Crown Mountain Coking Coal Project

Figure 15.7-24
Spotted Sandpiper Year-round Habitat Suitability in the Terrestrial Local Study Area

LEGEND

Habitat Suitability

- High
- Moderate
- Low
- Unclassified
- Terrestrial Local Study Area
- Project Footprint
- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- British Columbia/Alberta Border

0 2 4
Kilometres

N W E S

Scale 1:85,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Keefer Ecological Services Ltd, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada.
Imagery Provided By Landsat 8 (Aug 2018), and GeoBC Ortho Imagery (Aug 2016).

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Table 15.7-16: Spotted Sandpiper Habitat Suitability in the Project Footprint, Terrestrial LSA, and Birds, Bats, and Amphibians RSA

Habitat Suitability	Amount of Habitat in the Project Footprint		Amount of Habitat in the Terrestrial LSA		Amount of Habitat in the Birds, Bats, and Amphibians RSA	
	Area (ha)	% of Project Footprint	Area (ha)	% of Terrestrial LSA	Area (ha)	% of Birds, Bats, and Amphibians RSA
High (>2)	1	<1	77	<1	5,152	<1
Moderate (1-2)	2	0<1	227	1	13,771	1
Low (0-1)	116	9	2,084	9	122,521	10
Unclassified	1,165	91	21,833	90	1,121,726	89

Approximately 5,152 ha of the Birds, Bats, and Amphibians RSA (<1% of the total area of the Birds, Bats, and Amphibians RSA) was predicted as high-quality habitat for Spotted Sandpiper (Table 15.7-16).

15.7.2.4 Breeding Migratory Bird Guilds

Bird guilds are groups of species in a community that utilize the same set of resources. Migratory birds detected during breeding seasons were grouped into broad habitat guilds (Table 15.7-17) to characterize potential Project effects across multiple species. The habitat guilds include forest, grassland/shrubland, wetland, riparian, non-vegetated, and anthropogenic. Many birds utilize more than a single habitat type or require a matrix or mosaic of habitats; up to two habitats are listed for each species. Species that utilize many habitats were classified as generalist. The majority are associated with forest (46 of 80 species), followed by wetland (13 of 80), and grassland/shrubland (13 of 80).

Table 15.7-17: Migratory Birds Detected During Baseline Surveys in the Breeding Season with their Habitat Guild

Common Name	Scientific Name	Primary Habitat	Other Habitat
Mallard	*Anas platyrhynchos*	Wetland	Water
Canada Goose	*Branta canadensis*	Wetland	
Bufflehead	*Bucephala albeola*	Wetland	Water
Barrow's Goldeneye	*Bucephala islandica*	Wetland	Water
Harlequin Duck	*Histrionicus histrionicus*	Water	
Harlequin Duck	*Histrionicus histrionicus*	Riparian	
Hooded Merganser	*Lophodytes cucullatus*	Wetland	Forest
American Wigeon	*Mareca americana*	Wetland	Water
Common Merganser	*Mergus merganser*	Water	Forest
Common Nighthawk	*Chordeiles minor*	Grass/shrub	Non-vegetated
Calliope Hummingbird	*Selasphorus calliope*	Forest	Riparian
Rufous Hummingbird	*Selasphorus rufus*	Forest	Grass/shrub
American Coot	*Fulica americana*	Wetland	
Sora	*Porzana carolina*	Wetland	
Spotted Sandpiper	*Actitis macularius*	Wetland	
Wilson's Snipe	*Gallinago delicata*	Grass/shrub	Wetland

Common Name	Scientific Name	Primary Habitat	Other Habitat
Solitary Sandpiper	*Tringa solitaria*	Wetland	Forest
Common Loon	*Gavia immer*	Water	Wetland
Great Blue Heron	*Ardea herodias*	Wetland	Water
Northern Goshawk	*Accipiter gentilis atricapillus*	Forest	
Northern Flicker	*Colaptes auratus*	Forest	
Downy Woodpecker	*Picoides pubescens*	Forest	
Hairy Woodpecker	*Picoides villosus*	Forest	
Pileated Woodpecker	*Dryocopus pileatus*	Forest	
American Three-toed Woodpecker	*Picoides dorsalis*	Forest	
Red-naped Sapsucker	*Sphyrapicus nuchalis*	Forest	
Olive-sided Flycatcher	*Contopus cooperi*	Forest	
Western Wood-pewee	*Contopus sordidulus*	Forest	Grass/shrub
Pacific-slope Flycatcher	*Empidonax difficilis*	Forest	Riparian
Hammond's Flycatcher	*Empidonax hammondii*	Forest	
Least Flycatcher	*Empidonax minimus*	Forest	Forest
Willow Flycatcher	*Empidonax traillii*	Grass/shrub	Riaprian
Cassin's Vireo	*Vireo cassinii*	Forest	
Warbling Vireo	*Vireo gilvus*	Forest	
Cedar Waxwing	*Bombycilla cedrorum*	Forest	
Black-capped Chickadee	*Poecile atricapillus*	Forest	
Mountain Chickadee	*Poecile gambeli*	Forest	
Boreal Chickadee	*Poecile hudsonica*	Forest	
Barn Swallow	*Hirundo rustica*	Grass/shrub	Anthropogenic
Tree Swallow	*Tachycineta bicolor*	Grass/shrub	Generalist
Violet-green Swallow	*Tachycineta thalassina*	Forest	
Ruby-crowned Kinglet	*Regulus calendula*	Forest	
Golden-crowned Kinglet	*Regulus satrapa*	Forest	
Marsh Wren	*Cistothorus palustris*	Wetland	
Red-breasted Nuthatch	*Sitta canadensis*	Forest	
House Wren	*Troglodytes aedon*	Generalist	
Pacific Wren	*Troglodytes pacificus*	Forest	
Brown Creeper	*Certhia americana*	Forest	
Hermit Thrush	*Catharus guttatus*	Forest	
Swainson's Thrush	*Catharus ustulatus*	Forest	
Varied Thrush	*Ixoreus naevius*	Forest	
Townsend's Solitaire	*Myadestes townsendi*	Forest	
Mountain Bluebird	*Sialia currucoides*	Forest	Grass/shrub
American Robin	*Turdus migratorius*	Generalist	
American Dipper	*Cinclus mexicanus*	Water	Riparian
Evening Grosbeak	*Coccothraustes vespertinus*	Forest	

Common Name	Scientific Name	Primary Habitat	Other Habitat
Cassin's Finch	*Carpodacus cassinii*	Forest	
Purple Finch	*Carpodacus purpureus*	Forest	
Red Crossbill	*Loxia curvirostra*	Forest	
White-winged Crossbill	*Loxia leucoptera*	Forest	
Pine Grosbeak	*Pinicola enucleator*	Forest	
Pine Siskin	*Carduelis pinus*	Forest	
Wilson's Warbler	*Cardellina pusilla*	Grass/shrub	Riparian
MacGillivray's Warbler	*Geothlypis tolmiei*	Riparian	Forest
Common Yellowthroat	*Geothlypis trichas*	Generalist	
Orange-crowned Warbler	*Oreothlypis celata*	Forest	Riparian
Tennessee Warbler	*Oreothlypis peregrina*	Forest	
Northern Waterthrush	*Parkesia noveboracensis*	Riparian	Water
Yellow-rumped Warbler	*Setophaga coronata*	Generalist	
Yellow Warbler	*Setophaga petechia*	Riaprian	Grass/shrub
Townsend's Warbler	*Setophaga townsendi*	Forest	
Dark-eyed Junco	*Junco hyemalis*	Forest	Grass/shrub
Lincoln's Sparrow	*Melospiza lincolnii*	Wetland	Riparian
Song Sparrow	*Melospiza melodia*	Generalist	
Fox Sparrow	*Passerella iliaca*	Forest	Grass/shrub
Vesper Sparrow	*Pooecetes gramineus*	Grass/shrub	
Chipping Sparrow	*Spizella passerina*	Forest	Grass/shrub
White-crowned Sparrow	*Zonotrichia leucophrys*	Forest	Grass/shrub
Black-headed Grosbeak	*Pheucticus melanocephalus*	Generalist	
Western Tanager	*Piranga ludoviciana*	Forest	

Notes:
Only bird species listed under the Migratory Birds Convention Act are included in this table.

15.7.2.5 Federally-Listed Bird Species at Risk

There are 16 Federally-listed bird species that are known or have the potential to occur within the Terrestrial LSA (Table 15.7-18). Of these 16 species, four are known to occur in the Terrestrial LSA: Common Nighthawk, Barn Swallow, Olive-sided Flycatcher, and Evening Grosbeak. All four of these species are included in the assessment of project effects on bird species at risk. Barn Swallow and Olive-sided Flycatcher are also representative species under the migratory birds VC. Profiles of Barn Swallow and Olive-sided Flycatcher were included in Section 15.7.1.3. Profiles for Common Nighthawk and Evening Grosbeak are included below.

The remaining 12 species have very low potential to occur with the Terrestrial LSA and were not carried forward for further assessment. Peregrine Falcon was detected once during migration surveys (spring 2019). Peregrine Falcon is expected to occur only infrequently, and suitable breeding habitat is not expected to occur within the Terrestrial LSA.

Table 15.7-18: Federally-listed Bird Species Known to Occur or that May Occur in the Terrestrial LSA

Common Name	Scientific Name	B.C. Conservation List[1]	COSEWIC Status[2]	SARA Status[3]	Notes
Bank Swallow	*Riparia riparia*	Yellow	T	1-T	Known to breed in the region. None detected during baseline surveys and none detected at nearby Baldy Ridge (Golder Associates Ltd., 2015a). Potential for presence in Terrestrial LSA appears low. Not carried forward for further assessment.
Barn Swallow	*Hirundo rustica*	Blue	T	1-T	Detected one time during baseline surveys near Highway 3 (see Figure 15.7-6). Potential effects assessed under both the the migratory birds VC and bird species at risk.
Black Swift	*Cypseloides niger*	Blue	E	1-E	None detected during baseline surveys and none detected at nearby Baldy Ridge (Golder Associates Ltd., 2015a). Potential for presence in the Terrestrial LSA is very low. Not carried forward for further assessment.
Bobolink	*Dolichonyx oryzivorus*	Blue	T	1-T	The majority of the very small provincial population is concentrated in the South Okanagan and Kootenay River valleys (Siddle, 2015). None detected during baseline surveys and none detected at nearby Baldy Ridge (Golder Associates Ltd., 2015a). Potential for presence in the Terrestrial LSA is very low. Not carried forward for further assessment.
Common Nighthawk	*Chordeiles minor*	Yellow	SC	1-T	Detected in the Grave Prairie/rail loadout area and near Highway 3 at south end of Terrestrial LSA (see Figure 15.7-6). Potential effects assessed underbird species at risk.

Common Name	Scientific Name	B.C. Conservation List[1]	COSEWIC Status[2]	SARA Status[3]	Notes
Evening Grosbeak	*Coccothraustes vespertinus*	Yellow	SC	1-SC	Detected in the Grave Prairie/rail loadout area and near Highway 3 at south end of Terrestrial LSA (see Figure 15.7-6). Potential effects assessed under bird species at risk.
Lewis's Woodpecker	*Melanerpes lewis*	Blue	T	1-T	None detected during baseline surveys and none detected at nearby Baldy Ridge (Golder Associates Ltd., 2015a). B.C. records are almost entirely from the Ponderosa Pine, Interior Douglas-fir and Bunchgrass biogeoclimatic zones (Fraser and Ramsay, 2015), which are not present in the Terrestrial LSA. Not carried forward for further assessment.
Long-billed Curlew	*Numenius americanus*	Blue	SC	1-SC	Long-billed Curlews nest in grassland, primarily native short-grass and mid-grass prairie. Not detected during baseline surveys or during surveys at nearby Baldy Ridge. Potential for presence in the Terrestrial LSA is low. Not carried forward for further assessment.
Olive-sided Flycatcher	*Contopus cooperi*	Blue	SC	1-T	Detected widely throughout Terrestrial LSA (see Figure 15.7-6). Potential effects assessed under the migratory birds VC and bird species at risk.
Williamson's Sapsucker	*Sphyrapicus ruber*	Blue	E	1-E	Known distribution in the Kootenay region is in the southern portion of the region (Chytyk and Fraser, 2015). Potential for presence in the Terrestrial LSA is very low. Not carried forward for further assessment.

Common Name	Scientific Name	B.C. Conservation List[1]	COSEWIC Status[2]	SARA Status[3]	Notes
Flammulated Owl	*Psiloscops flammeolus*	Blue	SC	1-SC	Occurs in drier valleys, primarily in the dry Interior Douglas-fir biogeoclimatic zone, and secondarily in the Ponderosa pine zone (Cannings, 2015). Potential for presence in the Terrestrial LSA is very low. Not carried forward for further assessment.
Peregrine Falcon (*anatum* spp.)	*Falco peregrinus anatum*	Red	NAR	1-SC	Detected once during migration surveys (spring 2018-2019). Peregrine Falcon is expected to occur only infrequently, and suitable breeding habitat is not expected to occur within the Terrestrial LSA. Not carried forward for further assessment.
Short-eared Owl	*Asio flammeus*	Blue	SC	1-SC	None detected during baseline surveys and none detected at nearby Baldy Ridge (Golder Associates Ltd., 2015a). Short-eared Owl are very uncommon in the Columbian River basin (Cooper and Beauchesne, 2003). Potential for occurrence in the Terrestrial LSA is very low. Not carried forward for further assessment.
Western Screech Owl (*macfarlanei spp.)*	*Megascops kennicottii macfarlanei*	Blue	T	1-T	Owl surveys were conducted, and no Western Screech Owl were detected None detected at nearby Baldy Ridge (Golder Associates Ltd., 2015a). Not carried forward for further assessment.
Horned Grebe	*Podiceps auritus*	Yellow	SC	1-SC	Waterbird surveys were conducted and no Horned Grebe were detected. None detected at nearby Baldy Ridge (Golder Associates Ltd., 2015a).
Rusty Blackbird	*Euphagus carolinus*	Blue	SC	1-SC	Surveys were conducted and no Rusty Blackbird were detected. None detected at nearby Baldy Ridge (Golder Associates Ltd., 2015a). There are few records in southeastern B.C. (Di Corrado, 2015).

[1] B.C. list: Y=yellow (least risk of being lost), B= Blue (special concern), R= Red (risk of being lost (extirpated, endangered or threatened)

[2] COSEWIC designations E – Endangered; T – Threatened; SC – Special Concern; C – Candidate; NAR – Not at Risk.

[3] SARA Federal Species at Risk Act Schedule number (1-3). 1= Schedule 1, official list of wildlife species at risk.

15.7.2.5.1 Common Nighthawk

Common Nighthawk is provincially Yellow-listed, listed as Special Concern under COSEWIC and listed as Threatened under SARA (2002). They are an aerial insectivore and a migratory species, thus only present in Canada from spring to fall, spending winters in South America. Common Nighthawks require open ground or clearings for nesting. The species breeds in a wide range of open habitats including sandy areas (e.g., dunes, eskers, and beaches), open forests (e.g., mixedwood and coniferous stands, burns, and clearcuts), grasslands (e.g., short-grass prairies, pastures, and grassy plains), sagebrush, wetlands (e.g., bogs, marshes, lakeshores, and riverbanks), gravelly or rocky areas (e.g., outcrops, barrens, gravel roads, gravel rooftops, railway beds, mines, quarries, and bare mountain tops and ridges), and some cultivated or landscaped areas (e.g., parks, military bases, airports, blueberry fields, orchards, cultivated fields; from Environment Canada, 2016b). Nighthawks forage for insects in open areas in a variety of habitats. There is a high degree of uncertainty in the identification of habitat necessary for the survival or recovery of the Common Nighthawk in Canada. It is unknown whether breeding habitat is limiting in Canada (Environment Canada, 2016b). Widespread threats that may have an important impact include reduced abundance of aerial insects due to effects of agricultural and other pesticides, changes in precipitation and hydrological regimes, changes in temperature regimes, and increasing frequency of severe or extreme weather events (from COSEWIC, 2018b).

Nearly all Common Nighthawk detections during baseline surveys were incidental (see Appendix 15-E for more details). Observations generally occurred at low elevations in the valleys along southern Alexander Creek, along the Elk River, and in the lower reaches of Grave Creek (Figure 15.7-6). All observations occurred in or adjacent to open habitat. All Common Nighthawk observed were actively foraging, with one exception in which the individual was exhibiting “booming” behaviour, indicating territorial behaviour and the potential for nesting nearby. Based on their habitat preferences for foraging, they may also be present in other areas in the Terrestrial LSA, such as near the reservoir along Harmer Creek just north of the confluence with Grave Creek, and near wetlands present throughout the Terrestrial LSA.

15.7.2.5.2 Evening Grosbeak

Evening Grosbeak is provincially Yellow-listed and listed as Special Concern under both COSEWIC and SARA (2002). They are a year-round resident in most portions of their range, including southeastern B.C. Optimal Evening Grosbeak breeding habitat generally includes open, mature mixedwood forests, where fir species and/or white spruce are dominant, and spruce budworm is abundant. Outside the breeding season, the species seems to depend largely on seed crops from various trees such as firs and spruces (COSEWIC, 2016). COSEWIC (2016) reports that fluctuations of spruce budworm populations, which naturally occur every 25 to 40 years in eastern Canada and every 26 years in western Canada, are likely a key factor in fluctuations of the Evening Grosbeak population since 1970. Known threats to Evening Grosbeak include mortality caused by window strikes while birds are visiting feeders in winter, reduction of mature and old-growth mixedwood forests due to commercial forest management, and mortality due to road collisions when individuals feed on grit and road salt. Mortality related to ingestion of sodium chloride along roadsides may also be a threat.

During baseline surveys, Evening Grosbeak were observed in three locations: Grave Prairie and the rail loadout area, along the lower portion of Grave Creek Road near Harmer Creek, and along Alexander Creek (Figure 15.7-6).

15.7.3 Project Effects Assessment

15.7.3.1 Thresholds for Determining Significance of Residual Effects

The CEAA guidance document *Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects* (CEAA, 2015b) and the KNC's *Recommended Minimum Standards for Proponents in Determining Significance of Effects in Environmental Assessments (EAs) in the Elk Valley* (KNC, 2020) provide guidance on significance determination and the role of thresholds beyond which an effect is considered unacceptable. For wildlife species listed under SARA, there are prohibitions against causing harm, injury, or mortality of a species at risk, as well as against destruction of mapped critical habitat (depending on the species and land ownership). This can readily be applied as a threshold that can be used for determining the significance of residual effects. Aside from mapped critical habitat, there are no government or industry regulations or established objectives, environmental standards, or established benchmarks to establish thresholds for the significance of residual effects on bird VCs resulting from the Project. The desired endpoint for wildlife management is for persistent and self-sustaining wildlife populations. Any effect then that diminishes the ability of a wildlife population to be persistent and self-sustaining were therefore used as a threshold for the determination of significance for a residual effect.

Thus, in consideration of the above, a significant adverse residual environmental effect on bird VCs is one where the Project:

- Causes the non-permitted contravention of any of the prohibitions stated in Sections 32 to 36 of the *Species at Risk Act* including injury, harassment, or mortality of a bird species at risk;
- Results in the non-permitted loss of critical habitat for bird species at risk; or
- Causes a decline in abundance or change in distribution of bird populations such that the populations will not be sustainable in the Terrestrial LSA.

15.7.3.2 Project Effects

Potential effects on bird VC habitat availability and distribution, known occurrences, and abundance may occur as a result of Project activities associated with mine development. Potential effects on wildlife are discussed with respect to changes at both the individual level (i.e., behaviour, physiological condition, survival) and the population level (i.e., population size, distribution, mortality rate). Since potential effects at the population level are generally of greater importance than at the individual level, the assessment primarily focuses on the effects to local populations. The assessment focuses only on planned activities within the designed scope of the Project. Effects related to unplanned events (e.g., collisions, spills, equipment malfunctions, accidents) are presented in Chapter 21.

The Human and Ecological Health Assessment (Chapter 22) includes an analysis of the effects of potential contaminants of concern on select wildlife species and species groups. As initially described in Section 15.7.1, the AIR (EAO, 2018) identified waterbirds within the RSA (represented by Harlequin Duck, Mallard, Red-winged Blackbird, and Spotted Sandpiper) as a VC under aquatic health. Aquatic health is assessed as part of the Human and Ecological Health Assessment. The aquatic health components included in the human and ecological health assessment are waterbirds, benthic invertebrates, fish species and amphibians. The assessment of residual project effects and cumulative effects to the aquatic health components was summarized for all aquatic health components combined. Since waterbirds are a specific VC under aquatic health, it is important for conformity to the AIR that an effects assessment specifically for waterbird health be included. Project and cumulative effects to waterbird health are therefore

included in this section. The assessment of potential effects to waterbird health provided in this section is based entirely on the Human and Ecological Health Assessment and no new information is provided, with the exception of the characterization of residual Project and cumulative effects that are specifically tailored to waterbird health.

Potential effects to wildlife are interrelated with other assessment disciplines and components that represent pathways to effects on bird VCs:

- Atmospheric Environment Assessment (Chapter 6);
- Acoustic Environment Assessment (Chapter 7);
- Soils and Terrain Assessment (Chapter 8);
- Groundwater Assessment (Chapter 9);
- Surface Water Quantity Assessment (Chapter 10);
- Surface Water Quality Assessment (Chapter 11); and
- Landscapes and Ecosystems Assessment (Chapter 13).

15.7.3.2.1 Project Interactions

Project activities during the Construction and Pre-Production, Operations, Reclamation and Closure, and Post-Closure phases have the potential to affect bird VCs. Key Project activities that are expected to interact with bird VCs, with a potential for adverse effects, are presented in Table 15.7-19. Specific details on Project activities and components are discussed in Chapter 3.

Many Project activities have the potential to interact with birds. The key interactions resulting in potential significant adverse effect or significant concern (indicated as level III in Table 15.7-19) are primarily those involving habitat loss or alteration and potential for increased mortality. Many of the potential adverse effects that are not key but require mitigation (indicated as level II) are related to noise and other sensory disturbance related to construction and operation and operation of vehicles. Some of the Project activities with no or negligible predicted interactions with birds are:

- Stockpiling of wood waste in operation to be used for reclamation;
- Labour (hiring and training);
- Operational activities that do not generate any or very little noise;
- Monitoring activities; and
- The inactive rail line during Post-Closure.

15.7.3.2.2 Overview of Potential Effects

Potential effects of the Project on bird VCs were identified through working group meetings, consultations, review of other developments in the region, through mitigation included with BMPs, scientific literature, and using technical expertise/professional opinion. Potential effects of the Project on bird VCs were categorized as:

- Habitat loss and degradation;
- Sensory disturbance;
- Increased mortality risk; and
- Waterbird health.

Table 15.7-19: Project-Bird VC Interaction Matrix and Ranking

Project Phase	Project Component	Description of Activities	Migratory Birds	Northern Goshawk	Species at Risk	Waterbird Health
Construction and Pre-Production	Transportation	Use of Highway 43, Line Creek Mine Road, Valley Road, and Grave Creek Road by highway transport trucks, light duty vehicles, and crew busses to transport personnel, materials, and consumable items.	II	II	II	I
	Logging of Merchantable Timber	Merchantable timber will be logged from the infrastructure and pre-production development footprint.	III	III	III	I
	Clearing and Grubbing	After the merchantable timber has been removed, the remaining vegetation will be cleared and grubbed from the infrastructure and pre-production development footprint.	III	III	III	I
	Stockpiling Wood Waste	Wood waste will be stockpiled on site and used for reclamation as a source of coarse woody debris.	I	I	I	I
	Quarry for Construction Materials	Excavation of road bed materials from the North Pit footprint for use on Grave Creek Road.	II	II	II	I
	Water Management or Water Management Structures	Water management structures to support initial construction activities will be built prior to soil being salvaged from the run of mine (ROM) and plant site.	II	II	III[1]	I
		Interim Sediment Pond will be built prior to the soil removal and stockpiling from the pit access road and initial phase of the North Pit.	II	II	III	III
		Grave Creek Reservoir will be constructed to act as a back-up source of process water.	II	II	II	I
	Soil Salvage	Soil will be salvaged from the footprint of the infrastructure.	III	III	III	I
	Road Upgrading and Construction	Branch C Road will be widened and upgraded to facilitate construction and mine traffic to plant site area.	II	II	II	I

Project Phase	Project Component	Description of Activities	Migratory Birds	Northern Goshawk	Species at Risk	Waterbird Health
		Grave Creek Road will be widened to facilitate the clean coal haul.	II	II	II	I
		A new road will be constructed off the Valley Road to access the rail loadout for construction and operation.	II	II	II	I
	Linear Infrastructure	Installation of the powerline.	II	II	II	I
		Installation of the natural gas line.	II	II	II	I
	Overland Conveyor	Clearing, grubbing, and construction of overland conveyor from the plant site to Grave Creek Road.	III	III	III	I
	Coal Handling Process Plant Construction	Excavating and pouring of foundation.	II	II	II	I
		Transportation of materials and personnel to site.	II	II	II	I
		Constructing of the Coal Handling Process Plant (CHPP).	II	II	II	I
		Commissioning of the CHPP.	II	II	II	I
	Workshop / Mine Dry Construction	Excavating and pouring of foundations.	II	II	II	I
		Transportation of materials to site.	II	II	II	I
		Construction of workshop / mine dry.	II	II	II	I
		Equipment wash bay and heavy equipment parking.	II	II	II	I
		Administration, first aid, and mine dry building.	II	II	II	I
		Diesel tank farm.	II	II	II	I
		Warehouse.	II	II	II	I
		Potable water system.	II	II	II	I
		Septic system.	II	II	II	I

Project Phase	Project Component	Description of Activities	Migratory Birds	Northern Goshawk	Species at Risk	Waterbird Health
		Water supply pipelines from Grave Creek and West Alexander Creek.	II	II	II	I
		Commissioning of the facilities.	II	II	II	I
	Explosives Factory Construction	Construction of the explosives factory.	II	II	II	I
	Rail Loadout Construction	Excavation and preparation of the rail bed.	II	II	II	I
		Excavation and preparation of foundation stockpiling and coal handling systems.	II	II	II	I
		Transportation of materials and personnel to site.	II	II	II	I
		Construction of rail loadout.	II	II	II	I
		Connection to the CP Fording Sub-line.	II	II	II	I
		Commissioning of the rail loadout.	II	II	II	I
	Labour	Hiring of personnel for the mine, CHPP operations, administration, and coal haul.	I	I	I	I
		Training of personnel.	I	I	I	I
	Construction Waste Materials	Collection and transfer to a recycling facility or other approved facility.	I	I	I	I
Operations	Transportation	Use of Highway 43, Line Creek Mine Road, Valley Road, and Grave Creek Road by highway transport trucks, light duty vehicles, and crew busses to transport personnel, materials, and consumable items.	II	II	II	I
	Explosives Factory	Ammonium nitrate / emulsion storage facilities which have the ability to load explosive agents into delivery trucks.	I	I	I	I

Project Phase	Project Component	Description of Activities	Migratory Birds	Northern Goshawk	Species at Risk	Waterbird Health
		Wash facility to decontaminate the bulk explosive delivery trucks.	I	I	I	I
		Storage of explosives (detonators and boosters).	I	I	I	I
	Fuel Storage	Receiving bulk fuel deliveries.	I	I	I	I
		On-site storage of fuel.	I	I	I	I
		Dispensing fuel.	I	I	I	I
		Transferring fuel to on-site delivery trucks.	I	I	I	I
	Mine Roads Development	Building roads from material sourced on-site.	II	II	II	II
	Mining	Progressive clearing.	III	III	III	III
		Removal of unconsolidated material.	II	II	II	II
		Loading, hauling, and stockpiling of soil.	II	II	II	II
		Drilling and loading of blastholes.	II	II	II	II
		Detonating the explosives.	II	II	II	II
		Loading, hauling, and dumping of mine rock.	II	II	II	II
		Loading, hauling, and stockpiling of coal.	II	II	II	II
	Site Water Requirements	Using contact water as the primary process make-up water from Interim Sediment Pond (Year 1 to 5).	I	I	I	I
		Using contact water as the primary process make-up water from the North Pit (Year 5 to 15).	I	I	I	I
		Backup reservoir in Grave Creek as a secondary source of process make-up water.	II	II	II	I

Project Phase	Project Component	Description of Activities	Migratory Birds	Northern Goshawk	Species at Risk	Waterbird Health
	Coal Processing	Run of mine coal sizing.	II	II	II	I
		Washing coal.	II	II	II	I
		Mechanical and thermal drying of coal.	II	II	II	I
		Coal reject disposal (part of loading, hauling, and dumping of mine rock activities).	II	II	II	I
		Conveying clean coal.	II	II	II	I
	Sewage Treatment	Sewage will be treated by a septic system constructed at the plant site which will support the administration, mine dry, and CHPP facilities.	I	I	I	I
	Main Sediment Pond	Construction of Main Sediment Pond in Year 4.	II	II	III	III
		Management of the Main Sediment Pond discharge.	II	II	III	III
	Reclamation	Reclaiming available areas as soon as possible to achieve reclamation objectives.	I	I	I	I
	Transportation	Use of Highway 43, Line Creek Mine Road, Valley Road, and Grave Creek Road by highway transport trucks, light duty vehicles, and crew busses to transport personnel, materials, and consumable items.	II	II	II	I
Reclamation and Closure	Dismantling Infrastructure and Buildings	Dismantling of the CHPP, maintenance facilities, administration, and other facilities.	II	II	II	I
		Dismantling, salvaging, collecting, and transferring materials to a recycling facility or other approved facility.	II	II	II	I
	Removal of Linear Infrastructure	Removal of the powerline.	II	II	II	I
		Removal of the natural gas line.	II	II	II	I
	Reclamation	Reclaiming available areas as soon as possible to achieve reclamation objectives.	I	I	I	I
	Monitoring	Reclamation monitoring.	I	I	I	I
		Geotechnical monitoring.	I	I	I	I

Project Phase	Project Component	Description of Activities	Migratory Birds	Northern Goshawk	Species at Risk	Waterbird Health
	Water Management	Aquatic effects monitoring.	I	I	I	I
		Management of the Main Sediment Pond discharge.	I	I	III	I
Post-Closure	Water Management	Decommissioning the Main Sediment Pond once water quality objectives have been met.	II	II	II	II
	Road Use	Branch C Road will remain as a permanent access road for future commercial and recreational use.	II	II	II	II
	Rail Line	The rail line will remain as a permanent feature.	I	I	I	I
	Monitoring	Reclamation monitoring.	I	I	I	I
		Geotechnical monitoring.	I	I	I	I
		Aquatic effects monitoring.	I	I	I	I

Notes:
[1] Activities that affect surface water flows were ranked higher for riverine species (American Dipper, Harlequin Duck, and Spotted Sandpiper) than for other species.
Notes (after EAO, 2013):
I = No or negligible effect (positive or adverse) is anticipated; not carried forward in the assessment
II = Potential adverse effects requiring additional mitigation or substantive positive effects are expected; carried forward in the assessment
III = Key interaction resulting in potential significant adverse effect or significant concern; carried forward in the assessment

Potential effects to bird movements was considered under sensory disturbance. The rationale and a description of each potential effect on bird VCs is provided in Table 15.7-20.

Table 15.7-20: Potential Effects on Bird VCs

Potential Effect	Rationale for Selection of Environmental Effect
Habitat Loss and Degradation	Project components and activities may cause habitat loss and degradation for bird VCs. Habitat loss and degradation includes the loss or reduction in value of a particular set of resources that the specific habitat provides, such as feeding or nesting habitat. Habitat loss and degradation includes the potential effects of ground disturbance, logging, and vegetation clearing. Bird habitat may also be lost or degraded from reduction in surface water flows. Reduced or altered flows may affect riparian habitat for birds through changes to vegetation that provides feeding or nesting habitat. Reduced water flows may affect aquatic invertebrates and reduce food availability for American Dipper, Harlequin Duck, Spotted Sandpiper, and other waterbirds. Discharge from the sediment ponds has the potential to contain elevated concentrations of total suspended solids and may result in increased calcite formation and erosion downstream of the Project. This could affect invertebrate food sources for American Dipper, Harlequin Duck, and Spotted Sandpiper. Habitat degradation can occur from potential introduction and spread of invasive species, changes in vegetation vigour from dust deposition, and surface water runoff from the Project footprint that can contain suspended solids and affect vegetation. Each of these may affect the availability of food (i.e., plants and via habitat loss for prey species).
Sensory Disturbance	Project components and activities may cause sensory disturbance for bird VCs. Sensory disturbance includes behavioural responses to Project-related noise, light, dust, and human presence. Sensory disturbances can lead to disruptions in bird behaviour, causing individuals to lose time and energy normally allocated to foraging, hunting, breeding, and avoiding predators, and to nest abandonment. Bird VCs respond to sensory disturbances by reducing their use of habitats near the source of disturbance, avoiding habitats for a period (i.e., displacement), altering daily movements and therefore use of habitat, or abandoning portions of their current range. Such behavioural responses result in a functional loss of habitat.
Increased Mortality Risk	Project components and activities have the potential to cause the direct mortality of bird VCs. Effects include destruction of bird nests when occupied by birds or eggs, collisions with Project-related equipment and vehicle traffic on access or mine site roads, collisions with electrical wires, and through the physical impact of blasting. Chemical hazards (e.g., ingestion of toxic products) from materials stored on-site during Operations may reduce wildlife survival and reproduction.
Waterbird Health	The Project has the potential to emit chemical contaminants to the environment through controlled or uncontrolled emission such as permitted effluent discharge, surface water runoff, fugitive dust, and emissions from vehicle traffic or other direct facility emissions. These emissions in turn have the potential to alter environmental quality of local and regional landscapes which could potentially expose birds to chemical emissions from the Project.

15.7.3.2.3 Discussion of Potential Effects

The potential effects (i.e., habitat loss and degradation, sensory disturbance, and increased mortality risk) are discussed in the context of each Project phase below.

Habitat Loss and Degradation

The Project footprint overlaps with suitable habitat for bird VCs and bird habitat in general. The total Project footprint area is 1,283 ha, though this includes a buffer area intended to account for uncertainty in precise boundaries of disturbance, and not all of the buffer areas will be cleared. Most of the habitat loss within the Landscapes and Ecosystems LSA will be in forested habitats (83.4% of Project footprint; Table 15.7-21). The Landscapes and Ecosystems LSA is smaller than the Bird, Bats and Amphibians LSA, but is the only area in which detailed Terrestrial Ecosystem Mapping was completed. The amount of bird VC habitat potentially lost varies depending on the habtiat associations among different bird habitat guilds.

Table 15.7-21: Ecosystem Abundance within the Landscapes and Ecosystems LSA

Broad Ecosystem[1]	Landscapes and Ecosystems LSA		Project Footprint	
	Area (ha)	%	Area (ha)	%
Forest	9,977.8	77.4%	1,069.9	83.4%
Grassland/Shrubland	892.1	6.9%	79.5	6.2%
Wetland	81.0	0.6%	2.8	0.2%
Riparian	166.0	1.3%	0.1	0.0%
Alpine	200.4	1.6%	22.4	1.7%
Non-vegetated	822.1	6.4%	86.9	6.8%
Water	255.6	2.0%	14.5	1.1%
Anthropogenic	490.7	3.8%	7.0	0.5%
Total	12,885.7	-	1,283.1	-

Note:
[1] Ecosystems based on Project-specific Terrestrial Ecosystem Mapping (TEM; Keefer Ecological Services Ltd., 2021; Appendix 13-A)

Construction and Pre-Production

During Construction and Pre-Production, habitat loss will result from clearing and grubbing the infrastructure and pre-production development footprint, which includes the quarry, Interim Sediment Pond, Grave Creek Reservoir, the CHPP and workshop, initial portions of North Pit and Mine Rock Storage Facility, upgrading of the mine site road and Grave Creek Road, construction of the new road to the explosives factory, the overland conveyor, and the rail loadout.

Habitat degradation may occur in areas not yet cleared, in contingency areas, and areas directly adjacent to the Project footprint through dust deposition, spread of invasive species, and sedimentation from surface water runoff.

Riverine habitats (used by American Dipper, Harlequin Duck, and Spotted Sandpiper) may be further lost due to changes in surface water quantity. The Grave Creek Reservoir is proposed to be constructed during the Construction and Pre-Production phase and will result in changes to flows in Grave Creek. Water flows

in West Alexander Creek downstream of the footprint will be reduced, affecting American Dipper habitat outside the Construction and Pre-Production footprint.

Operations

Direct loss of bird habitat will occur during Operations as a result of progressive clearing of the pits, Mine Rock Storage Facility, construction of mine roads, and clearing for the construction of the Main Sediment Pond. Portions of West Alexander Creek and its tributaries will be progressively buried by the Mine Rock Storage Facility over the 15 years of Operations.

Habitat degradation may occur in areas not yet cleared, in contingency areas, and in areas directly adjacent to the Project footprint through dust deposition, spread of invasive species, and sedimentation from surface water runoff.

Riverine habitat may be further affected during Operations due to reduction of mean annual and mean monthly flows for areas downstream of the Project footprint in West Alexander Creek and Alexander Creek and from surface water withdrawals from Grave Creek as a source of process water.

Discharge from the sediment ponds may cause calcite formation that can change the characteristics of stream substrates by cementing rocks together, adversely affecting habitat for fish and invertebrates and in turn, food resources for American Dipper, Harlequin Duck, and Spotted Sandpiper.

Reclamation and Closure

There will be no additional loss of habitat for bird VCs during Reclamation and Closure. Habitat degradation may occur during decommissioning of mine site infrastructure and managing the Main Sediment Pond discharge though dust deposition, spread of invasive species, and sedimentation from surface water runoff.

For riverine habitat, withdrawals of surface water from Grave Creek will cease at the end of the Operations phase and surface water flows are expected to return to near baseline levels. Reduction in water flows in West Alexander Creek and Alexander Creek will persist through Reclamation and Closure.

Post-Closure

There will be no additional loss or degradation of habitat for bird VCs during Post-Closure, as all activities with the potential to result in habitat loss or degradation will be completed prior to mine closure. Reduction in water flows in West Alexander Creek and Alexander Creek will persist Post-Closure.

Sensory Disturbance

Sensory disturbance from Project-related noise, light, dust, and human presence is a potential effect for birds and bird VCs during all Project phases. Sensory disturbance may decrease or eliminate use of suitable habitat by bird in areas beyond the Project footprint. The effects of noise and vibration on wildlife receptors is assessed in Chapter 7. Noise and vibration modelling was completed for the worst-case operating scenario. It was determined that operational Year 10 of the Project was the worst-case year for noise and vibration effects from the Project on surrounding sensitive receptors. The effects of Project-related noise in all other years will be less than those arising during operational Year 10. Noise and

vibration sources associated with the Project potentially affecting wildlife receptors were split into two primary categories: continuous operations and blasting operations. The area affected by continuous noise was based on the modelled noise levels for:

- Continuous Project-related noise ≥ 55 dBA – the daytime sound level from the Project that is expected to cause disturbances for wildlife; and
- Continuous Project-related noise ≥ 45 dBA – the nighttime sound level from the Project that is expected to cause disturbances for wildlife.

The area affected outside the Project footprint by continuous project-related noise is approximately 242 ha in daytime and 1,118 in nighttime.

The area affected by noise from blasting operations was based on modelled peak noise (air overpressure) ≥ 108 dB from blasting. This threshold is the peak noise level at wildlife receptors that is expected to cause disturbed habitat. This distance was estimated to be at 1,500 m from pit blast sites, which affects 1,955 ha outside the Project footprint.

The key sources of ground vibration are rail and blasting operations. Rail-induced ground vibration was not expected to have a significant impact on wildlife (see Chapter 7).

Vibration levels from blasting greater than the threshold level of 10 mm/s will occur at distances of up to 400 m to 500 m from the pits. As such, wildlife could be adversely affected by vibration within the Project site itself; however, wildlife are not anticipated to be present on-site during Operations and no impacts are therefore expected.

Other types of sensory disturbance (light, dust, and human presence) are expected to extend much shorter distances than noise and vibration.

Construction and Pre-Production

Sensory disturbance is expected from the transportation of personnel and materials, land clearing activities, soil salvage, road construction and upgrading, construction of the rail loadout, excavation of the quarry, construction of the coal handling process plant, and construction of water management infrastructure such as the Grave Creek Reservoir and Interim Sediment Pond.

Operations

During Operations, noise will be generated from progressive clearing and grubbing, further mine road development, detonating explosives (two to three times per week), loading, hauling, and dumping of mine rock, coal processing, operation of the conveyor, hauling to the rail loadout, operation of the rail loadout, and construction of the Main Sediment Pond. Progressive reclamation will also generate noise.

Reclamation and Closure

During Reclamation and Closure, some sensory disturbance is expected to be generated from the dismantling of infrastructure and buildings and removal of linear infrastructure. Low-level sensory disturbance is also expected to be generated from human activity associated with monitoring and maintenance.

Post-Closure

Sensory disturbance is expected to be minimal during the Post-Closure phase of the Project. Sensory disturbance may arise from noise of light vehicle traffic and human activity associated with monitoring and maintenance activities.

Increased Mortality Risk

There is potential for direct mortality of bird VCs in all phases of the Project.

Construction and Pre-Production

Direct mortality of bird VCs during Construction and Pre-Production may occur from removal of trees and vegetation acting as bird habitat, destruction of nests when occupied by a bird or eggs, collisions with Project-related equipment during terrain disturbance and clearing of vegetation, collisions with Project-related traffic on access or mine site roads, and from blasting. When buildings are constructed, birds may construct nests on ledges, beams, and other features and may become a nuisance (e.g., aggressive behaviour and droppings), causing increased human-wildlife conflict.

Overhead powerlines will be constructed during the Construction and Pre-Production phase. There will be approximately 900 m of 138 kV line from the BC Hydro interconnection point to the substation near the rail loadout and 13.8 km of 34.5 kV line from the substation to the mine site. Once constructed, there is the potential for increased risk of bird collisions with powerlines and risk of electrocution. Waterfowl (Anseriformes), grebes (Podicipedidae), gulls and shorebirds (Charadriiformes), and cranes (Gruiformes) have behavioural and morphological characteristics that elevate their risk of collision and electrocution (Avian Powerline Interaction Committee [APLIC], 2012; Rioux et al., 2013). Additional bird groups that demonstrate susceptibility to powerline collision include herons (Pelecaniformes), grouse (Galliformes) and raptors (Accipitriformes and Falconiformes). Factors that increase collision risk are presence of a shield/grounding wire, presence of guy wires, individual wires in a vertical orientation, and lighting on poles. Landscape features that are associated with increased collisions risk are ridge lines, topographical depressions (e.g., river valley) if powerlines are perpendicular to flight paths, and proximity to wetlands (APLIC, 2012). The powerline will avoid ridge lines, will not be perpendicular to river valleys and there are few wetlands near the powerline.

Operations

The potential for direct mortality described in Construction and Pre-Production will continue in Operations.

Reclamation and Closure

The risk of direct mortality will progressively reduce due to reduced vehicle and equipment traffic and the end of active mining.

Post-Closure

The risk of direct mortality will be minimal during the Post-Closure phase as vehicle traffic will occur only occasionally with monitoring and maintenance activities.

Waterbird Health

Effluent discharge from the Project site is predicted to have a measurable effect on surface water quality and as such this contaminant exposure pathway is of primary importance to the overall quantitative environmental risk assessment and is the basis for the aquatic health risk assessment that includes waterbirds. Note that the risk assessment completed for waterbirds is for selenium exposure only. Bird health may be affected by concentrations of selenium in aquatic prey. Selenium exposure has the potential to occur in any Project phase.

15.7.3.2.4 Transboundary Effects

Birds are highly mobile and, for those species that are migratory, spend a substantial amount of the year outside Canada. Bird populations within the Terrestrial LSA and Birds, Bats, and Amphibians RSA are likely part of larger populations that span across both the B.C./Alberta and the Canada/U.S.A. borders, and on federal lands located within B.C and Alberta. While Project-related disturbances to bird habitat are limited to the Project footprint and do not extend beyond provincial or national borders, residual adverse effects to bird VCs have the potential to be considered transboundary effects in Alberta, the U.S.A., or on federal lands.

15.7.3.3 Mitigation Measures

The mitigation measures proposed for birds are based on available BMPs, provincial and federal guidance documents, mitigation measures conducted and accepted for similar projects, and professional judgment. The identification and selection of technically and economically feasible mitigation measures followed the mitigation hierarchy approach outlined by the provincial Environmental Mitigation Policy and related Environmental Mitigation Procedures (B.C. MOE, 2014a and 2014b). Technical and economic constraints dictated the highest level of the mitigation hierarchy that could be achieved for managing each potential effect.

Mitigation measures were identified for each potential effect on bird VCs, though are intended to apply to all birds. For the purposes of this assessment, mitigation measures are defined to include Project design features, procedures, or practices that will reduce or eliminate Project-related effects to bird VCs. Potential Project-related changes to bird VCs will be reduced through design mitigation, regulatory requirements, site reclamation, and BMPs, including management plans, monitoring, and adaptive management. Where mitigation measures are considered to be completely effective, potential Project effects to bird VCs are not identified as residual effects.

Many of the measures to mitigate impacts to bird and bird VCs are part of protocols described in the following management plans:

- Wildlife Management and Monitoring Plan (Chapter 33, Section 33.4.1.13);
- Air Quality and Greenhouse Gas Management Plan (Chapter 33, Section 33.4.1.1);
- Ecological Restoration Plan (Chapter 33, Section 33.4.1.3);
- Erosion and Sediment Control Plan (Chapter 33, Section 33.4.1.4);
- Landform Design and Reclamation Plan (Chapter 33, Section 33.4.1.6);
- Noise and Vibration Management Plan (Chapter 33, Section 33.4.1.7);
- Site Water Management Plan (Chapter 33, Section 33.4.1.8);
- Soil Management Plan (Chapter 33, Section 33.4.1.9);

- Spill Prevention, Control, and Countermeasures Plan (Chapter 33, Section 33.4.1.10);
- Waste Management Plan (Chapter 33, Section 33.4.1.12); and
- Traffic Control Plan (includes access management; Chapter 33, Section 33.4.2.4).

The following subsections describe mitigation for potential Project effects on birds and bird VCs. No other mitigations for birds were considered beyond those listed in the following sections. The Wildlife Management and Monitoring Plan (Chapter 33, Section 33.4.1.13) will be used to validate the efficacy of the proposed mitigation measures.

15.7.3.3.1 Mitigation Measures for Habitat Loss and Degradation

Bird habitat loss and degradation will occur primarily through:

- Loss from clearing and grubbing;
- Degradation through dust deposition, spread of invasive species, and sedimentation from surface water; and
- Degradation of habitat for riverine birds from reduction of surface water flows.

Measures to mitigate the impact of birds and bird VC habitat loss and degradation include:

- Minimizing disturbance and encroachment into natural vegetation, to the extent feasible, by clearing and grubbing only what is required for Construction and Pre-Production activities and progressive development of pits and Mine Rock Storage Facility;
- Clearing vegetation only in the year in which the area will be required for construction or operation to minimize the extent of cleared vegetation, to the extent possible;
- Sequencing the development of pits and Mine Rock Storage Facility areas to limit total disturbance during any one period and maximize progressive reclamation opportunities;
- Progressively reclaiming areas, as described in the Ecological Restoration Plan (Chapter 33, Section 33.4.1.3) and Landform Design and Reclamation Plan (Chapter 33, Section 33.4.1.6) as soon as possible to restore habitat for bird species that utilize early successional habitats;
- Implementation of the Erosion and Sediment Control Plan (Chapter 33, Section 33.4.1.4) to reduce the potential for sedimentation of riparian, wetland, and aquatic habitat used by birds;
- Implementation of the Air Quality and Greenhouse Gas Management Plan (Chapter 33, Section 33.4.1.1) to reduce deposition of dust of vegetation that can affect plant vigour;
- Implementation of the Site Water Management Plan (Chapter 33, Section 33.4.1.8) which will minimize downstream impacts to riverine birds through:
    - Controlling outflows from water management facilities to maintain streamflow conditions in the receiving watercourses to the extent possible, particularly during low flow conditions;
    - Limiting surface water withdrawals to minimize impacts on streamflows; and
    - Decommissioning and reclaiming water management facilities to restore natural streamflow conditions in the receiving watercourses to the extent possible.

The area around the rail loadout was found to have high bird species richness and abundance relative to other areas within or directly adjacent to the Project footprint. Interior portions of the rail loadout (the area inside the track loops) will not be cleared, thus minimizing loss of bird habitat in this area. Opportunities to further minimize the footprint of the rail loadout will be examined during detailed design.

Ecological restoration is the primary mitigation for habitat loss and degradation. The reclamation and closure of the Project footprint aims to restore the pre-existing landscapes and uses, including a vegetation mosaic of coniferous forest, open alpine tundra, rock outcrops, shrub and graminoid dominated brushland, talus slopes, wetlands and riparian areas, and habitat capability for key wildlife species (among other goals). Revegetation (reclamation) activities will begin during the Operations phase, soon after stable topography is created within the mine footprint and will proceed progressively as the area of stable topography grows during the Operations phase. Revegetation is planned to start in Year 6 of Operations, with other revegetation taking place in Years 8, 10, 11, and 15 of Operations and continuing into the Reclamation and Closure phase.

As part of the planning, a post-mine terrestrial ecosystem map (TEM) has been developed to envisage the post-mine environment functioning and successional trajectory and guide the selection of appropriate species to revegetate the Project footprint. The post-mine TEM accounts for factors such as elevation, aspect, soil, and plant ecology, and as such, it is the lens for envisioning a realistic post-mine environment. Approximately 790 ha in seven ecosystem types are planned for reclamation within the Project footprint. Remaining areas within the footprint include pit highwalls, water features, and buffer (or contingency) areas. Disturbed portions of the buffer areas (if any) will be assigned appropriate end-use objective according to their elevation, aspect, slope steepness, and proximity to water features (for riparian and wetland ecosystems). Further details of the ecological restoration can be found in the Ecological Restoration Plan (Chapter 33, Section 33.4.1.3). The mitigation measures described above will contribute to minimizing the effects of habitat loss and degradation on bird VCs with moderate confidence. These measures will not eliminate all effects and there will be a residual effect of habitat loss and degradation on bird VCs as a result of the project.

The mitigation measures described above will contribute to minimizing the effects of habitat loss and degradation on birds and bird VCs. These measures will not eliminate all effects and there will be a residual effect of habitat loss and degradation on bird VCs as a result of the Project.

15.7.3.3.2 Mitigation Measures for Sensory Disturbance

Sensory disturbance to birds will primarily occur from Project-related noise, light, dust, and human presence. Measures to mitigate the impact of sensory disturbance on birds and bird VCs include:

- A wildlife education program (as described in the Wildlife Management and Monitoring Plan) will be developed to raise awareness of requirements and commitments to avoid wildlife and protect wildlife and wildlife habitat;
- Implementation of the Noise and Vibration Management Plan (Chapter 33, Section 33.4.1.7) that includes the following measures:
  - Limit construction activities, especially those with high noise impact, to daytime hours;
  - Appropriately time construction activities to minimize cumulative noise levels;
  - Select equipment for construction activities that is appropriate for the task;
  - Construction equipment at a minimum, is fitted with standard noise-damping devices such as mufflers or enclosures, where possible;
  - Discourage unnecessary idling of construction equipment;
  - Perform regular vehicle maintenance and inspections on all Project equipment, including replacement of old and worn parts;

    - Inform employees of noise impacts and potential mitigation/control measures through appropriate training;
    - Install and maintain noise mitigation measures, where possible, on and around Project infrastructure; and
    - Clear blasting areas of birds and terrestrial wildlife;
- Directed/focused lighting will be used where possible rather than broad area lighting to minimize sensory disturbance. Light in non-essential areas will only be used when necessary, without compromising worker safety; and
- Implementation of the Air Quality and Greenhouse Gas Management Plan (Chapter 33, Section 33.4.1.1) to minimize dust around wildlife in off-site areas.

The mitigation measures described above will contribute to minimizing the effects of sensory disturbance on birds and bird VCs with high effectivenss. These measures will not eliminate all effects and there will be a residual effect of sensory disturbance on bird VCs as a result of the Project.

15.7.3.3.3 Mitigation Measures for Increased Mortality Risk

Increased mortality risk of birds and bird VCs will primarily occur from:

- Destruction of nests when occupied by a bird or eggs;
- Collisions with Project-related traffic during terrain disturbance and clearing of vegetation;
- Collisions with Project-related traffic on access or mine site roads;
- Collisions with powerlines and electrocution;
- Operational mining activities including blasting;
- Attractants that may increase bird-human conflict; and
- Ingestion of toxic products from materials stored on site.

Measures to mitigate the impact of direct mortality on birds and bird VCs include:

- All vegetation clearing and tree harvesting will be conducted outside the general bird nesting period (April 13 to August 19 in each year) to avoid impacts to nests when occupied by a bird or eggs;
- A wildlife education program (as described in the Wildlife Management and Monitoring Plan, (Chapter 33, Section 33.4.1.13) will be developed to raise awareness of requirements and commitments to avoid wildlife and protect wildlife and wildlife habitat;
- Management of vehicle traffic and access contributes to minimization of direct mortality during all project phases. Traffic related measures are documented in the Traffic Control Plan (Chapter 33, Section 33.4.2.4) and include:
    - Speed limits will be clearly marked and signed on all Project access roads. Lower speed limits will be set where monitoring and wildlife observation records indicate a high-risk area for animal-vehicle collisions (e.g., at identified wildlife crossings);
    - Additional road signs will be posted for wildlife crossings, speed limit changes, advisory corner speeds, areas with limited visibility, and other potential road hazards;
    - Wildlife will be given the right-of-way on all Project roads;
    - Wildlife sightings and incidents will be reported to the site supervisor as soon as possible;
    - Project traffic will be minimized to the greatest extent practicable;
    - Site workers will travel on crews buses to limit road traffic;

    - Where possible, roads will be designed with clear lines of sight to increase the ability of drivers to see wildlife or other hazards; and
    - Vegetation along Project roadsides will be mowed/brushed as necessary for visibility of wildlife and to reduce the risk of wildlife-vehicle collisions;
- To minimize the risk of collision and electrocution with the powerline:
    - Poles will be free-standing and without guy wires except where absolutely necessary;
    - No shield wire will be installed;
    - Individual wire will be installed in a horizontal configuration; and
    - Power poles will have no lighting;
- Measures to mitigate the impact of attractants on birds and bird VCs include:
    - If contaminants are present in the sediment ponds, exclusion and deterrence measures will be used to deter birds from using the waterbodies;
    - Exclusion and deterrence measures will be used on buildings if birds are found to be nesting on or in buildings; and
    - Implementation of the Waste Management Plan (Chapter 33, Section 33.4.1.12) to minimize the presence of food waste and garbage accessible to birds;
- To avoid and minimize the potential for exposure to chemical hazards, the following measures will be implemented:
    - The Spill Prevention, Control, and Countermeasures Plan (Chapter 33, Section 33.4.1.10) contributes to eliminating or minimizing exposure of wildlife to spills;
    - Petroleum products and chemicals will be stored in holding tanks or closed facilities that exclude wildlife; and
    - Grey water and sewage will be contained in a closed system of holding tanks that will be pumped out as required.

The mitigation measures described above are expected to contribute to avoidance and minimization of increased mortality risk on birds and bird VCs with high effectiveness. The effects of increased mortality risk on bird VCs are expected to be mitigated and a residual effect is not anticipated.

15.7.3.3.4 Mitigation Measures for Waterbird Health

The mitigation measures relevant to waterbird health are intrinsic to Site Water Management Plan (Chapter 33, Section 33.4.1.8) and related to the mitigation measures for surface water quality, which are described in detail in Chapter 11.

15.7.3.4 Summary of Mitigation Measures for Bird VCs

The key mitigation measures proposed to mitigate potential effects on bird VCs are summarized in Table 15.7-22. This table also identifies the anticipated residual effects that will be carried forward in the characterization of residual effects, significance, and likelihood and confidence. Where mitigation measures do not or may not mitigate all effects or if there is a low level of confidence in their effectiveness, the effect was carried forward for further analysis of residual effects. Mitigation measures that are expected to completely mitigate potential effects with a high level of confidence based on their proven effectiveness elsewhere were classified as having no expected residual effects. This includes increased mortality risk.

Table 15.7-22: Summary of Proposed Mitigation Measures related to Birds and Bird VCs

Potential Effect	Mitigation Measures	Rationale	Applicable Project Phases	Effectiveness	Residual Effect
Habitat Loss and Degradation	• Minimizing disturbance and encroachment into natural vegetation • Clearing vegetation only in the year in which the area will be required for construction or operation • Sequencing the development of pits and Mine Rock Storage Facility areas to limit total disturbance during any one period and maximize progressive reclamation opportunities • Progressive reclamation • Implementation of the Erosion and Sediment Control Plan • Implementation of the Air Quality and Greenhouse Gas Management Plan • Implementation of the Site Water Management Plan (riverine birds)	• Measures contribute to the avoidance, minimization, and restoration of lost or degraded bird VC habitat • Effects on bird VCs are not expected to be fully mitigated	• Construction and Pre-Production • Operations • Reclamation and Closure	Moderate	Yes
Sensory Disturbance	• Implement wildlife education program (as described in the Wildlife Management and Monitoring Plan) • Implementation of the Noise and Vibration Management Plan • Directed/focused lighting will be used where possible • Implementation of the Air Quality and Greenhouse Gas Management Plan	• Measures contribute to the avoidance and minimization of sensory disturbance to bird VCs from Project activities. • Effects on bird VCs are not expected to be fully. mitigated	• Construction and Pre-Production • Operations • Reclamation and Closure	High	Yes

Potential Effect	Mitigation Measures	Rationale	Applicable Project Phases	Effectiveness	Residual Effect
Increased Mortality Risk	• All vegetation clearing will be conducted outside the general bird nesting period (Mid-April to Mid-August in each year) • A wildlife education program (as described in the Wildlife Management and Monitoring Plan) • Management of vehicle traffic and access as described in Traffic Control Plan will contribute to minimization of direct mortality during all Project phases • Signage along Project roads in high-value wildlife areas or known wildlife travel corridors to warn vehicle operators of the potential to encounter wildlife • Powerline design will minimize risk of collision	• Measures contribute to the avoidance and minimization of direct mortality to bird VCs from Project activities • Effects on bird VCs are expected to be fully mitigated	• Construction and Pre-Production • Operations • Reclamation and Closure	High	No
Waterbird Health	• Intrinsic to the Site Water Management Plan	• Measures contribute to the avoidance and minimization of exposure to selenium	• Construction and Pre-Production • Operations • Reclamation and Closure • Post-Closure	Moderate	Yes

No other technically and economically feasible mitigation measures were considered for the bird VCs, and NWP is not aware of potential future technology innovations that could help further mitigate effects.

15.7.3.5 Characterization of Residual Effects, Significance, Likelihood, and Confidence

15.7.3.5.1 Methods

The assessment of potential residual effects on bird VCs was characterized using both quantitative methods and qualitative discussions. Quantitative methods were used to measure habitat loss and degradation and sensory disturbance.

Habitat loss and degradation was measured in two ways: (1) by calculating the loss of high-quality habitat within the Project footprint for the species where habitat suitability models were completed (Olive-sided Flycatcher, woodpeckers, and Northern Goshawk) and (2) for bird habitat guilds (see Section 15.7.2.4) using the change in ecosystem abundance within the Landscapes and Ecosystems LSA. For the habitat suitability models, high-quality habitat was defined as areas with high and very high habitat suitability. As described in Section 15.7.2.3, a habitat suitability model was not developed for Barn Swallow.

The effect of sensory disturbance was conducted for the species where habitat suitability models were completed (Olive-sided Flycatcher, woodpeckers, and Northern Goshawk) and used noise modelling presented in Chapter 7. Sensory disturbance from noise has the potential to extend furthest and is the focus of the residual effects assessment. Sensory disturbance was evaluated by calculating the amount of high-quality habitat that the VC may abandon or be disturbed, based on the modelled noise levels for:

- Continuous Project-related noise ≥ 55 dBA – This is the sound level from the Project that is expected to cause disturbances for wildlife in daytime;
- Continuous Project-related noise ≥ 45 dBA – This is the sound level from the Project that is expected to cause disturbances for wildlife in nighttime; and
- Peak noise (air overpressure) ≥ 108 dB from blasting - This is the peak noise level from blasting at wildlife receptors that is expected to cause disturbed habitat. This was estimated to be at 1,500 m from pit blast sites.

Noise modelling was completed for the worst-case operating scenario. It was determined that operational Year 10 of the Project was the worst-case year for noise from the Project on surrounding sensitive receptors. The effects of Project-related noise in all other years will be less than those arising during operational Year 10.

All birds included as VCs are diurnal (active in the daytime). The nighttime threshold of continuous Project-related noise ≥ 45 dBA may therefore be less relevant to diurnal birds, though is included to indicate a range of potential effects.

For the bird habitat guilds and the bird species at risk that did not have habitat suitability models completed, a qualitative assessment of noise was completed.

The methods used to assess waterbird health (under aquatic health) are described in Section 22.5.4.1 of the Human and Ecological Health Assessment.

Residual effects were characterized using the criteria described in Chapter 5, Section 5.3.4.5. The following limits were used for the magnitude of a residual effect on birds:

- Negligible: No detectable changes from baseline conditions;
- Low: 0-5% change;
- Moderate: 6-15% change; and
- High: >15% change.

The residual effects of contaminants of potential concern on bird VCs are described in Chapter 22 and are therefore not repeated here.

15.7.3.5.2 Migratory Birds

As initially described in Section 15.7.1, there are two assessment components to migratory birds:

- Three representative species were identified in the AIR (EAO, 2018): Olive-sided Flycatcher, Barn Swallow, and woodpeckers; and
- The EIS Guidelines (CEAA, 2015a) require consideration of all migratory birds (as defined under MBCA, 1994) and not a subset of representative species, as used in the AIR (EAO, 2018).

A guild approach was used to address the requirements of the EIS Guidelines. Migratory birds detected during the breeding seasons (reported under Section 15.7.2.2) and listed in the MBCA (1994) were grouped into broad habitat guilds (Table 15.7-17) to characterize potential Project effects across multiple species.

Migratory birds were assessed for potential Project-related effects on habitat loss and degradation, sensory disturbance, and increased mortality risk. Mitigation measures will contribute to avoidance, mitigation, and restoration of these effects, but residual effects for habitat loss and degradation and sensory disturbance will remain. Both effects were therefore carried forward and a residual effects assessment is presented below. The determination of significance of adverse residual effects was completed for the combined effects of habitat loss and degradation and sensory disturbance.

Characterization of Residual Effects

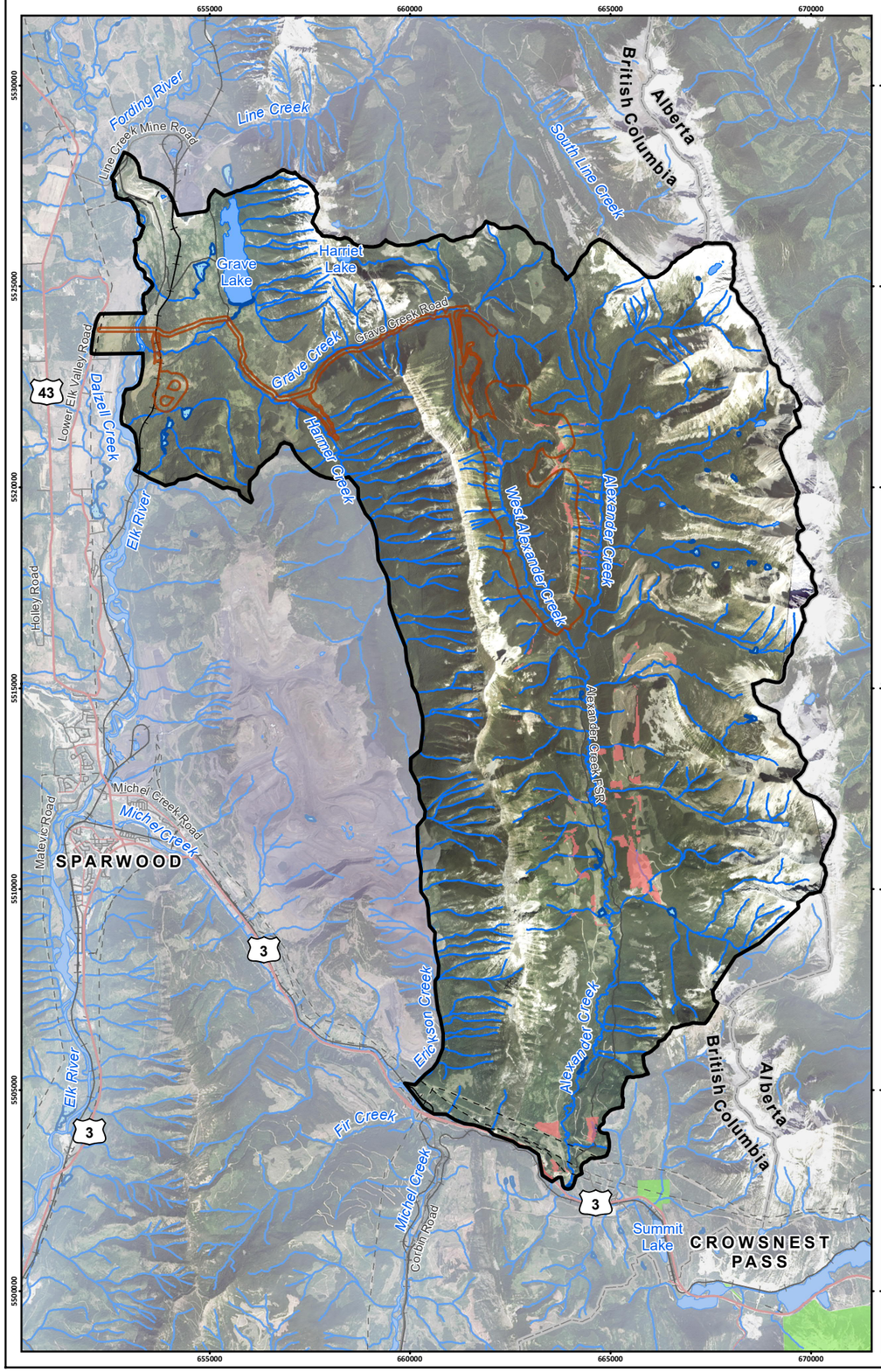
Habitat Loss and Degradation

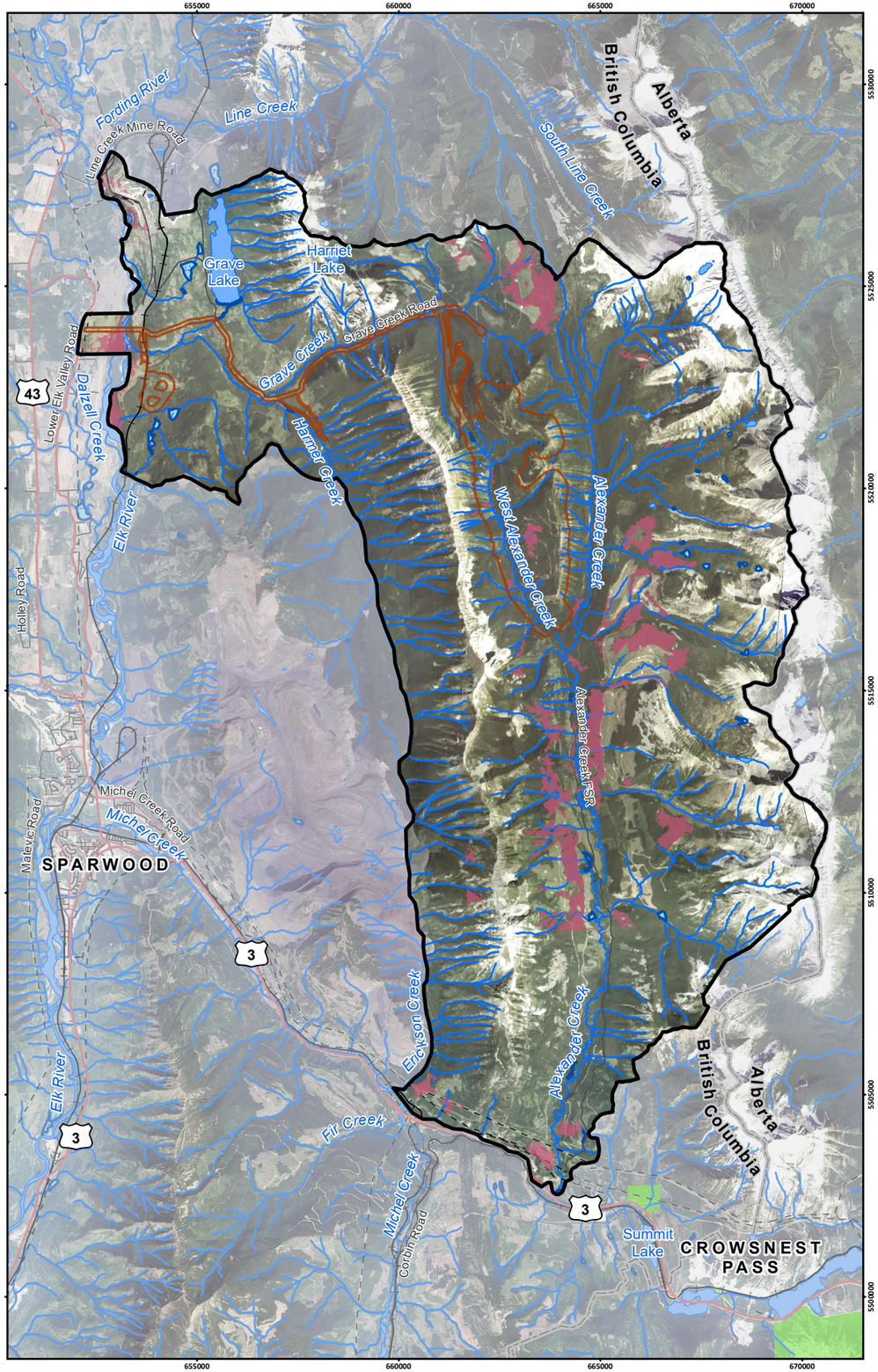
Migratory bird habitat loss and degradation was measured in two ways: (1) by calculating the loss of high-quality habitat within the Project footprint for the species where habitat suitability models were completed (Olive-sided Flycatcher and woodpeckers) and (2) for bird habitat guilds using the change in ecosystem abundance within the Landscapes and Ecosystems LSA.

For Olive-sided Flycatcher, the Project will result in a predicted loss of 16 ha of high-quality Olive-sided Flycatcher habitat within the Project footprint, representing 7.2% of the total amount of high-quality Olive-sided Flycatcher habitat available in the Terrestrial LSA (227 ha) (Figure 15.7-25 and summarized in Table 15.7-23). Nearly all loss will be within the pit and Mine Rock Storage Facility footprint and most at high elevation on Crown Mountain. Some areas predicted to be lost are within the buffer zone, and the area lost may be less. On a proportional basis, the availability of high-quality Olive-sided Flycatcher habitat is slightly higher within the Project footprint compared to the Terrestrial LSA as a whole (1.3% for the Project footprint and 0.9% for the Terrestrial LSA), meaning habitat is more common inside the footprint than outside.

OLIVE-SIDED FLYCATCHER

WOODPECKERS





Crown Mountain Coking Coal Project

Figure 15.7-25
High-Quality Migratory Bird Spring-Summer Habitat in the Terrestrial Local Study Area

LEGEND

- High-Quality Olive-sided Flycatcher Spring-Summer Habitat
- High-Quality Woodpecker Spring-Summer Habitat
- Terrestrial Local Study Area
- Project Footprint
- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- British Columbia/Alberta Border

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Kilometres

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Scale 1:130,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada.
Imagery Provided By Landsat 8 (Aug 2018), and GeoBC Orthoimagery (Aug 2016).

Map Created By: RB
Map Checked By: JM
Map Coordinate System: NAD 1983 UTM Zone 11N

NWP Coal Canada Ltd

Project: 12-6231
Status: FINAL
Date: 2022-01-14

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Table 15.7-23: Change in High-Quality Migratory Bird Habitat in the Project Footprint and Relative to the Terrestrial LSA

VC	Area (ha) in Project Footprint	% of Project Footprint	Area (ha) in Terrestrial LSA	% of Terrestrial LSA	Change as Proportion of Terrestrial LSA
Olive-sided Flycatcher	16	1.3	227	0.9	-7.2%
Woodpeckers	30	2.4	987	4.1	-3.1%

For woodpeckers, the Project will result in a predicted loss of 30 ha of high-quality woodpecker habitat, representing 3.1% of the total amount of high-quality woodpecker habitat available in the Terrestrial LSA (987 ha). Nearly all loss will be within the pit and Mine Rock Storage Facility footprints. On a proportional basis, the availability of high-quality woodpecker habitat is lower within the Project footprint compared to the Terrestrial LSA as a whole (2.4% for the Project footprint and 4.1% for the LSA), meaning woodpecker habitat is less common inside the footprint than outside.

Barn Swallow, the third species selected in the AIR to represent migratory birds, typically nest in colonies on artificial structures in areas associated with human and rural settings such as barns, garages, houses, bridges, and culverts. There are no barns, garages, or houses within the Project footprint. Bridges and culverts are present within the Project footprint, though with mitigation described in Section 15.7.3.3, no loss of Barn Swallow breeding habitat is expected to occur. Nesting sites are typically close to foraging sites such as fields, pastures, lake and river shorelines, rights-of-way, islands, and wetlands that support abundant aerial insect populations. The Project footprint overlaps with suitable foraging habitat (i.e., riparian areas, fields, and other cleared areas), though with little or no suitable nesting areas within or near the Project footprint, the foraging areas are unlikely to be used. One Barn Swallow was observed incidentally during baseline surveys at the south end of the Terrestrial LSA, near Highway 3 (see Figure 15.7-6).

The majority of habitat lost within the Project footprint will be for birds using forested habitats (83.4% of the Project footprint) (Table 15.7-24). As a proportion of lost habitat for birds in the footprint relative to the Landscapes and Ecosystems LSA (the area in which ecosystem mapping was completed), the largest proportional changes are in Alpine, Forest, and Non-vegetated habitats. No migratory birds detected during breeding seasons were considered to primarily use Alpine and Non-vegetated habitats (bird species and their guilds are listed in Table 15.7-17), though both habitat types will support a range of bird species.

Table 15.7-24: Change in Ecosystem Abundance for Bird Guilds as a Percentage of the Landscapes and Ecosystems LSA

Broad Ecosystem[1]	Landscapes and Ecosystems LSA		Project Footprint		Change as % of Landscapes and Ecosystems LSA[2]
	Area (ha)	%	Area (ha)	%	
Forest	9,977.8	77.4%	1,069.9	83.4%	-10.7%
Grassland/Shrubland	892.1	6.9%	79.5	6.2%	-8.9%
Wetland	81.0	0.6%	2.8	0.2%	-3.5%

Broad Ecosystem[1]	Landscapes and Ecosystems LSA		Project Footprint		Change as % of Landscapes and Ecosystems LSA[2]
	Area (ha)	%	Area (ha)	%	
Riparian	166.0	1.3%	0.1	0.0%	-0.0%
Alpine	200.4	1.6%	22.4	1.7%	-11.2%
Non-vegetated (primarily rock)	822.1	6.4%	86.9	6.8%	-10.6%
Water	255.6	2.0%	14.5	1.1%	-5.7%
Anthropogenic	490.7	3.8%	7.0	0.5%	-1.4%
Total	12,885.7	-	1,283.1	-	-10.0%

Notes:

1. Ecosystems based on Project-specific Terrestrial Ecosystem Mapping (TEM; Keefer Ecological Services Ltd., 2021; Appendix 13-A)
2. Note that the Landscapes and Ecosystems LSA is 53% of the size of the Terrestrial Local Study Area.

Clearing will begin in Construction and Pre-Production, with initial portions of the 1,283 ha Project footprint prepared for the mine site facilities, a portion of the North Pit, the Interim Sediment Pond, roads, the conveyor, the powerline and the rail loadout. During Operations, progressive clearing of the pits, Mine Rock Storage Facility, and Main Sediment Pond will continue through to Year 15. Habitat loss will have a continuous adverse effect until progressive reclamation begins in Year 10 of Operations. With progressive reclamation between Years 10 and 15 and continued reclamation in the Reclamation and Closure phase, the effect of habitat loss will begin to decline, though high-quality habitat for forest-dependent species will not be restored for many decade after Post-Closure.

Post mine reclamation will restore a mosaic of coniferous forest, open alpine tundra, rock outcrops, shrub and graminoid dominated brushland, talus slopes, wetlands, and riparian areas (described in Section 15.7.3.3.1 and in the Ecological Restoration Plan (Chapter 33, Section 33.4.1.3). All of the restored ecosystems will provide habitat for migratory birds through food availability or suitable nesting habitat over time. Reclamation will begin in Year 10 of Operations for limited areas and then accelerating at the end of Operations. Within five years of closure, graminoids, forbs, and some shrubs will have become established in grasslands and wetlands and will begin to provide bird habitat, though the quality will be variable and may be limited in many areas. Food availability will progressively improve at 25 and 50 years post-closure. Forest will begin to become established at 50 years post-closure onward, especially at low elevations, and begin to provide security and thermal protection. The Project footprint is ultimately expected to be a landscape similar in structure and composition to the pre-Project landscape.

Habitat for birds of open habitats (grasslands, shrublands, and wetlands), including Barn Swallow (for feeding), Olive-sided Flycatcher, and Common Nighthawk will become available early in the reclamation process, likely beginning within five years. Habitat for forest birds, including woodpeckers and Evening Grosbeak, may become minimally available at 50 years after closure, particularly at lower elevations, though high quality habitat will not likely be restored until 100 years or more after closure.

Habitat degradation of areas outside the Project footprint can occur from potential introduction and spread of invasive species, changes in vegetation vigour from dust deposition, and surface water runoff from the Project footprint that can contain suspended solids and affect vegetation. Mitigation for each of these effects was described in Chapter 13 and found to have no residual effects to each of the ecosystem VCs.

The residual effect to migratory birds from direct habitat loss and degradation is characterized as follows:

- Duration: *Long-term to permanent*, depending on the species. Habitat for Olive-sided Flycatcher and other migratory birds of open habitats will be at least partly restored prior to the end of Reclamation and Closure. Habitat for woodpeckers and other forest-dependent migratory birds will not be restored prior to the end of Reclamation and Closure.
- Magnitude: *Moderate*, up to 7.2% loss of high-quality habitat for Olive-sided Flycatcher in the Terrestrial LSA will be lost. A lesser amount of high-quality habitat for woodpeckers (3.1%) will also be lost. No high-quality Barn Swallow habitat will be lost as they are unlikely to be present within the footprint. Loss of habitat for the various bird guilds will vary; the highest is 11.2% for Alpine in the Landscape and Ecosystems LSA.
- Geographic Extent: *Discrete*, as the effect of habitat loss will be within the Project footprint only.
- Frequency: *Continuous*, the effect of habitat loss is expected to be continuous until lost habitat is reclaimed (where possible).
- Reversibility: *Irreversible to Reversible Long-Term*, depending on the species and their habitat requirements. Forest cover will not be restored prior to the end of Reclamation and Closure.
- Context: *Neutral* for Olive-sided Flycatcher, Barn Swallow, Common Nighthawk, and Evening Grosbeak as they are able to utilize disturbed landscapes. *Low* for woodpeckers due to their dependence on dead and decaying trees associated with older forests. Varying between Low and High for other species.

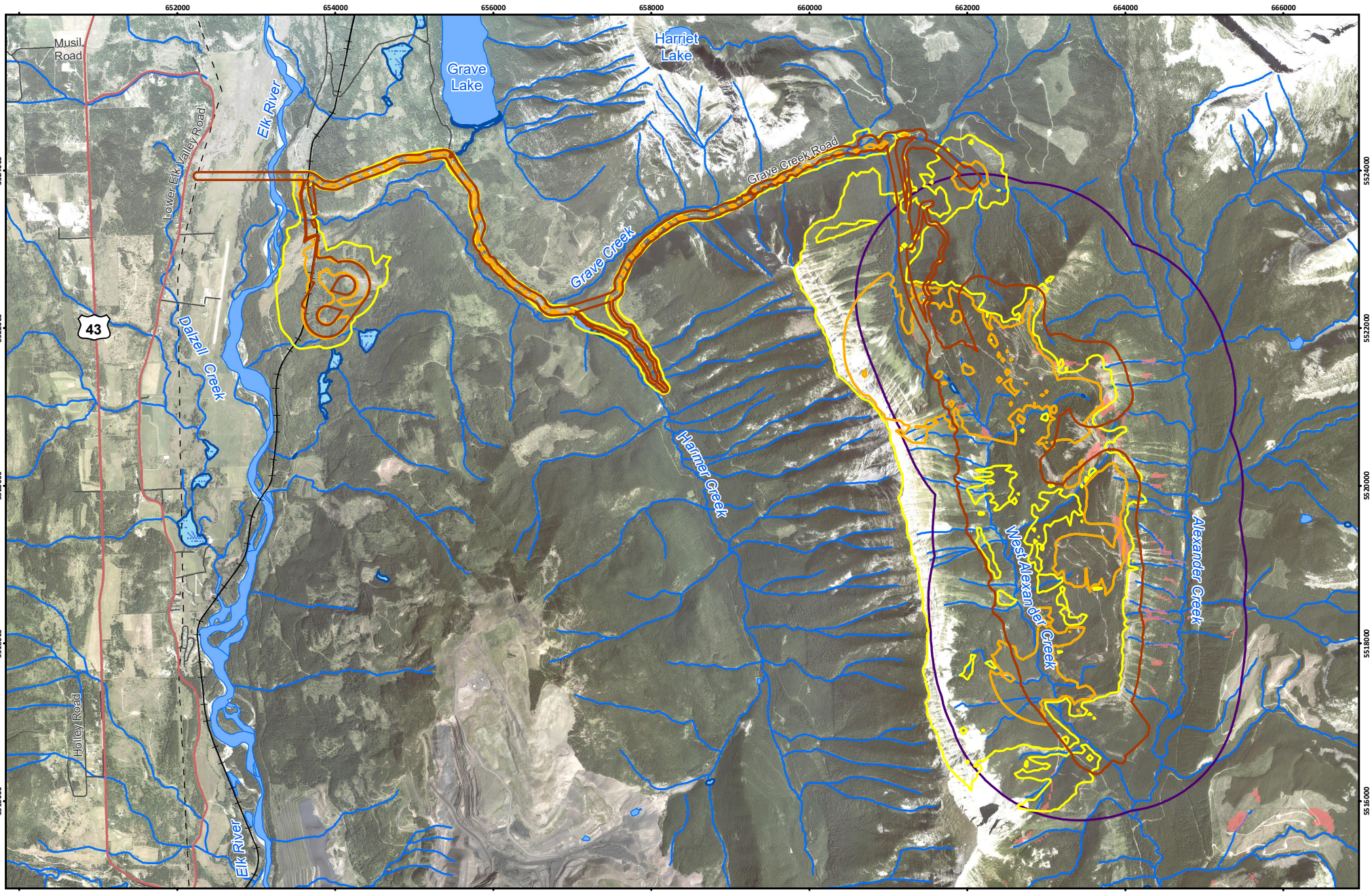
Sensory Disturbance

Migratory bird habitat may be functionally lost or disturbed due to sensory disturbance. This is in addition to direct habitat loss from clearing. Sensory disturbance for birds can include behavioural responses to Project-related noise, vibration, light, dust, and human presence. Sensory disturbance from noise has the potential to extend furthest and is the focus of the residual effects assessment.

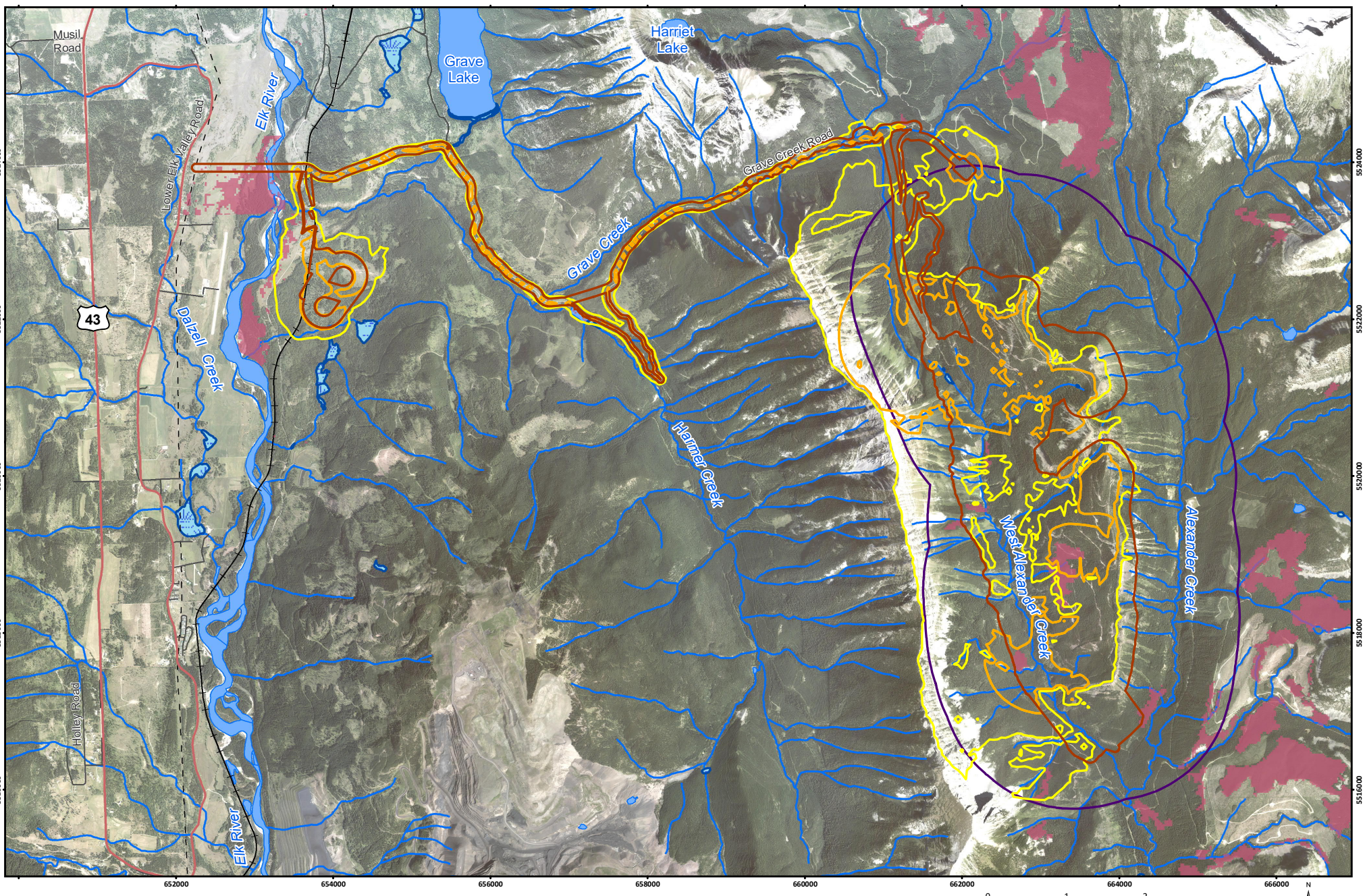
Chronic anthropogenic noise is known to influence habitat quality and reproductive fitness for birds (Halfwerk et al., 2011; Schroeder et al., 2012, Shannon et al., 2016), though the effect of noise may be different among bird species (e.g., Bayne et al. [2008b] studying forest birds). The effect of noise specifically on Barn Swallow, Olive-sided Flycatcher, and woodpeckers is not well studied, though it is assumed that there is at least some negative effect that would be highest near noise generating sources, which would be expected to decline with increasing distance from the noise source.

Continuous Project-related noise will affect up to 1,118 ha outside the Project footprint. This overlaps with up to 6.0 ha of high-quality Olive-sided Flycatcher habitat and 9.6 ha of high-quality woodpecker habitat (Figure 15.5-26 and Table 15.7-25) when Project-related noise is at its peak in Year 10 of Operations. This represents 2.6% of high-quality Olive-sided Flycatcher habitat and 1.0% of high-quality woodpecker habitat in the Terrestrial LSA.

OLIVE-SIDED FLYCATCHER



WOODPECKERS



Crown Mountain Coking Coal Project

Figure 15.7-26
High-Quality Migratory Bird Spring-Summer Habitat in Relation to the Project Footprint and Noise Contours

LEGEND

- High-Quality Olive-sided Flycatcher Spring-Summer Habitat
- High-Quality Woodpecker Spring-Summer Habitat
- Continuous Project Related Noise - 45 dBA Contours
- Continuous Project Related Noise - 55 dBA Contours
- Offsite Peak Noise Levels From Blasting >108 dB
- Project Footprint
- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- British Columbia/Alberta Border

0 1 2 Kilometres

N W E S

Scale 1:65,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Keefer Ecological Services Ltd, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada.
Imagery Provided By ESRI.

Map Created By: RB/PR
Map Checked By: JM
Map Coordinate System: NAD 1983 UTM Zone 11N

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Table 15.7-25: Area of Sensory Disturbance Outside the Project Footprint and Overlapping with High-Quality Migratory Bird Habitat

Season	Zone of Influence Area (ha)	Area (ha) of High-Quality Habitat Affected Outside Project Footprint	Area Affected as Proportion of High-Quality Habitat in the Terrestrial LSA
Continuous Project-related noise ≥ 55 dBA (daytime threshold)			
Olive-sided Flycatcher	242	1.0	0.4%
Woodpecker		0.2	0.0%
Continuous Project-related noise ≥ 45 dBA (nighttime threshold)			
Olive-sided Flycatcher	1,188	6.0	2.6%
Woodpecker		9.6	1.0%
Peak noise ≥ 108 dB from blasting			
Olive-sided Flycatcher	1,955	22.8	10.0%
Woodpecker		20.5	2.1%

The noise modelling indicated that the threshold peak sound level from blasting of 108 dB would be surpassed at a distance of up to approximately 1,500 m from the pit. Peak noise from blasting could therefore affect up to 22.8 ha of high-quality Olive-sided Flycatcher habitat and 20.5 ha of high-quality woodpecker habitat (Figure 15.5-26 and Table 15.7-25). This represents 10.0% of high-quality Olive-sided Flycatcher habitat and 2.1% of woodpecker habitat in the Terrestrial LSA. Noise from blasting will be intermittent (occurring several times per week).

Sensory disturbance to Barn Swallow is not expected as no Barn Swallows are expected to occur near the Project footprint. For other migratory bird species, a quantitative assessment of sensory disturbance was not completed; however, similar magnitudes of effects would be expected as those reported for Olive-sided Flycatcher and woodpeckers, though would vary depending on the species.

Once the Operations phase is complete, noise will substantially decrease and noise from blasting will cease. Noise during Reclamation and Closure will be from decommissioning and removal of infrastructure and reclamation activities, though to a lesser extent than during Operations.

The residual effect to migratory birds from sensory disturbance is characterized as follows:

- Duration: *Long-term*, as the effect of noise will extend through the Operations phase.
- Magnitude: *Moderate*, up to 10.0% of high-quality habitat in the Terrestrial LSA will be affected by noise (for Olive-sided Flycatcher).
- Geographic Extent: *Local*, as the effect of habitat loss will be outside the Project footprint and within the Terrestrial LSA.
- Frequency: *Continuous,* though at varying levels till the end of Operations, peaking at Year 10 of Operations. Noise from blasting will be intermittent.
- Reversibility: *Reversible long-term*, the effect of noise will decline substantially at the end of Operations and continue at lower levels during Reclamation and Closure.
- Context: *Neutral,* as migratory birds may have some resilience to sensory disturbance and may adapt to effects.

Determination of Significance

Both Olive-sided Flycatcher and Barn Swallow are Blue-listed in B.C. and listed as Threatened under SARA. Both species have undergone a large population decrease since the early 1970s and are considered to be below an acceptable level in Canada relative to their national population goal (ECCC, 2019b). For the woodpecker species detected within the Terrestrial LSA, all are Yellow-listed in B.C. and not listed federally. All woodpecker species have had little change to large increase in their population since 1970 and are at an acceptable level in Canada relative to their national population goal (Environment Canada, 2019b).

Of the three representative migratory bird species, the loss of high-quality habitat and habitat affected by sensory disturbance is largest for Olive-sided Flycatcher. Suitable Olive-sided Flycatcher habitat may be created with the creation of new edge habitat, and reclamation activities will restore some Olive-sided Flycatcher habitat by the end of Reclamation and Closure. There is expected to be a net incremental loss of high-quality Olive-sided Flycatcher in the Terrestrial LSA; however, a permanent reduction in the population as a result of the Project is likely minimal or nil. A relatively small amount of high-quality woodpecker habitat will be lost or affected by sensory disturbance in the Terrestrial LSA , and a permanent reduction in the population as a result of the Project is likely minimal or nil. No change to Barn Swallow abundance is expected, considering that little or no breeding habitat is present in the Project footprint and that feeding habitat is widely available in the Terrestrial LSA.

The majority of habitat lost within the Project footprint will be for birds using forested habitats (83.4% of the Project footprint). As a proportion of lost habitat for birds in the footprint relative to the Landscapes and Ecosystems LSA, the largest proportional changes are in Alpine, Forest, and Non-vegetated habitats. Based on the characterization of the residual effects, the Project would not limit the ability of migratory birds to persist and maintain self-sustaining populations in the Terrestrial LSA. The residual effects of habitat loss and degradation and sensory disturbance on migratory birds are therefore considered to be not significant.

Likelihood and Confidence

Effects from Project activities that are determined to be not significant do not require a characterization of likelihood.

There is a good understanding of migratory bird ecology, their habitat availability and distribution, their response to noise, known occurrences, and abundance in the Terrestrial LSA. The confidence in the determination of residual effects to migratory birds is high.

15.7.3.5.3 Northern Goshawk

Northern Goshawk was assessed for potential Project-related effects on habitat loss and degradation, sensory disturbance, and increased mortality risk. Mitigation measures will contribute to avoidance, mitigation, and restoration of these effects, but residual effects for habitat loss and degradation and sensory disturbance will remain. Both effects were therefore carried forward and a residual effects assessment is presented below. The determination of significance of adverse residual effects was completed for the combined effects of habitat loss and degradation and sensory disturbance.

Characterization of Residual Effects

Habitat Loss and Degradation

The Project footprint overlaps with high-quality Northern Goshawk habitat (Figure 15.7-27 and summarized in Table 15.7-26). The Project will result in a predicted loss of 162 ha of high-quality Northern Goshawk habitat, representing 5.1% of the total amount of high-quality Northern Goshawk habitat available in the Terrestrial LSA (3,214 ha). Habitat loss will be within various portions of the Project footprint, including the pits and Mine Rock Storage Facility, the overland conveyor, access road, and Grave Creek Road. On a proportional basis, Northern Goshawk habitat is similar within the Project footprint compared to the Terrestrial LSA as whole (13% for both).

Table 15.7-26: Change in High-Quality Northern Goshawk Habitat in the Project Footprint and Relative to the Terrestrial LSA

Season	Area (ha) in Project Footprint	% of Project Footprint	Area (ha) in Terrestrial LSA	% of Terrestrial LSA	Change as Proportion of Terrestrial LSA
Year-round	162	13	3,214	13	-5.1%

Clearing will begin in Construction and Pre-Production, with initial portions of the 1,283 ha Project footprint prepared for the mine site facilities, a portion of the North Pit, the Interim Sediment Pond, roads, the conveyor, the powerline and the rail loadout. During Operations, progressive clearing of the pits, Mine Rock Storage Facility, and Main Sediment Pond will continue through to Year 15. Habitat loss will have a continuous adverse effect until progressive reclamation begins in Year 10 of Operations. With progressive reclamation between Years 10 and 15 and continued reclamation in the Reclamation and Closure phase, the effect of habitat loss will begin to decline, though high-quality habitat for forest-dependent species will not be restored for many decade after Post-Closure.

Post mine reclamation will restore a mosaic of coniferous forest, open alpine tundra, rock outcrops, shrub and graminoid dominated brushland, talus slopes, wetlands, and riparian areas (described in Section 15.7.3.3.1 and in the Ecological Restoration Plan, Chapter 33, Section 33.4.1.3). Reclamation will begin in Year 10 of Operations for limited areas and then accelerating at the end of Operations. Forest will begin to become established at 50 years post-closure onward and begin to provide some habitat for Northern Goshawk, though of low quality. High-quality habitat may become established and available to Northern Goshawk starting at approximately 100 years post-closure.

Habitat degradation of areas outside the Project footprint can occur from potential introduction and spread of invasive species, changes in vegetation vigour from dust deposition, and surface water runoff from the Project footprint that can contain suspended solids and affect vegetation. Mitigation for each of these effects was described in Chapter 13 and found to have no residual effects to each of the ecosystem VCs.

Crown Mountain Coking Coal Project

Figure 15.7-27
High-Quality Northern Goshawk Spring-Summer Habitat in the Terrestrial Local Study Area

LEGEND

- High-Quality Northern Goshawk Spring-Summer Habitat
- Terrestrial Local Study Area
- Project Footprint
- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- British Columbia/Alberta Border

0 2 4
Kilometres

Scale 1:85,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Keefer Ecological Services Ltd, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada.
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The residual effect to Northern Goshawk from direct habitat loss and degradation is characterized as follows:

- Duration: *Permanent*, as mature and old forest habitat for Northern Goshawk will not be restored prior to the end of Reclamation and Closure.
- Magnitude: *Moderate*, up to 5.1% of high-quality Northern Goshawk habitat in the Terrestrial LSA will be lost.
- Geographic Extent: *Discrete*, as the effect of habitat loss will be within the Project footprint only.
- Frequency: *Continuous*, the effect of habitat loss is expected to be continuous until lost habitat is restored (where possible).
- Reversibility: *Irreversible,* as mature and old forest habitat for Northern Goshawk will not be restored prior to the end of Reclamation and Closure.
- Context: *Low*, as changes in habitat availability and level of fragmentation are known to affect Northern Goshawk abundance.

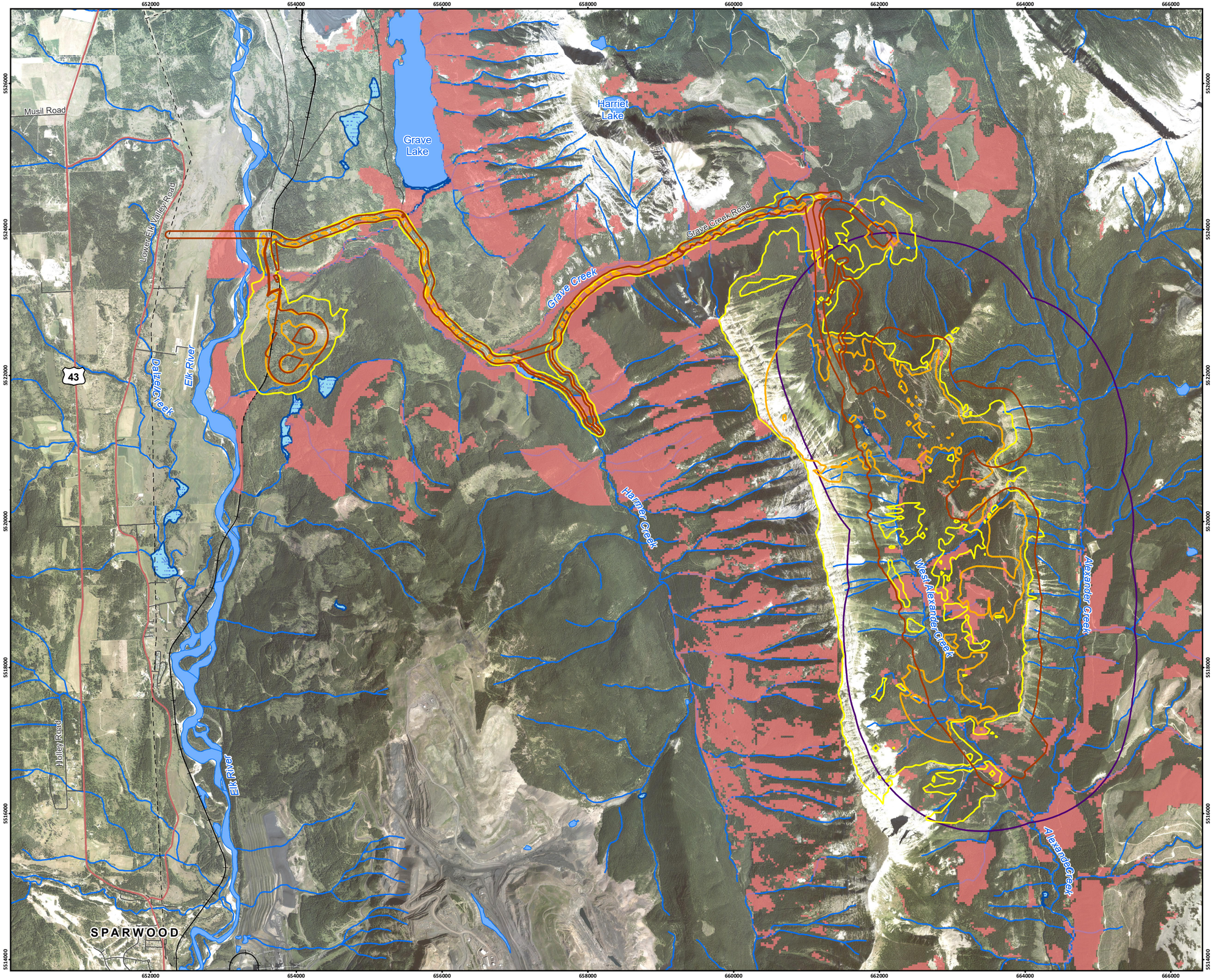
Sensory Disturbance

Northern Goshawk habitat may be functionally lost or disturbed due to sensory disturbance. This is in addition to direct habitat loss from clearing. Sensory disturbance for birds can include behavioural responses to Project-related noise, vibration, light, dust, and human presence. Sensory disturbance from noise has the potential to extend furthest and is the focus of the residual effects assessment.

Chronic anthropogenic noise is known to influence habitat quality and reproductive fitness for birds (Halfwerk et al., 2011; Schroeder et al., 2012), though the effect of noise may be different among bird species (e.g., Bayne et al. [2008b] studying forest birds). Noise and human activity are known to cause nest abandonment in Northern Goshawk (Squires et al., 2020). For the coastal subspecies of Northern Goshawk (*Accipiter gentilis laingi*), nests have been found within 15 m of deactivated forestry roads, 60 m of regularly used forestry haul roads, and within 200 m of regularly driven highways (Manning et al., 2005). On Vancouver Island, more than 80% of Northern Goshawk nests were found to be farther than 200 m from hard forest edges, which suggests some edge avoidance (Mahon et al., 2008 as cited in COSEWIC, 2013c). The effect of Project noise on Northern Goshawk is unclear, though it is assumed that there is a negative effect that would be highest near noise generating sources, which would be expected to decline with increasing distance from the noise source.

Continuous Project-related noise will affect up to 1,118 ha outside the Project footprint. This overlaps with up to 6.0 ha of high-quality Northern Goshawk habitat (Figure 15.7-28 and Table 15.7-27) when Project-related noise is at its peak in Year 10 of Operations. This represents 2.6% of high-quality Northern Goshawk habitat in the Terrestrial LSA.

The noise modelling indicated that the threshold peak sound level from blasting of 108 dB would be surpassed at a distance of up to approximately 1,500 m from the pit. Peak noise from blasting could therefore affect up to 140.7 ha of high-quality Northern Goshawk habitat (Figure 15.7-28 and Table 15.7-27). This represents 4.4% of high-quality Northern Goshawk habitat in the Terrestrial LSA. Noise from blasting will be intermittent (occurring several times per week).



Crown Mountain Coking Coal Project

Figure 15.7-28
High-Quality Northern Goshawk Spring-Summer Habitat in Relation to the Project Footprint and Noise Contours

LEGEND

- High-Quality Northern Goshawk Spring-Summer Habitat
- Continuous Project Related Noise - 45 dBA Contours
- Continuous Project Related Noise - 55 dBA Contours
- Offsite Peak Noise Levels From Blasting >108 dB
- Project Footprint
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- British Columbia/Alberta Border

0 1 2
Kilometres

N W E S

Scale 1:50,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Keefer Ecological Services Ltd, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada.
Imagery Provided By GeoBC OrthoImagery (Aug 2016).

Map Created By: RB
Map Checked By: JM
Map Coordinate System: NAD 1983 UTM Zone 11N

NWP Coal Canada Ltd

Project: 12-6231
Status: FINAL
Date: 2022-01-14

Document Path: \\42dillon\CAD\GIS\2012 and Prior\126231 Crown Mountain\EA_Report\EffectsAssessment\Wildlife\126231_EA_WHbird_NorthernGoshawkHabitat_Footprint_Noise_Contours.mxd

Table 15.7-27: Area of Sensory Disturbance Outside the Project Footprint and Overlapping with High-Quality Northern Goshawk Habitat

Season	Zone of Influence Area (ha)	Area (ha) of High-Quality Habitat Affected Outside Project Footprint	Area Affected as Proportion of High-Quality Habitat in the Terrestrial LSA
Continuous Project-related noise ≥ 55 dBA (daytime threshold)			
Year-round	242	4.7	0.2%
Continuous Project-related noise ≥ 45 dBA (nighttime threshold)			
Year-round	1,118	51.2	1.6%
Peak noise ≥ 108 dB from blasting			
Year-round	1,955	140.7	4.4

Once the Operations phase is complete, noise will substantially decrease and noise from blasting will cease. Noise during Reclamation and Closure will be from decommissioning and removal of infrastructure and reclamation activities, though to a lesser extent than during Operations.

The residual effect to Northern Goshawk from sensory disturbance is characterized as follows:

- Duration: *Long-term*, as the effect of noise will extend through the Operations phase.
- Magnitude: *Low*, up to 4.4% of high-quality habitat in the Terrestrial LSA will be affected by noise.
- Geographic Extent: *Local*, as the effect of habitat loss will be outside the Project footprint and within the Terrestrial LSA.
- Frequency: *Continuous,* though at varying levels till the end of Operations, peaking at Year 10 of Operations. Noise from blasting will be intermittent.
- Reversibility: *Reversible long-term*, the effect of noise will decline substantially at the end of Operations and continue at lower levels during Reclamation and Closure.
- Context: *Neutral,* as Northern Goshawk may have some resilience to sensory disturbance and may adapt to effects.

Determination of Significance

Northern Goshawk is Blue-listed in B.C. and is not listed federally. The population in Canada has had little change since 1970 (<25% decline), though is considered below the lowest acceptable level relative to its national population goal (ECCC, 2019b). There is expected to be a net incremental loss of high-quality Northern Goshawk habitat in the Terrestrial LSA. The loss is small and a permanent reduction in the population as a result of the Project is likely minimal. Additional habitat outside the Project footprint will be affected by sensory disturbance, though that amount is also small. Based on the characterization of the residual effects, the Project would not limit the ability of Northern Goshawk to persist and maintain self-sustaining populations in the Terrestrial LSA. The residual effects of habitat loss and degradation and sensory disturbance on Northern Goshawk are therefore considered to be not significant.

Likelihood and Confidence

Effects from Project activities that are determined to be not significant do not require a characterization of likelihood.

There is a good understanding of Northern Goshawk ecology, their habitat availability and distribution, known occurrences, and abundance in the Terrestrial LSA, and a moderate understanding of their response to sensory disturbance. The confidence in the determination of residual effects to Northern Goshawk is high.

15.7.3.5.4 Bird Species at Risk

Sixteen Federally-listed bird species were identified as known or have the potential to occur within the Terrestrial LSA (Section 15.7.2.5). Of these 16 species, four are known to occur in the Terrestrial LSA: Common Nighthawk, Barn Swallow, Olive-sided Flycatcher, and Evening Grosbeak. All four of these species are included in the assessment of project effects on bird species at risk. Barn Swallow and Olive-sided Flycatcher are also representative species under the migratory birds VC and were discussed in Section 15.7.3.5.2.

Bird species at risk were assessed for potential Project-related effects on habitat loss and degradation, sensory disturbance, and increased mortality risk. Mitigation measures will contribute to avoidance, mitigation, and restoration of these effects, but residual effects for habitat loss and degradation and sensory disturbance will remain. Both effects were therefore carried forward and a residual effects assessment is presented below. The determination of significance of adverse residual effects was completed for the combined effects of habitat loss and degradation and sensory disturbance.

Characterization of Residual Effect

Habitat Loss

The Project will result in a predicted loss of 16 ha of high-quality Olive-sided Flycatcher habitat within the Project footprint, representing 7.2% of the total amount of high-quality Olive-sided Flycatcher habitat available in the Terrestrial LSA.

Habitat suitability was not modelled for Barn Swallow though based on the ecosystem mapping, the Project footprint overlaps with suitable foraging habitat (i.e., riparian areas, fields, and other cleared areas), though there is little or no suitable nesting areas within or near the Project footprint and the foraging areas are unlikely to be used.

Habitat suitability was not modelled for Common Nighthawk or Evening Grosbeak; however, potential loss of suitable habitat can be qualitatively assessed using the ecosystem mapping. Suitable nesting habitat for Common Nighthawk in the Terrestrial LSA would include open ground or clearings such as sandy areas, open forests (e.g., mixedwood and coniferous stands, burns, and clearcuts), grasslands (e.g., short-grass prairies, pastures, and grassy plains), wetlands (e.g., bogs, marshes, lakeshores, and riverbanks), and gravelly or rocky areas (e.g., outcrops, barrens, gravel roads, gravel rooftops, railway beds, mines, quarries, and bare mountain tops and ridges; (from Environment Canada, 2016b). These types of habitats are relatively widespread, though within the footprint are most prevalent in the lower elevation areas around Grave Prairie and the rail loadout. This is also the area where most Common Nighthawk detections were made. The Project will result in a loss of approximately 25 ha of open habitat in the Grave Prairie/rail loadout area. This is a relatively small area relative to the amount of Common Nighthawk habitat potentially available in the vicinity of the Project.

Optimal Evening Grosbeak breeding habitat generally includes open, mature mixedwood forests, where fir species and/or white spruce are dominant, and spruce budworm is abundant. Evening Grosbeak habitat is widespread, as 83% of the Project footprint and 77% of the Terrestrial LSA is forest, and most stands contain a component of fir or white spruce. Evening Grosbeak populations have been in decline since the 1970s, though the causes of the decline are not well understood, but probably stem from multiple factors including large-scale forestry operations, disease, and reduced food availability due to fewer forest insect infestations, especially spruce budworm (Martell, 2015b).

The sequencing of clearing and ecological restoration as it relates to bird species at risk is similar to that described for migratory birds and is therefore not repeated here.

The residual effect to bird species at risk from direct habitat loss and degradation is characterized as follows:

- Duration: *Long-term to permanent*, depending on the species. Habitat for Olive-sided Flycatcher and Common Nighthawk will be at least partly restored prior to the end of Reclamation and Closure. Habitat for Evening Grosbeak will not be restored prior to the end of Reclamation and Closure.
- Magnitude: *Moderate*, up to 7.2% loss of high-quality habitat (for Olive-sided Flycatcher) in the Terrestrial LSA will be lost. No high-quality Barn Swallow habitat will be lost as they are unlikely to be present within the footprint. Habitat loss for Common Nighthawk and Evening Grosbeak was not quantified but estimated to be Moderate or Low.
- Geographic Extent: *Discrete*, as the effect of habitat loss will be within the Project footprint only.
- Frequency: *Continuous*, the effect of habitat loss is expected to be continuous until lost habitat is reclaimed (where possible).
- Reversibility: *Irreversible to Reversible Long-Term*, depending on the species and their habitat requirements. Forest cover will not be restored prior to the end of Reclamation and Closure.
- Context: *Neutral* for Olive-sided Flycatcher, Barn Swallow, Common Nighthawk, and Evening Grosbeak as they are able to utilize disturbed landscapes.

Sensory Disturbance

Bird species at risk habitat may be functionally lost or disturbed due to sensory disturbance. This is in addition to direct habitat loss from clearing. The potential effects of sensory disturbance to birds was described for migratory birds and is therefore not repeated here.

Continuous Project-related noise will affect up to 1,118 ha outside the Project footprint. This overlaps with up to 6.0 ha of high-quality Olive-sided Flycatcher habitat when Project-related noise is at its peak in Year 10 of Operations. This represents 2.6% of high-quality Olive-sided Flycatcher habitat in the Terrestrial LSA. The noise modelling indicated that the threshold peak sound level from blasting of 108 dB would be surpassed at a distance of up to approximately 1,500 m from the pit. Peak noise from blasting could therefore affect up to 22.8 ha of high-quality Olive-sided Flycatcher habitat. This represents 10.0% of high-quality Olive-sided Flycatcher habitat.

Sensory disturbance to Barn Swallow is not expected as no Barn Swallows are expected to occur near the Project footprint. Common Nighthawk observations generally occurred at low elevations in the valleys along southern Alexander Creek, along the Elk River, and in the lower reaches of Grave Creek. This area

will not be affected by the continuous noise associated with the pits and Mine Rock Storage Facility or the peak noise from blasting. They will be exposed to noise from road traffic and from activities at the rail loadout. Common Nighthawk are known to nest and forage in proximity to human activities (e.g., nesting on roof tops) and at least a degree of tolerance to noise may be assumed. Habitat for Evening Grosbeak is potentially widespread and may therefore be affected by sensory disturbance.

Once the Operations phase is complete, noise will substantially decrease and noise from blasting will cease. Noise during Reclamation and Closure will be from decommissioning and removal of infrastructure and reclamation activities, though to a lesser extent than during Operations.

The residual effect to bird species at risk from sensory disturbance is characterized as follows:

- Duration: *Long-term*, as the effect of noise will extend through the Operations phase.
- Magnitude: *Moderate*, up to 10.0% of high-quality habitat in the Terrestrial LSA will be affected by noise (for Olive-sided Flycatcher). Sensory disturbance to Common Nighthawk and Evening Grosbeak was not quantified but estimated to be Moderate as well.
- Geographic Extent: *Local*, as the effect of habitat loss will be outside the Project footprint and within the Terrestrial LSA.
- Frequency: *Continuous,* though at varying levels till the end of Operations, peaking at Year 10 of Operations. Noise from blasting will be intermittent.
- Reversibility: *Reversible long-term*, the effect of noise will decline substantially at the end of Operations and continue at lower levels during Reclamation and Closure.
- Context: *Neutral,* as these bird species at risk may have some resilience to sensory disturbance and may adapt to effects.

Determination of Significance

Both Olive-sided Flycatcher and Barn Swallow are Blue-listed in B.C. and listed as Threatened under SARA. Both species have undergone a large population decrease since the early 1970s and are considered to be below an acceptable level in Canada relative to their national population goal (ECCC, 2019b). Both Common Nighthawk and Evening Grosbeak are Yellow-listed in B.C. and listed as Special Concern under SARA. Both species have also undergone large population decreases since the 1970s and are considered to be below an acceptable level in Canada relative to their national population goal (Environment Canada, 2019b).

Based on the characterization of the residual effects, the Project would not limit the ability of species at risk to persist and maintain self-sustaining populations in the Terrestrial LSA. The residual effects of habitat loss and degradation and sensory disturbance on species at risk are therefore considered to be not significant.

Likelihood and Confidence

Effects from Project activities that are determined to be not significant do not require a characterization of likelihood.

There is a good understanding of migratory bird ecology, their habitat availability and distribution, their response to noise, known occurrences, and abundance in the Terrestrial LSA. The confidence in the determination of residual effects to species at risk is high.

15.7.3.5.5 Waterbird Health

Waterbird health is assessed under aquatic health in the Human and Ecological Health Assessment. Surface water quality mitigation measures will contribute to avoidance and minimization of selenium exposure risk (the only contaminant assessed for waterbirds), but residual effects may remain. Waterbird health is therefore carried forward and a residual effects assessment is presented below. The assessment of potential residual effects to waterbird health provided in this section is based entirely on the Human and Ecological Health Assessment and no new information is provided.

Characterization of Residual Effect

Overall, the proposed Project and associated activities are considered to present a low risk to aquatic health. Specifically, for waterbirds and selenium, there are no risk estimates in exceedance of the target threshold. Further details are provided in Section 22.5.4.2.2 of the Human and Ecological Health Assessment.

The residual effect to waterbird health is characterized as follows:

- Duration: *Long-term*, as the potential effect of could extend through the Operations phase to the end of reclamation.
- Magnitude: *Negligible*, as there are no risk estimates in exceedance of the target threshold.
- Geographic Extent: *Local*, as the risk will be outside the Project footprint and within the Terrestrial LSA.
- Frequency: *Continuous,* though at varying potential levels.
- Reversibility: *Reversible long-term*, the effect will decline substantially at the end of Operations and continue at lower levels during Reclamation and Closure.
- Context: *Low,* as waterbirds have low resilience to the effects of selenium.

Determination of Significance

The residual effects to waterbird health are considered to be not significant.

Likelihood and Confidence

Effects from Project activities that are determined to be not significant do not require a characterization of likelihood.

The confidence in the determination of significance for aquatic health was assessed and moderate. The confidence in the determination of significance for waterbird health is therefore also assessed as moderate.

15.7.3.5.6 Summary of Residual Effects Assessment

Residual effects and the selected mitigation measures, characterization criteria, significance determination, likelihood, and confidence are summarized in Table 15.7-28. There are no significant residual effects to bird VCs anticipated as a result of the Project.

Table 15.7-28: Summary of Residual Effects on Bird VCs

Valued Component	Residual Effect	Project Phases	Mitigation Measures	Summary of Residual Effects Characterization	Significance (Significant, Not Significant)	Likelihood (High, Moderate, Low)	Confidence (High, Moderate, Low)
Migratory Birds	Habitat Loss and Degradation	• Construction and Pre-Production • Operations	• Minimizing disturbance and encroachment into natural vegetation • Clearing vegetation only in the year in which the area will be required for construction or operation • Sequencing the development of pits and Mine Rock Storage Facility areas to limit total disturbance during any one period and maximize progressive reclamation opportunities • Progressive reclamation • Implementation of the Erosion and Sediment Control Plan • Implementation of the Air Quality and Greenhouse Gas Management Plan	Duration: Long-term to Permanent Magnitude: Moderate Geographic Extent: Discrete Frequency: Continuous Reversibility: Irreversible to Reversible long-term Context: Neutral (Olive-sided Flycatcher, Barn Swallow); Low (woodpeckers)	Not Significant	Not Applicable	High
	Sensory Disturbance	• Construction and Pre-Production • Operations	• Implement wildlife education program (as described in the Wildlife Management and Monitoring Plan • Implementation of the Noise and Vibration Management Plan • Directed/focused lighting will be used where possible	Duration: Long-term Magnitude: Moderate Geographic Extent: Local Frequency: Continuous Reversibility: Reversible long-term Context: Neutral			

Valued Component	Residual Effect	Project Phases	Mitigation Measures	Summary of Residual Effects Characterization	Significance (Significant, Not Significant)	Likelihood (High, Moderate, Low)	Confidence (High, Moderate, Low)
			• Implementation of the Air Quality and Greenhouse Gas Management Plan				
Northern Goshawk	Habitat Loss and Degradation	• Construction and Pre-Production • Operations	• Minimizing disturbance and encroachment into natural vegetation • Clearing vegetation only in the year in which the area will be required for construction or operation. • Sequencing the development of pits and Mine Rock Storage Facility areas to limit total disturbance during any one period and maximize progressive reclamation opportunities • Progressive reclamation • Implementation of the Erosion and Sediment Control Plan • Implementation of the Air Quality and Greenhouse Gas Management Plan	Duration: Permanent Magnitude: Moderate Geographic Extent: Discrete Frequency: Continuous Reversibility: Irreversible Context: Low	Not Significant	Not Applicable	High
	Sensory Disturbance	• Construction and Pre-Production • Operations	• Implement wildlife education program (as described in the Wildlife Management and Monitoring Plan • Implementation of the Noise and Vibration Management Plan • Directed/focused lighting will be used where possible	Duration: Long-term Magnitude: Low Geographic Extent: Local Frequency: Continuous Reversibility: Reversible long-term Context: Neutral			

Valued Component	Residual Effect	Project Phases	Mitigation Measures	Summary of Residual Effects Characterization	Significance (Significant, Not Significant)	Likelihood (High, Moderate, Low)	Confidence (High, Moderate, Low)
			• Implementation of the Air Quality and Greenhouse Gas Management Plan				
Bird Species at Risk	Habitat Loss and Degradation	• Construction and Pre-Production • Operations	• Minimizing disturbance and encroachment into natural vegetation • Clearing vegetation only in the year in which the area will be required for construction or operation • Sequencing the development of pits and Mine Rock Storage Facility areas to limit total disturbance during any one period and maximize progressive reclamation opportunities • Progressively reclaiming areas, as described in Reclamation and Closure Plan • Implementation of the Erosion and Sediment Control Plan • Implementation of the Air Quality and Greenhouse Gas Management Plan	Duration: Long-term to Permanent Magnitude: Moderate Geographic Extent: Discrete Frequency: Continuous Reversibility: Irreversible to Reversible long-term Context: Neutral	Not Significant	Not Applicable	High
	Sensory Disturbance	• Construction and Pre-Production • Operations	• Implement wildlife education program (as described in the Wildlife Management and Monitoring Plan • Implementation of the Noise and Vibration Management Plan	Duration: Long-term Magnitude: Moderate Geographic Extent: Local Frequency: Continuous Reversibility: Reversible long-term Context: Neutral			

Valued Component	Residual Effect	Project Phases	Mitigation Measures	Summary of Residual Effects Characterization	Significance (Significant, Not Significant)	Likelihood (High, Moderate, Low)	Confidence (High, Moderate, Low)
			• Directed/focused lighting will be used where possible • Implementation of the Air Quality and Greenhouse Gas Management Plan				
Waterbird Health	Selenium Risk	• All Phases	• Intrinsic to the Site Water Management Plan	Duration: Long-term Magnitude: Negligible Geographic Extent: Local Frequency: Continuous Reversibility: Reversible long-term Context: Low	Not Significant	Not Applicable	High

15.7.4 Cumulative Effects Assessment

Cumulative environmental effects are the result of Project residual environmental effects interacting with the effects of other past, present, and reasonably foreseeable future projects or activities to produce a combined/overlapping effect. The objective of the cumulative effects assessment is to consider overlapping effects for all residual adverse effects, not only those predicted to be significant (EAO, 2013). The assessment of cumulative effects on bird VCs requires that:

- The Project results in a residual adverse environmental effect on the bird VC;
- A residual Project effect interacts cumulatively with effects from other projects or activities (i.e., an effect of the Project overlaps spatially and temporally with those of other projects or activities that have been or will be carried out);
- The other projects or activities have been or will be carried out and are not hypothetical; and
- The cumulative effect is likely to occur.

Further information regarding the cumulative effects assessment methodology is provided in Chapter 5, Section 5.3.5.4.

An assessment of cumulative effects is required for bird VCs due to the possibility that potential Project residual effects on bird VCs may remain after implementation of proposed mitigation measures. Habitat loss and degradation and sensory disturbance were found to have residual (but not significant) effects for all bird VCs.

15.7.4.1 Assessment Boundaries

15.7.4.1.1 Spatial Boundaries

The assessment of cumulative effects for bird VCs was conducted for the Birds, Bats, and Amphibians RSA, as defined in Section 15.2.3.1. The Birds, Bats, and Amphibians RSA is approximately 12,634 km^2. It includes all operating and proposed mines within the Elk Valley and several developed areas including the municipal boundaries of Sparwood, Elkford, Fernie, and Crowsnest Pass.

15.7.4.1.2 Temporal Boundaries

The temporal boundaries for the Project include periods of Construction and Pre-Production, Operations, Reclamation and Closure, and Post-Closure, as identified in Section 15.2.3.2.

Temporal cases used in the assessment of cumulative effects includes the following:

1. Base Case – The current status of the VC prior to the start of the Project, including all appropriate past and present projects or activities – generally represented by existing conditions;
2. Project Case – Status of the VC with the Project in place, over and above the Base Case – generally represented by the Project effects assessment; and
3. Future Case – The status of the VC as a result of the Project Case in combination with all reasonably foreseeable future projects and/or activities that could be carried out.

The comparison of the Project Case with the Future Case allows the Project contribution to cumulative effects of all past, present, and reasonably foreseeable future projects and/or activities to be determined.

15.7.4.1.3 Technical Boundaries

In addition to those presented in Section 15.2.3.4, technical boundaries or constraints imposed on the assessment due to limitations in the ability to predict the cumulative effects of the Project in combination with those of other past, present, or reasonably foreseeable future projects or activities include the following:

- Information on species ranges and population numbers in the region is variable and, in some cases, limited;
- Habitat availability (including habitat suitability, resource selection, and habitat use) was assessed from occupancy and habitat modelling. The models have inherent uncertainty and are an imperfect representation;
- There is limited knowledge of the precise scope and extent of potential effects of past, present, and reasonably foreseeable future projects, aside from the Project. The geographic extents of footprints for these projects are from publicly available sources, and their accuracy cannot be guaranteed; and
- There is limited knowledge of species and individual responses to disturbance and the relationship to potential population-level effects is not well understood.

15.7.4.2 Identifying Past, Present, and Reasonably Foreseeable Projects and/or Activities

Descriptions of the past, present, and reasonably foreseeable projects and/or activities for consideration in the cumulative effects assessment are provided in Chapter 5, Section 5.3.5.3.

Several past, present, and reasonably foreseeable future projects or activities are expected to interact with the bird VCs, which may result in a potential for adverse cumulative effects (Table 15.7-29). Maps showing the location of the past, present, and reasonably foreseeable future projects or activities are presented in Figure 5.3-4 to Figure 5.3-6 (Chapter 5).

As noted in Chapter 5, Section 5.3.5.3, the following projects were considered as past, present, or reasonably foreseeable future projects and/or activities in the cumulative effects assessment but were not included:

- Coal Mountain Phase 2, as the environmental assessment was placed on hold by Teck Coal Limited in 2016;
- Mount Brussilof (Baymag Mine) by Baymag, due to no temporal overlap;
- Barnes Lake Phosphate Exploration Project by Fertoz International Inc., given that the project is in exploration phase and no project has been proposed; and
- Cabin Ridge Coal by Warburton Group is in exploration and no project has been proposed.

15.7.4.3 Mitigation for Cumulative Effects

Cumulative effects can be reduced through minimizing local Project-related effects using the mitigation measures described for the Project (Section 15.7.3.3). It is assumed that other projects or activities in the region will also adopt similar measures.

Table 15.7-29: Project-Bird VC Interactions Matrix for Potential Cumulative Effects

Past, Present, or Reasonably Foreseeable Future Projects or Activities	Migratory Birds	Northern Goshawk	Bird Species at Risk	Waterbird Health	Justification / Rationale
Past or Present Projects and/or Activities that Have Been Carried Out					
Natural Resource Extraction – Mining (past)	I	I	I	I	Has occurred within the range of bird VCs and their habitat.
Coal Mountain Operations	III	III	III	III	Occurs within the range of bird VCs and their habitat.
Elkview Operations	III	III	III	III	Occurs within the range of bird VCs and their habitat.
Line Creek Operations	III	III	III	III	Occurs within the range of bird VCs and their habitat.
Fording River Operations	III	III	III	III	Occurs within the range of bird VCs and their habitat.
Greenhills Operations	III	III	III	III	Occurs within the range of bird VCs and their habitat.
Kootenay West Mine	III	III	III	III	Occurs within the range of bird VCs and their habitat.
Elkhorn Quarry West (Windermere Mining Operations)	III	III	III	III	Occurs within the range of bird VCs and their habitat.
Marten Phosphate Project	III	III	III	III	Occurs within the range of bird VCs and their habitat.
Energy - Elko Dam	III	III	III	III	Occurs within the range of bird VCs and their habitat.
Koocanusa Reservoir	III	III	III	I	Occurs within the range of bird VCs and their habitat.
Forestry	III	III	III	I	Occurs within the range of bird VCs and their habitat.
Energy - Pipelines	II	II	II	I	Occurs within the range of bird VCs and their habitat.
Energy - Electrical Transmission	II	II	II	I	Occurs within the range of bird VCs and their habitat.
Transportation	II	II	II	I	Occurs within the range of bird VCs and their habitat.
Recreation and Tourism	I	I	I	I	Occurs within the range of bird VCs and their habitat, though adverse effects are expected to be minimal or absent.
Commercial, Residential, and Industrial Use	II	II	II	I	Occurs within the range of bird VCs and their habitat.
Parks and Protected Areas	I	I	I	I	Occurs within the range of bird VCs and their habitat, though adverse effects are expected to be minimal or absent.

Past, Present, or Reasonably Foreseeable Future Projects or Activities	Migratory Birds	Northern Goshawk	Bird Species at Risk	Waterbird Health	Justification / Rationale
Agriculture	I	I	I	I	Occurs within the range of bird VCs and their habitat. Not all effects are adverse.
Natural Processes or Events	I	I	I	I	Magnitude of effect on bird VCs likely very small.
Reasonably Foreseeable Future Projects and/or Activities That Will Be Carried Out					
Michel Coal Project	III	III	III	III	Occurs within the range of bird VCs and their habitat.
Grassy Mountain Coal Project	III	III	III	III	Occurs within the range of bird VCs and their habitat.
Tent Mountain Mine	III	III	III	III	Occurs within the range of bird VCs and their habitat.
Fording River Extension Project	III	III	III	III	Occurs within the range of bird VCs and their habitat.
Bingay Main Project	III	III	III	III	Occurs within the range of bird VCs and their habitat.
Elan Hard Coking Coal Project	III	III	III	III	Occurs within the range of bird VCs and their habitat.
Climate Change	III	III	III	I	May affect habitat availability of all bird VCs
Natural Processes or Events	I	I	I	I	Magnitude of effect on bird VCs likely very small.

Notes:

I – Residual Project effects do not act cumulatively with those of other past, present, or reasonably foreseeable future projects and/or activities. Not carried forward in the assessment.

II – Residual Project effects act cumulatively with those of other past, present, or reasonably foreseeable future projects and/or activities, but are unlikely to result in significant cumulative effects; or residual Project effects act cumulatively with existing significant cumulative effects but the Project will not measurably contribute to these cumulative effects on the VC. Carried forward in the assessment.

III – Residual Project effects act cumulatively with those of other past, present, or reasonably foreseeable future projects and/or activities, and may result in significant cumulative effects; or residual Project effects act cumulatively with existing significant cumulative effects and the Project may measurably contribute to adverse changes in the state of the VC. Carried forward in the assessment.

Addressing cumulative effects often requires regional stakeholder involvement and government-led initiatives to implement effective management plans and monitoring programs. NWP will participate in regional initiatives, where relevant and appropriate, and will adopt new management practices and measures to meet regional planning objectives, where possible.

15.7.4.4 Potential Residual Cumulative Effects

15.7.4.4.1 Assessment Methods

The assessment of potential cumulative effects on bird VCs was characterized using a combination of quantitative methods and qualitative discussions. Quantitative methods were used to measure habitat loss and degradation. Qualitative discussions are based on scientific literature, baseline studies, habitat models, and professional judgment and were used to characterize sensory disturbance.

Habitat loss and degradation was measured by calculating the loss of high-quality habitat within the Birds, Bats, and Amphibians RSA for the Base Case, the Project Case, and the Future Case. High-quality habitat was defined as areas with high and very high habitat suitability as determined by habitat suitability mapping.

The habitat suitability mapping for each species used for the Project and Future Cases is the same as used for the Base Case. Ecosystems change over time through natural successional processes (e.g., forest regrowth) and natural disturbance regimes (e.g., fire). Habitat suitability for any given wildlife species will therefore also change over time. For the purposes of the assessment of cumulative effects, the assumption is that while ecosystems are dynamic, the general amount and distribution of ecosystems (and therefore suitable habitat for any given wildlife species) in the Birds, Bats, and Amphibians RSA is approximately the same for the Base, Project, and Future Cases, aside from habitat losses from the reasonably foreseeable future projects and activities that are included in the Future Case. Reasonably foreseeable future projects and activities were assumed to result in complete removal of suitable wildlife habitat. This is a conservative approach, as some activities will not result in complete loss of habitat (e.g., cutblocks provide food resources for some species) and some physical disturbance footprints are restored over time (e.g., mine reclamation).

For sensory disturbance, ground vibration from rail was not expected to have a significant impact on wildlife (see Chapter 7) and vibration from blasting greater than the threshold level of 10 mm/s is not expected to extend beyond the pits. For the remaining types of sensory disturbance, the effect of noise extends greater distances than the effect of dust, light, and human presence. The focus of the assessment of residual cumulative effects of sensory disturbance is therefore on noise.

For the assessment of Project effects of noise, a quantitative approach was used. A fully quantitative approach could not be used for the cumulative effects of sensory disturbance because of the difficulty in assigning zones of influence or avoidance to all other reasonably foreseeable future projects or activities when design details are not available. A qualitative approach was therefore used.

The methods used to assess cumulative effects to waterbird health (under aquatic health) are described in Section 22.6 of the Human and Ecological Health Assessment.

15.7.4.4.2 Migratory Birds

Many present and future projects and activities occur within the distributional range of key migratory bird species including Olive-sided Flycatcher, woodpeckers, and Barn Swallow that are the focus of the migratory bird assessment, as well as in suitable habitat. The residual effects of habitat loss and degradation and sensory disturbance could potentially have a cumulative effect on migratory birds.

Characterization of Residual Cumulative Effects

Habitat Loss and Degradation

For the characterization of Project effects, migratory bird habitat loss and degradation was measured in two ways: (1) by calculating the loss of high-quality habitat within the Project footprint for the species where habitat suitability models were completed (Olive-sided Flycatcher and woodpeckers) and (2) for bird habitat guilds using the change in ecosystem abundance within the Landscapes and Ecosystems LSA. Ecosystem abundance is not available for the Bird, Bats and Amphibians RSA. The bird habitat guild approach used for the Project effects can therefore not be use for the Cumulative Effects Assessment. For the purposes of the cumulative effects assessment, it is assumed that the cumulative effects to bird guilds are of a similar range and magnitude to the species where habitat modelling was completed withing the Birds, Bats and Amphibians RSA, specifically Olive-sided Flycatcher and woodpeckers.

Several present and reasonably foreseeable future projects and activities occur within the range of Olive-sided flycatcher and woodpeckers and in potentially suitable habitat and thus may result in loss or alteration of migratory bird habitat (Figure 15.7-29 and Figure 15.7-30). The Base Case incorporates the cumulative loss or alteration of migratory bird habitat as a result of past and present projects and was the basis for the assessment of the Project Case. For the Future Case that includes both the Project and all other reasonably foreseeable future projects and activities, approximately 9.7% of high-quality Olive-sided Flycatcher habitat is predicted to be lost within the Birds, Bats, and Amphibians RSA (Table 15.7-30). The Project is predicted to contribute 0.23% of that habitat loss. Approximately 9.0% of high-quality woodpecker habitat is predicted to be lost with the Birds, Bats, and Amphibians RSA; the Project is predicted to contribute 0.02% of that loss.

Table 15.7-30: Change in High-Quality Migratory Bird Habitat for the Base Case, the Project Case, and the Future Case in the Birds, Bats, and Amphibians RSA

VC	Season	Amount (ha) of High-Quality Habitat (Change from Base Case in Brackets)			Change as Proportion of Birds, Bats, and Amphibians RSA	
		Base Case	Project Case	Future Case	Base Case to Project Case	Base Case to Future Case
Olive-sided Flycatcher	Spring-Summer	7,113	7,097 (-16)	6,424 (-689)	-0.23%	-9.7%
Woodpeckers	Spring-Summer	189,557	189,526 (-30)	172,562 (-16,995)	-0.02%	-9.0%

Crown Mountain Coking Coal Project

Figure 15.7-29
High-Quality Olive-sided Flycatcher Spring-Summer Habitat and Reasonably Foreseeable Future Projects and Activities in the Birds, Bats, and Amphibians Regional Study Area

LEGEND

- High-Quality Olive-sided Flycatcher Spring-Summer Habitat
- Reasonably Foreseeable Future Projects and Activities
- Birds/Bats/Amphibians Regional Study Area
- Terrestrial Local Study Area
- Crown Mountain Coking Coal Project
- Highway
- Railway
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- National Park
- British Columbia/ Alberta Border

0 10 20
Kilometres

Scale 1:600,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Keefer Ecological Services Ltd, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada.
Imagery Provided By ESRI.

Map Created By: LMM
Map Checked By: HEB
Map Coordinate System: NAD 1983 UTM Zone 11N

NWP Coal Canada Ltd

Project: 12-6231
Status: FINAL
Date: 2022-01-18

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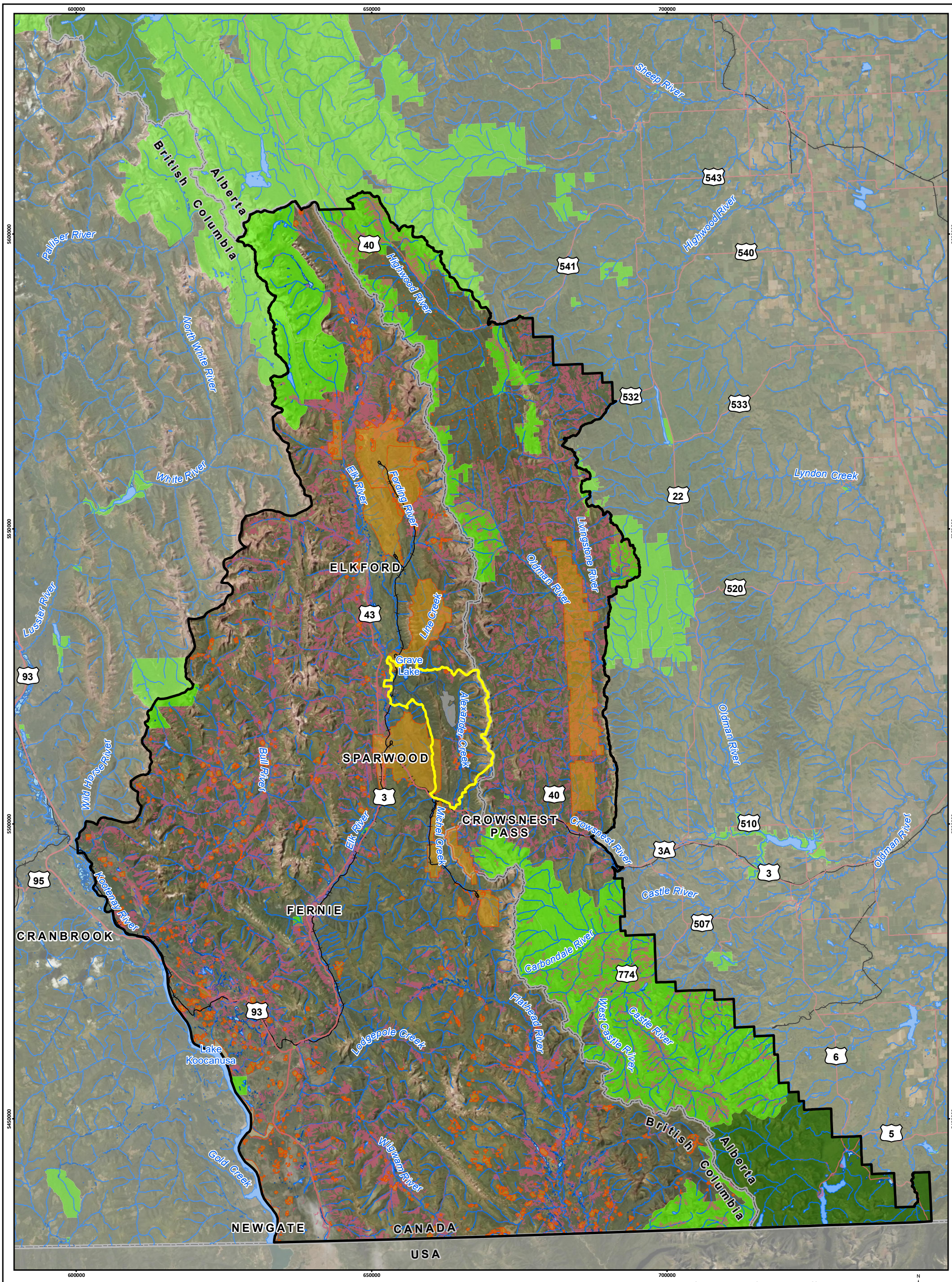

Crown Mountain Coking Coal Project

Figure 15.7-30
High-Quality Woodpecker Spring-Summer Habitat and Reasonably Foreseeable Future Projects and Activities in the Birds, Bats, and Amphibians Regional Study Area

LEGEND

- High-Quality Woodpecker Spring-Summer Habitat
- Reasonably Foreseeable Future Projects and Activities
- Birds/Bats/Amphibians Regional Study Area
- Terrestrial Local Study Area
- Crown Mountain Coking Coal Project
- Highway
- Railway
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- National Park
- British Columbia/ Alberta Border

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Kilometres

Scale 1:600,000

N W E S

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The residual cumulative effect to migratory birds from habitat loss and degradation arising from the effects of the Project in combination with those of other past, present, and reasonably foreseeable future projects and activities is characterized as follows:

- Duration: *Long-term to permanent*, depending on the species. Habitat for Olive-sided Flycatcher and other migratory birds of open habitats will be at least partly restored prior to the end of Reclamation and Closure. Habitat for woodpeckers and other forest-dependent migratory birds will not be restored prior to the end of Reclamation and Closure, as some lost habitat will be restored prior to the end of the Post-Closure phase and the remainder not restored until forest is established after the Post-Closure phase.
- Magnitude: *Moderate*, up to 9.7% of high-quality habitat for Olive-sided Flycatcher in the spring and summer will be lost in the Birds, Bats, and Amphibians RSA due to the development of the Project and other reasonably foreseeable future projects or activities. Up to 9.0% of high-quality spring-summer habitat for woodpeckers will be lost in the Birds, Bats, and Amphibians RSA. The Project contribution to these losses in the Bird, Bats, and Amphibians RSA is expected to be 0.23% and 0.02% for Olive-sided Flycatcher and woodpeckers, respectively.
- Geographic Extent: *Regional*, as the effect of habitat loss of the Future Case will be in the Birds, Bats, and Amphibians RSA.
- Frequency: *Continuous*, the effect of habitat loss and degradation is expected to be continuous until lost habitat is restored.
- Reversibility: *Irreversible to Reversible long-term*, depending on the species and their habitat requirements. Forest cover will not be restored prior to the end of Reclamation and Closure.
- Context: *Neutral* for Olive-sided Flycatcher and *Low context* for woodpeckers due to their dependence on dead and decaying trees associated with older forests.

Sensory Disturbance

Many present and reasonably foreseeable future projects and activities generate noise, light, vibration, and dust, which may affect suitable migratory bird habitat. A quantitative approach could not be used for the cumulative effects of sensory disturbance because of the difficulty in assigning zones of influence or avoidance to other reasonably foreseeable future projects or activities when design details (and the resulting noise, vibration, light, and dust) of those other projects or activities are not available. All other reasonably foreseeable future projects and activities included in the Future Case are either new coal mines or coal mine expansions. The effect of sensory disturbance is highly dependent on the distribution of migratory bird habitat, project activities, and on topography and land cover; however, it may be reasonable to use the results of the Crown Mountain Coking Coal Project-level sensory disturbance analysis for migratory birds (Section 15.7.3.5.2) as an indication of the amount of migratory bird habitat that may be affected by noise from other reasonably foreseeable future projects or activities. The Project-level sensory disturbance analysis for migratory birds found that the area potentially affected by continuous noise outside the Project footprint is up to 37% of the amount of high-quality Olive-sided Flycatcher and 32% of the amount of high-quality woodpecker habitat. If these proportional estimates are applied to the proportional loss of high-quality habitat for the Future Case (presented in the previous section in Table 15.7-25), then roughly 3.6% of high-quality Olive-sided Flycatcher habitat and 2.9% high-quality woodpecker habitat in the Birds, Bats, and Amphibians RSA will be affected by sensory disturbance outside of the project footprints. This may be an overestimate, as sensory disturbance is not generated continuously from all portions of any given project area, and not all projects are likely to be generating noise in overlapping time periods.

The residual cumulative effect to migratory birds from sensory disturbance arising from the effects of the Project in combination with those of other past, present, and reasonably foreseeable future projects or activities is characterized as follows:

- Duration: *Long-term*, as sensory disturbance will continue through to the end of the Operations phases of both the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.
- Magnitude: *Low*, as up to 3.6% of high-quality habitat will be affected in the Birds, Bats, and Amphibians RSA.
- Geographic Extent: *Regional*, as the effect of sensory disturbance will be within the Birds, Bats, and Amphibians RSA.
- Frequency: *Continuous,* though at varying levels until the end of Operations phases of the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.
- Reversibility: *Reversible long-term*, the effect of noise will decline substantially at the end of the Operations phases of the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.
- Context: *Neutral,* as migratory birds may have some resilience to sensory disturbance and may adapt to effects.

Determination of Significance

Historical migratory bird abundance data for the Birds, Bats, and Amphibians RSA are not available. There is some evidence that disturbance activities in the Elk Valley have resulted in a net negative effect on Olive-sided Flycatcher habitat since the 1890s (Golder Associates, 2014). There is expected to be net incremental losses of up to 9.7% of high-quality migratory bird habitat (depending on the species) in the Bird, Bats, and Amphibians RSA due to habitat alteration through clearing and related activities as well as sensory disturbance for the Future Case. The Project contribution to these losses is expected to be small. Based on the characterization of the residual cumulative effects and regional migratory population levels, the Project in combination with other reasonably foreseeable future projects and activities would not limit the ability of migratory birds to persist and maintain self-sustaining populations in the Birds, Bats, and Amphibians RSA, including within Alberta and on federal lands located within the RSA. The residual cumulative effects of habitat loss and degradation and sensory disturbance on migratory birds arising from the Project in combination with other past, present, and reasonably foreseeable future projects and activities during all phases are therefore considered not significant.

Likelihood and Confidence

Effects that are determined to be not significant do not require a characterization of likelihood.

There is a good understanding of migratory bird ecology and their habitat availability and distribution, though moderate understanding of known occurrences and abundance in the Birds, Bats, and Amphibians RSA. The confidence in the determination of the significance of residual cumulative effects to migratory birds is therefore high.

15.7.4.4.3 Northern Goshawk

Many present and future projects and activities occur within the distributional range of Northern Goshawk and in suitable habitat. The residual effects of habitat loss and degradation and sensory disturbance could potentially have a cumulative effect on Northern Goshawk.

Characterization of Residual Cumulative Effects

Habitat Loss and Degradation

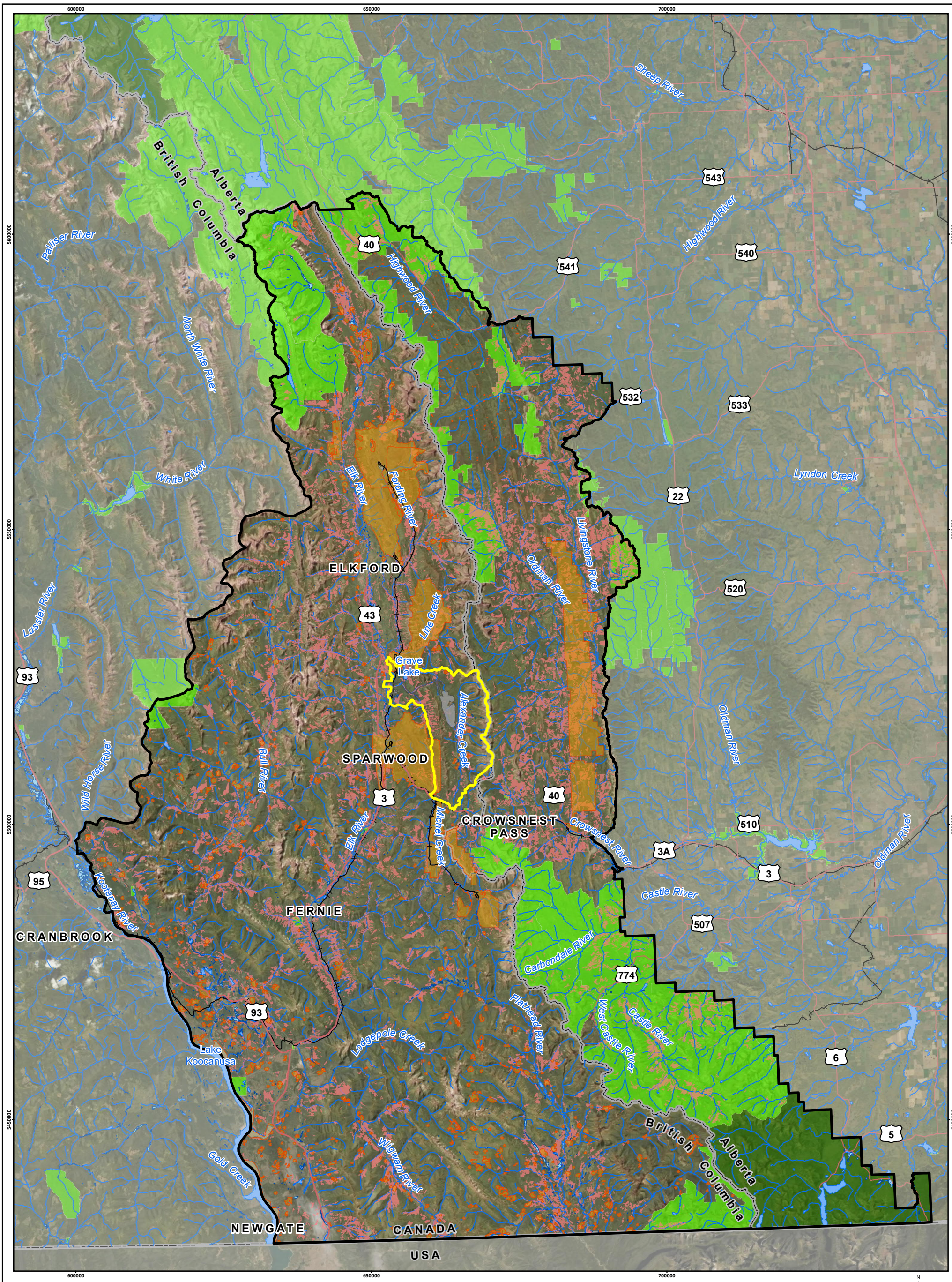
Most present and reasonably foreseeable future projects and activities occur within the range of Northern Goshawk and in potentially suitable habitat and thus may result in loss or alteration of Northern Goshawk habitat (Figure 15.7-31). The Base Case incorporates the cumulative loss or alteration of Northern Goshawk habitat as a result of past and present projects and was the basis for the assessment of the Project Case. For the Future Case that includes both the Project and other reasonably foreseeable future projects and activities, approximately 9.9% of high-quality spring-summer Northern Goshawk habitat is predicted to be lost within the Birds, Bats, and Amphibians RSA (Table 15.7-31). The Project is predicted to contribute 0.11% of that habitat loss.

Table 15.7-31: Change in High-Quality Northern Goshawk Habitat for the Base Case, the Project Case, and the Future Case in the Birds, Bats, and Amphibians RSA

VC	Season	Amount (ha) of High-Quality Habitat (Change from Base Case in Brackets)			Change as Proportion of Birds, Bats, and Amphibians RSA	
		Base Case	Project Case	Future Case	Base Case to Project Case	Base Case to Future Case
Northern Goshawk	Spring-Summer	153,258	153,095 (-162)	138,073 (-15,184)	-0.11%	-9.9%

The residual cumulative effect to Northern Goshawk from habitat loss and degradation arising from the effects of the Project in combination with those of other past, present, and reasonably foreseeable future projects and activities is characterized as follows:

- Duration: *Permanent*, as mature and old forest habitat for Northern Goshawk will not be restored until the forest is re-established after the Post-Closure phase.
- Magnitude: *Moderate*, up to 9.9% of high-quality habitat for Northern Goshawk in the spring and summer will be lost in the Birds, Bats, and Amphibians RSA due to the development of the Project and other reasonably foreseeable future projects or activities. The Project contribution to these losses in the Bird, Bats, and Amphibians RSA is expected to be 0.11%.
- Geographic Extent: *Regional*, as the effect of habitat loss of the Future Case will be in the Birds, Bats, and Amphibians RSA.
- Frequency: *Continuous*, the effect of habitat loss and degradation is expected to be continuous until lost habitat is restored.
- Reversibility: *Irreversible*, as mature and old forest habitat for Northern Goshawk will not be restored prior to the end of Reclamation and Closure.
- Context: *Low,* as changes in habitat availability and level of fragmentation are known to affect Northern Goshawk abundance.



Crown Mountain Coking Coal Project

Figure 15.7-31
High-Quality Northern Goshawk Spring-Summer Habitat and Reasonably Foreseeable Future Projects and Activities in the Birds, Bats, and Amphibians Regional Study Area

LEGEND

- High-Quality Northern Goshawk Spring-Summer Habitat
- Reasonably Foreseeable Future Projects and Activities
- Birds/Bats/Amphibians Regional Study Area
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0 10 20
Kilometres

N W E S

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Map Coordinate System: NAD 1983 UTM Zone 11N

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Sensory Disturbance

Many present and reasonably foreseeable future projects and activities generate noise, light, vibration, and dust, which may affect suitable Northern Goshawk habitat. A quantitative approach could not be used for the cumulative effects of sensory disturbance because of the difficulty in assigning zones of influence or avoidance to other reasonably foreseeable future projects or activities when design details (and the resulting noise, vibration, light, and dust) of those other projects or activities are not available. All other reasonably foreseeable future projects and activities included in the Future Case are either new coal mines or coal mine expansions. The effect of sensory disturbance is highly dependent on the distribution of Northern Goshawk habitat, project activities, and on topography and land cover; however, it may be reasonable to use the results of the Crown Mountain Coking Coal Project-level sensory disturbance analysis for Northern Goshawk (Section 15.7.3.5.3) as an indication of the amount of Northern Goshawk habitat that may be affected by noise from other reasonably foreseeable future projects or activities. The Project-level sensory disturbance analysis for Northern Goshawk found that the area potentially affected by continuous noise outside the Project footprint is up to 32% of the amount of high-quality Northern Goshawk habitat within the Project footprint. If these proportional estimates are applied to the proportional loss of high-quality habitat for the Future Case (presented in the previous section in Table 15.7-27), then roughly 3.1% of high-quality Northern Goshawk habitat in the Birds, Bats, and Amphibians RSA will be affected by sensory disturbance outside of the project footprints. This may be an overestimate, as sensory disturbance is not generated continuously from all portions of any given project area, and not all projects are likely to be generating noise in overlapping time periods.

The residual cumulative effect to Northern Goshawk from sensory disturbance arising from the effects of the Project in combination with those of other past, present, and reasonably foreseeable future projects or activities is characterized as follows:

- Duration: *Long-term*, as sensory disturbance will continue through to the end of the Operations phases of both the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.
- Magnitude: *Low*, as up to 3.1% of high-quality habitat will be affected in the Birds, Bats, and Amphibians RSA.
- Geographic Extent: *Regional*, as the effect of sensory disturbance will be within the Birds, Bats, and Amphibians RSA.
- Frequency: *Continuous,* though at varying levels until the end of Operations phases of the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.
- Reversibility: *Reversible long-term*, the effect of noise will decline substantially at the end of the Operations phases of the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.
- Context: *Neutral,* as Northern Goshawk may have some resilience to sensory disturbance and may adapt to effects.

Determination of Significance

Historical Northern Goshawk abundance data for the Birds, Bats, and Amphibians RSA are not available, and although there is some evidence that the Canadian population of Northern Goshawk has had little change since 1970, it is considered below the lowest acceptable level relative to its national population goal (ECCC, 2019b). Based on the characterization of the residual cumulative effects and regional

migratory population levels, the Project in combination with other reasonably foreseeable future projects and activities would not limit the ability of Northern Goshawk to persist and maintain self-sustaining populations in the Birds, Bats, and Amphibians RSA, including within Alberta and on federal lands located within the RSA. The residual cumulative effects of habitat loss and degradation and sensory disturbance on Northern Goshawk arising from the Project in combination with other past, present, and reasonably foreseeable future projects and activities during all phases are therefore considered not significant.

Likelihood and Confidence

Effects that are determined to be not significant do not require a characterization of likelihood.

There is a good understanding of Northern Goshawk ecology and their habitat availability and distribution, though moderate understanding of known occurrences and abundance in the Birds, Bats, and Amphibians RSA. The confidence in the determination of the significance of residual cumulative effects to Northern Goshawk is therefore moderate.

15.7.4.4.4 Bird Species at Risk

Many present and future projects and activities occur within the distributional range of Olive-sided Flycatcher, Barn Swallow, Common Nighthawk, and Evening Grosbeak. The residual effects of habitat loss and degradation and sensory disturbance could potentially have a cumulative effect on species at risk.

Characterization of Residual Cumulative Effects

Habitat Loss and Degradation

For the Future Case that includes both the Project and all other reasonably foreseeable future projects and activities, approximately 9.7% of high-quality Olive-sided Flycatcher habitat is predicted to be lost within the Birds, Bats, and Amphibians RSA (reported in Section 15.7.4.4.2). The Project is predicted to contribute 0.23% of that habitat loss. Calculations of habitat loss in the Birds, Bats, and Amphibians RSA for Barn Swallow, Common Nighthawk, and Evening Grosbeak were not estimated, as habitat suitability mapping was not completed for these species. Loss of habitat for Barn Swallow and Common Nighthawk would be expected for the Future Case; however, habitat may also be created, such as structures that provide nesting habitat and clearing that creates foraging habitat. Net loss of habitat for these species is expected to be low. Loss of habitat for Evening Grosbeak is expected for the Future Case, perhaps at a similar magnitude to woodpeckers (reported in Section 15.7.4.4.2), given their similar association with forested habitats.

The residual cumulative effect to bird species at risk from habitat loss and degradation arising from the effects of the Project in combination with those of other past, present, and reasonably foreseeable future projects and activities is characterized as follows:

- Duration: *Long-term to permanent*, depending on the species. Habitat for Olive-sided Flycatcher, Barn Swallow and Common Nighthawk will be at least partly restored prior to the end of Reclamation and Closure. Habitat for Evening Grosbeak and other forest-dependent migratory birds will not be restored prior to the end of Reclamation and Closure, as some lost habitat will be restored prior to the end of the Post-Closure phase and the remainder not restored until forest is established after the Post-Closure phase.

- Magnitude: *Moderate*, up to 9.7% of high-quality habitat for Olive-sided Flycatcher in the spring and summer will be lost in the Birds, Bats, and Amphibians RSA due to the development of the Project and other reasonably foreseeable future projects or activities. The Project contribution to these losses in the Bird, Bats, and Amphibians RSA is expected to be 0.23% and for Olive-sided Flycatcher. Habitat loss for Barn Swallow, Common Nighthawk, and Evening Grosbeak was not quantified but also estimated to be Moderate.
- Geographic Extent: *Regional*, as the effect of habitat loss of the Future Case will be in the Birds, Bats, and Amphibians RSA.
- Frequency: *Continuous*, the effect of habitat loss and degradation is expected to be continuous until lost habitat is restored.
- Reversibility: *Irreversible to Reversible long-term*, depending on the species and their habitat requirements. Forest cover will not be restored prior to the end of Reclamation and Closure.
- Context: *Neutral* as they are able to utilize disturbed landscapes.

Sensory Disturbance

Approximately 3.6% of high-quality Olive-sided Flycatcher habitat in the Birds, Bats, and Amphibians RSA may be affected by sensory disturbance outside of the project footprints (see Section 15.7.4.4.2). This may be an overestimate, as sensory disturbance is not generated continuously from all portions of any given project area, and not all projects are likely to be generating noise in overlapping time periods.

The residual cumulative effect to bird species at risk from sensory disturbance arising from the effects of the Project in combination with those of other past, present, and reasonably foreseeable future projects or activities is characterized as follows:

- Duration: *Long-term*, as sensory disturbance will continue through to the end of the Operations phases of both the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.
- Magnitude: *Low*, as up to 3.6% of high-quality Olive-sided Flycatcher habitat will be affected in the Birds, Bats, and Amphibians RSA. Habitat loss for Barn Swallow, Common Nighthawk, and Evening Grosbeak was not quantified but estimated also to be Low.
- Geographic Extent: *Regional*, as the effect of sensory disturbance will be within the Birds, Bats, and Amphibians RSA.
- Frequency: *Continuous,* though at varying levels until the end of Operations phases of the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.
- Reversibility: *Reversible long-term*, the effect of noise will decline substantially at the end of the Operations phases of the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.
- Context: *Neutral,* as these species may have some resilience to sensory disturbance and may adapt to effects.

Determination of Significance

Historical Olive-sided Flycatcher, Evening Grosbeak, Barn Swallow, and Common Nighthawk abundance data for the Birds, Bats, and Amphibians RSA are not available, though there is some evidence that disturbance activities in the Elk Valley have resulted in a net negative effect on Olive-sided Flycatcher

habitat since the 1890s (Golder Associates, 2014). There is expected to be net incremental losses of up to 9.7% of high-quality migratory bird habitat (depending on the species) in the Bird, Bats, and Amphibians RSA due to habitat alteration through clearing and related activities as well as sensory disturbance for the Future Case. The Project contribution to these losses is expected to be small. Based on the characterization of the residual cumulative effects, the Project in combination with other reasonably foreseeable future projects and activities would not limit the ability of bird species at risk to persist and maintain self-sustaining populations in the Birds, Bats, and Amphibians RSA, including within Alberta and on federal lands located within the RSA. The residual cumulative effects of habitat loss and degradation and sensory disturbance on bird species at risk arising from the Project in combination with other past, present, and reasonably foreseeable future projects and activities during all phases are therefore considered not significant.

Likelihood and Confidence

Effects that are determined to be not significant do not require a characterization of likelihood.

There is a moderate understanding of bird species at risk ecology and their habitat availability and distribution, and moderate understanding of known occurrences and abundance in the Birds, Bats, and Amphibians RSA. The confidence in the determination of the significance of residual cumulative effects to bird species at risk is therefore moderate.

15.7.4.4.5 Waterbird Health

The non-significant residual effects to waterbird health could combine with other past, present, and reasonably foreseeable project and have a cumulative effect on waterbird health.

Characterization of Residual Cumulative Effects

The results for the cumulative case for waterbirds and selenium are similar to those reported for Project effects: there are no risk estimates in exceedance of the target threshold. Further details are provided in Section 22.6.6.2 of the Human and Ecological Health Assessment.

The residual cumulative effect to waterbird health is characterized as follows:

- Duration: *Long-term*, as the potential effect of could extend through the Operations phase to the end of reclamation.
- Magnitude: *Negligible*, as there are no risk estimates in exceedance of the target threshold.
- Geographic Extent: *Local*, as the risk will be outside the Project footprint and within the Terrestrial LSA.
- Frequency: *Continuous,* though at varying potential levels.
- Reversibility: *Reversible long-term*, the effect will decline substantially at the end of Operations and continue at lower levels during Reclamation and Closure.
- Context: *Low,* as waterbirds have low resilience to the effects of selenium.

Determination of Significance

The residual cumulative effects to waterbird health are considered to be not significant.

Likelihood and Confidence

Residual cumulative effects that are determined to be not significant do not require a characterization of likelihood. The confidence in the determination of significance for aquatic health was assessed and moderate. The confidence in the determination of significance for waterbird health is therefore also assessed as moderate.

15.7.4.4.6 Summary of Cumulative Effects

Residual cumulative effects and the selected mitigation measures, characterization criteria, significance determination, likelihood, and confidence for bird VCs are summarized in Table 15.7-32.

15.7.5 Follow-up Strategy

A follow-up program is used to verify environmental effects predictions or to verify the effectiveness of mitigation measures where there is uncertainty (i.e., low to moderate confidence). Where environmental effects exceed that predicted under the effects assessment, or mitigation measures prove to be ineffective, alternative strategies are developed to adaptively manage the Project's effects on wildlife VCs.

Wildlife monitoring outlined in the Wildlife Management and Monitoring Plan (Chapter 33, Section 33.4.1.13) to support the verification of mitigation measures and effects predictions relating to bird VCs will include:

- For raptors that may nest earlier in the season (as early as March 15), pre-disturbance stick-nest surveys will be conducted;
- If limited vegetation clearing during the general nesting period for most migratory birds in the region (April 13 to August 19) is unavoidable, breeding bird point counts will be conducted to determine the potential presence of breeding birds;
- Monitoring of footprint and habitat losses/gains to track and compare the planned footprint with the actual footprint and to track ecological restoration;
- Recording and monitoring of use of Project infrastructure by birds; and
- Monitoring of species occurrence at the local level by Project personnel documenting incidental observations of wildlife (i.e., wildlife sighting and incidents).

15.7.6 Summary and Conclusions

Migratory birds (as represented by Olive-sided Flycatcher, Barn Swallow, woodpeckers, and migratory bird guilds), Northern Goshawk, and bird species at risk were selected as wildlife VCs. Bird species at risk included Olive-sided Flycatcher, Barn Swallow, Common Nighthawk and Evening Grosbeak. Effects to waterbird health (as represented by Mallard, Harlequin Duck, Red-winged Blackbird, American Dipper, and Spotted Sandpiper) were also included because of their inclusion under the aquatic health VC for the Human and Ecological Health Assessment (Chapter 22). The potential effects of the Project on bird VCs were considered to be habitat loss and degradation, sensory disturbance, increased mortality risk, and waterbird health. Various mitigation measures will avoid or minimize potential effects to bird VCs, though potential residual effects may remain. These residual effects were determined to be not significant. The residual cumulative effects of habitat loss and degradation, sensory disturbance, and waterbird health arising from the Project in combination with other past, present, and reasonably foreseeable future projects and activities were considered not significant.

Table 15.7-32: Summary of Cumulative Effects on Bird VCs

Valued Component	Residual Cumulative Effect	Mitigation Measures	Summary of Cumulative Residual Effects Characterization	Significance (Significant, Not Significant)	Confidence (High, Moderate, Low)
Migratory Birds	Habitat Loss and Degradation	• Minimizing local Project-related effects • Participate in regional initiatives, where relevant and appropriate, and adoption of new management practices and measures to meet regional planning objectives, where possible	Duration: Long-term to permanent Magnitude: Moderate Geographic Extent: Regional Frequency: Continuous Reversibility: Irreversible to reversible long-term Context: Neutral (Olive-sided Flycatcher, Common Nighthawk, and Evening Grosbeak); Low (woodpeckers)	Not Significant	High
Migratory Birds	Sensory Disturbance	• Minimizing local Project-related effects • Participate in regional initiatives, where relevant and appropriate, and adoption of new management practices and measures to meet regional planning objectives, where possible	Duration: Long-term Magnitude: Low Geographic Extent: Regional Frequency: Continuous Reversibility: Reversible long-term Context: Neutral		
Northern Goshawk	Habitat Loss and Degradation	• Minimizing local Project-related effects • Participate in regional initiatives, where relevant and appropriate, and adoption of new management practices and measures to meet regional planning objectives, where possible	Duration: Permanent Magnitude: Moderate Geographic Extent: Regional Frequency: Continuous Reversibility: Irreversible Context: Low	Not Significant	Moderate

Valued Component	Residual Cumulative Effect	Mitigation Measures	Summary of Cumulative Residual Effects Characterization	Significance (Significant, Not Significant)	Confidence (High, Moderate, Low)
Northern Goshawk	Sensory Disturbance	• Minimizing local Project-related effects • Participate in regional initiatives, where relevant and appropriate, and adoption of new management practices and measures to meet regional planning objectives, where possible	Duration: Long-term Magnitude: Low Geographic Extent: Regional Frequency: Continuous Reversibility: Reversible long-term Context: Neutral		
Bird Species at Risk	Habitat Loss and Degradation	• Minimizing local Project-related effects • Participate in regional initiatives, where relevant and appropriate, and adoption of new management practices and measures to meet regional planning objectives, where possible	Duration: Permanent Magnitude: Low Geographic Extent: Regional Frequency: Continuous Reversibility: Irreversible Context: Neutral	Not Significant	Moderate
	Sensory Disturbance	• Minimizing local Project-related effects • Participate in regional initiatives, where relevant and appropriate, and adoption of new management practices and measures to meet regional planning objectives, where possible	Duration: Long-term Magnitude: Low Geographic Extent: Regional Frequency: Continuous Reversibility: Reversible long-term Context: Neutral		

Valued Component	Residual Cumulative Effect	Mitigation Measures	Summary of Cumulative Residual Effects Characterization	Significance (Significant, Not Significant)	Confidence (High, Moderate, Low)
Waterbird Health	Selenium Risk	• Minimizing local Project-related effects • Participate in regional initiatives, where relevant and appropriate, and adoption of new management practices and measures to meet regional planning objectives, where possible	Duration: Long-term Magnitude: Negligible Geographic Extent: Local Frequency: Continuous Reversibility: Reversible long-term Context: Low	Not Significant	Moderate

Follow-up monitoring is to include pre-clearing raptor stick nest surveys, pre-clearing breeding bird surveys (if limited clearing is required during the general nesting period), and footprint and facility monitoring.

15.8 Amphibian Community

Five species of amphibians have been documented within the Elk Valley: Columbia spotted frog (*Rana luteiventris*), long-toed salamander (Ambystoma macrodactylum), northern Pacific treefrog (*Pseudacris regilia*), western toad (*Anaxyrus boreas*), and wood frog (*Lithobates sylvaticus*; B.C. CDC, 2020a). The Rocky Mountain tailed frog (*Ascaphus montanus*) has the potential to occur in the Elk Valley (B.C. CDC, 2020a), but this species is known to occur in the extreme southeast of B.C. with populations restricted to the Flathead River and Yahk River watersheds (Environment Canada, 2015), approximately 50 km south of the Project. The northern leopard frog (*Lithobates pipiens*) was previously present in the area but is presumed to be locally extirpated since the 1980s (B.C. CDC, 2016a).

Western toad was selected as a wildlife community VC (EAO, 2018) as being representative of other amphibian VCs (i.e., long-toed salamander, northern Pacific treefrog, and wood frog). The AIR (EAO, 2018) identified amphibians within the RSA (represented by Columbia Spotted Frog) as a VC under aquatic health. Aquatic health is assessed as part of the Human and Ecological Health Assessment (Chapter 22). The aquatic health components included in the human and ecological health assessment are waterbirds, benthic invertebrates, fish species and amphibians. The assessment of residual project effects and cumulative effects to the aquatic health components are conducted for all aquatic health components combined. Since amphibians are a specific VC under aquatic health, it is important for conformity to the AIR that an effects assessment specifically for amphibians of the RSA (as represented by Columbia spotted frog) be included. Project and cumulative effects to amphibians of the RSA are therefore included under the amphibian community VCs.

15.8.1 Introduction

15.8.1.1 Western Toad

Western toad is listed as Special Concern under Schedule 1 of the federal *Species at Risk Act* (2002) and the species is divided two designatable units: non-calling and calling populations. The calling population occurs mainly to the east of the Rocky Mountains, while the non-calling population occurs to the west (Pauly, 2008). The populations are distinguishable by the presence (calling) or absence (non-calling) of a vocal sac and production of a true breeding advertisement call in males (Pauly, 2008; COSEWIC, 2012c). Western toad is provincially Yellow-listed in B.C., and the International Union for Conservation of Nature Red List of Threatened Species (IUCN Red List) assessed western toad as Least Concern in 2015, with a decreasing global population trend (IUCN SSC Amphibian Specialist Group [IUCN], 2015a).

15.8.1.1.1 Habitat Requirements

Western toads inhabit a variety of aquatic and terrestrial environments throughout their lifecycle (COSEWIC, 2012c; ECCC, 2020) and are found at elevations ranging from sea level to greater than 3,000 m above mean sea level (amsl) (B.C. CDC, 2010b). Western toads demonstrate fidelity to breeding sites, foraging sites, and possibly hibernation sites throughout their home ranges (Browne and Paszkowski, 2010a). Home range size varies from less than 0.1 ha up to nearly 25 ha (Davis, 2000; Muths, 2003), and

season movements vary by sex. Females have been observed to migrate up to 2.3 km from their breeding pond during the summer foraging season, while males typically travel shorter distances (Muths, 2003). Toadlets can travel up to 2.7 km from breeding sites within eight weeks of metamorphosis by using drainages as dispersal corridors (Bull, 2009).

Typical breeding sites include shallow, sandy margins of lakes, ponds, streams, rivers, and geothermal springs (Jones et al. 2005; COSEWIC, 2012c). Western toads have also been observed breeding in anthropogenic waterbodies including ditches, road ruts, tailings ponds, and borrow pits (Stevens et al., 2006; COSEWIC, 2012c). Breeding occurs in water depths up to 2 m, but shallow water less than 1 m is preferred (Corn, 1998). Western toads prefer permanent waterbodies over ephemeral wetted areas and can be found in ponds with higher daytime temperatures and dissolved oxygen levels, which facilitate tadpole growth (Browne et al., 2009).

After breeding, adults may remain and forage in adjacent marshes or riparian edges of breeding sites, or they may travel up to 30 km to other wetlands, riparian areas along streams, or upland sites such as forests, meadows, shrub lands, or subalpine or alpine meadows (COSEWIC, 2012c). Western toads also inhabit clearcuts and clearcut edges, depending on desiccation risk (Ward and Chapman, 1995; Davis, 2000). COSEWIC (2012c) notes that adults have been observed using grass/dirt roads and seismic lines to disperse. Western toads seek overhead cover such as shrubs, dense herb layers, coarse woody debris, boulders, and mammal burrows, likely for protection from desiccation and predation (Davis, 2000; Bartelt et al., 2004; COSEWIC, 2012c). They may also dig shallow scrapes or burrows in loose soils or sand.

Western toads hibernate underground below the frost line in areas with sufficient moisture to prevent desiccation, such as peat hummocks, squirrel middens, cavities under trees, decayed root tunnels, abandoned beaver lodges, and small mammal tunnels (Browne and Paskowski, 2010a; COSEWIC, 2012c; ECCC, 2020). Hibernation may be communal in some areas (Browne and Paszkowski, 2010b), but characteristics of hibernation sites are not well understood (Provincial Western Toad Working Group, 2014). Hibernation sites range from approximately 150 m to 2 km from breeding sites (Browne and Paskowski, 2010a).

Adults are predators of ground-dwelling invertebrates and prey of mammals, birds, and snakes, despite the toad's ability to excrete toxins from their parotoid gland when stressed (COESWIC, 2012c). Larvae consume aquatic algae and detritus. Western toad eggs and tadpoles are consumed by birds, snakes, and invertebrates (COSEWIC, 2012c).

15.8.1.1.2 Life History

Breeding occurs in warm, temporary and permanent ponds and shallow littoral zones of lakes, often with silty or sandy bottoms, between late April to late May depending on latitude and elevation (COSEWIC, 2012c). Western toad exhibit breeding site fidelity (Bull and Carey, 2008) and use an aggregate breeding strategy during which large numbers of adults aggregate at a breeding site during a one-to-two-week period. A single female can produce 5,000 to 15,000 eggs per breeding season (COSEWIC, 2002). Tadpoles often form dense aggregations in shallow, warm water, develop rapidly, and metamorphose within three months of egg-laying (ECCC, 2020). Upon metamorphosis, western toads will form dense aggregations along the shorelines of lakes and ponds and migrate *en masse* towards terrestrial foraging areas, a process called emergence (ECCC, 2020).

Tadpoles mature to juveniles in four to twelve weeks, with males reaching maturity in three to four years and females reaching maturity in four to six years (COSEWIC, 2012c). Western toad can live for more than ten years (COSEWIC, 2012c). Breeding is an energy intensive process and adults may not breed every year.

15.8.1.1.3 Mortality

Western toad life history traits, including infrequent breeding, high breeding fidelity, communal breeding and hibernations, extensive movements, and large aggregations during emergence, make the species vulnerable to several anthropogenic threats (ECCC, 2020). The main threats to both calling and non-populations of western toad include habitat loss, fragmentation, and road mortality caused by transportation and service corridors; industrial and urban development; invasive species; and fungal infections with the amphibian chytrid fungus (*Batrachochytrium dendrobatidis*; COSEWIC, 2012c). Other threats include forestry activities, pollution (i.e., pesticides and herbicides, fertilizers, and road salt), and climate change (ECCC, 2020). The persistence of local populations depends on high adult survival rates, so threats that impact adult western toad may have the most pronounced effects of population health (COSEWIC, 2002). Local and regional population persistence also depend on breeding site distribution and connectivity (COSEWIC, 2012c).

15.8.1.2 Columbia Spotted Frog

Columbia spotted frog are one of the most commonly observed amphibians in B.C., designated as Not at Risk under the *Species at Risk Act* (2002) and provincially Yellow-listed in B.C. (B.C. CDC, 2004). The IUCN assessed Columbia spotted frog as Least Concern, with a decreasing global population trend in 2015 (IUCN, 2015b).

15.8.1.2.1 Habitat Requirements

Columbia spotted frog are highly aquatic and generally associated with permanent water sources, usually with abundant aquatic vegetation, such as slow-moving streams, rivers, and wetlands from sea level to over 3,000 m asl (James, 1998; Stebbins, 2003). Adults may move considerable distances following breeding, but generally prefer ponds or quiet water in subalpine forests, grasslands, and brushlands (Stebbins, 2003). Preferred Columbia spotted frog breeding habitat in the Rocky Mountains is generally in shallow permanent pools (James, 1998) and is often similar to western toad breeding pond preferences (Salt, 1979). Overwintering may occur underwater and has been observed in breeding ponds (Roberts, 1992; Leonard et al., 1996).

Although strongly associated with waterbodies for most of their lifecycle, Columbia spotted frog undergo significant migrations overland in the spring and late summer between breeding, foraging, and overwintering locations. Adults have been observed to disperse into forest, grassland, and shrub-dominated areas during wet weather and traverse to uplands to reach wintering sites (B.C. CDC, 2004). Though movements of up to 6.5 km have been recorded, this species generally stays in wetlands and along streams within 1 km of their breeding pond (Bull and Hayes, 2001; Pilliod et al., 2002) and individuals in isolated ponds may not leave those sites (Bull and Hayes, 2001). Columbia spotted frog are opportunistic and adults consume a wide variety of insects, molluscs, crustaceans, and arachnids, while larvae consume algae, organic debris, plant tissue, and planktonic organisms (B.C. CDC, 2004).

15.8.1.2.2 Life History

Columbia spotted frog breeding occurs in early spring, generally as soon as winter thaw permits (B.C. CDC, 2004). Females lay eggs in spherical masses containing 700 to 1,500 eggs in shallow water, sometimes communally, and the eggs hatch between 3 to 21 days later (Corkran and Thomas, 1996; B.C. CDC, 2004). Metamorphosis generally happens in the fall but tadpoles may overwinter and metamorphose the following spring (Logier, 1932; B.C. CDC, 2004). Time until sexual maturity depends on location and elevation, but usually occurs in two to six years (B.C. CDC, 2004). Females have been observed to breed every year at low elevations, and every two to three years at higher elevations (Nussbaum et al., 1983).

15.8.1.2.3 Mortality

Population level threats to Columbia spotted frog include predation by introduced species (e.g., rainbow trout [*Oncorhynchus mykiss*]; Pilliod and Peterson, 1997); habitat loss through urbanization and development (James, 1998); highway salting (hinders spring emergence and larval development; Morris and Tanner, 1969); and habitat disturbance through human activities including automobile and foot traffic, contaminated surface runoff, and impacts associated with development (Hapeman, 1995).

15.8.1.3 Regulatory and Policy Considerations

All native amphibian species in B.C. are protected under the provincial *Wildlife Act* (1996). Consequently, any development project located in or near amphibian habitat needs to implement measures to protect amphibians. The Government of B.C. has put forth a number of guidance documents related to amphibians, including *Best Management Practices for Amphibians and Reptiles in Urban and Rural Environments in British Columbia* (Ovaska *et al,* 2004) and *Guidelines for Amphibian and Reptile Conservation during Urban and Rural Land Development in British Columbia* (FLNRO, 2014b).

Both the federal and provincial governments have developed management plans for western toad populations in western Canada and B.C.: the *Management Plan for the Western Toad (Anaxyrus boreas), Calling and Non-calling populations, in Canada* (ECCC, 2020) *and Management Plan for the Western Toad (Anaxyrus boreas) in British Columbia* (Provincial Western Toads Working Group, 2014). The federal management objective outlined in the *Management Plan for the Western Toad (Anaxyrus boreas), Calling and Non-calling populations, in Canada* is to maintain stable or increasing populations throughout the species' present range in Canada (ECCC, 2020). Federal management strategies for western toad include identifying, securing, and mitigating threats to regionally important breeding sites and surrounding terrestrial habitats; research and monitoring; and outreach and stewardship initiates (ECCC, 2020).

The B.C. Conservation Framework ranks western toad as priority 2 under goal 2 (prevent species and ecosystems from becoming at risk) and as priority 3 under goal 1 (contribute to global efforts for species and ecosystem conservation; Provincial Western Toads Working Group, 2014). The provincial management strategy (Provincial Western Toads Working Group, 2014) aims to maintain stable or increasing populations throughout the species' present range in B.C. Management objectives include identifying regionally important breeding sites, identifying threats to western toad breeding sites, and mitigating high to moderate potential impacts to these areas (Provincial Western Toads Working Group, 2014).

15.8.2 Existing Conditions

This section describes the existing conditions of western toad and Columbia spotted frog in the Terrestrial LSA and Birds, Bats, and Amphibians RSA in sufficient detail to enable potential effects of the Project on amphibians to be identified, understood, and assessed.

15.8.2.1 Existing Regional and Local Information

Existing local and regional information for western toad and Columbia spotted frog were compiled by conducting a desktop assessment of background information for habitat availability, occurrence distribution, abundance, and connectivity in the Project study areas (i.e., the Project footprint, the Terrestrial LSA, and the Birds, Bats, and Amphibians RSA). Data sources included:

- Canadian Species at Risk Public Registry (Government of Canada, 2019);
- British Columbia Conservation Data Centre iMap and Species and Ecosystems Explorer (B.C. CDC, n.d.a.; n.d.b.);
- Scientific literature; and
- Other EAs undertaken near the Project.

15.8.2.1.1 Ecology and Habitat Requirements

Aquatic breeding habitat is believed to be the limiting factor for western toad habitat availability in the Elk Valley (Teck Coal Limited, 2015a). Terrestrial habitats that support western toad are considered to be widely available within the Birds, Bats, and Amphibians RSA due to the variety of habitats used by adult western toads (i.e., forests, clearings, shrub lands; Teck Coal Limited, 2015a).

Natural western toad breeding habitats in the Elk Valley have been negatively affected by various anthropogenic activities including settlement, farming, and natural resource industries (i.e., mining and forestry) since the arrival of non-Indigenous settlers (Teck Coal Limited, 2015a). Ranches, towns, and other settlements were often constructed in valley bottoms near waterbodies and aquatic environments conducive to western toad breeding (Teck Coal Limited, 2015a). Ranches and the presence of cattle or other livestock result in soil erosion and migration of animal waste into aquatic environments, which may lead to the degradation of aquatic habitats that support western toad breeding habitat (Knutson et al. 2004; COSEWIC 2012c). Agricultural irrigation ponds with limited livestock access, in addition to the creation of roadside ditches during resource extraction and road development, may increase the availability of aquatic breeding habitat (Knutson et al. 2004).

15.8.2.1.2 Occurrence and Abundance

Occurrences of both western toad and Columbia spotted frog have been documented within the Terrestrial LSA and Birds, Bats, and Amphibians RSA since 1938 (B.C. CDC, 2020a). The western toad's known distribution overlaps with the Terrestrial LSA and Birds, Bats, and Amphibians RSA (COSEWIC, 2012c). In 2017, western toad was observed at Beaver Wetland in Sparwood, B.C., a small marsh approximately 9 km west of the Terrestrial LSA south of the confluence of Michel Creek and east of the Elk River (Walker and Millions, 2017). Although this wetland may not act as a source population for wetlands in the Terrestrial LSA as migrating toads would have to cross through a large, disturbed area at the Elkview Operations, the occurrence of toads here confirms their presence in this part of the Birds, Bats, and Amphibians RSA.

Amphibian baseline studies completed by Golder Associates (2015a) in the vicinity of Teck's Elkview Operations documented western toads (5 adults, 20 toadlets, 12,500 eggs, and 770 tadpoles). Although Columbia spotted frogs were not observed during the assessment, it was concluded that they likely still occur in the vicinity of the Elkview Operations based on habitat suitability and prior observations of this species in the region (Golder Associates Ltd., 2015a). Teck also conducted baseline studies in 2011 in the vicinity of Line Creek. Amphibian inventory and habitat surveys were not conducted as part of the baseline program due to limited breeding habitat located within that study area; however, it was noted that known western toad distribution overlaps with the Line Creek Operations (Teck Coal Limited, 2011).

Historical western toad and Columbia spotted frog abundance data for the Birds, Bats, and Amphibians RSA are not available; however western toad may be declining in the Rocky Mountain Trench to the west of the Birds, Bats, and Amphibians RSA based on preliminary evidence gathered by Ohanjanian et al. (2006) during amphibian inventory surveys in the East Kootenay region. The potential decline is likely due to a combination of threats including the chytrid fungus, habitat loss and fragmentation, and increased mortality during migration (Provincial Western Toad Working Group 2014). The removal of occupied breeding sites through mining or other anthropogenic disturbances could have large effects on local population abundance, as western toad exhibit breeding site fidelity (Bull and Carey, 2008) and breed communally in large numbers (COSEWIC, 2012c).

15.8.2.1.3 Connectivity

Western toad breeding habitats are generally less abundant within the Birds, Bats, and Amphibians RSA due to the loss of breeding habitats as a result of anthropogenic activities. Infilling of wetlands and fragmentation of habitats by road networks and developments have likely decreased habitat connectivity within the Birds, Bats, and Amphibians RSA; however, western toads utilize a variety of terrestrial habitats and thus some anthropogenic disturbances (such as clearcuts) may not pose a significant barrier to the species from a habitat connectivity perspective. Most Columbia spotted frog migrate less than 2 km between breeding and foraging sites (Pilliod et al., 2002), and habitat connectivity data in the Elk Valley are not available for this species.

15.8.2.1.4 Transboundary Considerations

Western toad can migrate up to 7 km from breeding ponds (Davis, 2000) at high elevations, which may result in potential transboundary movements between B.C. and Alberta via the Continental Divide, approximately 5 km from the Project. Juvenile and adult western toad were observed during baseline studies for the Grassy Mountain Coal Project (Millennium EMS Solutions Ltd., 2016), located approximately 21 km east of the Terrestrial LSA near Blairmore, Alberta. Observations of the non-calling population of western toad were also recorded in Alberta within approximately 5 km of the Terrestrial LSA, as were Columbia spotted frog (Alberta Environment and Parks, 2020). Although most Columbia spotted frog migrate less than 2 km between breeding and foraging sites, individuals have been recorded to migrate up to 7.5 km (Pilliod et al., 2002). Transboundary movements of amphibians from the Birds, Bats, and Amphibians RSA to the U.S.A. are not expected, given the distance to that border.

15.8.2.2 Baseline Programs

15.8.2.2.1 Summary of Methods

Amphibian surveys were conducted in 2014, 2017, 2018, and 2019 to support the Project's baseline studies and the development of this Application/EIS. The surveys were completed to obtain information on amphibian habitat occupancy (presence/non-detect), extent of occurrence and abundance, and habitat availability and distribution within the Terrestrial LSA. The amphibian baseline surveys were conducted within the Project footprint and the Terrestrial LSA.

Most amphibians in B.C. require a wetland for part or all of their lifecycles (FLNRO, 2014b). Ephemeral areas where water can pool and quickly warm, such as roadside ditches and natural depressions, can also provide important amphibian habitat. Accessible wetlands and ephemeral areas in the Terrestrial LSA were surveyed within the Alexander Creek, Grave Creek, Harmer Creek, and Elk River watersheds. Thirty-one (31) wetlands and twenty-three (23) ephemeral wetted areas were targeted to assess amphibian occupancy and habitat characteristics. Survey effort totalled 210 visits and 160 person-hours over the 4 survey years. The amphibian surveys completed as part of the baseline program included the following survey types:

- Wetland perimeter searches;
- Evening transect and road surveys;
- Environmental DNA (eDNA collection for western toad);
- Tissue and co-located surface water sample collection; and
- Emergence surveys.

A summary of the amphibian baseline program surveys is outlined in Table 15.8-1 and survey locations are shown in Figure 15.8-1 and Figure 15.8-2. Amphibians were also recorded when observed incidentally during other baseline surveys (e.g., wetland and breeding bird surveys). For additional details on amphibian baseline survey methods, refer to Appendix 15-G.

15.8.2.2.2 Results

Amphibian Community

A total of 412 amphibian detections were recorded in the Terrestrial LSA during the amphibian baseline surveys (Table 15.8-2), including:

- 18 western toad (13 adults; 5 toadlets);
- 134 Columbia spotted frog (37 adults; 39 tadpoles; 58 egg masses);
- 109 wood frog (40 adults; 3 tadpoles; 66 egg masses); and
- 151 long-toed salamander (0 adults; 43 tadpoles; 108 egg masses).

Table 15.8-1: Amphibian Baseline Program Surveys

Survey Type	Survey Year	Survey Dates	Target Species	Survey Standards	Number of Surveys/Sample Sites
Wetland Perimeter Searches	2014	June 5 – June 11 June 29 – July 4	• Columbia spotted frog • Long-toed salamander • Northern Pacific treefrog • Eestern toad • Wood frog.	*Inventory Methods for Pond-breeding Amphibians and Painted Turtle (Version 2.0)*, RISC, 1998c	157 perimeter searches over 30 wetlands and 13 ephemeral areas
	2017	June 6 – June 9 June 30 – July 6			
	2018	April 22 – April 28 May 3 – May 9 July 1 – July 5 July 26 – July 30			
	2019	May 7 – May 9 May 22 – May 25 July 4 – July 11 July 25			
Evening Roadside Transects	2018	May 6	• Western toad • Migrating adult amphibians	*Inventory Methods for Pond-breeding Amphibians and Painted Turtle (Version 2.0)*, RISC, 1998c	12 call survey stations visited once

Survey Type	Survey Year	Survey Dates	Target Species	Survey Standards	Number of Surveys/Sample Sites
Tissue and Water Sample Collection	2017	July 6	• Columbia spotted frog • Long-toed salamander • Wood frog	• B.C. MOE Water Quality Guidelines (WQG) (short-term and long-term); • Canadian Council of Ministers of the Environment (CCME) Canadian WQG (long-term); • B.C. MOE (2014) guidelines for bird eggs, and • United States Environmental Protection Agency (U.S. EPA) (2016) guideline value for fish	3 tadpole tissue samples; 7 egg mass samples; 8 co-located water samples
	2018	May 5 – May 9			
		July 4			
	2019	May 9			
		May 22			
eDNA	2019	July 5 – July 10	Western toad	*Environmental DNA Protocol for Freshwater Aquatic Ecosystems (Version 2.2),* (B.C. MOE, 2017)	13 wetland sites
Emergence Surveys	2019	September 10 – 13	Western toad toadlets	Bull (2009) methods for surveying western toad dispersal of new mesomorphs	43 emergence surveys throughout the Terrestrial LSA

Crown Mountain Coking Coal Project

Figure 15.8-1
Amphibian Baseline Survey Locations

LEGEND

Emergence Survey
Perimeter Search
Evening Roadside Transect Surveys
eDNA Survey

- Tissue and Water Quality Sampling Location
- Evening Roadside Transect
- Terrestrial Local Study Area
- Project Footprint
- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Watershed
- Provincial Park/Protected Area
- British Columbia/Alberta Border

0 2.5 5
Kilometres

N W E S

Scale 1:115,000

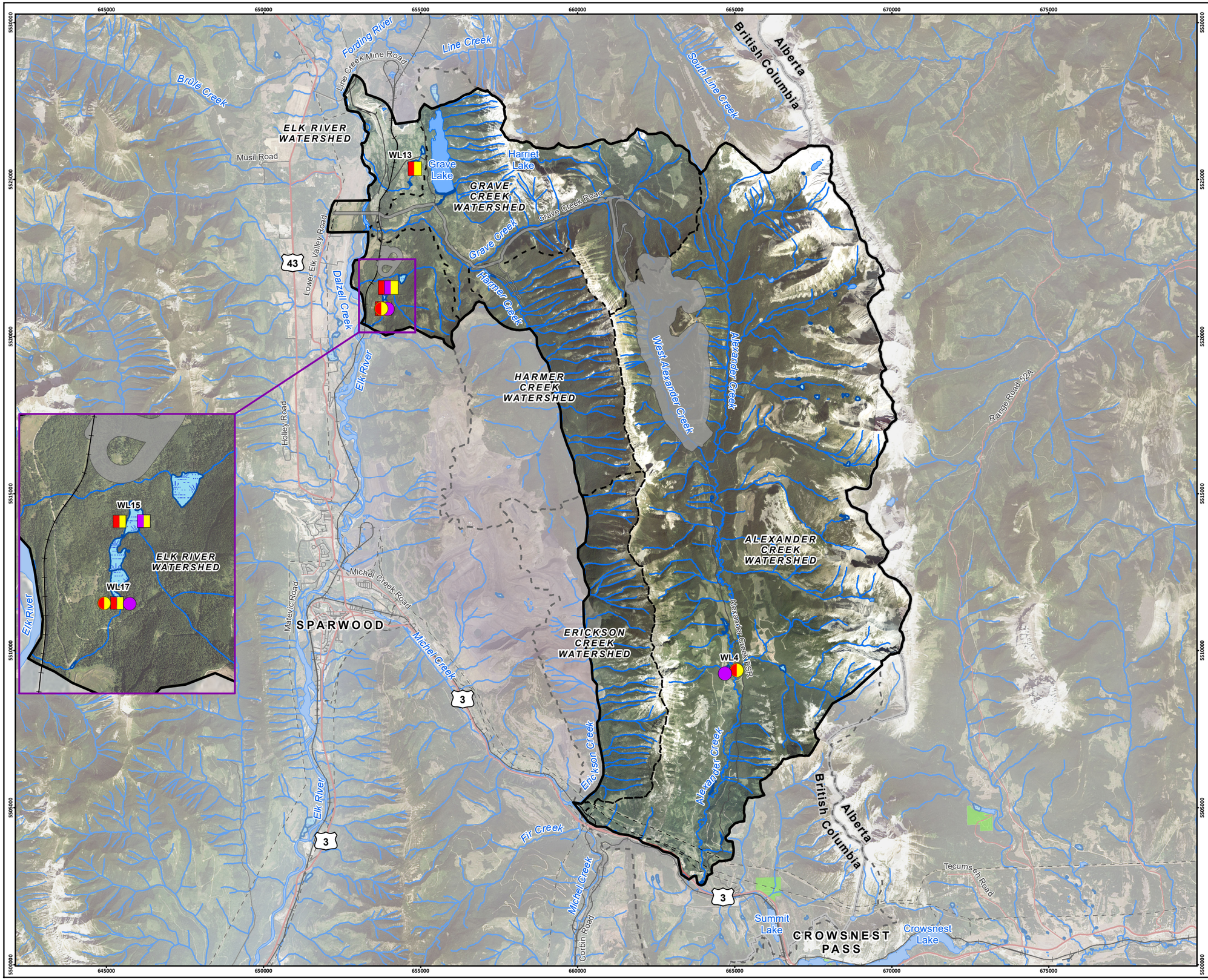
Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada.
Imagery Provided By Landsat 8 (Aug 2018), and GeoBC OrthoImagery (Aug 2016).

Map Created By: RB
Map Checked By: HEB
Map Coordinate System: NAD 1983 UTM Zone 11N

NWP Coal Canada Ltd

Project: 12-6231
Status: FINAL
Date: 2022-01-12

Document Path: \\42dillon\CAD\GIS\2012 and Prior\126231 Crown Mountain\EA_Report\ExistingConditions\Wildlife\126231_EC_WHamp_AmphibianBaselineSurveyLocations.mxd



Crown Mountain Coking Coal Project

Figure 15.8-2
Amphibian Tissue Collection and Co-located Water Quality Sampling Locations

LEGEND

Columbia Spotted Frog

- Egg Mass and Water Quality
- Tadpole

Wood Frog

- Egg Mass and Water Quality
- Tadpole and Water Quality
- Terrestrial Local Study Area
- Project Footprint
- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Watershed
- Provincial Park/Protected Area
- British Columbia/Alberta Border

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Kilometres

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Scale 1:115,000

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Table 15.8-2: Amphibian Detections in the Terrestrial LSA

Species	Number Observed During Surveys				Total
	Adult	Toadlet	Tadpole	Egg Mass	
Columbia spotted frog	37	-	39	58	134
Long-toed salamander	0	-	43	108	151
Western toad	13	5	0	0	18
Wood frog	40	-	3	66	109
				Total	412

Amphibians were detected at 18 wetland survey sites and two ephemeral areas during the baseline surveys, as well as incidentally at three wetland sites (Appendix 15-G). Western toads were detected at 18 locations in the Terrestrial LSA (Figure 15.8-3). Adult western toads were documented across the Terrestrial LSA, while toadlets were documented in only four locations in the Terrestrial LSA (Figure 15.8-3). No western toad egg masses or tadpoles were observed over the survey years. Western toads were documented at wetlands and ephemeral areas in the Terrestrial LSA from May to July across the sampling years, primarily during wetland perimeter searches. Through the baseline amphibian surveys, it was not determined if the western toad population present within the Terrestrial LSA is calling or non-calling.

Columbia spotted frog were detected at 11 locations across the Terrestrial LSA (Figure 15.8-4). Adults were observed in the Alexander Creek, Grave Creek, and Elk River watersheds, while tadpoles and egg masses were observed in the Alexander Creek and Elk River watersheds. No juvenile Columbia spotted frog were observed.

Amphibian Habitat and Distribution

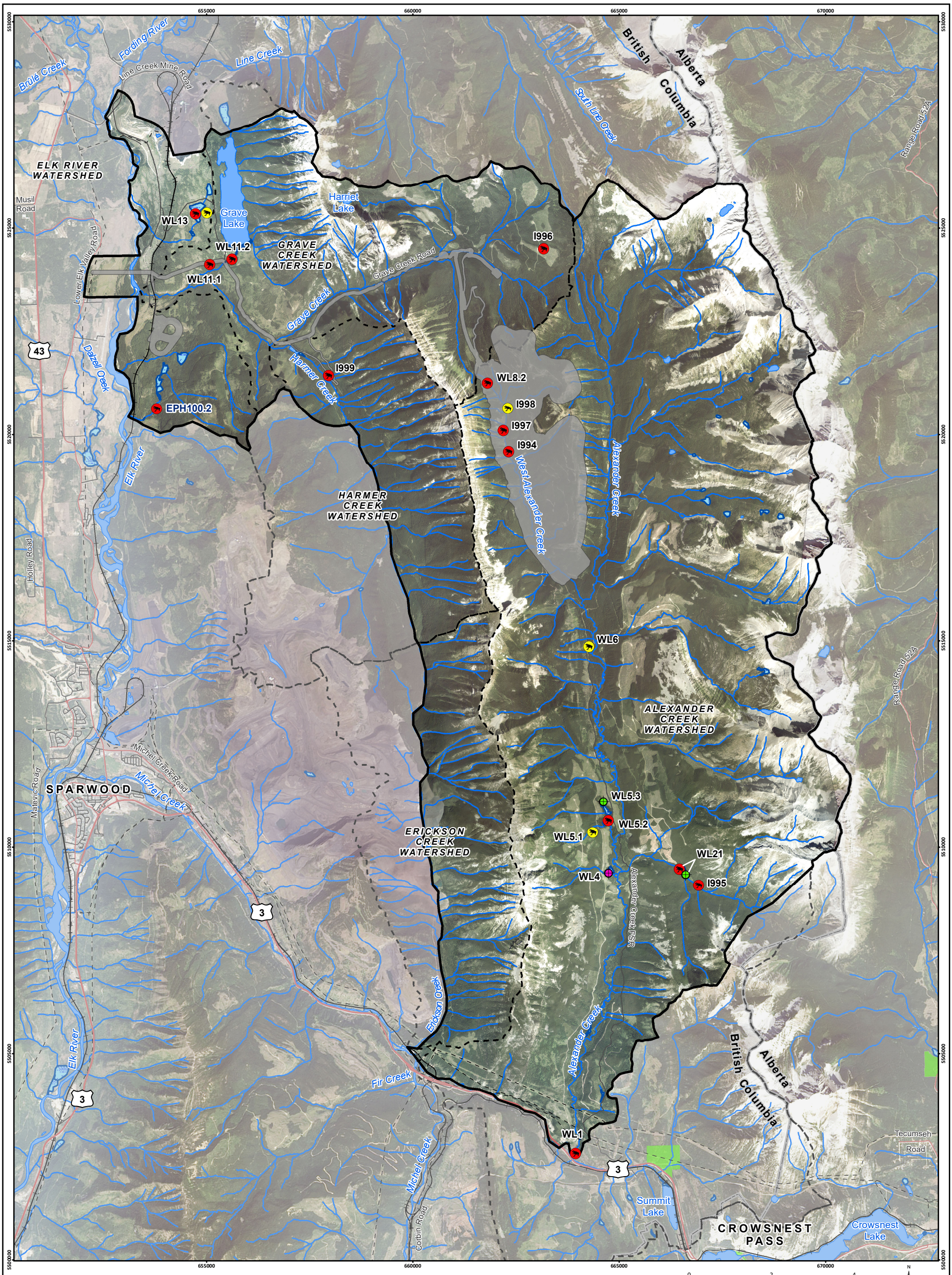
Most amphibian observations, including the majority of Columbia spotted frog observations, were recorded in marshes and shallow water wetlands with habitat characteristics such as peat and organic surface substrates, emergent vegetation cover, and moderate temperatures. Higher elevation/upland observations of western toad occurred in shallow water alpine wetlands, forested slopes, and a steep, re-planted cutblock.

Amphibian Tissues and Water Quality

The following is a brief summary of the tissue and co-located water sample results collected during the amphibian baseline program. For additional details, refer to Appendix 15-G.

Columbia spotted frog and wood frog tissues samples were collected to provide a baseline measure of metal concentrations in amphibian tissues. Egg mass samples were collected in May 2018 and 2019, and tadpoles were collected in July 2017 and 2018. Most tissue samples were collected in the Elk River watershed, except for two Columbia spotted frog egg masses and one tadpole from a wetland in the Alexander Creek watershed.

The mean concentration of selenium in tadpoles collected was 3.26 mg/kg dw (range: 2.39 to 5.33). The mean concentration of selenium in egg masses was 2.83 mg/kg dw (range: 1.86 to 5.00). Selenium levels in all tadpole tissue samples were below the U.S. EPA (2016) guideline value for fish (8.5 mg/kg dw).



Crown Mountain Coking Coal Project

Figure 15.8-3
Western Toad Survey Observations

LEGEND

- Adult
- Toadlet
- eDNA - Positive
- eDNA - Suspected
- Terrestrial Local Study Area
- Project Footprint
- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Watershed
- Provincial Park/Protected Area
- British Columbia/Alberta Border

0 2 4
Kilometres

Scale 1:85,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada. Imagery Provided By Landsat 8 (Aug 2018), and GeoBC Ortho Imagery (Aug 2016).

Map Created By: RB
Map Checked By: HEB
Map Coordinate System: NAD 1983 UTM Zone 11N

NWP Coal Canada Ltd

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