7.10 Wildlife

This section describes key wildlife species and there habitat in the project area and provides an assessment of project and cumulative effects on wildlife. Characterization of habitat draws in part on descriptions and mapping of vegetation associations as described in Section 7.9: Vegetation. Findings of this section inform the assessment of effects on non-traditional land use in Section 7.11: Land Use and Tenure. This section describes the effects of routine project activities. Effects of accidents and malfunctions are described in Section 8: Accidents and Malfunctions.

7.10.1 Scope of Assessment

The scope of the environmental effects assessment includes:

- identification of key wildlife issues within the Project Study Area
- delineation of spatial and temporal boundaries where Project related effects may occur
- identification of valued ecological and cultural components (VECCs) to focus the assessment
- an analysis of potential environmental effects including cumulative effects
- identification of mitigation measures
- a determination regarding the significance and likelihood of potential residual effects

Each of these topics is discussed in more detail in the following sections.

Key Issues

Based on the proposed project facilities and design, consultation with regulators and other deemed experts and the review of the EA Reportguidelines, a number of key issues were defined to focus the wildlife assessment on relevant project effects, and to assess the project's contribution to cumulative effects in the region. The potential project effects on wildlife may include the following key issues:

- **Habitat availability**—impacted either directly by habitat loss or alteration, or indirectly by sensory disturbance (e.g., noise, human activity) and reduced patch size (e.g., increased habitat fragmentation). Potential project effects are related to clearing and removal of habitat in the minesite area, clearing and construction of a 25 km access road from the Robert Campbell Highway to the site, and human use activities associated with both facilities (underground blasting, ore crushing, air and road transport).
- **Disruption to movement patterns**—resulting from increased habitat/landscape fragmentation (e.g., increased density of access corridors) or higher road use levels limiting daily or seasonal wildlife travel. The mine access road and Robert Campbell Highway, south of the access turn-off will be used to haul concentrate on a regular basis.
- **Mortality risk**—increased mortality resulting directly from site development, vehicle collisions (i.e., mine traffic), increased hunting/poaching, or lethal control of problem wildlife.

Of these key issues, the potential for increased wildlife mortality rates due to increased road access and human use is of particular concern.

Biodiversity Approach

Consideration of potential effects on biodiversity has only recently been integrated into the environmental impact assessment process. Biological diversity, or biodiversity, is defined as the variety and variability of life, and it includes the diversity of genes, species, ecosystems and landscapes. Effects on biodiversity may be assessed at various levels of biological organization. For purposes of most impact assessments, effects can be investigated at three levels, including:

- **Species level** – refers to the number and variety of animal species and their abundance.
- **Community/ecosystem level** – refers to the interrelationships between species and their habitats, focusing on the ecological units that sustain species.
- **Landscape level -** refers to the ability of the landscape to operate as a sustainable, integrated ecological unit, and is affected by such regional processes as habitat fragmentation.

For this assessment, potential project effects on wildlife biodiversity at the species level are evaluated in the context of habitat availability and mortality risk. Additionally, the assessment of potential project effects on selected vegetation VECCs (i.e., ecosystem communities of conservation concern, wetlands) (Section 7.8: Vegetation) addresses biodiversity at the community and ecosystem level, and can be indirectly related back to wildlife biodiversity considerations. At the landscape level, potential effects on biodiversity were assessed by considering regional habitat fragmentation and possible disruptions to wildlife movement patterns for wide-ranging species.

Study Area

For the purposes of this assessment, two study areas are identified—a Local Study Area (LSA), and a Regional Study Area (RSA) (Figure 7.10-1).

Local Study Area

The LSA encompasses all of the proposed project components where activities associated with construction and commissioning, operation, decommissioning as well as accidents and malfunctions could result in environmental effects on wildlife and wildlife habitat. Delineation of the LSA is specifically intended to assess the direct impacts of the proposed project on habitat availability (i.e., through habitat alteration or removal). In addition, the LSA will be the focus of qualitative discussion on other potential direct or indirect impacts of the proposed development (e.g., sensory disturbance, mortality risk, contaminants). The LSA is defined by a potential disturbance footprint for direct effects on wildlife and habitat, buffered by zones of influence for indirect effects on wildlife and habitat due to noise and human disturbance. The disturbance footprint is conservatively defined as the total areas of YZC claims that will be directly affected by project facilities. The actual disturbance footprint will comprise areas of clearing and development within these claim boundaries; however the area as defined allows for potential movement or expansion of project components within that area, without changing the conclusions of the effects assessment. The buffer zone is defined by three zones of influence related to the mine access road, the airstrip, and the minesite area (including, mine portal area and industrial complex, camp, tailings facility, borrow area and airstrip). Buffer distances are based on impact zones for caribou and grizzly bear species for cumulative effects thresholds in the Yukon, Territory (AXYS Environmental Consulting Ltd. 2001). These species are considered sensitive indicators of project effects and zones defined for these species should provide a conservative study area for assessment of effects on other species. The buffers included:

- a 1.5 km buffer on either side of the proposed route for the mine access road
- a 2.0 km buffer around the define minesite disturbance footprint
- a 1 km buffer from the sides of the airstrip footprint and a 6 to 7 km buffer from the ends of the airstrip footprint

Wildlife field assessments were conducted in detail within the LSA.

Regional Study Area

The RSA provides context for effects findings in the LSA by describing wildlife and wildlife habitat availability over a larger area surrounding the LSA. In addition, the RSA sets the spatial boundaries for the review of existing local knowledge in the area. Within the RSA, wildlife and wildlife habitat are discussed using existing knowledge for the area.

The RSA boundary was defined as an area sufficient to capture the annual home range for the largest ranging and or most mobile wildlife species that occur in the project area: caribou and grizzly bear. Annual home range estimates for woodland caribou vary between 700 km^2 and 4300 km^2 (Keim 2005, unpublished) whereas northern interior grizzly bear annual (approximately 180 days) home range estimates vary between 50 km^2 for an alpine dwelling sow with cub to 1200 km^2 for a mid-aged boar (Keim 2005, unpublished). The RSA is approximately 3,002 km^2 centered about the mine portal and would equate approximately to at least one annual caribou home range or about two grizzly bear annual home ranges. The RSA boundary is defined by the existing watershed boundaries, and provides an appropriate spatial scale to assess natural processes including potential constraints to animal movement.

Figure 7.10-1 Local and Regional Study Areas - Wildlife (Vol. 2)

Selection of Valued Ecosystem and Cultural Components

Up to 42 mammals, 153 birds, 4 amphibians, and an unknown number of reptile and invertebrate species may be present in the RSA (Appendix 7.10-2). For the purposes of this assessment, nine wildlife VECCs have been selected to represent the larger assemblage of wildlife species known to occur within the LSA and RSA. Wildlife VECCs were defined for the project environmental assessment based on the following criteria:

- conservation status (e.g., *Species at Risk Act*), known presence and relative abundance in the area

- ability of a species to be used as an indicator species for a broader number of species (keystone species)
- socio-economic and regional importance (including public profile and precedent)
- the EA ReportGuidelines (Yukon ECO 2005)
- review of the Biophysical Assessment Workplan submitted to regulators (YZC 2005a)
- findings of field investigations
- review and input from the project Technical Committee (Meeting of August 24, 2005)

Based on these criteria, the nine selected VECCs (Table 7.10-1) included:

- woodland caribou (*Rangifer tarandus caribou*) Finlayson Caribou Herd - northern ecotype
- moose (*Alces alces*)
- thinhorn sheep (*Ovis dalli dalli*)
- grizzly bear (*Ursus arctos*)
- a lynx (*Felis lynx*) and snowshoe hare (*Lepus Americanus*) predator-prey interrelationship
- marten (*Martes americana*)
- trumpeter swan (*Cygnus buccinator*)
- beaver (*Castor canadensis*)
- song bird community

These VECCs were used to direct the impact assessment of habitat availability for the project and to focus the review of existing knowledge in the area.

Temporal Boundaries

The timeframe for the assessment of project and cumulative effects encompassed baseline conditions as described in 2005 through all phases of project development to project closures. Based on the range of potential effects on wildlife, three assessment scenarios were used:

- **Baseline:** Represents conditions for wildlife species prior to any development activities under the proposed project. Seasonal habitat use for baseline conditions was characterized based on habitat conditions in 2005.
- **Full Build-out:** Represents conditions during construction activities (i.e., June 2006 - Oct 2007) operations (2007 – 2019), and decommissioning 2020-2025, assuming the worst-case land disturbances expected for this period (i.e., disturbance of the total area of all claim areas touched upon by project facilities).

Table 7.10-1 Selected Wildlife VECCs

Selected VECC	Rationale for VECC Selection	Linkage to EA ReportGuidelines or other regulatory drivers	Baseline Data
Caribou	• The Finlayson Caribou Herd is of social and economic significance • Sensitive to disturbance • Potential to sustain project impacts	• Information requested in EA ReportGuidelines and Baseline Assessment Workplan • Listed as a species of special concern by COSEWIC (2005)	• Field data • Terrestrial lichen model • Telemetry and survey point location data • YGT Key Wildlife Habitat polygons
Moose	• Identified in a regional context as a territorial significant moose population in the Yukon. • Species of social and economic significance • Potential to sustain project impacts	• Requirements to integrate traditional knowledge address social and economic issues in EAR	• Field data • YTG Key Wildlife Habitat Areas
Grizzly bear	• Species of social and economic significance • Sensitive to disturbance • Potential to sustain project impacts	• Listed as a species of special concern by COSEWIC (2005)	• Project ecosystem mapping • Field data
Lynx and snowshoe hare	• Species of social and economic significance • Potential to sustain project impacts	• Requirements to integrate traditional knowledge and address social and economic issues in EAR	• Field data • Project ecosystem mapping
American marten	• Species of social and economic significance • Potential to sustain project impacts	• Requirements to integrate traditional knowledge and address social and economic issues in EAR	• Field data • Project ecosystem mapping
Song bird community	• Sensitive to disturbance • Potential to sustain project impacts	• Includes species listed by COSEWIC (2005) and in the *Migratory Birds Convention Act*	• Project ecosystem mapping • Bird habitat indices provided from applicable studies
Trumpeter swan	• Breeding habitat occurrence in the LSA • Sensitive to disturbance • Potential to sustain project impacts	• Listed in Yukon Wildlife Act as a "specially protected" species. • Detailed in the *Migratory Birds Convention Act*	• Field data • YTG Key Wildlife Habitat polygons and report.
Beaver	• Occurrences in the LSA • Potential to sustain project impacts • Representative of other mammal species that utilize wetland habitats • Species of social and cultural significance	• Requirements to integrate traditional knowledge and address social and economic issues in EAR	• Project ecosystem mapping. • Aerial survey to detect presence of beaver lodges and dam locations in the LSA
Thinhorn sheep	• Habitat occurrences in LSA • Potential to sustain project impacts • Species of social and economic significance	• Requirements to integrate traditional knowledge and address social and economic issues in EAR	• Habitat suitability mapping in the RSA • Field validation of suitable habitats within the LSA

- **Closure:** Represents conditions forecasted into the future following complete decommissioning and reclamation of the minesite. This scenario assumes implementation of all mitigation recommendations to achieve optimal wildlife habitat conditions at closure. Decommissioning will be phased over a 5 year period to allow for retention and operation of the water treatment plant in the initial years of decommissioning as required. Reclamation will be complete five years following the end of production. All disturbed surfaces will be re-contoured, natural drainages reinstated and re-vegetated. The tailing facility will be reclaimed as a permanent pond. The airstrip and access road will remain in place. Reclamation goals are a stabilized surface and a native plant community to provide wildlife habitat. It is assumed that successional processes will move post-mine vegetation communities towards the original vegetation type, ideally within a 10-year period following decommissioning and final reclamation.

7.10.2 Baseline Conditions

7.10.2.1 Methods

Information Sources

Information sources used to describe baseline conditions and complete the assessment of wildlife and wildlife habitat included:

- a literature review
- consultation with regulators
- field surveys

Overall, the data that are currently available to describe baseline conditions and assess potential environmental effects of the project on wildlife and wildlife habitat are judged by the study team to be sufficient. The following sections describe the methods used to characterize baseline conditions, focusing on the nine selected VECCS.

Literature Review

Existing wildlife information was reviewed including wildlife inventory and habitat use information for the project area and the Yukon Territory, and from applicable studies conducted in the Northwest Territories and British Columbia within a similar ecological context. The review focused on the nine selected VECCs. Literature sources (including government reports and regulations, technical reports, unpublished documents, contractor reports, peer-reviewed publications, and graduate thesis) are cited throughout the document and referenced in Section 11.

Consultation

Consultation was undertaken to gather knowledge regarding wildlife from individuals who are most familiar with the project area and/or who have expertise with respect to specific VECCs. Specifically, consultation with regulators included:

- discussions on VECC selection
- impact assessment approach

- baseline habitat assessment methods at the VECC level
- issues and management concerns surrounding the project and selected VECCs
- available baseline knowledge and knowledge gaps for the selected VECCs in the study area

A list of individuals contacted is provided in Table 7.10-2.

Table 7.10-2 Individuals Consulted as part of the Wildlife Assessment

Individuals Contacted	Title	Area of Expertise
Al Baer	Yukon Government; Coordinator, Wolf Management Program	Grizzly bears, wolves
Bruce McLean	Yukon Government; A/Manager, Habitat Protection Habitat Section	EIA Approach / VECC selection
Helen Slama	Yukon Government; Fur Harvest Technician Habitat & Regional Management	Yukon trapper harvest / Fur bearing mammals
Jan Adamczewski	Yukon Government; Regional Biologist Liard Region	Wildlife biologist /Llocal and regional wildlife issues
Jean Carey	Yukon Government; Sheep & Goat Biologist Wildlife Management	Thinhorn sheep
Lee Foote	University of Alberta; Professor	Wetlands studies and beavers
Norm MacLean	Kaska Forest Stewardship Council; Chair	Biologist / Local and regional wildlife issues / VECC selection
Randy Lamb	Yukon Government; Manager Environmental Affairs Section	EIA approach / VECC selection
Remmona Maraj	Yukon Government; Carnivore Biologist Wildlife Management	Grizzly bears
Rick Farnell	Yukon Government; Caribou Biologist Wildlife Management	Caribou / Finlayson Caribou Herd
Rick Ward	Yukon Government; Caribou Biologist Wildlife Management	Moose
Rob Florkiewicz	Yukon Government; Regional Biologist Southern Lakes Region	Previous regional biologist for the Liard Region / Finlayson Caribou Herd
Scott Herron	Canadian Wildlife Service; Northern Ecosystem Specialist	Migratory birds / Song bird and trumpeter swan approach
Shawn Francis	Yukon Land Use Planning Council; Land and Resource Planner	Worked on previous assessment of the study area as a consultant / Land use planning in the Yukon Territory.
Wendy Nixon	Canadian Wildlife Service; Head, Environment Canada Wildlife Ecology	Migratory birds

Through consultation, several additional baseline data and information sources were obtained for use in this assessment and included, but are not limited to, the following:

- key wildlife habitat areas delineated within the project area

- survey and telemetry data, and technical reports from extensive studies on the Finlayson Caribou Herd
- survey data and technical reports from moose studies conducted within and in areas surrounding the Wolverine project area
- a list of bird species known to occur near Wolverine Lake and across the Yukon Territory
- a list of wildlife species of concern in the Yukon Territory
- Grizzly bear density estimates by eco-region for the Yukon Territory, including eco-region mapping
- fur harvest data and current traplines within a regional context to the study area
- numerous reports for wildlife surveys and for wildlife-habitat studies conducted in the project area and within similar ecological units in the Yukon Territory

Field Surveys

Three wildlife field surveys were conducted and or coordinated by AXYS during 2005, including:

- wildlife habitat assessment as part of the ecosystem mapping program
- aerial wetland and beaver lodge survey
- incidental wildlife observations within the Project Study Area

Methods are detailed below.

Ecosystem Mapping Program

Between July 24th and July 29th, 2005, a field program was conducted to validate the 1:20,000 scale ecosystem mapping conducted within the LSA. A four-person crew including a vegetation ecologist, a soil and terrain scientist, a rare plant specialist, and a wildlife biologist conducted the field program. From a wildlife perspective, the objectives of this field program were two-fold. First, to calibrate wildlife habitat models for each of the selected VECCs with attribute data collected for vegetation (Section 7.9), and terrain, surficial geology and soils (Section 7.3) classifications to be used for ecosystem mapping in the LSA. Secondly, to conduct an overview assessment of the baseline conditions in the LSA.

During this ecosystem mapping field program over 40 detailed wildlife habitat plots were ground-truthed, including 480 individual wildlife habitat assessments at the VECC level. A map depicting areas visited in the LSA during the field program is provided in Figure 7.10-2.

Figure 7.10-2 Ecosystem Survey Sites (Vol. 2)

Aerial Wetland, Beaver Lodge and Trumpeter Swan Survey

An aerial helicopter survey of wetlands in the LSA was conducted on September 10th, 2005. The objective of the survey was to confirm presence of active beaver lodges and breeding trumpeter swans within suitable wetland habitats. The aerial survey coverage on areas of the LSA delineated by low lying, relatively flat areas that had evidence of permanent water and creeks or rivers with semi-permanent flow. During this field assessment 1714 ha of wetland area were surveyed within the LSA (Figure 7.10-3).

Figure 7.10-3 Wetland Habitat Survey Sites (Vol. 2)

Incidental Wildlife Observations

Wildlife observations during the ecosystem mapping program and the aerial wetland survey (above) were recorded, referenced by a GPS location, and a digital picture was taken when possible.

7.10.2.2 Results

The following sections provide an overview of baseline conditions for major wildlife groups (ungulates, large carnivores and omnivores, furbearers and small mammals, birds (including migratory birds). Additional information is provided for each VECC species detailing habitat requirements, baseline habitat availability, local and regional distribution and abundance (population size if available), conservation and management concerns, and local and regional issues for each VECC. A review of hunter harvest and fur trapping harvest within the study area and in the Yukon Territory was conducted; this review provides supplemental information to the baseline conditions of numerous VECCs and is therefore discussed at the end of this section.

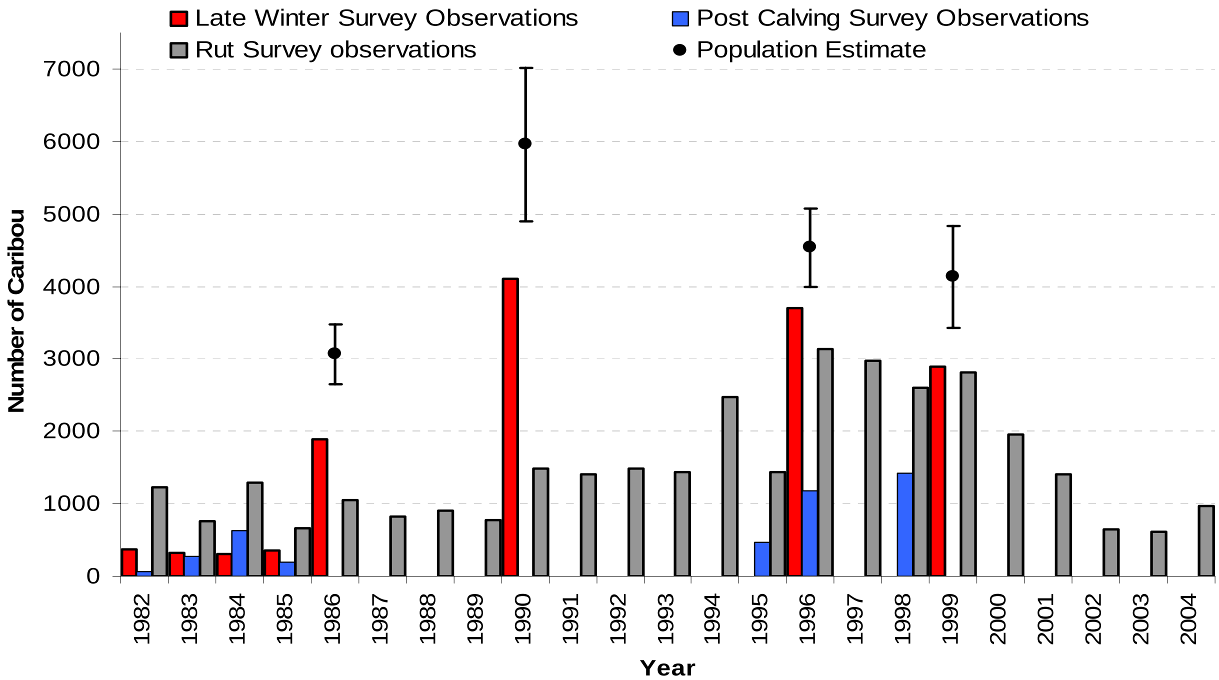
Ungulates

Three primary ungulate species are known to occur in the project area including caribou, moose, and thinhorn sheep; all three species were selected as VECCs for detailed impact assessment purposes. These species are discussed individually below.

Caribou

Woodland caribou (*Rangifer tarandus caribou*) ranges and populations have shrunk across North America likely due to the complex effects of human-caused habitat alterations. As a result, COSEWIC listed nearly all woodland caribou populations in Canada as either Threatened or of Special Concern in 2002. The woodland caribou (Finlayson Caribou Herd) that reside within the project area are part of the Northern Mountain caribou population and are currently listed under Schedule 1 of the *Species at Risk Act* (SARA) as a species of Special Concern (COSEWIC 2005).

The Finlayson Caribou Herd (FCH) population was last estimated at approximately 4000 in 1999. The FCH has had an annual monitoring program (population surveys, rut and post calving surveys, and aerial telemetry surveys of collared caribou) in place since 1982 to monitor population trends (Figure 7.10-4). The FCH rebounded from a population low of approximately 1,800 adults in the early 1980's to an estimated 4,500 adults by 1990 and stabilized at approximately 4,000 adults by the mid 1990s (Farnell et al. 1998). However, recent annual rut surveys (since 2000) appear to be indicating a potential declining trend in the FCH population (Farnell and Florkeweicz, pers. comm. 2005).



Notes: * Data provided by (R. Farnell, Environment Yukon; 2005) includes aerial survey observations collected between 1982 and 2004.

Figure 7.10-4 Population Estimates for the Finlayson Caribou Herd

Between 1983 and 1989, a wolf control program was implemented by Environment Yukon in the Finlayson area out of concern for the declining FCH population. In conjunction with wolf control, sport hunting was limited on the FCH including: limiting harvest to only bull caribou; a permit only hunt was set in 1991; and First Nation hunters have been encouraged to harvest male over female caribou. Data from 1982 to 1977 show a significant correlation between wolf numbers and calf survival in the Finlayson area (Figure 7.10-5). The effects of wolves, likely in concert with several years of harsh late-spring weather conditions are thought to have impeded calf survival in the FCH and may have had subsequent impacts on the herd population (Farnell pers. comm. 2005).

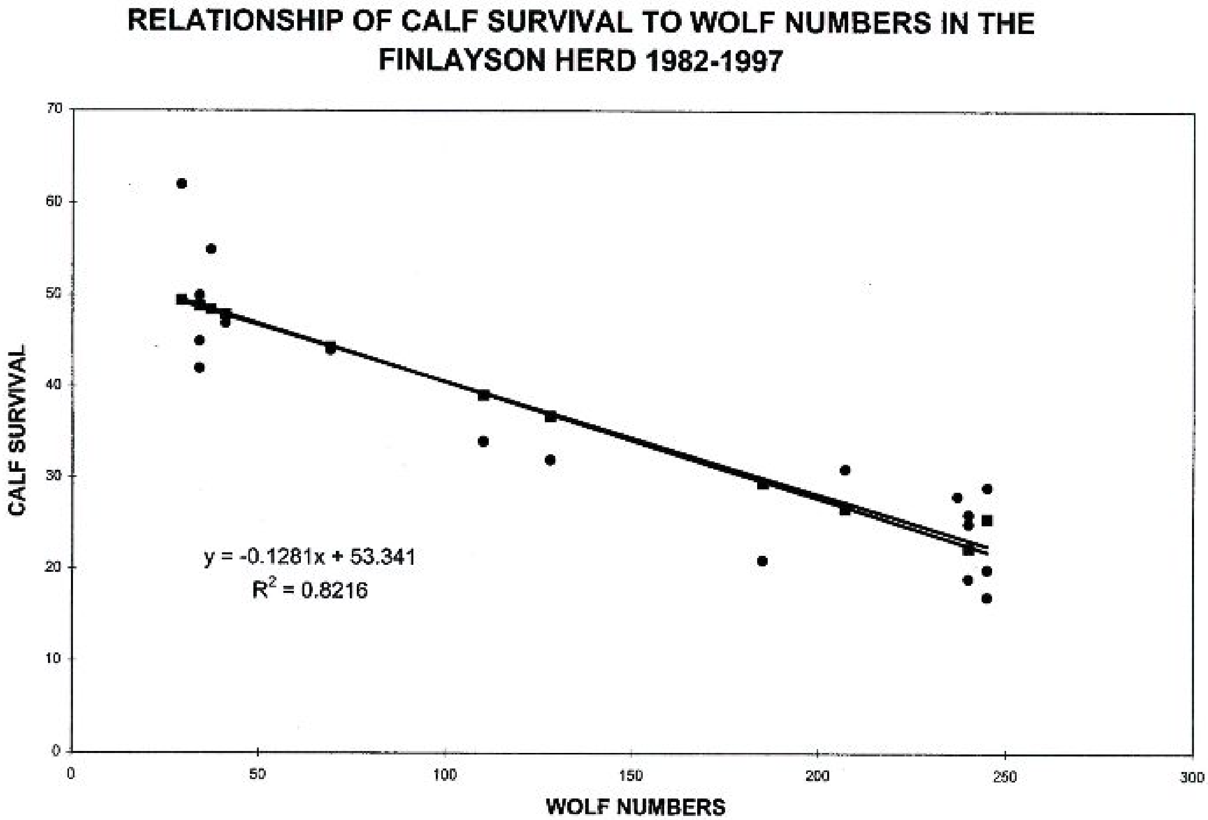
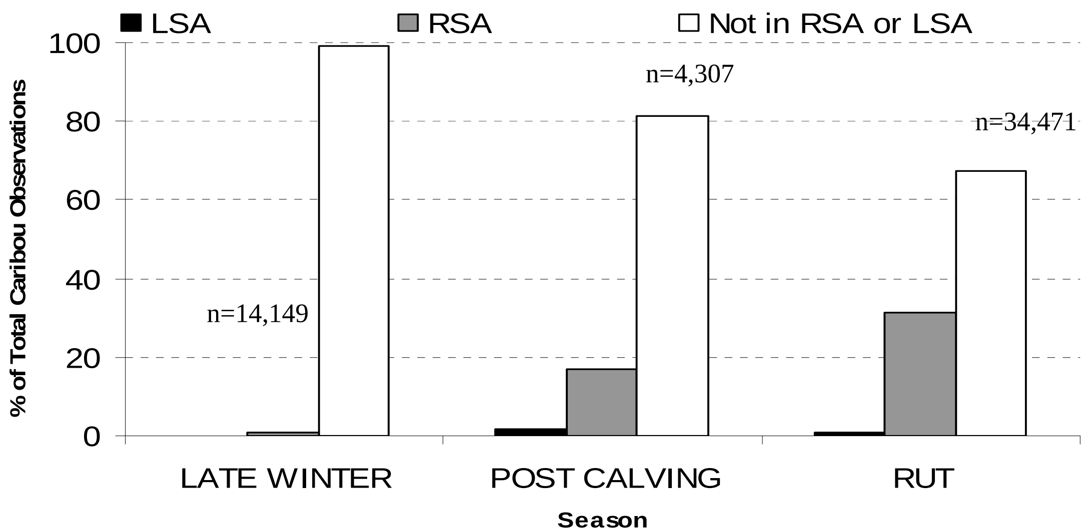


Figure 7.10-5 Relationship between Wolf Numbers and Caribou Calf Survival (Figure Obtained from Rick Ward, 2005)

FCH belongs to the northern mountain population of the woodland caribou. Female caribou disperse from wintering ranges and give birth to a single calf (rarely twins) on ridges and upper slopes of subalpine and alpine basins in late-May. Small aggregations of caribou regroup by mid-June in alpine and open canopy forests where caribou remain throughout the summer. Rutting aggregations form in early October within upland habitats (ridges and plateaus) at upper elevations. At this time, caribou may utilize alpine and shrub vegetation types. Following the rut (mid to late November), caribou disperse throughout their range occupying alpine, subalpine, and forest communities (commonly open-canopy subalpine fir forests and open-canopy black spruce vegetation types). By December-January, caribou have moved into a traditional winter range area in the Pelly River lowlands. This winter range includes boreal forest habitats along the Robert Campbell Highway east and north of the project area. In early to mid-May caribou once again move to higher elevations, following the receding snow to their calving areas.

Overall, the LSA is known to only be used to a limited extent by the FCH. Survey data indicates that limited late winter calving, and post-calving caribou activity occurs in or immediately adjacent to the LSA. However, approximately 32 percent of all rut observations, 18 percent of all post calving observations and less than 1 percent of all late winter observations collected for the FCH between 1982 and 2004 occurs within the RSA (Figure 7.10-6). Caution should be used when interpreting these numbers since the extent of the aerial survey coverage may have limited caribou observations within the project area during some survey years (Florkiewicz, pers. comm. 2005).



Notes: *Data provided by (R. Farnell, Environment Yukon; 2005) includes aerial survey and telemetry observations collected between 1982 and 2004.

Figure 7.10-6 Distribution of Caribou in the LSA and RSA

Fall and winter habitat availability was assessed within the RSA for the FCH based upon satellite imagery interpretations for terrestrial lichen abundance and key wildlife habitat areas identified for the FCH by Environment Yukon (Appendix 7.10-1). The area of late winter and fall caribou habitat available in the RSA is provided in Table 7.10-3.

Table 7.10-3 Caribou Habitat Available in the RSA at Baseline

Habitat Type	Winter Habitat		Fall Habitat			
	Confirmed Habitat	Confirmed Habitat within ZOI*	Non-confirmed Fall Habitat	Non-confirmed Fall Habitat within ZOI	Confirmed Fall Habitat	Confirmed Fall Habitat within ZOI
Area of Habitat (ha)	979.0	67.5	2727.1	129.4	1,593.9	4.8
Total Area	1,046.5			4,455.3		

Moose

Moose are not a species of conservation concern as listed by SARA, COSEWIC, or by Yukon Territory. However, Environment Yukon has several localized conservation concerns related to the potential effects of the project on moose habitat and populations. The primary concerns with mining activity in the area are related to habitat loss, potential disruption of moose migration patterns, potentially higher (and unsustainable) harvest rates due to increased road access and increased moose mortality associated with moose-vehicle collisions.

There is little information available regarding moose habitat in the project area. Early-winter surveys conducted in 1996 (Yukon Renewable Resources 1996) for the area indicated that the Kudz ze Kayah project area and subalpine willow zones in the Wolverine, Fire and North lakes regions along Money Creek are important to moose during the post-rut period. Traditional knowledge and local anecdotal observations suggest that the Kudz ze Kayah site and areas between Kudz ze Kayah and the Wolverine project sites are an important seasonal travel corridor for moose. Moose summering in the North Lakes area (southwest of Wolverine Lake) move north through the area between the Kudz ze Kayah and project areas to winter in the lowlands along the Robert Campbell Highway, and return via the same route in the spring.

Environment Yukon has previously conducted several aerial moose inventories in the Finlayson-Francis lake area using a stratified random block (SRB) technique to estimate the moose population. Summary results from these population surveys were obtained from aerial inventories conducted in November of 1987 (Jingfors 1988), 1991 (Larsen and Ward 1995) and 1996 (Yukon Renewable Resources 1996). Moose population estimates for the Finlayson-Francis Lake area are provided by survey year in Table 7.10-4. A summary of the moose population demographics observed in these surveys is provided in Figure 7.10-7.

Table 7.10-4 Summary of the Moose Population in the Finlayson-Francis Lake Area

Survey Year	Estimated number of Moose ± 90% CI	Moose Density / km^2
1987	741 ± 16%	0.19
1991	1409 ± 13%	0.36
1996	1220 ± 12%	0.31

The rate of population recruitment for the Finlayson-Francis Lake moose population has shown a consistent downward trend based on the SRB survey results. Although limited in trend, based on the moose population estimate data and the above composition data, Environment Yukon assessed the Finlayson Francis Lake moose population to have likely stopped increasing and is now stable or declining slowly (R Ward pers. comm., 2005). There has been speculation that this trend may be the result of a long-term residual impact from the wolf control program conducted in the area between 1983 and 1989 based on the following summary points (Provided as a draft summary report from R. Ward, 2005):

- Wolf numbers were reduced by 50 to 85% between 1983 and 1990
- Moose abundance increased by 85% to 93% between 1987 and 1991
- Wolf numbers rebounded to pre-wolf control numbers by 1995
- Moose recruitment rates declined since the end of wolf control
- Moose populations stopped growing by 1996
- Moose populations are now stable or declining

Figure 7.10-7 Summary of the demographic composition in the Finlayson-Francis Lake moose population

Moose in the Finlayson region utilize forested vegetation types during much of the year, particularly in the winter when they are more likely to inhabit low elevation areas. Riparian forests including tall shrub vegetation types and closed canopy conifer forests provide important browse and thermal cover during the winter period (mid-December through late-April). During spring through fall, moose are widely distributed throughout the area and can occur in any of the vegetation types found in the area. During the rut and post-rut period (September through mid-November), moose prefer upper subalpine basins and utilize the tall shrub vegetation types and open-canopy subalpine fir forests. Alpine areas are infrequently utilized likely due to their poor cover and forage that they provide for moose.

Existing suitable winter habitat for moose is found within the study area, especially at elevations below 1100m. Baseline habitat availability (by area) in the LSA is summarized by habitat suitability class in Table 7.10-5.

Table 7.10-5 Moose Habitat Available in the LSA at Baseline

Habitat Suitability	Low	Moderate	High	Nil	Total
Moose Winter Habitat Area (ha)	2,957.3	4,590.7	1,940.6	1,528.0	9,488.6

Thinhorn sheep

Thinhorn sheep are not listed as species at risk by either the Yukon Territory (*Yukon Wildlife Act*) or COSEWIC (*Species at Risk Act*). However, sheep have a high social and economic value as a hunted species in the Yukon, including high public demand for their conservation into the future. Sheep are believed to be at, or near, historic population levels in the Yukon and have recolonized some ranges where they had previously disappeared (probably due to overhunting). There are an estimated 22,000 sheep in the Yukon.

Thinhorn sheep have very specific habitat requirements. They need windblown, grassy slopes as winter range; steep, secure areas where ewes can safely bear their lambs; steep rugged cliffs where they can escape from predators; and access to mineral licks. For sheep displacement from critical habitat ranges, including winter and lambing areas, cannot only cause adverse nutritional impacts but also place newborns and mothers in a position of higher susceptibility to predation. Sheep can more easily learn to tolerate the presence of people and withstand the disturbance of industrial activities if they do not associate people with hunting. Sheep are very susceptible to disturbance by aircraft, all terrain vehicles, snowmobiles and especially helicopters. This susceptibility, combined with their very traditional use of habitats, makes disturbance an important matter to consider in a management strategy.

Key habitat areas have been identified for sheep by Environment Yukon in both the LSA (based upon historic and anecdotal accounts) and in the RSA (survey and anecdotal information). Sheep have been documented to utilize portions of the Campbell Range (east of Wolverine Lake) and to occur within close proximity of North Lakes (south of Wolverine Lake) during aerial inventories conducted in the RSA. There is as well, documented reference to several mineral licks north of North Lakes in the RSA.

A predictive winter and lambing habitat model was applied to the RSA (Appendix 7.10-1). The model was then field checked within the LSA in attempt to confirm habitat use by sheep in predicted areas and or in key habitat polygons. No sign of sheep habitat use was observed in the LSA; thus there are no project impacts expected for sheep within the project LSA. The results of the predictive habitat model are provided for the RSA to help guide future mine development activities (mineral exploration, helicopter and or fixed-wing flights, etc.) in the RSA.

Large Carnivores / Omnivores

Three large carnivore or omnivore species, wolf, black bear, and grizzly bear, are known to occur in the project area. These three species are discussed below. Grizzly bears were selected as a VECC for detailed impact assessment purposes (see also Appendix 7.10-1).

Wolf

Wolves (Canis lupus) may be found within all habitats in the RSA in pursuit of their prey (large ungulates and smaller mammals including beaver, snowshoe hare and ground squirrels). However for wolves, habitat reductions resulting from project impacts are likely not significant for several reasons. First, wolves should be able to travel through the project area, as the project footprint is unlikely to create movement barriers. Second, the presence of the access road may have a positive energetic effect for wolves that use the road for movements during low-use periods. Lastly, habitat use and wolf movements are closely related to pursuit of their prey. Therefore, wolf habitat is likely best assessed through habitat assessments of their major prey species in the area (large ungulates), which have been identified as VECCs for the project impact assessment.

Wolves are thought to play an important role among moose and caribou population levels in the Finlayson area. Environment Yukon studied wolves in the area intensively in the 1980's and 1990's; including a wolf control program between 1983 and 1989 that was thought to be successful in reducing the wolf population by approximately 85% (Farnell and Hayes, 1992). Following the wolf control program, wolf populations were monitored to examine population recovery rates. Within six years the wolf population was estimated to have recovered to pre-control levels (Hayes and Harestad, 2000). These same studies also concluded that kill rates of moose from wolf predation are best modeled by the number of wolf packs and pack sizes and are less related to prey density or snow depth (Hayes et al. 2000).

Wolf sign was observed in the project LSA and wolf sightings have been noted in upland areas (subalpine and alpine ecozones) of the LSA. An important denning area frequently reused by wolf packs occurs at the north west end of Wolverine Lake within the project RSA (Alan Baer pers. comm., 2005).

Black Bear

Black bears (*Ursus americanus*) are most common in forested habitats below treeline. Black bear sows breed every two years and will most commonly produce two or three young in January or February while in their winter dens. At the altitude of the study area black bears usually begin denning in late-October and emerge from hibernation in early spring (March-April). They spend the summer foraging on vegetation, berries, insects, and carrion. Black bears are thought to be more tolerant of humans and human development than are grizzly bears.

Black bears are more abundant in lower elevation forests near the Finlayson Lake and Robert Campbell Highway and are not expected to be as common within the LSA due to the predominance of high elevation subalpine habitats (Alan Baer pers. comm., 2005). Black bear sign, as identified by tracks, hair, and scat, was noted in a white spruce forest near the shore of Wolverine Lake during the 2005 summer field survey.

Grizzly Bear

Grizzly bears in Canada have no status under the Species at Risk Act. As of May, 2002, grizzly bears in Canada were listed as a species of special concern (COSEWIC 2004). A species of special concern is a species with characteristics that make it particularly sensitive to human activities or natural events. Overall, the species is stable but vulnerable to decline based on both factors (e.g., low reproductive rate) and vulnerabilities to human activities (e.g., attraction to non-natural food sources that can result in mortality). Grizzly bears within the project area are northern interior grizzlies, which are known to range throughout northern British Columbia, most of the Yukon, and extend into the southern Mackenzie District of the North West Territories.

The food habits of grizzly bears living in the northern boreal forest are understood only in general terms, especially in and surrounding the project area where grizzly bears are not well studied. The omnivorous and opportunistic feeding behaviour of grizzlies means that they will use a variety of foods according to availability within their ranges.

Existing suitable habitat for grizzly bears is found across the project area. Baseline habitat availability in the LSA is summarized by habitat suitability class in Table 7.10-6.

Table 7.10-6 Grizzly Bear Habitat Available in the LSA at Baseline

Habitat Suitability	Very high	High	Moderate	Low	Very Low	Nil	Total
Spring Forage Habitat Area (ha)	1,895.2	2,313.4	782.7	1,104.2	4,568.6	352.4	10,664.1
Summer/Fall Forage Habitat Area (ha)	7.2	1,376.2	4,410.6	3,143.8	1,729.8	348.9	10,667.6

Small Mammals

Small mammals known to occur in the project area include coyote (*Canis latrans*), lynx, red fox (*Vulpes vulpes*), wolverine (*Gulo gulo*), marten (*Martes Americana*), fisher (*Martes pennanti*), short-tailed weasel (*Mustela erminea*), least weasel (*Mustela nivalis*), mink (*Mustela vison*), river otter (*Lutra Canadensis)*, beaver (*Castor Canadensis)*, snowshoe hare (*Lepus americanus*), ground squirrels (*Spermophilus parryii*), and numerous bat, shrew, mouse, and vole species (Appendix 7.10-2). To date, no species of conservation concern has been documented in the project area. Beaver, lynx and snowshoe hare, and American marten were selected as VECCs; they are discussed individually below.

Beaver

Beavers have no listing under the *Species at Risk Act*. Conservation concerns for this species are relatively few given the beaver's adaptability to human encroachment (L.Foote. Pers. Comm, 2005). Beavers, in fact, find roadbeds and culverts very attractive due to the reduced effort it takes to dam a road or culvert instead of a whole waterway in order to flood land (Martell, 2004). Beaver problems where roads cross a stream can be remedied by using beaver exclusions.

Beavers were chosen as a VECC species due to their socio-economic value as a fur bearing species as well as their important role in wetland habitat construction (L.Foote. Pers. Comm., 2005; Martell 2004). The total fur harvest for beavers in the LSA is over 1300 pelts from 1980 to 2001. The habitat beavers create is used by other trapped species such as mink, muskrat and otter. Together these species provide approximately 3000 pelts respectively (approximately 11% of the total fur harvest) from 1980 to 2001 within a regional context (H.Slama 2005) (See also discussion of hunter and trapper harvest, below).

Beaver colonies are abundant in the LSA, playing a major roll in wetland development and maintenance in the area. During an aerial beaver survey in the LSA, 50 wetlands were confirmed to have past or present sign of beaver colonization including approximately 60 beaver dams and 23 beaver lodges (Table 7.10-7).

Table 7.10-7 Summary of Past and Present Beaver in the LSA, as Surveyed on September 10, 2005

Beaver Colonies	Count of Beaver Colony Observations
Active Colonies	3
Inactive Colonies	21
Suspected Active Colonies	6
Suspected Inactive Colonies	16
Unknown	4
Total	**50**

In the Yukon, beavers (*Castor canadensis*) inhabit forested and subalpine regions. Narrow, slow-moving streams, rivers, marshes, ponds and lakes are ideal sites for colonies (Cowan and Guiguet 1956; Banfield 1981). Swift flowing streams (risk of flash floods) and areas where there is seasonal fluctuation in the water supply are unsuitable for colonization (BC Ministry of Environment 1998).

Beaver dams, built out of rocks, mud and sticks, are high enough to hold back several meters of water, creating enough depth to ensure swimming space below the winter ice (Banfield 1981). Although beaver dams act more like a sieve, allowing some water through, the water that is held back often floods previously adjacent uplands (Government of Yukon 2005). The resulting new wetland habitat is beneficial to many other wildlife species (Martell 2004). A list of key wildlife species that benefit from beaver wetland associations and that occur in project area is provided in Table 7.10-8.

Table 7.10-8 Beaver Habitat Overlap with Other Wildlife Species (from L.Foote, 2005)

Wildlife Group	Species	Habitat Association
Mammals	Moose	Forage on aquatic plant species
	Muskrat	Share habitat and have been known to use beaver lodges in the winter (McKinstry et.al., 1990)
	Otter	Positive association with otter numbers and number of beaver flowages (Dubuc et.al., 1990)
	Mink	Share similar habitat with beavers.
	Hare	Find cover in willow thickets
	Lynx	Prey on hare
Waterfowl	Trumpeter Swans	Are expanding into this area – as beaver ponds provide an increased abundance of suitable habitat.
Fishes	Pike	Use habitat created by beavers
Invertebrates	Dragonflies	Feeding grounds, ideal habitat for life cycle.

A summary of available beaver habitat and confirmed beaver wetlands by area within the LSA is provided in Table 7.10-9.

Table 7.10-9 Beaver Habitat Available in the LSA at Baseline

Habitat Type	Potential Habitat	Confirmed Habitat	Total Habitat
Total Area within the LSA	527.8	1186.1	1,713.8

Lynx and Snowshoe Hare

Neither lynx nor snowshoe hare are listed under the *Species at Risk Act*. Snowshoe hare and lynx populations' are known to fluctuate over time with one population being dependent upon the other; they are therefore included as a combined VECC in this assessment. Lynx provide significant socio-economic values to this area as a furbearing species. Lynx comprised approximately 7% of the total fur harvest between 1980 and 2001 (H.Slama 2005) in a regional context.

The major factors responsible for a decline in lynx numbers occurs following a crash in the hare population where juvenile lynx mortality increases from starvation and possibly from failure of yearling females to breed (Brand et al. 1976; Brand and Keith 1979; Krebs et al. 2001). Both populations tend to fluctuate every 8-11 years with the lynx having a 1-2 year lag in response to the hare population (Poole 2003; Elton and Nicholson 1942; Keith 1963; Krebs et al. 2001). Other than their close association to the distribution of snowshoe hare, typically lynx habitat is found within climax boreal forests including both coniferous and mixed-woods with a dense undercover of thickets and windfall (Soper 1964; Banfield 1974; Smith 1993; Krebs et al. 2001). The snowshoe hare is a common and widely distributed resident of the boreal forest region, inhabiting forests, swamps and riverside thickets primarily having extensive shrub understories (O'Donoghue et.al. 1998; Soper 1964; Keith 1972; Windberg and Keith 1978; Krebs et al. 2001).

Existing habitat availability for snowshoe hare and lynx is found throughout the LSA. Baseline habitat availability in the LSA was assessed and quantified for both species; the area of available habitat is summarized by habitat suitability class in Table 7.10-10.

Table 7.10-10 Habitat Available in the LSA at Baseline

Habitat Suitability	Low	Moderate	High	Nil	Total
Area of Lynx Habitat (ha)	463.7	5,571.8	4,722.7	258.2	10,758.2

American Marten

The marten is not listed as a species at risk by either Environment Yukon or COSEWIC (2004) as a species of concern. In the Yukon, a Marten Conservation Area (MCA) extends from the Teslin River to Kluane National Park and north to Carmacks and Aishihik Lake (outside of the study area). A trapping quota has been placed on marten in the MCA intended to minimize harvest pressures and build a stable resident population (Yukon Environment Trapping Regulations, 2003-2004). The main rationale for the selection of this species as a VECC is due to their socio-economic value as a trapped species in the area.

The marten is primarily carnivorous, generally nocturnal and active throughout the year. Prey abundance (e.g., voles) appears to be a critical factor affecting marten population dynamics (Mech and Rogers 1977; Fryxell et al. 1999). The marten's prominence in the trapping records indicates that it is likely relatively abundant in the region.

Marten in the northern boreal forest are closely associated with late successional coniferous stands, especially those dominated by spruce and fir, with complex structure near the ground (i.e., coarse woody debris) (Slough 1989; Buskirk and Powell 1994), but will inhabit a variety of forests and even shrublands if food is available. Commonly reported refuge sites include ground burrows, rock piles and crevices, downed logs, stumps, snags, brush or slash piles and squirrel middens (Mech and Rogers 1977; Steventon and Major 1982; Buskirk 1984; Ruggiero et al. 1994; Bull and Heater 2000). Home range sizes are 2.0 to 15.7 km^2 for males and 0.8 to 8.4 km^2 for females (Strickland and Douglas 1987).

Marten are only moderately abundant in and around the LSA. No marten or marten sign were recorded during the field sessions associated with this project however several records of observed marten were noted at the exploration camp on Wolverine Lake.

Suitable habitat for marten is found within the LSA. Baseline habitat availability in the LSA was assessed and quantified for marten; the area of available habitat is summarized by habitat suitability class in Table 7.10-11.

Table 7.10-11 Marten Habitat Available in the LSA at Baseline

Marten Habitat Suitability	Low	Medium	High	Nil	Total
Winter Habitat Area (ha)	4,681.0	1,192.1	0.0	5,143.3	5,873.1

Birds

A wide variety of birds (e.g., waterfowl, shorebirds, raptors, songbirds) occur in the project area. There have been no documented occurrences in the project area of birds that are considered at risk by either Environment Yukon or COSEWIC. However, comprehensive bird inventories have not been conducted in the area to date. Four bird species that have a high priority rating (Olive-sided Flycatcher, Northern Shrike, Solitary Sandpiper, Trumpeter Swan) and 11 species having a moderate priority rating (Alder Flycatcher, Arctic Tern, Lesser Yellowlegs, Blackpoll Warbler, Bohemian Waxwing Boreal Chickadee, Horned Grebe, Osprey, Pine Grosbeak, Rusty Blackbird, Spruce Grouse, Varied Thrush, White-winged Crossbill) for conservation in the Yukon have been observed in or surrounding the RSA. A list of 77 bird species and their associated conservation status (various ratings) that have been documented in and surrounding the project RSA by the Canadian Wildlife Service is provided in Table 7.10-12.

Most of the suitable waterfowl habitat in the LSA was preliminarily assessed during the wetland beaver lodge and trumpeter swan aerial survey. Two bird VECCS were selected for detailed impact assessment purposes: a songbird community VECC and the trumpeter swan. These VECCs are discussed in more detail below.

Table 7.10-12 Recorded Bird Observations in and Surrounding the Project RSA (Data Provided by Scott Herron, CWS; 2005)

Species	Recorded Observations	Continental Conservation Concern*	Yukon Importance**	Yukon Priority***
Alder Flycatcher	14	moderate	moderate	moderate
American Kestrel	4	not at risk	some	
American Robin	20	not at risk	some	
American Tree Sparrow	2	not at risk	moderate	
Arctic Tern	4	moderate	moderate	moderate
Bald Eagle	4	moderate	some	
Bank Swallow	4	not at risk	some	
Barn Swallow	7	not at risk	some	
Belted Kingfisher	6	moderate	some	
Blackpoll Warbler	18	moderate	moderate	moderate
Bohemian Waxwing	18	low concern	moderate	moderate
Boreal Chickadee	26	moderate	moderate	moderate
Bufflehead	4	low concern	some	
Chipping Sparrow	31	not at risk	some	
Cliff Swallow	6	not at risk	some	
Common Loon	6	moderate	some	
Common Merganser	4	low concern	some	
Common Nighthawk	2	moderate	some	
Common Raven	10	not at risk	some	
Common Snipe	18			
Common Yellowthroat	14	not at risk	some	
Dark-eyed Junco	28	not at risk	some	
Fox Sparrow	26	not at risk	some	
Golden-crowned Kinglet	2	not at risk	some	
Gray Jay	38	not at risk	some	
Gray-cheeked Thrush	10	low concern	moderate	
Great Horned Owl	2	not at risk	some	
Greater White-fronted Goose	2	low concern	some	
Herring Gull	10	moderate	some	
Horned Grebe	2	moderate	moderate	moderate
Killdeer	2	moderate	some	
Least Flycatcher	2	moderate	some	
Lesser Yellowlegs	16	moderate	moderate	moderate
Lincoln's Sparrow	18	not at risk	some	
Mallard	4	not at risk	some	
Mew Gull	8	not at risk	high	
Northern Flicker	16	not at risk	some	
Northern Harrier	2	moderate	some	
Northern Pintail	2	moderate	some	
Northern Shrike	2	moderate	high	high
Northern Waterthrush	20	not at risk	moderate	
Olive-sided Flycatcher	20	high concern	moderate	high
Orange-crowned Warbler	10	not at risk	some	
Osprey	2	moderate	some	
Pine Grosbeak	14	low concern	moderate	moderate
Pine Siskin	6	not at risk	some	
Red-breasted Merganser	4	low concern	moderate	

Table 7.10-12 Recorded Bird Observations in and Surrounding the Project RSA (Data Provided by Scott Herron, CWS; 2005) (cont'd)

Species	Recorded Observations	Continental Conservation Concern*	Yukon Importance**	Yukon Priority***
Red-breasted Nuthatch	2	not at risk	some	
Red-throated Loon	4	low concern	moderate	
Red-winged Blackbird	2	not at risk	some	
Ring-necked Duck	3	low concern	some	
Ruby-crowned Kinglet	22	not at risk	some	
Rusty Blackbird	18	moderate	moderate	moderate
Sanderling	2	high concern	None	
Sandhill Crane	2	not at risk	some	
Savannah Sparrow	2	not at risk	some	
Semipalmated Plover	6	low concern	moderate	
Solitary Sandpiper	28	high concern	moderate	high
Sora	4		some	
Spotted Sandpiper	22	low concern	some	
Spruce Grouse	4	low concern	moderate	moderate
Swainson's Thrush	29	moderate	some	
Swamp Sparrow	2	not at risk	some	
Tennessee Warbler	18	moderate	some	
Three-toed Woodpecker	2			
Tree Swallow	4	not at risk	some	
Trumpeter Swan	8	high concern	high	high
Varied Thrush	8	low concern	high	moderate
Warbling Vireo	8	low concern	some	
Western Wood-Pewee	10	moderate	some	
White-crowned Sparrow	22	not at risk	moderate	
White-winged Crossbill	24	not at risk	moderate	moderate
Wilson's Warbler	18	moderate	some	
Yellow Warbler	4	not at risk	some	
Yellow-bellied Flycatcher	10	not at risk	some	
Yellow-bellied Sapsucker	2	not at risk	some	
Yellow-rumped Warbler	42	not at risk	some	

Notes: *Continental Conservation Concern: from continental conservation plans; high concern, moderate concern, low (some) concern, or not at risk, overall in North America.
**Yukon Importance: high=15-30% of North American range is in Yukon, moderate=7-15% of North American range is in Yukon, None=no conservation value
***Yukon Priority: high=Yukon Importance and Continental Conservation Concern are both "high", or one is "high" and one is "moderate" OR Yukon species at risk status is S1 or S2 and Continental Conservation Concern is high. Moderate=Yukon Importance and Continental Conservation Concern are both "moderate", or Yukon Importance is "high" and CCC is "low", OR Yukon species at risk status is S1or S2 and Continental Conservation Concern is moderate.

Songbird Community

For this EIA songbirds (i.e., passerines), as a community, were selected as a VECC and included an assessment of abundance for 43 bird species. The songbird community was chosen as a VECC because of their combined sensitivity to disturbances and international conservation concerns. This songbird community included long-distance migrants, short-distance migrants and resident birds, and included birds in the families Tyranidae, Laniidae, Vireonidae, Corvidae, Alaudidae, Hirundinidae, Paridae, Sittidae, Regulidae, Turdidae, Motacillidae, Bombycillidae, Parulidae, Emberizidae, Icteridae and Fringillidae. None of these bird species are listed as a species at risk (Environment Canada 2004). However, the Yukon has set a priority for conservation of numerous bird species given:

- a species combined Continental Conservation Concern with Yukon Stewardship Responsibility and Yukon Risk Status
- species which are of conservation concern in North America, for which the Yukon is important (i.e. represents a relatively high proportion of the breeding range)
- species that do not have high responsibility scores in any one province or territory but have a combined stewardship rating in the Arctic or Northern Forest Biome (from Rich et al. 2004) and a Yukon Importance rating

Within the Yukon, 21 high priority species for conservation along with 46 moderate priority species have been identified. Of the species considered in the songbird community VECC, one species is of high Yukon Priority for conservation (Olive-sided Flycatcher) and five species are of moderate Yukon Priority for conservation (blackpoll warbler, alder flycatcher, boreal chickadee, Townsend's warbler, and varied thrush).

Since comprehensive bird inventories have not previously been conducted in the RSA, this assessment relies on point count information from other studies and study areas to provide an estimate of individual bird densities for habitat units that occur in the LSA. A detailed description of the methods used in this assessment is provided in Appendix 7.10-1. In short, this approach provides an assessment tool to quantify bird species abundance and distribution at baseline and to further provide a framework for assessing potential impacts of proposed developments on migratory birds as per the Migratory Birds Environmental Assessment Guidelines (Milko, 1998). An overall abundance of 43 bird species was estimated within the LSA. A list of the bird species and their estimated abundance is provided in Table 7.10-13. The distribution of individual bird species within the LSA by ecosystem unit is provided in Appendix 7.10-1.

Trumpeter Swan

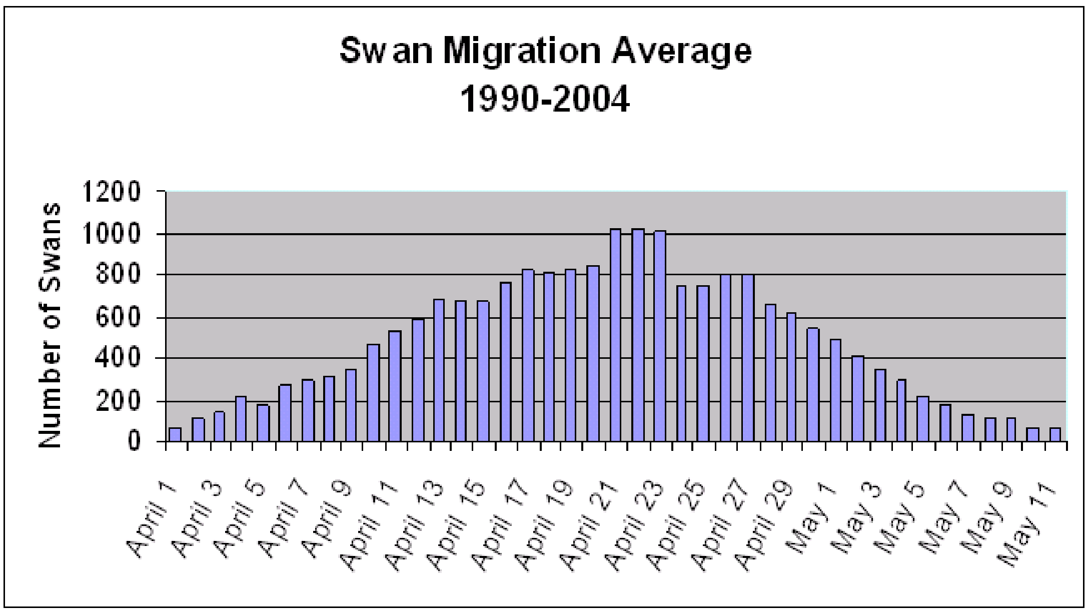
The trumpeter swan is not currently listed under the Species at Risk Act (2005) or under COSEWIC (2002). The trumpeter swan is identified as a Yukon stewardship species of "high priority", given their combined Continental Conservation Concern with Yukon stewardship responsibility and their Yukon risk status. The trumpeter swan was previously listed on the "species at risk" list as "vulnerable" in Canada by COSEWIC, but was then de-listed in 1996 (COSEWIC 2001). Trumpeter swans are noted as becoming more common and widespread in the Yukon. Still, the trumpeter swan is currently identified in the continental bird conservation plans as "Highly Imperiled" or of "High Concern" across North America and is as well detailed in the Migratory Birds Convention Act.

Table 7.10-13 Estimated Abundance of Selected Bird Species within the LSA, at baseline

Bird Species	Estimate of Abundance
Blackpoll Warbler	139
Gray Jay	191
Alder Flycatcher	2912
American Pipit	6135
American Redstart	6
American Robin	656
Black-capped Chickadee	17
Bohemian Waxwing	37
Boreal Chickadee	26
Chipping Sparrow	1404
Common Redpoll	23
Common Yellowthroat	3230
Dark-eyed Junco	2315
Fox Sparrow	1595
Golden-crowned Kinglet	6263
Hammond's Flycatcher	1457
Hermit Thrush	833
Horned Lark	4520
Least Flycatcher	119
Lesser Yellowlegs	59
Lincoln's Sparrow	2450
Northern Waterthrush	41
Olive-sided Flycatcher	92
Orange-crowned Warbler	237
Pine Grosbeak	61
Pine Siskin	3130
Red-breasted Nuthatch	480
Ruby-crowned Kinglet	895
Savannah Sparrow	35
Swainson's Thrush	752
Swamp Sparrow	3402
Tennessee Warbler	815
Townsend's Solitaire	154
Townsend's Warbler	7826
Varied Thrush	1027
Warbling Vireo	1486
White-crowned Sparrow	610
White-throated Sparrow	335
Wilson's Snipe	23
Wilson's Warbler	3093
Winter Wren	1517
Yellow-bellied Flycatcher	47
Yellow-rumped Warbler	1915
Cumulative Abundance Estimate	**62,80**

There have been 76 confirmed breeding records of trumpeter swans in the Yukon Territory (Sinclair et al. 2003), including one record in the project RSA (Dennington, 1988). There are currently three documented regional populations of trumpeter swans in North America, defined based on geographic distribution including the pacific population, the rocky mountain population, and the interior population. Trumpeter swans are a migratory bird species that utilize the southern United States as a wintering range and the Northern United States and Canada for breeding. The Pacific Population utilizes coastal British Columbia and Alaska (west of the Rocky Mountains) for breeding. Portions of NW Alberta, NE British Columbia, SW North West Territories and the SE Yukon are known as breeding habitats for the Rocky Mountain Population.

Trumpeter swan breeding and nesting habitat is most often found on lakes and marshes with permanent water and or slow moving creeks or rivers with semi-permanent flow, having emergent and submergent vegetation (Sinclair et al. 2003). Many of the wetlands used by breeding trumpeter swans are created or maintained by beaver dams (Foote 2005). Nesting sites and mounds are often reused in multiple years by trumpeter swans (Banko 1960). Trumpeter swans require approximately 140 to 150 days for nest building, incubation, and development of cygnets (cited in Sinclair et al. 2003) generally commencing in April or May within the Yukon, as measured at Marsh Lake approximately 60km east of Whitehorse (Figure 7.10-8).



Notes: *Figure obtained from Swan Wildlife Viewing Program; Department of Environment, Yukon Territory.

Figure 7.10-8 Average Number of Trumpeter Swans Observed during Spring Migration at March Lake, Yukon (1990-2004)

A pair of breeding trumpeter swans with two cygnets was observed in a small wetland, in the LSA (Appendix 7.10-2), on July 25, 2005. On September 10, 2005, a pair of breeding trumpeter swans with two cygnets was again observed in the same wetland during the aerial wetland survey. The combined observations confirm that the wetland is a nesting and staging site used by these trumpeter swans for the development of their cygnets.

Within the RSA, trumpeter swan breeding habitat has been identified by Environment Yukon, as a Key Wildlife Habitat Area southeast of the project LSA. This area was confirmed as trumpeter swan breeding habitat in an aerial and ground reconnaissance survey conducted by the Canadian Wildlife Service (Dennington, 1987).

Trumpeter swan breeding habitat availability was assessed in the project LSA. Habitat was identified for two habitat classes: suitable breeding wetlands and confirmed breeding habitat for trumpeter swans. The area of available breeding habitat for trumpeter swans in the LSA is summarized for each habitat class in Table 7.10-14.

Table 7.10-14 Trumpeter Swan Habitat Available in the LSA at Baseline

Trumpeter Swan Breeding Habitat	Potential Wetland Breeding Habitat	Confirmed Breeding Habitat	Total Habitat
Total Area within the LSA (ha)	581.8	3.6	585.4

Hunter and Fur Trapping Harvest

Information provided for hunter and fur trapping harvests includes excerpts and data provided in the Environment Yukon Trapping Regulations (2004), Environment Yukon Hunting Regulations (2005–2006), the Yukon Wildlife Act (2002), and includes information gathered from communication with wildlife biologists, a fur trapping technician, and conservation officers with Environment Yukon.

Hunter Harvest

The RSA is located within potions of the Environment Yukon hunting management zones 10 and 11 (Section 7.11). The LSA is located within hunting management zone 10, including portions of hunting management subzones 10-07 and 10-08. Within hunting management zone 10 and zone 11, there is seasonal hunting for male moose, sheep, black bear, grizzly bear, wolverine, wolf, coyote, snowshoe hare, arctic ground squirrel, porcupine, spruce grouse, ruffed grouse, blue grouse, ptarmigan, ducks, geese, rails, coots, sandhill cranes and snipe within all management subzones. Hunting for male caribou in management subzones 10-07 and 10-08 is by a permit hunt only. This requires candidate hunters to apply for a hunting permit in a lottery system that allows management of the caribou harvest in these areas by quota. It is unlawful to hunt male caribou in these areas without a valid permit.

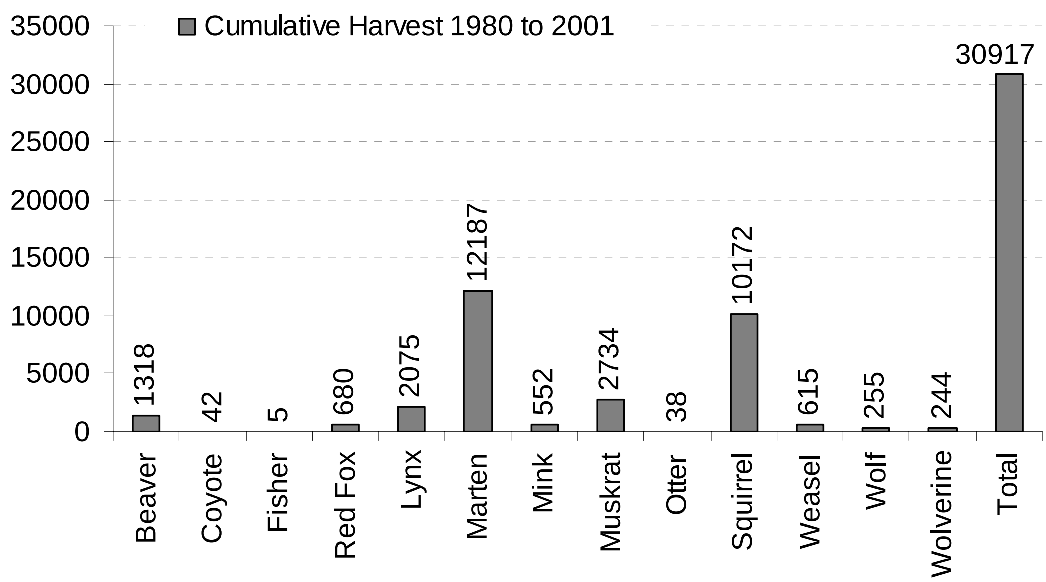
Environment Yukon requires mandatory reporting of moose and caribou harvests and requires compulsory submissions to a Conservation Officer or wildlife technician for harvested mountain sheep, mountain goat, black bear, grizzly bear, wolverine, wolf or wood bison. In Table 7.10-15 below, the harvest of moose, caribou, sheep, grizzly bears, and black bears in management zone 10 from the 2004-2005 hunting season is provided.

Fur Trapping Regulations and Harvest

Furbearing animals (species that may be trapped) in the Yukon include beaver, muskrat, squirrel, weasel, fisher, otter, marten, mink, wolverine, lynx, wolf, coloured fox, arctic fox or coyote. Other than for marten in the western Yukon, there are currently no species specific trapline quotas. However the Yukon Minister of Environment has emergency powers to prohibit trapping anywhere it is urgently required for the purpose of public health, public safety or conservation. Furthermore, Environment Yukon keeps track of the annual fur harvest by monitoring trapping licences, export permits, fur dealer and taxidermist records, and sealing certificates (harvest tags required for some species). Although, individual harvest information is confidential in the Yukon, a summary of the cumulative harvest for ten traplines between 1980 and 2001, in and surrounding the Wolverine project RSA, was obtained from Yukon Environment and is provided in Figure 4. Yukon First Nation members that trap for pelts must similarly comply with all Yukon trapping regulations.

Table 7.10-15 Harvested Animals in Zone 10 and 11 during the 2004-2005 Hunting Season

Zone	Moose	Caribou	Sheep	Grizzly Bear	Black Bear
Zone 10 (Resident + Non-Resident)	54 + 27	14 + 18	1 + 6	3 + 3	9 + 0
Zone 10 (Total Harvest)	81	32	7	6	9
Zone 11 (Resident + Non-Resident)	58 + 23	14 + 14	0 + 4	1 + 1	4 + 0
Zone 11 (Total Harvest)	81	28	4	2	4



Notes: Data obtained from Helen Slama, 2005

Figure 7.10-9 Cumulative Trapping Harvest between 1980 and 2001 from Ten Traplines Located in and Surrounding the RSA

7.10.3 Effects Assessment Methodology

A habitat-based approach was used to assess potential environmental effects of the project on each VECC. Specifically, a comparison of baseline wildlife habitat (i.e., before the project) was compared to the amount of habitat available after potential changes occurred within the LSA. This approach relies on characterization of the habitat types in the LSA and an understanding of the species-habitat relationships that exist for the selected VECCs. A habitat-based approach to an impact assessment is ideally suited for:

- large study areas
- long-term effects
- species for which species-habitat relationships can be determined
- area's where habitats are relatively static

Two quantitative tools were used to assess potential project and cumulative effects on wildlife habitat availability, movement patterns, and mortality risk:

- disturbance mapping (areas of existing and future project related disturbance)
- wildlife habitat models (characterization of habitat use using ecosystem mapping and understanding of important habitat requirements for VECCs and species specific disturbance buffers)

An overview of these analytical tools is provided below; detailed descriptions are provided in Appendix 7.10-1.

7.10.3.1 Disturbance Mapping

A digital disturbance layer was created that identifies the locations of human developments in the RSA based on a combination of existing mapping layers, satellite imagery interpretations, and or field reconnaissance. This digital disturbance layer provides an accurate assessment of anthropogenic disturbances that have occurred in the RSA up to 1999, as interpretable from the existing mapping layers and satellite imagery. Disturbance types in the RSA included transportation networks (roads, limited-use roads, bridges, airstrips, and trails), clearings (camps and burns), cutlines, industrial disturbances (landfills, liquid dumps), structural disturbances (buildings and campgrounds).

This analysis was used to assess baseline conditions (including wildlife habitat availability) and the effects of landscape fragmentation, and to determine the potential contribution of the project to regional access issues. These layers were also used to infer changes in mortality risk to key species such as caribou and grizzly bear due to increases in road access and density.

7.10.3.2 Wildlife Habitat Models

Wildlife habitat modeling is a predictive tool that provides a representation of a species' probability or density of occurrence (habitat use during a given season) in an area based on the biophysical attributes of the landbase. The following three approaches were used in this assessment:

- **Habitat Suitability Index (HSI) Models -** provide a probability that the habitat is suitable for the species, and hence a probability that the species will occur where that habitat occurs. If the value of the index is high in a particular location, then the chances that the species occurs there are higher than if the value of the index is low.

- **Animal Abundance Estimates -** calculate animal abundance by multiplying animal density (number/ha) within a given habitat unit by the area (ha) of the given habitat unit that is available within a study area. In order to apply this approach, estimates of animal density within habitat units are required.
- **Animal Presence and Habitat Suitability -** uses observational or other data (GPS or telemetry tracking) to confirm animal presence within suitable habitats (often defined using an HSI or similar approach). An animal presence approach is best suited for non-migratory species that have relatively small annual home ranges and or species that have a high rate of habitat (seasonal or other) fidelity (i.e., traditional habitat use behaviours). In such cases habitats with confirmed occupancy are likely a stronger spatial predictor of areas having future presence and are thus considered to have a higher habitat value. This method requires an adequate collection of habitat use data for a species.

The wildlife habitat models focused on the nine selected VECCs. The wildlife assessment modeling approach used for each VECC is provided in Table 7.10-16. The specific methods used for assessing habitat availability are provided for each VECC in Appendix 7.10-1.

Table 7.10-16 Modeling Approach used for each VECC

Modeling Approach	VECC
Habitat Suitability Index	Grizzly Bears Moose Lynx and Snowshoe Hare American Marten Thinhorn Sheep
Animal Abundance Estimates	Song Birds Grizzly Bears
Animal Presence and Habitat Suitability	Caribou Beavers, Trumpeter Swans Thinhorn Sheep

As a component of the habitat modeling, species-specific disturbance buffers were applied to all project component footprints for the construction/operations/ decommissioning scenario, and to some project component footprints for the closure scenario. The disturbance buffer defines the zone over which the effects of the project are presumed to result in the loss or alteration of available habitat (due to displacement or decreased use as a result of sensory disturbance or actual habitat loss). Thus, any habitat that falls within the disturbance buffer (including the actual footprint) is considered affected and the rating of the habitat is adjusted according to the projected impact (see Table 7.10-17).

To apply the disturbance buffers, the following information is required:

- Detailed project component footprints, including all related elements (e.g., mine and process plant footprint, new or upgraded road sections, tailings facility, camp, borrow areas etc.
- Regional spatial database of existing anthropogenic disturbances.

Table 7.10-17 Disturbance Buffers and Associated Habitat Rating Adjustments for Selected VECCs

Anthropogenic Disturbance Type	Moose			Grizzly Bear			Sheep			Lynx			Marten			Caribou		
	Footprint	Buffer (m)	Rating	Footprint	Buffer (m)	Rating Adjustment	Footprint	Buffer (m)	Rating	Footprint	Buffer (m)	Rating	Footprint	Buffer (m)	Rating	Footprint	Buffer (m)	Rating
Clearings / Camps	0	250	0.75	6	800	+3	0	350	0.5	0	250	0.75	0	100	0.75	0	100	0.5
Cutlines	0.75	100	0.75	N/A	400	+1	0	N/A	N/A	0.75	N/A	N/A	0.75	N/A	N/A	0	100	0.5
Industrial Liquid dump/depot	0	250	0.5	6	800	+3	0	500	0.5	0	250	0.75	0	100	0.75	0	500	0.5
Structure (buildings/campgrounds)	0	100	0.75	6	400	+1	0	500	0.5	0	250	0.75	0	100	0.75	0	500	0.5
Main Roads	0	250	0.5	6	800	+3	0	500	0.5	0	250	0.75	0	100	0.75	0	500	0.5
Main Road - ground level, loose surface, operational road	0	250	0.5	6	800	+3	0	500	0.5	0	250	0.75	0	100	0.75	0	500	0.5
Secondary Road - ground level, hard surface, operational road	0	100	0.75	6	800	+3	0	350	0.5	0	N/A	N/A	0	100	0.75	0	500	0.5
Limited-use, Cart, Track, Road, or Drill Road	0	100	0.75	6	400	+1	0	350	0.5	0.75	0	N/A	0.75	N/A	N/A	0	100	0.5
Airstrip	0	300	0.5	6	800	+3	0	500	0.5	0	250	0.75	0	100	0.75	0	500	0.5
Mine Site	0	250	0.25	6	400	+1	0	500	0.5	0	250	0.75	0	100	0.75	0	500	0.5

Notes: Habitat suitability may be reduced within the footprint and/or a buffer zone by multiplying the HSI value by the disturbance coefficient or by adjusting the habitat suitability rating. For example, a disturbance coefficient of 0.25 will reduce the HSI value by 75% or increasing the suitability rating by 3 (+3) will reduce the 6 point scale habitat rating by 50%.

7.10.3.3 Assessment Scenarios

As noted in Section 7.10.1.1, the assessment focused on three scenarios representing the full range of potential project effects and the site condition when the project is complete:

- **Baseline** – the baseline condition represents the habitat availability and use of the project area by wildlife prior to project-related habitat disturbances. This `condition is the yardstick by which project effects are measured
- **Full Build-out** – representing the maximum level of habitat and wildlife disturbance during the life of the project. It will be most intense during construction as a result of site clearing and building activities across the site and will persist during operation and the early stages of decommissioning with gradual reductions as a result of progressive reclamation. In terms of habitat effects, full build-out assumes a conservative disturbance footprint, that is, the total of all claim areas touched by project facilities and the access road (approximately 2186 ha). The actual disturbance footprint is likely to be considerably less than that, on the order of 100 ha. The use of the conservative footprint addresses all eventualities in the event that project facilities are modified or moved within that footprint. It also provides a worst-case assessment of potential effects.
- **Closure** – the emphasis on effects of closure is not so much on habitat availability since the access road and airstrip will remain at closure. Reclamation of the mine site will replace some of the habitat lost but it will be a relatively small component of the overall disturbance footprint. Accordingly the change in habitat availability at closure while positive, is relatively small. On the other hand the presence of the road at closure could potentially incur wildlife mortality and is the more important factor for determining potential project effects in this phase.

7.10.3.4 Effects Attributes

Predicted project and cumulative effects on wildlife derived from quantitative and qualitative assessments were characterized in accordance with the EA Report Guidelines using effects attributes defined in Table 7.10-18. Ecological and social contexts of effects were integrated in the attributes for effect magnitude and elaborated upon in the text where relevant.

7.10.3.5 Determination of Effects Significance

The significance of residual project related effects and cumulative effects will be determined based on the defined effects criteria as follows:

A residual adverse effect will be considered significant if it is;

- a moderate magnitude adverse effect that is far future (> 10 years) in duration
- a high magnitude adverse effect unless it is site-specific in geographic extent
- a high magnitude adverse effect that is site-specific in geographic extent and far future in duration

Otherwise, residual adverse effects will be rated as not significant.

In addition, as required by the EA ReportGuidelines, the likelihood that any significant adverse residual effects will occur as predicted will be stated with a supporting rationale.

Table 7.10-18 Effect Attributes for Wildlife

Attribute	Definition
Direction	
Positive	Condition of VECC is improving
Adverse	Condition of VECC is worsening or is not acceptable
Neutral	Condition of VECC is not changing in comparison to baseline conditions and trends
Magnitude	
Low	Effect occurs that might or might not be detectable, but is within the range of natural variability, does not pose a serious risk to VECC, and does not compromise economic or social/cultural values
Moderate	Clearly an effect but unlikely to pose a serious risk to the VECC or represent a management challenge from an ecological, economic or social/cultural standpoint
High	Effect is likely to pose a serious risk to the VECC and represents a management challenge from an ecological, economic or social/cultural standpoint
Geographic Extent	
Site-Specific	Effect on VECC confined to a single small area within the Local Study Area (LSA)
Local	Effect on VECC within Local Study Area (LSA)
Regional	Effect on VECC within Regional Study Area (RSA)
Duration[26]	
Short term	Effect on VECC is limited to 1 year
Medium term	Effect on VECC occurs between 1 and 4 years
Long term	Effect on VECC lasts longer than 4 years, but does not extend more than 10 years after decommissioning and final reclamation.
Far future[27]	Effect on VECC extends >10 years after decommissioning and abandonment
Frequency (Short Term duration effects that occur more than once)	
Low	Frequency within range of annual variability and does not pose a serious risk to the VECC or its economic or social/cultural values
Moderate	Frequency exceeds range of annual variability, but is unlikely to pose a serious risk to the VECC or its economic or social/cultural values
High	Frequency exceeds range of annual variability and is likely to pose a serious risk to the VECC or its economic or social/cultural values
Reversibility	
Reversible	Effects on VECC will cease during or after the project is complete
Irreversible	Effects on VECC will persist during and/or after the project is complete
Likelihood of Occurrence	
Unlikely	Effect on VECC is well understood or not well understood but, in either case, is not predicted to pose a serious risk to the VECC or its economic or social/cultural values
Unknown	Effect on VECC is not well understood and based on potential risk to the VECC or its economic or social/cultural values, effects will be monitored and adaptive management measures taken, as appropriate.
High	Effect on VECC is well understood and there is a high likelihood of effect on the VECC as predicted

7.10.3.6 Cumulative Effects Assessment

The general approach for the cumulative effects assessment for wildlife is as follows:

- determine conditions for the wildlife focal species within the RSA (i.e., conditions at baseline and into the foreseeable future[28]) in combination with the project effects

[26] Reclamation goals are a stabilized surface and a native plant community to subsequently provide adequate wildlife habitat. It is assumed that successional processes will move post-mine vegetation communities towards the original vegetation type, ideally within a 10 year period following decommissioning and final reclamation
[27] Effects to some VECCs may be permanent (see Reversibility).

- identify any further mitigation measures (in addition to those identified for project effects) for reducing or eliminating cumulative effects
- characterize and evaluate the significance of any residual cumulative effects on VECC species within the RSA
- characterize the project contribution to cumulative effects on VECC species within the RSA for the development phases under consideration

Cumulative effects were assessed within the RSA. Residual cumulative effects and the project contribution to these effects were evaluated using the same effect attributes used for the project effects (Table 7.10-18). The significance of cumulative effects was determined using the same criteria used to determine significance of projects effects (Section 7.10.3.4). Whether or not a residual cumulative effect is significant is, in theory, based on a threshold between 'acceptable' (not significant) and 'unacceptable' (significant) conditions. For wildlife such thresholds are little understood and this determination was qualitative rather than quantitative. If a residual cumulative effect with the project is significant (i.e., unacceptable) one of the following conclusions applies:

1. The project contribution to cumulative effects is responsible for causing the unacceptable (significant) shift. If this is the prediction, then the project contribution to cumulative effects is considered significant.
2. Other projects are already responsible for the unacceptable condition. In this case, the project is contributing incrementally to already significant cumulative effects. Therefore, contributions by the project may or may not be significant, depending on the degree of change predicted and the land use priorities for the region.

The results of the cumulative effects assessment are presented in Section 7.10.5.

7.10.4 Project Effects

Potential impacts on wildlife from the project may occur from changes to habitat availability, landscape disturbance creating disruptions to animal movement patterns, and population declines related to increased mortality risk (Section 7.10.1.1). These potential effects were assessed for the nine VECCs. Project effects were highlighted for species of conservation concern.

The greatest direct loss of habitat will occur during construction as a result of clearing for the mine site facilities and the 27 km access/haul road. One of the most important project effects is the potential for increased rates of wildlife mortality resulting from human access provided by the proposed road, since the project area has to date been inaccessible by vehicle. With the road comes noise and traffic flow, causing behavioral disturbance and increased mortality from collisions, as well as increased access for legal hunters and poachers. At closure, there is some concern regarding wildlife access to the tailings pond with potential for mortality (if trapped in the pond) or contaminant bioaccumulation.

In the following sections, project effects are assessed for each VECC, the three key project issues and the three assessment scenarios. Mitigation measures are identified and residual effects are characterized and significance determinations made.

[28] Although no spatial data was available for potential future developments in the RSA, the CE assessment considers these developments in a general sense with respect to this Project.

7.10.4.1 Caribou

Habitat Availability

Mine construction and road development will result in some alteration of caribou late winter and fall habitat types, key seasonal habitat requirements to sustain caribou. However, overall the project effects at full build-out only cause a 1.8% reduction in winter habitat availability within the RSA and a 0.6% reduction in fall habitat availability within the RSA (Table 7.10-19). The majority of winter habitat available to this herd is located to the east of the project outside of the RSA, and will remain unaffected by the project development. The most dramatic effect of the project is the 484.3% percent increase in fall habitat due to the zone of influence effect for anthropogenic disturbances. However, this represents an increase of only 21 ha in area of fall habitat, a minor consideration given the range of habitat area available to the Finlayson Caribou Herd. The majority of this effect is related to sensory disturbance from mine-related activities in the fall season for caribou, so there will likely be some recovery of habitat suitability in this area at closure. Given these projections on habitat availability, project effects although adverse are considered low in magnitude for availability of caribou winter and fall habitats. Effects will be local, long term and reversible in the mine site area only. The likelihood of effects as predicted are high, given habitat understandings gained on this caribou herd over the past 20 years.

Maps depicting the location of available fall and winter caribou habitat (Figures 7.10-10 and 7.10-11) are provided, with reference to the LSA, RSA, and the potential disturbance footprint.

Table 7.10-19 Caribou Habitat Availability Trends in the Local Study Area

Habitat Type	Habitat Area Available at Baseline (ha)	Habitat Area Available at Full Build Out (ha)	% Change from baseline
Suitable Winter Habitat	979.0	961.1	1.8% decrease
Suitable Winter Habitat (within ZOI*)	67.5	66.9	1.0% decrease
Total Winter Habitat	**1,046.5**	**1,028.0**	**1.8% decrease**
Confirmed Fall Habitat	1593.9	1558.2	2.2% decrease
Confirmed Fall Habitat (within ZOI)	4.8	25.8	434.3% increase
Non-Confirmed Fall Habitat	2727.1	2699.0	1.0% decrease
Non-Confirmed Fall Habitat (within ZOI)	129.4	1448.8	11.9% increase
Total Fall Habitat	**4,455.3**	**4,427.8**	**0.6% decrease**

Notes: * ZOI refers to Zone Of Influence from anthropogenic disturbances (refer to Table 7.10-17 and Appendix 7.10-1).

Figure 7.10-10 Caribou Habitat Availability in the RSA - Fall (Vol. 2)

Figure 7.10-11 Caribou Habitat Availability in the RSA – Winter (Vol. 2)

Disruption to Movement Patterns

Conservations concerns exist about potential project effects on caribou habitat fragmentation and interference with caribou moving to and from important wintering ranges and calving or post-rut habitat. This could have a serious adverse effect on caribou recruitment and over-winter adult survival.

The project is likely to have unavoidable and adverse impacts on movement patterns by caribou in the area; however, these effects are considered low in magnitude due to the following factors:

- The project footprint is located at an outer perimeter of the known range of the Finlayson Caribou Herd and will thus have extremely limited fragmentation effects on caribou movements between wintering areas and spring calving areas or post rut habitat areas for this herd.
- The following mitigation measures will be implemented, as per the project Wildlife Protection Plan (Section 9.5):
    - Access to the mine haul road will be restricted by a locked gated during the construction, operations, and decommissioning phases of the project.
    - Vehicle traffic volumes will not exceed 13 round trips per day on the proposed mine haul road.
    - Wildlife has the right-of-way on all roads, except where it is judged to be unsafe to do so.
    - Maximum speed limit on all access roads is 60 km/h.
    - Traffic signs will be posted at sensitive wildlife areas.
    - Snow clearing requirements will include wildlife escape routes as identified by the Environmental Superintendent.
    - Project-related traffic (including ATVs and snowmobiles) will be restricted to designated access roads and trails (with certain exceptions).
    - Access and use of ATVs and snowmobiles for recreational purposes on the mine haul road and the mine site will be prohibited.

Additionally, a monitoring program to specifically assess caribou movements would allow managers to monitor the effects of the project on caribou movement patterns and may also provide alternative management options. Accordingly project effects on caribou movement patterns are expected to be adverse, low magnitude, regional, and long term. The likelihood of this effect occurring as predicted is high based on knowledge of the herd's movement patterns and YZC's commitment to mitigation measures. Minesite related disturbance will cease at closure, largely reversing the low magnitude effects on caribou movement from that source.

Mortality Risk

There are conservation concerns related to project effects on regional caribou populations as a result of increased mortality risk. These include the potential for a higher and unsustainable harvest rate on the caribou population resulting from increased road access into the local area by legal and illegal hunters, and increased caribou mortality associated with caribou-vehicle collisions. Project effects on mortality risk are considered low in magnitude during the construction, operations, and decommissioning phases for the following reasons:

- Legal hunting for caribou within the RSA and surrounding area is by a permit hunt only. This requires candidate hunters to apply for a hunting permit in a lottery system that allows management of the caribou harvest in these areas by quota. It is unlawful to hunt caribou in these areas without a valid permit.
- The project haul road provides only minor access to the known range of the Finlayson caribou herd and population
- The density of existing access across the range of this caribou herd is also relatively low. This means that the cumulative access provided to across the range of the Finlayson caribou herd is relatively minimal.
- The following mitigation measures will be implemented as per the Wildlife Protection Plan (Section 9.5):
  - Access to the mine haul road will be restricted by a locked gated during the construction, operations, and decommissioning phases of the project.
  - Firearms are not permitted. This includes the carrying of firearms in private vehicles to and from the project site on workdays.
  - Hunting and fishing are prohibited at all times on or in the vicinity of the project site, including travel to and from the project site on workdays. This restriction is applicable to all mine employees, managers and contractors. It will be in effect throughout the life of the project from construction through to closure and reclamation. Infringement of this policy is to be reported.
  - Vehicle traffic volumes will not exceed 13 round trips per day on the proposed mine haul road.
  - Maximum speed limit on all access roads is set at 60 km/hr.

Accordingly project effects on caribou mortality during the life of the project are expected to be adverse, low magnitude, regional and long term. The likelihood of effects occurring as predicted is high based on knowledge of the caribou herd distribution, regulatory requirements and effectiveness of mitigation measures. Project effects influencing mortality risk are considered to increase at closure since it is possible that the mine haul road will remain open road access into the LSA may continue into the far future. However, adverse project effects are expected to remain low in magnitude for the following reasons:

- Legal hunting for caribou within the RSA and surrounding area is by a permit hunt only. This requires candidate hunters to apply for a hunting permit in a lottery system that allows management of the caribou harvest in these areas by quota. It is unlawful to hunt caribou in these areas without a valid permit.
- The project haul road provides only minor access to the known range of the Finlayson caribou herd and population
- The density of access available across the range of this caribou herd is also relatively low. This means that the cumulative access provided to across the range of the Finlayson caribou herd is relatively minimal.

Ongoing territorial monitoring programs to specifically assess trends in the Finlayson caribou herd population and movement patterns will allow managers to monitor the effects of the project on the caribou population. A cooperative program to systematically record caribou movements in the project area may support YTG studies and provide alternative management options.

Accordingly there are no changes to the effects attributes at closure. The likelihood of effects as predicted is high based on knowledge of the caribou herd distribution and regulatory requirements.

Residual Project Effects and Significance

Residual project effects on caribou habitat availability during operations, for the most part result from sensory disturbances related to mine-related activities in the fall season, so there will likely be some recovery of habitat suitability at closure. Mine related disturbance causing disruptions of caribou movement patterns will be greatly reduced at closure corresponding with a dramatic decrease in traffic volumes and human presence in the area. Risks of increased caribou mortality due to increased access during operations and closure will be low due to hunting restrictions and location of the project at the perimeter of the known range of the Finlayson herd. In summary, all residual project effects on caribou are all expected to be low in magnitude and therefore, are determined to be not significant using the criteria in Section 7.10.3.5. Mitigation measures are summarized in Table 7.10-28. Effects are summarized on Table 7.10-30.

7.10.4.2 Moose

Habitat Availability

The majority of the effects on moose late-winter habitat availability are related to habitat loss and alteration rather than sensory disturbance during the construction, operations, and decommissioning phases of the project. The estimated loss of winter moose habitat in the LSA from project development results in a 19.4% decrease in total habitat area. Within this 19.4% reduction, a 42.4% reduction of high quality winter moose habitat is indicated (Table 7.10-20). However, even though these numbers appear large, the project effect is considered low in magnitude for the following reasons:

- The assessment of habitat loss is a conservative overestimate, by assuming all claim areas are to be fully developed as a component of the mine and haul road footprint while in reality the actual footprint will be significantly smaller in area.
- The LSA provides a relatively small amount of high quality late-winter moose habitat compared to other localized areas on a regional scale. In fact, the area of high quality moose habitat at baseline was conservatively overestimated at only 17.6% of the LSA. At full build out, project effects would result in 10.1% of the LSA being high quality late-winter moose habitat, only a 7.6% reduction in the area available within the LSA.
- Within the project area, the density of disturbance is also low because there is only one main haul road proposed and the regional area is relatively void of other resource development. This means that cumulative development impacts resulting in habitat fragmentation, loss, and isolation are unlikely.

Maps depicting the location of available moose habitat at baseline (Figure 7.10-12) and at full build out (Figure 7.10-13) are provided, with reference to the Project LSA and the predicted disturbance footprint.

Accordingly project effects on moose habitat availability are expected to be adverse, low magnitude, local, and long term. At closure effects will be largely reversible in the mine site area but will persist at a lower levels along the access road. The likelihood of this effect occurring as predicted is high based on knowledge of the moose habitat availability and use in the vicinity of the project.

Table 7.10-20 Moose Habitat Availability Trends in the Local Study Area

Habitat Type	Habitat Area available at Baseline (ha)	Habitat Area available at Full Build Out (ha)	% Change from baseline
Nil / unusable	1,528.0	3,372.2	120.7% increase
Low	2,957.3	3,659.4	23.7% increase
Moderate	4,590.7	2,867.9	37.5% decrease
High	1,940.6	1,117.0	42.4% decrease
Total	**9,488.6**	**7,644.3**	19.4% decrease

Figure 7.10-12 Moose Habitat Available in the LSA at Baseline (Vol. 2)

Figure 7.10-13 Moose Habitat Available in the LSA at Full Build-out (Vol. 2)

Disruption to Movement Patterns

Environment Yukon has identified several issues of conservation concern related to potential fragmentation effects on moose habitat in the LSA. Anecdotal observations suggest that the proposed mine site and road route may interfere with an important seasonal travel corridor for moose between their winter habitats in lowland areas along the Robert Campbell Highway and upper elevation habitats occurring in spruce, willow, and birch vegetation communities during the spring summer and rutting periods (Ward 2005, pers. comm.). If mine activity interferes with moose moving to and from important rutting and calving areas, or displaces them into wintering areas of lower quality habitat, Environment Yukon suggests this could have significant impacts on moose recruitment and over-winter adult survival (Ward, 2005 pers. com.).

The project will have unavoidable and adverse effects on movement patterns by moose in the area. However, these project effects are considered low in magnitude given several mitigation measures that should be implemented during construction, operations and decommissioning phases, including the following:

- Access to the mine haul road will be restricted by a locked gated during the construction, operations, and decommissioning phases of the project.
- Vehicle traffic volumes will not exceed 13 round trips per day on the proposed mine haul road.

- Wildlife has the right-of-way on all roads, except where it is judged to be unsafe to do so.
- Maximum speed limit on all access roads is 60 km/h.
- Incorporate traffic signs for sensitive wildlife areas.
- Conform to road snow clearing requirements at the discretion of the Environmental Superintendent.
- Project-related traffic (including ATVs and snowmobiles) is restricted to designated access roads and trails (with certain exceptions).
- A policy prohibiting recreational use by employees and contractors of all-terrain vehicles and snowmobiles. Access and use of ATVs and snowmobiles for recreational purposes on the mine haul road and the mine site will be prohibited. All traffic will be restricted to designated access roads and trails.

Accordingly project effects on moose movement patterns are expected to be adverse, low magnitude, local, and long term. The likelihood of this effect occurring as predicted is high based on YZC's commitment to mitigation measures. Minesite related disturbance and traffic will cease at closure, largely reversing the low magnitude effects on moose movement from that source.

Mortality Risk

Potential increases in mortality risk to local moose populations are a concern to local wildlife managers (Ward 2005 pers. com.). The primary concerns are the potential for a higher and unsustainable harvest rate on the moose population resulting from increased road access into the local area for legal and illegal hunting and increased moose mortality associated with moose-vehicle collisions. The five-year (1999-2003) average harvest rate (as reported to Environment Yukon) ranges from 0.2 to 2.1 percent of the estimated regional Wolverine-Fire Lake moose population; well within the 3-4 percent annual allowable harvest limits identified for stable to increasing moose populations (Ward, 2005 pers. com.). The Wolverine-Fire Lake moose population is based on a regional estimate that includes portions of six game management subzones. Localized effects of the project access road are not expected to increase the average harvest rate for this regional moose population in excess of 2 to 3 percent (the allowable harvest rates) during construction, operations, and decommissioning phases assuming implementation of the following mitigation measures:

- Access to the mine haul road will be restricted by a locked gated during the construction, operations, and decommissioning phases of the project.
- Firearms are not permitted. This includes the carrying of firearms in private vehicles to and from the project site on workdays.
- Hunting and fishing is prohibited at all times on or in the vicinity of the Project site, including during travel to and from the Project site. This restriction is applicable to all mine employees, managers and contractors. It will be in effect throughout the life of the project from construction through to closure and reclamation. Infringement of this policy is to be reported.
- Vehicle traffic volumes will not exceed 13 round trips per day on the proposed mine haul road.

- Maximum speed limit on all access roads is set at 60 km/hr.

Project effects on moose mortality risk are therefore considered to be adverse, low magnitude, local, and long term during the construction, operations, and decommissioning phases of the project. The likelihood of effects as predicted is high, assuming implementation of identified mitigation measures.

At closure, the mine access road and airstrip will remain in place. YZC will not be responsible for road management at that time. If public use of the mine access road is allowed during and after closure there is a risk of increased mortality from legal and illegal hunting that could increase mortality rates in Wolverine-Fire Lake moose population in excess of the 2 to 3 percent (the allowable rate for sustainability of the population). This would constitute a significant adverse effect on the moose population. There are various mitigation options that could be employed at closure to mitigate this effect. These include:

- Continue to implement mitigation measures identified for the project, by the responsible agency at closure
- Close and decommission the haul road following mine closure;
- Restrict road access onto the haul road following mine closure;
- Limit hunter harvest for moose in the localized area surrounding the mine haul road;
- Establish no hunting zones for moose in the localized are surrounding the mine road; and or
- Conduct regular enforcement monitoring in the local area, including on and surrounding the mine road.

If adequate mitigation measures to decrease mortality risk to moose were established at closure this residual project effect would likely remain not significant.

Accordingly project effects on moose mortality at closure are expected to be adverse, moderate magnitude, regional, and far future in duration. The likelihood of this effect occurring as predicted is unknown due to the current uncertainty about implementation of mitigation measures at closure.

Residual Project Effects and Significance

Residual project effects on moose winter habitat availability and on disruption to moose movement patterns at closure are considered to be low magnitude since: (1) the mine area will be reclaimed and re-vegetated following the closure phase and (2) the volume of mine traffic on the haul road will decrease following mine the closure phase. Accordingly project effects at closure are expected to be not significant.

The likelihood that effects on habitat availability will occur as predicted is high, based on conservative assumptions regarding the actual project disturbance footprint, the abundance of available habitat in the area, and the proposed mitigation measures.

Residual effects on moose mortality during the life of the project are expected to be not significant given the proposed mitigation measures. However, residual project effects on moose mortality risk at closure and following closure are considered to be moderate to high magnitude at this time for the following reasons:

- It is possible that the mine haul road will remain open into the far future duration at project closure.
- Harvest rates of the regional moose population may increase to an unsustainable level should road access be unrestricted to legal and illegal hunting following closure. This would result in a moderate to high magnitude residual project effect.

Accordingly project effects at closure are expected to be adverse, moderate magnitude, regional, and potentially far future. Based on criteria 7.10.3.5, this would constitute a significant effect.

The likelihood that effects on mortality rates will occur as predicted during the life of the project is high, based on the proposed mitigation measures. The likelihood that effects on mortality rates will occur at predicted at closure is unknown, as the management regime and implementation of mitigation options cannot be confirmed at this time. Potential effects at closure are mitigable. Agreements and mechanisms for management of the road at closure will be determined by the YTG in consultation with the Kaska Dena and other interested parties. Until these measures are confirmed the significance of this effect has been determined as "unknown".

7.10.4.3 Thinhorn Sheep

Project effects on thinhorn sheep are assessed to not be significant during full build-out and at closure. No suitable thinhorn sheep habitat and no sign of thinhorn sheep presence were observed within the LSA. Direct effects of project development on habitat availability are therefore not expected to impact this species, and are therefore not discussed further.

However, some suitable thinhorn sheep habitat was modeled in the RSA, primarily to the south of the project footprint near North Lakes (see green shading on Figure 7.10-14). Indirect project effects related to aerial and ground disturbances particularly during the winter (January to April) and lambing (May to mid-June) seasons can affect sheep by disrupting to movement patterns and or causing mortality risk. This effect is however, assumed to be low in magnitude and neutral in direction given the following mitigation measures:

- Adopt and follow the Yukon guidelines for helicopters and fixed-wing flight paths and altitudes in the vicinity of sheep and other wildlife species.
- Provide orientation and training to all staff, pilots, guests and contractors with respect to wildlife harassment policies.

Figure 7.10-14 Thinhorn Sheep Habitat Availability in the RSA (Vol. 2)

7.10.4.4 Grizzly Bear

Habitat Availability

Maps depicting the location of available grizzly bear habitat at baseline (Figures 7.10-15 and 7.10-17) and at full build out (Figures 7.10-16 and 7.10-18) are provided with reference to the LSA and the potential disturbance footprint. Moderate or better suitability grizzly bear habitat within the LSA represents a large proportion of the habitat available at baseline, 52.6% in the summer/fall and 45.3% in the spring. (Tables 7.10-21 and 7.10-22).

Based on the conservative disturbance footprint, the absolute decrease in the availability of all suitable summer/fall habitat during full build-out is estimated at 2114 ha, a decrease of 19.2%. This involves a 59.9% and 33.3% decline in high and moderate quality summer/fall grizzly bear habitat, and leaves 32.7% moderate or better suitability grizzly bear habitat within the LSA, a net loss of 37.7% of the best quality habitat. The conversion of moderate and high suitability habitat is of concern, as the relative magnitude of the loss of 'good' habitat is comparatively large and it is replaced by an increase in the area of low and very low suitability habitat by 3.4%, and a projected 606% increase in the unusable habitat within the LSA (Table 7.10-21).

Based on the conservative disturbance footprint, the absolute decrease in the availability of all suitable summer/fall habitat during full build-out is estimated at 2115 ha, a decrease of 19.2%. This involves a 42.6% and 21.2% decline in very high and high quality spring grizzly bear habitat, and a 43.8% increase in moderate grizzly bear habitat. These changes leave 36.6% moderate or better suitability grizzly bear habitat within the LSA, a loss of 30.9% of this best quality habitat. The conversion of very high and high suitability habitat is of some concern, as the relative magnitude of the loss of 'good' habitat is comparatively large. This is moderated however, by a 43.8% increase in moderate suitability habitat and a decrease in the area of low and very low suitability habitat by 58.1% and 11.3% respectively. Of most concern is a projected large 606% increase in the unusable habitat (Table 7.10-22).

The large decrease in very high and high quality grizzly bear habitat availability in the LSA at full build-out is considered to be a moderate magnitude effect because:

- relatively large amounts of very high and high quality habitat remain abundant outside the zone of project influence after development
- on a regional scale these losses are not expected to be substantial
- very little bear sign was noted in the area during the 2005 field survey
- an increase in moderate quality habitat moderates the losses to high quality sites to some degree
- the assessment of habitat loss is based on a conservative overestimate, by assuming all affected claim areas will become low quality or unusable habitat. The actual footprint will be considerably smaller, but use of this conservative method ensures that project related sensory effects for this disturbance-sensitive species are fully accounted for

The food habits of grizzly bears living in the northern boreal forest are understood only in general terms, especially in and surrounding the project area where grizzly bears are not well studied. The omnivorous and opportunistic feeding behaviour of grizzlies means that they will use a variety of foods according to availability within their ranges. Generally, grizzly bears in more southerly regions prefer to feed on vegetation (*Hedysarum* spp), and favourite foods are usually found in open forest (McLellan and Hovey, 1995). More northerly ecotypes often feed on proportionally more animals, such as caribou, though they continue to rely heavily on vegetable foods (McLoughlin et al, 1997). Due to the habitat requirements of grizzly bears for specific vegetative units and soil types, project effects on habitat loss are deemed likely to have a long term impact on a local scale because of the long time period required for the vegetation to regrow to a state preferred by the bears along disturbed and reclaimed areas of the haul road, mine site and tailings dumps.

Accordingly project effects on grizzly bear habitat availability at full build-out are expected to be adverse, low magnitude, local, and long term. The likelihood of this effect occurring as predicted is high based on YZC's commitment to mitigation measures. Minesite related disturbance and traffic will cease at closure, reversing the effects on habitat availability in much of the LSA. Traffic on the access road at closure is expected to be greatly reduced at closure. Therefore effects at closure are reduced to low magnitude but will be far future in duration. The likelihood of effects as predicted is high based on the conservative approach used in the assessment. Any changes from predicted effects would be expected to be towards a lower level of impact.

Figure 7.10-15 Grizzly Bear Spring Habitat Available in the LSA at Baseline (Vol. 2)

Figure 7.10-16 Grizzly Bear Spring Habitat in the LSA at Full Build-out (Vol. 2)

Figure 7.10-17 Grizzly Bear Summer/Fall Habitat Available in the LSA at Baseline (Vol. 2)

Figure 7.10-18 Grizzly Bear Summer/Fall Habitat Available in the LSA at Full Build-out (Vol. 2)

Table 7.10-21 Actual and Projected Summer/Fall Grizzly Bear Habitat Availability Trends in the LSA

Habitat Type	Habitat Area available at Baseline (ha)	Habitat Area available at Full Build-out (ha)	% Change from baseline
1 - Very High	7.2	7.2	0.0%
2 - High	1,376.2	661.6	51.9% decline
3 - Moderate	4,410.6	2,943.6	33.3% decline
4 - Low	3,143.8	3,164.6	0.7% increase
5 - Very Low	1,729.8	1,776.1	2.7% increase
6 - Nil	348.9	2,463.4	605.9% increase
Total	**11,016.5**	**11,016.5**	

Table 7.10-22 Actual and Projected Spring Grizzly Bear Habitat Availability Trends in the LSA

Habitat Type	Habitat Area available at Baseline (ha)	Habitat Area available at Full Build-out (ha)	% Change from baseline
1 - Very High	1,895.2	1,087.8	42.6% decline
2 - High	2,313.4	1,822.2	21.2% decline
3 - Moderate	782.7	1,125.3	43.8% increase
4 - Low	1,104.2	462.2	58.1% decline
5 - Very Low	4,568.6	4,052.3	11.3% decline
6 - Nil	352.4	2,466.7	600.0% increase
Total	**11,016.5**	**11,016.5**	

Disruption to Movement Patterns

Overall, most carnivores are intimidated by highways and tend to avoid them when possible (Jalkotzy et al 1997). Grizzly bears use areas near low use roads, but tend to avoid high use roads. (Chruszcz et al 2003). Bears tend to cross near areas of high quality habitat, or when traveling from low to high quality sites, such as where the haul road crosses high quality spring grizzly bear habitat to the southeast of the mine site and where the haul road bisects high quality summer grizzly habitat in the northeast of the LSA. As well, they are at extra risk of mortality, when crossing roads to reach required high quality habitats at different seasons or due to temporal foraging requirements (Chruszcz et al 2003). Detailed models that predict where collisions likely may be used to lower the risk of wildlife mortalities, but require highly detailed site-specific habitat data collection (Malo et al 2003).

Copeland (Western Forest Carnivore Committee, 1994) and others (Gibeau & Heuer 1996) have noticed that carnivore home ranges tend to be along highways, rather than crossing them, implying that movement behaviour is being disrupted, with the road forming an artificial boundary of an individual animal’s home range. In addition to traffic volumes and vehicle types, road design itself can become part of the reason carnivores fail to cross. Fences, right-of-way clearance widths, cut slope grade and line of sight are design elements that can affect the ability of wildlife to attempt to cross and to cross safely (Ruedinger 1996). As traffic volume increases on roadways, the impacts of habitat fragmentation, mortality and displacement increase. However, there is a growing body of knowledge that two lane highways with low or moderate traffic volume can be negotiated by many wildlife species, particularly when long traffic pauses occur.

Based on these findings, grizzly bears are expected to avoid areas around the haul road and mine site during full build-out. Projected traffic volumes on the haul road are relatively low (13 vehicles per day), and grizzly bears are expected to avoid the road but remain able to cross in periods between vehicles. In summary, the project will result in avoidance around the mine site and some movement disruptions due to the haul road, resulting in an adverse, low magnitude, local, and long term effect. Mortality on the access road will be monitored during operations to check this prediction and implement adaptive management measures if required (see below). Project disturbance will cease at closure, reversing much of this effect. Effects at closure will persist into the far future.

Mortality Risk

Carnivores are particularly susceptible to mortality because of their large home ranges, low biological productivity, and the extensive areas required for sustaining stable populations and individuals. Due to the long life span of grizzly bear (over 30 years), they can persist as individuals, without persisting as populations. In this context, human-caused mortalities can be important.

Grizzly bear are rarely killed on highways. However, documented fatal collisions have occurred on Highways 93 and 2 in Montana, and the Trans-Canada Highway near Banff before fencing was employed (Clevenger pers. comm.). The rare occurrences of grizzly mortality are likely due to their general avoidance of highways and their low population numbers and densities. However, to a species with such a low reproductive rate as grizzly, even a small number of deaths can be of great importance to the population (Gibeau & Heuer 1996). At some combination of traffic volume and road design, roads become barriers or mortality sinks for carnivores, even when adjacent land uses and habitat availability are compatible with their existence there. Increasing evidence shows that this occurs when highways are 4-laned or twinned, which is usually correlated with increased traffic volumes. At some point, large and mid-sized carnivores cannot compensate for the increased mortality, or they stop trying to cross busy highways. There is also a growing body of knowledge indicating that two lane highways with low or moderate traffic volume can be negotiated by many wildlife species, particularly when long traffic pauses occur.

Because of the low traffic volumes anticipated on the haul road, grizzly avoidance of human use areas, and the related low probability of grizzly mortality observed on other roads of this type, project effects on grizzly bear mortalities from collisions during full build-out are expected to be adverse, low magnitude, local and long term. Wildlife mortalities along the access road will be monitored during operations. If bears are struck on the road, adaptive management measures, such as institution of traffic pauses to allow wildlife to cross, will be considered. At closure, project related traffic will cease, with a corresponding reduction in the risk of wildlife collisions. Effects at closure are predicted to be low magnitude and far future. The likelihood of effects as predicted are high based on observations of road-related mortality elsewhere and mitigation measures for other wildlife such as speed limits, and environmental orientation for project personnel and contractors.

Human conflicts can also result in grizzly bear mortality. Neilsen et al (2004) found that the highest risk of mortalities for grizzly bears in the Central Rockies Ecosystem was related to proximity to human disturbances. Area nearer than 500 meters from human habitation or roads and closer than 200 meters from human use trails were where grizzly bears were at greatest risk of mortality. This was due to increased problem human-bear interactions revolving around food and increased hunter and poacher access.

The project mine will bring an increase in human activity to the area and increase the risk of human-bear conflicts due to food waste attractants and increased access for hunters and poachers. Proper management of food waste attractants (Section 9: Environmental Management Plan) will minimize risks of mortality to problem wildlife. As noted earlier controlled access and prohibition of firearms or hunting by project personnel along the access road will prevent wildlife mortality from this source during operations. The risk of mortality from hunting may increase at closure, if access is not controlled. While various measures are feasible to reduce this risk, management of the road at closure is currently unknown. Project effects on grizzly bear mortality at full build-out and closure are expected to be adverse, low magnitude, local and long term to far future in duration. The likelihood of effects as predicted is high during operations based on the effectiveness of mitigation measures. The likelihood of effects at closure is unknown as access management measures are uncertain.

At closure there is potential for wildlife, including grizzly bear, to be exposed to contaminants accumulated in vegetation affected by contaminated discharges or drainage. Collection and treatment of site drainage and process waters to achieve high quality effluent during operations, and measures to prevent mobilization of contaminants in the backfilled mine (Sections 2.4 and 7.6 and 7.5) or tailings pond (Section 2.8), will minimize the risk of bioaccumulation in vegetation on site. No effect on wildlife is anticipated.

Residual Project Effects and Significance

All residual project effects on grizzly bear are expected to be low magnitude and local in extent. Based on criteria in Section 7.10.3 these effects are determined to be not significant (Table 7.10-30).

Potential adverse effects on habitat availability, while moderate in the context of the LSA, are low in a regional context and largely reversible at closure. Disturbance to movement patterns is unlikely, due to the low level of bear activity in the area and observations that indicate bears will cross two-way roads with low traffic volumes. Grizzly bear mortality from road collisions and hunting can be effectively mitigated during operations and at closure. The likelihood for effects occurring as predicted at full build-out is high, based on conservative assumptions for disturbance footprint, the effectiveness of mitigation measures and observations of grizzly behaviour in comparable circumstances. As access management measures at closure have not been confirmed, the likelihood of mortality effects occurring as predicted is unknown. Appropriate management measures will be developed by the YTG in consultation with the Kaska Dena and other interest holders. Observations of bear activity in the vicinity of the project during operations and reporting of mortalities, should they occur, will provide information for adaptive management measures, if necessary.

7.10.4.5 Beaver

Habitat Availability

Conservation concerns for this species are relatively few due to the beaver's adaptability to human disturbance (Foote, 2005). Beavers, in fact, find road beds and culverts attractive due to the reduced effort it takes to dam a culvert instead of a whole waterway in order to flood land (Martell, 2004).

Project disturbances within 50 m of beaver habitat were considered as impacts (as detailed in Appendix 7.10-1) and are assessed in terms of effects on habitat area in Table 7.10-23 below. A map depicting the location of available beaver habitat in the LSA at baseline is provided in Figure 7.10-19. The overall decrease in the available beaver habitat (confirmed used and potential wetlands) in the LSA during full build-out is a 19.7 percent. However the reduction in confirmed past or present habitat is only 7.8 percent. Effects therefore are characterized as adverse, low magnitude, local and long term. The small habitat reductions due to disturbance effects at full build-out are expected to be largely reversible at closure. The likelihood of this effect occurring as predicted is high based on knowledge of beaver activity in relation to human disturbance.

Table 7.10-23 Beaver Habitat Availability Trends in the Local Study Area

Habitat Type	Habitat Area Available at Baseline (ha)	Habitat Area Available at Full Build Out (ha)	Percent Change from Baseline
Confirmed Habitat	527.8	486.3	7.8% decline
Potential Habitat	1186.1	890.4	24.9% decline
Total	1713.8	1376.6	19.7% decline

Figure 7.10-19 Beaver Habitat Available in the LSA at Baseline (Vol. 2)

Disruption to Movement Patterns

Disruption to movement patterns is a concern for beavers in areas where project roads and mine development cross streams, fragmenting suitable habitats for beavers. This effects is expected to be low in magnitude given:

- Facility siting and road routing attempts to avoid wetland habitats as much as possible due to engineering design and cost considerations.
- Road widths and adjacent land clearing are not likely to exceed widths of 20m in proximity to wetland areas.
- Beaver’s adapt well to disturbances including roads and project developments.
- Vehicle traffic volumes will not exceed 13 round trips per day on the proposed mine haul road.

Mitigation measures to reduce potential effects on beaver movement patterns include:

- Restricting use of machinery and vehicles in beaver wetlands and surrounding riparian areas.
- Access to the mine haul road will be restricted by a locked gate during the construction, operations and decommissioning phases of the project.

Project effects on beaver movement patterns are expected to be adverse, low magnitude, local and long term to far future. Effects of disturbance on beaver movements will be largely reversed at closure. The likelihood of this effect occurring as predicted is high based on knowledge of beaver activity in relation to human disturbance.

Mortality Risk

Mortality risk to beaver may result from vehicle collisions and or from direct removal of beavers from the project area by mine staff and associated personnel. However, conservation concerns for this species are relatively few due to the beaver’s adaptability (Foote, 2005). Beavers are known to have a fast rate of population recruitment and may rapidly colonize areas. Furthermore, the areas within the local and regional study areas support relatively healthy beaver populations. Project effects on beaver mortality are expected to be low in magnitude based on the following mitigation measures:

- Access to the mine haul road will be restricted by a locked gated during the construction, operations, and decommissioning phases of the project.

- Firearms are not permitted on site. This includes the carrying of firearms in private vehicles to and from the project site on workdays.
- Hunting and fishing is prohibited at all times on or in the vicinity of the project site, including during travel to and from the site on workdays. This restriction is applicable to all mine employees, managers and contractors. It will be in effect throughout the life of the project. Infringement of this policy is to be reported.
- Vehicle traffic volumes will not exceed 13 round trips per day on the proposed mine haul road.
- Maximum speed limit on all access roads is set at 60 km/hr.

Project effects on beaver mortality, while potentially adverse, are expected to be low in magnitude, local, long term and largely reversible at closure. The likelihood of effects occurring as predicted is high, based on the effectiveness of mitigation measures.

Residual Project Effects and Significance

All project effects on beaver are expected to be of low magnitude, local extent and long term in duration. Based on criteria defined in Section 7.10.3, these effects are determined to be not significant. The likelihood of effects occurring as predicted is high, based on the knowledge of beaver response to human behaviour and the effectiveness of identified mitigation measures.

7.10.4.6 Lynx and Snowshoe Hare

Habitat Availability

Moderate, or better, suitability lynx/snowshoe hare habitat represents the largest proportion of habitat available (93%) within the LSA (Table 7.10-24) (Figure 7.10-20). Based on the conservative disturbance footprint at full build-out, the overall decrease in availability of all suitable habitats is estimated to be 2125 ha, a decrease of 19.3%. This includes a 32.3% decline in high quality lynx/hare habitat, and a 11.6 % reduction in moderate suitability habitat.. The loss of 'good' habitat is relatively large and it is replaced by a 10.2% increase in the area of low suitability habitat and a projected 800% increase in the unusable habitat (Table 7.10-24; Figure 7.10-21).

Although there is a large decrease in high and moderate quality lynx/hare habitat availability in the LSA at full build-out, this is considered to be a low magnitude effect because:

- high quality habitat remains abundant within the LSA
- on a regional scale these losses are not expected to be substantial
- the assessment of habitat loss is based on a conservative overestimate, by assuming the total area of all affected claim areas will become low quality or unusable habitat. The actual footprint will be smaller, but use of this conservative method ensures that project related sensory effects for this disturbance-sensitive species are fully accounted for.

Lynx depend on more structurally complex forests (Mowat et al 2000), though they may use young forests with sufficient structural complexity to provide hunting cover. Based on this requirement for older and more structurally diverse forests, project effects of site and access road clearing are deemed to be far future in duration, because of the long time period required to regenerate mature forest.

Accordingly, project effects on lynx/hare habitat suitability are expected to be adverse, low magnitude, local and far future. Reductions in habitat availability due to disturbance will be reversible at closure, but loss of habitat on the road corridor will persist. The likelihood of effects occurring as predicted is high based on the conservative disturbance footprint and abundance of available high quality habitat.

Figure 7.10-20 Lynx/Snowshoe Hare Habitat Available in the LSA at Baseline (Vol. 2)

Figure 7.10-21 Lynx/Snowshoe Hare Habitat Available in the LSA at Full Build-Out (Vol.2)

Table 7.10-24 Actual and Projected Lynx Habitat Availability Trends in the Local Study Area

Habitat Type	Habitat Area Available at Baseline (ha)	Habitat Area Available at Full Build-Out (ha)	% Change from Baseline
Nil / unusable	258.2	2,382.6	822.8% increase
Low	463.7	511.1	10.2% increase
Moderate	5,571.8	4927.2	11.6% decline
High	4,722.7	3,195.5	32.3% decline
Total	**11,016.5**	**11,016.5**	

Disruption to Movement Patterns

Lynx, because of their requirements as a large predatory animal, require relatively large areas of land in which to hunt and live. This means that individuals need to move large distances on the landscape in order to fulfill their minimum requirements for survival. Lynx are a shy ‘stalk-and-pounce’ predator that prefers to avoid human contact, and they have been observed to avoid large openings during daily movements within their home ranges (Koehler1990; Staples 1995). This is partially due to a lack of hiding cover for hunting and avoiding possible exposure to larger predators. A study of lynx behaviour in relation to intensity of traffic on roads and highways found that this species is reluctant to cross high-use roads, but will more readily cross those with lower traffic volumes, and with no centerline barrier (Alexander, pers. comm. 1999; Hallstrom, pers. obs.).

The haul road be unpaved and will have less traffic volume than the roads in the studies cited above; lynx are thus expected to cross any forest gap caused by the haul road without great difficulty. The width of the haul road is expected to be relatively narrow as well (less than 35m cleared right-of-way), which will facilitate movements. Any avoidance of the haul road traffic or reluctance to cross by lynx should be reversible at closure.

Changes in the landscape from project development will break formerly contiguous blocks of suitable lynx habitat into smaller patches, and will create some impediment to movement of lynx across the haul road and in the vicinity of the mine site and tailings dump site(s). As described in Section 7.10.2, baseline lynx winter habitat availability is best where large contiguous blocks of high value habitat exist near Go Creek and near the Robert Campbell Highway. Lower quality sites exist to the northeast of the proposed mine site. Potential habitat fragmentation caused by the location of the mine site will occur in generally low suitability habitat; therefore, effects to movement are considered to be low magnitude, and ultimately reversible.

In summary, project effects on lynx movements are expected to be adverse, low magnitude, local and far future. Disturbance barriers to movement will be reversible at closure while any physical barrier caused by the road corridor will persist. The likelihood of effects occurring as predicted is high, based on knowledge of lynx behaviour related to crossing roads like the mine access/haul road.

Mortality Risk

Due to the relatively long life spans of lynx (over 12 years), they can continue existing as individuals without persisting as populations, making assessments of population effects difficult without long term assessment or resorting to population modeling.

Despite behavioural avoidance of the road, lynx are occasionally killed on the Trans-Canada Highway in Banff National Park (Gibeau and Heuer 1996; Clevenger, pers. comm.; Alexander, pers. comm.; Hallstrom, pers. obs.). In the north, occurrences of lynx highway mortalities have been documented in Alaska (Staples 1995). Given the reported occurrence of lynx mortality on roads, it is possible that haul road traffic could result in lynx mortality.

The risk and magnitude of mortality at full build-out is expected to be low given the speed restrictions (60 km/hr) and low volume of vehicles (13 return trips/day) on the haul road, in comparison to situations in other studies where road related mortalities were observed (Gibeau and Heuer 1996; Theil 1987; Staples 1995). In addition lynx are expected to change their behaviour to avoid the cleared and high human-use mine site area.

At closure there is a risk that the presence of the access road will increase trapping success. Effects on the local and regional lynx population could increase to moderate magnitude in years when the lynx population cycle is low. The road may give access to habitat that was once a refuge, and depress the population when it is in a vulnerable recovery phase. Depressing population growth at such a site may reduce overall lynx population recovery by removing individuals that could spread to re-establish populations at other sites (Ruediger, 1996). It is unlikely that this effects will occur as there are numerous areas of refuge habitat in the vicinity of LSA to support the regional lynx population.

Accordingly, project effects on lynx mortality are expected to be adverse, low magnitude, local and far future. Effects will be partially reversed at closure. The likelihood of effects occurring as predicted is high, based on knowledge of lynx behaviour related to crossing roads like the mine access/haul road and the abundance of refuge habitat in the project area.

Residual Project Effects and Significance

All adverse residual project effects on the lynx and snowshoe hare VECC are expected to low magnitude and local (Table 7.10-30). Effects in the LSA are largely offset by the abundance of lynx/snowshoe hare habitat in the area. Effects of clearing on habitat availability are expected to be far future in duration, based on the time required for recovery of more mature forest stands that are the preferred habitat of lynx. Using the criteria in Section 7.10.3, project effects on lynx/snowshoe have are determined to be not significant. The likelihood of these effects occurring as predicted is high, based,on available information concerning lynx response to human disturbances and the abundance of high quality habitat in the project area.

7.10.4.7 American Marten

Habitat Availability

The majority of the effects on marten habitat availability are related to habitat loss and alteration rather than sensory disturbance during full build-out. Moderate winter habitat for marten within the LSA represents a relatively small proportion of habitat available within the RSA (10.8%) (Figure 7.10-12). There is no high quality winter habitat rated in the LSA relative to a broader boreal forest scale benchmark for marten (Table 7.10-25). While this region contains no areas of high suitability habitat, under full build-out the area of moderate and low suitability habitat decreases by 23.9%. However, since the projected footprint of the mine road is overestimated and as there are no high quality habitats for marten in the LSA, the project effects, although adverse, are judged to be low in magnitude. Since marten depend on older and more structurally complex forests (Poole et al, 2004), this effect is deemed likely to have a far future duration due to the long time period required for the re-growth to a mature forested state.

In general, habitat availability is expected to decrease at full build-out (Table 7.10-25) (Figure 7.10-13) and return to slightly lower than baseline values at closure. This change is expected because construction and operations activities will remove some available habitat (through direct habitat loss and sensory disturbance), which will then be reversed by lower activity and mitigation measures such as re-vegetation at closure. During operations, the effects of cleared land on marten habitat may be mitigated for to some degree by leaving slash piles for cover enhancement. Marten are known to use slash piles as a preferred part of their habitat (Slough 1989; Buskirk and Powell 1994; Poole et al, 2004), and leaving the brush and woody debris from the road clearings may add some habitat quality for marten following post closure.

Project effects on habitat availability for marten are expected to be adverse, low magnitude, local and far future. Effects will be partially reversible at closure, but those associated with the road corridor will persist. The likelihood of effects occurring as predicted is high given the lack of good habitat in the LSA, the conservative size of the disturbance footprint and the opportunity for some mitigation of habitat loss.

Table 7.10-25 Marten Winter Habitat Availability Trends in the Local Study Area

Habitat Type	Habitat Area available at Baseline (ha)	Habitat Area Available at Full Build Out (ha)	% Change from Baseline
Nil / unusable	5,143.3	6,548.2	27.3% ↑ increase
Low	4,681.0	3,558.8	24.0% ↓ decline
Moderate	1,192.1	909.4	23.7% ↓ decline
High	0.0	0.0	0.0
Total	**5873.1**	**4468.2**	

Figure 7.10-22 American Marten Habitat in the LSA at Baseline (Vol. 2)

Figure 7.10-23 American Marten Habitat at in the LSA at Full Build-Out (Vol. 2)

Disruption to Movement Patterns

Some behavioural effects causing disruption to the movement patterns of marten may result from vegetation clearing and vehicle traffic associated with the haul road and minesite. Project effects associated with habitat loss and alteration will fragment moderate habitat patches into several disjunct smaller blocks, and potentially cause disruptions to marten movements between these patches. Marten have been observed to cross high-use roads less frequently than low use roads (Alexander and Waters 2000; Clevenger et al 2001), implying that movement disruptions may occur for marten due to the haul road. However, because the haul road will have less traffic volume than did the roads in that study, marten are expected to cross the forest gap caused by the haul road without great difficulty. Similarly, the width of the haul road and adjacent clearings is expected to be relatively narrow (less than 35m), which is likely to facilitate marten movements. It has been shown that small territorial animals such as marten will avoid project footprints during actual construction, but will not significantly shift their territorial distributions in response to rights-of-way activities (Eccles and Duncan 1987; Morgantini 1994). As the density of disturbance is low in the project areas (only one road), impacts resulting in habitat fragmentation and isolation are unlikely.

Project effects on disruption to marten movement patterns are expected to be adverse, low magnitude, local and long term. Effects will be partially reversible at closure. The road will remain, but traffic will be substantially reduced. The likelihood of effects occurring as predicted is high based on observations of marten movements related to similar sized roads and the fact that the disturbance footprint will be compact, with not other habitat fragmentation in the project area.

Mortality Risk

Mortality risk to marten from the project development is expected to arise from three separate sources: collisions with project vehicles or machinery, direct mortality from road collisions or machinery, and potential toxic effects from contaminated project wastes and tailings.

Although expected to some degree, mortalities collisions and machinery are expected to be minimal because the traffic volume on the haul road is expected to be low enough to allow marten to cross during longer gaps between vehicles. Other traffic control measure (speed limits, signage), will reduce the risk of collisions during operations. If traffic volume increases, vehicle departures could be staggered, to create gaps, which would allow marten and other wildlife to cross the road. Since marten tend to change their use behaviours in relation to areas of high human use, it is expected that they will avoid the mine site unless attracted by poorly managed food wastes.

Marten are a carnivorous mammal. Chronic or acute toxicity may occur from ingestion of contaminated water or contaminated small mammals that have been living in and around the tailings ponds, resulting in potential bioaccumulation of Zn (WHO, 2001) or other metals. Water treatment and tailing management are expected to effectively mitigate effect on aquatic systems and plants. In addition, marten tend to avoid large areas of open ground and are not likely to frequent these locations. As noted previously, effects monitoring in aquatic systems influenced by project discharges will flag increasing metals trends in sediments and potential for accumulations at higher trophic levels. Monitoring of metals level in plant and animal tissues will be triggered, as required.

The mortality risk for marten resulting from the project is therefore considered to be adverse, low magnitude, local and far future. Effects will be partially reversed due to reclamation and reduced human activity at closure. Habitat alienation, barriers to movement and mortality associated with the access road will persist at closure. The likelihood that effects will occur as predicted is high, based on the conservative estimates of project disturbance, effectiveness of mitigation measures, and knowledge of marten behaviour in response to human disturbances.

Residual Project Effects and Significance

All project effects on marten are expected to be low magnitude and local. Based on criteria in Section 7.10.3, effects are determined to be not significant. Effects on habitat in the minesite area and those related to human disturbance and road traffic will be largely reversible at closure, but effects associated with the road right of way will persist. The likelihood of effects occurring as predicted is high.

7.10.4.8 Song Bird Community

Habitat Availability

Based on known densities of birds in habitats similar to those found in the LSA, song bird densities of 3.12 birds/ha are estimated at baseline (Refer to Appendix 7.10-1 for methodologies used to develop songbird densities). Full build-out will result in a loss of some habitat suitable for birds. Associated reductions in bird density are estimated to be up to 22%, resulting in an average of 2.43 birds/ha in the LSA.

Each species will be affected differently as area of disturbance will vary for different habitat types. The Yukon moderate priority conservation species which were observed in the LSA, including blackpoll warbler, alder flycatcher, boreal chickadee, Townsend’s warbler(this one wasn’t on the list), and varied thrush (see Section 7.10.2; Table 7.10-12), are expected to lose as much as 20, 21, 20, 28, and 23 percent of their populations respectively, based on the conservative estimates of the full build-out scenario (Table 7.10-26). The Yukon high priority conservation species, the olive-sided flycatcher, is expected to lose up to 28 percent of its habitat in the LSA.

Edges in the landscape are important because they interface between two different types of environment or habitat. They share characteristics of both adjacent areas but have a unique character of their own. Some species require large tracts of contiguous habitat and may not be able to live in areas where edges occur, a process referred to as 'edge effects' (Reis et al 2004). For example, individuals of a forest-dependent species living in an area adjacent to a disturbance may become more susceptible to predators that use the clearings to move around the landscape. At the regional scale, human developments often contribute to creation of edge environments, and there is potential for edge effects as a result of project development. The very conservative approach taken in this habitat analysis implicitly accounts for the possibility of 'edge effects', by assuming that a large area around the construction sites will become unsuitable habitat.

Disturbance by roads and construction is known to negatively affect the habitat use by passerine birds, reducing densities of many species in broad zones of woodland and open habitat adjacent to noisy developments and busy roads (Reijnen et al 1997). To avoid this potential problem, construction activities for the project (proposed to begin in the winter 2005/06) should be timed to avoid the time of year when migrant passerine birds are living in the area (the incubating and fledging period for most species is May to July). Winter-resident species are highly mobile and, in the event of disturbance from project construction, will be able to select alternate habitat situated away from the source of disturbance along the project footprint. Year-round resident bird species may be exposed to sensory disturbance and reduced habitat availability. These individuals will likely relocate away from the sources of disturbance.

Estimated effects are very conservative to ensure that they encompass any potential effects. During full build-out, actual losses are predicted to be minor within the LSA/RSA areas. Locating the road along existing forest edges and other linear clearings where possible will help to minimize the effects of forest loss, but may impact species that prefer open spaces. Residual project effects are expected to be adverse, low magnitude, local, long term and partially reversible at closure when the minesite is revegetated and traffic is greatly reduced. The likelihood of effect is unknown, but the conservative assumptions used in the assessment suggest that effects are not likely to be greater than predicted.

Table 7.10-26 Estimated Effects of Build-Out on the Abundance of Selected Bird Species within the LSA

Species	Birds at Baseline	Birds Impacted	Birds at Full Build out	% of Birds Remaining	% of Birds Impacted
**Blackpoll Warbler*	139	29	111	80	20
Gray Jay	191	40	152	79	21
**Alder Flycatcher*	2912	600	2312	79	21
American Pipit	6135	1280	4855	79	21
American Redstart	6	1	5	86	14
American Robin	656	137	519	79	21
Black-capped Chickadee	17	2	15	86	14
Bohemian Waxwing	37	8	30	79	21
**Boreal Chickadee*	26	5	20	80	20
Chipping Sparrow	1404	286	1118	80	20
Common Redpoll	23	5	19	79	21
Common Yellowthroat	692	143	548	79	21
Common Yellowthroat	2538	518	2020	80	20
Dark-eyed Junco	2315	608	1706	74	26
Fox Sparrow	1595	447	1148	72	28
Golden-crowned Kinglet	6263	1308	4954	79	21
Hammond's Flycatcher	1457	288	1169	80	20
Hermit Thrush	833	213	621	74	26
Horned Lark	4520	939	3581	79	21
Least Flycatcher	119	17	103	86	14
Lesser Yellowlegs	59	12	46	79	21
Lincoln's Sparrow	2450	502	1948	79	21
Northern Waterthrush	41	8	33	80	20
***Olive-sided Flycatcher*	92	26	66	72	28
Orange-crowned Warbler	237	46	191	81	19
Pine Grosbeak	61	13	48	79	21
Pine Siskin	3130	871	2260	72	28
Red-breasted Nuthatch	480	104	376	78	22
Ruby-crowned Kinglet	895	235	660	74	26
Savannah Sparrow	35	7	28	79	21
Swainson's Thrush	752	149	603	80	20
Swamp Sparrow	3402	695	2707	80	20
Tennessee Warbler	815	157	658	81	19
**Townsend's Solitaire*	154	43	110	72	28
Townsend's Warbler	7826	1744	6082	78	22
**Varied Thrush*	1027	234	793	77	23
Warbling Vireo	1486	303	1182	80	20
White-crowned Sparrow	610	133	477	78	22
White-throated Sparrow	335	72	263	78	22
Wilson's Snipe	23	5	19	79	21
Wilson's Warbler	3093	719	2374	77	23
Winter Wren	1517	340	1177	78	22
Yellow-bellied Flycatcher	47	10	37	79	21
Yellow-rumped Warbler	1935	467	1468	76	24
Grand Total	**62380**	**13770**	**48610**	**78**	**22**

Notes: * denotes species of moderate Yukon priority for conservation, and ** denotes species of high Yukon priority for conservation.

Disruption to Movement Patterns

Movement of individuals at local, regional and even global scales is a key process in maintaining animal populations. Usually disturbance results in a primary effect from the simple loss of habitat area. Fragmentation of habitat caused by breaking up larger contiguous blocks of habitat by natural and anthropogenic disturbances has been shown to strongly affect most species, including birds, by affecting their movement behaviour (Bélisle and St. Clair 2001). For example most birds were found to follow strips of forest (travel corridors) to avoid crossing forest gaps of greater than 25meters (St.Clair et al 1998). However, when relocated across the road they were reluctant to re-cross rivers and noisy roads such as the high-use Trans-Canada Highway (~50m width), but were not averse to crossing smaller forest gaps or quieter roads (St. Clair 2003). If the density of disturbances reaches a critical threshold, there may also be a state where the remaining patches of habitat have become isolated from each other (Andren 1996). This results in even lower habitat quality, the combined effect of habitat loss and isolation of remaining habitat patches acting synergistically to have a negative impact on the disturbance-affected species.

In the LSA, some unavoidable disturbance to movements is expected to occur around the mine portal due to habitat clearing and heavy machinery. However, the haul road will have less traffic volume than the highway in the St.Clair study (2003) and it will not be paved. Both factors are expected to result in less reluctance by the birds to cross road right-of - way. The haul road right-of-way is expected to be under 30m and birds have been noted to cross natural gaps of up to 200 meters (St.Clair et al 1998). For the project area, the density of disturbance is low because there is only one haul road proposed. This means that cumulative development impacts resulting in habitat fragmentation and isolation are unlikely.

Accordingly effects of full build-out on songbird movement patterns are expected to be adverse, low magnitude, local, long term and partially reversible at closure. The likelihood of effects occurring as predicted is high, based on the project design and observations of bird behaviour at road crossings..

Mortality risk

Direct mortality of individuals may also affect bird populations. Potential sources of bird mortality at the project include :

- bird strike by vehicles, aircraft or machinery while attempting to cross project clearings
- direct or indirect destruction of nests by clearing or disturbance causing nest abandonment
- exposure to contaminants in the tailings facility during operation or closure.

Mitigation measures include:

- waste management to minimize bird attraction into oncoming vehicles or flight paths
- avoidance of clearing during nesting season (May to July)
- decommissioning of the tailings pond and monitoring and treatment until stability of decant water quality and suitability for safe discharge to Go Creek is confirmed.

Monitoring to check water and sediment quality (Section 7.5.7), and vegetation analysis (Section 7.9.7) will examine potential pathways of exposure to contaminants and flag any concerns that might require adaptive management. Based on these measures, residual project effects on songbird mortality are expected to be adverse, low magnitude, local, and long term. Effects due to clearing and traffic during full build-out will be reversed at closure. The likelihood of effects occurring as predicted is high based on the effectiveness of mitigation measures.

Residual Project Effects and Significance

All residual project effects on songbirds are expected to be of low magnitude and local extent. Based on criteria in Section 7.10.3 these effects are determined to be not significant. Effects will be partially reversed at closure due to minesite reclamation and reduced traffic and human disturbance. Persistent effects due to ongoing road use will be functionally irreversible. The likelihood of effects on habitat availability are unknown, but predictions are considered to be conservative and effects are unlikely to be of higher magnitude than predicted. The likelihood of project effects due to movement barriers and mortality occurring as predicted is considered high, based on the effectiveness of mitigation measures.

7.10.4.9 Trumpeter Swan

Habitat Availability

Mine construction and road development will result in some alteration of Trumpeter Swan breeding habitat. Facilities siting avoids wetland areas as much as possible. While some loss of nesting habitat will occur due to clearing and road development within the LSA, the significance of this loss is likely to be minimal.

Project construction may result in sensory disturbances to Trumpeter Swans during the incubating and fledging period (April to September). This is a potential concern during the construction phase. Henson and Grant (1991) assessed the influences of human disturbances (including aircraft overflights, vehicle traffic, pedestrian activity, and researcher presence) on Trumpeter Swan breeding behaviour; based on their results the following mitigation practices were recommended:

- Restrict use of airboats and other sources of loud noise on or near Trumpeter Swan breeding grounds during the breeding season.
- Discourage people in vehicles from stopping and making noise and passengers from disembarking near nesting wetlands. An environmental orientation for project staff and contractors will include information on preventing harassment of wildlife.
- Wildlife viewing areas should be located greater than 300m from a trumpeter swan nest.

Project disturbances within 500 m of Trumpeter Swan breeding habitat were considered as impacts (as detailed in 7.10-1) and are assessed in terms of habitat area in Table 7.10-27, below. The location of available Trumpeter Swan habitat at baseline is shown in Figure7.10-14) The relatively small decrease in Trumpeter Swan habitat availavibility is predicted at full build-out (9.2 percent decrease within the LSA). The confirmed breeding site for Trumpeter Swans (2 adults and 2 cygnets) in the LSA, east of the road route in the Light Creek drainage, is not expected to be affected, given the distance between this habitat area and the proposed route.

Residual project effects on habitat availability for Trumpeter Swans is expected to be adverse, low magnitude, site specific, long term and largely reversible at closure, due to reduced sensory disturbance at the site and on the road. The likelihood of effects occurring as predicted is high based on the current road route, the assuming implementation of mitigation measures.

Table 7.10-27 Trumpeter Swan Habitat Availability Trends in the Local Study Area

Habitat Type	Habitat Area available at Baseline (ha)	Habitat Area available at Full Build Out (ha)	Percent Change from Baseline
Confirmed Habitat	3.6	3.6	0.0% change
Potential Habitat	581.8	527.6	9.3% decline
Total	585.2	531.2	9.2% decline

Figure 7.10-24 Swan Habitat in the LSA – Baseline (Vol. 2)

Disruption to Movement Patterns

Trumpeter Swan movement patterns will not impeded by project related clearing or sensory disturbance.

Mortality Risk

Potential project-related sources of increased risk of mortality to Trumpeter Swans include:

- access-related hunting or poaching is a concern
- exposure to contaminants in reclaimed tailings pond
- destruction of active nests during construction activities.

To date only one breeding pair of Trumpeter Swans and two cygnets have been observed in the LSA. A minimum count swan survey conducted in 2005 (U.S. Fish and Wildlife, 2005) found that at least 4, 944 swans from the Rocky Mountain Trumpeter Swan population (at least 5, 361 swans) breed in Canada. The mortality risk associated with the project on the Rocky Mountain Trumpeter Swan population that breeds in Canada is therefore low. Implementation of the access and hunting controls during the life of the project (Section 9.5: Wildlife Protection Plan) and the site decommissioning plan, including monitoring of potential metals bioaccumulation, as required will minimize the risk of mortality from these sources. Reduced traffic levels on the road at closure will minimize the risk of mortality effects into the far future.

Accordingly, residual project effects on swan mortality are expected to be adverse, low magnitude, site specific and long term during the life of the project, extending to far future at closure. The likelihood of effects occurring, as predicted, is expected to be high, assuming implementation of mitigation measures during operation and based on the low level of habitat use in the project area.

Residual Project Effects

All residual project effects on trumpeter are expected to be of low magnitude and site-specific. Based on criteria in Section 7.10.3 these effects are determined to be not significant. Effects associated with human disturbance will be largely reversed at closure. Low level effects are expected to persist at closure with ongoing use of the access road. The likelihood of effects on habitat availability are unknown, but predictions are considered to be conservative and effects are unlikely to be of higher magnitude than predicted. The likelihood of project effects due to movement barriers and mortality occurring as predicted is considered high, based on the effectiveness of mitigation measures.

7.10.4.10 Residual Project Effects and Significance

Residual project effects on wildlife VECCs and significance determinations are made at the end of each preceding section and summarized on Table 7.10-30.

7.10.5 Cumulative Effects

Based on the project effects described in Section 7.10.4, the main concern with respect to potential cumulative effects is increased mortality risk for VECC species, with extensive home ranges or movement patterns, that might encounter other sources of mortality risk in daily or seasonal movements, i.e., moose, caribou, grizzly bear, marten, and lynx. Low Residual project effects were identified for these VECCs; all were low magnitude except for moose which were expected to be low to moderate at closure.

Other facilities or activities within the range of these species that could contribute to cumulative effects include:

- the Robert Campbell Highway - increased traffic on the southern leg of the Robert Campbell Highway associated with operation of the Cantung mine (See Section 7.11). The likelihood of effects from this is unknown due to various factors (e.g., potential highway improvements, traffic volumes, and associated effects on non-industrial traffic)
- the Kudz Ze Kayah project and access road – ongoing assessment and planning activities (particulars of current activities were not available from YTG).

Several regionally based mitigation measures and monitoring initiatives led by government or joint management groups are assumed in this assessment including the following.

- Access to the Kudz Ze Kayah Mine and access road will continue to be restricted and will thus reduce the overall mortality risk to wildlife in the RSA from that project.
- Harvest management including hunter harvest and trapping will continue to be managed and monitored by Environment Yukon with intent to maintain a sustainable or below sustainable harvest of wildlife species in the area.
- The hunting of caribou within and surrounding the Project area will remain a permit hunt on a quota based management system.

7.10.5.1 Residual Cumulative Effects and Significance

Given the general uncertainty with expected management directions of the project access road at closure, it is difficult to accurately assess the residual cumulative effects on mortality risk for moose. During construction. Operations, and decommissioning, the Project will be able to largely control access and subsequent effects of mortality along the haul road. Following close, the road access management will be no longer be in the proponents control. If not managed accordingly, the increased access into high quality moose habitat may have significant effects on local moose populations. However it is likely that residual cumulative effects at a regional level will not be significant for the following reasons:

- Moose mortality risk associated with the Kudz Ze Kayah project is minimal;
- Traffic volumes on the access road are likely to decrease following closure;
- Traffic volumes and traffic speed on the Robert Campbell Highway (gravel road) are minimal and likely thus has a limited potential mortality risk for moose in the RSA; and
- Agreements and mechanisms for management of the access road at closure will likely be determined by the YTG and the Kaska Dena, in consultation with interested parties.

Residual cumulative effects for mortality risk associated with caribou are considered to be adverse and not significant. These effects are considered low in magnitude for several reasons. First, mortality resulting from caribou–vehicle collisions is considered to be low in the RSA since traffic volume associated with the Project haul road is considered to decrease following Project closure and traffic volumes are not predicted to change along the Robert Campbell Highway within areas overlapping the range of the Finlayson Caribou Herd in the future. Second, the harvest of caribou, within and surrounding the RSA is managed on a quota system within the RSA. This limits legal harvest of caribou from the Finlayson Caribou Herd to within a sustainable limit, as defined by annual monitoring surveys conducted on this caribou herd by Environment Yukon. Residual cumulative effects on caribou are thus considered to be not significant with a high prediction confidence given mitigation measures already in place and ongoing monitoring of the regional caribou population by Environment Yukon.

Residual cumulative effects on mortality risk to grizzly bear are considered to be adverse and not significant, low in magnitude, and far future in duration. The magnitude of these effects was considered low since: 1) grizzly bear-vehicle collisions within the RSA affecting mortality are likely to be minimal as traffic volumes are likely to decrease following project closure; 2) grizzly bear and human interactions are likely to decrease in the area following project closure since there is likely to be less human presence in the area after project closure; and 3) because the grizzly bear density in the are is relatively low when compared to the remainder of the Yukon Territory and surrounding areas that likely support the areas bear population. Prediction confidence for this residual cumulative effects assessment on grizzly bear mortality risk is considered to be moderate given a limited understanding of grizzly bears in the region.

Residual cumulative effects on the American marten and the lynx and snowshoe hare VECCs are considered not to be significant, low in magnitude, and far future in duration. The potential residual cumulative effects of greatest concern are from wildlife-vehicle collisions, increased trapping harvest, and chronic poisoning by ingestion and by bioaccumulation of residual contaminants from mine tailings and milling that may potentially increase the mortality risk to the respective species population. These mortality risks are, however, expected to be minimal since: (1) mining operations in the RSA mitigate wildlife interactions with residual contaminants during the life of mine operations and as well plan for remediation after project closure; (2) Environment Yukon monitors trapping harvest in the area and trapping is restricted in the RSA; and (3) the cumulative level of access from roads and project developments in the RSA is minimal (currently 1 mine haul road, the Robert Campbell Highway and the proposed Project). The prediction confidence is considered moderate to high in this assessment given the minimal level of cumulative disturbances currently assessed within the RSA and the mitigation processes already in place as discussed.

Several monitoring and mitigation practices are recommended with respect to improving predictive capabilities of this residual cumulative effects assessment and or for implementing a process of adaptive management practices to learn from current mitigation measures (Section 7.10.6 and Section 7.10.7).

7.10.6 Mitigation Measures

Many mitigation measures for wildlife have been compiled into the Wildlife Protection Plan in Section 9.5. Other measures are integrated into the site waste management plans including water treatment and tailing management to achieve high quality discharges and minimize the risk of metals accumulation in vegetation used by wildlife. At closure the tailings pond will be reclaimed as a permanent pond facility and contents will be physically and chemically stable. The risk of wildlife exposure to contaminant will be minimal. Access management on the haul route at closure has yet to be defined. Mitigation options will be developed by the YTG, the Kaska Dena and other interest holders as appropriate to support preferred use and minimize potential adverse effects on wildife (Table 7.10-28).

Table 7.10-28 Mitigation Measures for Effects on Wildlife

Potential Project Effect	Mitigation Measures
Potential exposure of wildlife to contaminants, directly and though bio-accumulation	• Mine waste segregation and management to minimize potential ARD (Section 2.7). • Collection of waste rock drainage for treatment, if required (Section 2.9) • Long term storage of waste rock in non-oxidizing environments (mine backfill, tailings impoundment) to minimize potential for acid generation (Section 2.7) • Water treatment and management to protect water quality (Section 2.9 and 7.5) • EEM, contingencies to initiate monitoring metals accumulation in vegetation and biota, and adaptive management based on monitoring results (Section 7.5.6, 7.9.6) • Wildlife Protection Plan (Section 9.5)
Increased wildlife mortality risk from vehicle collisions and hunting during operations	• Refer to Wildlife Protection Plan (Section 9.5)

Table 7.10-28 Mitigation Measures for Effects on Wildlife (cont'd)

Potential Project Effect	Mitigation Measures
Increased wildlife mortality risk, with potential effects on moose populations, from hunting and road access at closure	• Continue to implement mitigation measures identified for the project, by the responsible agency at closure • Close and decommission the haul road following mine closure • Restrict road access onto the haul road following mine closure • Limit hunter harvest for moose in the localized area surrounding the mine haul road • Establish no hunting zones for moose in the localized are surrounding the mine road • Conduct regular enforcement monitoring in the local area, including on and surrounding the mine road
Reduction in habitat availability for all VECCs at full build-out and closure	• Compact project foot print • Progressive and final reclamation (Section 3.4)
Wildlife and human safety risks from problem wildlife	• Refer to Wildlife Protection Plan (Section 9.5) • Solid waste management plan (Section 9.4)
Increased bird mortality due to destruction of nests, collisions	• Avoid clearing in nesting season (April through July) • Properly dispose of food wastes that might attract bird into collision paths • Environmental orientation program of staff and contractors re wildlife harassment.
Potential effects of aircraft on thinhorn sheep in North Lakes area due to project aircraft overflights	• Adopt and follow the Yukon guidelines for helicopters and fixed-wing flight paths and altitudes in the vicinity of sheep and other wildlife species. • Provide orientation and training to all staff, pilots, guests and contractors with respect to wildlife harassment policies.
Potential Cumulative Effect	**Mitigation Measures**
Increased wildlife mortality risk associated with management of the haul road at closure	• Determination of wildlife protection plan for the access road at closure by YTG, the Kaska Dena and other interests as appropriate prior to closure.
Increased mortality risk for caribou, moose, grizzly bear, marten and lynx due to cumulative effects of project, Kudz Ze Kayah project, Robert Campbell Highway and Cantung hauling activities.	• Access to the Kudz Ze Kayah project area and access road will continue to be restricted and will thus reduce the overall mortality risk to wildlife in the RSA from that project. • Harvest management including hunter harvest and trapping will continue to be managed and monitored by Environment Yukon with intent to maintain a sustainable or below sustainable harvest of wildlife species in the area. • The hunting of caribou within and surrounding the project area will remain a permit hunt on a quota based management system.

7.10.7 Monitoring and Follow-up

Follow-up Studies

In order to improve increase predictive capabilities for project effects at closure, it is recommended that follow-up work include development of an access management plan for the haul road at closure, with emphasis on measure to minimize risk of moose mortality and associated effects on regional population sustainability. As the agents responsible for management of the road at closure, it is recommended that the Kaska Dena and YTG lead this work, in consultation with other interested parties:

Monitoring Programs

Onsite wildlife monitoring programs to be conducted by YZC during the life of the project include:

- systematic documentation wildlife sightings in or near the project area, road kills, and problem wildlife incidents
- systematic documentation of wildlife use of reclaimed habitats

These programs are specifically intended to check mortality predictions and mitigation effectiveness (Section 9.5: Wildlife Protection Plan) and guide adaptive management as required.

The onsite environmental monitor will maintain systematic records of wildlife observations, and incidents (e.g., wildlife-vehicle collision, aggressive bear observation) in or near the project area will be kept in a ‘wildlife log’. Reports will include the date, time, description of location, species, number of individuals, and the activity (e.g. feeding, nesting).

The following monitoring programs and, where applicable, adaptive management strategies, are proposed:

Wildlife-vehicle mortalities – Large mammal mortalities or accidents along the haul routes will be recorded and reviewed. If road kills occur, corrective actions or additional mitigation measures (e.g., lower speed limits, warning signs, improvement of visibility, worker advisories) may be implemented.

Problem wildlife – Problem wildlife incidents will be monitored and recurrent incidents will precipitate a re-evaluation of the effectiveness and enforcement of existing prevention measures.

Grizzly bears– Observations of grizzly bears or their sign (e.g., tracks, scat) in and around the project area will be recorded. These observations will informally track grizzly bear use patterns within the project area through all development phases.

Table 7.10-29 Monitoring and Follow-up Programs for Wildlife

Potential Project Effect	Program Objectives	General Methods	Reporting	Implemen-tation
Follow-Up Programs				
Management of the haul road at closure	• Confirm the accuracy of the effects predictions • Initiate contingency plans to address unexpected effects, as required	• Consultation by YTG, Kaska Dena and other interests as relevant to develop wildlife protection plan for the haul road at Closure	• N/A	YTG
Monitoring Programs				
Wildlife vehicle mortalities	• Confirm the accuracy of the effects predictions • Initiate contingency plans to address unexpected effects, as required	• Record and report incidents	• YTG as required	Proponent
Problem wildlife	• Confirm the accuracy of the effects predictions • Initiate contingency plans to address unexpected effects, as required	• Record and report incidents	• YTG as required •	Proponent
Grizzly bear/project interations	• Confirm the accuracy of the effects predictions • Initiate contingency plans to address unexpected effects, as required	• Record observations of grizzly bear sign and activities in the project area	YTG as required	Proponent
Exposure to contaminants and potential bioaccumulation of metals	• Confirm the accuracy of the effects predictions • Initiate contingency plans to address unexpected effects, as required	• EMM (Section 7.5.8) • Vegetation metals analysis (Section 7.9.8)	• EEM reports as required (Section 7.5.8)	Proponent
Potential Cumulative Effect	**Program Objectives**	**General Methods**	**Reporting**	**Implementation**
Monitoring Programs				
Caribou and moose mortality	• Confirm the accuracy of the effects predictions • Initiate contingency plans to address unexpected effects, as required	• Ongoing YTG regional population monitoring	• N/A	YTG

7.10.8 Summary of Effects

Residual project and cumulative effects are summarized in Table 7.10-30.

Table 7.10-30 Program Effects on Wildlife

VECC	Potential Effect	Level of Effect[1]						Effect Rating[2]	
		Direction	Magnitude	Extent	Duration/ Frequency	Reversibility	Likelihood	Project Effect	Cumulative Effect
	Construction, Operations and Decommissioning (Full Build-out)								
Caribou	Reduction in seasonal habitat availability due to clearing and sensory disturbance	Adverse	Low	Local	Long Term	Partially reversible	High	Not Significant	Not Significant
	Disruption to movement patterns due to sensory disturbance	Adverse	Low	Regional	Long Term	Reversible	High	Not Significant	Not Significant
	Increased mortality risk from collisions	Adverse	Low	Regional	Long Term	Irreversible	High	Not Significant	Not Significant
Moose	Reduction in seasonal habitat availability due to clearing and sensory disturbance	Adverse	Low	Local	Long Term	Partially reversible	High	Not Significant	Not Significant
	Disruption to movement patterns due to habitat fragmentation and sensory disturbance	Adverse	Low	Local	Long Term	Partially reversible	High	Not Significant	Not Significant
	Increased mortality risk from collisions	Adverse	Low	Local	Long Term	Irreversible	High	Not Significant	Not Significant
Thinhorn Sheep	Disruption to movement patterns from aerial overflights in North Lakes area	Adverse	Low	Regional	Short Term			Not Significant	Not Significant
Grizzly bear	Reduction in seasonal habitat availability due to clearing or sensory disturbance	Adverse	Low	Local	Long term	Partially reversible	High	Not significant	Not Significant
	Increased mortality risk from collisions and site conflicts	Adverse	Low	Local	Long term	Partially reversible	High	Not significant	Not Significant
	Disruption to movement patterns from sensory disturbance	Adverse	Low	Local	Long term	Partially reversible	High	Not Significant	Not Significant

Table 7.10-30 Program Effects on Wildlife (cont'd)

VECC	Potential Effect	Level of Effect[1]						Effect Rating[2]	
		Direction	Magnitude	Extent	Duration/ Frequency	Reversibility	Likelihood	Project Effect	Cumulative Effect
Beaver	Reduction in seasonal habitat availability from wetland removal	Adverse	Low	Local	Long Term	Partially reversible	High	Not Significant	Not Significant
	Disruption to movement patterns from sensory disturbance	Adverse	Low	Local	Long Term	Partially reversible	High	Not Significant	Not Significant
	Increased mortality risk from collisions	Adverse	Low	Local	Long Term	Partially reversible	High	Not Significant	Not Significant
Lynx and Snowshoe Hare	Reduction in seasonal habitat availability from clearing or sensory disturbance	Adverse	Low	Local	Long Term	Partially reversible	High	Not Significant	Not Significant
	Increased mortality risk from collisions	Adverse	Low	Local	Long Term	Partially reversible	High	Not Significant	Not Significant
	Disruption to movement patterns from disturbance or habitat fragmentation	Adverse	Low	Local	Long Term	Partially reversible	High	Not Significant	Not Significant
Marten	Reduction in seasonal habitat availability from clearing and sensory disturbance	Adverse	Low	Local	Long Term	Partially reversible	High	Not Significant	Not Significant
	Increased mortality risk from collisions	Adverse	Low	Local	Long term	Partially reversible	High	Not Significant	Not Significant
	Disruption to movement patterns from sensory disturbance or habitat fragmentation	Adverse	Low	Local	Long term	Partially reversible	High	Not Significant	Not Significant
Songbird Community	Reduction in seasonal habitat availability due to clearaing and sensory disturbance	Adverse	Low	Local	Long Term	Partially reversible	Unkown	Not Significant	NA

Table 7.10-30 Program Effects on Wildlife (cont'd)

VECC	Potential Effect	Level of Effect[1]						Effect Rating[2]	
		Direction	Magnitude	Extent	Duration/ Frequency	Reversibility	Likelihood	Project Effect	Cumulative Effect
	Disruption to movement patterns due to habitat fragmentation and sensory disturbance	Adverse	Low	Local	Long term	Partially reversible	High	Not Significant	NA
	Increased mortality risk due to nest destruction, collisions or contaminant exposure	Adverse	Low	Local	Long-term	Partially reversible	High	Not Significant	NA
Trumpeter Swan	Reduction in nesting habitat and sensory disturbance	Adverse	Low	Site Specific	Long Term	Partially reversible	Unknown	Not Significant	Not Significant
	Increased mortality risk due to nest destruction or contaminant exposure	Adverse	Low	Site Specific	Long Term	Partially reversible	High	Not Significant	Not Significant
	Closure								
Caribou	Reduction in seasonal habitat availability due access road	Adverse	Low	Local	Far Future	Partially reversible	High	Not Significant	N/A
	Disruption to movement patterns due to access road	Adverse	Low	Regional	Far Future	Irreversible	High	Not Significant	N/A
	Increased mortality risk from collisions, hunting and poaching	Adverse	Low	Regional	Far Future	Irreversible	High	Not Significant	Not Significant
Moose	Reduction in seasonal habitat availability due to access road	Adverse	Low	Local	Far Future	Irreversible	High	Not Significant	N/A
	Disruption to movement patterns due to access road	Adverse	Low	Local	Far Future	Irreversible	High	Not Significant	N/A
	Increased mortality risk from collisions, hunting or poaching	Adverse	Moderate	Regional	Far Future	Reversible	Unkown	Unknown[3]	Unknown[3]

Table 7.10-30 Program Effects on Wildlife (cont'd)

VECC	Potential Effect	Level of Effect[1]						Effect Rating[2]	
		Direction	Magnitude	Extent	Duration/ Frequency	Reversibility	Likelihood	Project Effect	Cumulative Effect
Grizzly bear	Increased mortality risk from collisions and hunting	Adverse	Moderate	Local	Far Future	Reversible	Unkown	Not significant	Not Significant
	Disruption to movement patterns from sensory disturbance	Adverse	Low	Local	Far Future	Irreversible	High	Not Significant	N/A
	Reduction in seasonal habitat availability from access road	Adverse	Low	Local	Far Future	Irreversible	High	Not Significant	N/A
Beaver	Reduction in seasonal habitat availability from access road	Adverse	Low	Local	Far Future	Irreversible	High	Not Significant	N/A
	Disruption to movement patterns from sensory disturbance	Adverse	Low	Local	Far Future	Irreversible	High	Not Significant	N/A
	Increased mortality risk from hunting and collisions	Adverse	Low	Local	Far Future	Irreversible	High	Not Significant	N/A
Lynx and Snowshoe Hare	Reduction in seasonal habitat availability from access orad	Adverse	Low	Local	Far future	Irreversible	High	Not Significant	N/A
	Increased mortality risk from hunting and collisions	Adverse	Low	Local	Far Future	Irreversible	High	Not Significant	Not Significant
	Disruption to movement patterns from sensory disturbance and habitat fragmentation	Adverse	Low	Local	Far Future	Irreversible	High	Not Significant	N/A
Marten	Increased mortality risk from collisions and harvest	Adverse	Low	Local	Far Future	Partially reversible	High	Not Significant	Not Significant

Table 7.10-30 Program Effects on Wildlife (cont'd)

VECC	Potential Effect	Level of Effect[1]						Effect Rating[2]	
		Direction	Magnitude	Extent	Duration/ Frequency	Reversibility	Likelihood	Project Effect	Cumulative Effect
	Disruption to movement patterns from access road	Adverse	Low	Local	Far Future	Partially reversible	High	Not Significant	N/A
	Reduction in seasonal habitat availability from access road	Adverse	Low	Local	Far Future	Partially reversible	High	Not Significant	N/A
Songbird Community	Disruption to movement patterns from sensory disturbance and habitat fragmentation	Adverse	Low	Local	Far Future	Irreversible	Unkown	Not Significant	N/A
	Increased mortality risk from collisions and exposure to contaminants	Adverse	Low	Site Specific	Far Future	Irreversible	Unkown	Not Significant	N/A
	Reduction in seasonal habitat availability due to access road	Adverse	Low	Local	Far Future	Irreversible	Unkown	Not Significant	N/A
Trumpeter Swan	Disruption to movement patterns due to access road	Adverse	Low	Site Specific	Far Future	Irreversible	High	Not Significant	N/A
	Increased mortality risk due to hunting and exposure to contaminants	Adverse	Low	Site Specific	Far Future	Irreversible	High	Not Significant	N/A
	Reduction in seasonal habitat availability due to access road	Adverse	Low	Local	Far Future	Irreversible	High	Not Significant	N/A

Notes:
1 Based on effects attributes in Table 7.10-18
2 Based on significance criteria in Section 7.10-3
3 The significance of Project effects and cumulative project effects are unknown at this time since the management regime and implementation of mitigation options for the access road following project closure can not be confirmed at this time. Agreements and mechanisms for management of the road at closure will be determined by YTG and the Kaska Dena in consultation with interested parties. It is likely that once mitigation measures have been established that project effects and cumulative effects will not be significant.
4 Partially reversible reflects the reduction of effects at closure due to minesite reclamation and reduction in human activity and traffic. At closure, habitat alienation and sensory disturbance associated with ongoing use of the haul road is expected to persist and will be functionally irreversible.
N/A = not applicable