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5.4.9 Forest and Grassland Birds

5.4.9.1 Introduction

This section assesses the potential effects of the Project on the forest and grassland birds Valued Component (VC). The indicator species are the olive-sided flycatcher (*Contopus cooperi*) and Clark's nutcracker (*Nucifraga columbiana*) under songbirds, and red-tailed hawk (*Buteo jamaicensis*) under raptors. The assessment is described in the subsections below and will be conducted for these species. This introduction describes the information sources of the assessment and the applicable regulatory framework for the assessment of the VC (**Section 5.4.9.1.1**). The spatial, temporal, administrative, technical boundaries and assessment approach is describes in (**Section 5.4.9.3**).

Forest and grassland birds are a well-known group of birds with respect to taxonomy, ecology, biology, and conservation status and include songbirds, raptors, and upland game birds. They are commonly grouped together as forest and grassland birds due to shared habitat requirements and predator-prey relationships. Effects on migratory forest birds and their habitats are represented by olive-sided flycatchers and red-tailed hawk, while resident forest birds are represented by Clark's nutcracker. Resident forest bird habitat is also represented by habitat assessments for olive-sided flycatchers and red-tailed hawk.

Of the 99 forest and grasslands birds that potentially breed in the Project area, 67 species were detected during baseline studies. Of these, six species are federally-listed as being of conservation concern (**Appendix 5.1.3.4A**, Figures 3.4-5 to 3.4-8) (Committee on the Status of Wildlife in Canada (COSEWIC, 2014; Government of Canada, 2002). The rusty blackbird (*Euphagus carolinus*) and short-eared owl (*Asio flammeus*) are listed as Special Concern, and the common nighthawk (*Chordeiles minor*), olive-sided flycatcher (*Contopus cooperi*), barn swallow (*Hirundo rustica*), and bank swallow (*Riparia riparia*) are listed as Threatened. These species are listed as Threatened for reasons ranging from habitat loss to declines in numbers across their ranges (COSEWIC, 2014).

Seven forest and grassland bird species that potentially breed in the Project area are provincially listed species (BC Conservation Data Centre, 2014; Bird Studies Canada, 2012). The rusty blackbird, short-eared owl, olive-sided flycatcher, barn swallow, and sharp-tailed grouse *columbianus* subspecies (*Tympanuchus phasianellus columbianus*) are Blue-listed, and the common nighthawk and bank swallow are Yellow-listed. Clark's nutcracker (*Nucifraga columbiana*) is a year-round resident that is closely associated with whitebark pine (*Pinus albicaulis*) stands and of conservation interest because of the provincial Red-listing of whitebark pine and limited habitat available in the Project area. Whitebark pine is at risk throughout its range and has been impacted locally by white pine blister rust and mountain pine beetle (MPB) (Clason and Moody, 2013b).

The olive-sided flycatcher and red-tailed hawk (*Buteo jamaicensis*) were selected as indicators for forest and grassland birds due to their representative habitat found within the study areas (**Appendix 5.4.9A** and **Appendix 5.4.9B**). Both species are abundant and require a mosaic of

forest habitat consisting of late successional coniferous forest in close proximity to open areas such as wetlands, burns, or clearcuts (Altman and Sallabanks, 2000; Preston and Beane, 1999). The conservation of these two species and associated protective actions help preserve other forest and grassland birds in the Project area, including several other species of conservation concern that use similar habitat. Habitat suitability mapping for a third species selected as an indicator, Clark's nutcracker (*Nucifraga columbiana*) (**Appendix 5.4.9C**), was completed due to the limited habitat availability of whitebark pine in the Project area. In the area of Mt. Davidson, whitebark pine is the only coniferous tree species that the nutcracker harvests cones from and caches seeds for winter use (Tomback, 1998).

5.4.9.1.1 Regulatory Considerations

To assess potential effects, a number of regulatory requirements were considered (**Table 5.4.9-1**) that apply to forest and grassland birds and different phases of Project development, mitigation, and reclamation. The federal *Migratory Bird Convention Act* (Government of Canada, 1994) and provincial *Wildlife Act* afford different degrees of protection for most birds during the breeding season. Section 34 of the *Wildlife Act* specifically protects the nests of eagles, peregrine falcons, gyrfalcons, ospreys, burrowing owls, and herons year-round, as well as the nests of most other birds when the bird or their eggs are in the nest (Government of British Columbia, 1996a) at the time of construction and clearing. Species at Risk that may occur in the region are afforded protection under the *Species at Risk Act (SARA)* (Government of Canada, 2002). Red- and Blue-listed bird species are subject to BC Wildlife Act regulations; when also listed federally, the Red- and Blue-listed species are subject to SARA and/or COSEWIC. The Vanderhoof Land and Resource Management Plan (LRMP) (ILMB, 1997) provides guidance for the development of the regional area as well as recommendations for the protection of wildlife habitat. Management of wildlife habitat and populations is considered under the BC *Forest and Range Practices Act* (Government of BC, 2002) and the BC Conservation Framework.

Table 5.4.9-1: Regulatory Considerations Regarding Forest and Grassland Birds

Regulation/ Guideline	Brief Description or Requirements	Data Required to Meet Regulation/Guideline	Timeframe
Canada <i>Species at Risk Act</i>	Species at risk may require federal permits for handling, harvest, or habitat destruction, and recovery plans may exist.	Occurrence and abundance, distribution data from surveys.	Ongoing monitoring of mitigation measures, for exploration, construction and operation.
Canada <i>Migratory Bird Convention Act</i>	Pertains to migratory birds and their management.	Occurrence through breeding, bird surveys, nest searches, and play/call-back data.	Ongoing monitoring of mitigation measures, wildlife management plan for exploration, construction and operation potentially affecting listed birds.
BC <i>Wildlife Act</i>	Pertains to some bird species and their management. Permits are required for handling or hunting of some species.	Abundance and distribution data from BC CDC records and surveys.	Wildlife management plans, wildlife permits for capture and handling.
BC Conservation Data Center	BC species are assessed for conservation ranking based on abundance, distribution and risks.	Abundance and distribution data from BC CDC records and surveys.	Ongoing assessment of conservation status for species such as Clark's nutcracker
Vanderhoof LRMP Resource Management Zones	The Vanderhoof LRMP presents a number of wildlife objectives and strategies for maintaining habitat that benefit forest and grassland birds.	Abundance and distribution data from BC CDC records and surveys.	Wildlife management plans and permitting for exploration.

Note: BC CDC = British Columbia Conservation Data Centre; LRMP = Land and Resource Management Plan

5.4.9.2 Valued Component Baseline

Background searches did not identify previous forest and grassland bird surveys within the Project area. Baseline surveys for forest and grassland birds were conducted from 2011 to 2013 in the Project area. Baseline field studies followed Resource Inventory Standards Committee (RISC) methodologies relevant for each individual species group: songbirds, upland game birds, and raptors. Baseline surveys detected 99 forest and grassland bird species, including 76 species of songbirds, 5 species of upland game birds, and 18 species of raptors.

Olive-sided flycatchers were detected in matrices of old-growth forest and harvested areas adjacent to wetlands. The majority of detections occurred in the Sub-Boreal Spruce (SBS) Kluskus Moist Cold (SBSmc3) variant followed by the SBS Dry Cool (SBSdk) subzone. This species was the most frequently detected species of conservation concern with 90 detections recorded during surveys or incidentally in the Project area. Most detections (63) were in or within 100 m of logged areas, and the remaining observations were in forested areas adjacent to wetlands. Examination of the locations revealed that the 88 detections represented 79 territories, as detections were

repeated observations of territorial males during both rounds of surveys each year. Nesting was not confirmed, likely due to the lack of specific surveys; however, due to the large number of territorial males, this species likely nests throughout the RSA.

Raptor surveys, combined with incidental observations, detected 18 raptor species within the RSA survey areas (**Appendix 5.1.3.4A**, Figures 3.4-3 and 3.4-9 to 3.4-12). The greatest diversity of raptors was found within the SBSmc3 variant, followed by the Engelmann Spruce-Subalpine Fir (ESSF) Moist Very Cold (ESSFmv) subzone. Red-tailed hawks were detected throughout the LSA.

The short-eared owl was the only federal and provincial listed raptor species detected during raptor surveys. The detection of one individual occurred during the breeding season in an agricultural field and grassland near Davidson Creek. Nests are hard to detect (Wiggins et al., 2006), and the breeding status of the owl could not be confirmed.

Clark's nutcrackers were detected incidentally within the ESSF zone at Mount Davidson in 2011, 2012, and 2013 (**Appendix 5.1.3.4A**, Figure 3.4-2). No nutcrackers were detected during nutcracker surveys in 2012, which corresponded with a low whitebark pine cone crop. Transects in 2013 noted nutcrackers at various locations around Mount Davidson, including several within whitebark pine stands, although larger numbers were not observed until late July. These observations included a group of seven individuals observed flying towards Mount Davidson at Km 2 along the current mine access road on 22 July 2013. Five individuals were also noted on the north slope of Mount Davidson in the last week of July 2013, and single birds were noted in early and mid-September. A single nutcracker was detected on Mount Davidson in early June before the whitebark pine cones were ripe. In July 2013, some whitebark pine cones were caged to allow for further development and to prevent predation, and therefore allow for collection later in the year as part of the whitebark pine mitigation plan. During cone collection in mid-September, all cones that were not caged had been harvested by Clark's nutcrackers, suggesting that the local nutcracker population may have been near capacity for the existing baseline habitat, as they were the primary cone harvester observed in these habitats.

5.4.9.2.1 Past, Present, or Future Project Activities

The project or activities considered in the assessment are in the Project Inclusion List (PIL). The PIL identifies those projects or human activities that may overlap spatially or temporally with the Project summarized in **Section 4 Table 4.3-11**. **Appendix 4C** presents the detailed Project Inclusion List and descriptions of various projects and activities used for assessing potential environmental effects.

Pre-existing habitat loss and fragmentation due to logging and road development has altered the habitat within the Project area. The mountain pine beetle has infested large areas of mature pine forest in the region including the LSA and RSA, some of which was then harvested while remaining stands are in various stages of degeneration. Mineral exploration in the area has increased the number of access roads. Baseline information collected on forest and grassland birds was conducted in the Local Study Area (LSA) and portions of the Regional Study Area (RSA) that have been altered by these past and present activities. Both the LSA and the RSA comprise the Project area. Future activities in the Project area are expected to include the same activities.

5.4.9.2.2 Traditional Ecological and Community Knowledge

Forest and grassland birds are important to local residents and Aboriginal groups. Comments provided during the engagement and consultation process offered insight into traditional, ecological, or community knowledge (AMEC, 2013), including unique knowledge about the local environment, how it functions, and its characteristic ecological relationships.

Forest and grassland birds are harvested by Aboriginal groups in the area. Aboriginal members residing at Tatelkuz Lake Indian Reserve #28 (IR#28) harvest grouse as a food source. Aboriginal groups have raised concerns about potential effects on migratory birds.

Consultation with the public identified what was deemed by the community representatives to be a sensitive migratory bird sanctuary located along the Nechako River. Representatives noted the Nechako watershed harbours a high biodiversity of animals (including forest and grassland birds) that are sensitive to variations in the environment.

5.4.9.3 Potential Effects of the Proposed Project and Proposed Mitigation

This subsection identifies and analyzes potential adverse effects on the forest and grassland birds VC resulting from the proposed Project's construction, operations, closure and post-closure phases.

It first describes the features of the study area, temporal, administrative, and technical boundaries. (**Section 5.4.9.3.1 to Section 5.4.9.3.5**).

Then, **Section 5.4.9.3.6** details the assessment approach used in the assessment followed by **Section 5.4.9.3.8** Mitigation Measures.

The assessment considers the following:

- Terrestrial habitat, including the quality and quantity of any lost habitat for relevant species of birds;
- Feeding, nesting, or breeding habitats;
- Any wetland habitat alteration or loss;
- Any species of birds that are Rare, Vulnerable, Endangered, Threatened, or of Special Concern as listed under provincial Blue and Red lists, SARA, COSEWIC, as well as any migratory birds and species of international significance (**Section 5.4.9.1.1**);
- Direct and indirect wildlife mortality from the mine operations and traffic;
- Wildlife habitat is being rated for suitability as a surrogate for wildlife productivity; and
- Implications of the proposed Project acting as an attractant for particular species.

A range of potential effects on forest and grassland birds can be associated with a project involving a mine and transmission line. Assessment boundaries define the scope or limits of the

assessment. The boundaries encompass the areas and time periods during which the Project is expected to interact with forest and grassland birds (spatial and temporal boundaries), any constraints placed on the assessment of those interactions due to political, social, and/or economic realities (administrative boundaries), and any limitations in predicting or measuring changes (technical boundaries). Each of these boundaries is defined in the subsections below.

Activities occurring during each phase of the Project could potentially interact with forest and grassland birds. Habitat alteration, noise disturbance (displacement), and potential mortality are the predicted key and moderate interactions for forest and grassland birds. Implications of the Project acting as an attractant for forest and grassland birds include potential attraction to roadsides for foraging and attraction to light sources associated with the project facilities. Taking a conservative approach, both key and moderate interactions are combined and considered jointly in assessment of project and cumulative effects.

5.4.9.3.1 Study Area Boundaries

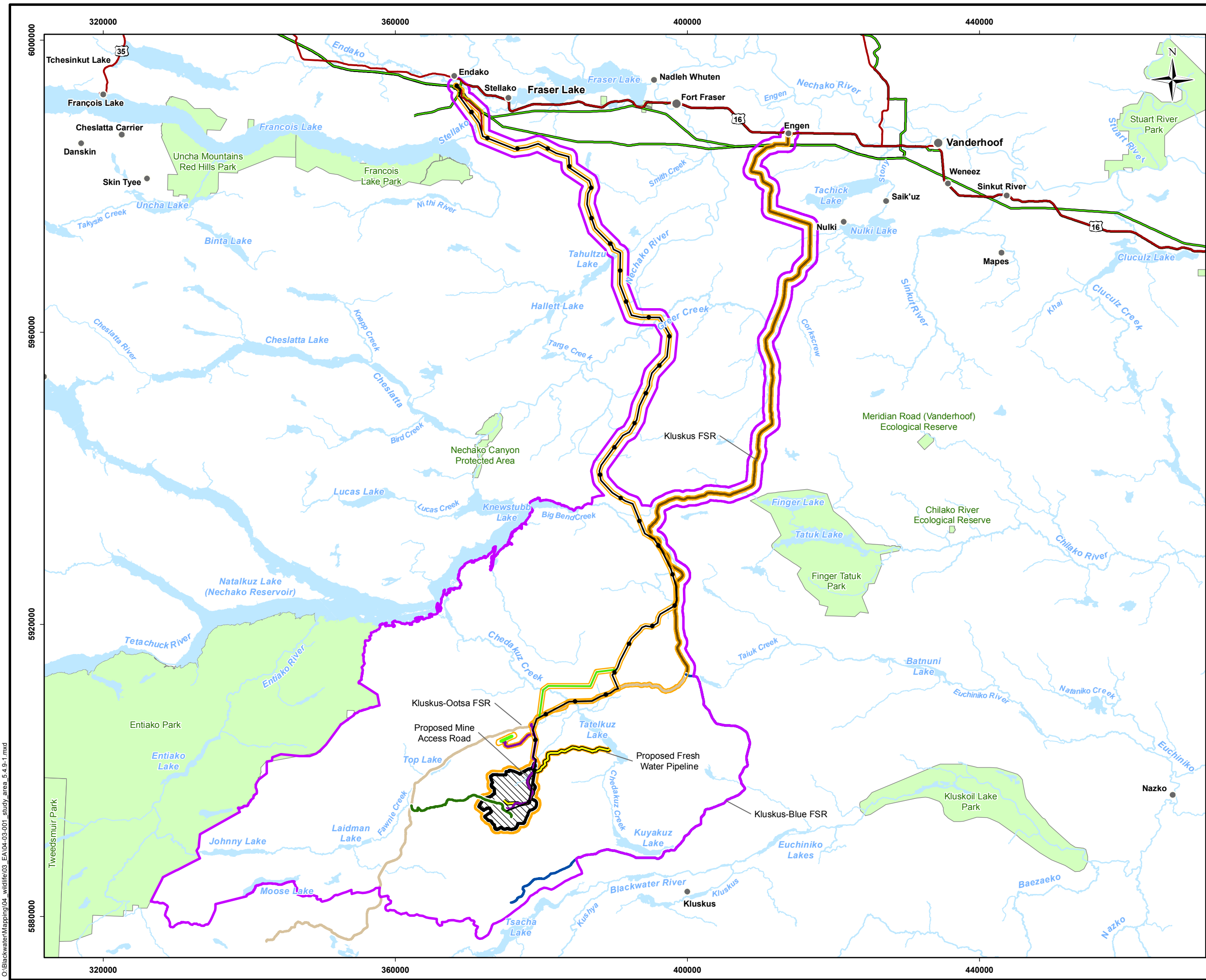
Two geographic scales were defined for the consideration of Project effects on forest and grassland birds and habitat, as shown on **Figure 5.4.9-1** and described below. These areas were used for collecting baseline information. The Project area encompasses the LSA and the RSA as described below. Past, present and future activities that may affect forest and grassland birds within these areas were identified and assessed within the RSA.

Local Study Area: The AIR describes the LSA as follows (**Table 4.3-1** of **Section 4**):

- Mine Site: Approximate 500 m buffer around the proposed mine site facilities; and
- Transmission line, mine access road, airstrip, freshwater supply pipeline, and Kluskus FSR: approximately 250 m buffer from each side of the linear component boundary.

The rationale for the LSA is as follows (**Table 4.3-1** of **Section 4**):

- The LSA includes the entire mine site where habitat will be removed and considers a buffer to take into account sensory disturbance; and
- The LSA includes all linear components and a buffer to take into account sensory disturbance. The buffer along the linear corridors varies because activities along those corridors varies from an access road that may have greater sensory disturbance to a transmission line with limited human activity or traffic after construction.



Legend

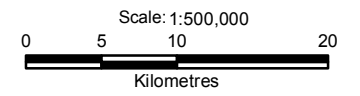
- Populated Place
- Highway
- Kluskus FSR
- Kluskus-Blue FSR
- Kluskus-Ootsa FSR
- Existing Transmission Line
- Stream
- Waterbody
- Parks & Protected Areas

Project Components

- Exploration Road
- Proposed Mine Site Access Road
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch Reroute)
- Proposed Transmission Line (Stellako Reroute)
- Proposed Freshwater Pipeline
- Proposed Airstrip Access Road
- Proposed Airstrip
- Proposed Mine Site

Forest and Grassland Birds and Associated Habitat

- Local Study Area
- Regional Study Area



Reference
BC Government GeoBC Data Distribution

CLIENT: **newgold™**

PROJECT: **Blackwater Gold Project**

Study Area Boundaries for Forest and Grassland Birds and Associated Habitat

DATE: September, 2015	ANALYST: MY	Figure 5.4.9-1
JOB No: VE52277	QA/QC: MB	
GIS FILE: 04-03-001_study_area_5.4.9-1.mxd		amec
PROJECTION: UTM Zone 10	DATUM: NAD83	

O:\Blackwater\mapping\04_wildlife\03_EA\04-03-001_study_area_5.4.9-1.mxd

The LSA for the purpose of the forest and grassland birds VC comprises 22,509 ha and includes 7,032 ha for the Project footprints (**Table 5.4.9-2**). The LSA includes the proposed mine site area (the mine site footprint plus a 500 m buffer), and all linear components areas (linear components with 250 m buffer on each side of linear component boundary, except for the airstrip which is 300 m buffer on each side). The linear component boundary, also referred to as the footprint, is comprised of the feature's right-of-way (ROW) and an additional buffer. The linear component boundary widths are as follows: existing Kluskus FSR is 20 m (20 m ROW with no buffer), proposed mine access road is 120 m (20 m ROW with 50 m buffer each side), proposed transmission line is 140 m (40 m ROW with 50 m buffer on each side), proposed freshwater supply pipeline is 110 m (10 m ROW with 50 m buffer on each side), proposed airstrip is 200 m (100 m ROW with 50 m buffer each side), and the proposed airstrip access road is 10 m (10 m ROW, with no buffer). The FSR re-alignment and Transmission Line access roads are included in the LSA area for these features. The transmission line includes a mainline route and two potential re-routes, the Mills Ranch and Stellako options.

Table 5.4.9-2: Project Component Footprint Areas

Component	Area (ha)
Mine Site	4,430
Mine Access Road	95
Existing Kluskus Forest Service Road	253
Airstrip	50
Freshwater Pipeline	132
Main Transmission Line	1,806
Mills Ranch Transmission Line	202
Stellako Transmission Line	62
Total Project Footprint	7,032

Regional Study Area: The AIR describes the RSA as follows (**Table 4.3-1 of Section 4**):

- Mine Site: Includes ungulate winter range established for the Tweedsmuir-Entiako caribou herd (U-7-012). The western and southern edges of the RSA outline these winter ranges. The southwestern boundary follows the Upper Blackwater Management Zone where the RSA then follows the Blue Road until it reaches the Ootsa – Kluskus FSR and follows this north until it reaches the Nechako Reservoir. The northern boundary of the RSA follows the shoreline of the Nechako Reservoir. The northern boundary of the RSA follows the shoreline of the Nechako Reservoir; and
- Transmission Line and Kluskus FSR. Approximate 1 km buffer from the linear component boundary.

The rationale for the RSA is as follows (**Table 4.3-1 of Section 4**):

- Extends beyond the mine site LSA to consider natural barriers for wildlife such are large water bodies or watershed divides.

The RSA for the purpose of the forest and grassland birds VC comprises 291,714 ha and is large enough to assess the seasonal home range movements and important seasonal habitats of most forest and grassland species considered, some of which have long-distance movement patterns. The RSA was selected to include a wide variety of habitat types also found in the LSA, allowing the assessment of relative abundance of habitat within the LSA relative to the greater region within which the Project is situated.

5.4.9.3.2 Temporal Boundaries

Preliminary temporal boundaries of the Project, which are contingent on permitting, include four primary phases.

- **Construction phase:** The construction phase of the Project will occur over 2 years and will likely start following receipt of the required permits;
- **Operations phase:** The operations phase of the Project will extend for approximately 17 years;
- **Closure phase:** The closure phase is estimated to last approximately 18 years (ending in year 35); and
- **Post-closure phase:** The post-closure phase starts in year 35.

In terms of duration of effects, the following terms are used in this effects assessment: Short-term effects occur during the construction phase; Medium-term effects are not applicable for forest and grassland birds as they were considered long term to provide a conservative assessment; Long-term effects occurs throughout operations and closure; and Chronic effects extend into post-closure or beyond.

5.4.9.3.3 Administrative Boundaries

The Project site is located in the Northern Rockies Bird Conservation Region (NRBCR), an ecologically defined conservation unit managed by the Canadian Wildlife Service for bird conservation (Environment Canada (EC), 2013). The strategy for NRBCR provides information on priority bird species present in that region, as well as their population objectives, habitats, threats, and recommended conservation objectives and actions (EC, 2013).

The Vanderhoof LRMP identifies smaller Resource Management Zones (RMZs) that have different resource development and conservation objectives to guide land use decisions and management. Each RMZ has a species of management concern and objectives. The mine site and associated infrastructure including the roads and transmission line are located within the following RMZs: Nechako Valley, Nechako West, Upper Nechako River, Vanderhoof South, Crystal Lake, Kluskus, Chedakuz, Davidson Creek, and Laidman Lake. These RMZs have objectives that are considered for each species effects assessment if relevant. The Project is also located within five Wildlife Management Units (WMUs): 5-12, 5-13, 6-1, 7-11, and 7-12. Each WMU is the primary designation tool for conservation lands under section 4 of the *Wildlife Act*. Conservation and management of fish, wildlife, and their associated habitats are a priority in a WMU and are used to set hunting

regulations (BC MFLNRO, 2014). Species of management concern for these RMZs include caribou, grizzly bear and listed species.

5.4.9.3.4 Technical Boundaries

Technical boundaries for the assessment are established by the wildlife habitat model predictions used in the effects assessment. There is uncertainty and some margin of error associated with the use of habitat suitability models; however, Resources Information Standards Committee (RISC) standards for ratings and suitability classes were followed (RISC, 1999). Therefore, these are considered acceptable levels of uncertainty for an assessment.

5.4.9.3.5 Potential Project Effects

The named projects from the PIL in **Table 4.3-11** that represent present and future projects will not have interactions with the Project; however, the listed activities from the list will. Pre-existing habitat loss and fragmentation due to logging and road development has altered the habitat within the Project area. The mountain pine beetle has infested large areas of mature pine forest in the region including the LSA and RSA. Some of the mature pine forest was then harvested; remaining stands are in various stages of degeneration. Mineral exploration in the area has increased the number of access roads. Baseline information on forest and grassland birds was collected in the Local Study Area (LSA) and portions of the Regional Study Area (RSA) that have been altered by these past and present activities. Both the LSA and the RSA comprise the Project area. Future activities in the Project area are expected to include the same activities.

Project effects consider both the key and moderate interactions defined and identified in **Section 4. Table 4.3-2** (Project Component and Activity Interaction Matrix). In order to conservatively assess interactions of the project with forest and grassland birds and forest and grassland bird habitat, both key and moderate interactions were combined and included in the modeling and effects assessment. The interactions were further identified using a ranking table (**Table 5.4.9-3**) to identify different Project phases and whether the resulting effect can be managed to acceptable levels through standard operating practices through the application of best management practices (BMPs) or codified practices or if the resulting effect may exceed acceptable levels without implementation of specified mitigation. The table was used to guide specific mitigation and monitoring needed for this VC. Analysis includes determining whether the resulting effect can be managed to acceptable levels using standard operating practices. These practices include application of BMPs or codified practices, or if the resulting effect may exceed acceptable levels without implementation of specified mitigation. The table was used to guide specific mitigation and monitoring needed for this VC.

Table 5.4.9-3: Potential Interaction of the Project with Forest and Grassland Birds

Proposed Project Activities and Physical Works	Potential Key and Moderate Interaction
Construction of Mine, Airstrip, Access Roads, Freshwater Supply Pipeline, and Transmission Line	
Clearing and grubbing	2
Open pit preparation	1
General earthworks (moving surface soil)	2
Equipment operation	1
Road upgrading and construction	2
Borrow pit excavation	2
Road and airstrip use	1
Operations of Mine, Airstrip, Access Roads, Freshwater Supply Pipeline, and Transmission Line	
Transportation system	1
Temporary waste rock stockpiles	1
Tailings storage facility	2
Camp	1
Road use	1
Water collection pond	1
Decommissioning Closure and Post-Closure Mine, Airstrip, Access Roads, Freshwater Supply Pipeline, and Transmission Line	
Roads	2
Reclamation	2

Note: 0 = No interaction.
 1 = Moderate Interaction occurs; however, based on past experience and professional judgment, the resulting effect can be managed to acceptable levels through standard operating practices and/or through the application of best management or codified practices.
 2 = Key Interaction occurs. The resulting effect may exceed acceptable levels without implementation of mitigation. Further assessment and monitoring is warranted.

Several measurable categories of assessment for Project effects were defined. **Table 5.4.9-4** presents the rationale for the selection of each category of assessment.

Table 5.4.9-4: Categories of Assessment for Forest and Grassland Birds

Category of Assessment	Notes or Rationale for Selection
Habitat Loss and Alteration	Population abundance and distribution are directly affected by habitat availability and displacement from effective habitat. Vegetation clearing for the Project and disturbance from Project activities during construction and operations may affect habitat availability and quality. This analysis included a rating of habitat quality for forest and grassland birds so that the relative quantitative loss of moderate to high value habitat was assessed in relation to local and regional availability of suitable habitat measured as percentage lost and hectares lost.
Changes in Forest and Grassland Bird Population Dynamics	For some species, predation may be affected by changes in predator populations resulting in differential mortality of bird species. This relies on provincial data and potential monitoring data of game and predator populations and distribution over the life of the Project, including species, features and occurrences based on field surveys and BC CDC records. Future change can be monitored with surveys. For forest and grassland birds, the focus is on relative abundance and presence / absence surveys in areas of potential impact and measures of known mortality.
Mortality Risk	This relies on provincial data and potential monitoring data of game and predator populations and distribution over the life of the Project. Vegetation clearing and potential interactions with traffic associated with transportation routes may affect forest and grassland bird mortality risk. For forest and grassland birds, this is a qualitative estimate based on risk of vehicle collisions.
Changes in Forest and Grassland Bird Movement Patterns	This relies on monitoring and surveys, as well as provincial survey data (i.e., for breeding birds). Aspects such as noise, light, and human presence may affect use of habitats close to the Project. For forest and grassland birds, changes in movement patterns may affect species breeding and survival rates and may increase predation/mortality.
Change in Forest and Grassland Bird Health	This qualitative measure relies on reporting of animal health and provincial data. For forest and grassland birds, contaminant loading may affect forest and grassland bird health. Health can include assessment of the potential impacts of identified contaminants of potential concern on feeding, movement, reproductive behaviour and success, and direct mortality

Note: BC CDC = British Columbia Conservation Data Centre; RSA = Regional Study Area; TEM = Terrestrial Ecosystem Mapping

Evidence suggests that, below certain thresholds of habitat cover, species may decline more rapidly than would be expected from habitat loss alone (Andr n, 1994). When remaining functional habitat is greater than 10 to 30% in a region, species are still affected by habitat loss (Andr n, 1994; Fahrig, 1997; Swift and Hannon, 2010) but are not necessarily at risk of regional extirpation. Higher thresholds have been reported for some species (e.g., Gibbs, 1998; Homan et al., 2004), which may reflect sensitivity to fragmentation after only moderate habitat loss. Depending on taxa and landscape, residual habitat thresholds ranging from 10 to as high as 60% may be required to avoid rapid population declines (Bennett and Ford, 1997; Villard et al., 1999; Swift and Hannon, 2010). However, most threshold evidence supports a minimum 30% residual habitat threshold at a landscape level to avoid rapid declines that may lead to regional extirpation (Swift and Hannon, 2010). For this assessment, precautionary thresholds have been

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identified for species for which specific thresholds do not exist. A precautionary threshold is defined as the point before a resource would be expected to undergo an unacceptable change, either from an ecological, regulatory, or social perspective. This definition allows the Proponent and regulators to enact mitigation measures with sufficient time to prevent the particular resource from reaching or exceeding the true ecological threshold. The following precautionary thresholds are used in this assessment: 70% residual habitat (30% loss) for species not identified as a conservation concern (e.g., moose); and 80% residual habitat (20% loss) for species of conservation concern (e.g., Clark's nutcracker, olive-sided flycatcher, caribou, grizzly bear, northern myotis). For forest and grassland birds, the precautionary threshold of 20% loss is used for assessment of the effects within the RSA because several species are federally listed as Threatened including the olive-sided flycatcher used as an indicator species, and the Clark's nutcracker is of conservation concern in BC due to the Red-listed whitebark pine habitat.

The next step is to assess each of these relative interactions for the Project phases and forest and grassland birds to examine which effects may be expected in different areas and times (**Table 5.4.9-5**).

Potential key and moderate interactions are linked to the temporal scale of the Project phases and vary in the time needed to return to baseline conditions (**Table 5.4.9-6**). For instance, sensory disturbance effects tend to be very short-lived and transient, and effects may be related to frequency of disturbance and duration, but recovery may be very quick once disturbances stop. Conversely, habitat loss due to Project construction may require significant amounts of time to recover to baseline conditions.

Table 5.4.9-5: Potential Interactions on Categories of Assessment for Forest and Grassland Birds

Project Activities	Category of Assessment				
	Changes in Forest and Grassland Bird Habitat Availability	Changes in Forest and Grassland Bird Population Dynamics	Changes in Forest and Grassland Bird Mortality Risk	Changes in Forest and Grassland Bird Movement Patterns	Changes in Forest and Grassland Bird Health
Construction of Mine, Airstrip, Access Roads, Freshwater Supply Pipeline, and Transmission Line					
Clearing and grubbing	2	1	1	2	0
Open pit preparation	1	1	1	1	0
General earthworks (moving surface soil)	2	0	0	2	1
Equipment operation	1	1	1	1	1
Road upgrading and construction	2	1	2	2	1
Borrow pit excavation	2	2	1	2	1
Road and airstrip use	1	1	1	1	1
Operations of Mine, Airstrip, Access Roads, Freshwater Supply Pipeline, and Transmission Line					
Open pit mining	1	1	1	1	1
Process plant	1	1	1	1	1
Transportation system preparation	2	1	1	2	1
Temporary waste rock stockpiles	1	1	1	1	1
Tailings storage facility	1	1	1	1	1
Camp	1	1	1	1	1
Road use	2	1	1	2	1
Water collection pond	2	2	2	2	2
Decommissioning Closure and Post-Closure Mine, Airstrip, Access Roads, Freshwater Supply Pipeline, and Transmission Line					
Roads	2	1	1	2	2
Reclamation	2	2	1	2	1

Note: 0 = No interaction.
 1 = Moderate Interaction occurs; however, based on past experience and professional judgment, the resulting effect can be managed to acceptable levels through standard operating practices and/or through the application of best management or codified practices.
 2 = Key Interaction occurs. The resulting effect may exceed acceptable levels without implementation of mitigation. Further assessment and monitoring is warranted.

Table 5.4.9-6: Temporal Boundaries

Category of Assessment	Temporal Boundary
Changes in Forest and Grassland Bird Population Dynamics	All phases after clearing during construction
Habitat Loss and Alteration	Construction through to operations
Mortality Risk	Construction and operations
Changes in Forest and Grassland Bird Population Movement Patterns	Construction and operations
Changes in Forest and Grassland Bird Population Health	Construction through to operations

Anticipated Project effects include habitat loss (e.g., cleared vegetation, changes to Clark's nutcracker whitebark pine habitat quantity and quality) and some potential degradation (**Table 5.4.9-7**). The construction of the proposed mine site, access roads, transmission line, freshwater supply pipeline, and airstrip will require the removal of vegetation and may affect forest and grassland ecosystems including the health and ecosystem function of whitebark pine. A small amount of this vegetation will be lost permanently (greater than 100 years), while the majority of other areas will be reclaimed progressively or during closure, with potential chronic effects due to lag time in re-establishment of cone-producing whitebark pine for Clark's nutcrackers.

Table 5.4.9-7: Overview of Potential Project Effects on Forest and Grassland Birds

Category of Assessment	Description	Project Phases	Project Components
Habitat Lost and Alteration	Areas cleared of vegetation for Project infrastructure (e.g., facility direct footprint, road surface and cut/fill, borrow areas, etc.) result in temporary to long-term habitat loss.	Construction, operations, closure, and post-closure	Mine site, access roads, site, transmission line, freshwater supply pipeline, and airstrip

In addition to direct habitat loss, activity on the mine site, airstrip, and access road may reduce effective use of habitat in some cases, attracting forest and grassland birds close to activity and resulting in direct mortality from vehicle collisions. An Environmental Effects Monitoring (EEM) program will be used to validate or refute effects predictions. Adaptive management practices will be used to mitigate significant residual effects observed through the EEM program that are reasonably ascribed to mine activities.

Of the five potential categories of assessment, habitat loss and alteration is considered to have potential measurable residual effects, and is therefore carried through the effects assessment. The other four potential effects, changes in mortality risk, population dynamics, and wildlife health, will not be considered further in the assessment due to the mitigation measures in place within the Project area. The Wildlife Management Plan (WLMP) (**Section 12.2.1.18.4.6**), Landscape, Soils and Vegetation Management and Restoration Plan (LSVMP) (**Section 12.2.1.18.4.4**), Reclamation and Closure Plan (**Section 2.6**), Water Quality and Liquid Discharges Management Plan (WQLDMP) (**Section 12.2.1.18.4.10**), Noise and Vibration Mitigation Measures (**Section 5.2.2.3**), and Air Quality and Emissions Management Plan (AQEMP) (**Section 12.2.1.18.4.9**) are expected to limit potential effects on these categories to negligible levels. Restoration of forest habitat throughout the Project area is expected to restore forest and grassland birds to baseline condition and mitigation measures will minimize potential for changes in health, population dynamics, and mortality until reclamation is completed. Based on professional judgement related to forest bird behaviour, changes in wildlife movement patterns due to noise disturbance are not considered further but are included in habitat alteration considerations through incorporation into reduced habitat suitability ratings and habitat loss buffers near infrastructure.

Changes in wildlife health are not carried forward in this assessment due to the conclusions of the atmospheric effects assessment and the surface water quality effects assessment. The atmospheric effects assessment determined that overall, potential effects of the Project on air

quality are not predicted to result from the construction, operations, or decommissioning of the Project. Similarly, there are limited residual effects predicted for water quality after mitigation, since mitigation is incorporated into the Project design. The surface water quality effects assessment predicts that residual effects relate to potential exceedances of specific water quality guidelines that are a consequence of existing background concentrations above guidelines, not as a result of Project effects, and therefore are not considered residual. Manual clearing of vegetation along the transmission line will be used instead of chemical control where feasible.

5.4.9.3.6 Assessment Approach for Measuring Potential Effects

A quantitative approach was used for determining the potential loss and alteration of habitat on forest and grassland birds.

5.4.9.3.6.1 Habitat Suitability Model Assumptions

Habitat suitability modeling is based on assumptions related to TEM and PEM habitat interpretations, professional judgment and experience related to forest and grassland birds and forest and grasslands habitat, literature and traditional knowledge. Assumptions include the quantitative rating of TEM and PEM units for value to forest and grassland birds during different life history stages and seasons and are based on similar models used and tested throughout BC and assessed over time through population estimates and research. Specific assumptions related to habitat quality are described in each sub-model. Habitat suitability value is assumed to reflect the current value of habitat and not the future value.

Assumptions related to mortality, disturbance, displacement, predation and health are described in the effects sections related to these categories of assessment. Habitat ratings were interpreted to represent potential reductions in habitat quality and effectiveness related to mine infrastructure. Models assumed that all suitable habitat could be used and that habitat was included in calculations of habitat impacted by the Project.

5.4.9.3.6.2 Habitat Loss and Alteration

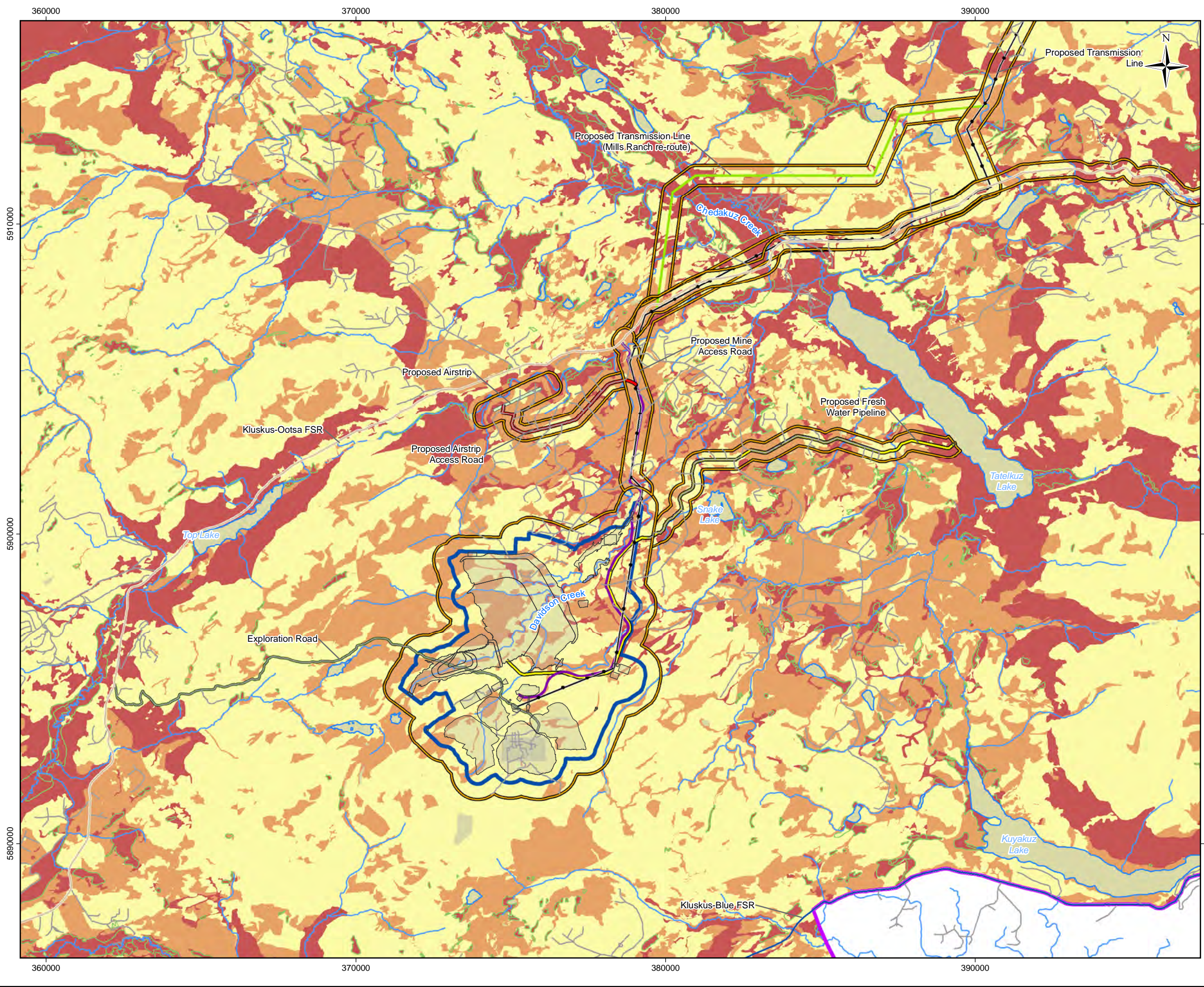
To capture the most critical habitats for forest and grassland bird species, potential habitat was rated on a four-class system (RISC, 1999) depending on biogeoclimatic zone, forest age, and ecosystem classification (**Appendix 5.4.9D**). A quantitative habitat approach was used for assessment of potential effects on the three species selected as indicators: red-tail hawk, olive-sided flycatcher and Clark's nutcracker. Ratings tables were developed and created to complete habitat suitability mapping and calculate potential areas affected by Project component footprints (**Appendix 5.4.9D**). Terrestrial Ecosystem Mapping (TEM) or Predictive Ecosystem Mapping (PEM) was used to identify the polygons containing moderate and high value habitat for forest and grassland birds (**Figure 5.4.9-2**). Although the olive-sided flycatcher and red-tailed hawk are not usually resident in higher elevations, all potential habitat sites were included to present a conservative measure of potential effects on forest and grassland birds. Clark's nutcracker habitat was rated and mapped separately and is associated with whitebark pine that occurs in the high elevation areas within the mine site and adjacent RSA but not within the lower elevations.

5.4.9.3.6.3 *Forest and Grassland Bird Growing Habitat Model*

Due to the number of species of forest and grassland birds in the Project area, two of the indicator species, the olive-sided flycatcher and red-tailed hawk, were chosen due to their habitat representing a large proportion of forest and grassland birds present (not including Clark's nutcracker). Due to the similar habitat requirements for both species (i.e., mature forest adjacent to open habitat such as burns, clearcuts, meadows, with snags and mature trees in openings), one habitat model was used for both species. By combining the habitat requirements of these species, a more conservative estimate of habitat alteration is measured.

Due to these species' requirements for mature or old-growth forests adjacent to open areas (e.g., clearcuts, wetlands, burns), forest with age classes 1 to 3 and 6 and 7 were rated as high, and forests with age classes 4 and 5 were rated as moderate. Areas within the SBSmc2, SBSmc3, SBSdk, and SBSdw2 subzone/variants were rated as high, and areas within the ESSF Nechako Moist Very Cold variant (ESSFmv1) were rated as moderate to reflect reduced suitability at higher colder elevations. Open water, non-vegetated areas, urban, alpine (BAFA), and ESSF Moist Very Cold Parkland (ESSFmvp) were classified as nil and not of use by these two species.

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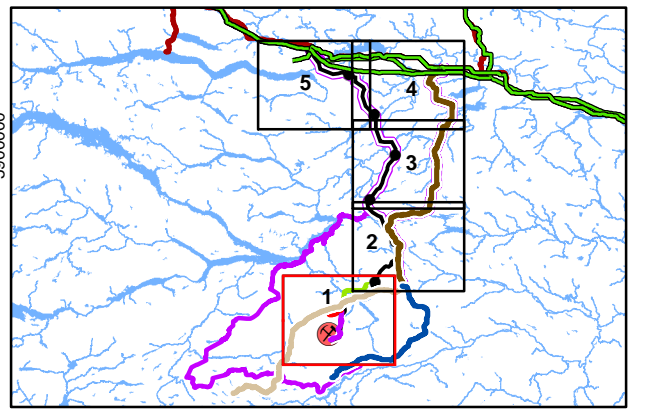
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- Kluskus-Ootsa FSR
- Exploration Road
- Proposed Airstrip Access Road
- Proposed Mine Access Road
- Proposed Fresh Water Pipeline
- Proposed Transmission Line
- Proposed Transmission Line (Mills Ranch re-route)
- Proposed Airstrip
- Proposed Site Facilities
- Stream (>=2nd Order)
- Waterbody (>= 4 Ha)
- Wetlands (within RSA)

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Wildlife Habitat Rating

- H - High
- M - Moderate
- L - Low
- N - Nil



Scale: 1:120,000
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Kilometres

Reference
BC Government GeoBC Data Distribution

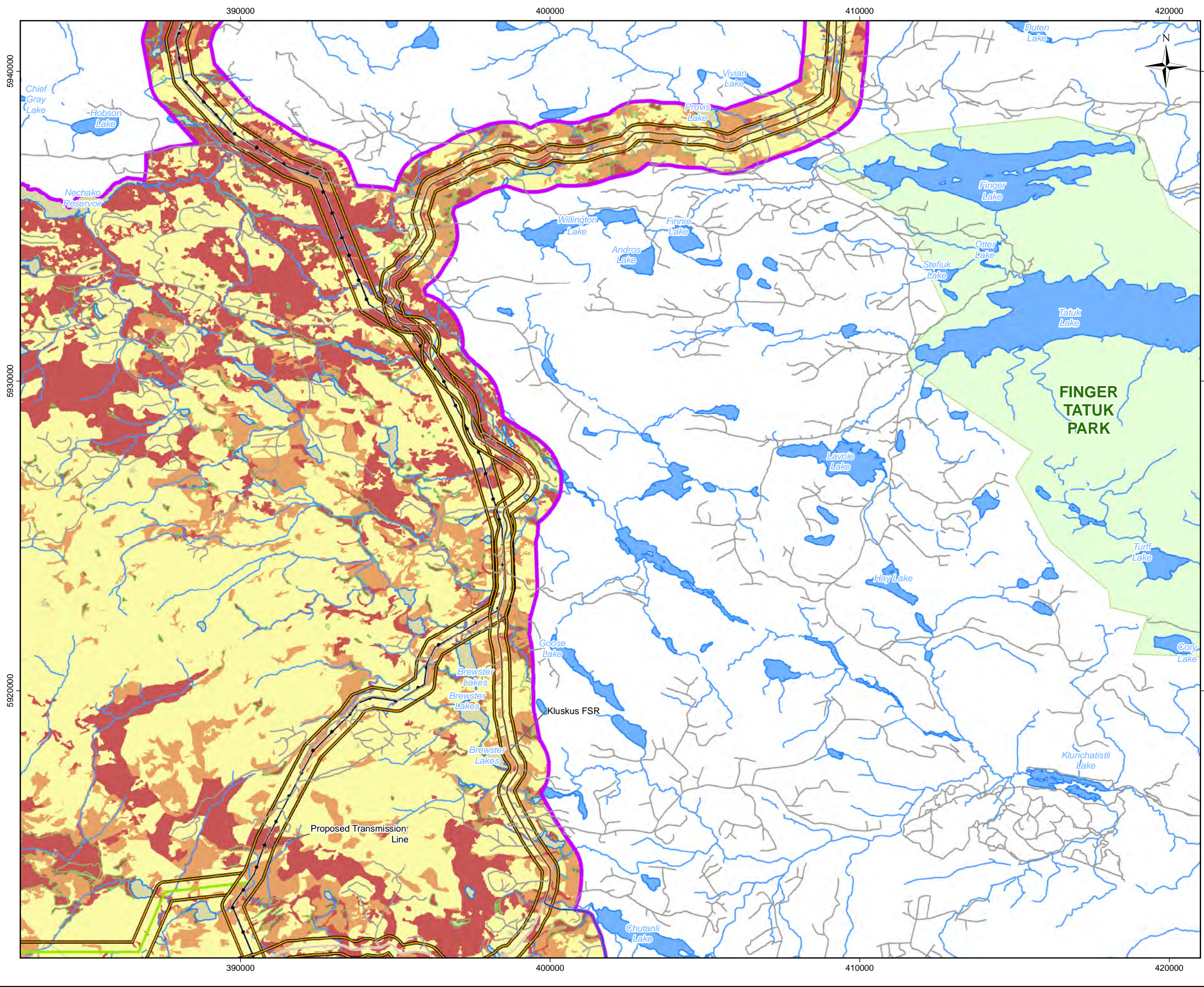
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newgold™

PROJECT:
Blackwater Gold Project

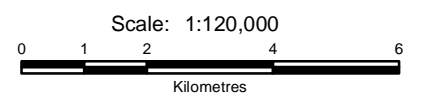
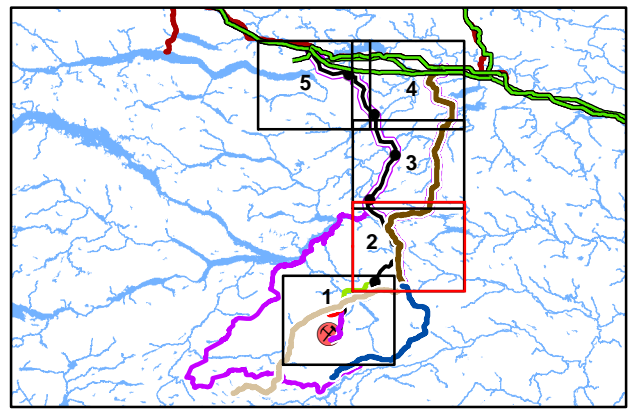
**Terrestrial Birds
Habitat Suitability, Map 1 of 5**

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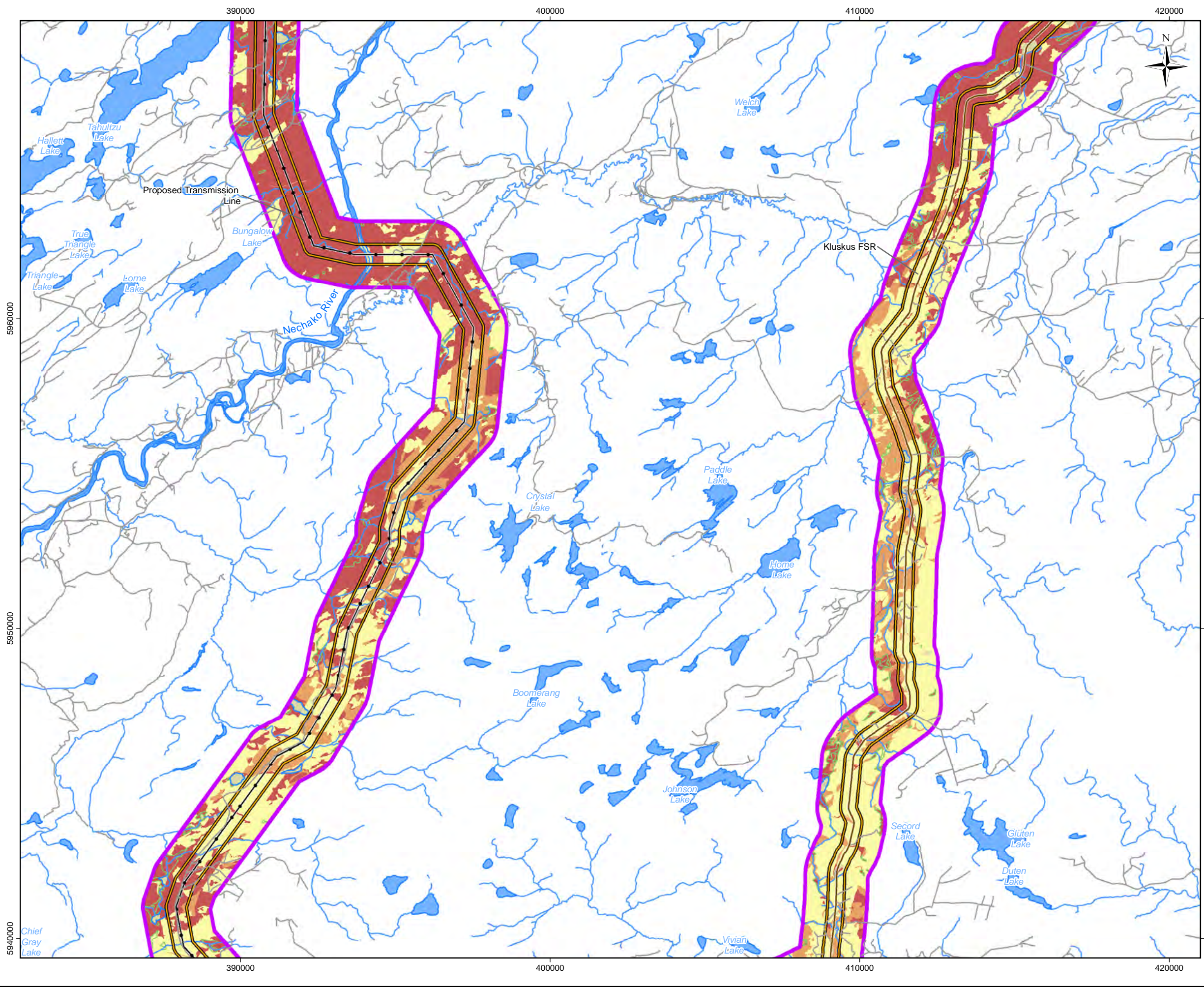
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 - Proposed Transmission Line (Mills Ranch re-route)
 - Stream (>=2nd Order)
 - Waterbody (>= 4 Ha)
 - Wetlands (within RSA)
 - Parks and Protected Areas
- Wildlife and Wildlife Habitat**
- Local Study Area
 - Regional Study Area
- Wildlife Habitat Rating**
- H - High
 - M - Moderate
 - L - Low
 - N - Nil



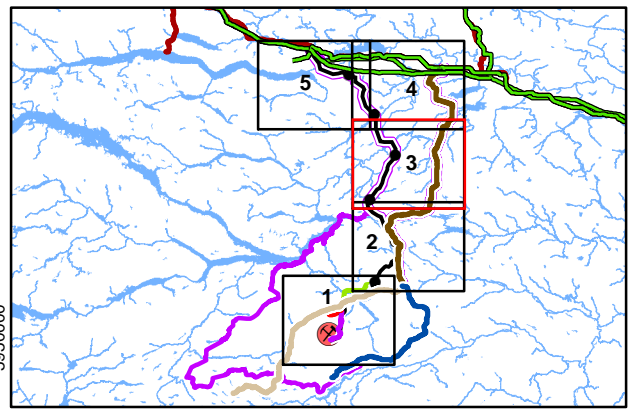
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BC Government GeoBC Data Distribution

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PROJECT: Blackwater Gold Project		
Terrestrial Birds Habitat Suitability, Map 2 of 5		
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- Legend**
- Existing Road
 - Kluskus FSR
 - Proposed Transmission Line
 - Stream (>=2nd Order)
 - Waterbody (>= 4 Ha)
 - Wetlands (within RSA)
- Wildlife and Wildlife Habitat**
- Local Study Area
 - Regional Study Area
- Wildlife Habitat Rating**
- H - High
 - M - Moderate
 - L - Low
 - N - Nil



Scale: 1:120,000
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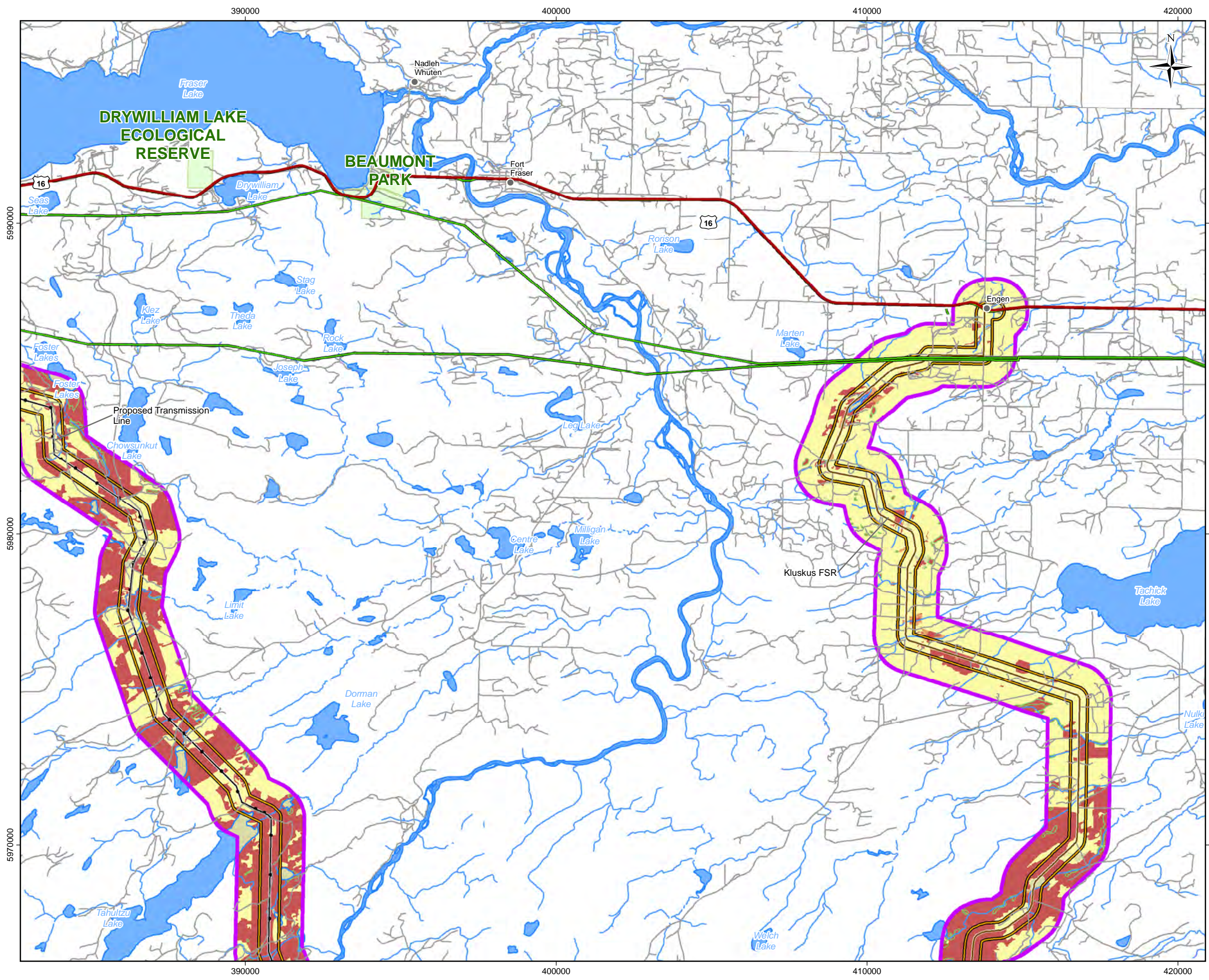
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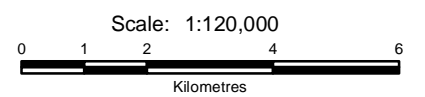
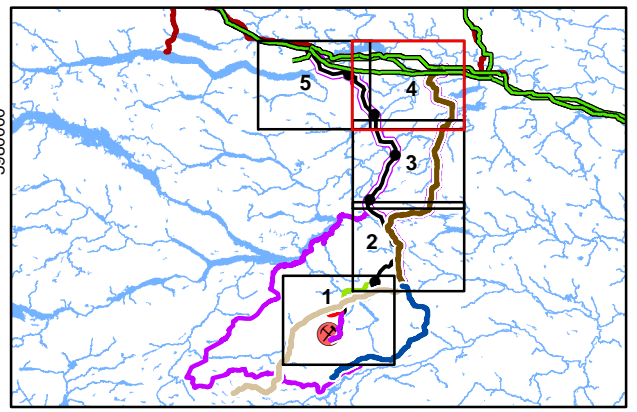
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**Terrestrial Birds
Habitat Suitability, Map 3 of 5**

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PROJECTION: UTM Zone 10	DATUM: NAD83	



- Legend**
- Existing Transmission Line
 - Highway
 - Existing Road
 - Kluskus FSR
 - Proposed Transmission Line
 - Stream (>=2nd Order)
 - Waterbody (>= 4 Ha)
 - Wetlands (within RSA)
 - Parks and Protected Areas
- Wildlife and Wildlife Habitat**
- Local Study Area
 - Regional Study Area
- Wildlife Habitat Rating**
- H - High
 - M - Moderate
 - L - Low
 - N - Nil



Reference
BC Government GeoBC Data Distribution

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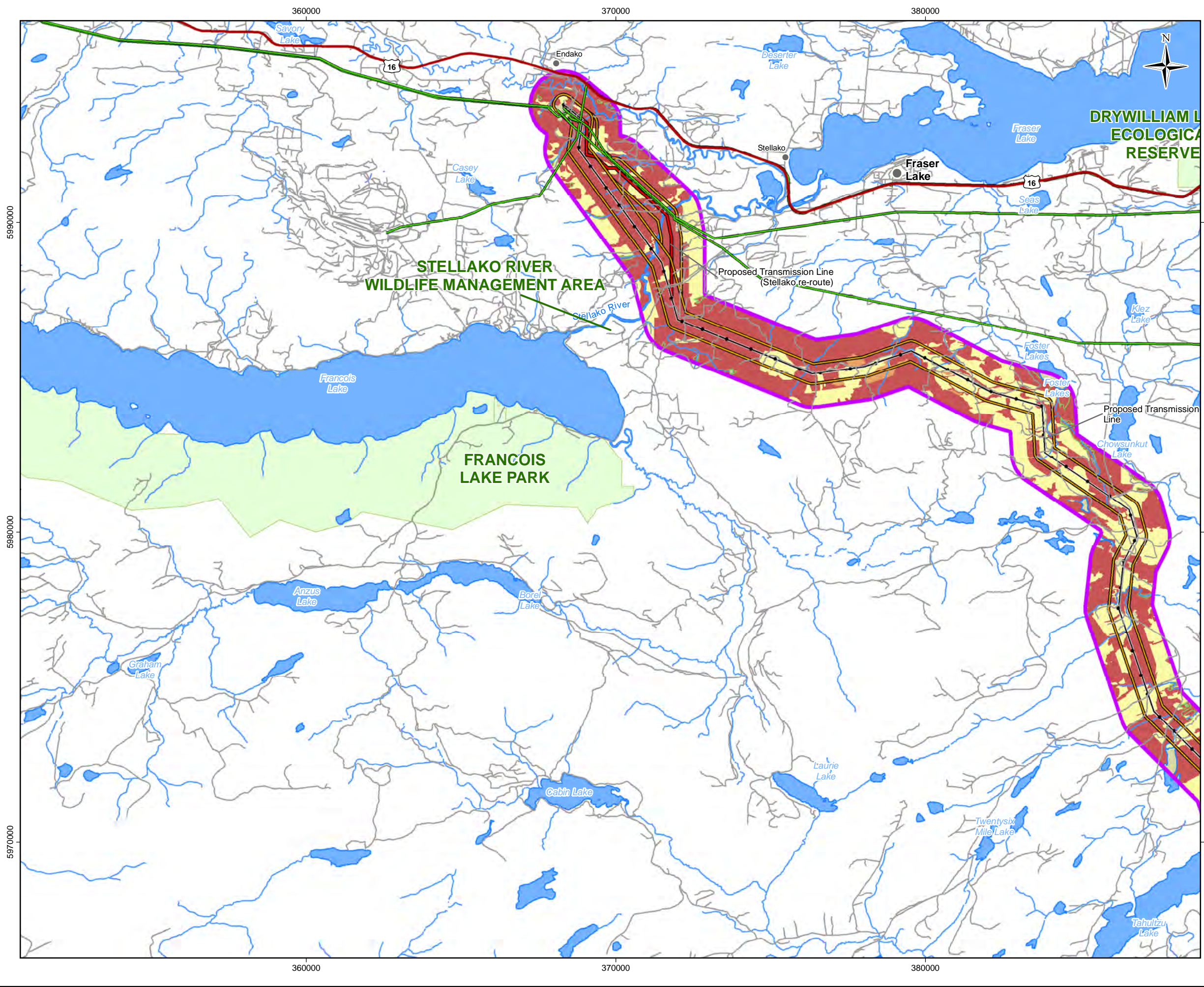
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**Terrestrial Birds
Habitat Suitability, Map 4 of 5**

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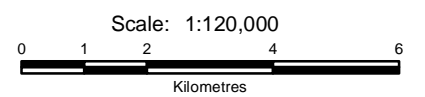
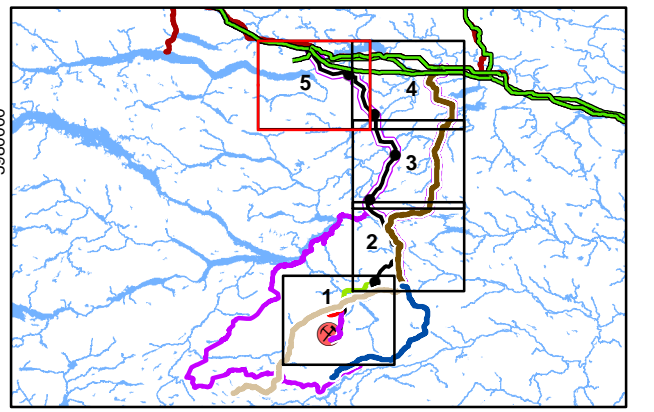
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- Existing Transmission Line
- Highway
- Existing Road
- Proposed Transmission Line
- Proposed Transmission Line (Stellako re-route)
- Stream (>=2nd Order)
- Waterbody (>= 4 Ha)
- Wetlands (within RSA)
- Parks and Protected Areas

Wildlife and Wildlife Habitat

- Local Study Area
- Regional Study Area

Wildlife Habitat Rating

- H - High
- M - Moderate
- L - Low
- N - Nil



Reference
BC Government GeoBC Data Distribution

CLIENT:		
PROJECT:		Blackwater Gold Project
Terrestrial Birds Habitat Suitability, Map 5 of 5		
DATE: September, 2015	ANALYST: MY	Figure 5.4.9-2e
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The specific life requisites and habitat for the representative forest and grassland birds (not including Clark's nutcracker) were identified and mapped within the LSA and RSA using a four-class habitat suitability ranking system for the growing season. The specific habitat requisites and a distance model were used to identify Clark's nutcracker habitat due to its specific limiting habitat constraints (i.e., whitebark pine). A buffer of 300 m was applied to the area where whitebark pine is located in the LSA and RSA, and rated as high. This buffer was selected to account for areas of whitebark pine that may have been missed or have already been removed on Mt. Davidson as well as potential nesting habitat. Moderate value habitat included a buffer of 3 km from this line. This 3 km radius was where the majority of Clark's nutcrackers not detected in the whitebark pine ecosystem were detected during baseline surveys. The low habitat suitability extended from 3 km, out to 32 km from the whitebark pine stand, and a distance of greater than 32 km from whitebark pine was deemed unsuitable for the Clark's nutcracker.

5.4.9.3.7 Model Results for Quantification of Potential Project Effects on Habitat

The potential overlap of Project component footprints on focal species of forest and grassland bird habitats is tabulated in **Table 5.4.9-8** (olive-sided flycatcher and red-tailed hawk) and **Table 5.4.9-9** (Clark's nutcracker) and illustrated on **Figure 5.4.9-2** and **Figure 5.4.9-3**, respectively. The areas shown represent the maximum potential habitat affected, and do not account for existing disturbance or mitigation measures.

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Table 5.4.9-8: Potential Forest and Grassland Birds (not including Clark’s Nutcracker) Moderate and High Habitat Area Affected within Footprints, LSAs, and RSA

	LSA Component	Moderate Habitat Area (ha)	Total Area (ha)	Moderate Habitat % of Total Area	% of RSA Habitat by Footprint Component	High Habitat Area (ha)	Total Area (ha)	High Habitat % of Total Area	% of RSA Habitat by Footprint Component
Footprint or Corridor	Access Road	69	95	72	<1%	7	95	7	<1%
	Airstrip	25	50	49	<1%	13	50	26	<1%
	Kluskus FSR	26	253	10	<1%	11	253	4	<1%
	Mine site	1,242	4,430	28	2	188	4,430	4	<1%
	Freshwater Supply Pipeline	47	132	36	<1%	17	132	13	<1%
	Transmission Line – Main	272	1,806	15	<1%	719	1,806	40	1
	Transmission Line – Mills Ranch	19	202	9	<1%	36	202	18	<1%
	Transmission Line – Stellako	0	62	0	0	45	62	72	<1%
	Total	1,699	7,032	24	3	1,036	7,032	15	1
LSA	Access Road	262	363	72	<1%	37	363	10	<1%
	Airstrip	289	465	62	<1%	94	465	20	<1%
	Kluskus FSR	1,244	6,574	19	2	1,147	6,574	17	2
	Mine site	1,729	6,123	28	3	311	6,123	5	<1%
	Freshwater Supply Pipeline	295	731	40	<1%	122	731	17	<1%
	Transmission Line – Main	1,143	8,068	14	2	3,407	8,068	42	5
	Transmission Line – Mills Ranch	135	924	15	<1%	186	924	20	<1%
	Transmission Line – Stellako	0	306	0	0	233	306	76	<1%
	Total	5,096	23,554	22	9	5,537	23,554	24	8
RSA		56,237	291,714	19	-	72,448	291,714	25	-
Area	Footprint % RSA	2	-	-	-	2	-	-	-
	Footprint % LSA	30	-	-	-	30	-	-	-
Habitat	Footprint % RSA habitat	3	-	-	-	1	-	-	-
	Footprint % LSA habitat	33	-	-	-	19	-	-	-

Note: FSR = forest service road; ha = hectare; LSA = Local Study Area; RSA = Regional Study Area

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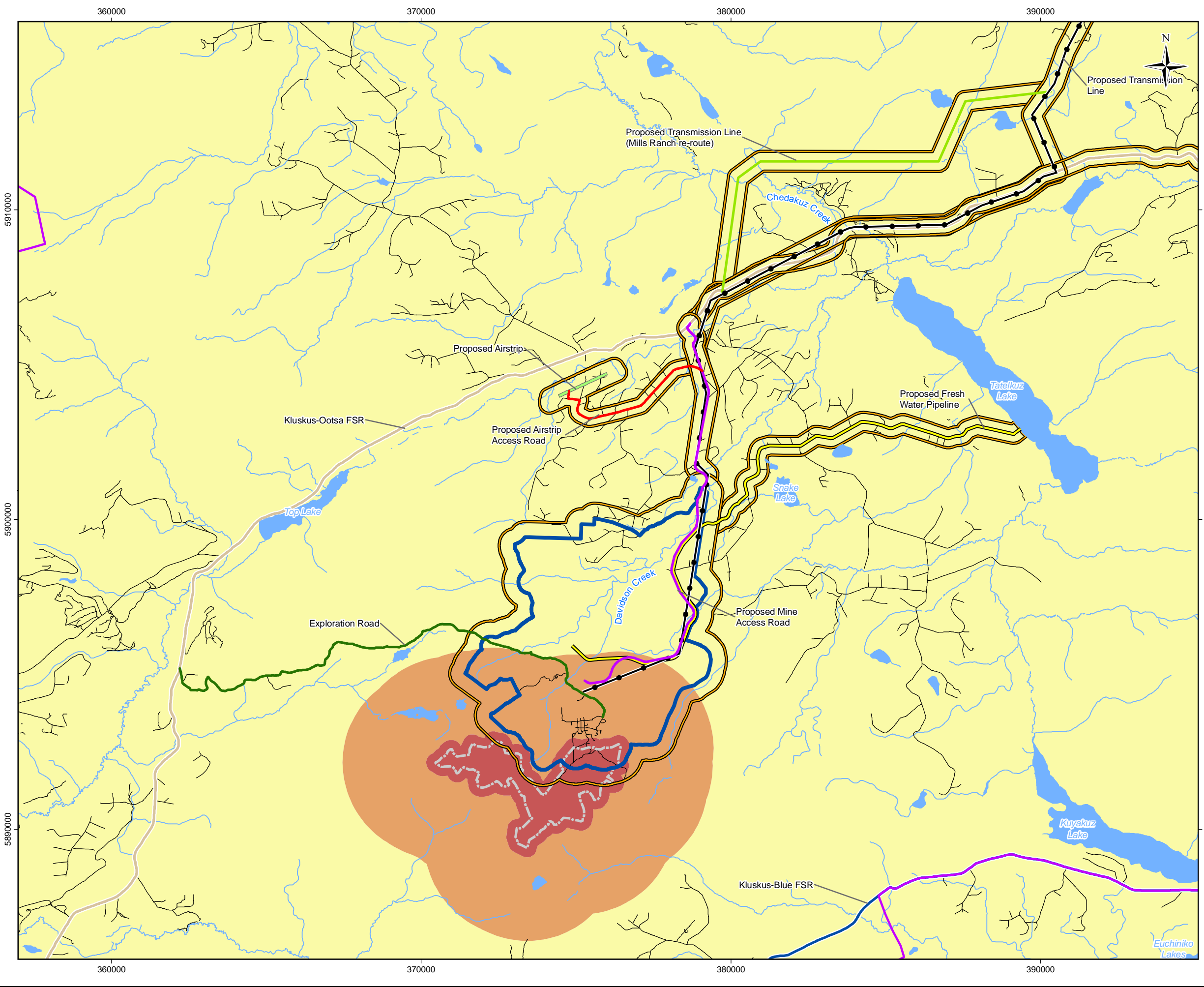


Table 5.4.9-9: Potential Clark’s Nutcracker Moderate and High Value Habitat Area Affected Within Footprints, LSAs, and RSA

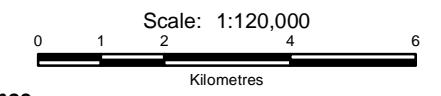
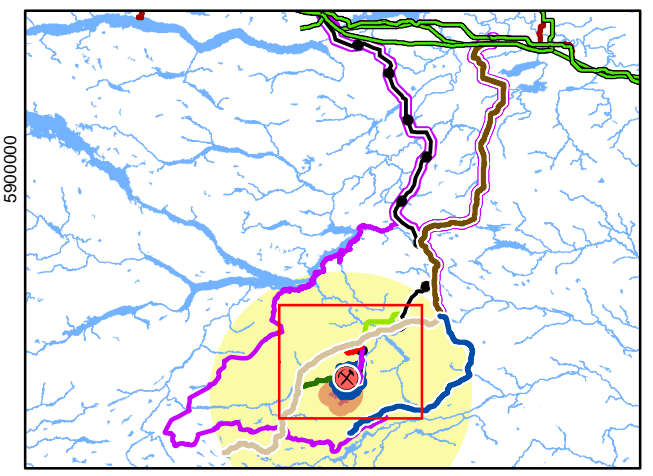
	LSA Component	Moderate Habitat Area (ha)	Total Area (ha)	Moderate Habitat % of Total Area	% of RSA Habitat by Footprint Component	High Habitat Area (ha)	Total Area (ha)	High Habitat % of Total Area	% of RSA Habitat by Footprint Component
Footprint or Corridor	Access Road	0	95	0	0	0	95	0	0
	Airstrip	0	50	0	0	0	50	0	0
	Kluskus FSR	0	230	0	0	0	230	0	0
	Mine site	1,684	4,430	38	23	207	4,430	5	15
	Freshwater Supply Pipeline	0	132	0	0	0	132	0	0
	Transmission Line – Main	0	1,806	0	0	0	1,806	0	0
	Transmission Line – Mills Ranch	0	202	0	0	0	202	0	0
	Transmission Line – Stellako	0	62	0	0	0	62	0	0
	Total	1,684	7,032	24	23	207	7,032	3	15
LSA	Access Road	0	363	0	0	0	363	0	0
	Airstrip	0	465	0	0	0	465	0	0
	Kluskus FSR	0	5,529	0	0	0	5,529	0	0
	Mine site	2,135	6,123	35	30	435	6,123	7	32
	Freshwater Supply Pipeline	0	731	0	0	0	731	0	0
	Transmission Line – Main	0	8,068	0	0	0	8,068	0	0
	Transmission Line – Mills Ranch	0	924	0	0	0	924	0	0
	Transmission Line – Stellako	0	306	0	0	0	306	0	0
	Total	2,135	23,554	9	30	435	23,554	2	32
RSA		7,177	291,714	2	-	1,375	291,714	0	-
Area	Footprint % RSA	2	-	-	-	2	-	-	-
	Footprint % LSA	30	-	-	-	30	-	-	-
Habitat	Footprint % RSA habitat	23	-	-	-	15	-	-	-
	Footprint % LSA habitat	79	-	-	-	48	-	-	-

Note: FSR = forest service road; ha = hectare; LSA = Local Study Area; RSA = Regional Study Area

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- Legend**
- Kluskus-Blue FSR
 - Kluskus-Ootsa FSR
 - Existing Road
 - Exploration Road
 - Proposed Transmission Line
 - Proposed Transmission Line (Mills Ranch re-route)
 - Proposed Mine Site Access Road
 - Proposed Airstrip Access Road
 - Proposed Fresh Water Pipeline
 - Proposed Airstrip
 - Stream (>= 2nd Order)
 - Waterbody (>= 4 Ha)
 - Proposed Mine Site
- Wildlife and Wildlife Habitat**
- Local Study Area
 - Regional Study Area
- Habitat Suitability Rating**
- High
 - Moderate
 - Low
 - WhiteBark Pine Distribution Extent



Reference
BC Government GeoBC Data Distribution

CLIENT: 		
PROJECT: Blackwater Gold Project		
Clark's Nutcracker Habitat Suitability Rating		
DATE: September, 2015	ANALYST: MY	Figure 5.4.9-3
JOB No: VE52277	QA/QC: MB	PDF FILE: 04-03-006_WHR_CLNU_5.4.9-3.pdf
GIS FILE: 04-03-006_WHR_CLNU_5.4.9-3.mxd		
PROJECTION: UTM Zone 10	DATUM: NAD83	

5.4.9.3.7.1 *Habitat Loss and Alteration*

The habitat loss and alteration category of effects is a method of accounting for areas of vegetation removal and/or ground disturbance due to placement of infrastructure. To simplify the effects assessment, all lost areas are combined regardless of how long they are lost (even though the Project area will be reclaimed, except for some small features) to represent a worst-case scenario.

The potential degradation to wildlife habitat includes sensory disturbance, physical hazards, and chemical hazards. Physical and chemical hazards can be a source of habitat loss as well as a sensory effect (**Table 5.4.9-12**). These habitat effects are assessed within the LSA to estimate potential habitat loss and alterations to forest and grassland birds. These habitat effects are assessed within 100 m from the edge of infrastructure to estimate potential degradations. This is considered a reasonable distance based on the various types of degradation of effects that have potential to occur on the focal species.

5.4.9.3.7.1.1 *Olive-sided Flycatcher and Red-tailed Hawk*

The olive-sided flycatcher and red-tailed hawk were detected in matrices of mature forest and harvested areas adjacent to wetlands. Most of the detections of the olive-sided flycatcher (greater than 89%) and red-tailed hawk (85%) were from the SBSmc2 and SBSmc3 variants and SBSdk subzone found in the lower elevation forests below the mine site. Clearing of vegetation for the linear features such as roads and the transmission line will likely provide additional suitable clearcuts and roadside area for this species to forage. The overall effect of the proposed development on these two indicator species may increase the amount of suitable habitat, through the creation of increased edge and open habitat required by both species for foraging.

Within the RSA, 19% (56,237 ha) of the area was rated as moderate value habitat for forest and grassland birds (not including Clark's nutcracker) and 25% (72,448 ha) was rated as high value habitat. In the RSA, footprint components overlap approximately 3% of the moderate value forest and grassland habitat, and 1% of the high value habitat. High elevation mine facilities are not expected to be located on high value habitat because higher elevation forest has lower suitability for nesting and growing for red-tail hawk and olive-sided flycatcher compared to lower elevation more productive forest, with the exception of Clark's nutcracker discussed below. Most potential Project effects on forest and grassland birds are anticipated to be associated with the clearing of vegetation along the main transmission line route including the two transmission line re-route options (Mills Ranch and Stellako), mine access road, airstrip, and freshwater supply pipeline, due to their location in lower elevations and in the SBS zone.

The clearing limits equal maximum lost area, regardless if previously disturbed or not. A potential loss of 0.12 territories of red-tailed hawks and 273.5 territories of olive-sided flycatchers is predicted, based on average territory size of 23,000 ha for red-tailed hawks (Campbell et al., 1990) and 10 ha for olive-sided flycatchers (Altman and Sallabanks, 2000; COSEWIC, 2007).

5.4.9.3.7.1.2 *Clark's Nutcracker*

In the RSA, 2% (7,177 ha) of the area was rated as moderate value habitat for Clark's nutcracker and less than 1% (1,375 ha) was rated as high value. Within the LSA, 9% (2,135 ha) of the area was rated as moderate value habitat and 2% (435 ha) as high value habitat. Of the moderate and high value habitat in the LSA, 79% of the moderate value habitat and 48% of the high value habitat was overlaid by Project components. The habitat suitability model uses habitat other than pure whitebark pine stands as suitable habitat for Clark's nutcracker, resulting in different area values between the vegetation assessment and wildlife assessment. Footprint components overlap a maximum of 23% of moderate and 15% of high suitable nutcracker habitat in the RSA before mitigation measures. After reclamation and mitigation, suitable habitat is expected to be near baseline. Mitigation for whitebark pine loss will include a range of strategies, including replanting, progressive reclamation and supporting research as described in the LSVMRP (**Section 12.2.1.18.4.4**). It is expected that it will take approximately 80 years for these trees to reach maturity and provide a suitable cone source for Clark's nutcracker. Suitability mapping for Clark's nutcracker include the whitebark pine stands and adjacent conifer forest in the high and moderate suitability classes. In the LSA, the transmission line, Kluskus FSR, airstrip, access road, and freshwater supply pipeline areas are not high or moderate value habitat for Clark's nutcracker.

The potential direct habitat loss for Clark's nutcracker will include an area of the mine site that is predicted to be approximately 1,684 ha of moderate habitat (maximum of 79% of available LSA habitat) and 207 ha of high-value habitat (maximum of 48% of available LSA habitat). The most important habitat areas affected are those within the mine site LSA. Surveys during the early summer period detected few birds (AMEC, 2013), and it is expected that, at most, a few pairs may nest on Mount Davidson. As a result, it is difficult to quantify how many territories may be lost due to habitat loss.

Clark's nutcrackers were found around Mount Davidson within and near the distribution of whitebark pine, and could potentially nest anywhere within 30 km of the whitebark pine distribution limit. Some whitebark pine trees have already been cleared as part of the exploration program, with the remaining scheduled to be cleared during construction. Other effects that could lead to loss of whitebark pine at Mount Davidson could be effects associated with the Project such as nitrogen deposition, dust deposition, as well as natural disturbance regimes including white pine blister rust, fire, and MPB (**Section 5.4.5**).

Effects have the potential to occur from the start of construction to the end of post-closure. Rehabilitation of the mine site open pit into a useable habitat for Clark's nutcracker is not possible and therefore will be a permanent loss.

5.4.9.3.8 **Mitigation Measures**

A range of habitat mitigation was adapted and applied to the Project as described in the WLMP (**Section 12.2.1.18.4.6**), LSVMRP (**Section 12.2.1.18.4.4**) and the RCP (**Section 2.6**). The following habitat mitigation measures apply to all forest and grassland birds and are specific to the potential effects carried through the assessment.

5.4.9.3.8.1 *Habitat Loss and Alteration*

The following mitigation measures will help reduce or eliminate habitat loss and alteration. Avoiding and/or mitigating loss and degradation effects to forest and grassland birds and habitat begins with the Project design. The Kluskus FSR is an existing road for most of its footprint. Some of the mitigation measures already in place include:

- Road design using existing roads and cleared areas, and locating proposed access roads and transmission lines away from wetland and riparian areas or spanning wetlands; and
- Movement of the facilities and topsoil piles within the mine site area away from wetlands, and/or minimizing ground disturbance footprint, and minimizing clearance of mature forest.

To meet provincial and federal regulatory requirements for wildlife, vegetation, and aquatic resources relating to the conservation of species and ecosystems at risk, the following plans will be implemented: LSVMRP (**Section 12.2.1.18.4.4**), ISMP (**Section 12.2.1.18.4.5**), WMP (**Section 12.2.1.18.4.3**), SECP (**Section 12.2.1.18.4.1**), RCP (**Section 2.6**), and ARMP (**Section 12.2.1.18.4.2**). These plans are designed to control invasive plant species, protect wildlife habitat, and protect in-stream resources. Implementing these management plans, including the wildlife and wetland specific best management practices (BMPs), will protect and minimize the potential effects of the Project to forest and grassland bird habitat not directly affected by the Project.

Mitigation for unavoidable loss of forest and grassland bird habitat will include:

- Mitigation for loss and degradation of adjacent riparian forest bird habitats by designating well demarcated no-work zones and management work zones (with restrictions, such as no heavy machinery, etc.) and setbacks in accordance with the *Forest and Range Practices Act* BMPs (BC MFLNRO, 2014) where feasible;
- Restoring disturbed habitats at mine closure or development of habitats capable of supporting forest and grassland birds as defined in the RCP (**Section 2.6**) and WLMP (**Section 12.2.1.18.4.6**);
- Minimizing sensory disturbance due to noise and light to areas adjacent to the mine area and airstrip, as stated in the Noise and Vibration Mitigation Measures (**Section 5.2.2**);
- Implementing pre-clearing nest tree surveys of areas to be cleared during the bird breeding seasons (February to August) to identify any nests or listed species to allow avoidance or adaptive management such as delayed clearing until after the least-risk window for any species found or pre-clearing surveys and contacting regulators if exceptions arise;
- Restoring disturbed habitats at mine closure or development of habitats capable of supporting a diversity of wildlife species, using local native vegetation wherever possible or appropriate such as replanting conifer forest and especially whitebark pine in suitable sites;

- Managing waste from the Project to prevent wildlife from accessing food and waste from mine camp, roads, and airstrip (Industrial and Domestic Waste Management Plan (IDWMP) (**Section 12.2.1.18.4.11**));
- To improve air quality and visibility, dust generation on the mine access road and on-site roads will be mitigated as per the Air Quality and Emissions Management Plan (AQEMP) (**Section 12.2.1.18.4.9**);
- Implementing invasive plant management techniques as defined in ISMP (**Section 12.2.1.15.5**);
- Applying erosion and sediment control measures in SECP (**Section 12.2.1.18.4.1**); and
- Installing appropriate culverts where required and maintaining water tables and drainage as per the WMP (**Section 12.2.1.18.4.3**).

In addition to the mitigation measures presented above, follow-up monitoring is proposed for the Clark’s nutcracker to confirm its presence in the Project Area. Details of the follow-up monitoring proposed are presented in **Section 13**.

5.4.9.3.8.2 *Effectiveness of Mitigation*

Table 5.4.9-10 provides ratings for effectiveness of mitigation measures to avoid or reduce potential effects on forest and grassland birds during mine site development.

Table 5.4.9-10: Mitigation Measures and Effectiveness of Mitigation to Avoid or Reduce Potential Effects on Forest and Grassland Birds during Mine Site Development

Likely Environmental Effect	Project Phase	Mitigation/Enhancement Measure	Effectiveness of Mitigation Rating
Habitat loss and alteration	Construction, Operations, Closure, Post-Closure	Road design using existing roads and cleared areas, and locating proposed access roads and transmission lines away from wetland and riparian areas or spanning wetlands	Moderate
		Movement of the facilities and topsoil piles within the mine site area away from wetlands, and/or minimizing ground disturbance footprint, and minimizing clearance of mature forest	Moderate
		Mitigation for loss and degradation of adjacent riparian forest bird habitats by designating well demarcated no-work zones and management work zones (with restrictions, such as no heavy machinery, etc.) and setbacks in accordance with the <i>Forest and Range Practices Act</i> BMPs (BC MFLNRO, 2014) where feasible	High
		Restoring disturbed habitats at mine closure or development of habitats capable of supporting forest and grassland birds as defined in the RCP (Section 2.6) and WLMP (Section 12.2.1.18.4.6)	High
		Minimizing sensory disturbance due to noise and light to areas adjacent to the mine area and airstrip, as stated in the Noise and Vibration Mitigation Measures (Section 5.2.2)	Moderate

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Likely Environmental Effect	Project Phase	Mitigation/Enhancement Measure	Effectiveness of Mitigation Rating
		Implementing pre-clearing nest tree surveys of areas to be cleared during the bird breeding seasons (February to August) to identify any nests or listed species to allow avoidance or adaptive management such as delayed clearing until after the least-risk window for any species found or pre-clearing surveys and contacting regulators if exceptions arise	High
		Restoring disturbed habitats at mine closure or development of habitats capable of supporting a diversity of wildlife species, using local native vegetation wherever possible or appropriate such as replanting conifer forest and especially whitebark pine in suitable sites	High
		Managing waste from the Project to prevent wildlife from accessing food and waste from mine camp, roads, and airstrip (IDWMP) (Section 12.2.1.18.4.11)	High
		To improve air quality and visibility, dust generation on the mine access road and on-site roads will be mitigated as per the AQEMP (Section 12.2.1.18.4.9)	High
		Implementing invasive plant management techniques as defined in ISMP (Section 12.2.1.15.5)	Moderate
		Applying erosion and sediment control measures in SECP (Section 12.2.1.18.4.1)	Moderate
		Installing appropriate culverts where required and maintaining water tables and drainage as per the WMP (Section 12.2.1.18.4.3)	Moderate
Mortality risk	Construction, Operations, Closure, Post-Closure	Following the WLMP to reduce potential effects on birds and their habitat	High
		Enforcing speed limits, as outlined in the TAMP	Moderate
Forest and grassland bird health	Construction, Operations, Closure, Post-Closure	Implementing the Spill Management and Prevention Plan, IDWMP and AQEMP	High
Sensory disturbance	Construction, Operations, Closure, Post-Closure	Minimizing Project footprint, as outlined in existing Project Description	High
		Implementing the noise and light mitigation measures to reduce attraction of birds to facilities and potential resultant mortality	Moderate
Changes in population dynamics	Construction, Operations, Closure, Post-Closure	Implementing vegetation management	High

Note: AQEMP = Air Quality and Emissions Management Plan; BC MFLNRO = British Columbia Ministry of Forests, Lands and Natural Resource Operations; BMP = Best Management Practice; IDWMP = Industrial and Domestic Waste Management Plan; ISMP = Invasive Species Management Plan; RCP = Reclamation and Closure Plan; SECP = Sediment and Erosion Control Plan; TAMP = Transportation and Access Management Plan; WLMP = Wildlife Management Plan; WMP = Wetlands Management Plan

The mitigation/offsetting success ratings shown in **Table 5.4.9-10** are incorporated into the confidence ratings defined in **Section 4.3.5** and summarized in **Table 5.4.9-13**. In summary, low success rating means mitigation has not been proven successful, moderate success rating means

mitigation has been proven successful elsewhere, and high success rating means mitigation has been proven effective.

In the case of forest and grassland birds on the mine site, mitigation/offsetting success rating is classified as moderate overall because most mitigation measures are consistent with those proposed by BC MFLNRO and Environment Canada for protection of forest and grassland bird populations, and demonstrated as moderate to high in effectiveness in other locations.

In the case of Clark’s nutcracker on the mine site, mitigation/offsetting success rating is classified as moderate to low overall because most important mitigation measures for protection of populations have not been demonstrated in effectiveness in other locations. **Table 5.4.9-11** provides ratings for effectiveness of mitigation measures to avoid or reduce potential effects on Clark’s nutcracker during mine site development.

Table 5.4.9-11: Mitigation Measures and Effectiveness of Mitigation to Avoid or Reduce Potential Effects on Clark’s Nutcracker during Mine Site Development

Mitigation measures will be based on site-specific information and construction engineering and are therefore preliminary at this stage.

Likely Environmental Effect	Project Phase	Mitigation/Enhancement Measure	Effectiveness of Mitigation Rating
Habitat loss and alteration	Construction, Operations, Closure, Post-Closure	Road design using existing roads and cleared areas, and locating proposed access roads and transmission lines away from wetland and riparian areas or spanning wetlands	Moderate
		Movement of the facilities and topsoil piles within the mine site area away from wetlands, and/or minimizing ground disturbance footprint, and minimizing clearance of mature forest	Moderate
		Mitigation for loss and degradation of adjacent riparian forest bird habitats by designating well demarcated no-work zones and management work zones (with restrictions, such as no heavy machinery, etc.) and setbacks in accordance with the <i>Forest and Range Practices Act</i> BMPs (BC MFLNRO, 2014) where feasible	Moderate
		Restoring disturbed habitats at mine closure or development of habitats capable of supporting forest and grassland birds as defined in the RCP (Section 2.6) and WLMP (Section 12.2.1.18.4.6)	Low
		Minimizing sensory disturbance due to noise and light to areas adjacent to the mine area and airstrip, as stated in the Noise and Vibration Mitigation Measures (Section 5.2.2)	Moderate

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Likely Environmental Effect	Project Phase	Mitigation/Enhancement Measure	Effectiveness of Mitigation Rating
		Implementing pre-clearing nest tree surveys of areas to be cleared during the bird breeding seasons (February to August) to identify any nests or listed species to allow avoidance or adaptive management such as delayed clearing until after the least-risk window for any species found or pre-clearing surveys and contacting regulators if exceptions arise	Low
		Restoring disturbed habitats at mine closure or development of habitats capable of supporting a diversity of wildlife species, using local native vegetation wherever possible or appropriate such as replanting conifer forest and especially whitebark pine in suitable sites	Low
		Managing waste from the Project to prevent wildlife from accessing food and waste from mine camp, roads, and airstrip (IDWMP) (Section 12.2.1.18.4.11)	High
		To improve air quality and visibility, dust generation on the mine access road and on-site roads will be mitigated as per the AQEMP (Section 12.2.1.18.4.9)	High
		Implementing invasive plant management techniques as defined in ISMP (Section 12.2.1.15.5)	Moderate
		Applying erosion and sediment control measures in SECP (Section 12.2.1.18.4.1)	Moderate
		Installing appropriate culverts where required and maintaining water tables and drainage as per the WMP (Section 12.2.1.18.4.3)	Moderate
Mortality risk	Construction, Operations, Closure, Post-Closure	Following the WLMP to reduce potential effects on birds and their habitat	Moderate
		Enforcing speed limits, as outlined in the Transportation and Access Management Plan (TAMP)	Moderate
Forest and grassland bird health	Construction, Operations, Closure, Post-Closure	Implementing the Spill Management and Prevention Plan, IDWMP and AQEMP	High
Sensory disturbance	Construction, Operations, Closure, Post-Closure	Minimizing Project footprint, as outlined in existing Project Description	Moderate
		Implementing the noise and light mitigation measures to reduce attraction of birds to facilities and potential resultant mortality	Moderate
Changes in population dynamics	Construction, Operations, Closure, Post-Closure	Implementing vegetation management	Moderate

Note: AQEMP = Air Quality and Emissions Management Plan; BC MFLNRO = British Columbia Ministry of Forests, Lands and Natural Resource Operations; BMP = Best Management Practice; IDWMP = Industrial and Domestic Waste Management Plan; ISMP = Invasive Species Management Plan; RCP = Reclamation and Closure Plan; SECP = Sediment and Erosion Control Plan; TAMP = Transportation and Access Management Plan; WLMP = Wildlife Management Plan; WMP = Wetlands Management Plan

5.4.9.4 Residual Effects and their Significance

Table 5.4.9-12 summarizes the residual categories of assessment after mitigation, as well as management strategies by Project phase and component.

Table 5.4.9-12: Summary of Categories of Assessment and Mitigation Measures – Forest and Grassland Birds

Project Phase	Project Component	Category of Assessment	Mitigation and Management of Effects	Potential for Residual Effect?
Construction, Operations, Closure, and Post-Closure	Mine site, access roads, freshwater supply pipeline, airstrip, and transmission line	Habitat Loss and Alteration	Landscape, Soils and Vegetation Management Plan and Restoration Plan (LSVMP) proposed progressive reclamation with appropriate species. Revegetation of lost mature and old-growth forest on the transmission line.	Yes
Construction, Operations, Closure and Post-Closure	Mine site, access roads, freshwater supply pipeline, airstrip, and transmission line	Mortality Risk	Following the Wildlife Management Plan (WLMP) to reduce potential effects on birds and their habitat. Enforcing speed limits, as outlined in the Transportation and Access Management Plan (TAMP).	No
Construction, Operations, Closure and Post-Closure	Mine site, access roads, freshwater supply pipeline, airstrip, and transmission line	Forest and Grassland Bird Health	Implementing the Spill Management and Prevention Plan, Industrial and Domestic Waste Management Plan (IDWMP) and Air Quality and Emissions Management Plan (AQEMP).	No
Construction, Operations, and Closure	Mine site, access roads, freshwater supply pipeline, airstrip, and transmission line	Sensory Disturbance	Minimizing Project footprint, as outlined in existing Project Description. Implementing the noise and light mitigation measures to reduce attraction of birds to facilities and potential resultant mortality.	No
Construction, Operations, Closure and Post-Closure	Mine site, access roads, freshwater supply pipeline, airstrip, and transmission line	Changes in Population Dynamics	Implementing vegetation management.	No

Residual effects are those remaining after implementing all mitigation measures, and the expected consequences of the Project on forest and grassland birds (BC EAO, 2013). Each of the categories of assessment determined to have residual effects on forest and grassland birds is characterized in terms of the effect's magnitude or severity, geographic extent, duration, reversibility, context/resilience of forest and grassland birds or habitat, probability of the effect's occurrence, and confidence in the conclusions (**Table 5.4.9-13**).

Table 5.4.9-13: Characterization of Residual Environmental Effects for Forest and Grassland Birds

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Magnitude	The amount of change in a measurable parameter or variable relative to baseline case	Negligible—Effects are not measurable Low—A measurable change but within the range of natural variation Medium—A measurable change but less than high High ⁽¹⁾ —A measurable change of density, abundance, or distribution (>30% change and >20% for listed species such as yellow rail)
Geographical Extent	The geographic area in which an environmental, economic, social, heritage, or health effect of a defined magnitude occurs	Site-specific: Within the Project site – Local (e.g., effect is closely linked to the footprint but does not extend far outside of it); many wildlife effects that extend into the LSA are referred to as local Local: Within the LSA – Effect is confined to the LSA Regional: Within the RSA – Effect extends beyond the LSA into the RSA
Frequency	When the effect occurs and the number of times during the Project or a specific Project phase that an environmental effect may occur	Once—Effect occurs on one occasion Intermittent—Effect occurs several times Continuous—Effect occurs continuously
Duration	The period of time required until birds returns to their baseline condition or the effect can no longer be measured or otherwise perceived	Short-term—Less than two years (i.e., effects happens during the construction phase only) Medium-term – Not applicable for forest and grassland birds Long-term—From more than 17 to less than 35 years (i.e., effect happens during construction, operations and closure) Chronic—More than 35 years and beyond (i.e., effect happens from construction through to post closure and beyond)
Reversibility	The likelihood that a measurable parameter will recover from an effect	Yes—Effect is reversible within part of a whole generation after the impact ceases No—Effect is not reversible over the timescales listed
Context	Resilience to stress due to ecological fragility and degree of disturbance of area in which the Project is located	Low—Forest and grassland birds have high resilience to stress, have not been affected by other projects or activities or natural changes. No listed species or ecosystems identified Medium—Forest and grassland birds have moderate resilience to stress, the VC has been affected by other projects or activities, or natural changes but still has capacity to assimilate more changes. Presence of blue-listed species or ecosystems High—Forest and grassland birds have weak resilience to stress, the VC has been severely affected by other projects or activities, or natural changes. Presence of red-listed or SARA-listed species or ecosystems
Likelihood of Effect	The likelihood that a residual effect will occur	Low—Low likelihood a residual effect will occur Moderate – Moderate likelihood a residual effect will occur High—High likelihood a residual effect will occur

Characterization	Description	Quantitative Measure or Definition of Qualitative Categories
Significance	Expectation of a residual effect on the VC that is above the suggested threshold	<p>Not Significant (negligible)—Effects are point-like or local in geographic extent, or a low context rating, and a negligible magnitude; short-term, reversible, and with a low frequency (once or intermittent)</p> <p>Not Significant (minor)—Effects are local in geographic extent, or a low magnitude and low context rating; short-term to chronic, reversible, and with a low frequency (once or intermittent)</p> <p>Not Significant (moderate)—Effects are local to regional in geographic extent, medium in magnitude, medium context rating, medium-term to chronic, reversible, and occur at all frequencies</p> <p>Significant—Effects occur to forest and grassland birds with a moderate to high context, high magnitude, regional in geographic extent, long-term to chronic, non-reversible, and occur at all frequencies</p>
Confidence Level	Confidence in the residual effects prediction	<p>Low—Effects on forest and grassland birds are not well understood; mitigation has not been proven effective</p> <p>Moderate—Effects on forest and grassland birds are understood in similar ecosystems and effects documented in the larger regional area or in the literature; mitigation proven effective elsewhere</p> <p>High—Effects on forest and grassland birds are well understood; mitigation has been proven effective</p>

Note: LSA = Local Study Area; RSA = Regional Study Area; SARA = *Species at Risk Act*
 High: A threshold of 20% change or loss is proposed for high magnitude. This is a general environmental practitioner approach, which has been used and supported in the past for resource development projects, including the Joint Review Panel Report on the Jackpine Mine Expansion Project which decision statement was made under *CEAA 2012*.

Thresholds are based on the ability to likely detect change in local populations as a result of Project effects. Threshold effect levels to forest and grassland birds were selected to reflect the ability of surveys to detect quantitative and qualitative changes (**Table 5.4.9-14**).

Table 5.4.9-14: Threshold(s) for Determining Significance of Residual Forest and Grassland Birds Habitat and Population Effects in the RSA

Category of Assessment	Proposed Threshold of Environmental Effect
Habitat Loss and Alteration	>20% reduction in relative forest and grassland bird habitat abundance or habitat areas with a moderate to high suitability ratings (e.g., >20% change in amount of forest and grassland bird moderate to high suitable habitats within the RSA, as estimated in suitability model). Evidence of lack of use or displacement due to sensory disturbance may be included as lost habitat if evident.

Note: RSA = Regional Study Area

Table 5.4.9-15 and **Table 5.4.9-16** present the residual effects assessment summaries for forest and grassland birds, based on the categorization of effects.

Table 5.4.9-15: Residual Effects Assessment Summary for Forest and Grassland Birds (not including Clark's Nutcracker)

Project Phase	Project Component	Category of Assessment	Mitigation and Management	Potential for Residual Effect?	Residual Effect	Context	Magnitude	Geographic Extent	Duration	Reversibility	Frequency	Likelihood Determination	Level of Confidence for Likelihood	Significance Determination	Level of Confidence for Significance
Construction through to Post-Closure	Mine site, airstrip, transmission line, freshwater supply pipeline and access roads	Habitat Loss and Alteration	Vegetation Management Plan, progressive reclamation with appropriate species, maintain forest function and vegetation cover.	Yes	Unavoidable loss of habitat	Low	Low	Local	Chronic	Reversible (mine site, transmission line, freshwater supply pipeline and access road) Irreversible (FSR)	One time	High	High	Not Significant (minor)	High

Table 5.4.9-16: Residual Effects Assessment Summary for Clark's Nutcracker

Project Phase	Project Component	Category of Assessment	Mitigation and Management	Potential for Residual Effect?	Residual Effect	Context	Magnitude	Geographic Extent	Duration	Reversibility	Frequency	Likelihood Determination	Level of Confidence for Likelihood	Significance Determination	Level of Confidence for Significance
Construction through to Post-Closure	Mine site, airstrip, transmission line, freshwater supply pipeline and access roads	Loss includes habitat loss and alteration, physical and chemical hazards, and changes in wildlife population dynamics.	Vegetation Management Plan, progressive reclamation with appropriate species, maintain forest function and vegetation cover. Replanting of whitebark pine during operations, closure and post closure. Potential for supplemental feeding and augmentation if needed, radio-tagging and monitoring use and movement of nutcrackers	Yes	Unavoidable loss of habitat	Medium	Moderate	Local	Chronic	Yes	One time	High	High	Not Significant (moderate)	Low

5.4.9.4.1 Mine Site

The residual effects of habitat loss and degradation of forest and grassland bird habitat (not including Clark's nutcracker) are rated as Not Significant (minor) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring. Loss will occur during the construction phase, and these effects will be evident through the closure and post-closure phases, and are rated chronic in duration.

Within the mine site, the effect is rated as low magnitude. A small percentage of available habitat will be affected (2% of the moderate and <1% of high suitable RSA habitat) and the sensitivity to recovery for these ecosystems is high. The clearing of trees from forested habitats, including moderate and high quality habitat, will generally make the habitat unsuitable for forest birds, however, regionally these habitats are widespread and relatively common. The habitat impacts will have a local effect restricted to the LSA. Some areas will be reclaimed post-closure; however, other areas will be revegetated before closure, reducing the time the habitat is lost. Forest and grassland bird habitat can respond in the long term recovering from disturbances. The duration of the habitat effect will be short term. The habitat effect will occur once and will be reversible. There is a high probability that loss of some moderate and high value habitat will occur and high confidence that the effect will be Not Significant. Project activities are not expected to affect the viability of forest and grassland birds due to the widespread and common extent of these species and their habitat within the RSA.

For Clark's nutcracker, the residual effects of habitat loss are rated as Not Significant (moderate) with low confidence, due to the magnitude, geographical extent, frequency, and reversibility. The effects will occur during the construction phase and will be evident in the closure and post-closure phases. Within the mine site, the effect is rated as medium magnitude because 22% of the high and moderate rated habitat will be affected before mitigation (below the high threshold of 30%), and the geographic extent will be local and limited to the LSA. The clearing of trees from forested habitats will generally make the habitat unsuitable for this species, as whitebark pine trees are an essential component of the Clark nutcracker's habitat. The habitat effect will occur once and will be reversible; however, affected habitats will take up to 80 years to recover to near baseline conditions due to the slow maturation rate of whitebark pine (Clason and Moody, 2013a). Therefore, the duration of the habitat effect will be chronic and mitigation is closely linked to the LSVRMP (**Section 12.2.1.18.4.4**) implementation and monitoring.

Regionally, these moderate and high value ecosystems are not widespread and are relatively uncommon (Clason and Moody, 2013a). Areas on the Nechako Plateau, to the north and east, do not support whitebark pine. Suitable habitats are found in the mountains to the west and south. The nearest populations of whitebark pine are potentially found approximately 43 km south of Mount Davidson in the Itcha Ilgachez Provincial Park, which has a low abundance of whitebark pine. The nearest sizeable population of whitebark pine suitable to support breeding nutcrackers is approximately 85 km away in Tweedsmuir Provincial Park, which is farther than the known maximum caching distance of 32 km.

Mitigation and reclamation efforts for whitebark pine habitat are described under the Plant Species and Ecosystems-At-Risk valued component (**Section 5.4.6**) and include measures such as awareness, population inventory, rust screening and cone collection and seedling propagation. Reclamation trials using whitebark pine seedlings will be undertaken during progressive reclamation stages as suitable areas within the mine site become available. Also, off-site transplanting initiated during the exploration phase of the Project will continue through the mine life. Supporting research initiatives is also considered as part of the strategy to mitigate effects on whitebark pine habitat. Whitebark Pine Management Plan will be developed and submitted to BC MOE and designated Aboriginal groups prior to clearing in whitebark pine habitat. The Whitebark Pine Management Plan will be implemented and process will be reported at least every three years to the BC MOE and designated Aboriginal groups. Additional information is provided in **Section 5.4.6**.

Project activities will potentially affect the viability of Clark's nutcracker if mitigation measures are not effective due to the uncommon extent of the species and the limited available habitat within the RSA. Clark's nutcracker and its important mutualistic interaction with whitebark pine are well understood, as are the natural disturbance effects on whitebark pine. Follow-up monitoring is proposed to confirm the presence of Clark's nutcracker in the Project area.

For Clark's nutcracker, there is a high likelihood of a Not-Significant (moderate) residual effect occurring, based on the magnitude, geographical extent, frequency, and reversibility; however, the effect has low confidence because the Project interaction with Clark's nutcracker is not well understood.

5.4.9.4.2 Access Roads and Kluskus Forest Service Road

The residual effects of habitat loss for forest and grassland birds (not including Clark's nutcracker) are rated as Not Significant (minor) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring. Within the proposed access road area and Kluskus FSR study area, the effect is rated as low magnitude because a small percentage of available habitat will be affected (less than 1%) and the potential for replanting whitebark pine trees is high. Due to the high resilience to stress for this group, the context was rated as low. Following the one-time habitat removal during construction, it will be approximately 17 years before mine closure and at least 20 or more years for the ecosystems to recover to near baseline conditions. The duration of the habitat effect will be chronic. The habitat impacts and the sensory disturbance and predation risk have a local effect, limited to the LSA.

Regionally, suitable habitats for forest and grassland birds (with the exception of Clark's nutcracker) appear to be widespread and relatively common. In addition, the territory size of most breeding forest and grassland birds is small (i.e., less than 1 ha) and the amount of habitat lost regionally will be minimal (i.e., less than 2%). There is no reasonable expectation that, after mitigation measures, Project activities would affect the viability of forest and grassland birds.

No whitebark pine ecosystems are found within the LSA near the proposed access roads and the Kluskus FSR; therefore, it is with high confidence that the residual effect is rated as Not Significant (negligible) for Clark's nutcracker.

5.4.9.4.3 Airstrip, Transmission Line, and Freshwater Supply Pipeline

The residual effects of habitat loss for forest and grassland birds (not including Clark's nutcracker) are rated as Not Significant (minor) with high confidence, due to the magnitude, geographical extent, frequency, and reversibility of the effect occurring. The habitat loss effects for the airstrip and freshwater supply pipeline have a low magnitude because much of the area is already disturbed and mitigation practices will minimize the majority of effects. The effects have a site-specific extent, limited to the immediate Project footprint. The one-time clearing of forested habitats will generally make the habitat unsuitable for these species; however, this effect is reversible after approximately 20 years once forest is restored. The moderate recovery time of habitat disturbance results in forest and grassland birds having a medium ecological resilience and a medium context rating. There is no reasonable expectation that Project activities would affect the viability of forest and grassland birds due to the widespread and common extent of suitable habitat within the RSA.

No whitebark pine ecosystems are found within the LSAs of the airstrip, transmission line and freshwater supply pipeline; therefore, the residual effect is rated as Not Significant (negligible) with high confidence for Clark's nutcracker.

5.4.9.4.4 Project Area

The loss and alteration of forest and grassland bird habitat will occur during Project construction. Within the RSA, the overall effect of the Project on forest and grassland birds will likely be a small reduction in area of suitable habitat, affecting 3% of suitable red-tailed hawk and olive-sided flycatcher moderate to high value habitat and 22% of suitable Clark's nutcracker moderate to high value habitat. The habitat effect will occur once and will be reversible in the long term during operations through to closure. The Project is unlikely to affect the overall habitat supply for forest and grassland birds within the RSA, due to the large amount of suitable habitat present (greater than 128,000 ha) with the exception of habitat for Clark's nutcracker.

Project activities will potentially affect the viability of Clark's nutcracker near the mine site if mitigation measures are not effective due to the uncommon extent of the species and the limited available habitat for the Clark's nutcracker within the RSA. Clark's nutcracker and its important mutualistic interaction with whitebark pine are well understood, as are the natural disturbance effects on whitebark pine.

5.4.9.5 Cumulative Effects

A Cumulative Effects Assessment (CEA) for the Forest and Grassland Birds VC is necessary because the Project is expected to have a Not Significant (minor) residual adverse effect on forest and grassland bird habitat loss, and a Not Significant (moderate) residual adverse effect for Clark's nutcracker. The spatial boundary for this assessment is the RSA. The temporal boundaries include historical, present, and certain and reasonably foreseeable projects within the RSA. Rationale for carrying forward into the CEA is shown below in **Table 5.4.9-17** and **Table 5.4.9-18**.

Table 5.4.9-17: Project Related Residual Effects; Rationale for Carrying forward into the CEA for Forest and Grassland Birds (not including Clark's Nutcracker)

Project Component	Project Phase	Residual Effect	Rationale	Carried Forward to Cumulative Effects Assessment
Mine site, airstrip, transmission line, freshwater supply pipeline and access roads	Construction through to Post-Closure	Habitat Loss and Alteration	Decreases from the baseline amount of moderate to high rated suitable habitat available to forest and grassland birds	Yes

Table 5.4.9-18: Project Related Residual Effects; Rationale for Carrying forward into the CEA for the Clark's Nutcracker

Project Component	Project Phase	Residual Effect	Rationale	Carried Forward to Cumulative Effects Assessment
Mine site, airstrip, transmission line, freshwater supply pipeline and access roads	Construction through to Post-Closure	Habitat Loss and Alteration	Decreases from the baseline amount of moderate to high rated suitable habitat available to the Clark's nutcracker	Yes

For the CEA, the most relevant land uses in the RSA that could potentially interact include forestry, mining, and agriculture activities and are listed in the project inclusion list (PIL) (Reference Section 4. Methods). Identified interactions between past, present, and future projects and land uses in the RSA for the CEA are presented in **Table 5.4.9-19** and **Table 5.4.9-20**.

Table 5.4.9-19: Key and Moderate Interactions between Forest and Grassland Birds (not including Clark’s Nutcracker) and other Past, Present, and Future Projects/Activities

Residual Effect	Historical Land Use		Representative Current and Future Land Use			Carried Forward into CEA?
	Forestry (cutblocks and woodlots)	Agriculture (range tenures)	Mining (active, current prospecting, quarries)	Forestry (cutblocks and woodlots)	Agriculture (active range tenures)	
Loss of Forest and Grassland Bird Habitat	I	I	I	I	I	Yes

Note: I = interaction, KI = key interaction, NI = no interaction

Table 5.4.9-20: Key and Moderate Interactions between Clark’s Nutcracker and other Past, Present, and Future Projects/Activities

Residual Effect	Historical Land Use		Representative Current and Future Land Use			Carried Forward into CEA?
	Forestry (cutblocks and woodlots)	Agriculture (range tenures)	Mining (active, current prospecting, quarries)	Forestry (cutblocks and woodlots)	Agriculture (active range tenures)	
Loss of Clark’s Nutcracker Habitat	I	I	I	I	I	Yes

Note: I = interaction, KI = key interaction, NI = no interaction

Forestry-related activities in the RSA have the potential to temporarily alter and degrade forest and grassland bird habitat through habitat conversion, erosion and sedimentation, and invasive species introduction. Forestry activities do not typically result in permanent loss of forest and grassland bird habitat and the effects on habitat loss are considered temporary for most species and expected to return to baseline conditions after reclamation for all species.

Forestry-related activities in the Project area will comprise degrading and removing some moderate-value habitat of Clark’s nutcracker. The primary means to mitigate the impacts of forestry operations will include following forest harvest guidelines, including cutblock and road design; minimizing erosion and maximizing reforestation; and implementing invasive plant control measures and monitoring systems and other currently implemented BMPs. Given the adherence to these practices, the loss of baseline ecosystem composition to forestry is expected to be reversible as long as whitebark pine is replanted in these harvested areas.

Agricultural activities in the RSA have the potential to cause the loss and degradation of forest and grassland bird habitat. Conversion of natural habitat to agricultural habitat typically results in the loss of habitat for forest birds and many species of grassland birds. Cattle grazing can alter forest and grassland bird habitat in emergent habitats, and potentially introduce invasive vegetation species. Trampling can compact soils and cause erosion in riparian areas resulting in

sedimentation of surface waters. Mechanical harvesting of wetland vegetation can cause rutting and soil displacement. Farms and other agricultural operations can result in reduced water quality in forest and grassland bird habitat through fertilizer and pesticide use. Agricultural activities in the RSA are not expected to cause the loss or degradation of Clark’s nutcracker habitat, as agricultural activities are present only at low elevations where whitebark pine are not found.

Mining activities (e.g., current prospecting, exploration) occur southeast and northwest of the mine site, and are likely to continue into the future. Mineral prospecting can result in degraded forest and grassland bird habitat through vegetation removal.

The known mining activity (i.e., current prospecting) is or will occur in the area to the west-northwest and southeast of the mine site. No known whitebark pine ecosystems are located in these areas therefore future mining activity is unlikely to overlap spatially with habitat Clark’s nutcracker.

The interactions between residual effects on Clark’s nutcracker related to the Project and past, present, or foreseeable projects and ecological effects are identified within the Project CEA and summarized in **Table 5.4.9-21**. The interactions include forestry activities, transportation and access activities, mining activities, and guide outfitting, traditional land use, recreational activities, and other projects, as well as the effects of disease, insects, and fire on whitebark pine habitat. The residual effect due to chronic temporal loss of baseline whitebark pine ecosystems as a result of the Project is only expected to occur to Clark’s nutcrackers at the mine site.

Table 5.4.9-22 and **Table 5.4.9-23** summarize the residual effect and the extent and duration of the historical, current, and future land use effects.

Table 5.4.9-21: Project Related Residual Effects – Rationale for Carrying Forward into the CEA

Indicator	Project Phase	Residual Effect	Historical Land Use				Representative Current and Future Land Use and Ecological Effects							Reasonably Foreseeable Projects		Carried Forward into CEA
			Recreational (trails, fishing and lodges)	Forestry (cutblocks and woodlots)	Aboriginal Traditional Use	Guide outfitting	Mining (activities, current prospecting, quarries)	Recreational (sites, trails, fishing and lodges)	Forestry (cutblocks and woodlots)	Aboriginal Traditional Use	Guide outfitting	Agriculture (Present)	Natural Disturbance (Fire and MPB and Blister Rust)	Nulki Hills Wind Project	Agriculture (pending range tenures)	
Clark’s nutcracker	C, O, CL, PC	Ecosystem Loss	NI	I	NI	NI	I	I	I	I	I	I	KI	NI	NI	Yes

Note: I = interaction, KI = key interaction, NI = no interaction; C = Construction, O = Operations, CL = Closure, PC = Post-Closure

Table 5.4.9-22: Assessment of Spatial and Temporal Overlap between the Project and Other Projects and Human and Ecological Actions with Ecosystem Composition

	Human or Natural Activity	Residual Environmental Effect	Extent	Duration	Rationale	Cumulative Effect (Contribution from Project or Overlap)
Historical Land Use	Forestry	Change in baseline ecosystems	Regional	Chronic	Forestry companies operate within the RSA	Yes
	Recreation	Disturbance	Regional	Chronic	Trails and other access routes in the RSA	No
	Guiding	Disturbance and mortality	Regional	Chronic	Hunters and trappers operate within the RSA	No
	Traditional use	Change in baseline ecosystems	Regional	Chronic	Aboriginal groups are present within the RSA	No
Representative Current and Future Land Use	Forestry activities	Change in baseline ecosystems following forestry	Regional	Chronic	Forestry companies will continue to pursue logging operations	Yes
	Traditional use	Change in baseline ecosystems	Regional	Chronic	A RCP for re-vegetation is in place	No
	Mining	Change in baseline ecosystems	Regional	Chronic	Mining projects will continue in the RSA	Yes
	Recreation	Disturbance	Regional	Chronic	Recreation will continue in the RSA	Yes

Table 5.4.9-23: Assessment of Spatial and Temporal Overlap between the Project and Natural Actions with Ecosystem Composition for Clark's Nutcracker

Natural Action	Residual Environmental Effect	Extent	Duration	Rationale	Cumulative Effect (Contribution from Project or Overlap)
White Pine Blister Rust	Change in baseline ecosystems	Regional	Chronic	Disease reduces the number of healthy trees that can produce cone crops	Yes
Mountain Pine Beetle	Change in baseline ecosystems	Regional	Chronic	Infestation reduces the number of healthy trees that can produce cone crops	Yes (minor proportion of dead trees)
Fire	Change in baseline ecosystems	Regional	Chronic	Timber harvesting companies will continue to pursue logging operations	No (no recent fires at Mount Davidson)

5.4.9.5.1.1 Habitat Loss and Alteration

Activities quantified for habitat loss and degradation, include the Nulki Hills Wind Project, mining activity (quarries and prospecting), forestry cutblocks and woodlots, and forestry-related roads.

The RSA is a total of 291,714 ha, of which 90,177 ha interacts these other activities and 160,462 ha interacts with natural disturbances (**Table 5.4.9-24**).

Table 5.4.9-24: Spatial Overlap of RSA by Source of Overlap

Project	Spatial Overlap with Terrestrial RSA	Temporal Overlap with Terrestrial RSA	Amount of Overlap (ha)
Nulki Hills Wind Project	Yes	Yes	2,896
Mining Activity	Yes	Yes	491 ^(a)
Forestry (cutblocks and woodlots) – past, present and future	Yes	Yes	82,161
Forest Service Roads	Yes	Yes	3,497
Fire	Yes	Yes	10,990
Mountain Pine Beetle ^(c)	Yes	Yes	149,472
Total			249,507^(b)

Note: (a) Current prospecting = 221 ha and Quarries = 202 ha;
 (b) The total does not equal the sum of the Projects because of overlap;
 (c) Mountain pine beetle infestations of $\geq 10\%$;
 ha = hectare; RSA = Regional Study Area

The activities included in **Table 5.4.9-24** were overlaid with the habitat rated as moderate and high for Clark’s nutcracker to determine spatial overlap (**Table 5.4.9-25** and **Table 5.4.9-26**). About 12% was rated of moderate value and 2% of the high value habitat is overlapping with forestry and mining in addition to the potential Project effects. MPB has affected 58% of the moderate value habitat and 11% of the high value habitat for Clark’s nutcracker; this calculation includes all pine species in the area.

Table 5.4.9-25: Spatial Overlap by Moderately Rated Clark’s Nutcracker Habitat

Project	Spatial Overlap with Moderate Rated Habitat	Temporal Overlap with Moderate Rated Habitat	Amount of Overlap with RSA (ha)	Total Moderate Habitat in RSA (ha)	Amount of Overlap with Moderate Habitat (%)
Nulki Hills Wind Project	No	No	0	7,177	0
Mining Activity	Yes	Yes	94	7,177	1
Forestry (cutblocks and woodlots) – past, present, and future	Yes	Yes	808	7,177	11
Forest Service Roads	Yes	Yes	<1	7,177	<1
Fire	No	No	0	7,177	0
Mountain Pine Beetle	Yes	Yes	4,198	7,177	58
Total			5,100		

Note: ha = hectare; RSA = Regional Study Area

Table 5.4.9-26: Spatial Overlap by Highly Rated Clark's Nutcracker Habitat

Project	Spatial Overlap with High Rated Habitat	Temporal Overlap with High Rated Habitat	Amount of Overlap with RSA (ha)	Total High Habitat in RSA (ha)	Amount of Overlap with High Habitat (%)
Nulki Hills Wind Project	No	No	0	1,375	0
Mining Activity	Yes	Yes	28	1,375	2
Forestry (cutblocks and woodlots) - past, present, and future	No	No	0	1,375	0
Forest Service Roads	Yes	Yes	<1	1,375	<1
Fire	No	No	0	1,375	0
Mountain pine beetle	Yes	Yes	156	1,375	11
Total			184		

Note: ha = hectare; RSA = Regional Study Area

5.4.9.5.2 Residual Cumulative Effects and Mitigation

A cumulative effects assessment for forest and grassland birds within the RSA was conducted because of the following conditions:

- Residual effects on forest and grassland bird habitat are considered Not Significant (minor) with moderate confidence;
- Red- and Blue-listed species are present within the Project area; and
- Loss of habitat will be chronic due to the length of time for the recovery of some habitats (e.g., mature forests including whitebark pine).

Typical mitigation measures for forestry activities include: 1) follow forest harvest guidelines, including cutblock and road design to minimize erosion and maximize reforestation; 2) maintain buffers around wetlands and riparian areas; 3) apply sediment control to areas around wetlands and other waterbodies; 4) to implement invasive plant control measures and monitoring systems, and 5) replanting native vegetation to expedite succession. These mitigation activities are already included in the environmental management plans for the Project (**Section 12.2.1**).

Typical mitigation measures for agricultural activities include: 1) establishing cattle exclusion zones to limit grazing to uplands, thereby minimizing erosion and sedimentation to riparian vegetation and allowing increased opportunity of bird use of water habitats; 2) minimizing pesticide and fertilizer use around aquatic resources and before precipitation events to limit chemical runoff from entering wetlands; 3) establishing protected riparian areas prior to clearing, and 4) controlling invasive species.

Typical mitigation measures for mineral exploration and prospecting, which are typical permit conditions under the *Mines Act* (Government of BC, 1996b), include: 1) pre-planning to avoid wetlands and minimizing stream crossings for access roads; 2) avoiding work during critical

breeding and rearing seasons for wildlife; 3) limiting the production of excess drilling fluids, and 4) avoiding discharges of drilling fluids into aquatic systems.

5.4.9.5.3 Residual Cumulative Effects and Mitigation Measures for Clark's Nutcracker

A cumulative effects assessment for the VC within the RSA was conducted on Clark's nutcracker because of the following conditions:

- Residual effects on Clark's nutcracker are considered Significant (moderate) with low confidence because the Project interaction of temporal habitat loss is not well understood;
- The reclamation efforts to replace whitebark pine have not been proven to be effective at a large scale where natural actions such as fire, white pine blister rust, and MPB are present; and
- The nearest suitable habitat for Clark's nutcracker is 85 km away, suggesting that metapopulation exchange may be limited for the species.

The declining health of whitebark pine within the LSA and RSA due to the spread of white pine blister rust will continue to degrade some of the moderate and high value habitat for Clark's nutcracker. A health assessment in 2013 determined that approximately 30% of the pine trees at Mount Davidson were infected with blister rust. Fire has not recently removed any moderate or high value Clark's nutcracker habitat; however, MPB has affected both moderate and high value Clark's nutcracker habitat.

5.4.9.5.4 Significance of Residual Cumulative Effects

The Project will contribute to additional loss of forest and grassland bird habitat in combination with the past, present, and future activities (e.g., forestry, agricultural, and mineral exploration) identified in the RSA for this CEA. The significance of the Project's contribution to cumulative effects in the RSA was determined at the post-closure phase for this assessment as forests and other habitat loss will be mitigated through reclamation primarily during closure. Logging activities in the RSA have generated loss of habitat; however, application of BMPs (BC MFLNRO, 2014) will protect the key habitats needed by forest and grassland bird species by minimizing disturbance, increasing success of reforestation, and minimizing the duration of disturbance. Although Project effects and the effects of other activities in the RSA may be cumulative, no additional adverse residual effects on forest and grassland birds are anticipated due to the Project. Due to the loss of forest and grassland bird habitat associated with MPB, forestry, agricultural, and mineral exploration, the significance determination for residual cumulative effects is Not Significant (minor) as a result of Project implementation (**Table 5.4.9-27**) because of the mitigation and compensation measures for the Project and forestry management practices to reclaim forest cover. The level of confidence is moderate due to the uncertainty associated with the forest and grassland bird habitat mitigation measures.

Table 5.4.9-27: Residual Cumulative Effects Assessment for Loss of Forest and Grassland Bird (not including Clark’s Nutcracker) Habitat

Effect Attribute	Current/Future Cumulative Environmental Effect(s) without Project	Cumulative Environmental Effect with Project Contributions
Context	Medium	Medium
Magnitude	Low	Low
Geographic Extent	Regional	Local
Duration	Long-term	Long-term
Reversibility	Reversible	Reversible
Frequency	Intermittent	Once
Likelihood Determination	High	High
Level of Confidence for Likelihood	High	High
Significance Determination	Not Significant (minor)	Not Significant (minor)
Level of Confidence for Likelihood	High	Moderate

Table 5.4.9-28 summarizes the residual cumulative effects on Clark’s nutcracker. The assessment considers all Project phases. The tables include the CEAs both with and without Project contribution. The likelihood of no significant residual cumulative effects for Clark’s nutcracker, both with and without the Project contribution, is considered low with chronic loss of the whitebark pine ecosystem. The mitigation measures (replanting whitebark pine and site restoration) proposed as part of the whitebark pine management plan, although successful in trials, have not proven effective on a large scale such as the Project (AMEC, 2013); therefore, low confidence is applied to the significance of the cumulative residual effect.

Table 5.4.9-28: Residual Cumulative Effects Assessment on Clark’s Nutcracker

Effect Attribute	Current/Future Cumulative Environmental Effect(s) without Project	Cumulative Environmental Effect with Project Contributions
Context	High	High
Magnitude	High	High
Geographic Extent	Regional	Regional
Duration	Chronic	Chronic
Reversibility	Yes	Yes
Frequency	Continuous	Continuous
Likelihood of Effect	High	High
Level of Confidence for Likelihood	High	High
Significance Determination	Not Significant (Moderate)	Not Significant (Moderate)
Level of Confidence for Significance	Low	Low

Note: PC = post-closure

5.4.9.6 Limitations

The key limitation of this assessment is the limited surveys conducted in the study areas to quantify the forest and grassland bird species presence over time, as some species may have cyclic

population numbers. Regional abundance and habitat use are not known beyond habitat suitability models and professional judgment.

Baseline studies for Clark's nutcrackers were not sufficient to determine if there is a minimum area of suitable habitat threshold below which a viable population would not exist. As the presence of Clark's nutcrackers is also important to natural dispersal and regeneration of whitebark pine, any decline or loss of the local population could significantly affect the future viability of the listed whitebark pine ecosystem.

5.4.9.7 Conclusion

Forest and grassland birds will be adversely affected through loss and degradation of habitat during the life of the Project. The Project will directly affect 3% of the moderate suitable forest and grassland bird habitat in the RSA and 1% of high value habitat, not including Clark's nutcracker. The Project will directly affect 22% of the moderate and high value Clark's nutcracker habitat in the RSA before mitigation. Loss and degradation effects include effects from direct habitat loss due to Project construction, nitrogen and dust deposition on vegetation, and invasive species introduction and/or spread. There is a high probability that lost habitat will recover to average baseline conditions upon closure, except limited portions of the airstrip and access roads, but it will take many years for the establishment of mature forests including whitebark pine.

These effects will be primarily caused by the construction of new portions of the road, widening along the existing FSR, development of the airstrip, freshwater pipeline, and mine site, and clearing for the transmission line. Habitat degradation will occur from all Project components. The maximum extent of these effects is local for forest and grassland birds including Clark's nutcrackers, with the loss pertaining to the clearing limits and degradation within 50 m of those limits, although the majority of the degrading effects will occur within 10 m to 30 m from the road edges.

Mitigation and adaptive management plans will avoid and mitigate the majority of adverse effects. Where it is not possible to mitigate completely, the effects will be minimized to keep the magnitude of effects at a maximum of low, with the majority at a negligible to low level of impact. Mitigation measures include devising management plans (**Section 12.2**), implementing a reclamation and closure plan (**Section 2.6**), and following management plans to reduce noise and vibration, improve air quality, minimize invasive species, and avoid spills (**Section 12.2**), which may be disruptive to forest and grassland bird nesting.

Additional mitigation measures will help to minimize residual effects to an even greater degree. The most important mitigation measures for minimizing residual effects to forest and grassland birds will include:

- Maintain quantity and quality of wetlands and forest cover;
- Close and decommission access roads and trails after mine closure and reclamation are achieved; and
- Conduct habitat restoration of existing disturbed habitats affected by the current road and transmission line, including closure and decommissioning spur roads/trails.

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The residual effect of habitat loss and degradation on forest and grassland birds is rated as Not Significant (minor); however, the residual effect on Clark's nutcracker is rated as Not Significant (moderate).

Cumulative effects of forestry and mining activities along with natural effects such as disease, insect infestation, and fire are rated as Not Significant (moderate) with low confidence on Clark's nutcracker with and without the Project contribution. The low confidence is due to more than 30% of the whitebark pine trees currently infected would be lost with white pine blister rust, which is an additional increase in loss of habitat to the Project, and the uncertainty of effectiveness of mitigation measures such as replanting of whitebark pine and maintenance of Clark's nutcrackers in the Project area. Although the mutualistic relationship between Clark's nutcracker and whitebark pine is understood, it is not currently known how the loss of this additional habitat associated with the Project for 80 years will affect generations of nutcrackers. There is a risk associated with these effects, with a potentially small breeding population (i.e., potentially only 1 to 3 pairs), and with the uncertainty of augmentation and other mitigation measures to maintain birds. The reclamation program for whitebark pine has not been proven effective at a large scale; however, adaptive management will be used in monitoring the success of the whitebark pine plantings in original habitat and new areas. It is expected that planted trees will take approximately 80 years to reach maturity and baseline levels of cone production.