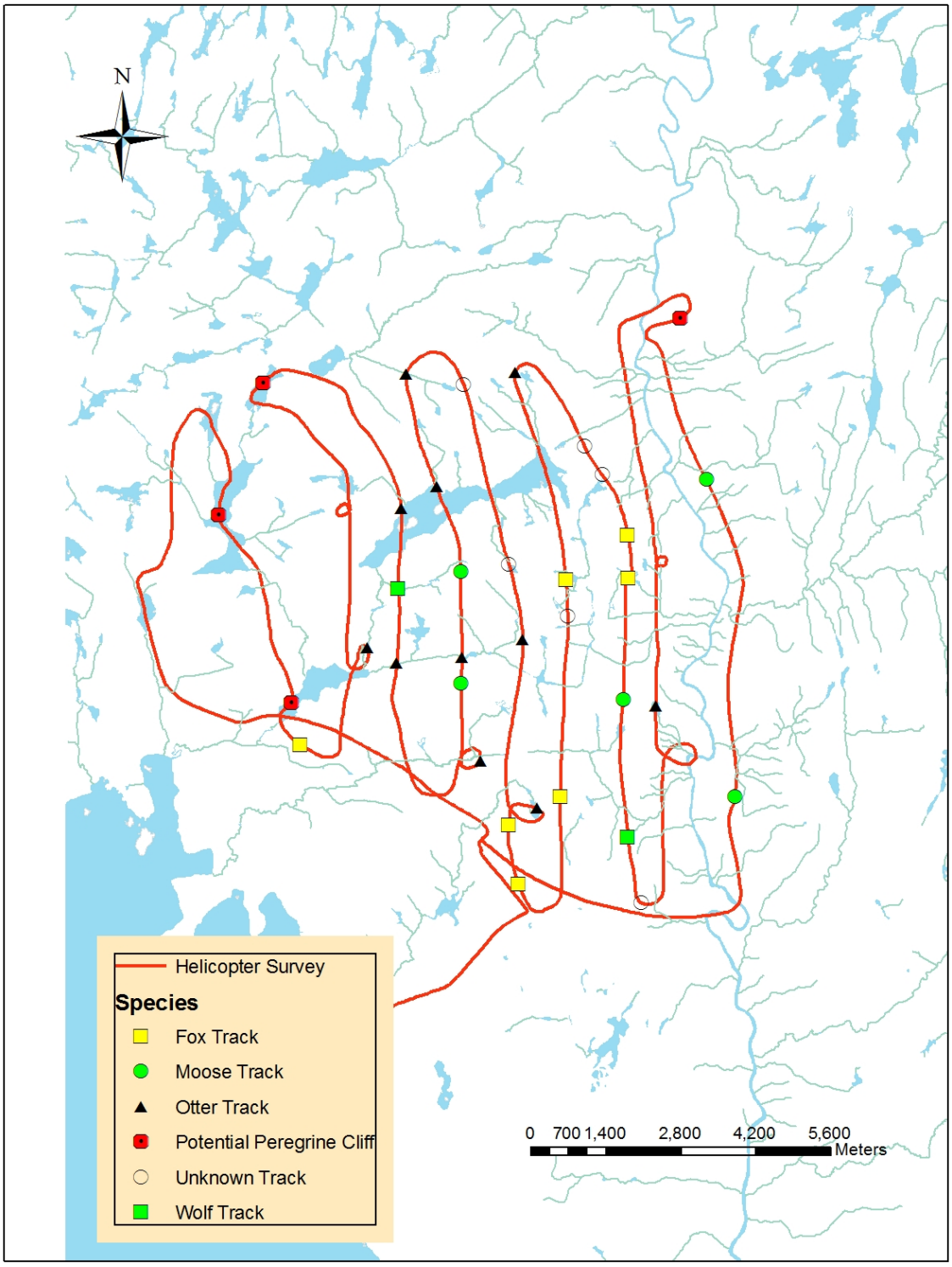


Figure 12. Helicopter survey route March 20 2009. Marathon PGM study area.

Amphibians

Seven species of amphibians were observed in the study area, none of them provincially rare (Appendix 4). No reptiles were observed. The early season breeders (spring peeper, wood frog, American toad) had dispersed from their breeding pools by the time fieldwork was initiated, but were commonly observed in forest habitat. Mink frogs were heard calling in small lakes and ponds on several occasions in mid summer and apparently breed there. A single green frog was heard in similar habitat on August 5, 2009. Two salamander species, red-backed and blue spotted, were seen on one occasion each. These species are uncommonly seen north of Lake Superior (Foster et al. 2004).

Invertebrates

Twelve species of butterflies (Appendix 5) and 19 species of dragonflies and damselflies (odonates) were observed in the study area in 2009 (Appendix 6). Most of the odonate species were associated with lakes, ponds, or small streams. Relatively few clubtail (Gomphidae) species, usually associated with larger, fast-flowing streams, were observed.

No rare species of butterflies or odonates were observed despite targeted surveys. The cold, wet conditions that predominated during 2009 fieldwork meant that few butterflies or odonates were flying and reduced the likelihood of finding rarer species. Two rare butterflies identified by Golder Associates Ltd. (2009) as potentially occurring in the study area (large marble (*Euchloe ausonides*) and taiga alpine (*Erebia mancinus*) were not confirmed in the present study.

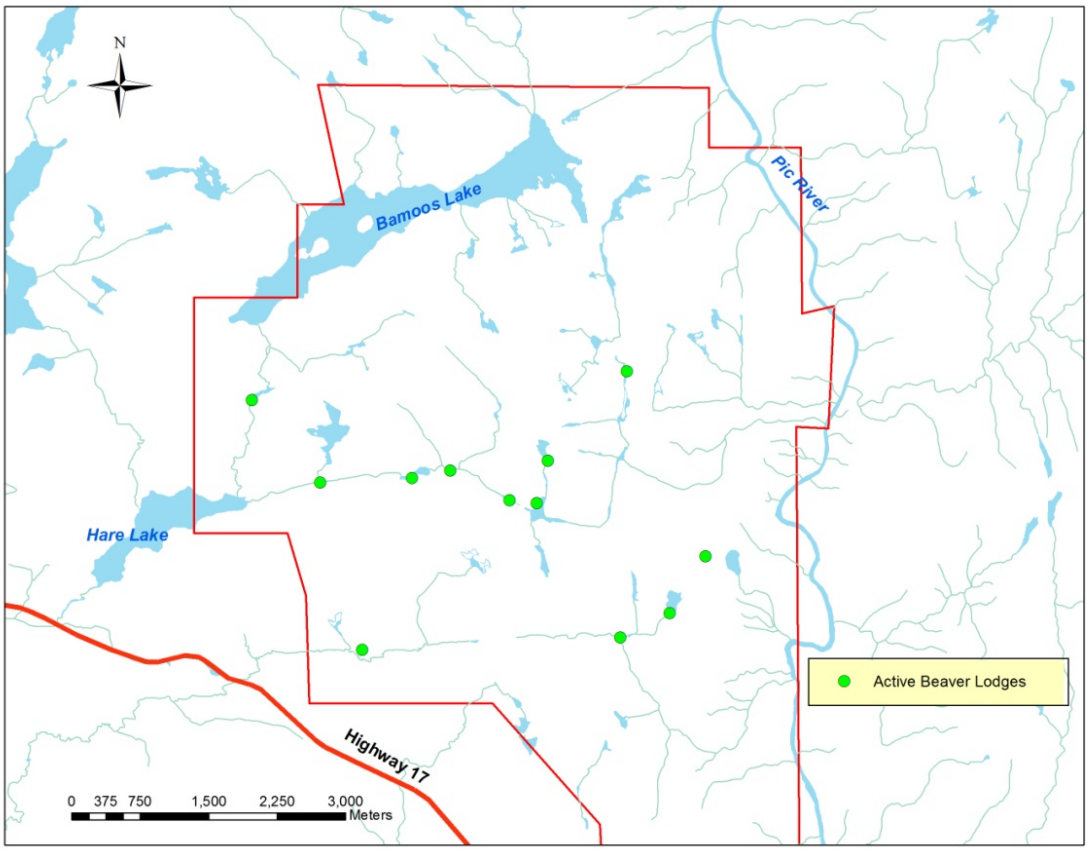


Figure 13. Active beaver lodges 2009. Marathon PGM study area.

Species at Risk

The following species are designated as Species At Risk (SAR) and are therefore protected under provincial or federal legislation. Locations are shown in Figure 15 and details provided in Appendix 8.

Canada Warbler (Threatened Nationally; Special Concern in Ontario)

Canada warbler is a common nesting species in birch-dominated mixedwood forest in the study area. Seventeen were observed during species at risk encounter surveys and the species was detected at 4 out of 31 FBMP stations (total of 5 birds). Canada warblers were also recorded every year of 23 years of Breeding Bird Survey south of the study area (1976 to 2004) with a maximum count of 15 in 1985.

Rusty Blackbird (Special Concern Nationally; Not at Risk in Ontario)

The discovery of a family group of rusty blackbirds on a beaver meadow indicates that this species nests in the study area. Searches of similar habitat elsewhere in the study area failed to find any more individuals. Typical habitat includes shorelines and open wetlands.

Olive-sided Flycatcher (Threatened Nationally; Special Concern in Ontario)

A single olive-sided flycatcher was seen on the shore of a small lake southeast of Bamoos Lake. The presence of this species in June suggests that it nests in the study area, but no singing males or other nesting evidence was observed. This species was reported on 2 years (1979 and 1980) of 23 years of Breeding Bird Surveys south of the study area. Typical habitat is shorelines and peatlands with scattered trees.

The following three bird species were not recorded in the study area, but are known to nest in the surrounding landscape.

Common Nighthawk (Threatened Nationally; Special Concern in Ontario)

Although no common nighthawks were observed in 2008 or 2009, this species was tallied once (1998) in the Breeding Bird Survey south of the study area. It may be an uncommon nesting species in the study area, preferring open bedrock ridges, burns and cutovers.

Peregrine Falcon (Special Concern Nationally; Threatened in Ontario)

No peregrine falcons were observed in the study area in 2009. OMNR data shows the nearest nest location about 8 km west of the study area. An aerial survey in March 2009 found four potential nesting cliffs just outside the study area (Figure 14). However a follow-up aerial survey in June 2009 found no evidence of nesting on these cliffs. Cliff habitat within the study area were classified as "marginal" habitat value (cliff faces less than 15 m high and less than 100 m long; Brian Ratcliff pers. comm.).

Bald Eagle (Not at Risk Nationally; Special Concern in Ontario)

Bald eagles are not known to nest in the study area. This species is apparently an uncommon nesting birds in the Marathon area. No nests or birds were observed in 2009 fieldwork, although a single adult was observed near the Marathon Airport in 2008 (Golder Associates Ltd 2009). None were reported in 23 years of Breeding Bird Surveys along Highway 17 at the south edge of the study area. OMNR data show the nearest nest bald eagle nest at about 11 km north of the study area (there is an unknown raptor species stick nest about 3 km southeast of the study area).

Figure 14. Potential peregrine falcon nesting cliff at Seeley Lake (in background), west of the Marathon PGM study area.

Rare Plants

The following plants are designated as provincially area (S1 to S3; NHIC 2009) but are not listed under endangered species legislation. Locations are shown in Figure 17 and Figure 18 and details are provided in Appendix 8.

Appalachian Firmoss (S3)

A few individuals of this species were discovered growing in a bedrock crevice on the south shore of Bamoos Lake (Figure 19).

Alpine Woodsia (S2)

A small population of this fern was discovered in on a north-facing cliff. Alpine woodsia is an arctic-alpine disjunct species, found in colder than average microclimates outside its typical range.

Braun's Holly Fern (S3)

A single patch of Braun's holly fern grows in a wooded valley between two cliffs near the centre of the study area.

Alga Pondweed (S2)

This aquatic species was discovered in two lakes in the study area (Figure 16). It was quite abundant where it did occur, forming dense mats on the lake beds. Alga pondweed is easily overlooked and may be more common in the study area.

Shore Plantain (S3)
Shore plantain grows on a sand beach at the west end of Hare Lake (Figure 20). This location is just outside the study area.

Regionally Rare Plants

Eleven plant species that are rare in Thunder Bay District (TBFN 2003) are found in the study area (Figure 18, Appendix 8). Although rare in Thunder Bay District (found at <6 locations) these plants are common elsewhere in Ontario. Notable among these is Oake's pondweed, which was not previously known to occur in Thunder Bay District (TBFN 2003). This aquatic plant was discovered at six locations in small lakes.

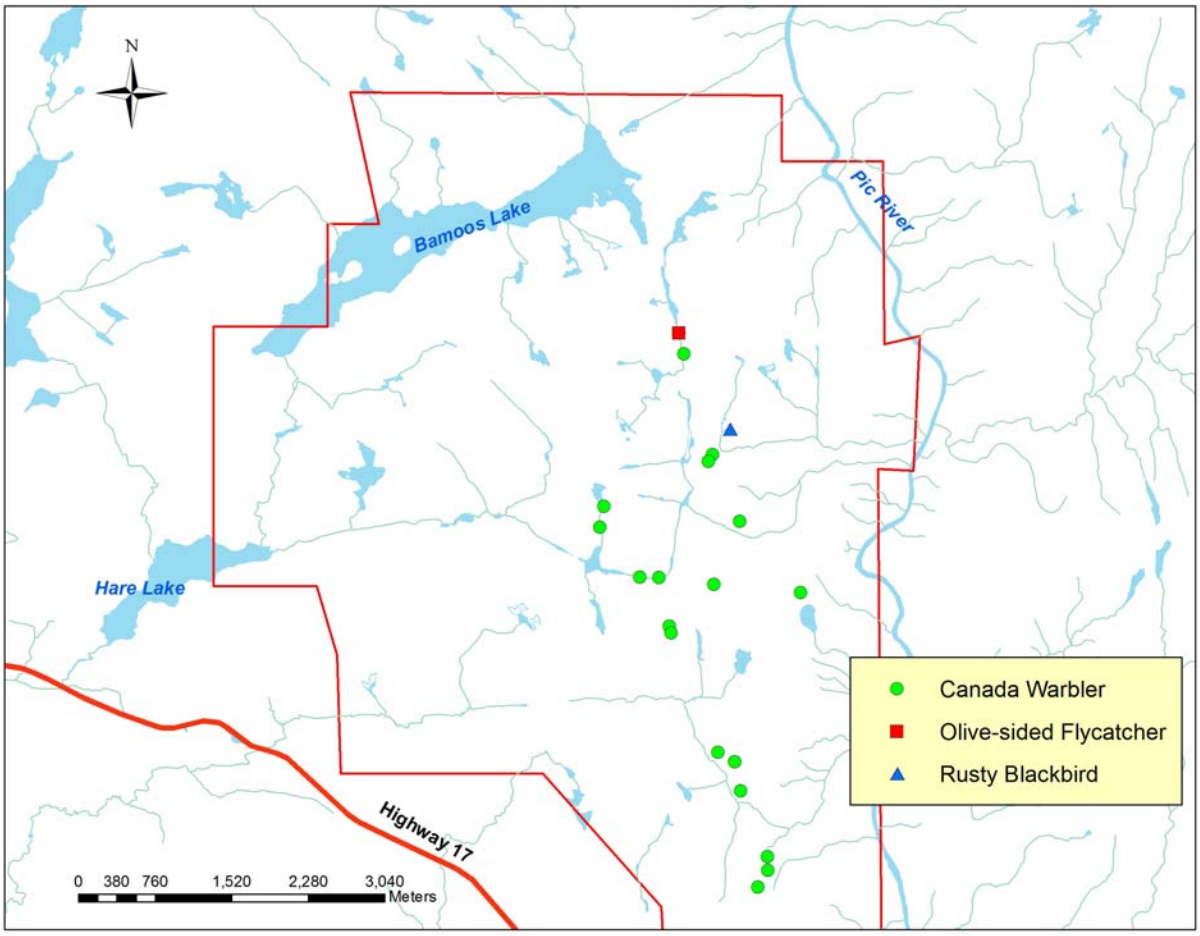


Figure 15. Map of Marathon PGM study area showing rare bird locations.

Figure 16. Alga pondweed (*Potamogeton confervoides*), a provincially rare plant, occurs in several small lakes.

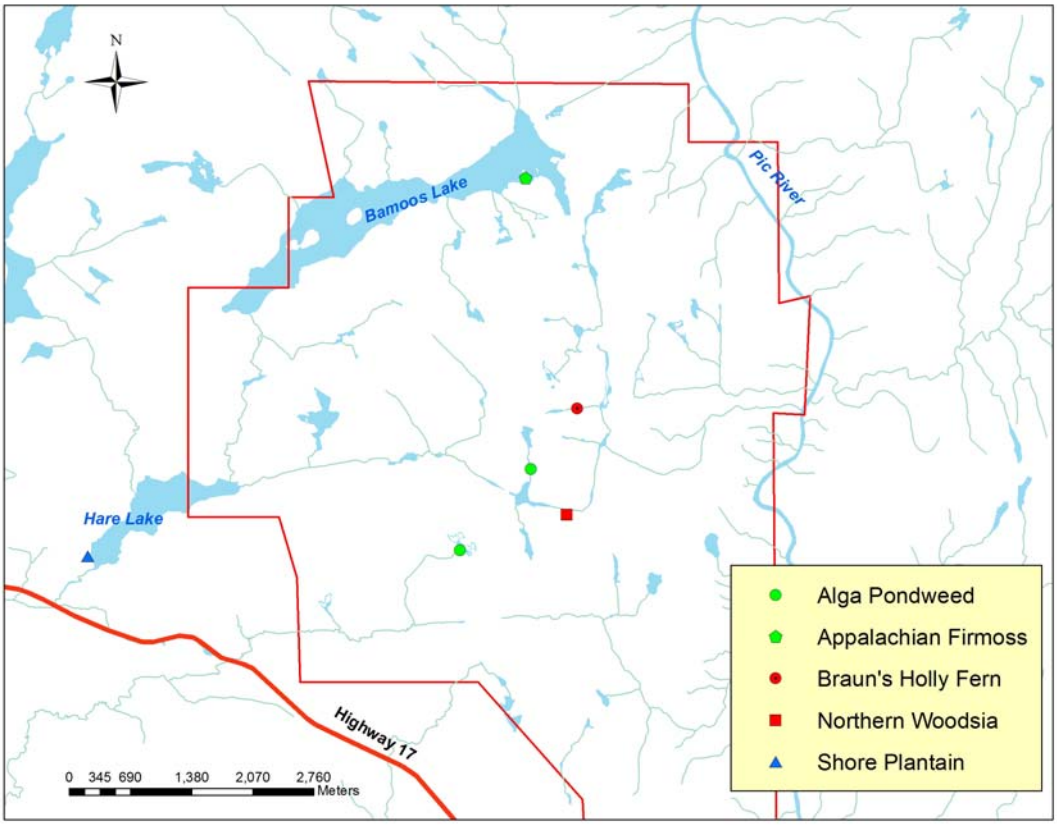


Figure 17. Map of Marathon PGM study area showing provincially rare plants locations.

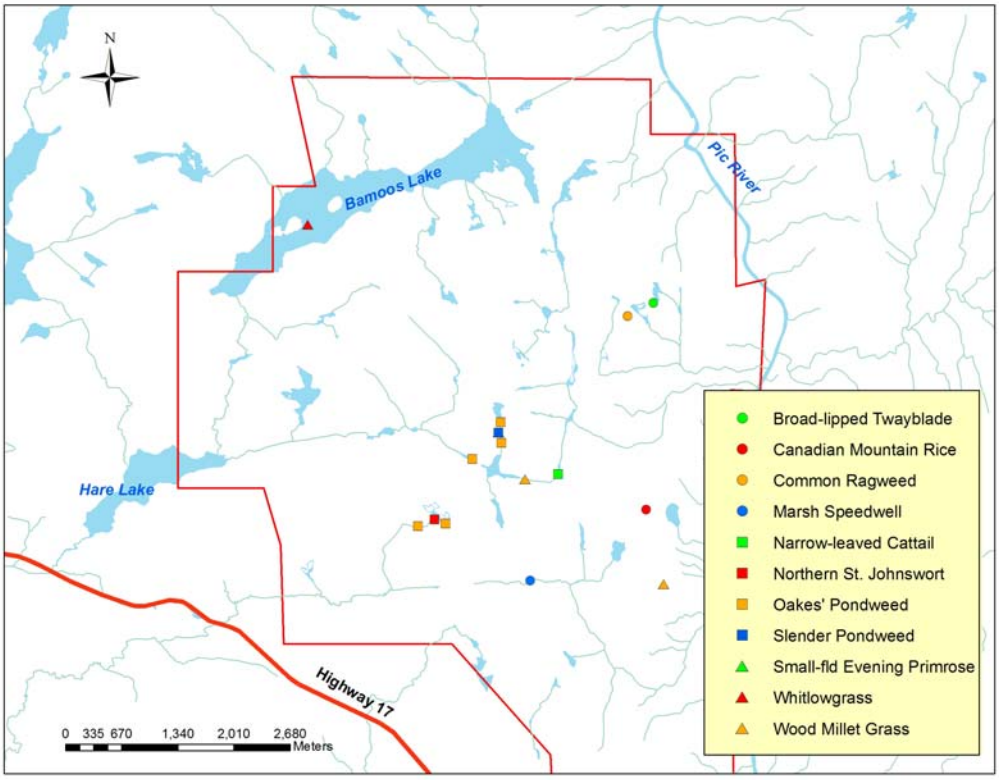


Figure 18. Map of Marathon PGM study area showing regionally rare plants locations.

Figure 19. Appalachian firmoss (Huperzia appalachiana) growing in a bedrock crevice on Bamoos Lake shoreline.

Figure 20. Shore plantain (*Littorella americana*) grows on a beach on Hare Lake.

Woodland Caribou (Threatened Nationally; Threatened in Ontario)

Woodland caribou are classified as Threatened in Ontario under the *Endangered Species Act 2007*. Historically, caribou probably occupied the study area, but their range has receded northward in Ontario leaving several small residual populations along the Lake Superior coast. The range recession is associated with habitat changes due to human settlement and forest fragmentation (Schaefer 2003). These habitat changes have caused changes in the predator prey balance, increased hunting mortality, and displacement due increased human activity.

No evidence of woodland caribou was observed in the present study. Survey effort included an aerial survey in March; searching shorelines, trails and roads for tracks; and searching bedrock barrens for pellets or evidence of winter feeding (cratering). OMNR records included no caribou records in or adjacent to the study area. The nearest known extant caribou populations are in Neys Provincial Park at Pic Island (about 20 km to the west), in Slate Islands Provincial Park (about 50 km to the west), and Pukaskwa National Park (about 30 km to the south). In addition, there are a number of scattered records of individual animals or small groups from the north shore, possibly representing individual animals, rather than established populations (OMNR data).

Despite the lack of recent caribou records, the study area is considered to be caribou habitat since this species uses habitat at various spatial scales. We examine habitat at three scales:

1. Local Scale (study area)
2. Landscape Scale (approximately Terrace Bay to Pukaskwa National Park), and
3. Range Scale

Local Scale

The study area lacks large tracts of mature coniferous forest (Figure 6) where caribou can isolate themselves from moose and deer and their associated predators (Ontario Woodland Caribou Recovery Team 2008). Typical calving habitat, including large lakes (Ontario Woodland Caribou Recovery Team 2008) with islands and extensive peatlands (where cows and isolate themselves from predators) is also lacking. Some rocky hilltops with lichen cover (Figure 21) are potential winter habitat and could support caribou moving through area, particularly in winter. The predominantly hardwood forest of the study area (Figure 6) may support high moose and predator populations and therefore be unsustainable for caribou.

Figure 21. Terrestrial lichens on rocky hilltops may provide small patches of woodland caribou habitat.

The following assessment of Refuge Habitat, Winter Habitat, and Capable Habitat is based on output from Ontario's Landscape Tool (Elkie et al. 2009b). These analyses are more meaningfully conducted at a larger scale as part of the range assessment (see *Range Management*), but will give a preliminary picture of the status of caribou habitat in the study area.

Refuge Habitat

Refuge habitat consists of forest that may be suitable for caribou year-round and includes low productivity winter sites with lichen as well as well-stocked upland mature and old conifer with little lichen abundance. Soils may be productive to very productive but the conifer cover has suppressed the growth of shrubs and forbs preferred by moose and deer. Age of onset for refuge is generally 40-60 years in fire origin sites. Only 14% of the study area landbase was classified as refuge habitat with the largest areas along the eastern uplands and scattered pockets on the southeast boundary (where they overlap with winter habitat) (Figure 22).

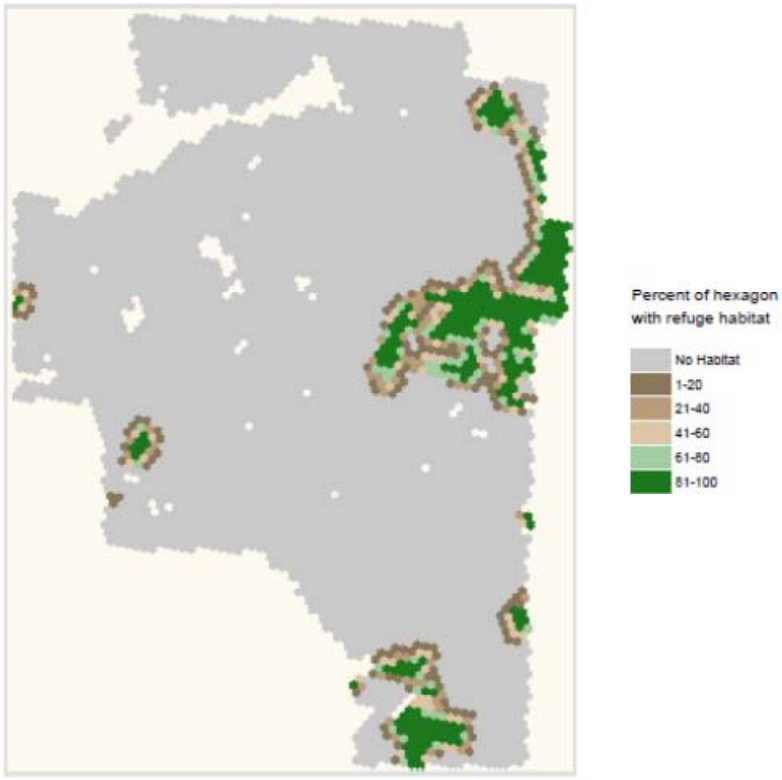


Figure 22. Areas that are classified as refuge habitat of supporting caribou habitat within MPGM study area based on OMNR's Ontario Landscape Tool (Elkie et al. 2009). The outermost grey pixels approximate the study area boundary.

Winter Habitat

Approximately 2% of the study area land base can be considered suitable winter habitat for caribou. Winter suitable habitat consists of mature and old upland conifer stands dominated by jack pine and black spruce, especially those on open stocked poorer site classes (i.e. lower productivity), and often rich in ground lichens (Elkie et al. 2009a). Although the model may indicate that 2% of the study area may be suitable winter habitat, this does not take into account constraints due to proximity to disturbance that may affect actual use by caribou. The winter habitat identified in Figure 23 are in close proximity to the highway and noise disturbance may deter use of this habitat by caribou. In addition, approximately 11% of the study area land base is considered suitable habitat for moose winter cover (Figure 24), and these areas overlap with potential caribou winter habitat. Increased risk of predation by wolves attracted by higher moose densities in these areas could further limit the suitability for caribou.

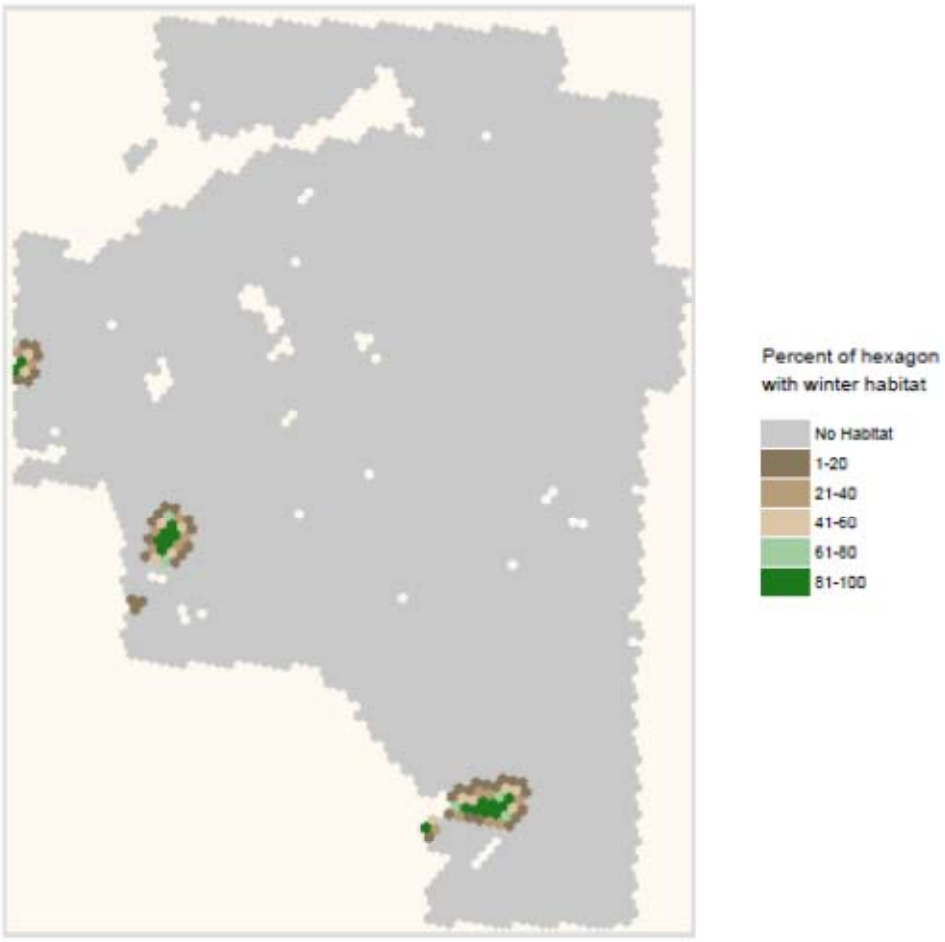


Figure 23. Caribou winter habitat within MPGM study area based on OMNR's Ontario Landscape Tool (Elkie et al. 2009). The outermost grey pixels approximate the study area boundary.

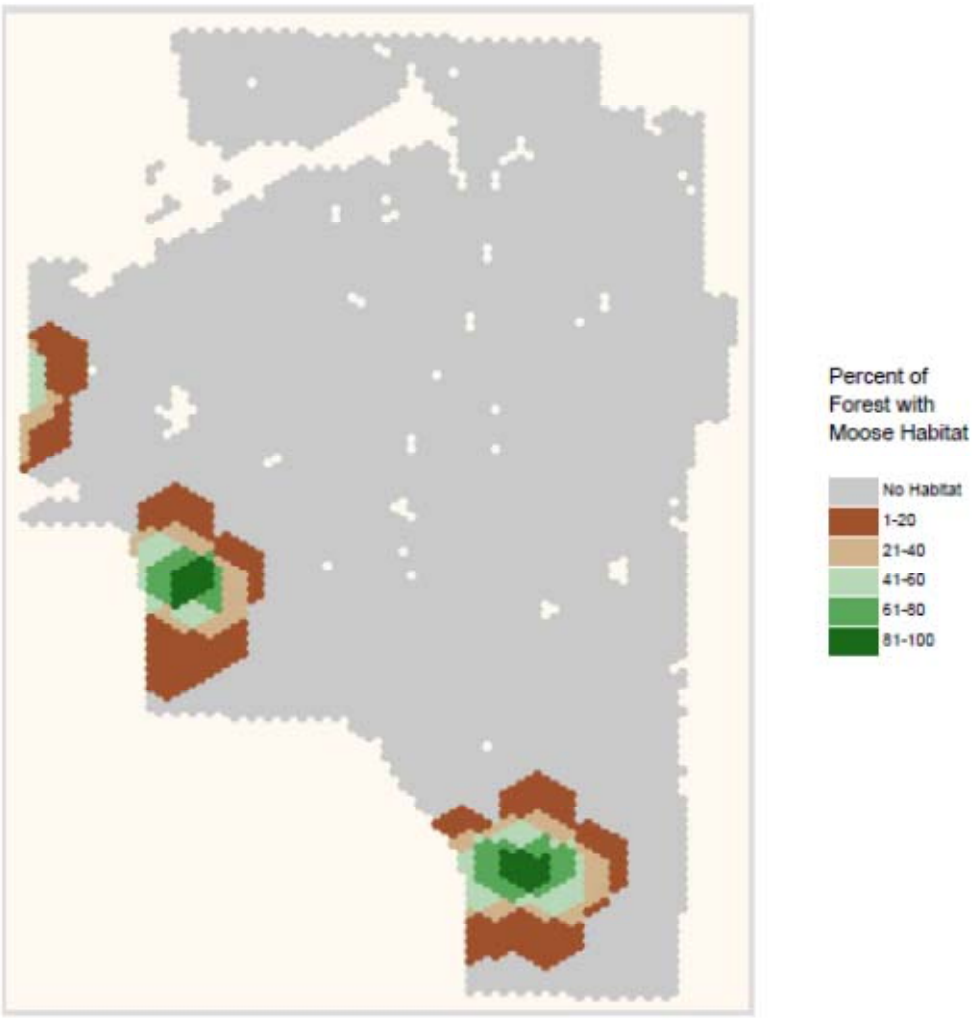


Figure 24. Forest Resource Inventory based suitability index for moose – winter cover (50 ha scale) based on OMNR's Ontario Landscape Tool (Elkie et al. 2009b). The outermost grey pixels approximate the study area boundary.

Capable Habitat

Areas that are classified as "capable" by the OMNR's Ontario Landscape Tool (OLT) are generally those where the soil and/or landform types that are conducive to perpetuating conifer dominated forest, and may provide suitable winter habitat in the future. They are characterized in the uplands by generally lower primary productivity, shallow soil, exposed bedrock, or if underlain by deeper and richer soils, they have a strong conifer legacy. In the lowlands, capability is characterized by black spruce lowland, bogs and fens. Capability is independent of tree/stand age since it represents potential of the stand to become suitable for winter habitat 40-60 years hence. Very little (4%) of the study area landbase is classified as capable (Figure 25).

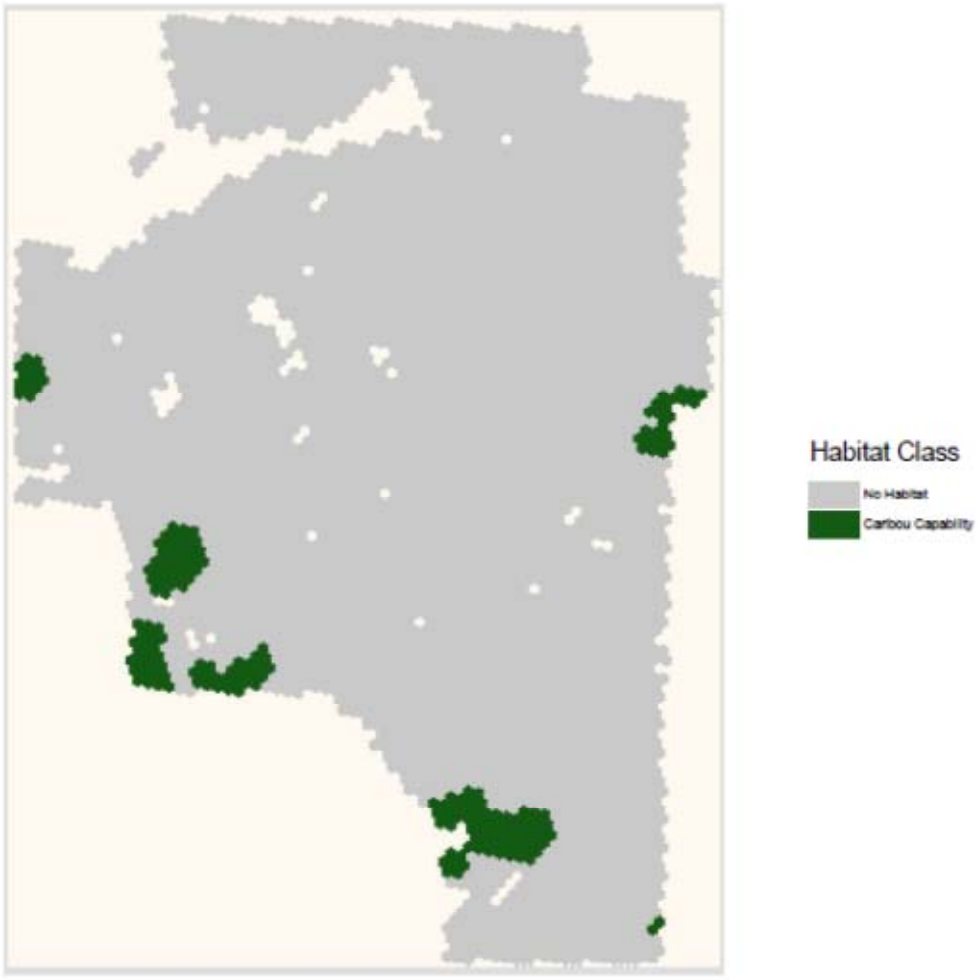


Figure 25. Areas that are classified as capable of supporting caribou winter habitat in the future within MPGM study area based on OMNR's Ontario Landscape Tool (Elkie et al. 2009). The outermost grey pixels approximate the study area boundary.

Landscape Scale

On the landscape scale (roughly Terrace Bay to Pukaskwa National Park), key habitat components include landforms allowing connectivity between caribou subpopulations. North of the study area, management of the Lake Superior Uplands Linkage will focus on "specific landforms that may support temporary caribou occupancy or movement between continuous range and Lake Superior" (OMNR 2009).

A preliminary caribou habitat disturbance assessment centred on the proposed mine site was completed for the surrounding landscape (as per 3.6.2 of the CCP) (Figure 27). This consisted of an assessment of existing disturbance adjacent to the study area to gain an impression of range quality and was not intended as a substitute for a full range assessment. The landscape surrounding the study area is most heavily disturbed along Lake Superior with the town site of Marathon, Highway 17 and several utility corridors. Most of the study area itself has a medium level of disturbance due to the presence of a hydro corridor, an old (but active) road network,

and active mining exploration. The lowest level of disturbance are northwest and east of the study area where there are relatively large blocks of more or less roadless, inaccessible forest.

The high level of disturbance along the Lake Superior coast south of the study area may restrict caribou movement in a north - south direction from Lake Superior but some relatively undisturbed patches north and east of the study area may constitute part of a potential travel corridor. The proposed mine development may restrict potential caribou movement along coast between Pukaskwa National Park at point west, if caribou have to swing farther north.

Range Scale

The Woodland Caribou Conservation Plan (CCP) (OMNR 2009) identifies caribou "ranges " as the geographical basis for caribou management. The study area is within the "Lake Superior Coast" range, consisting of an approximately 10 km wide strip along the shoreline from Lake Superior Provincial Park to just west of Terrace Bay (Figure 26). Immediately north of the study area is the "Lake Superior Uplands Linkage" consisting of discontinuous caribou range.

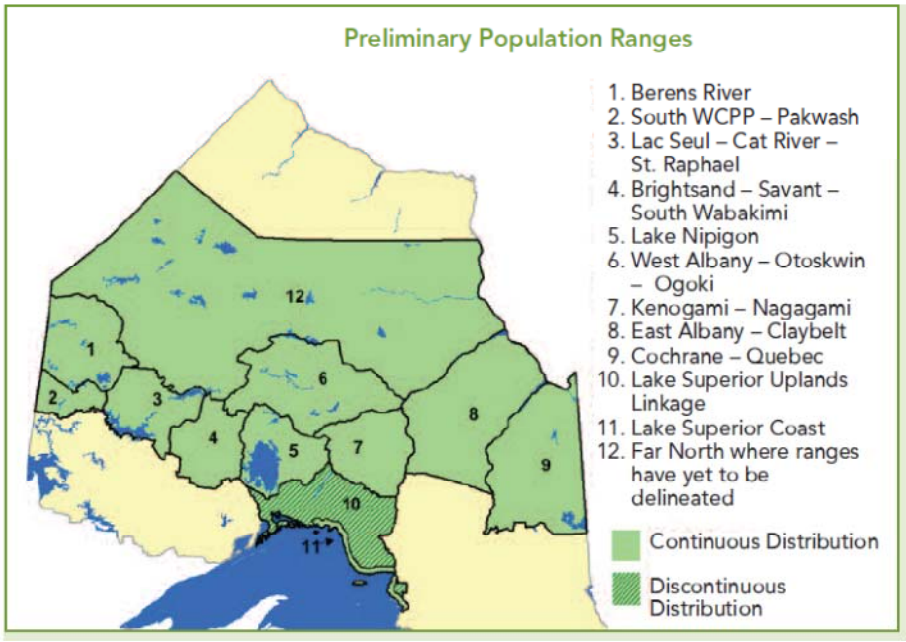


Figure 26. Preliminary delineation of local Woodland Caribou population ranges along the southern edge of the provincial extent of occurrence (OMNR 2009).

OMNR is committed to conducting cumulative effects assessments for all caribou population ranges by May 2010. The results of this assessment will "...evaluate range quality in terms of thresholds, probability of persistence, and habitat composition and structure" (OMNR 2009). Additional disturbance in these ranges may push the range status to the point where it is insufficient to sustain caribou ("Code Red" in the CCP). A range assessment of Code Red may not allow for approval of further developments.

In summary, the study area itself lacks significant caribou winter or calving habitat, and there are no known records of caribou within about 20 km. However its position in the Lake Superior Coast Range means that the study area is considered to be caribou habitat. The area could function as a travel corridor connecting the Lake Superior coast with the Lake Superior Uplands and caribou ranges farther north.

The impacts of the proposed development and mitigation will need to be assessed at the range level, but this assessment will be unavailable until at least mid 2010. On a smaller scale, potential mitigation activities could include:

- removing roads or making roads impassable when no longer required
- minimizing road densities
- habitat rehabilitation in the form of reforestation of disturbed areas.

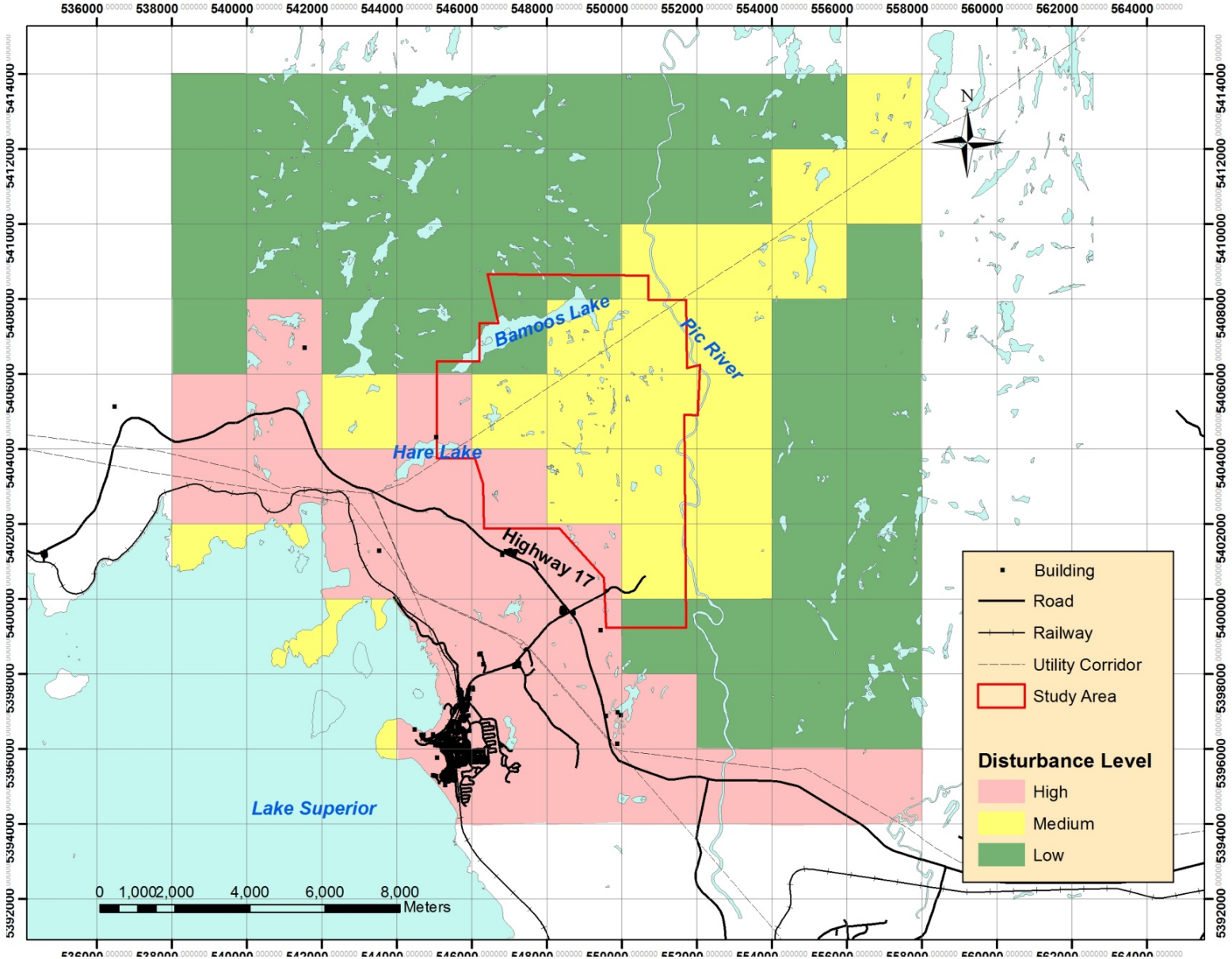


Figure 27. Preliminary woodland caribou habitat disturbance assessment based on 2 km X 2 km blocks.

Acknowledgements

We thank Brian Ratcliff, Brian Fraser, Natalie Cormier and Dave Barker, Ray Tyhuis, Glen Hooper, Steve Kingston, Ted Armstrong, and Ray Mason.

Literature Cited

American Ornithologists' Union. 1998. Checklist of North American Birds. 6th ed. Allen Press, Lawrence, Kansas.

Banfield, A.W.F. 1974. The Mammals of Canada. University of Toronto Press. Toronto.

Cadman , M.D., D.A. Suthland, G.G. Beck, D. Lepage, and A.R. Couturier (eds). 2007. Atlas odf Breeding Birds of Ontario, 2001-2005. Bird Studies Canada, Environment Canada, Ontario Ministry of Natural Resources, and Ontario Nature, Toronto. xxii + 706 pp.

Blancher, P. J., K. V. Rosenberg, A. O. Panjabi, B. Altman, J. Bart, C. J. Beardmore, G. S.Butcher, D. Demarest, R. Dettmers, E. H. Dunn, W. Easton, W. C. Hunter, E. E. Iñigo-Elias, D. N. Pashley, C. J. Ralph, T. D. Rich, C. M. Rustay, J. M. Ruth, and T. C. Will. 2007. Guide to the Partners in Flight Population Estimates Database. Version: North American Landbird Conservation Plan 2004. Partners in Flight Technical Series No 5. http://www.partnersinflight.org/

Conant, R. and J.T. Collins. 1991. Reptiles and Amphibians of Eastern and Central North America. Third Edition. Houghton Mifflin co.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2008 website. http://www.cosewic.gc.ca/

Elkie, P., M. Gluck, J. Elliott, G. Hooper, R. Kushneriuk, G. Lucking, M. Ouellette, R. Rempel, K. Ride. 2009a. Science and Information in support of the Forest Management Guide for Landscapes: Package “Caribou” Habitat Definitions, Habitat Tracts, Habitat Models and Simulation Results. Ontario Ministry of Natural Resources. Forest Policy Section.

Elkie, P., A. Smiegielski, M. Gluck, J. Elliott, R. Rempel, R. Kushneriuk, B. Naylor, J. Bowman, B. Pond and D. Hatfield. 2009b. Ontario’s Landscape Tool. Ontario Ministry of Natural Resources. Forest Policy Section. Sault Ste. Marie Ontario.

Foster, R.F., B. Ratcliff and A.G. Harris. 2004. Amphibians and reptiles of the Ontario portion of the Lake Superior Basin. Unpublished report prepared for the Wildlife Assess. Prog. NW Region, Ont. Min. Natur. Res., Thunder Bay, ON. 63 p.

Golder Associates Ltd. 2009. Baseline assessment of the terrestrial and aquatic environments. Unpublished report.

Natural Heritage Information Centre (NHIC). 2009. Ontario Ministry of Natural Resources. Accessed September 2009. http://nhic.mnr.gov.on.ca/nhic_.cfm

Newmaster, S.G., A. Lehela, M.J. Oldham, P.W.C. Uhlig, and S. McMurray. 1998. Ontario Plant List. Forest Information Paper No. 123, Ontario Forest Research Institute, Sault Ste. Marie, Ontario. 550 pp. + appendices.

Ontario Breeding Bird Atlas. 2009. website. http://www.birdsontario.org/atlas/atlasmain.html Accessed September 2009.

Ontario Ministry of Natural Resources (OMNR). 2009. Ontario's Woodland Caribou Conservation Plan.

Ontario Partners in Flight. 2006. Ontario Landbird Conservation Plan: Boreal Softwood Shield (North American Bird Conservation Region 8), *Priorities, Objectives and Recommended Actions.* Version 1.0 EC/MNR .

Ontario Woodland Caribou Recovery Team. 2008. Woodland Caribou (*Rangifer tarandus caribou*) (Forest-dwelling, Boreal Population) in Ontario. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario. 93 pp.

Racey, G.D., A.G. Harris, J.K. Jeglum, R.F. Foster and G.M. Wickware. 1996. Terrestrial and wetland ecosites of northwestern Ontario. Ont. Min. Natur. Resour., Northwest Sci. & Technol. Thunder Bay, Ont. Field Guide FG-02. 88 pp. + Append.

Ranta, B. (Editor). 1993. Selected Wildlife and Habitat Features: Inventory Manual for Use in Timber Management Planning.. Ontario Ministry of Natural Resources.

Schaefer, J.A. 2003. Long-term range recession and the persistence of caribou in the taiga. Conservation Biology. 17 (5): 1435–1439.

Taylor, K.C., R.W. Arnup, B.G Merchant, W.J. Parton, J. Nieppola. 2000. *A field guide to forest ecosystems of Northeastern Ontario, 2nd edition. NEST Field Guide FG-001*. Queen's Printer for Ontario. Ontario, Canada.

Thunder Bay Field Naturalists (TBFN). 2003. Checklist of Vascular Plants of Thunder Bay District. Revised Edition. Thunder Bay Field Naturalists.

Uhlig, P., A. Harris, G. Craig, C. Bowling, B. Chambers, B. Naylor and G. Beemer. 2001. Old growth forest definitions for Ontario. Ont. Min. Nat. Res., Queen's Printer for Ontario, Toronto, ON. 53 p.

U.S. Department of the Interior . 2009. North American Breeding Bird Survey. Accessed September 2009. http://www.pwrc.usgs.gov/BBS/

Appendices

Appendix 1. Vascular plant species of the Marathon PGM study area.

The following species were observed in the Marathon PGM study area in 2009. Taxonomic authority is Newmaster et al. (1998). "P" indicates provincially rare species (NHIC 2009). "R" indicates regionally rare species (i.e. rare in Thunder Bay District; TBFN 2003).

FAMILY EQUISETACEAE		**Horsetail Family**
	Equisetum arvense L.	Field Horsetail
	Equisetum hyemale L.	Rough Horsetail
	Equisetum variegatum Schleich. ex Fried., Weber & Mohr	Variegated Horsetail
FAMILY ASPLENIACEAE		**Spleenwort Family**
	Asplenium trichomanes L.	Maidenhair Spleenwort
FAMILY DENNSTAEDTIACEAE		**Bracken Fern Family**
	Pteridium aquilinum (L.) Kuhn	Bracken Fern
FAMILY DRYOPTERIDACEAE		**True Fern Family**
	Cystopteris fragilis (L.) Bernh.	Fragile Fern
	Dryopteris carthusiana (Vill.) H.P. Fuchs	Spinulose Shield-fern
	Dryopteris expansa (C. Presl.) Fraser-Jenk. &	Spreading Woodfern
	Dryopteris fragrans (L.) Schott	Fragrant Cliff Woodfern
	Gymnocarpium dryopteris (L.) Newman	Oak Fern
	Matteuccia struthiopteris (L.) Tod.	Ostrich Fern
	Onoclea sensibilis L.	Sensitive Fern
P	*Polystichum braunii (Spenn.) Fée*	Braun's Holly Fern
P	*Woodsia alpina (Bolton) S.F. Gray*	Northern Woodsia
	Woodsia glabella R. Br. ex Richardson	Smooth Woodsia
	Woodsia ilvensis (L.) R. Br.	Rusty Woodsia
	Woodsia oregana D.C. Eaton	Western Cliff Fern
FAMILY OSMUNDACEAE		**Flowering Fern Family**
	Osmunda claytoniana L.	Interrupted Fern
FAMILY POLYPODIACEAE		**Polypody Family**
	Polypodium virginianum L.	Rock Polypody
FAMILY PTERIDACEAE		**Brake Family**
	Cryptogramma stelleri (S.G. Gmel.) Prantl.	Fragile Rockbrake
FAMILY THELYPTERIDACEAE		**Marsh Fern Family**
	Phegopteris connectilis (Michx.) Watt	Northern Beech Fern
FAMILY ISOETACEAE		**Quillwort Family**
	Isoetes echinospora Durieu	Spiny-spore Quillwort

FAMILY LYCOPODIACEAE		**Clubmoss Family**
P	*Huperzia appalachiana Beitel & Mickel*	Appalachian Fir-clubmoss
	Lycopodiella inundata (L.) Holub	Northern Bog Clubmoss
	Lycopodium annotinum L.	Stiff Clubmoss
	Lycopodium clavatum L.	Running Pine
	Lycopodium obscurum L.	Tree Clubmoss
FAMILY CUPRESSACEAE		**Juniper Family**
	Juniperus communis L.	Ground Juniper
	Thuja occidentalis L.	Eastern White Cedar
FAMILY PINACEAE		**Pine Family**
	Abies balsamea (L.) Miller	Balsam Fir
	Picea glauca (Moench) Voss	White Spruce
	Picea mariana (Miller) B.S.P.	Black Spruce
FAMILY TAXACEAE		**Yew Family**
	Taxus canadensis Marshall	Canadian Yew
FAMILY ALISMATACEAE		**Water Plantain Family**
	Sagittaria latifolia Willd.	Broadleaf Arrowhead
FAMILY ARACEAE		**Arum Family**
	Calla palustris L.	Wild Calla
FAMILY CYPERACEAE		**Sedge Family**
	Carex adusta Boott	Crowded Sedge
	Carex aurea Nutt.	Golden-fruited Sedge
	Carex bebbii (L.H. Bailey) Olney ex Fern.	Bebb's Sedge
	Carex brunnescens (Pers.) Poir. ex Lam.	Brownish Sedge
	Carex buxbaumii Wahlenb.	Buxbaum's Sedge
	Carex canescens L.	Hoary Sedge
	Carex chordorrhiza Ehrh. ex L. f.	Creeping Sedge
	Carex crinita Lam.	Fringed Sedge
	Carex deflexa Hornem.	Short-stemmed Sedge
	Carex deweyana Schwein.	Short-scale Sedge
	Carex houghtoniana Torr. ex Dewey	Houghton's Sedge
	Carex interior L.H. Bailey	Inland Sedge
	Carex lasiocarpa Ehrh.	Slender Sedge
	Carex lenticularis Michx.	Shore Sedge
	Carex leptonervia (Fern.) Fern.	Finely-nerved Sedge
	Carex limosa L.	Mud Sedge
	Carex magellanica Lam.	Boreal Bog Sedge
	Carex michauxiana Boeck.	Michaux Sedge
	Carex oligosperma Michx.	Few-seeded Sedge
	Carex pauciflora Lightf.	Few-flowered Sedge

	Carex peckii Howe	White-tinged Sedge
	Carex retrorsa Schwein.	Retrorse Sedge
	Carex stipata Muhlenb. ex Willd.	Stalk-grain Sedge
	Carex tenuiflora Wahlenb.	Sparse-flowered Sedge
	Carex trisperma Dewey	Threeseeded Sedge
	Carex utriculata Boott	Bottle Sedge
	Carex viridula Michx.	Little Green Sedge
	Carex vulpinoidea Michx.	Fox Sedge
	Dulichium arundinaceum (L.) Britton	Three-way Sedge
	Eleocharis acicularis (L.) Roem. & Schult.	Least Spikerush
	Eleocharis ovata (Roth) Roem. & Schult.	Ovate Spikerush
	Eleocharis smallii Britton	Creeping Spikerush
	Scirpus atrovirens Willd.	Dark-green Bulrush
	Scirpus cyperinus (L.) Kunth	Cottongrass Bulrush
	Scirpus microcarpus C. Presl	Red-tinge Bulrush
FAMILY ERIOCAULACEAE		**Pipewort Family**
	Eriocaulon aquaticum (Hill) Druce	Seven-angled Pipewort
FAMILY IRIDACEAE		**Iris Family**
	Sisyrinchium montanum Greene	Strict Blue-eyed-grass
FAMILY JUNCACEAE		**Rush Family**
	Juncus effusus L.	Soft Rush
	Juncus filiformis L.	Thread Rush
	Juncus nodosus L.	Knotted Rush
	Juncus tenuis Willd.	Path Rush
	Luzula parviflora (Ehrh.) Desv.	Small-flowered Woodrush
FAMILY LILIACEAE		**Lily Family**
	Clintonia borealis (Aiton) Raf.	Blue Bead-lily
	Lilium philadelphicum L.	Wood Lily
	Maianthemum canadense Desf.	Wild-lily-of-the-valley
	Maianthemum racemosum (L.) Link	Feathery False Lily of the Valley
	Maianthemum stellatum (L.) Link	Starflower False Solomon's-seal
	Maianthemum trifolium (L.) Sloboda	Three-leaf Solomon's-seal
	Streptopus amplexifolius (L.) DC.	White Mandarin
	Streptopus lanceolatus (Aiton) Reveal	Rose Twisted-stalk
	Trillium cernuum L.	Nodding Trillium
FAMILY ORCHIDACEAE		**Orchid Family**
	Cypripedium acaule Aiton	Pink Lady's-slipper
R	*Listera convallarioides (Sw.) Nutt. ex Ell.*	Broad-leaved Twayblade
FAMILY POACEAE		**Grass Family**
I	*Agrostis gigantea Roth*	Black Bentgrass

	Agrostis scabra Willd.	Rough Bentgrass
	Agrostis stolonifera L.	Spreading Bentgrass
	Bromus ciliatus L.	Fringed Brome
	Calamagrostis canadensis (Michx.) P. Beauv.	Blue-joint Reedgrass
	Cinna latifolia (Trevir. ex Goepp.) Griseb. in	Slender Wood Reedgrass
	Danthonia spicata (L.) P. Beauv. ex Roem. &	Poverty Oatgrass
	Deschampsia flexuosa (L.) Trin.	Crinkled Hairgrass
	Elymus trachycaulus (Link) Gould	Wild-rye
	Glyceria borealis (Nash) Batch.	Small Floating Mannagrass
	Glyceria canadensis (Michx.) Trin.	Canada Mannagrass
	Glyceria grandis S. Watson	American Mannagrass
	Glyceria striata (Lam) A.Hitchc.	Fowl Mannagrass
I	*Lolium persicum Boiss. & Hohen. ex Boiss.*	Persian Ryegrass
R	*Milium effusum L.*	Tall Millet-grass
R	*Oryzopsis canadensis (Poir.) Trin.*	Canada Mountain-ricegrass
	Panicum acuminatum Sw.	Panicgrass
I	*Phleum pratense L.*	Meadow Timothy
I	*Poa annua L.*	Annual Bluegrass
	Poa glauca Vahl	Glaucous bluegrass
	Poa palustris L.	Fowl Bluegrass
	Schizachne purpurascens (Torr.) Swallen	Purple Oat
	Torreyochloa fernaldii (A. Hitchc.) Church	Fernald's False Mannagrass
FAMILY POTAMOGETONACEAE		**Pondweed Family**
	Potamogeton amplifolius Tuckerm.	Large-leaf Pondweed
P	*Potamogeton confervoides Reichb.*	Algae-like Pondweed
	Potamogeton epihydrus Raf.	Ribbon-leaf Pondweed
	Potamogeton gramineus L.	Grassy Pondweed
	Potamogeton natans L.	Floating Pondweed
R	*Potamogeton oakesianus Robb.*	Oakes Pondweed
R	*Potamogeton pusillus L.*	Slender Pondweed
	Potamogeton spirillus Tuckerm.	Spiral Pondweed
FAMILY SPARGANIACEAE		**Bur-reed Family**
	Sparganium angustifolium Michx.	Many-stalked Bur-reed
	Sparganium emersum Rehmann	Greenfruit Bur-reed
	Sparganium fluctuans (Morong) Robinson	Floating Bur-reed
FAMILY TYPHACEAE		**Cat-tail Family**
I	*Typha angustifolia L.*	Narrow-leaved Cattail
	Typha latifolia L.	Broad-leaf Cattail

FAMILY ACERACEAE		**Maple Family**
	Acer spicatum Lam.	Mountain Maple
FAMILY APIACEAE		**Parsley Family**
	Heracleum lanatum Michx.	Cow-parsnip
	Osmorhiza berterii DC.	Sweet-cicely
FAMILY APOCYNACEAE		**Dogbane Family**
	Apocynum androsaemifolium L.	Spreading Dogbane
FAMILY ARALIACEAE		**Ginseng Family**
	Aralia hispida Vent.	Bristly Sarsaparilla
	Aralia nudicaulis L.	Wild Sarsaparilla
FAMILY ASTERACEAE		**Sunflower Family**
	Achillea millefolium L.	Yarrow
R	*Ambrosia artemisiifolia L.*	Annual Ragweed
	Anaphalis margaritacea (L.) Benth. & Hook. f. ex C.B. Clarke	Pearly Everlasting
I	*Chrysanthemum leucanthemum L.*	Oxeye Daisy
I	*Cirsium vulgare (Savi) Ten.*	Bull Thistle
	Conyza canadensis (L.) Cronquist	Canadian Horseweed
I	*Crepis tectorum L.*	Narrow-leaf Hawksbeard
	Doellingeria umbellata (Mill.) Nees	Parasol Whitetop
	Erigeron philadelphicus L.	Philadelphia Fleabane
	Eupatorium maculatum L.	Spotted Joepyeweed
	Eurybia macrophylla (L.) Cass.	Large-leaf Wood-aster
	Euthamia graminifolia (L.) Nutt.	Flat-top Fragrant Goldenrod
I	*Hieracium aurantiacum L.*	Orange Hawkweed
R	*Hieracium kalmii*	Kalm's Hawkweed
I	*Hieracium piloselloides Vill.*	Tall Hawkweed
	Lactuca biennis (Moench) Fern.	Tall Blue Lettuce
I	*Matricaria maritima L.*	Scentless Chamomile
	Megalodonta beckii (Torr. ex Spreng) Greene	Water-marigold
	Packera aurea (L.) A.& D. Löve	Golden Ragwort
	Prenanthes alba L.	White Rattlesnakeroot
	Solidago canadensis L.	Canada Goldenrod
	Solidago gigantea Aiton	Smooth Goldenrod
	Solidago hispida Muhlenb.	Hairy Goldenrod
	Solidago juncea Aiton	Early Goldenrod
I	*Sonchus arvensis ssp. uliginosus L.*	Moist Sowthistle
	Symphyotrichum puniceum (L.) A.& D. Löve	Swamp Aster
I	*Tanacetum vulgare L.*	Common Tansy
I	*Taraxacum officinale G. Weber*	Brown-seed Dandelion

FAMILY BALSAMINACEAE		**Touch-me-not Family**
	Impatiens capensis Meerb.	Spotted Jewel-weed
FAMILY BETULACEAE		**Birch Family**
	Alnus viridis (Villars) DC.	Green Alder
	Betula cordifolia Regel	Heartleaf Birch
	Betula papyrifera Marshall	Paper Birch
	Corylus cornuta Marshall	Beaked Hazelnut
FAMILY BORAGINACEAE		**Borage Family**
	Mertensia paniculata (Aiton) G. Don	Tall Bluebells
FAMILY BRASSICACEAE		**Mustard Family**
	Arabis divaricarpa A. Nelson	Limestone Rockcress
	Cardamine parviflora L.	Small-flower Bitter-cress
	Cardamine pensylvanica Muhlenb. ex Willd.	Pennsylvania Bitter-cress
I	*Conringia orientalis (L.) Dumort.*	Hare's-ear Mustard
R	*Draba cana Rydb.*	Hoary Draba
I	*Erysimum cheiranthoides L.*	Worm-seed Mustard
	Rorippa palustris (L.) Besser	Marsh Yellow Cress
FAMILY CALLITRICHACEAE		**Water Starwort Family**
	Callitriche palustris L.	Vernal Water-starwort
FAMILY CAMPANULACEAE		**Harebell Family**
	Campanula aparinoides Pursh	Marsh Bellflower
	Campanula rotundifolia L.	American Harebell
FAMILY CAPRIFOLIACEAE		**Honeysuckle Family**
	Diervilla lonicera Miller	Northern Bush-honeysuckle
	Linnaea borealis L.	Twinflower
	Lonicera canadensis Bartram	American Fly-honeysuckle
	Lonicera involucrata (Richardson) Banks	Fly-honeysuckle
	Sambucus racemosa L.	European Red Elder
	Viburnum edule (Michx.) Raf.	Squashberry
FAMILY CARYOPHYLLACEAE		**Pink Family**
	Cerastium nutans Raf.	Nodding Chickweed
I	*Silene vulgaris (Moench) Garcke*	Maiden's Tears
I	*Spergularia rubra (L.) J. & C. Presl*	Purple Sandspurry
	Stellaria borealis Bigelow	Northern Stitchwort
FAMILY CHENOPODIACEAE		**Goosefoot Family**
	Chenopodium album L.	Goosefoot
FAMILY CLUSIACEAE		**St. Johnswort Family**
	Hypericum ellipticum Hook.	Pale St. John's-wort
	Hypericum majus (A. Gray) Britton	Larger Canadian St. John's-wort

R	*Hypericum mutilum L.*	Slender St. John's-wort
I	*Hypericum perforatum L.*	Common St. John's-wort
	Triadenum fraseri (Spach) Gleason	Marsh St. John's-wort
FAMILY CORNACEAE		**Dogwood Family**
	Cornus canadensis L.	Bunchberry
	Cornus rugosa Lam.	Roundleaf Dogwood
	Cornus stolonifera Michx.	Red-osier Dogwood
FAMILY DROSERACEAE		**Sundew Family**
	Drosera rotundifolia L.	Roundleaf Sundew
FAMILY ERICACEAE		**Heath Family**
	Andromeda polifolia ssp. glaucophylla L.	Bog Rosemary
	Chamaedaphne calyculata (L.) Moench	Leatherleaf
	Epigaea repens L.	Trailing Arbutus
	Gaultheria hispidula (L.) Muhlenb. ex Bigelow	Creeping Snowberry
	Kalmia polifolia Wangenh.	Pale Laurel
	Ledum groenlandicum Oeder	Common Labrador Tea
	Vaccinium angustifolium Aiton	Late Lowbush Blueberry
	Vaccinium oxycoccos L.	Small Cranberry
	Vaccinium vitis-idaea L.	Mountain Cranberry
FAMILY FABACEAE		**Pea Family**
	Lathyrus ochroleucus Hook.	Pale Vetchling Peavine
	Lathyrus palustris L.	Vetchling Peavine
I	*Lotus corniculatus L.*	Birds-foot Trefoil
I	*Medicago lupulina L.*	Black Medic
I	*Melilotus alba Medik.*	White Sweetclover
I	*Trifolium pratense L.*	Red Clover
I	*Trifolium repens L.*	White Clover
	Vicia americana Muhlenb. ex Willd.	American Purple Vetch
I	*Vicia cracca L.*	Tufted Vetch
FAMILY FUMARIACEAE		**Fumitory Family**
	Corydalis sempervirens (L.) Pers.	Pale Corydalis
FAMILY GENTIANACEAE		**Gentian Family**
	Halenia deflexa (Sm.) Griseb.	Spurred Gentian
FAMILY GERANIACEAE		**Geranium Family**
	Geranium bicknellii Britton	Bicknell Northern Crane's-bill
FAMILY GROSSULARIACEAE		**Currant Family**
	Ribes glandulosum Grauer	Skunk Currant
	Ribes hudsonianum Richardson	Northern Black Currant
	Ribes triste Pall.	Swamp Red Currant

FAMILY HIPPURIDACEAE		**Mare's-tail Family**
	Hippuris vulgaris L.	Common Mare's-tail
FAMILY LAMIACEAE		**Mint Family**
I	*Galeopsis tetrahit L.*	Brittle-stem Hempnettle
	Lycopus uniflorus Michx.	Northern Bugleweed
I	*Melissa officinalis L.*	Garden Balm
	Mentha arvensis L.	Corn Mint
	Prunella vulgaris L.	Self-heal
	Scutellaria galericulata L.	Hooded Skullcap
FAMILY LENTIBULARIACEAE		**Bladderwort Family**
	Utricularia intermedia Hayne	Flatleaf Bladderwort
	Utricularia minor L.	Lesser Bladderwort
	Utricularia vulgaris L.	Greater Bladderwort
FAMILY MONOTROPACEAE		**Indian Pipe Family**
	Monotropa uniflora L.	Indian-pipe
FAMILY MYRICACEAE		**Bayberry Family**
	Myrica gale L.	Sweet Bayberry
FAMILY NYMPHAEACEAE		**Water Lily Family**
	Nuphar variegata Durand in Clinton	Yellow Cowlily
FAMILY ONAGRACEAE		**Evening-primrose**
	Circaea alpina L.	Small Enchanter's Nightshade
	Epilobium angustifolium L.	Fireweed
	Epilobium ciliatum Raf.	Hairy Willow-herb
R	*Oenothera parviflora L.*	Northen Evening-primrose
FAMILY OXALIDACEAE		**Wood Sorrel Family**
	Oxalis acetosella L.	Irish Shamrock
FAMILY PLANTAGINACEAE		**Plantain Family**
P	*Littorella americana Fern.*	American Shore-grass
I	*Plantago major L.*	Nipple-seed Plantain
FAMILY POLYGONACEAE		**Buckwheat Family**
	Polygonum amphibium L.	Water Smartweed
	Polygonum cilinode Michx.	Fringed Black Bindweed
	Polygonum viviparum L.	Viviparous Knotweed
FAMILY PRIMULACEAE		**Primrose Family**
	Lysimachia ciliata L.	Fringed Loosestrife
	Lysimachia terrestris (L.) B.S.P.	Swamp Loosestrife
	Primula mistassinica Michx.	Bird's-eye Primrose
	Trientalis borealis Raf.	Northern Starflower

FAMILY PYROLACEAE	**Wintergreen Family**
Moneses uniflora (L.) A. Gray	One-flower Wintergreen
Pyrola minor L.	Lesser Wintergreen
FAMILY RANUNCULACEAE	**Buttercup Family**
Actaea rubra (Aiton) Willd.	Red Baneberry
Anemone canadensis L.	Canada Anemone
Anemone quinquefolia L.	Wood Anemone
Aquilegia canadensis L.	Wild Columbine
Caltha palustris L.	Marsh Marigold
Coptis trifolia (L.) Salisb.	Goldthread
Ranunculus abortivus L.	Kidney-leaved Buttercup
Ranunculus acris L.	Tall Butter-cup
Ranunculus flammula L.	Greater Creeping Spearwort
Ranunculus pensylvanicus L. f.	Bristly Crowfoot
Thalictrum dasycarpum Fischer & Avé-Lall.	Purple Meadowrue
FAMILY ROSACEAE	**Rose Family**
Amelanchier bartramiana (Tausch) M. Roem.	Bartram Shadbush
Fragaria vesca L.	Woodland Strawberry
Fragaria virginiana Miller	Virginia Strawberry
Geum aleppicum Jacq.	Yellow Avens
Physocarpus opulifolius (L.) Maxim.	Eastern Ninebark
Potentilla norvegica L.	Norwegian Cinquefoil
Potentilla palustris (L.) Scop.	Marsh Cinquefoil
Potentilla tridentata Sol. ex Aiton	Three-toothed Cinquefoil
Prunus pensylvanica L. f.	Pin Cherry
Rosa acicularis Lindl.	Prickly Rose
Rosa blanda Aiton	Smooth Rose
Rubus pubescens Raf.	Dwarf Raspberry
Sorbus americana Marshall	American Mountain-ash
Sorbus decora (Sarg.) C.K. Schneid.	Northern Mountain-ash
FAMILY RUBIACEAE	**Bedstraw Family**
Galium trifidum L.	Small Bedstraw
FAMILY SALICACEAE	**Willow Family**
Populus balsamifera L.	Balsam Poplar
Populus tremuloides Michx.	Trembling Aspen
Salix eriocephala Michx.	Heart-leaved Willow
Salix humilis Marshall	Tall Prairie Willow
Salix pellita Anderss. ex Schneider	Satiny Willow
Salix petiolaris Sm.	Meadow Willow
FAMILY SARRACENIACEAE	**Pitcher Plant Family**
Sarracenia purpurea L.	Northern Pitcher-plant

FAMILY SAXIFRAGACEAE	**Saxifrage Family**
Mitella nuda L.	Naked Bishop's-cap
Parnassia parviflora DC.	Small-flower Grass-of-parnassus
Saxifraga virginiensis Michx.	Virginia Saxifrage
FAMILY SCROPHULARIACEAE	**Figwort Family**
Euphrasia stricta D. Wolff ex Lehm.	Drug Eyebright
Melampyrum lineare Desr.	American Cow-wheat
Rhinanthus minor L.	Yellow Rattle
Veronica americana (Raf.) Schwein. ex Benth.	American Speedwell
Veronica peregrina ssp. xalapensis L.	Neckweek
FAMILY VIOLACEAE	**Violet Family**
Viola pubescens Aiton	Downy Yellow Violet

Appendix 2. Birds of the Marathon PGM study area.

The following species were observed or heard in or near the Marathon PGM study area. Taxonomic order and nomenclature follow AOU (1998). Species not observed in the 2009 study, but reported in Golder Associates Ltd. (2009) are indicated ▲. Additional species recorded on a Breeding Bird Survey (1976 to 2004) adjacent to the study area are indicted Δ.

Nesting Evidence

Nest evidence codes follow the Ontario Breeding Bird Atlas (Cadman et al. 2007):

Possible nesting

H - Species observed in breeding season in suitable habitat.

S – Singing male present or breeding calls heard observed in breeding season in suitable habitat.

Probable nesting

A – Agitated behaviour.

Confirmed Nesting

CF - Adult carrying food to young

FY – Recently fledged young or downy young

NU – Nest used in current nesting season

Conservation Status

* Partners in Flight Priority Species (Ontario Partners in Flight 2006)

\+ Species at Risk (COSEWIC or COSSARO listed species)

Loons		**FAMILY GAVIIDAE**
H	Common Loon	*Gavia immer*
Cormorants		**FAMILY PHALACROCORIDAE**
Δ	Double-crested Cormorant	*Phalacrocorax auritus*
Bitterns and Herons		**FAMILY ARDEIDAE**
Δ	American Bittern	*Botaurus lentiginosus*
H	Great Blue Heron	*Ardea herodias*
Ducks and Geese		**FAMILY ANATIDAE**
▲	Canada Goose	*Branta canadensis*
Δ	Wood Duck	*Aix sponsa*
Δ	American Wigeon	*Anas americana*
H	American Black Duck	*Anas rubripes*
H	Mallard	*Anas platyrhynchos*
Δ	Blue-winged Teal	*Anas discors*
Δ	Green-winged Teal	*Anas crecca*
Δ	Lesser Scaup	*Aythya affinis*
FY	Common Goldeneye	*Bucephala clangula*
FY	Hooded Merganser	*Lophodytes cucullatus*
Δ	Common Merganser	*Mergus merganser*

Vultures			**FAMILY CATHARTIDAE**
	Δ	Turkey Vulture	*Cathartes aura*
Eagles and Hawks			**FAMILY ACCIPITRIDAE**
*	Δ	Sharp-shinned Hawk	*Accipiter striatus*
	Δ	Northern Goshawk	*Accipiter gentilis*
	H	Broad-winged Hawk	*Buteo platypterus*
	H	Red-tailed Hawk	*Buteo jamaicensis*
Falcons			**FAMILY FALCONIDAE**
	Δ	American Kestrel	*Falco sparverius*
	H	Merlin	*Falco columbarius*
Grouse and Quail			**FAMILY PHASIANIDAE**
*	H	Ruffed Grouse	*Bonasa umbellus*
	FY	Spruce Grouse	*Dendragapus canadensis*
Plovers			**FAMILY CHARADRIIDAE**
	▲	Killdeer	*Charadrius vociferus*
Sandpipers			**FAMILY SCOLOPACIDAE**
	H	Solitary Sandpiper	*Tringa solitaria*
	H	Spotted Sandpiper	*Actitis macularia*
	Δ	Wilson's Snipe	*Gallinago delicata*
Gulls and Terns			**FAMILY LARIDAE**
	Δ	Ring-billed Gull	*Larus delawarensis*
	Δ	Herring Gull	*Larus argentatus*
Doves and Pigeons			**FAMILY COLUMBIDAE**
	Δ	Rock Pigeon	*Columba livia*
	Δ	Mourning Dove	*Zenaida macroura*
Cuckoos			**FAMILY CUCULIDAE**
	Δ	Black-billed Cuckoo	*Coccyzus erythropthalmus*
Goatsuckers			**FAMILY CAPRIMULGIDAE**
+	Δ	Common Nighthawk	*Chordeiles minor*
Hummingbirds			**FAMILY TROCHILIDAE**
	H	Ruby-throated Hummingbird	*Archilochus colubri*
Kingfishers			**FAMILY ALCEDINIDAE**
*	NU	Belted Kingfisher	*Ceryle alcyon*
Woodpeckers			**FAMILY PICIDAE**
+	Δ	Red-headed Woodpecker	*Melanerpes erythrocephalus*
*	H	Yellow-bellied Sapsucker	*Sphyrapicus varius*
	▲	Downy Woodpecker	*Picoides pubescens*
	H	Hairy Woodpecker	*Picoides villosus*
*	H	Black-backed Woodpecker	*Picoides arcticus*
*	H	Northern Flicker	*Colaptes auratus*

		H Pileated Woodpecker	*Dryocopus pileatus*
		Tyrant Flycatchers	**FAMILY TYRANNIDAE**
*	+	H Olive-sided Flycatcher	*Contopus borealis*
*		▲ Yellow-bellied Flycatcher	*Empidonax flaviventris*
*		S Alder Flycatcher	*Empidonax alnorum*
		S Least Flycatcher	*Empidonax minimus*
		Δ Eastern Kingbird	*Tyrannus tyrannus*
		Swallows	**FAMILY HIRUNDINIDAE**
		Δ Tree Swallow	*Tachycineta bicolor*
		Δ Northern Rough-winged Swallow	*Stelgidopteryx serripennis*
		Δ Bank Swallow	*Riparia riparia*
		Δ Cliff Swallow	*Hirundo pyrrhonota*
		Δ Barn Swallow	*Hirundo rustica*
		Jays, Crows and Ravens	**FAMILY CORVIDAE**
		H Gray Jay	*Perisoreus canadensis*
		Δ Blue Jay	*Cyanocitta cristata*
		H American Crow	*Corvus brachyrhynchos*
		NE Common Raven	*Corvus corax*
		Chickadees	**FAMILY PARIDAE**
		H Black-capped Chickadee	*Parus atricapillus*
		H Boreal Chickadee	*Parus hudsonicus*
		Nuthatches	**FAMILY SITTIDAE**
		H Red-breasted Nuthatch	*Sitta canadensis*
		Creepers	**FAMILY CERTHIIDAE**
		▲ Brown Creeper	*Certhia americana*
		Wrens	**FAMILY TROGLODYTIDAE**
		Δ House Wren	*Troglodytes aedon*
*		S Winter Wren	*Troglodytes troglodytes*
		Kinglets	**FAMILY REGULIDAE**
		S Golden-crowned Kinglet	*Regulus satrapa*
*		S Ruby-crowned Kinglet	*Regulus calendula*
		Thrushes	**FAMILY TURDIDAE**
		Δ Eastern Bluebird	*Sialia sialis*
		S Veery	*Catharus fuscescens*
		S Swainson's Thrush	*Catharus ustulatus*
		S Hermit Thrush	*Catharus guttatus*
		S American Robin	*Turdus migratorius*
		Mockingbirds and Thrashers	**FAMILY MIMIDAE**
		Δ Gray Catbird	*Dumetella carolinensis*
		Δ Brown Thrasher	*Toxostoma rufum*

			Waxwings	**FAMILY BOMBYCILLIDAE**
		H	Cedar Waxwing	*Bombycilla cedrorum*
			Starlings	**FAMILY STURNIDAE**
		Δ	European Starling	*Sturnus vulgaris*
			Vireos	**FAMILY VIREONIDAE**
*		S	Blue-headed Vireo	*Vireo solitarius*
*		S	Philadelphia Vireo	*Vireo philadelphicus*
		S	Red-eyed Vireo	*Vireo olivaceus*
			Wood-warblers	**FAMILY PARULIDAE**
*		S	Tennessee Warbler	*Vermivora peregrina*
*		S	Nashville Warbler	*Vermivora ruficapilla*
		S	Northern Parula	*Parula americana*
		▲	Yellow Warbler	*Dendroica petechia*
*		S	Chestnut-sided Warbler	*Dendroica pensylvanica*
*		S	Magnolia Warbler	*Dendroica magnolia*
*		Δ	Cape May Warbler	*Dendroica tigrina*
		S	Black-throated Blue Warbler	*Dendroica caerulescens*
		S	Yellow-rumped Warbler	*Dendroica coronata*
		S	Palm Warbler	*Dendroica palmarum*
*		S	Black-throated Green Warbler	*Dendroica virens*
*		S	Blackburnian Warbler	*Dendroica fusca*
*		S	Bay-breasted Warbler	*Dendroica castanea*
		CF	American Redstart	*Setophaga ruticilla*
	*	S	Ovenbird	*Seiurus aurocapillus*
		S	Northern Waterthrush	*Seiurus noveboracensis*
*		Δ	Connecticut Warbler	*Oporornis agilis*
*		S	Mourning Warbler	*Oporornis philadelphia*
		S	Common Yellowthroat	*Geothlypis trichas*
		▲	Wilson's Warbler	*Wilsonia pusilla*
*	+	A	Canada Warbler	*Wilsonia canadensis*
			Cardinals and Allies	**FAMILY CARDINALIDAE**
		▲	Rose-breasted Grosbeak	*Pheucticus ludovicianus*
		Δ	Indigo Bunting	*Passerina cyanea*
			Emberizids	**FAMILY EMBERIZIDAE**
		S	Chipping Sparrow	*Spizella passerina*
		Δ	Clay-colored Sparrow	*Spizella pallida*
		Δ	Vesper Sparrow	*Pooecetes gramineus*
		Δ	Savannah Sparrow	*Passerculus sandwichensis*
		▲	Fox Sparrow	*Passerella iliaca*
		Δ	Song Sparrow	*Melospiza melodia*
		Δ	Lincoln's Sparrow	*Melospiza lincolnii*
*		S	Swamp Sparrow	*Melospiza georgiana*
*		S	White-throated Sparrow	*Zonotrichia albicollis*
		S	Dark-eyed Junco	*Junco hyemalis*

			New World Blackbirds	**FAMILY ICTERIDAE**
		Δ	Bobolink	*Dolichonyx oryzivorus*
		Δ	Red-winged Blackbird	*Agelaius phoeniceus*
*	+	FY	Rusty Blackbird	*Euphagus carolinus*
		Δ	Brewer's Blackbird	*Euphagus cyanocephalus*
		Δ	Common Grackle	*Quiscalus quiscula*
		Δ	Brown-headed Cowbird	*Molothrus ater*
			Finches	**FAMILY FRINGILLIDAE**
*		S	Purple Finch	*Carpodacus purpureus*
		Δ	Red Crossbill	*Loxia curvirostra*
		Δ	White-winged Crossbill	*Loxia leucoptera*
		S	Pine Siskin	*Carduelis pinus*
		Δ	American Goldfinch	*Carduelis tristis*
*		H	Evening Grosbeak	*Coccothraustes vespertinus*

Appendix 3. Mammals of the Marathon PGM study area.

The following species were observed in the Marathon PGM study area in 2009. Taxonomic order and nomenclature follow Banfield (1974).

Rabbits and Hares	**FAMILY LEPORIDAE**
Snowshoe Hare	*Lepus americanus*
Squirrels	**FAMILY SCIURIDAE**
Least Chipmunk	*Tamias minimus*
Red Squirrel	*Tamiasciurus hudsonicus*
Beavers	**FAMILY CASTORIDAE**
Beaver	*Castor canadensis*
New World Porcupines	**FAMILY ERITHIZONTIDAE**
Porcupine	*Erethizon dorsatum*
Dogs	**FAMILY CANIDAE**
Timber Wolf	*Canis lupus*
Red Fox	*Vulpes vulpes*
Bears	**FAMILY URSIDAE**
Black Bear	*Ursus americanus*
Weasels and Their Allies	**FAMILY MUSTELIDAE**
River Otter	*Lutra candensis*
Marten	*Martes americana*
Deer	**FAMILY CERVIDAE**
Moose	*Alces alces*

Appendix 4. Amphibians of the Marathon PGM study area.

The following species were observed or heard in or near the Marathon PGM study area in 2009. Taxonomic order and nomenclature follow Conant and Collins (1991).

Lungless Salamanders	**FAMILY PLETHODONTIDAE**
Northern Redback Salamander	*Plethodon cinereus*
Mole Salamanders	**FAMILY AMBYSTOMATIDAE**
Blue-spotted Salamander	*Ambystoma laterale*
Toads	**FAMILY BUFONIDAE**
Eastern American Toad	*Bufo americanus americanus*
Treefrogs	**FAMILY HYLIDAE**
Northern Spring Peeper	*Pseudacris crucifer crucifer*
True Frogs	**FAMILY RANIDAE**
Green Frog	*Rana clamitans melanota*
Mink Frog	*Rana septentrionalis*
Wood Frog	*Rana sylvatica*

Appendix 5. Butterflies of the Marathon PGM study area.

The following species were observed or heard in or near the Marathon PGM study area in 2009.

Skippers	**FAMILY HESPERIIDAE**
Common Roadside Skipper	*Amblyscirtes vialis*
Peck's Skipper	*Polites peckius*
Swallowtails	**FAMILY PAPILIONIDAE**
Canadian Tiger Swallowtail	*Papilio glaucus canadensis*
Whites and Sulphurs	**FAMILY PIERIDAE**
Pink-edged Sulphur	*Colias interior*
Mustard White	*Pieris oleracea*
Coppers, Hairstreaks and Blues	**FAMILY LYCAENIDAE**
Dorcas Copper	*Epidemia dorcas*
Brushfoots	**FAMILY NYMPHALIDAE**
White Admiral	*Basilarchia arthemis*
Mourning Cloak	*Nymphalis antiopa*
Northern Crescent	*Phycoides cocyta*
Hoary Comma	*Polygonia gracilis*
Great Spangled Fritillary	*Speyeria cylebe*
Red Admiral	*Vanessa atalanta*

Appendix 6. Dragonflies and Damselflies of the Marathon PGM study area.
The following species were observed or heard in or near the Marathon PGM study area in 2009.

Dragonflies

Darners	**FAMILY AESHNIDAE**
Canada Darner	*Aeshna canadensis*
Variable Darner	*Aeshna interrupta*
Emeralds	**FAMILY CORDULIIDAE**
American Emerald	*Cordulia shurtleffi*
Racket-tailed Emerald	*Dorocordulia libera*
Ocellated Emerald	*Somatochlora minor*
Clubtails	**FAMILY GOMPHIDAE**
Dragonhunter	*Hagenius brevistylus*
Zebra Clubtail	*Stylurus scudderi*
Skimmers	**FAMILY LIBELLULIDAE**
Hudsonian Whiteface	*Leucorrhinia hudsonica*
Variable Whiteface	*Leucorrhinia proxima*
Chalk-fronted Skimmer	*Libellula julia*
Four-spotted Skimmer	*Libellula quadrimaculata*
Band-winged Meadowfly	*Sympetrum semicinctum*

Damselflies

Bluets	**FAMILY COENAGRIONIDAE**
Subarctic Bluet	*Coenagrion interrogatum*
Boreal Bluet	*Enallagma boreale*
Northern Bluet	*Enallagma cyathigerum*
Hagen's Bluet	*Enallagma hageni*
Eastern Forktail	*Ischnura verticalis*
Sedge Sprite	*Nehalennia irene*
Spreadwings	**FAMILY LESTIDAE**
Common Spreadwing	*Lestes disjunctus*

Appendix 7. Helicopter survey March 20 2009. Track sightings. Marathon PGM study area.

Waypoint	Easting	Northing	Species
422	552460.0772	5401776.677	Moose Track
423	551927.0839	5407677.134	Moose Track
424	551439.1962	5410671.662	Potential Peregrine Cliff
426	550980.7348	5403464.464	Otter Track
427	550722.5931	5399806.224	Unknown Track
428	550464.6212	5401036.176	Wolf Track
429	550376.7762	5403589.614	Moose Track
430	550471.7272	5405852.019	Fox Track
431	550464.3567	5406648.047	Fox Track
432	549988.3402	5407769.612	Unknown Track
433	549658.9298	5408304.359	Unknown Track
434	548363.2322	5409668.978	Otter Track
435	549312.5736	5405813.068	Fox Track
436	549342.5635	5405143.894	Unknown Track
437	549287.7211	5404241.841	Snowshoe Hare Track
438	549205.7424	5401783.375	Fox Track
439	549226.8858	5400273.54	Snowshoe Hare Track
440	548430.4309	5400150.588	Fox Track
441	548241.2046	5401252.232	Fox Track
442	548766.5902	5401572.356	Otter Track
443	548500.6092	5404700.333	Otter Track
444	548253.4712	5406099.807	Unknown Track
445	547409.1706	5409443.22	Unknown Track
446	546334.1314	5409645.773	Otter Track
447	546902.7762	5407539.821	Otter Track
448	547352.8143	5405969.499	Moose Track
449	547370.9153	5404377.407	Otter Track
450	547361.7871	5403884.099	Moose Track
451	547713.8653	5402444.478	Otter Track
452	546159.516	5404260.905	Otter Track
453	546188.3544	5405656.373	Wolf Track
454	546238.0209	5407146.911	Otter Track
455	543664.2203	5409474.649	Potential Peregrine Cliff
456	544866.0555	5408210.523	Snowshoe Hare Track
457	545612.6777	5404554.977	Otter Track
458	544363.3313	5402743.54	Fox Track
459	544193.4329	5403535.438	Potential Peregrine Cliff
460	542837.9231	5407017.616	Potential Peregrine Cliff

Appendix 8. Rare species locations at Marathon PGM study area, 2009.

Common Name	Scientific Name	Date	Easting	Northing	Observer
Common Ragweed	*Ambrosia artemisiifolia*	06-Aug-09	550440	5405800	AGH
Whitlowgrass	*Draba cana*	05-Aug-09	546618	5406889	AGH
Northern St. Johnswort	*Hypericum mutilum*	06-Aug-09	548136	5403376	AGH
Broad-lipped Twayblade	*Listera convallarioides*	16-Jul-09	550748	5405958	AGH
Wood Millet Grass	*Milium effusum*	04-Aug-09	549216	5403852	AGH
Wood Millet Grass	*Milium effusum*	15-Jul-09	550870	5402600	AGH
Small-flowered Evening Primrose	*Oenothera parviflora*	17-Jul-09	548897	5404411	AGH
Canadian Mountain Rice	*Oryzopsis canadensis*	16-Jul-09	550664	5403490	AGH
Oakes' Pondweed	*Potamogeton oakesianus*	17-Jul-09	548587	5404096	AGH
Oakes' Pondweed	*Potamogeton oakesianus*	06-Aug-09	547936	5403292	AGH
Oakes' Pondweed	*Potamogeton oakesianus*	24-Aug-09	548934	5404289	AGH
Oakes' Pondweed	*Potamogeton oakesianus*	24-Aug-09	548927	5404538	AGH
Oakes' Pondweed	*Potamogeton oakesianus*	06-Aug-09	548268	5403327	AGH
Slender Pondweed	*Potamogeton pusillus*	17-Jul-09	548897	5404411	AGH
Narrow-leaved Cattail	*Typha angustifolia*	17-Jul-09	549610	5403918	AGH
Marsh Speedwell	*Veronica scutellata*	25-Aug-09	549278	5402644	AGH
Appalachian Firmoss	*Huperzia appalachiana*	05-Aug-09	548875	5407566	AGH
Shore Plantain	*Littorella americana*	07-Aug-09	543934	5403309	AGH
Braun's Holly Fern	*Polystichum braunii*	18-Jul-09	549460	5404968	AGH
Alga Pondweed	*Potamogeton confervoides*	24-Aug-09	548934	5404289	AGH
Alga Pondweed	*Potamogeton confervoides*	06-Aug-09	548136	5403376	AGH
Northern Woodsia	*Woodsia alpina*	17-Jul-09	549342	5403777	AGH
Canada Warbler	*Wilsonia canadensis*	21-Jun-09	550575	5401057	RFF
Canada Warbler	*Wilsonia canadensis*	16-Jul-09	550903	5403688	AGH
Canada Warbler	*Wilsonia canadensis*	18-Jul-09	550026	5405058	AGH
Canada Warbler	*Wilsonia canadensis*	18-Jul-09	549986	5404990	AGH
Canada Warbler	*Wilsonia canadensis*	21-Jun-09	550083	5402099	RFF
Canada Warbler	*Wilsonia canadensis*	21-Jun-09	550248	5402001	RFF
Canada Warbler	*Wilsonia canadensis*	15-Jul-09	549496	5403835	AGH
Canada Warbler	*Wilsonia canadensis*	21-Jun-09	550306	5401712	RFF
Canada Warbler	*Wilsonia canadensis*	20-Jun-09	549600	5403353	RFF
Canada Warbler	*Wilsonia canadensis*	21-Jun-09	550577	5400925	RFF
Canada Warbler	*Wilsonia canadensis*	21-Jun-09	550479	5400757	RFF

Common Name	Scientific Name	Date	Easting	Northing	Observer
Canada Warbler	*Wilsonia canadensis*	17-Jul-09	548947	5404544	RFF
Canada Warbler	*Wilsonia canadensis*	17-Jul-09	548906	5404335	RFF
Canada Warbler	*Wilsonia canadensis*	18-Jul-09	549743	5406060	RFF
Canada Warbler	*Wilsonia canadensis*	18-Jul-09	549695	5406269	RFF
Canada Warbler	*Wilsonia canadensis*	21-Jun-09	550248	5402001	RFF
Olive-sided Flycatcher	*Contopus borealis*	18-Jul-09	549695	5406269	RFF
Rusty Blackbird	*Euphagus carolinus*	15-Jul-09	550204	5405309	AGH

Appendix 9. Forest Bird Monitoring data. Marathon PGM study area 2009. Refer to Appendix 10 for locations and dates.

Plot	Species	0 to 5 minutes			5 to 10 minutes			Total
		0 - 50 m	50-100 m	>100 m	0 - 50 m	51 - 100 m	>100 m	
1	Ovenbird	1	1					2
1	Blue-winged Teal		1					1
1	Red-eyed Vireo	1		1				2
1	Black-throated Green Warbler	2						2
1	Winter Wren	1						1
1	Chipping Sparrow	1						1
2	Winter Wren			2				2
2	Blackburnian Warbler	1						1
2	Black-throated Green Warbler	2						2
2	Swainson's Thrush	1		1				2
2	Philadelphia Vireo	1						1
2	Ovenbird	1						1
2	Mourning Warbler	1						1
2	American Redstart	1						1
2	Bay-breasted Warbler	1						1
2	White-throated Sparrow			2				2
3	Swainson's Thrush	1		1				2
3	Mourning Warbler	1						1
3	Black-throated Green Warbler	1						1
3	Magnolia Warbler	1						1
3	Red-eyed Vireo				1			1
3	Blue Jay	1						1
3	Winter Wren	1						1
3	Tennessee Warbler	1						1
3	Chestnut-sided Warbler				1			1
3	American Redstart	1						1
3	Canada Warbler						1	1
3	White-throated Sparrow	1						1
4	Swainson's Thrush			1				1
4	White-throated Sparrow	1						1
4	Veery			1				1
4	Black-throated Green Warbler	3						3
4	Winter Wren	1						1
4	Least Flycatcher	1						1
4	American Redstart	1						1
4	Northern Parula	1						1

Plot	Species	0 to 5 minutes			5 to 10 minutes			Total
		0 - 50 m	50-100 m	>100 m	0 - 50 m	51 - 100 m	>100 m	
4	Ovenbird	1						1
5	Winter Wren	1						1
5	White-throated Sparrow			2				2
5	American Redstart	2						2
5	Black-throated Green Warbler	3						3
5	Pine Siskin	1						1
5	Red-eyed Vireo	1						1
5	Nashville Warbler	1						1
5	American Robin	1						1
5	Mourning Warbler	1						1
5	Red-eyed Vireo	1						1
5	Common Goldeneye			1				1
6	White-throated Sparrow			2				2
6	Swainson's Thrush	1						1
6	Tennessee Warbler	1						1
6	American Redstart	1						1
6	Winter Wren			1				1
6	Red-eyed Vireo	1						1
6	Black-throated Green Warbler	1						1
6	Pine Siskin	1						1
6	American Robin	1		1				2
6	Least Flycatcher	1						1
6	Northern Parula	1						1
6	Chipping Sparrow	1						1
7	Black-throated Green Warbler	3						3
7	Mourning Warbler	2			1			3
7	Nashville Warbler	1						1
7	Winter Wren			2				2
7	Hermit Thrush			1				1
7	White-throated Sparrow	3		1				4
7	Veery			1				1
7	Least Flycatcher	1						1
7	American Redstart	1						1
7	American Robin				1			1
7	Swainson's Thrush			1				1
8	Black-throated Green Warbler	1					1	2
8	White-throated Sparrow	3						3
8	Nashville Warbler	1						1
8	Alder Flycatcher	1						1

Plot	Species	0 to 5 minutes			5 to 10 minutes			Total
		0 - 50 m	50-100 m	>100 m	0 - 50 m	51 - 100 m	>100 m	
8	Red-eyed Vireo	1			1			2
8	Magnolia Warbler	1						1
8	Mourning Warbler	1			1			2
8	Blue Jay						1	1
8	Swainson's Thrush	1						1
8	American Redstart	1						1
8	Yellow-bellied Sapsucker	1						1
8	Blue-headed Vireo				1			1
8	Chestnut-sided Warbler	1						1
9	Common Raven			1				1
9	White-throated Sparrow	3						3
9	Winter Wren			1	1			2
9	Nashville Warbler	1						1
9	Swainson's Thrush	2						2
9	Magnolia Warbler	1						1
9	Black-throated Green Warbler	1						1
9	American Redstart	1						1
9	Mourning Warbler	1						1
9	American Robin				1			1
9	Hairy Woodpecker	1						1
9	Nashville Warbler				1			1
10	American Redstart	2						2
10	Magnolia Warbler	1						1
10	Swainson's Thrush	1			1			2
10	Black-throated Green Warbler				1			1
10	Common Raven			1				1
10	Winter Wren	1			1			2
10	White-throated Sparrow	3						3
10	Ruby-crowned Kinglet	1						1
10	American Robin	1						1
10	Yellow-rumped Warbler	1						1
10	Tennessee Warbler	1						1
11	Common Raven			1				1
11	Black-throated Green Warbler	4						4
11	Red-eyed Vireo				1			1
11	Pine Siskin	1						1
11	Magnolia Warbler	1						1
11	White-throated Sparrow			2		1		3
11	Northern Waterthrush	1						1

Plot	Species	0 to 5 minutes			5 to 10 minutes			Total
		0 - 50 m	50-100 m	>100 m	0 - 50 m	51 - 100 m	>100 m	
11	Red-breasted Nuthatch	1						1
11	Swainson's Thrush			1				1
11	Winter Wren	1		1				2
11	Nashville Warbler	1						1
11	American Redstart	1						1
12	White-throated Sparrow	1		2				3
12	American Redstart	1						1
12	Spotted Sandpiper	1						1
12	Nashville Warbler	1						1
12	Mourning Warbler	2						2
12	Red-eyed Vireo	2						2
12	Winter Wren	1		1				2
12	Hairy Woodpecker	1						1
12	Black-throated Green Warbler	1						1
12	Swainson's Thrush	1						1
13	White-throated Sparrow	2		1				3
13	Nashville Warbler				1			1
13	Mourning Warbler	1						1
13	Red-eyed Vireo	1						1
13	Swainson's Thrush				1			1
13	American Robin	2						2
13	Magnolia Warbler	1						1
13	Black-throated Green Warbler	2						2
13	Canada Warbler	2						2
13	Least Flycatcher	1						1
14	Blue Jay	1						1
14	Red-eyed Vireo	2						2
14	Chipping Sparrow	1						1
14	Northern Waterthrush						1	1
14	Nashville Warbler	1						1
14	White-throated Sparrow			1				1
14	Ovenbird	1			1			2
14	Black-throated Green Warbler	2						2
14	American Redstart				1			1
14	Red-breasted Nuthatch	1						1
14	Winter Wren	1						1
14	Magnolia Warbler	1						1
14	Swainson's Thrush	1						1
14	Winter Wren	1						1

Plot	Species	0 to 5 minutes			5 to 10 minutes			Total
		0 - 50 m	50-100 m	>100 m	0 - 50 m	51 - 100 m	>100 m	
15	Black-throated Green Warbler	3						3
15	Swainson's Thrush	2						2
15	Least Flycatcher	2						2
15	Winter Wren	1						1
15	Magnolia Warbler	1						1
15	Northern Parula	1						1
16	White-throated Sparrow	2						2
16	Nashville Warbler	2						2
16	Hermit Thrush	1						1
16	Swainson's Thrush	2						2
16	Winter Wren	2						2
16	Red-eyed Vireo	1						1
16	Ovenbird	1						1
16	Least Flycatcher	1						1
17	American Redstart				1			1
17	Bay-breasted Warbler					1		1
17	Red-eyed Vireo		2					2
17	Winter Wren		1	1				2
17	Least Flycatcher		1					1
17	Black-and-White Warbler		1					1
17	Veery		1					1
17	Pine Siskin					1		1
17	White-throated Sparrow						1	1
17	Hermit Thrush						1	1
17	Palm Warbler			1				1
18	Least Flycatcher		1					1
18	Black-throated Green Warbler					1		1
18	Yellow-rumped Warbler		1					1
18	White-throated Sparrow			1		1		2
18	Winter Wren			1		1		2
18	Mourning Warbler			1				1
18	Hermit Thrush			1				1
18	Red-eyed Vireo			1				1
19	Magnolia Warbler				1			1
19	Golden-crowned Kinglet				1			1
19	Yellow-rumped Warbler				1			1
19	Ovenbird					1		1
19	Black-and-White Warbler		1					1
19	Ruffed Grouse		1					1

Plot	Species	0 to 5 minutes			5 to 10 minutes			Total
		0 - 50 m	50-100 m	>100 m	0 - 50 m	51 - 100 m	>100 m	
19	Least Flycatcher		1	1				2
19	White-throated Sparrow			1				1
19	Winter Wren			1			1	2
19	Swainson's Thrush			1				1
19	Red-eyed Vireo						1	1
19	Hermit Thrush						1	1
20	Canada Warbler							0
20	White-throated Sparrow	2	2					4
20	American Redstart				1			1
20	Ruby-crowned Kinglet		2					2
21	American Redstart	1						1
21	Swainson's Thrush	1		1				2
21	Magnolia Warbler				1			1
21	White-throated Sparrow		2				1	3
21	Ovenbird		1					1
21	Black-throated Green Warbler		1			2		3
21	American Robin	1				1		2
21	Golden-crowned Kinglet					1		1
21	Nashville Warbler					1		1
21	Least Flycatcher						1	1
21	Hermit Thrush						1	1
22	Golden-crowned Kinglet	1						1
22	Black-throated Green Warbler	1	1					2
22	Black-and-White Warbler		1					1
22	American Redstart					1		1
22	White-throated Sparrow		2	1				3
22	Least Flycatcher		1			1		2
22	Winter Wren		1					1
22	Northern Flicker			1				1
22	Swainson's Thrush			1			1	2
22	American Robin			1				1
23	Black-throated Green Warbler	1						1
23	American Redstart	1			1			2
23	Black-capped Chickadee				1			1
23	Bay-breasted Warbler	1						1
23	White-throated Sparrow		2					2
23	Red-eyed Vireo					2		2
23	American Robin		1	1		1		3
23	Winter Wren		1					1

Plot	Species	0 to 5 minutes			5 to 10 minutes			Total
		0 - 50 m	50-100 m	>100 m	0 - 50 m	51 - 100 m	>100 m	
24	Common Yellowthroat	1						1
24	Alder Flycatcher	1						1
24	American Redstart	1			1			2
24	Magnolia Warbler	1						1
24	White-throated Sparrow		1	1		1		3
24	Evening Grosbeak				1			1
24	Cedar Waxwing	5						5
24	Winter Wren		1					1
24	Blue Jay		1					1
25	Black-throated Green Warbler	1			1			2
25	White-throated Sparrow		3					3
25	Magnolia Warbler				1			1
25	Veery				1			1
25	Red-eyed Vireo		1					1
25	Nashville Warbler					1		1
25	American Redstart		1					1
25	American Robin					2		2
25	Swainson's Thrush			1				1
26	Black-capped Chickadee	2						2
26	White-throated Sparrow	1	2					3
26	Yellow-rumped Warbler	1						1
26	Red-eyed Vireo	1				2		3
26	Mourning Warbler		1		1			2
26	Black-and-White Warbler				1			1
26	Black-throated Green Warbler					1		1
26	Cedar Waxwing					3		3
26	Red-breasted Nuthatch		1					1
26	American Robin						1	1
26	Common Raven			1				1
27	Yellow-rumped Warbler	2						2
27	Nashville Warbler	1						1
27	American Robin		1					1
27	Black-throated Green Warbler		1			1		2
27	Red-eyed Vireo		1					1
27	Chipping Sparrow					1		1
27	Pine Siskin		1					1
27	White-throated Sparrow		1					1
27	Swainson's Thrush		1					1
27	Common Raven			1				1

Plot	Species	0 to 5 minutes			5 to 10 minutes			Total
		0 - 50 m	50-100 m	>100 m	0 - 50 m	51 - 100 m	>100 m	
28	Mourning Warbler	1						1
28	Nashville Warbler		1					1
28	Winter Wren		2	1			1	4
28	American Robin			1			1	2
28	Ovenbird		1					1
28	American Redstart					1		1
29	White-throated Sparrow	1		1		1		3
29	Winter Wren			2				2
29	Black-throated Green Warbler		2					2
29	Swainson's Thrush			2				2
30	White-throated Sparrow	1						1
30	Least Flycatcher	1				1		2
30	American Redstart		1					1
30	Yellow-rumped Warbler				1			1
30	Black-and-White Warbler		1					1
30	Northern Parula		1					1
30	Winter Wren		1	1			1	3
30	Swainson's Thrush			1				1
31	Black-throated Green Warbler	1	1					2
31	Magnolia Warbler	1						1
31	Canada Warbler					1		1
31	Bay-breasted Warbler		1					1
31	Least Flycatcher			1				1
31	Hairy Woodpecker					1		1
31	American Robin						1	1
31	Swainson's Thrush						1	1
33	Red-breasted Nuthatch	1						1
33	White-throated Sparrow		1					1
33	Ovenbird		2					2
33	Winter Wren		1			1		2
33	Ruffed Grouse					1		1
33	Yellow-rumped Warbler					1		1
33	Swainson's Thrush			3				3
33	American Redstart		1			1		2
33	American Robin					1		1
33	Black-throated Green Warbler					1		1
34	Magnolia Warbler	1						1
34	White-throated Sparrow		1			2	1	4
34	American Redstart				1			1

Plot	Species	0 to 5 minutes			5 to 10 minutes			Total
		0 - 50 m	50-100 m	>100 m	0 - 50 m	51 - 100 m	>100 m	
34	Black-throated Green Warbler	1						1
34	Nashville Warbler		1					1
34	Bay-breasted Warbler		1					1
34	Least Flycatcher		1	1				2
34	Pileated Woodpecker			1				1

Appendix 10. Forest Bird Monitoring details. Marathon PGM study area 2009. Observers were Robert Foster (RFF) and Brian Ratcliff (BR).

Date	Observer	Plot	WP	UTM Zone	UTM Easting	UTM Northing
June 20, 2009	RFF	1	187	16	550446	5402602
June 20, 2009	RFF	2	188	16	549617	5403283
June 20, 2009	RFF	3	189	16	549617	5403283
June 20, 2009	RFF	4	191	16	549778	5403514
June 20, 2009	RFF	5	192	16	550153	5404213
June 20, 2009	RFF	6	194	16	550037	5404475
June 20, 2009	RFF	7	195	16	550319	5405276
June 20, 2009	RFF	8	197	16	550516	5405519
June 20, 2009	RFF	9	198	16	550515	5406388
June 20, 2009	RFF	10	199	16	550559	5406634
June 20, 2009	RFF	11	200	16	550085	5407319
June 20, 2009	RFF	12	204	16	550703	5405686
June 21, 2009	RFF	13	208	16	550299	5404395
June 21, 2009	RFF	14	209	16	550548	5404443
June 21, 2009	RFF	15	210	16	550511	5404654
June 21, 2009	RFF	16	211	16	550661	5404822
June 20, 2009	BR	17	12	16	550762	5402618
June 20, 2009	BR	18	13	16	550069	5402613
June 20, 2009	BR	19	14	16	549693	5403025
June 20, 2009	BR	20	15	16	550039	5403767
June 20, 2009	BR	21	16	16	550262	5403934
June 20, 2009	BR	22	17	16	550245	5404767
June 20, 2009	BR	23	18	16	550319	5405024
June 20, 2009	BR	24	19	16	550466	5405811
June 20, 2009	BR	25	20	16	550546	5406125
June 20, 2009	BR	26	21	16	550218	5406784
June 20, 2009	BR	27	22	16	550176	5407055
June 21, 2009	BR	28	26	16	550048	5404028
June 21, 2009	BR	29	27	16	549812	5403880
June 21, 2009	BR	30	28	16	549563	5403835
June 21, 2009	BR	31	29	16	549305	5403838
June 21, 2009	BR	33	30	16	551029	5402547
June 21, 2009	BR	34	31	16	551317	5402580