



**APPENDIX 6.11-A
Wildlife Environment Baseline Report**

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EXECUTIVE SUMMARY

This document provides an overview of the wildlife environment of the Kitsault Mine Project (proposed Project) to support the Application for an Environmental Assessment Certificate for the proposed Project. Wildlife baseline studies were conducted in 2009 and winter 2010 by Rescan Environmental Services Ltd (Rescan) and in June 2010 by AMEC Earth and Environment (AMEC). The results of 2009 wildlife baseline surveys are reported in *Kitsault Project Wildlife Characterization Baseline* (Rescan 2010b). This report provides a summary of the Rescan (2010b) wildlife baseline report, 2010 wildlife surveys (Rescan 2010e), and presents the results of the 2010 summer wildlife field surveys.

Field studies within the baseline Local Study Area (LSA) and Regional Study Area (RSA) confirmed the presence of seventeen species of conservation concern as defined by provincial and federal standards.

Four amphibian species were detected including Columbia spotted frog, long-toed salamander, rough-skinned newt, and western toad, a species of conservation concern. No reptiles were observed incidentally in the field and no reptile species of conservation concern are expected to occur in the terrestrial LSA.

Twenty-six bird species of conservation concern could potentially occur in the Project area. Thirteen of these species were identified during baseline field surveys. Evidence of breeding activity for two species of raptor (bald eagle and an unidentified hawk) was documented through observations of nest sites, all of which were located outside the LSA. No northern goshawk were detected during call playback surveys. While 42 terrestrial bird species were identified, two species of conservation concern were observed: olive-sided flycatcher and sooty grouse. Ten wetland birds were identified along lakes, ponds, or wetlands. Breeding evidence was confirmed for six of these species including Canada goose, Barrow's goldeneye, northern shoveler, mallard, Pacific loon, and red-throated loon. None were identified as species of conservation concern. The marine bird surveys recorded 35 marine birds. Eleven species of conservation concern were observed during surveys. Three of these are both provincially and federally listed (marbled murrelet, great-blue heron *fannini* subspecies and horned grebe) while the remaining eight are provincially listed. None of these species were confirmed as breeders; however, the marbled murrelet is the only marine bird species of conservation concern likely breeding in the study area.

Riparian areas provide important foraging and roosting habitat for bats. Most activity was associated with riparian areas. Nine species of bat were identified as potentially occurring within the LSA. From these, five are likely to occur, four are possible and two species (little brown myotis and western long-eared myotis) were confirmed.

The terrestrial LSA does not provide good mountain goat habitat, nor does it support a large mountain goat population. However, goats do use some parts of the study area for their life requisites. Low elevation forested habitats used in the summer were also considered

important year-round for goats. The goats were found in a range of elevations and slopes, and were primarily associated with escape terrain across the seasons of survey.

Moose and Stika black-tailed deer were uncommon and they avoided intermediate-aged conifer stands with extremely thick canopies such as the lowlands separating the north shore of Alice Arm from Observatory Inlet. In the winter, when snowpack conditions are deeper than normal, moose are mostly restricted to the Kitsault River and estuary. Low elevation areas of Alice Arm also supported some wintering moose.

A grizzly bear regional specialist (A. Grant MacHutchon) was contracted to map and field assess important grizzly bear habitat polygons in the wildlife RSA and access road for the proposed Project. This mapping program was completed during the summer 2010. The *Kitsault Mine Project Grizzly Bear Habitat Mapping* report (MacHutchon 2011) is provided in the appendix of this report. In summary, much of the proposed Project site is of moderate (class 3) value for grizzly bear. This is mainly due to the bog / fen complexes northeast of the old Kitsault mine site, which is of moderate suitability for grizzly bear. Grizzly bears may occasionally use the area, most likely in the late summer or fall when food availability declines at low elevations and some bears move to higher elevations to feed on late phenology graminoids and forbs or huckleberries and blueberries. There may also be seasonal movement through the area in spring as some grizzly bears, particularly adult males, move between the Kitsault River and the Nass River valley.

The marine mammal surveys recorded observations of six marine mammal species consisting of harbour porpoises, harbour seals, a sea lion species, humpback whale, an unidentified whale species, and river otters. Six species of conservation concern potentially occur in the marine study area, and two were observed: harbour porpoise (blue-listed in BC and special concern by COSEWIC); and humpback whale (blue-listed in BC and threatened by COSEWIC). Although not observed, orcas may occasionally occur in the marine study area and likely follow the salmon runs associated with Alice Arm Chinook.

ACRONYMS, ABBREVIATIONS AND DEFINITIONS

Abbreviation	Definition
AMEC	AMEC Earth & Environmental
Amsl	Above Mean Sea Level
Application (the)	The proponent's Application for an Environmental Assessment Certificate for the proposed Project, made under section 16 of the British Columbia <i>Environmental Assessment Act</i>
AT	Alpine tundra
BBS	Breeding Bird Survey
BC	British Columbia
BC CDC	BC Conservation Data Center
<i>BCEAA</i>	British Columbia <i>Environmental Assessment Act (2002)</i>
BC EAO	BC Environmental Assessment Office
BC ILMB	BC Integrated Land Management Bureau
BC MFLNRO	BC Ministry of Forests Lands and Natural Resource Operations
BC MOE	BC Ministry of Environment
BC MOF	BC Ministry of Forests
BC MSRM	BC Ministry of Sustainable Resource Management
BEC	Biogeoclimatic Ecosystem Classification
BGC	Biogeoclimatic
<i>CEA Act</i>	<i>Canadian Environmental Assessment Act (1992)</i>
CLIR	Cross-linked Information Resources
CLO	Clary Lake Outlet
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPS	Call play-back survey
CWD	coarse woody debris
CWH	Coastal Western Hemlock
CWHwm	Coastal Western Hemlock wet maritime
CWHws1	Coastal Western Hemlock wet subarctic submontane variant
CWHws2	Coastal Western Hemlock wet subarctic montane variant
CWS	Canadian Wildlife Service
E	easting
EBM	Ecosystem Based Management
FSR	Forest Service Road
GPS	Global Positioning System
HSI	Habitat Suitability Index
<i>ibid</i>	The same reference as previously noted
LLC	Lower Lime Creek
LSA	Local Study Area
LRMP	Land and Resource Management Plan

Abbreviation	Definition
MH	Mountain Hemlock
MHm2	Mountain Hemlock moist maritime leeward variant
MHmmp	Mountain Hemlock moist maritime parkland subzone
n=	number of species / sites / items
N	northing
NFA	Nisga'a Final Agreement
Nisga'a Nation	The Nisga'a Nation as represented by the Nisga'a Lisims Government
NTS	National Topographic System
NWA	Nass Wildlife Area
proponent (the)	Avanti Kitsault Mine Ltd.
proposed Project (the)	Kitsault Mine Project
Rescan	Rescan Environmental Services Ltd.
RISC	Resource Information Standards Committee
RSA	Regional Study Area
ROW	right-of-way
SARA	<i>Species at Risk Act (2002)</i>
SLI	Sad Lake Inlet
SLO	Sad Lake Outlet
SRMP	Sustainable Resource Management Plan
SU	Sample Unit
TEM	Terrestrial Ecosystem Mapping
ULC	Upper Lime Creek
UTM	Universal Transverse Mercator
VRPC	Varied Radial Point Count

UNITS OF MEASUREMENT

Abbreviation	Definition
°	degree
°C	degrees Celsius
cm	centimetre
m	metre
m ³	cubic metre
'	minute
"	second
d	day
km	kilometre
km/hr	kilometre per hour

Abbreviation	Definition
km ²	kilometres squared
%	percent

1.0 WILDLIFE ENVIRONMENT

1.1 Introduction

This document provides an overview of the wildlife environment of the Kitsault Mine Project (proposed Project) to support the Application for an Environmental Assessment Certificate for the proposed Project, made under section 16 of the British Columbia *Environmental Assessment Act 2002 (BCEAA)* (Application) (Government of BC 2002a). Wildlife baseline studies were conducted in 2009 and winter 2010 by Rescan Environmental Services Ltd (Rescan) and in June 2010 by AMEC Earth and Environment (AMEC). The results of 2009 wildlife baseline surveys are reported in *Kitsault Project Wildlife Characterization Baseline* (Rescan 2010b). 2010 winter baseline surveys are summarised in a wildlife survey trip report (Rescan 2010e). 2010 grizzly bear habitat assessment is reported in *Kitsault Mine Project Grizzly Bear Habitat Mapping* (MacHutchon 2011; provided in Appendix 2 of this report). The following sections provide a summary of the 2009 and 2010 baseline wildlife surveys.

1.1.1 Objectives

The overall goal of conducting wildlife baseline inventories was to characterise the wildlife community. Specific objectives of the 2009 wildlife baseline study were to:

- Identify wildlife species of conservation concern and focal species and / or groups occurring or potentially occurring in the study area;
- Characterise the terrestrial and marine mammal community and collect baseline information on focal species presence and their distribution in the study area;
- Characterise the avian community and collection of baseline information on species presence and diversity in the study area; and
- Characterise the amphibian community to determine species presence and identify species of conservation concern in the study area.

The 2010 wildlife field program complemented the 2009 field surveys, and included a winter and summer survey to fill any data gaps resulting from changes to the proposed Project footprint. Specific objectives of the 2010 wildlife baseline field program were to:

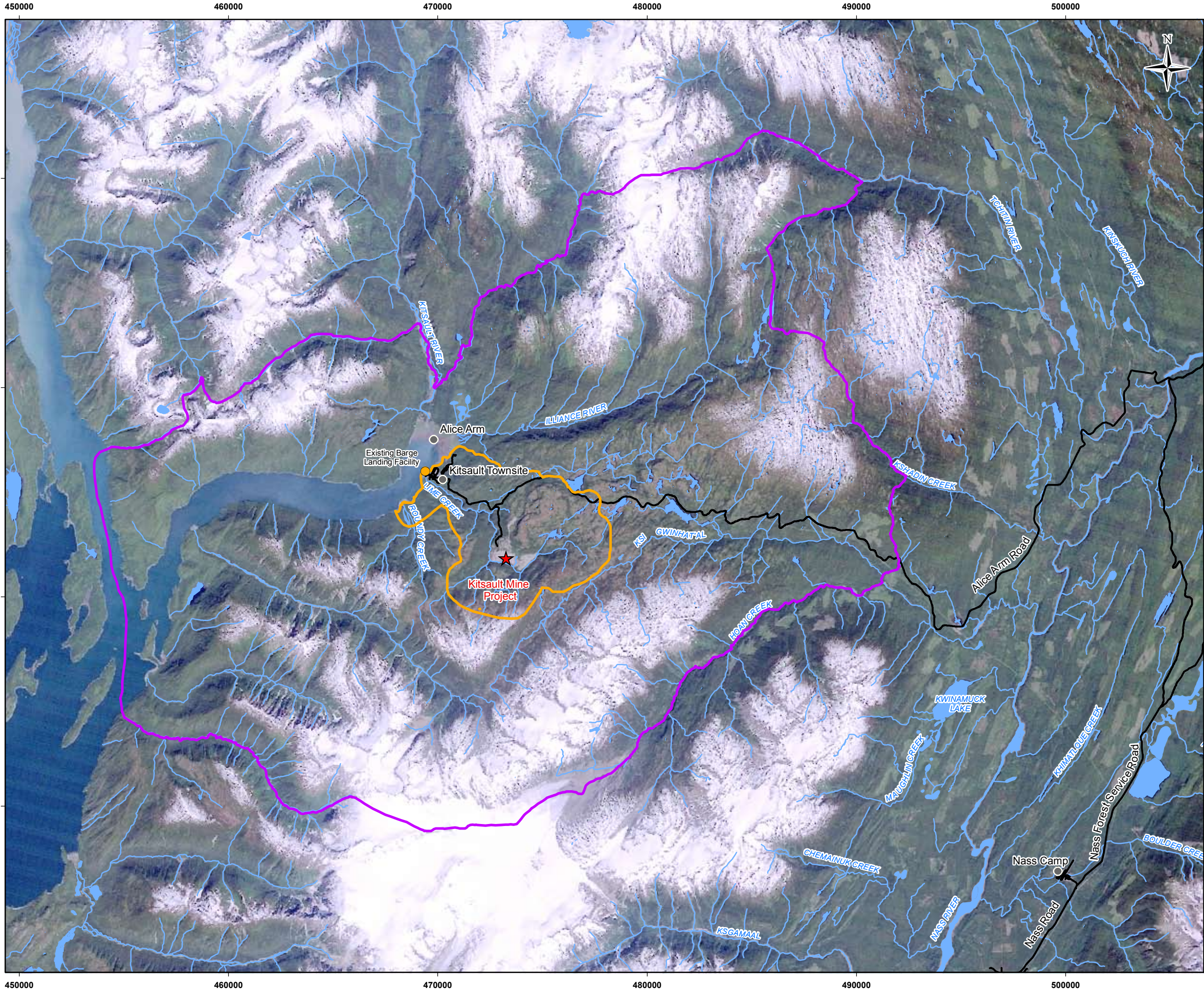
- Evaluate the use of the study area by mountain goats during winter, particularly in suitable habitats that were not surveyed in 2009;
- Establish baseline information on terrestrial breeding bird species present in the area of the extended footprint; and
- Determine the presence of coastal tailed frog and western toad in areas of the extended footprint.

1.1.2 Study Area

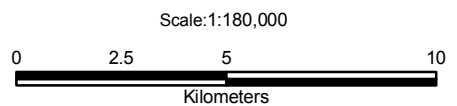
Two parts to the study area, the LSA and a Regional Study Area (RSA), were considered for terrestrial wildlife inventories for the proposed Project (Figure 1.1-1). The baseline LSA was

based on the Terrestrial Ecosystem Mapping (TEM) area (Rescan 2010d). The baseline RSA was delineated to reflect an area anticipated to provide habitat for wildlife species that may come in contact with proposed Project infrastructure during the course of a season or lifetime. Species information, including home range sizes, habitat use, and seasonal movement patterns, were considered when selecting the RSA boundary. Other ecological factors, such as height of land (which can act as a barrier to movement), were also considered when delineating the RSA and LSA boundaries.



In 2009, two study areas were also considered for the marine wildlife inventories. The marine wildlife LSA was selected to encompass all water and coastal areas within Alice Arm, and the marine wildlife RSA was delineated to reflect the area anticipated to provide marine wildlife habitat (marine mammals in particular) for species that may enter the LSA during the course of a season or lifetime.



- Legend**
- Populated Place
 - ★ Kitsault Mine Project
 - Existing Barge Landing Facility
 - Road
 - Highway
 - Forest Service Road
 - Stream Network
 - Parks & Protected Area
 - River & Lake
 - ▭ Local Study Area
 - ▭ Regional Study Area



Reference
 Base Data: Geobase Road 1:20,000 (TRIM)
 Water feature: Watershed Atlas 1:50,000
 Imagery: Landsat 2006

CLIENT:  Avanti Kitsault Mine Ltd.		
PROJECT: Kitsault Mine Project		
Local and Regional Study Areas for Wildlife		
DATE: June 27, 2010	ANALYST: MY	Figure 1.1-1
JOB No: VE51988	QA/QC: CG	PDF FILE: 11-50-001_study_area.pdf
GIS FILE: 11-50-001.mxd		
PROJECTION: UTM Zone 9	DATUM: NAD83	

\\bby-fs1\by-ee-gis\Projects\VE51988_Kitsault\Mapping\11_wildlife\Baseline\11-50-001.mxd

1.1.3 Background Information Source Review

Background information sources in this study included: *2009 Kitsault Project Wildlife Characterization Baseline* (Rescan 2010b); government publications; peer-reviewed scientific papers; technical reports, unpublished reports; and incidental records. The wildlife data gathered at this site as part of earlier assessments for the proposed Project were also included in this assessment. The information sources are outlined below:

- Within the BC MOE, the Ecosystems Branch provides information on the biodiversity of BC, and the Fish and Wildlife Branch provides legislation and management practices regarding BC's biodiversity;
- BC Ministry of Sustainable Resource Management (BC MSRM) Land and Resource Management Plans (LRMPs), provide information and management strategies for wildlife within the LRMP area;
- BC Integrated Land Management Bureau (BC ILMB) Sustainable Resource Management Plans (SRMPs) provide information and management strategies for wildlife within the SRMP area;
- Interview with, and reports by, BC MOE staff Mr. Rick Keim, R.P. Bio, Ecosystem Biologist Skeena Region (Keim pers. comm. 2010);
- Identification of ungulate winter ranges and wildlife habitat features under the *Forest and Range Practices Act*;
- Technical reports on local wildlife populations;
- Any site-specific data or incidental observations. Data relating to areas outside of the terrestrial study area were also considered, if applicable for any wide-ranging species (e.g., mountain goats (*Oreamnos americanus*));
- The *2009 Kitsault Project Wildlife Characterization Baseline* conducted by Rescan Environmental Services Ltd. (Rescan 2010b); and
- Nisga'a Nation Overview Report – Interim Report for Review by Nisga'a Nation. (Rescan 2010c).

Using data from BC MOE information resource websites, an analysis was conducted to determine the amount of information that was available for the area prior to conducting field work. Other information sources searched and reviewed (all accessed December 2010) included:

- BC Breeding Bird Atlas (<http://www.birdatlas.bc.ca/english/index.jsp>);
- BC MOE's BC CDC data on species biology, ecology, known range and spatial occurrences, as well as species lists and a search of the Rare Element Occurrence Report;
- BC MOE Cross-linked Information Resources (CLIR) (<http://www.env.gov.bc.ca/clir/>);
- BC MOE Species Inventory Web Explorer (<http://www.env.gov.bc.ca/wildlife/wsi/siwe.htm>);

- BC MOE Species and Ecosystem Explorer (<http://a100.gov.bc.ca/pub/eswp/>);
- BC MOE Species Inventory Web Explorer and Ecocat for information on past species and habitat inventories conducted in the study area;
- Biodiversity Atlas (<http://www.biodiversityatlas.org/>);
- Digital mapping data downloaded from BC MOE such as the Species Inventory Database;
- E-Fauna - BC Electronic Atlas of the Wildlife of BC (<http://www.geog.ubc.ca/biodiversity/efauna/>);
- Hectares BC web page (<http://www.hectaresbc.org:22080/app/habc/HaBC.html>);
- North Coast LRMP (BC MSRM 2005) for sub-regional, integrated resource plans that establish the framework for land use and resource management objectives and strategies for detailed land management planning. The study area's Crown land was combined with the Central Coast LRMP in the Coast Land Use Decision to form the Central and North Coast Ecosystem Based Management (EBM) implementation (BC ILMB 2009a);
- Nisga'a Final Agreement (NFA) - The NFA outlines Nisga'a rights to wildlife harvesting in the study area, including moose (*Alces alces*), mountain goat, and grizzly bear;
- Nass South SRMP (BC ILMB 2009b) - This mapping identifies a number of features for the area. The Nass Wildlife Area (NWA) is located along the eastern end of the proposed Project study area and provides no data for the proposed Project RSA. The Central and North Coast EBM defines the tip of the Alice Arm north of the study area as a biodiversity, mining and tourism area;
- Reports including: "Wildlife Habitat Assessment in the Nass Wildlife Area" (Yazvenko et al. 2002), "Moose in the Nass Wildlife Area" (Demarchi 2000), "Moose Winter Range Mapping in the North Coast Forest District" (Pollard 2001);
- Royal BC Museum's Living Landscapes site (<http://www.livinglandscapes.bc.ca/>); and
- Species at Risk Public Registry (http://www.sararegistry.gc.ca/default_e.cfm).

1.2 Species of Conservation Concern

Species of conservation concern include those species listed federally by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and on Schedule 1 of the *Species at Risk Act (SARA)* (Government of Canada 2002) and provincially by the BC Conservation Data Centre (BC CDC) on its Red and Blue lists. Rescan (2010b) identified species of conservation concern occurring and potentially occurring in the Project study area. This list was updated to include observations during 2010 field surveys. Overall, 20 federally listed species at risk and an additional 22 provincially listed species were identified through review of the BC CDC database and SARA registry (Table 1.2-1). Of these, 17 listed species were confirmed to occur and 22 potentially occur (considered likely or possible occurrence but presence not confirmed).

Additional sources of information on species distribution were reviewed to include species that may not have been included in the BC CDC search (BC CDC 2010). Species or groups of species that were deemed biologically, socially, economically, or culturally important, or that may be vulnerable to development include the mountain goat, moose, Sitka black-tailed deer (*Odocoileus hemionus sitkensis*), and black / Kermode bear.

Table 1.2-1: Potentially Occurring Wildlife Species of Conservation Concern in the Regional Study Area

Common Name	Scientific Name	COSEWIC	BC CDC List	SARA	Potentially Present in Study Area	Presence Recorded During Survey	Breeding Confirmed
Amphibians							
Coastal tailed frog	<i>Ascaphus truei</i>	Special concern	Blue	1	Likely	No	No
Western toad	<i>Anaxyrus boreas</i>	Special concern	Blue	1	Likely	Yes	No
Birds							
Sooty grouse	<i>Dendragapus fuliginosus</i>	Not listed	Blue		Likely	Yes	No
Pelagic cormorant	<i>Phalacrocorax pelagicus pelagicus</i>	Not listed	Red		Likely	Yes	No
Great blue heron <i>fannini</i> ssp	<i>Ardea herodias fannini</i>	Special concern	Blue	1	Likely	Yes	No
Northern goshawk <i>laingi</i> ssp	<i>Accipiter gentilis laingi</i>	Threatened	Red	1	Possible	No	No
Peregrine falcon, <i>pealei</i> ssp	<i>Falco peregrinus pealei</i>	Special concern	Blue	1	Possible	No	No
Marbled murrelet	<i>Brachyramphus marmoratus</i>	Threatened	Blue	1	Likely	Yes	No
Tufted puffin	<i>Fratercula cirrhata</i>	Not listed	Blue		Unlikely	No	No
Cassin's auklet	<i>Ptychoramphus aleuticus</i>	Not listed	Blue		Unlikely	No	No
Ancient murrelet	<i>Synthliboramphus antiquus</i>	Special concern	Blue	1	Unlikely	No	No
Common murre	<i>Uria aalge</i>	Not listed	Red		Possible	Yes	No
Band-tailed pigeon	<i>Patagioenas fasciata</i>	Special concern	Blue	1	Unlikely	No	No
Western screech-owl, <i>kennicottii</i> ssp	<i>Megascops kennicottii kennicottii</i>	Special concern	Blue	1	Possible	No	No
Olive-sided flycatcher	<i>Contopus cooperi</i>	Threatened	Blue	1	Likely	Yes	No
Barn swallow	<i>Hirundo rustica</i>	Not listed	Blue		Likely	No	No
Rusty blackbird	<i>Euphagus carolinus</i>	Special concern	Blue	1	Unlikely	No	No
American bittern	<i>Botaurus lentiginosus</i>	Not listed	Blue		Possible	No	No

Common Name	Scientific Name	COSEWIC	BC CDC List	SARA	Potentially Present in Study Area	Presence Recorded During Survey	Breeding Confirmed
American golden-plover	<i>Pluvialis dominica</i>	Not listed	Blue		Possible	No	No
Brant	<i>Branta bernicla</i>	Not listed	Blue		Possible	No	No
Caspian tern	<i>Hydroprogne caspia</i>	Not at Risk	Blue		Possible	No	No
Double-crested cormorant	<i>Phalacrocorax auritus</i>	Not at Risk	Blue		Likely	Yes	No
Horned grebe	<i>Podiceps auritus</i>	Special concern	Yellow		Possible	Yes	No
Red-necked phalarope	<i>Phalaropus lobatus</i>	Not listed	Blue		Possible	Yes	No
Rough-legged hawk	<i>Buteo lagopus</i>	Not at Risk	Blue		Possible	No	No
Surf scoter	<i>Melanitta perspicillata</i>	Not listed	Blue		Likely	Yes	No
Swainson's hawk	<i>Buteo swainsoni</i>	Not listed	Red		Possible	No	No
Tundra swan	<i>Cygnus columbianus</i>	Not listed	Blue		Possible	No	No
Western grebe	<i>Aechmophorus occidentalis</i>	Not listed	Red		Possible	Yes	No
Yellow-billed loon	<i>Gavia adamsii</i>	Not at Risk	Blue		Possible	Yes	No
Brandt's cormorant	<i>Phalacrocorax penicillatus</i>	Not listed	Red		Unlikely	No	No
California gull	<i>Larus californicus</i>	Not listed	Blue		Possible	Yes	No

Mammals

Wolverine, <i>luscus</i> ssp	<i>Gulo gulo luscus</i>	Special concern	Blue		Likely	No	No
Fisher	<i>Martes pennanti</i>	Not listed	Blue		Likely	Yes	No
Grizzly bear	<i>Ursus arctos</i>	Special concern	Blue		Likely	No	No
Keen's myotis	<i>Myotis keenii</i>	Data Deficient	Red	3	Possible	No	No
Northern myotis	<i>Myotis septentrionalis</i>	Not listed	Blue		Possible	No	No
Steller sea lion	<i>Eumetopias jubatus</i>	Special concern	Blue	1	Possible	unknown	No
Grey whale	<i>Eschrichtius robustus</i>	Special concern	Blue	1	Possible	No	No
Harbour porpoise	<i>Phocoena phocoena</i>	Special concern	Blue	1	Likely	Yes	No
Humpback whale	<i>Megaptera novaeangliae</i>	Threatened	Blue	1	Possible	Yes	No
Killer whale, northern resident pop	<i>Orcinus orca</i>	Threatened	Blue	1	Possible	No	No
Killer whale, west coast transient pop	<i>Orcinus orca</i>	Threatened	Red	1	Possible	No	No

1.3 Field Sampling Methodology

The 2009 field program covered the following periods:

- Fall (marine mammal and marine bird);
- Winter (large mammals, furbearers and mountain goat aerial surveys);
- Spring (marine bird); and
- Summer (songbirds, wetland surveys including water-associated birds and amphibians, raptor / northern goshawk (*Accipiter gentilis*), bat, marine mammals).

The 2010 field program included a winter survey for mountain goats and a summer survey for terrestrial breeding birds and amphibians, and a grizzly bear habitat assessment (MacHutchon 2011). Table 1.3-1 below provides further detail about the timing of field surveys.

Table 1.3-1: Timing and Survey Effort Associated with Components of the Wildlife Field Program (2009 and 2010)

Survey Type	Timing	Number of Days
2009		
Mountain goat	17-19 February, 16 March, 5 August	6
Moose and Sitka black-tailed deer	16 / 18 March	2
Bat	4-7 August	4
Furbearer (incidental sightings)	March to 31 August	Incidental sightings only
Marine mammals	9-11 June, 16-18 September	6
Raptor	22-28 June	7
Songbird	22-28 June	7
Wetland bird	6 / 7 August	2
Marine bird	17-19 March, 10-12 May, 5-7 August and 17 / 18 September	11
Amphibian	5-7 August	3
2010		
Mountain goat	17-20 February	4
Amphibian	26-29 June	4
Breeding bird	28-30 June	3
Grizzly bear habitat	26-29 June	4

The focus of the field surveys was to determine the presence of wildlife, but specific focus was on species at risk and regionally significant species as defined by BC MOE (BC CDC 2010). Regionally significant species are species that are not at risk provincially, but are considered important to a region of BC, rely on habitats that are not protected under the

Forest and Range Practices Act (Gov BC 2002b), and may be adversely impacted by forest or range practices.

Wildlife presence and use of the proposed Project RSA was assessed using habitat-specific sampling techniques. Locations sampled during the 2009 field survey period and detailed methods for each survey type are presented in Rescan (2010b) and summarised below.

1.3.1 Amphibians

1.3.1.1 Western Toad Surveys

Western toad (*Anaxyrus boreas*) surveys were conducted in the terrestrial LSA in 2009 by Rescan and 2010 by AMEC. The objectives of the surveys were to:

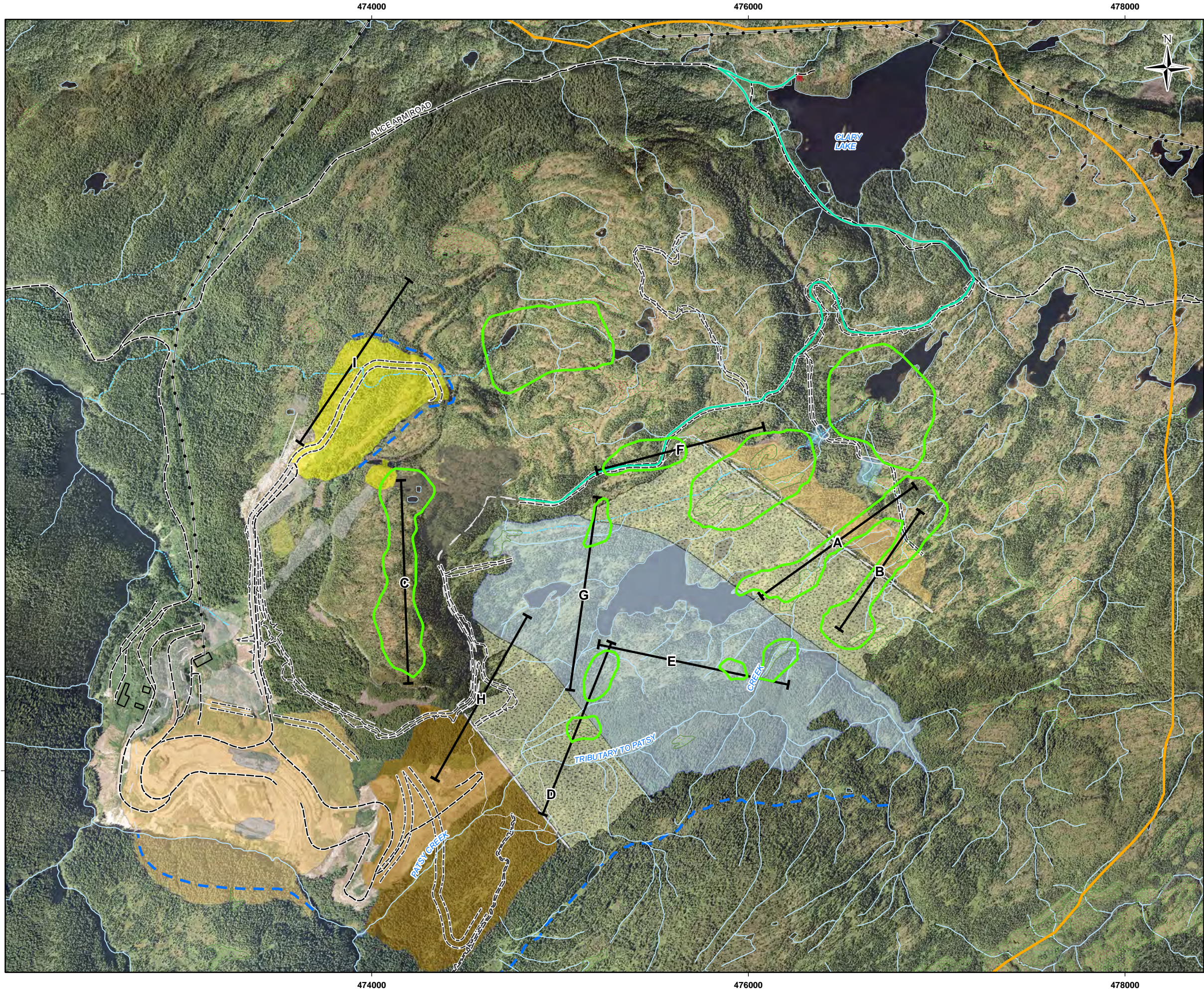
- Determine the presence of western toad within the LSA;
- Conduct nocturnal road surveys for western toad; and
- Survey wetlands of the proposed tailings management facility and along the existing road.

Sample sites are presented on Figure 1.3-1. Amphibian sampling methods are presented below.

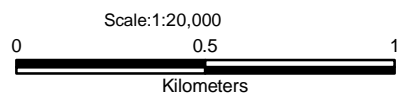
1.3.1.1.1 Visual Encounter Surveys (2009-2010)

Visual encounter surveys for western toad adults and tadpoles were conducted at 25 wetlands and along Roundy Creek in 2009 (Rescan 2010b). Twenty-four sites were evaluated from the air and those with the greatest potential to contain amphibians were ground-truthed in 2009. Surveys were also conducted along small ephemeral pools around Clary and Patsy Lake by AMEC in 2010.

Suitable habitat required the following criteria: wetlands with an open canopy; shallow sloping edges; and muddy substrate. The shorelines of chosen wetlands were surveyed for tadpoles and adult amphibians. If the presence of individuals was confirmed, waypoints using Universal Transverse Mercator (UTM) coordinates were taken at the surveyed wetlands. Each amphibian encountered was aged as adult or young-of-the-year.



- Legend**
- 1 km Bird survey transect
 - Transmission line
 - Road
 - Clary Lake Freshwater Pipeline
 - Diversion Ditch
 - Process Plant
 - Open Pit
 - Ore Stockpile
 - Topsoil Stockpiles
 - Clary Lake Freshwater Intake
 - East Waste Rock Management Facility
 - Tailings Beach
 - TMF Supernatant Pond
 - Local Study Area
 - Amphibian sampling location



Reference

1. Base Data
Geobase 1:20,000 (TRIM)
Land and Resource Data Warehouse 1:20,000 (TRIM)
Image: Orthophoto 40cm
2. Project Infrastructure
Supplied by AMEC and Knight Piesold December 2010
3. Survey Data
Rescan 2009

CLIENT: Avanti Kitsault Mine Ltd.		
PROJECT: Kitsault Mine Project		
AMEC 2010 Amphibian & Terrestrial Bird Surveys		
DATE: December 2010	ANALYST: MY	Figure 1.3-1
JOB No: VE51988	QA/QC: LM	
GIS FILE: 11-50-013.mxd		PDF FILE: 11-50-013_amec_amphibian_bird_2010.pdf
PROJECTION: UTM Zone 9	DATUM: NAD83	

Y:\GIS\Projects\VE\VE51988_Kitsault\Mapping\11_wildlife\Baseline\11-50-013.mxd

1.3.1.1.2 Nocturnal Road Surveys (2009)

Road surveys to detect active adult western toads (Rescan 2010b) were conducted on foot or by vehicle in accordance with RISC protocols (RISC 1998b). The start and end of survey locations, the length of search, and the species, number, and location of any amphibians encountered were recorded.

1.3.1.2 Coastal Tailed Frog Surveys (2010)

Time-constrained searches for coastal tailed frogs (*Ascaphus truei*) were completed as part of the fisheries invertebrate sampling program by AMEC in 2010. Surveys were conducted as follows:

- Sampling started at the downstream end of the section of stream to be sampled;
- Approximately three to four hours were spent at each site sampling up and down the stream banks;
- Teams inspected the stream and stream bank, up to 1 metre (m) past / above the water's edge. At each station, bankfull widths were collected. While crews collected periphyton, and conducted Surber and kick-net sampling, rocks and debris were examined for tadpoles;
- Objects such as rocks and coarse woody debris (CWD) were overturned and scanned for clinging tailed frog tadpoles;
- Larger anchored rocks were searched by hand;
- Habitat conducive to tailed frogs was sampled during the benthic sampling (i.e., slope and cobble / boulder substrate with a limited amount of fines); and
- A dip net placed downstream of the cobbles / rocks being searched / overturned was used to catch dislodged material.

Sample stations and sample dates are listed below:

1. 1 September 2010: Lower Lime Creek (LLC) just above the road crossing.
2. 5 September 2010: Upper Lime Creek (ULC) just above Patsy Creek.
3. 4 September 2010: Patsy Creek just above Lime Creek.
4. 11 September 2010: Clary Lake Outlet (CLO) about 100 m downstream of lake.
5. 11 September 2010: Sad Lake Inlet (SLI).
6. 31 August 2010: Sad Lake Outlet (SLO).

1.3.2 Birds

Bird surveys were conducted in the LSA in 2009 (Rescan 2010c) and by AMEC in 2010. Figure 1.3-1 presents transects used for AMEC's 2010 terrestrial breeding bird survey.

1.3.2.1 Raptor Surveys (2009)

The overall objective of the raptor surveys was to determine the presence and distribution of raptor species (i.e., hawks, eagles, osprey) in the LSA, with a focus on the northern goshawk. The northern goshawk is a forest raptor that is widely distributed in Canada. The *laingi* subspecies, which is red-listed in BC, federally listed as threatened by COSEWIC and protected under Schedule 1 of SARA, is restricted to coastal BC west of the Coast Mountains (BC MOE 2008). The proposed Project study area falls within the possible range overlap of *A. g. laingi* and *A. g. atricapillus* (yellow-listed in BC). Specific objectives of the raptor surveys were to:

- Conduct call-playback surveys for northern goshawk presence;
- Record incidental observations of raptors and raptor nest presence; and
- Record any other raptor species of conservation concern in the LSA and RSA.

The LSA boundary was used as a sample area for the northern goshawk call-playback surveys. However, all incidental encounters with raptors were recorded. Active and inactive raptor nests were also recorded.

The following protocols were followed for the call-playback surveys:

- Surveys were conducted each day after completion of the varied radius point count surveys (see below) for songbird / terrestrial breeding birds;
- Following completion of the last varied radius point count survey station, observers waited for two minutes and then performed a call-playback survey for the northern goshawk;
- Survey effort was directed toward mature forests wherever possible as these are areas of northern goshawk nesting;
- Observers waited five and a half minutes after the broadcast period to record any potential response before moving on, which amounted to eight minutes per call-playback survey station;
- The time, species, sex, age and type of response (visual / aural) was recorded. Field crews also recorded the responses of other hawks and mimics (e.g., jays) to a broadcast; and
- Any incidental observations of raptors or raptor nests were also documented by field staff in other disciplines and during other wildlife surveys.

1.3.2.2 Terrestrial Breeding Bird Surveys (2009)

Breeding bird surveys were designed to collect baseline information on species presence, abundance, richness, and diversity. The specific objectives were to:

- Establish species baseline information on terrestrial / songbird breeding bird species present in the LSA;

- Assess species richness, abundance, diversity, and equitability (evenness) throughout the terrestrial LSA and RSA; and
- Identify terrestrial breeding bird species of conservation concern.

The breeding bird surveys were conducted as follows:

- Effort was focused on the terrestrial LSA;
- Surveys were conducted following standard varied radius point count inventory methods for songbirds (Ralph et al. 1995);
- Surveys began at sunrise and continued until approximately 11:00 hours;
- Surveys were not carried out when wind speed exceeded approximately 30 kilometres per hour (km/h) or during rain or snow storms;
- For point count stations that were difficult to reach, the observers were transported via helicopter and dropped at a distance that minimised flushing birds in the survey area;
- Each transect was 1 kilometre (km) long;
- Point counts were approximately 200 m apart; and
- At each point, count location data were collected on the number of birds, species, breeding behaviour, habitat descriptions and weather.

Near the wharf along Alice Arm, the point counts were conducted at variably spaced locations; the same point count methodology was followed. Minor variation included recording birds encountered within a 50 m radius. The data within 50 m and the wharf point count data were analysed separately.

The following protocol was followed for data analysis:

- At each point count location, bird observations were recorded for 5 minutes within 0 to 50 m and 50 to 100 m radii;
- Incidental observation included birds flying overhead and >100 m away except at the wharf this included birds >50 m away;
- Data collected within 100 m of the observer for mine site transects, within 50 m for the wharf site point count stations, and within the five minute survey period were included for comparisons of abundance, richness, diversity, and equitability; and
- For the purpose of consistent data analysis, if more than five stations were surveyed along a transect line, data from additional point count stations were randomly omitted to ensure only five point count stations were used for analyses.

Data were analysed for abundance, species richness, diversity, and equitability using Shannon's H equation and the Shannon-Weiner index of diversity (Rescan 2010b). A linear mixed effects model was generated using point count data as a random effect and habitat type (plant and cover type) as a fixed effect. This allowed comparison of the four metrics

across habitat types. Poisson regression was used, as this was more suitable for the abundance and richness analysis (Rescan 2010b).

1.3.2.3 Terrestrial Breeding Bird Surveys (2010)

Transects and point counts were also used for the breeding bird surveys in 2010. The surveys were conducted to fill gaps in the 2009 data resulting from changes to the proposed Project footprint. The 2010 survey used the same methods as the 2009 survey, however due to the lack of data collected due to inclement weather it was not used for analysis. The objectives of the 2010 breeding bird surveys were to:

- Establish species baseline information on terrestrial / songbird breeding bird species present in the LSA; and
- Identify terrestrial breeding bird species of conservation concern in proximity to Patsy Lake.

1.3.2.4 Wetland Bird Surveys (2009)

The wetland bird community was investigated within the LSA (Rescan 2010a). Some species of wetland birds were anticipated to use the LSA for spring and fall staging and localised breeding. The objectives of the wetland bird surveys were to:

- Determine species composition and distribution of wetland birds; and
- Identify species of conservation concern.

The following field program methods were used:

- Aerial and ground surveys were conducted concentrating on freshwater sites at higher elevations;
- Wetlands in the terrestrial LSA were inventoried for wetland birds using point counts. Stand watches were performed for approximately 30 minutes;
- Species and individuals, number, gender (if possible), age (if possible), and behaviour were recorded using binoculars and spotting scopes;
- Wetland bird species observed incidentally during other wildlife field surveys were also recorded;
- Wetlands were classified into three categories: shallow wetland; pond; or lake; and
- Wetland birds were grouped as dabbling ducks, diving ducks (including sea ducks), geese, loons, shorebirds, and gulls.

One aerial survey was conducted on 6 August 2009, for 1.52 hours, and three ground surveys were conducted on 7 August 2009, within the LSA and outside of the study area (Rescan 2010b).

1.3.2.5 Marine Bird Surveys (2009)

The presence and abundance of marine bird species were documented within the proposed Project marine LSA to determine areas of particular or seasonal importance to marine birds (Rescan 2010b). Specific objectives of the surveys were to:

- Establish baseline information for marine bird presence and relative abundance;
- Survey for wintering, migratory, and breeding marine birds that are using the marine study area;
- Establish baseline information on locations that are particularly important for promoting high species richness or diversity; and
- Determine whether any species with a conservation listing use the marine LSA.

The following methods for fieldwork were used:

- Four ground-based stationary counts of marine birds were conducted using the RISC standards (RISC 1998b) in the Alice Arm Inlet;
- Surveys were conducted in the winter (17-19 March), spring (10-12 May), summer (5-7 August), and fall (17-18 September) 2009;
- A spotting scope and binoculars were used to assist in species identification;
- Species, number of individuals and gender of individuals (if possible) were recorded;
- Surveys were conducted for 60 minutes at each point. All birds observed within a 300 m radius were recorded. Individuals observed outside of the 300 m or after the 60 minute sampling window were considered incidental observations and not included in the analysis; and
- All other wildlife species (e.g., raptors, mammals, songbirds) were also recorded as incidental observations.

Data analysis for marine birds followed the same approach as for the Rescan 2009 terrestrial breeding bird surveys (Rescan 2010b).

1.3.3 Terrestrial Mammals

1.3.3.1 Bats

The objectives of the 2009 bat baseline study (Rescan 2010b) were to:

- Determine if, and to what extent, bats (with special consideration for species of conservation concern) exist in the LSA; and
- Identify presence, diversity, and distribution of bats.

An information review of range maps and species habitat requirements was conducted to determine potentially occurring bat species prior to the field surveys. Bat sampling locations were chosen based on the likelihood that species occurred within the LSA. Species were placed into two categories: likely; and possible.

The surveys used two methodologies: mist net captures; and recording ultrasonic calls (echolocation). Mist net captures and echolocation call surveys were conducted at four sites on 4-7 August 2009. Call characteristics were reviewed to assist in species identification during sonogram analysis. Inventory methods followed RISC standards (RISC 1998a) and were as follows:

- Use of a mist net and an Anabat II echolocator bat detector;
- Surveys were timed between dusk and dawn;
- Sample sites were selected based on preferred species foraging habitat, which included sites next to mature or intermediate forest. These areas also provide snags suitable for roosts;
- Location, weather conditions, and duration were recorded at each sampling site;
- Captured bats were photographed and keyed to species using provincial keys; and
- Morphometrical data including mass, forearm length, calcar and tragus lengths (diagnostic characteristics for species identification), ear length, as well as age class and sex were recorded.

1.3.3.2 Mountain Goats

The goal of the mountain goat study was to collect baseline information on mountain goat distributions within the terrestrial LSA and RSA. Specific objectives were to:

- Establish a baseline estimate of the summer and winter population size, herd composition, and distribution of mountain goats; and
- Identify characteristics of occupied summer and winter habitat.

Methods used to inventory mountain goats followed RISC protocols (RISC 2002):

- Helicopters were used to traverse the LSA and RSA. Personnel included two observers, a pilot, and a navigator;
- The helicopter maintained an average speed of approximately 100 km/hr. However, speed varied with terrain and sightability; faster over open areas where visibility was good, and slower over areas where visibility was obscured by vegetation cover;
- During summer, the surveys focused on areas above the tree line, as it is difficult to see ungulates under a closed canopy forest. Forested areas associated with escape terrain were surveyed during winter; and
- Flight lines were spaced at intervals of approximately 200 m.

Mountain goat surveys were conducted in terrestrial LSA SUs that contained goat escape terrain. Eight different SUs were assessed during the winter and summer. The first set of surveys were completed on 16 March 2009 and repeated on 5 August 2009. Another set of surveys were conducted to evaluate mountain goat habitat use from 15-19 February 2010 (Rescan 2010b). The focus of the 2010 surveys was to fill gaps in the 2009 data and to assess inter-annual variability in habitat use by re-surveying two SUs studied in 2009.

In addition, the field team conducted habitat reconnaissance surveys along the proposed access roads, collected water quality samples at five locations, and collected habitat information at six fisheries sites. Unseasonably warm weather resulted in very shallow snow depths throughout the RSA. However; much of the lower elevation near Alice Arm was snow-free.

1.3.3.3 Moose

Aerial surveys for moose were conducted in winter in conjunction with surveys for mountain goats and Sitka black-tailed deer. The RSA was divided into SUs based on potential wintering habitat that could be affected by mine activities. Topographic boundaries separated each SU. The field methods followed RISC aerial survey protocols (RISC 2002) and were as follows:

- All surveys were conducted using a helicopter with two observers, a pilot, and a navigator;
- The helicopter speed averaged approximately 100 km/hr;
- The survey flight path followed a systematic pattern starting at low elevation and working upward within the SU until conditions were no longer considered to be moose winter habitat;
- Moose and moose sign were recorded and characterised. Each individual encountered was aged as calves or adults (including yearlings). Adults were distinguished by sex (cows or bulls); and
- For each animal or group of animals, observers estimated the percent (%) vegetative cover around the first animal seen in the group.

Moose surveys were conducted from 16-18 March, 2009.

1.3.3.4 Sitka Black-Tailed Deer

Priority areas for the deer inventory were defined from a desktop exercise prior to field work. Sample locations focused on areas with the lowest elevation (<300 m), around Alice Arm and its associated drainages. For this study the RSA was subdivided into the same sample units that were used for moose except one additional SU was placed on a small island at the mouth of Alice Arm. Field work was conducted using the following protocols:

- Presence / absence of deer was assessed and areas that may provide winter range were documented;
- A helicopter with two observers, a pilot, and a navigator was used;
- Helicopter speed averaged approximately 100 km/hr;
- Potential late-winter habitat within each SU, including steeper topography at lower elevations, was surveyed;
- Deer and moose surveys were conducted concurrently; and
- All evidence of deer presence was recorded.

Aerial surveys for Sitka black-tailed deer were conducted in the winter between 16-18 March 2009, in conjunction with surveys for moose and mountain goat.

1.3.3.5 Furbearers

Incidental observations of terrestrial mammals including furbearers were recorded during the Rescan 2009 surveys, as well as by field staff during other discipline surveys (Rescan 2010b). The location, date, species, number of individuals, or type of sign (scat or tracks) observed were documented.

1.3.4 Marine Mammals

The marine mammal surveys (Rescan 2010b) were conducted in the following manner:

- Boat transects were established throughout the marine LSA of Alice Arm in 2009 during the spring and fall;
- Survey speed varied from 4 to 7 knots (7 to 13 km/hr);
- The survey team consisted of three people: a port observer; a starboard observer; and a data recorder. Observers searched for marine mammals on each side of the vessel;
- Information recorded for each sighting included: time; location; approximate distance from vessel; bearing to sighting; group size; species; level of certainty of species identification; and activity;
- Weather conditions were recorded; and
- A “zig-zag” design for the transect lines was used.

The marine mammal surveys were conducted in the Alice Arm Inlet on 9-10 June 2009 and on 17-18 September 2009. A survey of the marine RSA (Observatory Inlet) was completed on 8 / 11 June 2009, and on 16 September 2009.

1.4 Results

1.4.1 Reptiles and Amphibians

Background data searches did not provide any information on amphibian or reptile species of conservation concern for the study area. Reptiles were not observed or recorded in the field. No reptile species of conservation concern are expected to occur in the terrestrial LSA. Two amphibian species of concern have the potential to be present in the study area: the western toad is of “special concern” according to COSEWIC and Blue- listed by BC CDC; and the coastal tailed frog is Blue- listed by the BC CDC.

1.4.1.1 2009 Amphibian Survey Results

During the Rescan 2009 surveys, four species of amphibians were detected (Table 1.4-1). The western toad is the only species of conservation concern identified in the LSA, and 10 individuals were recorded along the Kitsault Townsite access road outside of the LSA. The

Columbia spotted frog (*Rana luteiventris*) was the most abundant amphibian recorded during all surveys (Table 1.4-1).

Table 1.4-1: Amphibians Recorded in 2009

Common Name	Latin Name	COSEWIC Status	Provincial Status	No. Recorded
Columbia spotted frog	<i>Rana luteiventris</i>	not listed	Yellow	32
Rough-skinned newt	<i>Taricha granulosa</i>	not listed	Yellow	1
Western toad	<i>Anaxyrus boreas</i>	special concern	Yellow	10
Long-toed salamander (larvae)	<i>Ambystoma macrodactylum</i>	not listed	Yellow	1

Road transect surveys for amphibians were conducted during the evenings of 6-7 August 2009, and six western toads were detected. Four toads were observed on 5 August 2009. Amphibians were detected at large lakes, such as Patsy Lake, as well as ponds that form part of bog complexes. Western toad breeding sites were not documented, but one large lake was identified as containing suitable breeding habitat.

Rescan (2010a) classified and mapped the wetlands in the terrestrial LSA. Fen habitats are the most abundant and comprise 61% of the LSA wetlands. Fen habitats do not offer good western toad breeding habitat because many are deep and have steep drop-off banks (Rescan 2010a). This topography makes it difficult for toads to access and leave the wetland areas. The abrupt transition from aquatic to terrestrial habitat makes it difficult for the development of newly emerging toadlets / metamorphs to disperse to the surrounding terrestrial environment. In addition, these deep ponds are suspected to not have water temperatures sufficiently warm enough for western toad development before the onset of winter.

1.4.1.2 2010 Amphibian Survey Results

Table 1.4-2 presents the results of the amphibian surveys that were conducted from 26-29 June 2010.

A total of 58 Columbia spotted frogs and two western toad adults were identified within the LSA. In addition, numerous ponds and wet pools contained tadpoles and eggs.

Table 1.4-2: Amphibians Recorded During AMEC 2010 Field Surveys

Date	Number	Species	Location	UTM
26 Jun 2010	Egg masses	unknown	Pond west of Patsy Lake 1 km from lake on bird transect between C4 and C5	n/a
26 Jun 2010	4	Columbia spotted frog	Ponds north of Patsy Lake	N 0476598, E 6144023
26 Jun 2010	2	Columbia spotted frog	Ponds north of Patsy Lake	N 0476588, E 6144073
26 Jun 2010	1	Columbia spotted frog	Ponds north of Patsy Lake	N 0476537, E 6144066
26 Jun 2010	2	Columbia spotted frog	Ponds north of Patsy Lake	N 0476614, E 6144075
26 Jun 2010	1	Columbia spotted frog	Ponds north of Patsy Lake	N 0476559, E 6143838
26 Jun 2010	3	Columbia spotted frog	Ponds north of Patsy Lake	N 0476107, E 6143696
27 Jun 2010	2	Columbia spotted frog	Pond south of Patsy Lake	N 0475787, E 6142578
27 Jun 2010	1	Columbia spotted frog	Pool	N 0476808, E 6143915
27 Jun 2010	1	Tadpole	Pool	N 0476808, E 6143915
27 Jun 2010	150+	Tadpole	Pool	N 0475878, E 6143444
27 Jun 2010	20	Columbia spotted frog	Pool	N 0475878, E 6143444
27 Jun 2010	12	Columbia spotted frog	Pool	N 0476153, E 6143520
27 Jun 2010	5	Columbia spotted frog	Pool	N 0476233, E 6143556
27 Jun 2010	4	Columbia spotted frog	Pool	N 0476058, E 6143575
28 Jun 2010	1	Columbia spotted frog	Pool	N 0474970, E 6144059
28 Jun 2010	2	Western toad	Pool	N 0475110, E 6144386

Note: E - easting; km - kilometre; N - northing; n/a - not available; UTM - Universal Transverse Mercator

1.4.1.3 2010 Coastal Tailed Frog Survey Results

A coastal tailed frog survey was conducted as part of the benthic survey by AMEC in 2010. Sampling involved assessing aquatic life in six watercourses within six sample stations. No coastal tailed frogs or tadpoles were identified at any of the sample stations.

1.4.2 Birds

There is limited historical information on birds in the RSA however, based on habitat and species life requisites, 26 bird species of conservation concern could potentially occur in the Project area (Table 1.2-1). Thirteen of these species have been identified in the Project area during field surveys (Table 1.2-1).

Information collected from the North Coast LRMP (BC MSRM 2005) identifies the proposed Project LSA to be part of a management area for marbled murrelets (*Brachyramphus marmoratus*) and northern goshawk. The North Coast LRMP provides general management directions to protect habitat and individuals for these two birds.

1.4.2.1 Raptor Surveys

Raptor surveys were conducted from 22-28 June 2009 (Rescan 2010b). Three species of raptors were observed incidentally during wildlife surveys (Rescan 2010b): the bald eagle (*Haliaeetus leucocephalus*); golden eagle (*Aquila chrysaetos*); and great gray owl (*Strix nebulosa*).

Breeding was confirmed for two raptor species in the terrestrial LSA: the bald eagle; and an unidentified hawk species. No species of conservation concern (e.g., northern goshawk) were identified.

1.4.2.2 Terrestrial Bird Surveys

1.4.2.2.1 2009 Terrestrial Bird Surveys

This section summarises the results of the 2009 surveys (Rescan 2010b). A total of 42 terrestrial bird species were identified. No evidence of reproduction was observed during surveys; however, 38 of the 42 species breeding range overlaps with the RSA, while the remaining four species are unconfirmed breeders. The most commonly observed species (including incidentals) were dark-eyed junco (*Junco hyemalis*), varied thrush (*Ixoreus naevius*), Townsend's warbler (*Dendroica townsendi*), Pacific wren (*Troglodytes pacificus*), Pacific-slope flycatcher (*Empidonax difficilis*), and hermit thrush (*Catharus guttatus*).

There were no significant differences between the two BEC zones (Mountain Hemlock and Coastal Western Hemlock) for bird community diversity. However, dark-eyed juncos, Wilson's warbler (*Wilsonia pusilla*), pine siskin (*Carduelis pinus*), and gray jay (*Perisoreus canadensis*) were more commonly observed in the MH zone, while hermit thrush, Townsend's warbler, and Pacific wren were more commonly observed in the CWH zone. Bird species distribution varies with elevation changes and vegetation structural stage

diversity. Sample plots showed higher species diversity in areas of the foreshore and habitat with a complex vegetative structure (three-dimensional structure).

Two species of conservation concern were confirmed as being present within the LSA in the 2009 surveys: the olive-sided flycatcher (MH zone); and sooty grouse (MH and CWH zones). The sooty grouse was more abundant than the olive-sided flycatcher throughout the LSA. Sixteen sooty grouse individuals were recorded. Five olive-sided flycatchers were identified in the following biogeoclimatic (BGC) units:

- Mountain Hemlock moist maritime variant (MHmm2) (number (n) =1);
- Mountain Hemlock moist maritime parkland subzone (MHmmp) (n=2); and
- Coastal Western Hemlock wet subarctic submontane variant (CWHws2) (n=2).

Each individual was associated with possible breeding habitat. Sample plots showed higher species diversity in areas of the foreshore and habitat with a complex vegetative structure (three-dimensional structure) and species diversity, equitability, richness and abundance were similar in both the MH and CWH zones.

1.4.2.2.2 2010 Terrestrial Bird Surveys

Bird surveys were performed by AMEC around Patsy Lake from 23-30 June 2010. A total of 43 species of birds were identified during the transect surveys. Hermit thrush, dark-eyed junco and the varied thrush were the most abundant species recorded.

Bird abundance and species composition were characteristic of the vegetation composition and structural stage (i.e., diverse vegetation in varied structural stages contained higher diversities and numbers of songbirds). A transect north of Patsy Lake contained the highest abundance and species variation. Conversely, transects west and southwest of Patsy Lake contained the lowest variation and species composition.

Similar to 2009, two species of conservation concern were detected within the LSA: the olive-sided flycatcher (north of Patsy Lake in the same area of Rescan (2010b) surveys); and the sooty grouse (n=8). Based on bird presence and the timing of the surveys, these two species are believed to breed in the area.

1.4.2.3 Wetland Bird Surveys

Ten wetland birds were identified along lakes, ponds, or wetlands. Breeding evidence was confirmed for six of these species. They include:

- Canada goose (*Branta canadensis*);
- Barrow's goldeneye (*Bucephala islandica*);
- Northern shoveler (*Anas clypeata*);
- Mallard (*Anas platyrhynchos*);
- Pacific loon (*Gavia pacifica*); and

- Red-throated loon (*Gavia stellata*).

No wetland bird species of conservation concern were detected in the terrestrial LSA and relatively few individuals were observed (n=<100).

1.4.2.4 Marine Bird Surveys

Results of the Rescan 2009 marine bird surveys (Rescan 2010b) are summarised in this section. Thirty-five marine birds were identified to species level from a total of 5,547 individual birds recorded, either during surveys or incidentally in Alice Arm. Eighteen of the 35 species identified were diving birds, two were alcids, seven were gulls or terns, and eight were other marine-dependent birds. The five most abundant marine birds detected were surf scoters (*Melanitta perspicillata*), Canada geese, mallards, marbled murrelets, and Barrow's goldeneyes. Abundance of species was highest in the spring (n=2,317) followed by summer (n=819), winter (n=737), and fall (n=675).

Perry Peninsula, at the junction of Alice Arm and Hastings Arm support a large number of species and individual birds throughout the year, particularly during winter, spring, and fall. Alice Arm provides wintering, staging, and breeding habitat for marine birds. The coastal marine areas at the start of the passage are important areas during winter and spring. Alice Arm inlet is important during the fall, as it provides staging for ducks and marine birds, as well as habitat for marine birds throughout the year. The highest species diversity was observed near the town of Alice Arm and the boat dock, areas southwest of the boat dock along the shore and at the mouth of Roundy Creek.

The highest species richness was observed at the mouth of Alice Arm Inlet off Perry Peninsula and the north side of Davis Passage. The second highest richness was observed near Lime Creek. Equitability values indicate that the number of individuals observed per species was similar at the majority of sites. Low equitability values were observed close to the mouth of Alice Arm. Large flocks of diving marine birds such as scoter species were observed at these locations, reducing the equitability values.

High bird diversity and species richness were identified during the winter period (17-19 March 2009). Equitability values during the winter and fall indicated that the number of individuals observed per species was similar during these seasons. In contrast, there was not an equal representation of the number of individuals observed per species during the spring and summer surveys. Equitability values were lowest during the spring because, a large number of surf scoters (n=1,881 individuals) and marbled murrelets (n=154 individuals) were recorded. Eleven species of conservation concern (three COSEWIC listed species and nine provincially listed species; marbled murrelet is listed both provincially and federally), comprising 3,877 individual birds were observed during the surveys in Alice Arm. The three COSEWIC-listed species were:

- Marbled murrelet (n=233; federally listed as a threatened species protected under SARA Schedule 1, and provincially Red-listed);

- Great-blue heron *fannini* subspecies (*Ardea herodias fannini*) (n=12; federally listed as a species of special concern protected under SARA Schedule 1, and provincially Blue- listed); and
- Horned grebe (*Podiceps auritus*) (n=5; federally listed as a species of special concern protected under SARA Schedule 1, and provincially Yellow- listed).

Species recorded in 2009 that are provincially listed as potentially being at risk include:

- Marbled murrelet;
- Surf scoter;
- Red-necked phalarope (*Phalaropus lobatus*);
- Common murre (*Uria aalge*);
- Pelagic cormorant pelagicus subspecies (*Phalacrocorax pelagicus pelagicus*);
- Yellow-billed loon (*Gavia adamsii*);
- Double crested cormorant (*Phalacrocorax auritus*);
- Western grebe (*Aechmophorus occidentalis*); and
- California gull (*Larus californicus*).

The most commonly observed species of conservation concern were the provincially Blue-listed surf scoter (n=3,591) and the marbled murrelet, which is considered provincially Red-listed and federally listed as a threatened species (n=233). The majority of both surf scoters and marbled murrelets were observed during spring surveys (10-12 May 2009) throughout the inlet.

1.4.3 Terrestrial Mammals

Mammal surveys were conducted by Rescan in 2009 (Rescan 2010b). Field data were collected on the following mammals for the baseline assessment: bats, mountain goats, moose, Sitka black-tailed deer, furbearers (through incidental sightings), and marine mammals. Results of each set of surveys is presented in the following subsections, as well as results from background searches on existing information for the Project area. During 2010, a grizzly bear habitat assessment was completed by a regional specialist (MacHutchon 2011). Details regarding this survey are presented below and the final report is provided in Appendix 2 of this report.

1.4.3.1 Bats

Nine species of bat were identified as potentially occurring within the LSA (Rescan 2010b). From these, five are likely to occur and four are possible (Table 1.4-3). The amount of suitable roost habitat (more abundant within old growth forest) may be limited in the terrestrial LSA. Riparian areas provide foraging and roosting habitat for bats. Riparian areas are particularly important foraging habitat for *Myotis* species.

Bats were detected at two sites: near Clary Lake along an access road; and along the shoreline of Alice Arm near the existing barge facilities. Using ultrasonic recordings of echolocation calls, two species of bat were identified in the study area: likely the little brown myotis (*Myotis lucifugus*); and the western long-eared myotis (*Myotis evotis*). Keen’s long-eared myotis and the northern long-eared myotis may be present within the terrestrial LSA.

Table 1.4-3: Bat Species Potentially Occurring Within the Local Study Area

Common Name	Scientific Name	Likelihood of Occurrence
California myotis	<i>Myotis californicus</i>	Possible
Western long-eared myotis	<i>M. evotis</i>	Present
Keen’s long-eared myotis	<i>M. keenii</i>	Likely
Northern long-eared myotis	<i>M. septentrionalis</i>	Possible
Little brown myotis	<i>M. lucifugus</i>	Present
Long-legged myotis	<i>M. volans</i>	Possible
Yuma myotis	<i>M. yumanansis</i>	Likely
Silver-haired bat	<i>Lasionycteris noctivagans</i>	Likely
Big brown bat	<i>Eptesicus fuscus</i>	Possible

1.4.3.2 Mountain Goat

1.4.3.2.1 Background and Historical Review

Limited information is available for mountain goat winter range in the proposed Project terrestrial RSA. A single unconfirmed mountain goat population is present northeast of the proposed Project terrestrial RSA (Rescan 2010b).

The North Coast LRMP (BC MSRM 2005) provides general management direction for mountain goats with the following objectives:

- Maintaining the structural and functional quality of mountain goat habitat; and
- Minimising disruption and potential mortality to goats resulting from access (air and road).

Yazvenko et al. (2002) completed a report for wildlife in the portion of the NWA east of the RSA using a species Habitat Suitability Index (HSI) modelling approach. Some of the habitat is similar to that of the RSA. This study concluded that nearly one third of the study area did not provide any wintering habitat for mountain goat and the remaining portion was rated mostly low value (Yazvenko 2002).

1.4.3.2.2 Field Surveys

Results of the 2009 and 2010 mountain goat surveys completed by Rescan (2010b and Rescan 2010e) are summarised in this section.

During 2009 aerial surveys for mountain goat were conducted in the winter and summer within and surrounding the LSA. Seven goats (4 groups) were observed in winter and five goats (2 groups) were observed in summer. One group of goats observed in summer were in the low elevation canyon associated with the Illiance River near the confluence with Alice Arm. Although the sample sizes observed were too small to draw conclusions on goat habitat use, the terrestrial LSA does not provide good mountain goat habitat, nor does it support a large mountain goat population.

During 2010, twenty-three groups of mountain goats consisting of 46 individual animals were observed in 13 SUs (all outside of the LSA). An additional 13 goats were observed outside of the regional study area. Outside of the RSA, the south access road, along Gitwinksilkw (New Aiyansh area) to the Nass Forest Service Road (FSR), contained potential goat winter range.

1.4.3.3 Moose

1.4.3.3.1 Background and Historical Review

Moose are abundant throughout most of the plan area and are a species of management concern (BC MSRM 2005). The Nisga'a Nation and Aboriginal groups advise that they have used moose and black-tailed deer for cultural purposes. Moose are associated with riparian habitats, especially floodplains and large wetlands (BC MSRM 2005). Their winter ranges provide important forage and thermal cover during adverse weather conditions. Low elevation wetlands, floodplains or rich forests adjacent to closed canopy mature and old forests are important to moose.

The North Coast LRMP defines moose winter habitat as either primary or secondary based on available forage communities:

- **Primary**, or permanent habitats, are shrub communities that are perpetuated within a landscape due to continuous and predictable disturbances (e.g., riparian areas and avalanche tracks); and
- **Secondary**, or transient habitats, are those that exist temporarily within a landscape due to non-continuous and random disturbances, such as very deep snows, fire, or wind throw. Secondary habitats can be further subdivided into type A, which does not contain self-perpetuating forage communities, and type B, which does contain self-perpetuating communities of reduced value due to other limiting factors such as snow depth, poor connectivity or small areas (Pollard 2001).

Pollard (2001) compiled winter range maps of moose in the Alice Arm sub-region of the Prince Rupert Forest District (tributaries to Alice Arm including the Illiance and Kitsault River drainages) as part of the North Coast Forest District's LRMPs. Moose and ungulate winter range is present primarily in the Kitsault estuary and less so in the Kitsault River secondary ranges. The CWHws subzone produces higher concentrations of preferred moose winter forage species in its seral progression than other subzones found closer to the coast. This sub-region is found in the proposed Project RSA.

In the Kitsault River basin, where a number of studies have been completed, two valuable moose winter range units are generally observed: the cottonwood tree habitat; and fluvial floodplain regions. The cottonwood tree habitat provides high densities of cottonwood and diverse shrub forage within the floodplain of the Kitsault River. The Kitsault estuary is primarily used by moose as winter range, which encompasses fluvial fans and forested land adjacent to the Illiance River.

Snow at higher elevations generally limits winter use by ungulates (Pollard 2001). The upper floodplains of the Kitsault River were designated as a secondary winter range location (Pollard 2001). Little information is available on moose in the Alice Arm sub-region of the NWA, likely due to its relative isolation and lack of commercial activities.

Yazvenko et al. (2002) completed a report for wildlife in the portion of the NWA east of the RSA using a species Habitat Suitability Index (HSI) modelling approach. Some of the habitat is similar to that of the RSA and the conclusions from the report are as follows:

- For moose, the NWA contains an abundance of non-winter habitat rated at moderate or better suitability;
- There is an abundance of riparian habitat and coniferous cover which contributes to good habitat suitability for moose;
- Moderately high to high habitat suitability values are defined as mid- to high-elevation forests, interspersed with riparian habitat; and
- Clear-cuts with vigorous regeneration of conifers, abundant shrubs and deciduous species also have moderate suitability. These vegetation types form corridors of habitat with moderate to moderately high suitability values along the Nass River Valley and its major tributaries (i.e., the Cranberry, Tseax, and Kinskuch Rivers and the lower reaches of the Kiteen River), all east of the terrestrial RSA.

1.4.3.3.2 Field Surveys

Results of the moose surveys conducted in 2009 (Rescan 2010b) are summarised in this section. Groups of moose were found on slopes ranging from 0 to 58%. Six of the groups were found on slopes of <20% at lower elevations. In winter, when snowpack conditions are deeper than normal, moose become restricted to the Kitsault River and estuary.

Moose were uncommon and avoided intermediate-aged conifer stands with extremely thick canopies, such as the lowlands separating the north shore of Alice Arm from Observatory Inlet. Heavy canopy prevents growth of forage vegetation. Low numbers of moose observations are likely the result of habitat indicative of CWH and MH habitats (i.e., steep slopes with dense conifer-dominated stands that limit forage production).

Moose winter in lower elevation riparian areas of the RSA. The largest concentration of wintering moose was observed in the estuary of the Kitsault River. Low elevation areas of Alice Arm also supported some wintering moose.

The following are demographics calculated based on the data collected:

- 27 moose were identified (17 cows, 8 bulls, 1 calf, and 1 unclassified);
- Using AERIAL SURVEY™ software, population estimates indicate that the sex ratio of moose male to female was 70:100;
- Productivity in the RSA was estimated to be five calves per 100 cows;
- Habitats capable of sustaining moose include the Coastal Western Hemlock wet maritime (CWHwm), Coastal Western Hemlock wet submontane variant (CWHws1), and CWHws2 zones on slopes greater than 60%;
- Moose density was estimated to be 0.29 moose/km² for total area in the SUs and 0.49 moose/km² of capable habitat area;
- The access road from the Nass FSR to the proposed operations area appear to experience almost continuous use as a travel corridor by moose; and
- Moose use the road that accesses the LSA from the south along Gitwinksilkw (New Aiyansh area) to the Nass FSR.

1.4.3.4 Sitka Black-Tailed Deer

1.4.3.4.1 Background and Historical Review

Sitka black-tailed deer are abundant throughout most of the plan area and are a species of management concern. The Nisga'a Nation and Aboriginal groups advise that they have used black-tailed deer for cultural purposes. Black-tailed deer are associated with riparian habitats, especially floodplains and large wetlands (BC MSRM 2005). Their winter ranges provide important forage and thermal cover during adverse weather conditions. Low elevation wetlands, floodplains or rich forests adjacent to closed canopy mature and old forests are important to the black-tailed deer.

1.4.3.4.2 Field Surveys

This section summarises results of the Rescan surveys for Sitka black-tailed deer in 2009 (Rescan 2010b). Two sets of deer tracks and one deer were observed in three out of the eight SUs surveyed in 2009. One deer was observed near Pearson Point, while tracks were observed near the shoreline near Perry Peninsula and near Davis Point. The areas of deer or deer sign observations were at lower elevations, associated with steep, south facing topography or near the shoreline where snowpack was reduced. Based on the limited number of observations, the area does not appear to support a large number of deer during the winter. The absence of large tracts of mature and old growth conifer stands likely reduces the suitability of the area as winter range for deer, and may be a contributing factor to the low density of deer observed in the area.

1.4.3.5 Grizzly Bear

1.4.3.5.1 Background and Historical Review

For grizzly bear, Yazvenko et al. (2002) state that in the eastern interior of the NWA, spring and early summer offers abundant moderate- to high-suitability habitat, with the exception of the MH and Alpine tundra (AT) zones. These were rated lowest (low or very low) largely due to late snow-melt. All BGC units are rated fairly evenly. During the late summer and fall, habitat suitability in the NWA was considerably more variable than during the spring to early summer. The Kitsault mine terrestrial RSA only has MH and CWH zones. Riparian areas adjacent to salmon-bearing streams are rated as high value for this species.

Yazvenko et al. (2002) concluded that the central and east sections of the NWA likely represent little available high suitability habitat for the grizzly bear.

The terrestrial RSA is north of the Skeena-Nass Grizzly Bear Management Area. Plans prepared by the Nisga'a Nation and Aboriginal groups in the North Coast LRMP reference cultural and spiritual values connected to grizzly bears. A 2003 assessment estimated the North Coast grizzly bear population at a minimum of 227 bears (BC MSRM 2005).

Key components for coastal grizzly bear management in the North Coast LRMP outside of protection areas include (BC MSRM 2005):

- Managing motorised vehicle and aircraft access to minimise bear displacement and mortality;
- Maintaining habitat quality and quantity at multiple scales, including landscape level forage supply and critical habitats at the stand level;
- Minimising potential for bear displacement and habituation as a result of human activities such as wildlife viewing;
- Regulation of hunting levels and providing benchmark areas where hunting of bears is not permitted; and
- Minimising potential for bear-human interaction by promoting “bear awareness”.

1.4.3.5.2 Habitat Suitability Assessment

A grizzly bear regional specialist (A. Grant MacHutchon) was contracted to map and field assess important grizzly bear habitat polygons in the wildlife RSA and access road for the proposed Project. This mapping program was completed with site surveys from June 26-29, 2010. The *Kitsault Mine Project Grizzly Bear Habitat Mapping* report (MacHutchon 2011) is provided in Appendix 2. The following section summarises the results of the report.

Overall, much of the proposed Project site is of moderate (class 3) value for grizzly bear. This is mainly due to the bog / fen complexes northeast of the old Kitsault mine which is of moderate suitability for grizzly bear. Grizzly bears may occasionally use the area, most likely in the late summer or fall when food availability declines at low elevations and some bears move to higher elevations to feed on late phenology graminoids and forbs or huckleberries and blueberries. There may also be seasonal movement through the area in

spring as some grizzly bears, particularly adult males, move between the Kitsault River and the Nass River valley.

There are two human-created bear habitats within the proposed Project LSA and RSA that were not mapped, but noted in the report (Appendix 2). The old Kitsault mine pit was seeded with grass, clover and alfalfa when the mine was shut down. These seeded areas are now well-used by black bears for feeding on the graminoids and forbs, particularly in spring. There is a cleared power transmission line right-of-way (ROW) for the old Kitsault mine that goes over the divide between Alice Arm and the Nass River valley. This ROW, in places, is thick with berry-producing shrubs used by both black bears and grizzly bears. Consequently, it is expected that portions of the ROW are well-used for berry feeding by both species in summer and fall.

1.4.3.6 Furbearers

A single registered trap area (Permit No. 0614T-088) is present in the RSA. The trap area has been owned and trapped since 1994. The permit is also used for trapping at cabins at Clary Lake and Roundy Creek.

Two furbearing species of conservation concern (wolverine and fisher) could occur in the proposed Project RSA (based on the species life requisites). Ten terrestrial mammal species or their sign were observed between 16 March 2009 and 31 August 2009 (Rescan 2010b):

- Nine furbearers were identified (Table 1.4-4);
- Bones, scat, trails, and tracks were the most common sighting;
- Black bear and tracks were common throughout the LSA;
- The highest numbers of observations were along the shoreline of Alice Arm; and
- Small mammals of genii *Sorex* and *Peromyscus* were recorded incidentally but positive species identification was not possible.

Table 1.4-4: Terrestrial Mammals Incidentally Observed in 2009 (Rescan 2010b)

Common Name	Scientific Name
American marten*†	<i>Martes americana</i>
American mink†	<i>Neovision vison</i>
Bear species*†	<i>Ursus spp</i>
Black bear†	<i>Ursus americanus</i>
Cougar	<i>Puma concolor</i>
Fisher*†	<i>Martes pennanti</i>
Gray wolf*†	<i>Canis lupus</i>
Lynx*†	<i>Lynx canadensis</i>
Red fox†	<i>Vulpes vulpes</i>
Red squirrel	<i>Tamiasciurus hudsonicus</i>

Note: *Observed only through sign.
 †Furbearing species.

1.4.4 Marine Mammals

Marine mammal results for the 2009 surveys are presented as a synthesis of the two surveys in June and September (Rescan 2010b):

- During surveys in Alice Arm (marine LSA), harbour seals and harbour porpoises were observed. These two species are considered residents of Alice Arm. Harbour seals were the most frequently observed species in the spring;
- During surveys in Observatory Inlet, harbour seals, harbour porpoises, Dall's porpoises, and one humpback whale were observed. Eighty harbour seals were recorded near Fig Island (junction between Alice Arm and Hastings Arm) on 9 June 2009. Ten Dall's porpoises, 21 harbour porpoises, and 11 harbour seals were observed in Observatory Inlet the same day;
- Incidental observations included five marine mammal species in the LSA consisting of harbour porpoises, harbour seals, a sea lion species, an unidentified whale species, and river otters (along the coast in Alice Arm);
- Six marine mammal species of conservation concern potentially occur in the marine study area, and two were observed in 2009: the harbour porpoise; and humpback whale. The harbour porpoises were recorded in both the LSA and the RSA in June and September, a humpback whale was observed in the RSA in September 2009;
- While dolphins and porpoises can occur year-round in both the LSA and the RSA, their distributions tend to be related to the seasonal distributions of favoured prey. The single humpback whale observed in the RSA (Observatory Inlet) in September was likely a transient migrating through the area; and

- Although not observed, orcas may occasionally occur in the marine LSA and likely follow the salmon runs associated with Alice Arm Chinook.

1.5 Baseline Summary

The scope and focus of the baseline studies were guided by wildlife and vegetation work plans developed in consultation with technical working groups involved in the BC EAO review of the proposed Project. Baseline studies included 2009 and winter 2010 field surveys completed by Rescan (2010b) and fieldwork conducted by AMEC during the summer of 2010. The following sections summarise each family group.

1.5.1 Reptiles and Amphibians

No reptiles were recorded in the field. No reptile species of conservation concern are expected to occur in the terrestrial LSA. Only one amphibian of conservation concern was identified: the western toad. No other amphibian species of conservation concern were recorded.

1.5.2 Birds

The following conclusions can be made regarding birds:

- Twenty-six bird species of conservation concern could potentially occur in the Project area. Thirteen of these species were identified during baseline field surveys, although no reproduction evidence was observed, two species likely breed in the Project area: sooty grouse, and olive-sided flycatcher;
- The proposed Project area is part of a management area for the marbled murrelet and the northern goshawk (*A. g. laingi*), both species of conservation concern;
- Evidence of breeding activity for two species of raptor (bald eagle and an unidentified hawk) was documented through observations of nest sites, all of which were located outside the LSA. No northern goshawks were detected during call playback surveys;
- While 42 terrestrial bird species were identified, two species of conservation concern were observed: olive-sided flycatcher (federally and provincially listed) and sooty grouse (provincially listed);
- Ten wetland birds were identified along lakes, ponds, or wetlands. Breeding evidence was confirmed for six of these species including Canada goose, Barrow's goldeneye, northern shoveler, mallard, Pacific loon, and red-throated loon. None were identified as species of conservation concern; and
- The marine bird surveys recorded 35 marine bird species. Eleven species of conservation concern were observed during surveys. Three of these are both provincially and federally listed (marbled murrelet, great-blue heron *fannini* subspecies and horned grebe) while the remaining eight are provincially listed. None of these species were confirmed as breeders; however, the marbled murrelet is the only marine bird species of conservation concern likely breeding near the Project area.

1.5.3 Mammals

The following conclusions can be made about mammals:

- Two furbearing species of conservation concern could occur in the proposed Project RSA; the wolverine, and the fisher. Neither was identified during the 2009 surveys;
- Riparian areas provide foraging and roosting habitat for bats. Most activity was associated near riparian areas of Clary Lake and the shoreline of Alice Arm. Riparian areas are particularly important foraging habitat for bat species. Nine species of bat were identified as potentially occurring within the LSA. From these, five are likely to occur and four are possible;
- The terrestrial LSA does not provide good mountain goat habitat, nor does it support a large mountain goat population. However, goats do use some parts of the study area for their life requisites. Low elevation forested habitats were occupied during the summer and are considered important year-round for goats;
- Ungulates like moose and stika black-tailed deer were uncommon and avoided intermediate-aged conifer stands with extremely thick canopies such as the lowlands separating the north shore of Alice Arm from Observatory Inlet. In winter, when snowpack conditions are deeper than normal, moose become restricted to the Kitsault River and estuary. Low elevation areas of Alice Arm also supported some wintering moose. The largest concentration of wintering moose was observed in the estuary of the Kitsault River;
- Grizzly bear habitat is of moderate value in the Project study area. Transient grizzly bears may occasionally use the site during the late summer and fall when food availability at low elevations declines. Two human-made habitats were of value to bears, including the reclaimed Old Kitsault mine pit area due to the seeded alfalfa, clover and grass, and the existing transmission line right-of-way, which is thick with berry producing shrubs.
- The marine mammal surveys recorded incidental observations of five marine mammal species including harbour porpoises, harbour seals, a sea lion species, an unidentified whale species, and river otters. Seven species of conservation concern could occur in the marine LSA, and two were observed: harbour porpoise, and humpback whale. Although not observed, orcas may occasionally occur in the marine study area and likely follow the salmon runs associated with Alice Arm Chinook.

REFERENCES

- Biodiversity Atlas. 2010. <http://biodiversityatlas.org/>. (accessed December 2010).
- British Columbia Breeding Bird Atlas. 2010. <http://www.birdatlas.bc.ca/english/index.jsp>. (accessed December 2010).
- British Columbia Conservation Data Centre (BC CDC). 2010. <http://www.env.gov.bc.ca/cdc/>. (accessed November 2010).
- British Columbia Integrated Land Management Bureau (BC ILMB). 2009a. Central and North Coast Ecosystem Based Management Implementation. <http://archive.ilmb.gov.bc.ca/slrp/lrmp/nanaimo/cencoast/plan/objectives/index.html>. (accessed December 2010).
- BC ILMB. 2009b. Nass South Sustainable Resource Management Plan (Public Review Draft - March 2009). Integrated Land Management Bureau, Skeena Region.
- British Columbia Ministry of Aboriginal Relations and Reconciliation. 2000. Nisga'a Final Agreement. <http://www.gov.bc.ca/arr/firstnation/nisgaa/default.html>.
- British Columbia Ministry of Environment (BC MOE). 2010a. Cross-linked Information Resources. <http://www.env.gov.bc.ca/clir/>. (accessed December 2010).
- BC MOE. 2010b. Ecocat. Information on past species and habitat inventories. <http://www.env.gov.bc.ca/ecocat>. (accessed December 2010).
- BC MOE. 2010c. Species and Ecosystems Explorer. <http://www.env.gov.bc.ca/atrisk/toolintro.html>. (accessed November 2010).
- BC MOE. 2010d. Species Inventory Web Explorer. <http://www.env.gov.bc.ca/wildlife/wsi/siwe.htm>. (accessed December 2010).
- British Columbia Ministry of Sustainable Resource Management (BC MSRM). 2005. North Coast Land and Resource Management Plan: Final Recommendations (February 2005). Ministry of Sustainable Resource Management, Skeena Region.
- Chesser, Terry, R., et al. 2010. Fifty first supplement to the American Ornithologists' Union checklist of North American birds. *Auk* 127(3):726-744, 2010.
- Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2010. http://www.cosewic.gc.ca/eng/sct0/index_e.cfm. (accessed November 2010).
- Demarchi, Mike W. 2000. Moose in the Nass Wildlife Area (Final Report). LGL Limited, Environmental Research Associates (June 2000).
- Government of BC (Gov BC). 1996a. *Mines Act*. R.S.B.C. 1996. Chapter 293.
- Gov BC. 1996b. *Wildlife Act*. RSBC 1996. Chapter 293.
- Gov BC. 2002a. *Environmental Assessment Act*. S.B.C. 2002. Chapter 43.
- Gov BC. 2002b. *Forest and Range Practices Act*. S.B.C 2002. Chapter 69.

- Government of Canada. 1992. *Canadian Environmental Assessment Act*. S.C. 1992, c.37 C-15.2.
- Government of Canada. 2002. *Species at Risk Act*. S.C. 2002. C.29.
- Hectares BC. 2010. <http://www.hectaresbc.org:22080/app/habc/HaBC.html>. (accessed December 2010).
- Keim, Rick. 2010. Personal communication. Ecosystem Biologist Skeena Region, BC MOE.
- MacHutchon, A.G. 2011. Kitsault Mine Project Grizzly Bear Habitat Mapping. Nelson, BC.
- Meidinger, D.V., and J. Pojar. 1991. *Ecosystems of British Columbia*. Special Report Series 6, British Columbia Ministry of Forests, Victoria, B.C. ISBN 0843-6452.
- Ralph, C. J., S. Droege, and J. R. Sauer. 1995. Managing and monitoring birds using point counts: standards and applications. In *Monitoring Bird Populations by Point Counts*. Ed. J. R. S. C.J. Ralph, and S. Droege. 161-68. Albany, California.: Pacific Southwest Research Station.
- Pollard, Brad T. 2001. Moose Winter Range Mapping in the North Coast Forest District.
- Rescan. 2010a. Kitsault Project: 2009 Wetlands Baseline Report. Vancouver, BC: Prepared for Avanti Mining Inc. by Rescan Environmental Services Ltd.
- Rescan. 2010b. Kitsault Project: Wildlife Characterization Baseline. Vancouver, BC: Prepared for Avanti Mining Inc. by Rescan Environmental Services Ltd. (June 2010).
- Rescan. 2010c. Nisga'a Nation Overview Report – Interim Report for Review by Nisga'a Nation.
- Rescan. 2010d. Vegetation and Ecosystem Mapping Baseline Report. Vancouver, BC: Prepared for Avanti Mining Inc. by Rescan Environmental Services Ltd.
- Rescan. 2010e. Trip Report Memo for Kitsault Wildlife Survey from February 15 to 21, 2010.
- Resource Information Standards Committee (RISC). 1998a. Inventory Methods for Bats. Standards for Components of British Columbia's Biodiversity No. 20. Version 2.0. February 1998). Prepared by Ministry of Environment, Lands and Parks, Resources Inventory Branch for Terrestrial Ecosystem Task Force, Resources Inventory Committee.
- RISC. 1998b. Inventory Methods for Pond-breeding Amphibians and Painted Turtle. Standards for Components of British Columbia's Biodiversity No. 37. Victoria, BC: Prepared by Ministry of Environment, Lands and Parks, Resources Inventory Branch for the Terrestrial Ecosystem TaskForce, Resources Information Committee.
- RISC. 1999. British Columbia wildlife habitat rating standards. Prepared by Ministry of Environment, Lands and Parks Resources Inventory Branch for the Terrestrial Ecosystems Task Force Resources Inventory Committee (Version 2.0).

- RISC. 2002. Aerial-based Inventory Methods for Selected Ungulates: Bison, Mountain Goat, Mountain Sheep, Moose, Elk, Deer & Caribou. Standards for Components of British Columbia's Biodiversity No. 32. Victoria, BC: Prepared by Ministry of Environment, Lands and Parks, Resources Inventory Branch for Terrestrial Ecosystem Task Force, Resources Inventory Committee.
- Royal BC Museum. 2010. Living Landscapes. <http://.livinglandscapes.bc.ca>. (accessed 2010).
- Species at Risk Public Registry. http://sararegistry.gc.ca/default_e.cfm. (accessed December 2010).
- University of British Columbia. 2010. E-Fauna - BC Electronic Atlas of the Wildlife of BC. <http://www.geog.ubc.ca/biodiversity/efauna/> (accessed December 2010).
- Yazvenko, Sergei B., Gary F. Searing, and Mike W. Demarchi. 2002. Wildlife habitat assessment in the Nass Wildlife Area (Revised). LGL Limited, Environmental Research Associates, June 2002.