To assess both grizzly bear populations, hair sampling was stratified throughout both the coastal and interior population areas. Hair sampling consisted of bait stations in alpine and forested areas or trail sets along salmon-spawning streams. Single strands of barbed wire were hung across trails, between trees or t-shaped metal fence posts (alpine areas) to catch hair from passing grizzly bears.

DNA analysis was conducted to identify individual grizzly bears, and a closed mark-recapture analysis was used to estimate population size. Movements were investigated by sampling in spawning areas where bears tend to congregate and in alpine areas at various distances from spawning sites. Detailed methods and results of the grizzly bear study are presented in Appendix 6-M, *Galore Creek Grizzly Bear Baseline Report 2004-2005.*

Regional Project Area

The grizzly bear study area for summer 2004 covered approximately 10,199 km^2 and was divided into two sub-study areas, coastal and interior (Figure 6.13-5). The coastal area included accessible salmon habitats. A third study area encompassing the access corridor and other areas of potential development impact, and partially overlapping the northern portions of the 2004 coastal and interior study areas, was defined in 2005 and was referred to as the northern study area (Figure 6.13-5).

Hair sampling in 2004 identified 119 individual grizzly bears within the regional project area over four two-week sampling sessions between late July and mid-September.

Coastal Study Area

Of the 119 individual grizzly bears identified during the 2004 hair sampling, 58 were detected in the coastal study area. The coastal grizzly bear population was estimated at 238 (Confidence Interval [C.I.] 87-273) and the density at 22.2 grizzly bears/1,000 km^2 (C.I. 14.0-44.0).

Grizzly bear density in coastal areas of B.C. is modest compared to areas of coastal Alaska (Miller *et al*., 1997; Mowat *et al*., 2005), and the density in the lower Stikine area would appear to be lower than in other areas of the B.C. coast. This may be due to modest salmon runs in the Stikine drainage compared to other areas of the north coast. However, a large portion of the coastal area is rock or glacier, and removing unproductive habitat for the mapping increased the density to 46.0 grizzly bears/1,000 km^2.

Most bears were detected near salmon-spawning areas, and the Scud, Craig, Christina and Inhini rivers attracted 5 to 8 individual bears. The chum/sockeye runs in these streams appear to be important to this population of grizzly bears. Two bears were detected at Verrett Creek and two more in nearby streams. There were few detections in upland areas away from spawning streams in the coastal area. Capture success was much higher for males than for females. This suggests that most males used salmon streams, while females were more widely dispersed during the spawning period.

No movement between major spawning streams was detected, and only three bears were found to move from upland areas to salmon streams. Isotope analysis for coastal grizzly bears indicated that salmon was an important food source and a measurable portion of the diet, even in spring.

310000 340000 370000 400000 430000

6350000

6320000

6290000

Scud River

Mount Edziza Provincial Park

Stewart - Cassiar Hwy

37

Skeena Mountains

British Columbia, Canada

Alaska, USA

Galore Creek Project

Porcupine River

Stikine River

Sphaler Creek

More Creek

Iskut River Hot Springs Provincial Park

Bob Quinn Lake

Ningunsaw River Ecological Reserve

Ningunsaw Provincial Park

Great Glacier Provincial Park

Choquette Hot Springs Provincial Park

Eskay Creek Road

Iskut River

Eskay Creek Mine

Craig Headwaters Protected Area

N

Access Road

Porcupine Aerodrome

Transmission Line

Areas of Potential Disturbance or Habitat Modification

Protected Area

Goat Natal Area

Goat and Sheep Natal Area

1:400,000

0 10 20

Kilometres

Projection: UTM9, NAD83

FIGURE 6.13-4

NovaGold Canada Inc.

Lambing and Kidding Areas For Mountain Ungulates

Rescan™

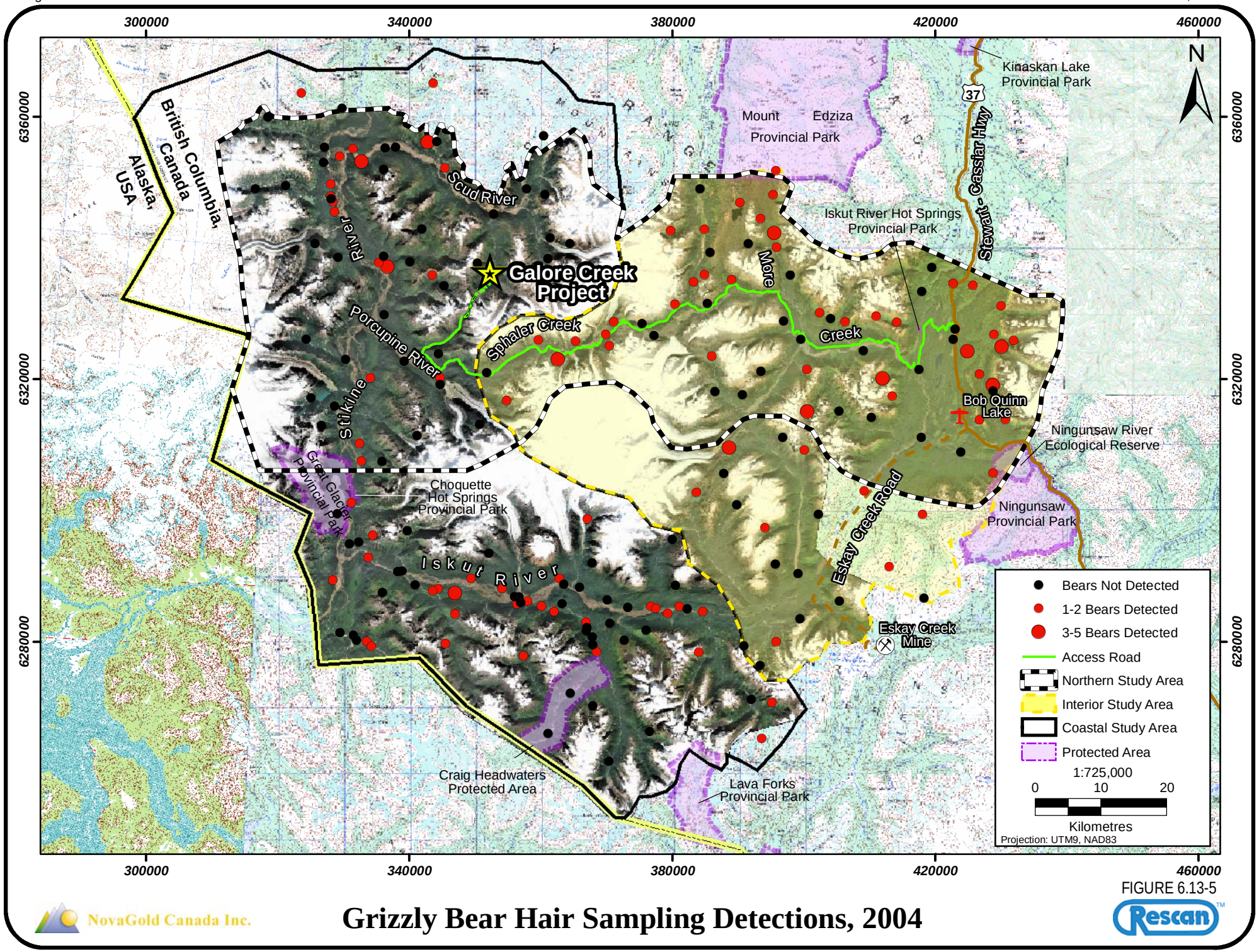


FIGURE 6.13-5

NovaGold Canada Inc.

Grizzly Bear Hair Sampling Detections, 2004

Rescan™

Interior Study Area

A total of 61 individual grizzly bears were detected in the interior study area in 2004. The population estimate was 126 (C.I. 105-158) and the density estimate 31.0 grizzly bears/1,000 km^2 (C.I. 25.8-38.8). Grizzly densities vary substantially in the interior areas of B.C. compared to the coastal areas, and the interior study area for the project appears to support one of the higher densities of bears documented in the interior of the province. This high density is likely related to the high rainfall, which generates lush vegetation; the low treeline, which maintains a large portion of the landscape in herb and shrub cover; and the presence of a large burn site (Burrage Creek burn) in the northeast corner of the area, which produces large huckleberry crops. Twelve grizzly bears were detected in the Burrage Creek burn and another three within 3 km of the burn. The bears appeared to concentrate in the burn to exploit huckleberries during late July and August.

Bears were detected throughout the interior study area, mostly above the treeline and particularly in the open habitat found in the north-central part of the interior study area; the relative density of bears may be higher here than in other parts of the interior study area. Forested areas appeared to receive little use during late summer and early fall.

Isotope analysis for 2004 suggested very modest changes in the diet of interior grizzly bears from season to season. The bears in this sample derived very little of their June to September diet from meat.

Northern Study Area

Grizzly bear sampling was done between June and November of 2005 in the newly defined northern study area; analysis of the collected hair samples is ongoing. A population estimate for this study area was generated by using the 2004 capture data. Eighty grizzly bears had been detected in habitats considered parts of the 2005 northern study area during the summer and fall of 2004. The resulting population estimate for the 2005 northern study area was 165 (CI 140-200) with a density of 24.7 grizzly bears/1,000 km^2 (CI 21.0-29.9).

Denning

Winter denning habitat is abundant in the Stikine River area and is mostly located at or above the treeline on steep slopes. Grizzly bear dens tend to be located at high elevations in areas of deep snowfall and relatively low snowmelt (Schwartz *et al.*, 2003; MoE, 1994). New dens are usually dug each year and bears emerge from them in April and May. Bears are vulnerable to disturbance at den sites, although the consequences for an individual bear may be small if other habitat is available nearby (Linnell *et al.*, 2000).

Breeding habitat, travel routes and migration routes are not distinct or significant parts of grizzly bear life histories; these habitats are simply constituents of the yearly home range and in most cases would not be easily identifiable from other seasonal use areas such as foraging habitat.

Mortality

The annual average recorded human-caused mortality from 1993 to 2002 was 3.8 grizzly bears for the southern half of the Edziza-Lower Stikine Grizzly Bear Population Unit (GBPU) (MoE FWB, 2004). Most of the mortalities were hunter kills and were reported in the Bob Quinn area along Highway 37. Unrecorded mortality is probably low because most of the study area is very inaccessible.

6.13.1.4 Small Mammals

Small mammals are often overlooked in biological assessments because their value as a resource is not always directly evident. Small mammals can comprise a major part of the biomass within ecosystems and are important prey for both avian and mammalian predators (RIC, 1998). A field investigation to characterize the use of the project area by small mammals was conducted from July to September 2005. Before commencing the field surveys, a list of species potentially present in the project area was compiled. The primary goals of the field inventory were to characterize species composition, identify the presence of species at risk and evaluate the relative abundance of small mammals by ecosystem type (BEC zones) to assist in rating habitat suitability for predators (*i.e.*, marten and grizzly bear).

The specific groups targeted during the small mammal inventory were rodents (mice, voles and lemmings) and insectivores (shrews). Small mammals were trapped with a combination of Havahart live traps and pitfall arrays distributed along transects within the local project area. Transects were run throughout those BEC zones most representative of the areas of potential impact from the access corridor, aerodrome facility and mine area. A wide range of ecological types were sampled within each BEC, including early seral stage wetland habitat through to closed canopy old growth forest. Detailed methods and results of the small mammal study are presented in Appendix 6-N, *Galore Creek Small Mammals, Bats and Herpetiles Baseline Report 2005*.

Local Project Area

Survey effort included 1,873 trap-nights for live traps and 600 trap-nights for pitfall traps (trap-nights = number of traps set multiplied by the number of nights trapped). The small mammals captured were identified on the basis of morphometric data gathered at the time of capture. Mortalities were retained and deposited as voucher specimens at the Royal British Columbia Museum. Eight species of small mammal were positively identified, including three voles, two mice and three insectivores:

- northern red-backed vole (*Clethrionomys rutilus*)
- long-tailed vole (*Microtus longicaudus littoralis*)
- meadow vole (*Microtus pennsylvanicus*)
- Keen's mouse (*Peromyscus keeni*)
- meadow jumping mouse (*Zapus hudsonicus hudsonicus*)
- common shrew (*Sorex cinerus*)

- dusky shrew (*Sorex monticolus*)
- water shrew (*Sorex palustris*).

The most commonly captured species were Keen's mouse, northern red-backed vole, common shrew and dusky shrew. Two species at risk, tundra shrew (*Sorex tundrensis*) and the *alaskansis* subspecies of meadow jumping mouse, identified initially as potentially occurring within the study area were not detected. Recent information on the distribution of the two species suggests that they are geographically restricted (Nagorsen, 1996; 2005) and therefore cannot exist within the study area. No lemmings were captured.

Small mammal abundance varied with habitat. In general, the later seral stages of the ESSF, CWH and MH zones supported the greatest abundance of voles and mice. Small mammals were also relatively abundant in the herb meadows and open willow thickets of the ESSFwvp ecosystems selected by grizzly bear during summer and fall. The consumption of small mammals by grizzly bear was identified in the study area by Tahltan Elders during the 2004 field season, through observations of bear scat containing the remnants of small mammals. The abundance of small mammals further enhances the value of these sites for grizzly bear.

6.13.1.5 Bats

Inventory information for bats is lacking within the Galore Creek area and within northwestern B.C. in general. Bats provide an important but often overlooked component of biodiversity within an ecosystem. They are considered the most important predators of night-flying insects and are of particular importance in areas where insect pest species are highly abundant (Whitaker, 1996).

The objective of the bat inventory work was to characterize the species present and identify species at risk within the local project area. Bat inventory was conducted at 10 different locations in the local project area, including sites within the access corridor, aerodrome facility and mine area. The inventory was conducted between July and September of 2005 using two methodologies: mist-net capture and echolocation characterization using a bat detector. Detailed methods and results of the bat survey are presented in Appendix 6-N.

Local Project Area

Prior to conducting field surveys a list of species potentially present in the local project area was compiled. Seven species of bats were identified as potentially occurring, including the red-listed Keen's long-eared myotis. However, this species is believed to have one of the most restricted ranges in B.C. and is unlikely to occur in the study area due to habitat limitations.

Only one bat was captured during the bat survey. However, echolocations were recorded at eight of the ten inventory locations, indicating that bats are present throughout the study area from low elevations to the higher elevation ESSF zone. At least two species of *Myotis* are likely present: little brown myotis and at least one species of long-eared myotis, probably western long-eared myotis. In general, the number of detections per hour of inventory was low, and this limited the ability to differentiate species

Filter Plant and Access Corridor

Bat detections were recorded along the access corridor near Sphaler Creek and adjacent to the Porcupine River along the road route. Bats were also detected near Bob Quinn and the filter plant. No bats were detected at a site west of More Creek along the access corridor.

Mine Area

A high number of bat detections (19.5 detections/hour) was recorded at the Galore camp wastewater storage lagoon in the mine area within the ESSFwv subzone.

Aerodrome Facility

A low number of bat detections (1 detection/hour) was recorded at the Porcupine River aerodrome site within the CWHvm subzone.

6.13.2 Birds

To address concerns that project development may influence surrounding avifauna, investigations were conducted during 2004 and 2005 to characterize the use of the area by birds. Studies focused on migratory birds, including waterfowl, trumpeter swan (*Cygnus uccinators*), harlequin duck (*Histrionicus histrionicus*), marbled murrelet, songbirds and raptors. An additional survey for harlequin ducks and waterfowl was conducted in 2006. The studies were designed to collect baseline information on species distribution (species presence or absence in areas of potential impact) and behaviour (breeding, migration staging and over-wintering).

In order to focus the 2005 work with respect to species of conservation concern, a list of avian species of interest, or "focal species," was developed for the project area (Appendix 6-O, *Galore Creek Bird Studies Baseline Report 2004-2005*). Focal species included all species listed either provincially or by COSEWIC that have the potential to occur within the project area.

Throughout the 2004 and 2005 avian surveys (including incidental observations) a total of 117 bird species were identified within the study area (Table 6.13-2).

6.13.2.1 Waterfowl

During May of 2004 a reconnaissance-level waterfowl survey was conducted along the access corridor and Iskut River. Comprehensive surveys were conducted during 2005 throughout the local project area to characterize waterfowl diversity and identify habitats used for breeding and migration staging. Breeding habitat surveys were conducted in June, July and August of 2005 and included a combination of aerial and ground surveys. Migration staging surveys were conducted within major wetlands and lakes along the Iskut and Stikine rivers during spring migration (mid-May 2005), along the More Creek portions of tehe access corridor during spring migration (May 2006), and along the access corridor and within the Porcupine River Valley during fall migration (September and October 2005). Detailed methods and results of the waterfowl surveys are presented in Appendix 6-O and 6-P.

Local Project Area

A total of 20 species of waterfowl were observed within the local project area (access corridor, mine area and aerodrome facility, including the Porcupine River to the confluence of the Stikine River), including seven diving species, three merganser species, seven species of dabbler, two species of geese, two species of loons and trumpeter swans. One great blue heron was observed in wetlands at the confluence of the Porcupine and Stikine rivers during October 2005. Surf scoters, a blue-listed species, were observed; however, breeding was not recorded for this species. These results suggest that surf scoters use lakes and rivers in the study area as stop-over points for resting during migration only.

Table 6.13-2
Bird Species Identified in the Galore Creek Study Area 2004-2005

Species	Species Name[1]	Species Code[2]
Alder flycatcher	*Empidonax alnorum*	ALFL
American crow	*Corvus brachyrhynchos*	AMCR
American dipper	*Cinclus mexicanus*	AMDI
American kestrel	*Falco sparverius*	MAKE
American pipit	*Anthus rubescens*	AMPI
American redstart	*Setophaga ruticilla*	AMRE
American robin	*Turdus migratorius*	AMRO
American three-toed woodpecker	*Picoides dorsalis*	ATTW
American wigeon	*Anas americana*	AMWI
Arctic tern	*Sterna paradisaea*	ARTE
Bald eagle	*Haliaeetus leucocephalus*	BAEA
Barn swallow	*Hirundo rustica*	BARS
Barrow's goldeneye	*Bucephala islandica*	BAGO
Belted kingfisher	*Ceryle alcyon*	BEKI
Black scoter	*Melanitta nigra*	BLSC
Black swift	*Cypseloides niger*	BLSW
Black-backed woodpecker	*Picoides arcticus*	BBWO
Black-billed magpie	*Pica hudsonia*	BBMA
Blackpoll warbler	*Dendroica striata*	BLPW
Blue grouse	*Dendragapus obscurus*	BLUG
Blue-winged teal	*Anas discors*	BWTE
Bohemian waxwing	*Bornbycilla garrulus*	BOWA
Bufflehead	*Bucephala albeola*	BUFF
Canada goose	*Branta canadensis*	CANG
Cedar waxwing	*Bornbycilla cedrorum*	CEDW
Chestnut-backed chickadee	*Poecile rufescens*	CBCH
Chipping sparrow	*Spizella passerina*	CHSP
Common loon	*Gavia immer*	COLO
Common merganser	*Mergus merganser*	COME
Common nighthawk	*Chordeiles minor*	CONI
Common raven	*Corvus corax*	CORA
Common yellowthroat	*Geothlypis trichas*	COYE
Dark-eyed junco	*Junco hyernalis*	DEJU
Dusky flycatcher	*Empidonax oberholseri*	DCFL

(continued)

Table 6.13-2
Bird Species Identified in the Galore Creek Study Area 2004-2005 (continued)

Species	Species Name[1]	Species Code[2]
Evening grosbeak	*Coccothraustes vespertinus*	EVGR
Fox sparrow	*Passerella iliaca*	FOSP
Gadwall	*Anas strepera*	GADW
Golden eagle	*Aquila chrysaetos*	GOEA
Golden-crowned kinglet	*Regulus satrapa*	GCKI
Golden-crowned sparrow	*Zonotrichia atricapilla*	GCSP
Gray jay	*Perisoreus canadensis*	GRAJ
Gray-cheeked thrush	*Catharus minimus*	GCTH
Gray-crowned rosy-finch	*Leucosticte tephrocotis*	GCRF
Great blue heron	*Ardea herodias*	GBHE
Greater white-fronted goose	*Anser albifrons*	GWFG
Green-winged teal	*Anas crecca*	GWTE
Gyrfalcon	*Falco rusticolus*	GYRF
Hairy woodpecker	*Picoides villosus*	HAWO
Hammond's flycatcher	*Empidonax hammondii*	HAFL
Harlequin duck	*Histrionicus histrionicus*	HADU
Hermit thrush	*Catharus quttatus*	HETH
Herring gull	*Larus argentatus*	HERG
Hooded merganser	*Lophodytes cucullatus*	HOME
Horned lark	*Eremophila alpestris*	HOLA
Least sandpiper	*Calidris minutilla*	LESA
Lesser scaup	*Aythya affinis*	LESC
Lesser yellowlegs	*Tringa flavipes*	LEYE
Lincoln's sparrow	*Melospiza lincolnii*	LISP
MacGillivray's warbler	*Oporornis tolmiei*	MGWA
Mallard	*Anas platyrhynchos*	MALL
Marbled murrelet	*Brachyramphus marmoratus*	MAMU
Merlin	*Falco columbarius*	MERL
Mew gull	*Larus canus*	MEGU
Mountain chickadee	*Poecile gambeli*	MOCH
Northern flicker	*Colaptes chrysoides*	NOFL
Northern harrier	*Circus cyaneus*	NOHA
Northern hawk owl	*Surnia ulula*	NHOW
Northern pintail	*Anas acuta*	NOPI
Northern shoveler	*Anas clypeata*	NSHO
Northern waterthrush	*Seiurus noveboracensis*	NOWA
Olive-sided flycatcher	*Contopus cooperi*	OSTF
Orange-crowned warbler	*Verrnivora celata*	OCWA
Osprey	*Pandion haliaetus*	OSPR
Pacific loon	*Gavia arctica*	PALO
Pacific-slope flycatcher	*Empidonax occidentalis*	PSFL
Peregrine falcon	*Falco peregrinus* spp.	PEFA
Pine grosbeak	*Pinicola enucleator*	PIGR
Pine siskin	*Carduelis pinus*	B-PISI

(continued)

Table 6.13-2
Bird Species Identified in the Galore Creek Study Area 2004-2005 (continued)

Species	Species Name[1]	Species Code[2]
Red crossbill	*Loxia curvirostra*	RECR
Red-breasted merganser	*Mergus serrator*	RBME
Red-breasted nuthatch	*Sitta canadensis*	RBNU
Red-breasted sapsucker	*Sphyrapicus ruber*	RBSA
Red-tailed hawk	*Buteo jamaicensis*	RTHA
Red-throated loon	*Gavia stellata*	RTLO
Ring-necked duck	*Aythya collaris*	RNDU
Rock ptarmigan	*Lagopus muta*	ROPT
Rough-legged hawk	*Buteo lagopus*	RLHA
Ruby-crowned kinglet	*Regulus calendula*	RCKI
Ruffed grouse	*Bonasa umbellus*	RUGR
Rufous hummingbird	*Selasphorus rufus*	RUHU
Savannah sparrow	*Passerculus sandwichensis*	SAVS
Semipalmated plover	*Charadrius semipalmatus*	SEPL
Sharp-shinned hawk	*Accipiter striatus*	SSHA
Solitary sandpiper	*Tringa solitaria*	SPTS
Song sparrow	*Melospiza melodia*	SOSP
Spotted sandpiper	*Actitis macularius*	SPSA
Steller's jay	*Cyanocitta stelleri*	STJA
Surf scoter	*Melanitta perspicillata*	SUSC
Swainson's thrush	*Catharus ustulatus*	SWTH
Tennessee warbler	*Verrnivora peregrina*	TEWA
Townsend's warbler	*Dendroica townsendii*	TOWA
Tree swallow	*Tachycineta bicolor*	TRES
Trumpeter swan	*Cygnus buccinator*	TRUS
Varied thrush	*Ixoreus naevius*	VATH
Vaux's swift	*Chaetura vauxi*	VASW
Warbling vireo	*Vireo gilvus*	WAVI
Western tanager	*Piranga ludoviciana*	WETA
Western wood-pewee	*Contopus sordidulus*	WEWP
White-tailed ptarmigan	*Lagopus leucura*	WTPT
White-winged scoter	*Melanitta fusca*	WWSC
Willow ptarmigan	*Lagopus lagopus*	WIPT
Wilson's warbler	*Wilsonia pusilla*	WIWA
Winter wren	*Troglodytes troglodytes*	WIWR
Yellow warbler	*Dendroica petechia*	YWAR
Yellow-rumped warbler	*Dendroica coronata*	YRWA

[1]Scientific names taken from the Birds of North America online (http://bna.birds.cornell.edu/BNA)
[2]Species codes taken from Cannings, R.A. and A.P. Harcombe. 1990. *The Vertebrates of British Columbia: Scientific and English Names*. Wildlife Branch, Wildlife Report No. R24.

Filter Plant and Access Corridor

Breeding Habitat

Nine waterfowl species were recorded using lakes and wetlands along the Devil Creek Forest Service Road (FSR) and More and Sphaler creeks during surveys in June 2005, including:

- Barrow's goldeneye
- common merganser
- ring-necked duck
- lesser scaup
- mallard
- blue-winged teal
- green-winged teal
- Canada goose
- common loon.

The observed waterfowl were recorded from a survey of 10 lakes of various sizes in the ESSF zone of More and Sphaler creeks and one small lake in the MH zone in the lower Sphaler. Loons were observed on lakes in the ICH zone of More Creek and along the Devil Creek FSR (Figure 6.13-6).

Of the nine species observed, broods were recorded for two species, lesser scaup and common loon, during the July/August 2005 survey. Four lesser scaup broods were recorded on two lakes in the lower Mess Creek area. These lakes are situated in the ESSF zone at an elevation of approximately 1,020 m. The depth of each lake appeared to be >2 m, and each contained little or no emergent vegetation and was bordered by low-level coniferous forest (Plate 6.13-3).

A common loon brood was recorded on a lake to the west of the More Creek/Iskut River confluence. The lake is situated within the ICH zone at an elevation of approximately 485 m, is bordered by coniferous forest and supports a shallow water littoral marsh around its margins (Plate 6.13-4). An additional common loon brood was observed on a lake along the Devil Creek FSR. The lakes along this FSR occur within the ICH zone at elevations of approximately 585 m. They are typically associated with shallow water marsh/fen wetland zones at either end of each lake and are bordered by coniferous forest.

Barrow's goldeneye was a predominant species in lakes along More and Sphaler creeks and also on lakes associated with the Devil Creek FSR. However, broods of this species were not detected in these areas.

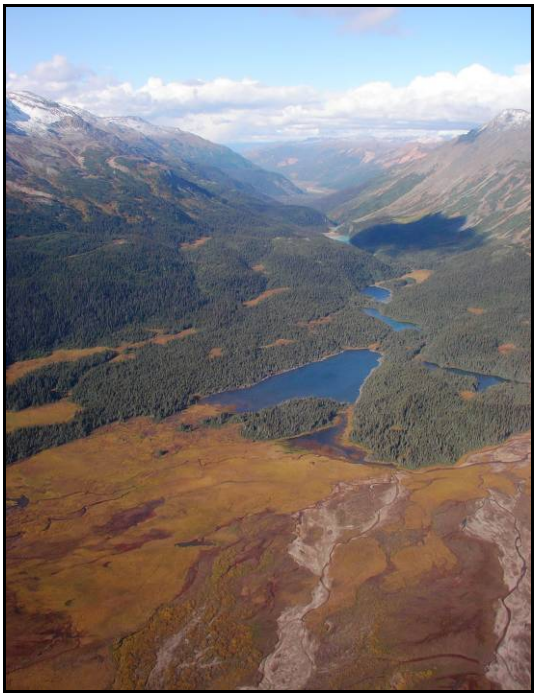


Plate 6.13-3 Lakes supporting lesser scaup broods, lower Mess Creek.

Plate 6.13-4 Lake supporting common loon brood, lower More Creek.

Migration Staging Habitat

Fall migration surveys were conducted in September and October of 2005 along the access corridor. Species observed during fall migration surveys but not during breeding surveys included:

- American wigeon
- black scoter
- gadwall
- great blue heron
- northern pintail
- northern shoveler
- white-winged scoter.

Two species, common merganser and surf scoter, were observed in greater numbers during the fall migration surveys than during the breeding surveys. Migrating waterfowl were most commonly observed on lakes associated with the ESSF zone of More and Sphaler creeks (Figure 6.13-7, Plate 6.13-5). The lakes used during migration included those identified as being used by waterfowl during brood surveys in June and August 2005. Migrating waterfowl also used other lakes such as Round Lake (Plate 6.13-6), which may not be important for breeding waterfowl but could be important stop-over points.

330000 340000 350000 360000 370000 380000 390000 400000 410000 420000

6340000 6330000 6320000 6310000 6300000

Scud River
Galore Creek
See figure 6.13-8
Round Lake
Sphaler Creek
Stikine River
Inset 1
1:60,000
Inset 2
1:70,000
Mess Creek
Moore Creek
37
Devil Creek FSR
Stewart Cassiar Hwy
Iskut River
N

Waterfowl without broods
- Dabbling Ducks
- Diving Ducks
- Geese
- Loons
- Swans
- Unknown Ducks
- 1-5 Birds Counted
- 6-15 Birds Counted
- 16-30 Bird Counted

Waterfowl with broods
- Dabbling Ducks
- Diving Ducks
- Geese
- Loons
- Swans
- Mergansers
- 1-5 Birds Counted
- 6-15 Birds Counted
- 16-30 Bird Counted

- Mine Access
- Porcupine Aerodrome
- Transmission Line
- Access Corridor
- Mine Area

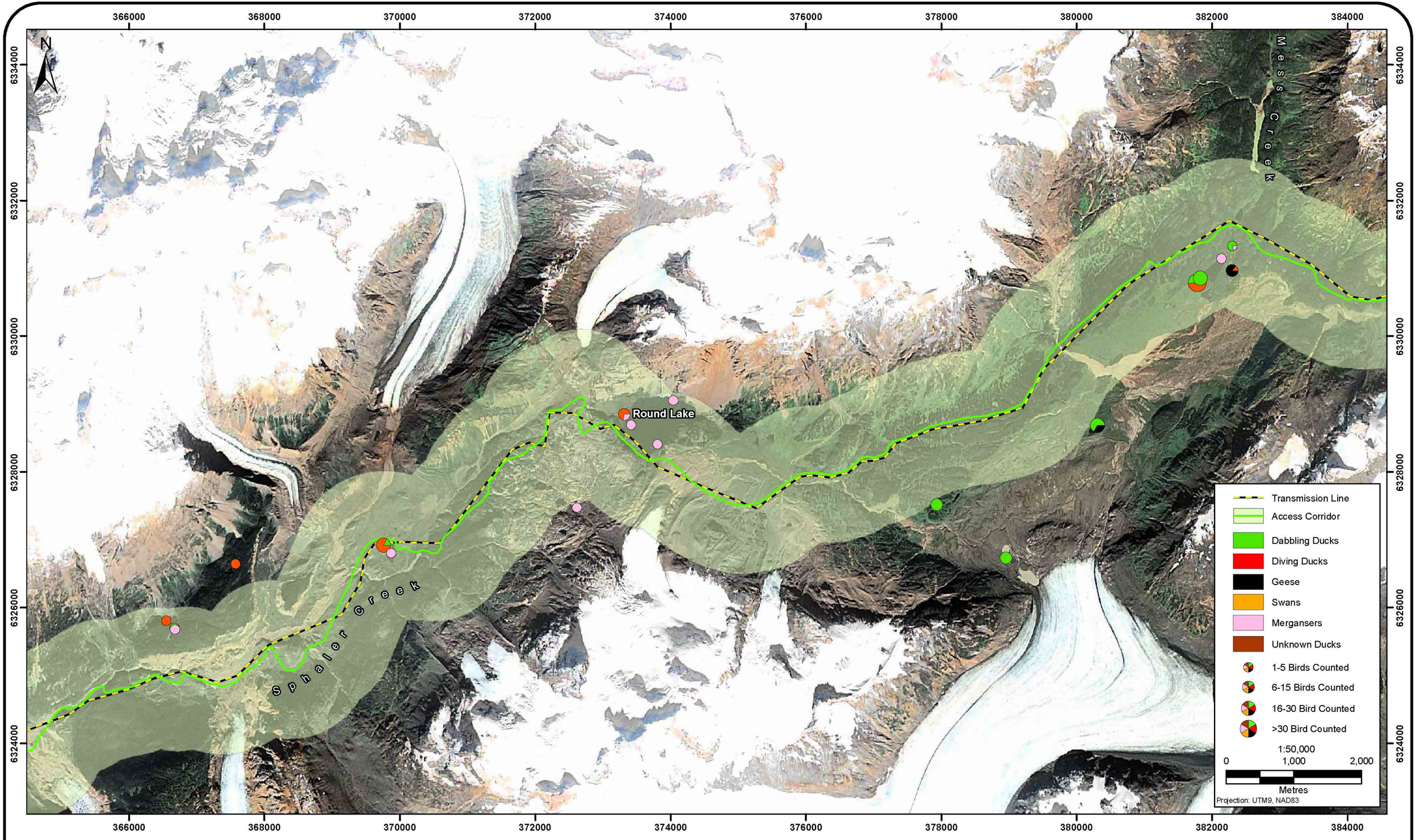
1:240,000
0 5 10
Kilometres
Projection:UTM9, NAD83

FIGURE 6.13-6

NovaGold Canada Inc.

Waterfowl Survey Locations and Observations, Breeding Surveys, June to August 2005

Rescan



NovaGold Canada Inc.

Waterfowl Survey Observations, More and Sphaler Creek
Fall Migration Surveys, September and October 2005

FIGURE 6.13-7

Rescan

Spring migration surveys were conducted in May 2006 along the More Creek portion of the access corridor. Numerous waterfowl were recorded during the survey. The species recorded included green-winged teal, mallard, common merganser, lesser scaup, ring-necked duck, American wigeon, northern shoveler, barrows goldeneye and Canada goose. All species recorded had been previously observed in the study area (Appendix 6-O and 6-P).

Due to heavy remaining snow cover in the study area at the time of the survey, habitats used by the migrating waterfowl were restricted to open water associated with More Creek and tributaries into More Creek.

Mine Area

Breeding Habitat

Low numbers of Barrow's goldeneye were recorded at one of the high-elevation lakes in the Galore Creek Valley in late July 2005; however, no broods were recorded (Figure 6.13-6). These lakes occur within the ESSF and AT zones at a range of elevations from approximately 1,128 to 1,405 m. The lakes are typically small and shallow with no emergent vegetation and are located in areas with little to no surrounding vegetation.

Plate 6.13-5 Lake used by waterfowl in the ESSF zone of Sphaler Creek.

Plate 6.13-6 Round Lake.

Aerodrome Facility

Breeding Habitat

Two aerial surveys were conducted in July 2005 to detect waterfowl broods along the Porcupine River and at the confluence of the Porcupine and Stikine rivers. Based on relative numbers and species diversity of waterfowl broods observed, wetlands at the confluence appear to provide important breeding habitat for waterfowl. This area supported broods for eight species of waterfowl, including:

- Barrow's goldeneye
- blue-winged teal
- bufflehead
- Canada goose
- hooded merganser
- mallard
- red-breasted merganser
- trumpeter swan.

In general, broods observed for both dabbling and diving species (including mergansers) were associated with wetlands or small river side-channels on the east and west sides of the Stikine River (Figure 6.13-8).

A Barrow's goldeneye brood was also located along the Porcupine River in association with a small marsh/fen complex at the end of a small river side-channel, and a mallard brood was observed in a sedge fen/swamp complex on the north side of the Porcupine River within 1 km of the access road. Several Canada geese broods were observed. These broods were associated with a variety of habitats, including swamp/marsh complexes, marshes and side-channels along the Stikine River.

The wetlands used by breeding waterfowl along the Porcupine River and at the confluence of the Porcupine and Stikine rivers occur within the CWH zone at elevations of approximately 35 m (Plates 6.13-7 and 6.13-8).

Migration Staging Habitat

Both spring (May 2005) and fall (September and October 2005) migration surveys were conducted along the Porcupine and Stikine rivers. During the spring, both dabbling and diving species (including mergansers) used habitat along the Porcupine River and at the confluence of the Porcupine and Stikine rivers. This included small river side-channels on the east and west sides of the Stikine River, in addition to the numerous wetlands (swamps, marshes and, less commonly, fens) associated with the CWH zone in this area. During the fall surveys, fewer divers were observed relative to those recorded in the same areas during the spring. However, the numbers of mergansers and Canada geese observed were higher in the fall than in spring.

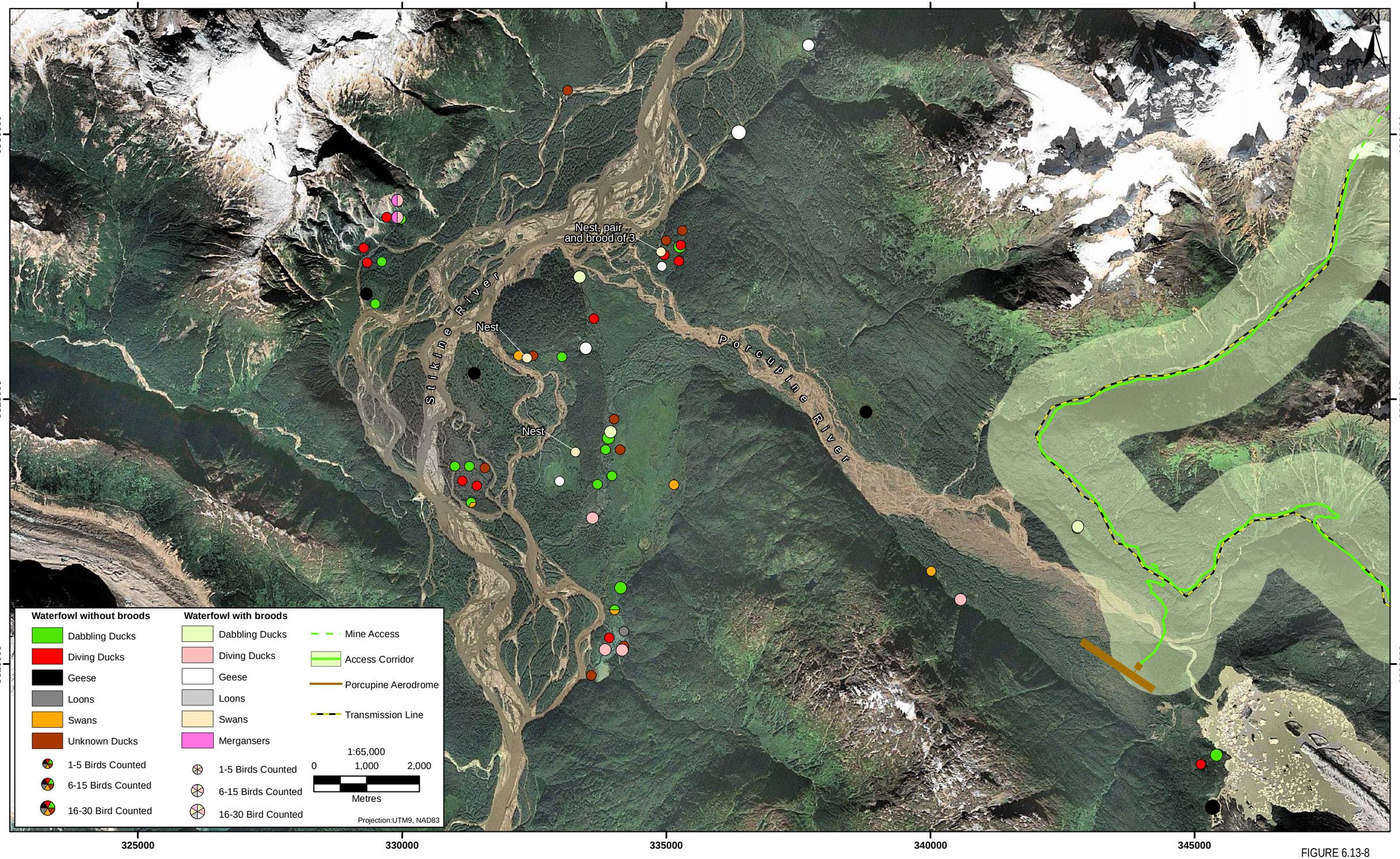


FIGURE 6.13-8

Waterfowl Survey Observations, Stikine and Porcupine River Breeding Surveys, July 2005

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Plate 6.13-7 Swamp/fen habitat associated with waterfowl observations, Porcupine and Stikine rivers.

Plate 6.13-8 Marsh habitat associated with waterfowl observations, Porcupine and Stikine rivers.

Overall, results from the spring and fall migration surveys indicate that the wetlands at the confluence of the Porcupine and Stikine rivers support a number of migrating waterfowl and are also used by breeding waterfowl. This indicates that these wetlands are important to waterfowl from spring through breeding and into fall.

6.13.2.2 Trumpeter Swans

Trumpeter swans are blue-listed in B.C. and are identified in the Cassiar Iskut-Stikine Land and Resource Management Plan (CIS LRMP) and by the Canadian Wildlife Service (CWS) as a species requiring increased consideration in the study area.

In May 2004, surveys for trumpeter swans were conducted within the lower Stikine River Valley, from the Scud River to the international boundary with the U.S., and also in all areas of the Porcupine, Scud, Craig, Katete and Iskut rivers considered likely to support nesting. No surveys were conducted above Snippaker Creek on the Iskut River or along the access corridor because no wetlands suitable for breeding occur in these areas. In 2005, nesting trumpeter swans were recorded as part of the general waterfowl surveys outlined above, and wintering trumpeter swans were recorded in conjunction with moose surveys.

Detailed methods and results of the trumpeter swan surveys are presented in Appendix 6-O.

Regional Study Area

Overall, 26 trumpeter swans were observed in 17 groups within the study area in the 2004 and 2005 surveys. Most of these observations were associated with the Iskut and Stikine rivers, and one group was observed near the aerodrome site at Porcupine River.

Three trumpeter swans nests were identified in sedge-marshes at the confluence of the Porcupine and Stikine rivers (Figure 6.13-8) during the waterfowl surveys conducted in July 2005. One of these pairs successfully bred and was observed with a brood of three.

No wintering swans were observed along the Iskut, Craig, Stikine, Porcupine and Scud rivers in February 2005, although surveys for mountain goats in March 2005 identified the presence of trumpeter swans associated with open water in back channels of the Iskut River near the confluence of the Stikine River (Appendix 6-B).

6.13.2.3 Harlequin Ducks

Harlequin ducks have been identified by the CWS as a focal species of riverine birds requiring increased consideration for the project. Aerial and ground surveys for harlequin duck pairs were conducted in May and June of 2005 along all the main channels within the access corridor, mine area and Stikine and Iskut rivers. Harlequin duck brood surveys and additional pair surveys were conducted along More Creek during July/August 2005 and May 2006, respectively. Detailed methods and results of the harlequin duck surveys are presented in Appendix 6-O and Appendix 6-P (*Harlequin Duck and Waterfowl Survey 2006*).

Access Corridor

Four pairs of harlequin ducks were observed in Scotsimpson Creek during the May 2005 survey (Figure 6.13-9), and a depredated harlequin duck nest was found within a washed-out tree stump along the creek in June 2005. Several harlequin duck drakes were also observed on this creek in July (Guy Monty, Wildlife Consultant, *personal communication*).

No harlequin duck pairs were observed along the More Creek section of the access corridor during surveys in June 2005; however, this may have been the result of surveying too late in the season to detect pairs. Aerial and ground-based harlequin duck brood surveys were therefore conducted along More Creek during July/August 2005. No broods were detected during these surveys, but a Rescan fisheries research crew observed a female with a brood of four older ducklings along a slow-moving side-channel of More Creek during August 2005. No harlequin duck pairs were observed along More Creek during additional pair surveys in May 2006. This result suggests that the female observed with a brood in August 2005 nests outside the study area; likely at headwaters of tributaries not anticipated to be affected by the development.

Overall, the results indicate that harlequin ducks successfully breed along portions of Scotsimpson Creek and tributaries into More Creek. Scotsimpson Creek is typical of the streams used by harlequin ducks during the breeding season: it is fast-flowing in a sub-alpine habitat that includes small islands and gravel/sand bars (*i.e.*, braided) with loafing areas. The location of the brood observed on More Creek was also typical, as older broods are sometimes moved to slower-moving stretches during rearing (Robertson and Goudie, 1999).

6.13.2.4 Marbled Murrelets

Marbled murrelets are a red-listed species in B.C. They are also listed as threatened by COSEWIC and on Schedule 1 of the *Species at Risk Act* (SARA).

Radar and audio-visual surveys for marbled murrelets were undertaken to assess the presence / not-detected status of this species in the study area. These surveys were conducted in June 2005 at two locations: the confluence of the Iskut and Stikine rivers, and along the

Porcupine River Valley. Detailed methods and results of the marbled murrelet surveys are presented in Appendix 6-O.

Regional Project Area

Ten marbled murrelets were detected flying toward the confluence of the Iskut and Stikine rivers. None were detected at any of the three survey locations within the Porcupine River Valley. The distance from the ocean (>70 km) likely accounted for the lack of detections at this survey location.

The radar surveys conducted for this study provide the first landscape-scale data for marbled murrelets in this region and are the most northerly in B.C. to date.

6.13.2.5 Raptors

Raptors are highlighted by both the CIS LRMP and regulating agencies as requiring enhanced consideration in the area and for the project. Surveys in 2005 aimed to assess the presence and distribution of focal raptor species within the project area and to identify any nest locations that could be affected by the proposed development. Focal species included:

- bald eagle
- peregrine falcon
- gyrfalcon
- northern goshawk (*Accipiter gentiles laingi*)
- short-eared owl (*Asio flammeus*).

Stand watch surveys were conducted for tree-nesting and cliff-nesting raptors in early to mid-June 2005. Surveys for tree-nesting raptors were conducted in riparian habitat along the major rivers within the access corridor and near the aerodrome facility. Particular emphasis was placed on detecting bald eagles and their nests. Surveys for cliff-nesting raptors were conducted adjacent to suitable nesting habitat within the access corridor and mine area. Call playback surveys were also conducted for forest-dwelling raptors, specifically northern goshawk. Detailed methods and results of the raptor surveys are presented in Appendix 6-O.

Local Project Area

Stand watches and call playback surveys for raptors were conducted along the access corridor, aerodrome facility and mine area (Figure 6.13-10). Overall, 10 species were detected, including:

- bald eagle
- peregrine falcon (subspecies not differentiated)
- gyrfalcon
- golden eagle
- osprey
- red-tailed hawk

- American kestrel
- sharp-shinned hawk
- merlin
- rough-legged hawk.

The call playback surveys elicited no response from northern goshawk, suggesting the absence of this species in the local project area. Responses were received from red-tailed hawk, American kestrel and merlin, however, indicating their probable breeding status in the area. No short-eared owls were observed.

Filter Plant and Access Corridor

Tree-Nesting Raptors

Sightings of bald eagles were minimal and no nests were recorded along the access corridor. A pair of red-tailed hawks observed in old cottonwood stands in the ICH zone along the lower section of More Creek demonstrated aggressive behaviour typical of pairs defending a breeding territory and was therefore suspected of nesting. American kestrel were observed on several occasions within the same cottonwood stands and were also likely to be nesting in the area. Responses to call playback surveys for northern goshawk were also obtained from American kestrel in this area.

Near the Bob Quinn area, an active osprey nest was found at the top of a conifer on an island in Devil Lake along the Devil Creek FSR, but the location of the nest was beyond the 1 km buffer along the access corridor. The osprey observation and nest location were associated with habitat typical for osprey breeding: close to water that provides good feeding areas, at the top of trees to allow easy access to nest, and at high or over-water locations (including islands) to ensure safety from ground predators. A sharp-shinned hawk was incidentally observed along the Devil Creek FSR in June 2005.

Cliff-Nesting Raptors

A cluster of three golden eagle nests was observed in the ESSF zone of Sphaler Creek (Plate 6.13-9) and a cluster of four in the ICH zone along More Creek west of the canyon at the junction of More Creek and Iskut River (Figure 6.13-10). In both instances the nest clusters were on cliffs and were inactive during the 2005 season (*i.e.*, no incubating adults, eggs or young observed). It is considered likely that each cluster belonged to at least two different pairs. Golden eagles tend to show strong site fidelity to breeding areas, and individuals will establish and defend a territory of approximately 20 to 30 km^2. Golden eagles often construct alternate nests, separated by <1 m or >5 km, and so territories can contain up to 14 nests. All golden eagle observations and nest locations were associated with habitat typical of that used for breeding, including rugged topography or mountainous terrain and sites near or above treeline (Kochert *et al.*, 2002).

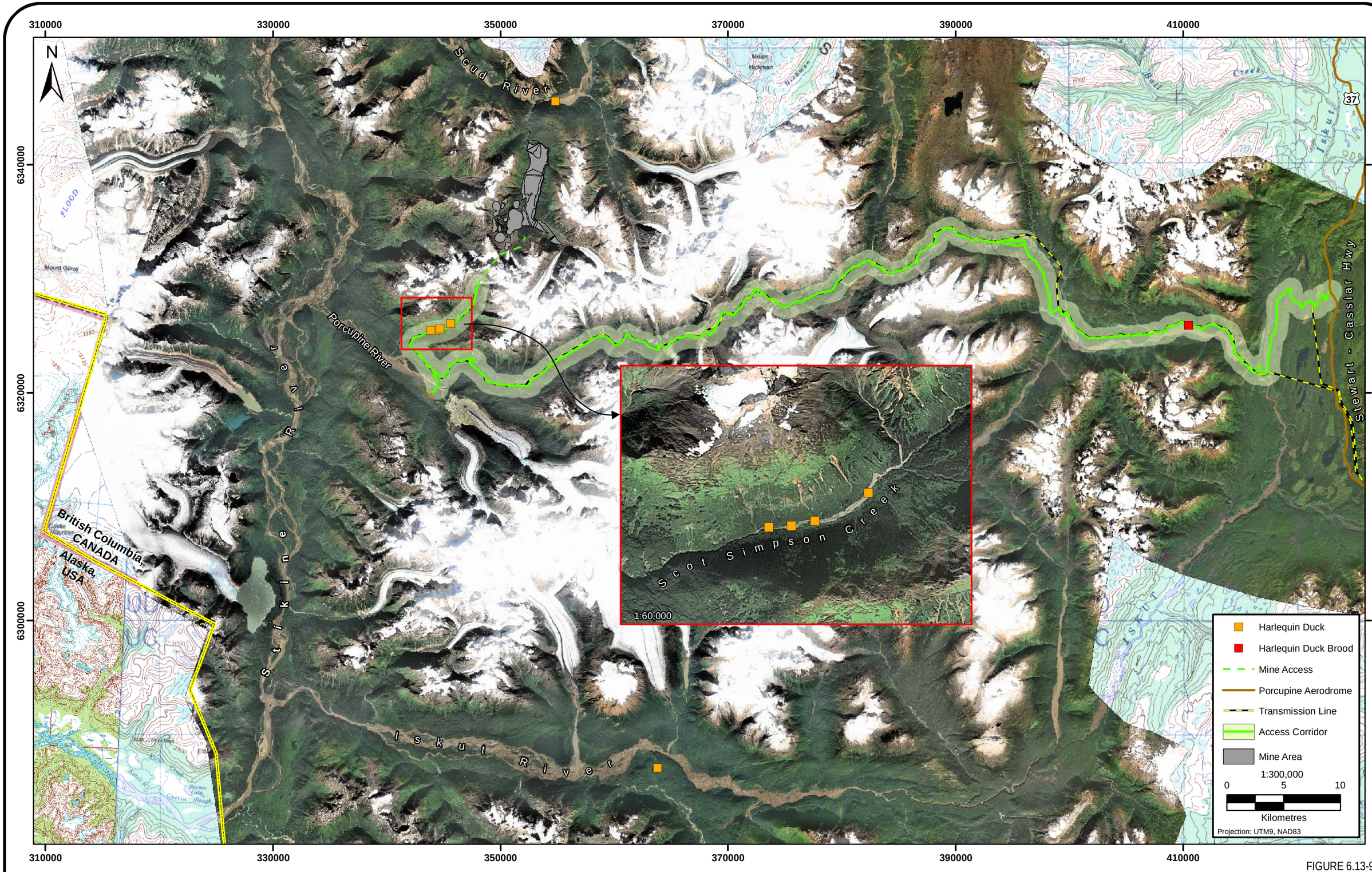

FIGURE 6.13-9

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Harlequin Duck Survey Observations, 2005

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Gyrfalcon were observed along the access road corridor on two occasions: along the stretch of road associated with the aerodrome facility in May 2005, and in the upper Sphaler Creek area in June 2005 (Figure 6.13-10). An individual peregrine falcon was observed during the waterfowl migration survey along the Porcupine River in September 2005. Nesting was not observed for either species in the study area.

Aerodrome Facility

Tree-Nesting Raptors

Bald eagles were sighted in the Porcupine River Valley and along the Stikine River at the confluence of the Porcupine during June 2005; however, no nests were observed. High numbers of bald eagles were observed feeding on spawning salmon at the confluence of the Stikine and Porcupine rivers during October 2005. Bald eagles are opportunistic foragers that prefer fish (Buehler, 2000), but they have limited fishing ability. Suitable foraging habitat is therefore typically defined by conditions that make live fish available or that make fish, birds and mammals available as carrion. Accumulation of Pacific salmonid carcasses is an annual occurrence along the lower Iskut, Stikine and Porcupine rivers in late summer and fall each year. The high density of bald eagles at the confluence of the Stikine and Porcupine rivers suggests this is an important area for this species.

A pair of red-tailed hawks in the CWH zone of the Porcupine River Valley demonstrated aggressive behaviour typical of pairs defending a breeding territory and was therefore suspected of nesting. An individual merlin also displayed aggressive behaviour suggestive of breeding along the Porcupine River in June 2005.

Plate 6.13-9 Location of golden eagle nest sites, Sphaler Creek.

A common nighthawk (*Chordeiles minor*) nest was incidentally observed in the Porcupine River Valley during stand watches for raptors in this area. The nest was located on the ground in the vicinity of the proposed airstrip.

Mine Area

Several observations of rough-legged hawks were recorded in the mine area, and one pair was consistently observed flying above the proposed mine site throughout June and July 2005. Rough-legged hawk is an artic breeder, and the Galore Creek study area is well to the south of its documented breeding range. However, the sightings in June and July are within the breeding season for this species. Additional incidental observations within the study area may help determine the activity of the species in the area.

6.13.2.6 Songbirds

Surveys of breeding songbirds were conducted along the access corridor, aerodrome facility and mine areas using two survey methodologies: encounter transects surveys (ETS) and variable radius point counts (VRPC). Focal species included:

- Smith's longspur (*Calcarius pictus*)
- hairy woodpecker

- pine grosbeak
- Le Conte's sparrow (*Ammodramus leconteii*).

VRPC were conducted during the breeding season (early June to early July) to characterize songbird diversity and detect focal species. ETS were conducted to complement the VRPC survey by recording wildlife presence or inferred presence due to activity signs. Detailed methods and results of the raptor surveys are presented in Appendix 6-O.

Local Project Area

Overall, 66 bird species were identified during 161 VRPC on 19 survey mornings within the study area. Species richness (number of different species) was relatively consistent among BEC zones, although the lowest number was observed within the MHmmp and ATun subzones.

Hairy woodpecker, a blue-listed species in B.C. and one of the focal species for the study area, was observed in the ICHwc subzone along More Creek during VRPC and ETS. In B.C., hairy woodpecker is found in all forest regions from sea level to 1,900 m and in a wide range of habitats, including mature conifer forests, such as those along More Creek. The species also frequents edge habitat, such as beaver (*Castor canadensis*) ponds associated with mature conifer forests (Jackson *et al.*, 2002), which occurs extensively along the Stikine River. It is therefore possible that hairy woodpecker occur elsewhere in the study area, but this was not confirmed in the 2005 studies.

Pine grosbeak was also detected within the study area, specifically in association with habitats within the Galore Creek Watershed. However, genetic tests would be required to determine if the individuals observed were of the *carlottae* focal blue-listed subspecies.

Incidental to the songbird identifications, a least sandpiper nest and chicks were recorded on the flats near Roca Creek in the upper More Creek Valley (Plate 6.13-10). Distraction displays indicative of breeding were observed for semi-palmated plovers near Round Lake in the alpine (Plate 6.13-11) and also in the upper Sphaler Creek area. No nests or chicks were recorded, although it is likely these birds were breeding in the area.

Plate 6.13-10 Least sandpiper nest habitat, Roca Creek.

Plate 6.13-11 Semi-palmated plover habitat, Round Lake.

6.13.3 Herpetiles

The objective of the inventory work for herpetiles within the local project area was to identify the species present, particularly species at risk. With the exception of tailed frog (*Ascaphua truei*), no formal surveys of amphibian and reptilian fauna were conducted within the study area. Instead, incidental observations were made in conjunction with other field studies undertaken during 2004 and 2005 (see Appendix 6-N).

Local Project Area

Herpetiles were incidentally encountered on 59 occasions (n = 500) during the 2004 and 2005 field inventory (Figure 6.13-10). Three amphibians and no reptilian species were recorded within the study area, including:

- spotted frog (*Rana pretiosa*)
- western toad (*Bufo boreas*)
- long-toed salamander (*Ambystoma macrodactylumi*).

Western toad is listed as a species of special concern on Schedule 1 of the *Canadian Species at Risk Act* (SARA) and was the most commonly observed and widely distributed amphibian within the study area. Observations of individual adults were typically associated with wetlands and moist upland habitat from the lower CWHwm and ICHwc subzones to the higher ESSFmvp. No observations were made within the ATp ecosystem. Pond and wetlands at lower elevations throughout the study area supported large numbers of juvenile toads or "toadlets." However, the apparent abundance may be related to the species' biology, particularly during the breeding season.

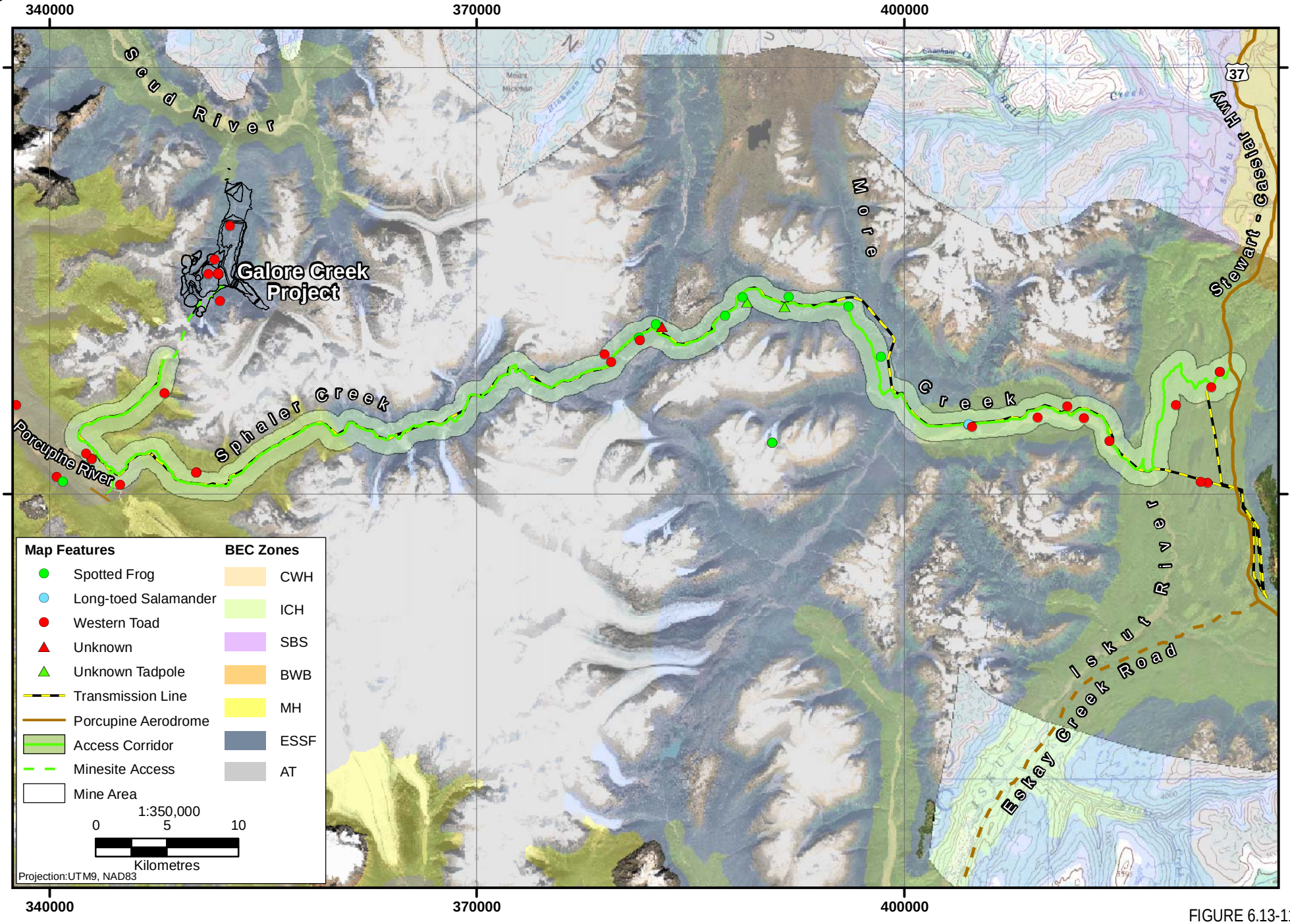

FIGURE 6.13-11

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Location of Incidental Amphibian Observations, 2004 - 2005

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The western toad is an explosive breeder, with female toads laying thousand of eggs each per breeding season. However, young toads and toadlets experience high mortality rates through predation and as a result of extreme climatic conditions (Wind and Dupius, 2002).

Spotted frog is primarily an aquatic species, preferring permanent ponds and small lakes. They are tolerant of cold waters and range up to the treeline in elevation (Green and Campbell, 1984). Observations of spotted frog were restricted to wetlands up to 1,030 m elevation within the CWHwm, ESSFwv and MHmm subzones. The long-toed salamander was encountered in association with wet riparian shrub habitats as well as zonal mature and old growth forest.

Surveys for tailed frog, a species of special concern on Schedule 1 of SARA, were conducted during May and June of 2005. A total of 35 searches were completed along 21 rivers and streams surveyed on foot in the study area, including the Galore Creek Watershed. No tailed frogs (tadpoles of adults) were detected during these surveys.

6.13.4 Wildlife Habitat Suitability

Wildlife habitat suitability mapping was carried out to assess wildlife habitat for six focal species in the study area: moose, mountain goat, grizzly bear, American marten (*Martes americanus*), hoary marmot (*Marmota caligata*) and western toad. These species were selected based on input from regulating agencies and the Cassiar Iskut-Stikine Land and Resource Management Plan (MSRM, 2000) as well as results of consultation with stakeholders and First Nations.

Terrestrial ecosystem mapping (TEM) and predictive ecosystem mapping (PEM) suitability models were developed for the six focal species within the project area. The methods for developing the TEM and PEM products, accounts detailing focal species biology and the determination of the wildlife habitat ratings (WHRs) for each species are described in Appendix 6-Q, *Galore Creek Wildlife Habitat Ratings and Enhanced Suitability Models for Six Focal Species - 2004 to 2005.*

In addition to these models, refined habitat models referred to as "enhanced suitability models" were created to generate more-accurate models of habitat suitability for the six focal species. The models were developed using a combination of available digital layers, including ecosystem mapping (TEM and PEM models); terrain resource inventory mapping (TRIM) topographic models; wetlands inventory; and important habitats identified during the course of field inventories. The TEM and PEM products developed for the project were incorporated as either a contributing component of the enhanced models (moose, goat, western toad breeding and hoary marmot) or provided the primary layer for the enhanced models (grizzly bear, western toad terrestrial and marten). The methods, model parameters and results (with associated maps) of the enhanced suitability models are described in detail in Appendix 6-Q referenced above.

The study area for ecosystem mapping was defined ecologically based on the watershed boundaries and included approximately 5,760 km^2 of PEM mapped area, of which 370 km^2 was also TEM mapped (Figure 6.13-11). The TEM mapped areas were further divided into three sub-study areas: the access corridor (including the filter plant), aerodrome facility (including the Porcupine River area) and mine area (including the Galore Creek Valley).

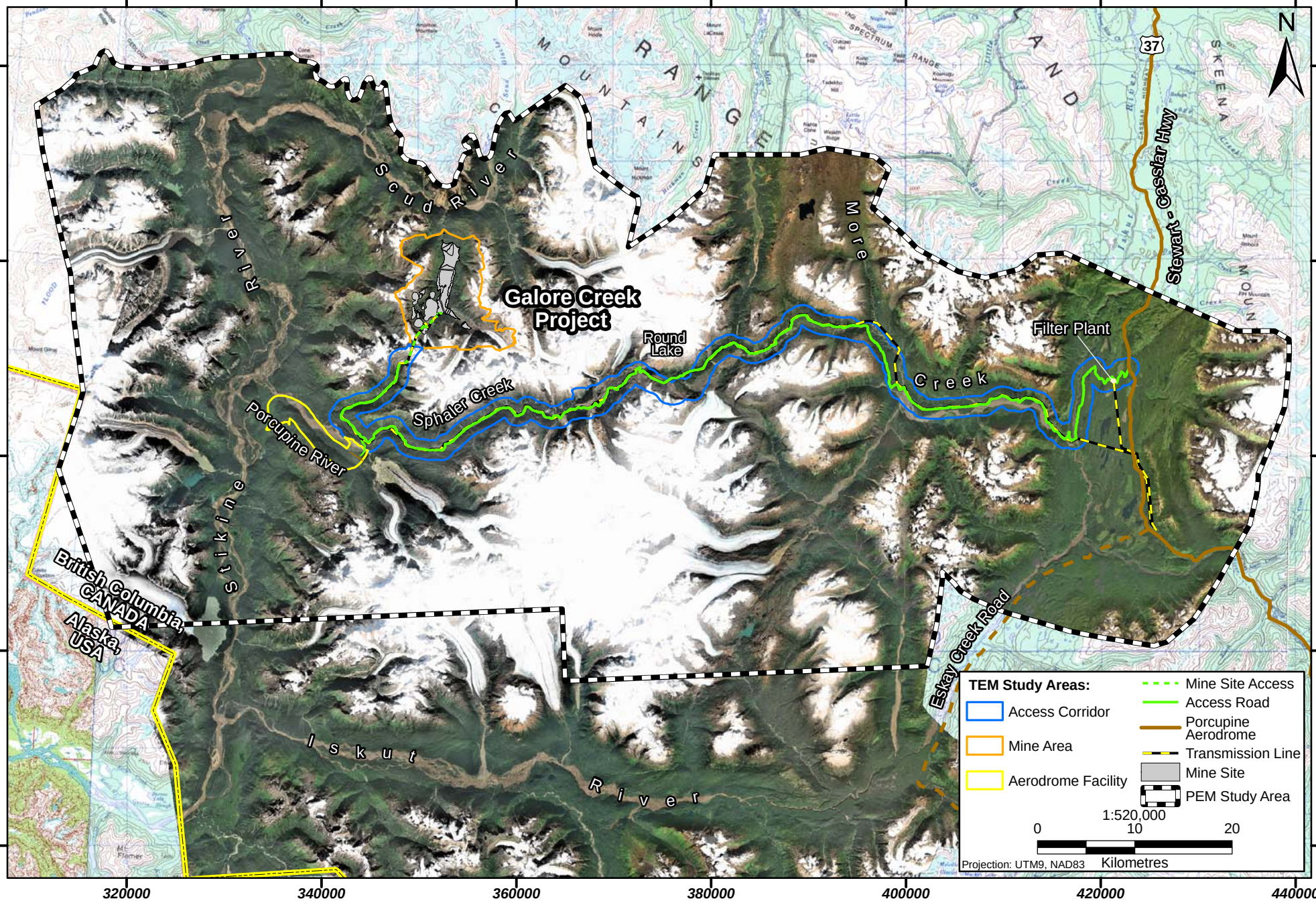

FIGURE 6.13-12

Galore Creek TEM and PEM Study Areas

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Habitat ratings were developed for the following:

- moose – winter
- mountain goat – natal (summer) and winter
- grizzly bear – spring, summer and fall
- American marten – winter
- hoary marmot – growing season (spring, summer and fall)
- western toad – terrestrial and breeding (aquatic)

"Suitable" habitat includes areas assigned an enhanced suitability rating (ESR) of 1 to 3 for the 6-class ranking scheme that includes moose, mountain goat and grizzly bear; as H and M for the 4-class ranking scheme that includes American marten and hoary marmot; and as U for the 2-class ranking scheme that pertains to western toad.

6.13.4.1 Moose

The modelling of moose winter habitat was identified as a priority for the project because of the importance of moose as a food resource for humans as well as the economic contribution realized from their harvest.

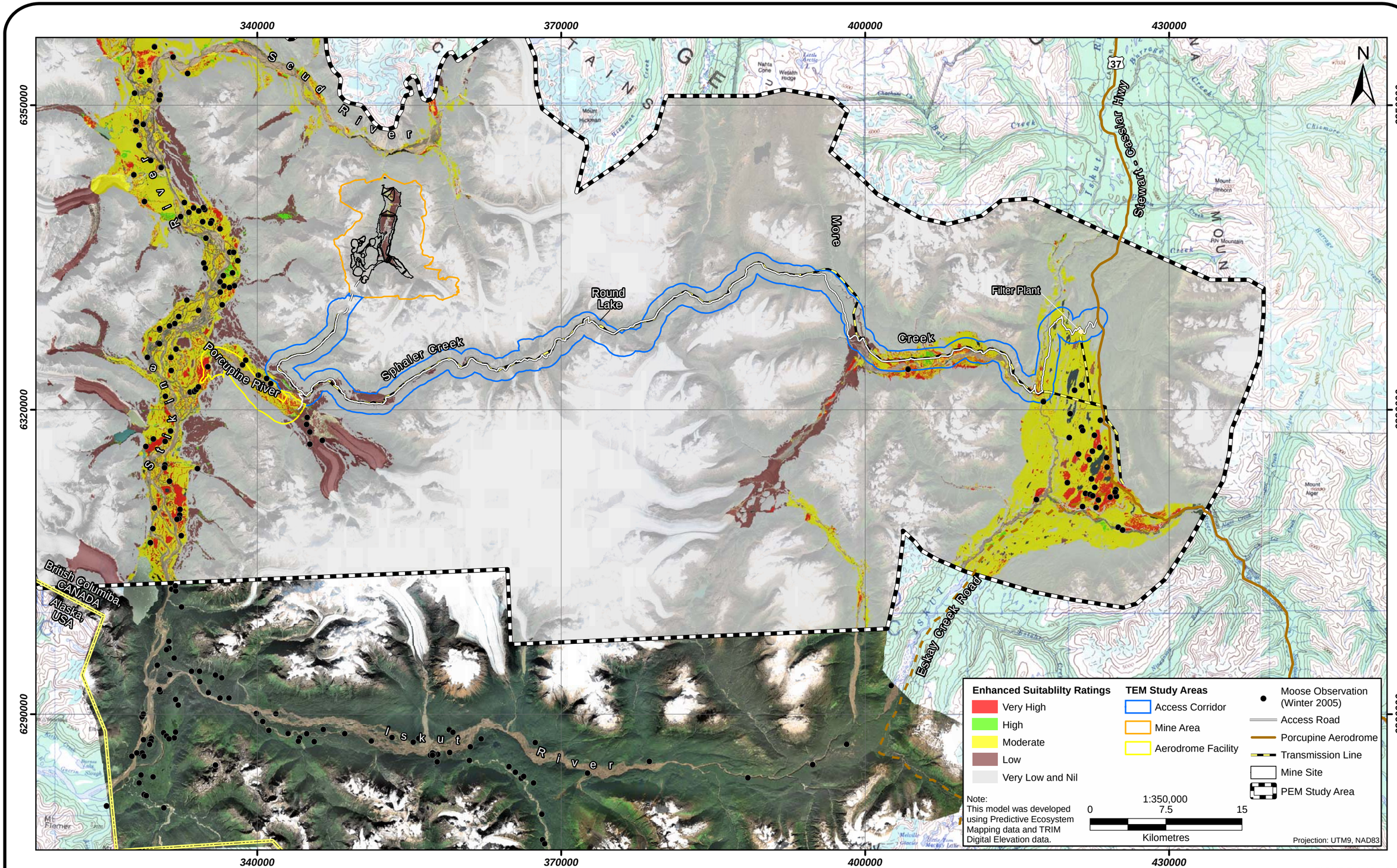
While other habitats are also important, it is generally acknowledged that winter habitat is generally the limiting factor dictating regional moose land base carrying capacity, owing to the increased energy demands from moving through snow pack and the reduced nutritional quality of forage. Snow depths greater than 70 cm may impede moose movement (Karns, 1998), but low temperature does not appear to be a factor precluding moose use of habitat. No critical low temperature appears to have been recorded, and moose have been observed to be unaffected by temperatures as low as -40^{o}C (Peek, 1998). In winter moose require up to 20 kg of browse per day (MELP, 2000), with preferred browse species including willow (*Salix* spp.), red osier dogwood (*Cornus stolonifera*), high bush cranberry (*Viburnum edule*) and scrub birch (*Betula glandulosa*).

Filter Plant and Access Corridor

Highly suitable moose winter habitat along the access corridor was found to be restricted to areas of the lower More Creek (Figure 6.13-12). The dense shrub layer associated with the ICHwc BEC zone provides important winter range for moose.

Aerodrome Facility

The Porcupine aerodrome will be developed in an area adjacent to highly suitable and occupied moose winter range. The Porcupine River is quite braided and includes small islands, channels and bars that are often associated with willow production (Plate 6.13-12). During winter the river freezes over, allowing moose to access this willow forage and to travel across the ice to exploit smaller patches along the river banks.



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Enhanced Habitat Suitability Moose (Winter) Model and Winter Moose Survey Observations

FIGURE 6.13-13

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Mine Area

Since the mine area is located at elevations >500 m, this area is not suitable for moose winter range.

Plate 6.13-12 Highly suitable winter habitat for moose, Porcupine River, 2005.

6.13.4.2 Mountain Goat

The focal areas for mountain goat within are natal habitat (synonymously defined as summer habitat, given the similarities) and winter habitat. Among ungulates, mountain goats tend to have the greatest overlap between natal and growing season habitat and winter range. Hawkes (2003) identified a 70% overlap in the summer and winter range of radio-tracked goats. The presence of escape cover for predator avoidance, which includes steep precipitous terrain, is the most important feature of goat habitat. Mountain goat can exploit a wide range of forage, including conifer litterfall, shrubs and lichen in winter, and grasses, sedges and herbs in the growing season from spring to fall (Foster and Rahs, 1981; Fox and Smith, 1988). Thermal cover, including closed canopy forest, can also be an important component of goat winter range as it provides snow interception and arboreal forage such as conifer and lichen litterfall (Demarchi *et al.*, 2000).

Filter Plant and Access Corridor

Suitable goat summer and winter habitat identified within the TEM area was found mostly above the access corridor (Figures 6.13-13 and 6.13-14). Other locations included the entrance to More Canyon (Plate 6.13-13), low-elevation habitat at the access road crossing of the Iskut River and low-elevation summer habitat along Sphaler Canyon.